

**Supplement C—
Welder
Performance
Qualification
Sheet Metal Test
Requirements**



Key Words — AWS Certified Welders, sheet metal welding, welders, welder certification, welder qualification

AWS QC7-93, Supplement C

Welder Performance Qualification Sheet Metal Test Requirements

Developed by
AWS Qualification and Certification Committee

Under the Direction of
AWS Education and Certification Council

Approved by
AWS Board of Directors
April 4, 1994

Abstract

This Supplement C to AWS Standard QC7, *Standard for AWS Certified Welder Program*, describes testing administered by Accredited Test Facilities to the requirements of AWS QC4-89, *Standard for Accreditation of Test Facilities for AWS Certified Welder Program*. The welder performance testing for this Supplement was developed using ANSI/AWS D9.1, *Sheet Metal Welding Code*, as reference.



American Welding Society

550 N.W. LeJeune Road, Miami, Florida 33126

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Foreword

(This Foreword is not a part of Supplement C to AWS QC7-93, *Standard for AWS Certified Welders*, but is included only for information.)

The American Welding Society (AWS) Certified Welder Program is established to identify all elements necessary to implement a National Registry of Certified Welders. Four key elements are identified:

- (1) Welder performance qualification standards
- (2) Standard welding procedure specifications
- (3) Accredited performance qualification test facilities
- (4) AWS welder certification requirements

Supplement C, *Welder Performance Qualification Sheet Metal Test Requirements and AWS QC7-93, Standard for AWS Certified Welders*, contain the criteria for AWS Certified Welder Program and the AWS National Registry of Welders. Public listing or disclosure is at the option of the individual welder. It is expected that all four elements outlined above will allow the transfer of welder qualification from employer to employer. This potential transfer of welder qualification can affect financial savings to the welding industry.

The purpose of the QC7-93 is to document the ability of welders to deposit sound welds in accordance with standardized requirements and to impose sufficient controls on the documentation and maintenance of certification to allow transfer between employers without requalification, where allowed by Standard or Contract documents.

Supplement C shall be used in conjunction with AWS QC7-93. This Supplement C is not a standard unto itself and shall be considered only as a supplementary part of AWS QC7-93. The intent of this supplement is to provide welder performance test data to the industry that all employers may use without retesting each welder.

This supplement does not apply to employers that conduct welder qualification tests for their own employees in accordance with ANSI/AWS D9.1, *Sheet Metal Welding Code*. Supplement C to AWS QC7-93 specifies requirements intended to provide an *alternative* welders certification method to comply with the requirements of ANSI/AWS D9.1.

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Supplement C

Welder Performance Qualification

Sheet Metal Test Requirements

C1. Scope

This Supplement C to AWS QC7-93, *Standard for AWS Certified Welders*, specifies requirements intended to provide an alternative welders certification method. The rules for performance qualification are defined in ANSI/AWS D9.1, *Sheet Metal Welding Code*. When the term certified welder is used it shall also denote "welding operator."

C1.1 Program. The administrative rules for the American Welding Society (AWS) Certified Welder Program and the requirements for maintenance of certification are provided in AWS QC7-93, *Standard for AWS Certified Welders*. Test facilities participating in the program are required to meet AWS QC4, *Standard for Accreditation of Test Facilities for AWS Certified Welder Program*.

C1.2 Exclusion. Neither AWS QC7-93 nor this Supplement C prevents or supersedes a Contractor from continuing to qualify welders in accordance with ANSI/AWS D9.1 or other standards. Employers may impose supplementary requirements in addition to this standard.

C1.3 Limitation. Welders participating in the AWS Certified Welder Program shall be limited to those welding essential variables defined in the applicable Performance Tests Descriptions.

C1.4 Safety Precautions. This document is not intended to address safety and health matters regarding the training of certified welders. This document only covers the rules of certification of welders to AWS QC7-93.

C2. Definitions

The terms used in this Supplement C are defined in AWS QC7-93 and ANSI/AWS A3.0, *Standard Welding Terms and Definitions*, except as follows:

Employer. The term is used collectively to mean contractor, fabricator, erector or manufacturer.

C3. Responsibilities Regarding AWS Certified Welders

C3.1 Employer Responsibility. The employers of AWS Certified Welders are responsible for the work performed by their employees. The employers may accept the AWS certification without additional testing or may add requirements as deemed necessary to meet their particular need.

C3.2 Employer Obligation. Companies who employ AWS certified welders should be fully aware of the provisions of the AWS QC7-93 standard and of this Supplement C.

C3.2.1 Employers should specifically note the extent of qualification as stated on the AWS welder certification card.

C3.2.2 The employer shall obtain a copy of the Performance Qualification Test Record from the AWS Qualification and Certification Department.

