

The Professional's Advisor on Procedure Qualification Variables/Cross Reference Tables for AWS D1.1, AWS D1.5, AWS B2.1, ASME IX, and API 1104

WELDING PROCEDURE SPECIFICATION (