C3.2.3 The welders current status shall be checked with the Qualification and Certification Department.

C3.2.4 The employer shall maintain a record of performance for all welders during their periods of employment. The backup record to be filed with the employer's certification shall be the completed Performance Test Description and Limitation of Variables form prepared by the Accredited Test Facilities. A suggested certification record is shown in Form QC-WFC1, Welder Qualification Test Record.

C3.2.5 The Employer is responsible for all work performed by their employees; and therefore, should verify that the qualification(s) apply to each employee's work.

C3.2.6 The use of these qualifications may require the approval of the Engineer or Owner. The employer shall obtain such approval when required.

C3.3 Qualification and Certification Department Responsibilities. The Qualification and Certification Department shall complete the responsibilities defined in AWS QC7-93, 3.3.

C3.4 Test Facility Responsibilities. The Test Facility is responsible for safety and health matters during testing at that location in addition to other requirements stated herein.

C4. Provisions for Testing

C4.1 Welding Procedure Specification (WPS). The WPSs incorporated in this Supplement C shall be used to qualify welders to this standard. The WPSs in this supplement are for qualification of welders. Production welding procedures shall be provided by employers in accordance with AWS D9.1.

C4.2 Test Facilities. The Test Facilities for this AWS Welder Certification program shall comply with the requirements of AWS QC7-93, 4, Provisions for Testing. The Test Facility shall have been accredited according to AWS QC4, *Standard for Accreditation of Test Facilities for AWS Certified Welder Program*.

C5. Certification Requisites

C5.1 Test Control

C5.1.1 Performance qualification test coupons shall be welded in accordance with a written WPS and the Performance Test Description.

C5.1.2 Performance Test Descriptions include welding variables and define the limits of qualification for each test.

C5.2 Test Supervisor

C5.2.1 Qualification testing shall be performed under the direction of a person designated as the Test Super-

visor in accordance with AWS QC4, *Standard for Accreditation of Test Facilities for AWS Certified Welder Program*.

C5.2.2 The Test Supervisor shall be responsible for the performance qualification in accordance with this Supplement C.

C5.2.3 If during qualification testing, the Test Supervisor determines that the welder does not exhibit the skill to perform the test satisfactorily, the test may be terminated.

C5.2.4 The Test Supervisor may allow a welder to retest immediately or may require additional training or practice prior to retesting in accordance with C7, Retests.

C5.2.5 The Test Supervisor shall be responsible for enforcement of test shop safety rules, procedures, and cleanliness, as established by the Test Facility QA Manual.

C5.3 Test Facility. The Test Facility conducts the qualification tests and prepares the test reports. The American Welding Society issues the certification.

C6. Performance Test

C6.1 Identification. The applicant shall be assigned an identification letter, symbol or number, and this identifier shall be marked on the test materials and records.

C6.2 Verification. Prior to the initiation of welding, the applicant's photographic identification shall be verified by the Test Supervisor.

C6.3 Safety Equipment. The applicant shall use personal safety equipment applicable for the welding process. The safety requirements of the Accredited Test Facility shall conform to the requirements of ANSI/ASC Z49.1.

C6.4 Machine Adjustment. Before starting the qualification test, the welder shall adjust the machine settings to meet those of the WPS.

C6.5 Material Check. The base material and filler metal identifications shall be verified by the Test Supervisor prior to tack welding.

C6.6 Fit-Up. The applicant shall assemble the specified test assembly(ies) for welding in accordance with the WPS. The test assembly shall be verified by the Test Supervisor. The Test Supervisor shall inspect each test assembly prior to welding in accordance with AWS D9.1.

C6.7 Assembly Control. The Test Supervisor shall witness the placing of each test assembly in the specified welding position and shall mark the test assembly, or secure it, so that it remains in the specified position until welding has been completed.

C6.8 Positioning. All cleaning, grinding, chipping of slag or other in-process operations shall be performed

with the test assembly in the specified welding position. Evidence of removal of the test assembly or movement from the original location, except by accidental means (subject to concurrence by the Test Supervisor), shall be cause for test termination.

C6.9 Eye Correction. The Test Supervisor shall note the use of and type of eye correction on the Welder Qualification Test Record. The welder's certification card shall also reflect eye correction use.

C6.10 Power Tools. Any use, or lack of use, of power tools shall be noted on the Welding Qualification Test Record by the Test Supervisor.

C7. Examination Methods and Acceptance Standards

C7.1 All additional tests required by ANSI/AWS D9.1 shall be conducted under the supervision of the Test Supervisor.

C7.2 Visual Examination. The test plates shall meet the visual acceptance criteria for performance testing as defined in ANSI/AWS D9.1. The visual examination shall be performed by a current CWI without aid of magnification.

C8. Retests

If the welder performance test fails to meet the requirements a retest of each test failed may be allowed under the following conditions:

C8.1 Immediate Retest. No more than three immediate retests shall be permitted. The retest specimens shall meet all of the specified requirements.

C8.2 Retest after Further Training or Practice. A retest may be made, provided there is evidence that the welder has had further training or practice. A complete retest of the types and positions failed shall be made.

C9. Documentation of Welder Performance Qualification

The performance qualification data and results of the examination and testing shall be recorded on QC-WF1C. Records of applicants that meet the requirements shall be processed in accordance with AWS QC7-93.

C10. Period of Effectiveness

C10.1 The period of certification is twelve months. The period begins on the date of completion of the examina-

tion results and signature by the Test Supervisor. Thereafter, the certification shall be considered as remaining in effect indefinitely unless:

(1) the welder is not engaged in a given welding process for which the welder is certified for a period exceeding twelve months unless otherwise specified by ANSI/AWS D9.1, or

(2) there is some specific reason to question the welder's ability.

C10.2 Indefinite certification in accordance with C10 may be maintained by documenting the use of the welding process in accordance with C12, Maintenance of Certification.

C11. Identification/Certification Documents

The welder certification card is issued by AWS in accordance with AWS QC7-93.

C12. Maintenance of Certification

Welders may maintain their certification indefinitely by verifying the use of the welding process(es). The use of the process(es) shall be verified by the welder submitting completed forms required in AWS QC7-93, 11, Maintenance and Certification each year as a minimum. Such forms shall be postmarked prior to the expiration of certification. The certification expiration date is extended for a period of 12 months, as defined in ANSI/AWS D9.1 from the date of the last use of the process(es), as documented on Form QC-WF3A, received and accepted by the AWS Qualification and Certification Department.

After the certification period has expired, without the welder using the process, a single test need be made only in any thickness for each process in which the welder is qualified. Successful completion of such test restores all of the previous qualifications for the process tested.

C13. Renewal of Certification

Renewal of certifications shall be in accordance with AWS QC7-93, 12, Renewal of Certification.

C14. Revocation

The AWS Certification of a welder may be revoked in accordance with the administrative procedures defined in AWS QC7-93, 13, Revocation.

WELDER AND WELDING OPERATOR PERFORMANCE QUALIFICATION TEST RECORD

Qualification Test Performed

Name _____	WPS Number _____
I.D. No. _____	Base Metal _____
Date of Test _____	Gauge _____
Test Position _____	Square groove (butt joint) _____
Shield gas used _____	Code <u>ANSI/AWS D9.1</u> _____
Eye correction used <input type="checkbox"/> Yes <input type="checkbox"/> No	Performance Test Description No. _____
Power tools used <input type="checkbox"/> Yes <input type="checkbox"/> No	

Essential Variables Qualified by Test

Type of base metal _____	Welding process _____
Thickness <input type="checkbox"/> Min <input type="checkbox"/> Max	Method of application <input type="checkbox"/> Manual <input type="checkbox"/> Semiautomatic
Uncoated Sheet <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Automatic
Coating material on sheet <input type="checkbox"/> Yes <input type="checkbox"/> No	Mode of transfer (GMAW) _____
Backing material _____	Welding Current <input type="checkbox"/> ac <input type="checkbox"/> dce <input type="checkbox"/> dcep
Filler metal specification _____	Shield gas used _____
Filler Metal Classification _____	Positions qualified <input type="checkbox"/> Flat <input type="checkbox"/> Horizontal <input type="checkbox"/> Vertical <input type="checkbox"/> Overhead

Visual Inspection Results

Condition	Acceptable	Unacceptable
Complete fusion	_____	_____
Complete joint penetration	_____	_____
Maximum face and root reinforcement — 1/8 in.	_____	_____
No more than one visible pore per in. of weld	_____	_____
Maximum pore or inclusion size — 0.25 t where t = base metal thickness	_____	_____
No undercut exceeding 0.15 t for t less than or equal to 0.187 in.	_____	_____
No undercut exceeding 0.25 t for t greater than 0.187 in.	_____	_____
No cracks	_____	_____

Date Tested _____	Signed By _____ Test Supervisor
Test Facility _____	AWS CWI No. _____
Test Facility No. _____	Date Signed _____

MAINTENANCE OF CERTIFICATION

Name _____ I.D. # _____

Enter date of last use of each of the following process(es):

SMAW _____ FCAW _____ GTAW _____

GMAW _____ SAW _____ Other _____

CERTIFICATION IS EXTENDED FROM DATE INDICATED ABOVE

Employer/Test Supervisor/Customer (circle one) Verification: We certify that the above named welder used the processes on the dates indicated.

Print Name _____ Title _____

Company Name _____ Phone _____

Signature _____ Date _____

WE RECOMMEND SENDING "U.S. MAIL, RETURN RECEIPT REQUESTED."

**AWS QC7-93 Supplement C
Performance Test Description C-1
GMAW 18 Gauge Coated Steel**

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A526 CQ G90 or A527 LFG G90 **Coating Type:** Galvanized

Material Form: Sheet — 3" x 6" **Thickness:** 18 Gauge

Filler Metal: ANSI/AWS A5.18, Class ER-70S-X (F Number 6)

Weld Joint Detail: Square butt, root opening (R) = 0 – 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 4G

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS) No.: QC7-93, C-1-O

Welding Technique: Single pass

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Electrode Extension: 1/4 to 1/2 in.

Test Required: Visual inspection per ANSI/AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: Gas metal arc welding (GMAW) — semiautomatic/automatic transfer mode — short circuiting

Base Metal: Galvanized or uncoated carbon steel (See ANSI/AWS D9.1)

Material Form: Sheet

Backing: With or without

Groove Weld Thickness: 16 Gauge and thinner

Fillet Weld Size: Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.18, (F Number 6)

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Positions: All groove and fillet

Vertical Welding Progression: Up or down

Welding Procedure Specification (WPS)

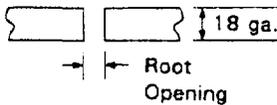
WPS Number C-1 Supported by PQR No.(s) WRC¹, 047A, 050A, 051B, 052B²
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A526CQ G90 or A527LFQ G90, galvanized
 Metal thickness 18 Gauge (0.0516 in., 1.31 mm)
 Coating type Galvanized G90
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 4G Overhead Welding Progression: N/A
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.18
 Filler metal class ER70S-X (F Number 6)
 Electrical Characteristics dcep Electrode Extension 1/4 to 1/2 in.
 Mode of transfer Short circuit
 Shielding gas/combination 75% Argon, 25% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	50-130	100-230	15-17	As Required	 <p style="text-align: center;">18 ga. Root Opening</p> <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

AWS QC7-93 Supplement C
Performance Test Description C-2
GMAW 18 Gauge Coated Steel

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A526 CQ G90 or A527 LFQ G90 **Coating Type:** Galvanized

Material Form: Sheet — 3" x 6" **Thickness:** 18 Gauge

Filler Metal: ANSI/AWS A5.18, Class ER-70S-X (F Number 6)

Weld Joint Detail: Square butt, root opening (R) = 0 – 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 3G

Vertical Welding Progression: Down

Welding Procedure Specification (WPS) No.: QC7-93, C-2-V

Welding Technique: Single pass

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Electrode Extension: 1/4 to 1/2 in.

Test Required: Visual inspection per ANSI/AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: Gas metal arc welding (GMAW) — semiautomatic/automatic transfer mode — short circuiting

Base Metal: Galvanized or uncoated carbon steel (See ANSI/AWS D9.1)

Material Form: Sheet

Backing: With or without

Groove Weld Thickness: 16 Gauge and thinner

Fillet Weld Size: Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.18, (F Number 6)

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Positions: Flat, horizontal and vertical groove and fillet

Vertical Welding Progression: Up or down

Welding Procedure Specification (WPS)

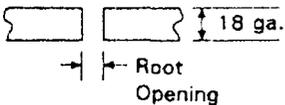
WPS Number C-2 Supported by PQR No.(s) WRC¹, 047A, 050A, 051B, 052B²
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A526CQ G90 or A527LFQ G90, galvanized
 Metal thickness 18 Gauge (0.0516 in., 1.31 mm)
 Coating type Galvanized G90
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 3G Vertical Welding Progression: Down
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.18
 Filler metal class dcep
 Electrical Characteristics dcep Electrode Extension 1/4 to 1/2 in.
 Mode of transfer Short circuit
 Shielding gas/combination 75% Argon, 25% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	50-130	100-230	15-17	As Required	 <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

AWS QC7-93 Supplement C
Performance Test Description C-3
GMAW Coated Steel

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A526 CQ G90 or A527 LFQ G90 **Coating Type:** Galvanized

Material Form: Sheet — 3" x 6" **Thickness:** 18 Gauge

Filler Metal: ANSI/AWS A5.18, (F Number 6)

Weld Joint Detail: Square butt, root opening (R) = 0 – 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 1G

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS) No.: QC7-93, C-3-F

Welding Technique: Single pass

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Electrode Extension: 1/4 to 1/2 in.

Test Required: Visual inspection per ANSI/AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: Gas metal arc welding (GMAW) — semiautomatic/automatic transfer mode — short circuiting

Base Metal: Galvanized or uncoated carbon steel (See ANSI/AWS D9.1)

Material Form: Sheet

Backing: With or without

Groove Weld Thickness: 16 Gauge and thinner

Fillet Weld Size: Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.18, (F Number 6)

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Positions: Flat groove and fillet

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS)

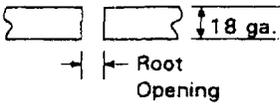
WPS Number C-3 Supported by PQR No.(s) WRC', 047A, 050A, 051B, 052B'
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A526CQ G90 or A527LFQ G90, galvanized
 Metal thickness 18 Gauge (0.0516 in., 1.31 mm)
 Coating type Galvanized G90
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 1G Flat Welding Progression: N/A
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.18
 Filler metal class ER70S-X
 Electrical Characteristics dcep Electrode Extension 1/4 to 1/2 in.
 Mode of transfer Short circuit
 Shielding gas/combination 75% Argon, 25% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	50-130	100-230	15-17	As Required	 <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

**AWS QC7-93 Supplement C
Performance Test Description C-4
GMAW Coated Steel**

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A526 CQ G90 or A527 LFQ G90 **Coating Type:** Galvanized

Material Form: Sheet — 3" x 6" **Thickness:** 10 Gauge

Filler Metal: ANSI/AWS A5.18, Class ER-70S-X (F Number 6)

Weld Joint Detail: Square butt, root opening (R) = 0 – 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 4G

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS) No.: QC7-93, C-4-0

Welding Technique: Single pass

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Electrode Extension: 1/4 to 1/2 in.

Test Required: Visual inspection per ANSI/AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: Gas metal arc welding (GMAW) — semiautomatic/automatic transfer mode — short circuiting

Base Metal: Galvanized or uncoated carbon steel (See ANSI/AWS D9.1)

Material Form: Sheet

Backing: With or without

Groove Weld Thickness: 16 Gauge to 0.276 in.

Fillet Weld Size: Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.18, (F Number 6)

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Positions: All groove and fillet

Vertical Welding Progression: Up or down

Welding Procedure Specification (WPS)

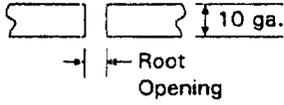
WPS Number C-4 Supported by PQR No.(s) WRC¹, 048A, 049A, 053A, 054B, 055B²
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A526CQ G90 or A527LFQ G90, galvanized
 Metal thickness 10 Gauge (0.1382 in., 3.51 mm)
 Coating type Galvanized G90
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 4G Overhead Welding Progression: N/A
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.18
 Filler metal class ER70S-X
 Electrical Characteristics dcep Electrode Extension 1/4 to 1/2 in.
 Mode of transfer Short circuit
 Shielding gas/combination 75% Argon, 25% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	75-150	120-280	18-20	As Required	 <p style="text-align: center;">→ ← Root Opening</p>
Note: Root Opening = 0-1/2t					

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

AWS QC7-93 Supplement C
Performance Test Description C-5
GMAW Coated Steel

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A526 CQ G90 or A527 LFQ G90 **Coating Type:** Galvanized

Material Form: Sheet — 3" x 6" **Thickness:** 10 Gauge

Filler Metal: ANSI/AWS A5.18, Class ER-70S-X (F Number 6)

Weld Joint Detail: square butt, root opening (R) = 0 - 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 3G

Vertical Welding Progression: Down

Welding Procedure Specification (WPS) No.: QC7-93, C-5-V

Welding Technique: Single pass

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Electrode Extension: 1/4 to 1/2 in.

Test Required: Visual inspection per ANSI/AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: Gas metal arc welding (GMAW) — semiautomatic/Automatic transfer mode — short circuiting

Base Metal: Galvanized or uncoated carbon steel (See ANSI/AWS D9.1)

Material Form: Sheet

Backing: With or without

Groove Weld Thickness: 16 Gauge to 0.276 in.

Fillet Weld Size: Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.18, (F Number 6)

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Positions: Flat, horizontal and vertical groove and fillet

Vertical Welding Progression: Up or down

Welding Procedure Specification (WPS)

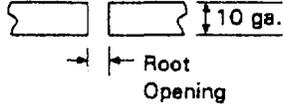
WPS Number C-5 Supported by PQR No.(s) WRC¹, 048A, 049A, 053A, 054B, 055B²
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A526CQ G90 or A527LFQ G90, galvanized
 Metal thickness 10 Gauge (0.1382 in., 1.31 mm)
 Coating type Galvanized G90
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 3G Vertical Welding Progression: Down
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.18
 Filler metal class ER70S-X
 Electrical Characteristics dcep Electrode Extension 1/4 to 1/2 in.
 Mode of transfer Short circuit
 Shielding gas/combination 75% Argon, 25% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	75-150	120-280	18-20	As Required	 <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

AWS QC7-93 Supplement C
Performance Test Description C-6
GMAW Coated Steel

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A526 CQ G90 or A527 LFQ G90 **Coating Type:** Galvanized

Material Form: Sheet — 3" x 6" **Thickness:** 10 Gauge

Filler Metal: ANSI/AWS A5.18, Class ER-70S-X (F Number 6)

Weld Joint Detail: square butt, root opening (R) = 0 – 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 1G

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS) No.: QC7-93, C-6-F

Welding Technique: Single pass

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Electrode Extension: 1/4 to 1/2 in.

Test Required: Visual inspection per ANSI/AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: Gas Metal Arc Welding (GMAW) — semiautomatic/automatic transfer mode — short circuiting

Base Metal: Galvanized or uncoated carbon steel (See ANSI/AWS D9.1)

Material Form: Sheet

Backing: With or Without

Groove Weld Thickness: 16 Gauge to 0.276 in.

Fillet Weld Size: Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.18, (F Number 6)

Current: dcep

Shielding Gas: 75% Argon, 25% Carbon dioxide

Positions: Flat groove and fillet

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS)

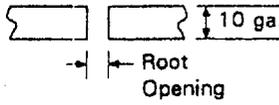
WPS Number C-6 Supported by PQR No.(s) WRC¹, 048A, 049A, 053A, 054B, 055B²
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A526CQ G90 or A527LFQ G90, galvanized
 Metal thickness 10 Gauge (0.1382 in., 3.51 mm)
 Coating type Galvanized G90
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 1G Flat Welding Progression: N/A
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.18
 Filler metal class ER70S-X
 Electrical Characteristics dcep Electrode Extension 1/4 to 1/2 in.
 Mode of transfer Short circuit
 Shielding gas/combination 75% Argon, 25% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	75-150	120-280	18-20	As Required	 <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

AWS QC7-93 Supplement C
Performance Test Description C-7
GMAW Stainless Steel

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A167 or A240, Type 3xx **Coating Type:** None

Material Form: Sheet — 3" x 6" **Thickness:** 18 Gauge

Filler Metal: ANSI/AWS A5.9, Class ER-3xx (F Number 6)

Weld Joint Detail: Square butt, root opening (R) = 0 – 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 4G

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS) No.: QC7-93, C-7-0

Welding Technique: Single pass

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Electrode Extension: 1/4 to 3/8 in.

Test Required: Visual inspection per ANSI/AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: gas metal arc welding (GMAW) — semiautomatic/automatic transfer mode — short circuiting

Base Metal: Chromium and chromium nickel steel (uncoated) (See ANSI/AWS D9.1)

Material Form: Sheet **Backing:** With or without

Groove Weld Thickness: 16 Gauge and thinner **Fillet Weld Size:** Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.9, (F Number 6)

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Positions: All groove and fillet

Vertical Welding Progression: Up or down

Welding Procedure Specification (WPS)

WPS Number C-7 Supported by PQR No.(s) WRC¹, 068A, 070A, 074A, 075B, 076A

WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A167 or A240 type 3XX

Metal thickness 18 Gauge (0.0500 in., 1.27 mm)

Coating type None

Joint preparation Shall be free of loose scale, rust, grease or foreign matter

Backing material None

Position of welding 4G Overhead Welding Progression: N/A

Welding process GMAW

Manual, semiautomatic, or automatic Semiautomatic

Filler metal spec. ANSI/AWS A5.9

Filler metal class ER-3XX

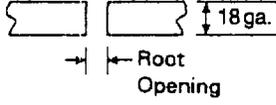
Electrical Characteristics dcep Electrode Extension 1/4 to 3/8 in.

Mode of transfer Short circuit

Shielding gas/combination 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	60-100	120-210	16-19	As Required	 <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

AWS QC7-93 Supplement C
Performance Test Description C-8
GMAW Stainless Steel

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A167 or A240, Type 3XX **Coating Type:** None

Material Form: Sheet — 3" x 6" **Thickness:** 18 Gauge

Filler Metal: ANSI/AWS A5.9, Class ER-3XX (F Number 6)

Weld Joint Detail: Square butt, root opening (R) = 0 – 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 2G

Vertical Welding Progression: Down

Welding Procedure Specification (WPS) No.: QC7-93, C-8-V

Welding Technique: Single pass

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Electrode Extension: 1/4 to 3/8 in.

Test Required: Visual inspection per ANSI/AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: gas metal arc welding (GMAW) — semiautomatic/automatic transfer mode — Short circuiting

Base Metal: Chromium and chromium nickel steel (See ANSI/AWS D9.1)

Material Form: Sheet

Backing: With or without

Groove Weld Thickness: 16 Gauge and thinner

Fillet Weld Size: Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.9, (F Number 6)

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Positions: Flat, horizontal and vertical groove and fillet

Vertical Welding Progression: Up or Down

Welding Procedure Specification (WPS)

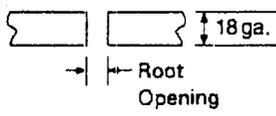
WPS Number C-8 Supported by PQR No.(s) WRC¹, 068A, 070A, 074A, 075A, 076A²
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A167 or A240 Type 3XX
 Metal thickness 18 Gauge (0.0500 in., 1.27 mm)
 Coating type None
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 3G Vertical Welding Progression: Down
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.9
 Filler metal class ER-3XX
 Electrical Characteristics dcep Electrode Extension 1/4 to 3/8 in.
 Mode of transfer Short circuit
 Shielding gas/combination 90% Helium, 7.5% Argon, 2.5% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	60-100	120-210	16-19	As Required	 <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

AWS QC7-93 Supplement C
Performance Test Description C-9
GMAW Stainless Steel

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A167 or A240 Type 3XX **Coating Type:** None

Material Form: Sheet — 3" x 6" **Thickness:** 18 Gauge

Filler Metal: ANSI/AWS A5.9, Class ER-3XX (F Number 6)

Weld Joint Detail: Square butt, root opening (R) = 0 – 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 1G

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS) No.: QC7-93, C-9-F

Welding Technique: Single pass

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Electrode Extension: 1/4 to 3/8 in.

Test Required: Visual inspection per ANSI/AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: gas metal arc welding (GMAW) — semiautomatic/automatic transfer mode — short circuiting

Base Metal: Chromium to chromium nickel steel (uncoated) (See ANSI/AWS D9.1)

Material Form: Sheet

Backing: With or without

Groove Weld Thickness: 16 Gauge and thinner

Fillet Weld Size: Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.9, (F Number 6)

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Positions: Flat groove and fillet

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS)

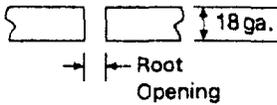
WPS Number C-9 Supported by PQR No.(s) WRC¹, 068A, 070A, 074A, 075A, 076A²
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A167 or A240 Type 3XX
 Metal thickness 18 Gauge (0.0500 in., 1.27 mm)
 Coating type None
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 1G Flat Welding Progression: N/A
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.9
 Filler metal class ER-3XX
 Electrical Characteristics dcep Electrode Extension 1/4 to 3/8 in.
 Mode of transfer Short circuit
 Shielding gas/combination 90% Helium, 7.5% Argon, 2.5% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	60-100	120-210	16-19	As Required	 <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

AWS QC7 Supplement C
Performance Test Description C-10
GMAW Stainless Steel

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A167 or A240 Type 3XX **Coating Type:** None

Material Form: Sheet — 3" x 6" **Thickness:** 10 Gauge

Filler Metal: ANSI/AWS A5.9, Class ER-3XX (F Number 6)

Weld Joint Detail: Square butt, root opening (R) = 0 - 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 4G

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS) No.: QC7-93, C-10-O

Welding Technique: Single pass

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Electrode Extension: 1/4 to 3/8 in.

Test Required: Visual inspection per AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: gas metal arc welding (GMAW) — semiautomatic/automatic transfer mode — short circuiting

Base Metal: Chromium and chromium nickel steel (See ANSI/AWS D9.1)

Material Form: Sheet

Backing: With or without

Groove Weld Thickness: 16 Gauge to 0.281 in.

Fillet Weld Size: Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.9, (F Number 6)

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Positions: All groove and fillet

Vertical Welding Progression: Up or Down

Welding Procedure Specification (WPS)

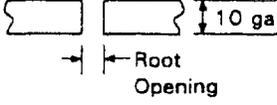
WPS Number C-10 Supported by PQR No(s) WRC¹, 071B, 072B, 073A, 077A, 078A, 079A²
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A167 or A240, Type 3XX
 Metal thickness 10 Gauge (0.1406 in., 2.57 mm)
 Coating type None
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 4G Overhead Welding Progression: N/A
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.9
 Filler metal class ER3XX
 Electrical Characteristics dcep Electrode Extension 1/4 to 3/8 in.
 Mode of transfer Short circuit
 Shielding gas/combination 90% Helium, 7.5% Argon, 2.5% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	100-150	210-330	16-29	As Required	 <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

AWS QC7-93 Supplement C
Performance Test Description C-11
GMAW Stainless Steel

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A167 or A240 Type 3XX **Coating Type:** None

Material Form: Sheet — 3" x 6" **Thickness:** 10 Gauge

Filler Metal: ANSI/AWS A5.9, Class ER-3XX (F Number 6)

Weld Joint Detail: Square butt, root opening (R) = 0 – 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 3G

Vertical Welding Progression: Down

Welding Procedure Specification (WPS) No.: QC7-93, C-11-V

Welding Technique: Single pass

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Electrode Extension: 1/4 to 3/8 in.

Test Required: Visual inspection per AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: gas metal arc welding (GMAW) — semiautomatic/automatic transfer mode — short circuiting

Base Metal: Chromium and chromium nickel steel (See ANSI/AWS D9.1)

Material Form: Sheet **Backing:** With or without

Groove Weld Thickness: 16 Gauge to 0.281 in. **Fillet Weld Size:** Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.9, (F Number 6)

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Positions: Flat, horizontal and vertical groove and fillet

Vertical Welding Progression: Up or Down

Welding Procedure Specification (WPS)

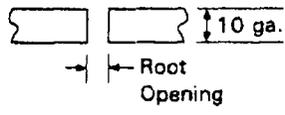
WPS Number C-11 Supported by PQR No.(s) WRC¹, 071B, 072B, 073A, 077A, 078A, 079A²
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A167 or A240, Type 3XX
 Metal thickness 10 Gauge (0.1406 in., 2.57 mm)
 Coating type None
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 3G Vertical Welding Progression: Down
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.9
 Filler metal class ER3XX
 Electrical Characteristics dcep Electrode Extension 1/4 to 3/8 in.
 Mode of transfer Short circuit
 Shielding gas/combination 90% Helium, 7.5% Argon, 2.5% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	100-150	210-330	16-20	As Required	 <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017.

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

AWS QC7-93 Supplement C
Performance Test Description C-12
GMAW Stainless Steel

Code: ANSI/AWS D9.1

Welding Process: Semiautomatic gas metal arc welding (GMAW) **Transfer Mode:** Short circuiting

Base Material: ASTM A167 or A240 Type 3XX **Coating Type:** None

Material Form: Sheet — 3" x 6" **Thickness:** 10 Gauge

Filler Metal: ANSI/AWS A5.9, Class ER-3XX (F Number 6)

Weld Joint Detail: square butt, root opening (R) = 0 – 1/2 t. Where t = base metal thickness

Backing: None

Welding Position(s): 1G (Flat, See AWS D9.1, Fig 2 (A))

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS) No.: QC7-93, C-12-F

Welding Technique: Single pass

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Electrode Extension: 1/4 to 3/8 in.

Test Required: Visual inspection per AWS D9.1

Limits of Welder Qualification

Code: ANSI/AWS D9.1

Welding Process: gas metal arc welding (GMAW) — semiautomatic/automatic transfer mode — short circuiting

Base Metal: Chromium and chromium nickel steel (See ANSI/AWS D9.1)

Material Form: Sheet

Backing: With or without

Groove Weld Thickness: 16 Gauge to 0.281

Fillet Weld Size: Unlimited

Pipe and Tubing: Not applicable

Filler Metal: ANSI/AWS A5.9, (F Number 6)

Current: dcep

Shielding Gas: 90% Helium, 7.5% Argon, 2.5% Carbon dioxide

Positions: Flat groove and fillet

Vertical Welding Progression: Not applicable

Welding Procedure Specification (WPS)

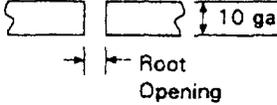
WPS Number C-12 Supported by PQR No.(s) WRC¹, 071B, 072B, 073A, 077A, 078A, 079A²
 WPS Rev. No. Original WPS Rev. Date January 1994

Code Reference ANSI/AWS D9.1, Sheet Metal Welding Code

Variables

Base metal ANSI/ASTM A167 or A240, Type 3XX
 Metal thickness 10 Gauge (0.1406 in., 2.57 mm)
 Coating type None
 Joint preparation Shall be free of loose scale, rust, grease or foreign matter
 Backing material None
 Position of welding 1G Flat Welding Progression: N/A
 Welding process GMAW
 Manual, semiautomatic, or automatic Semiautomatic
 Filler metal spec. ANSI/AWS A5.9
 Filler metal class ER3XX
 Electrical Characteristics dcep Electrode Extension 1/4 to 3/8 in.
 Mode of transfer Short circuit
 Shielding gas/combination 90% Helium, 7.5% Argon, 2.5% Carbon dioxide
 Gas flow (CFH) 20-40 CFH

Joining Procedure

Filler Metal Size in.	Welding Power			Speed of Travel	Joint Detail
	Current Range Ampere	Wire Feed Speed (Reference) ipm	Voltage Range Volts		
0.035	100-150	210-330	16-20	As Required	 <p>Note: Root Opening = 0-1/2t</p>

¹Welding Research Council, 345 East 47th Street, New York, New York 10017

²Also on file at AWS Headquarters (Qualification and Certification Dept.).

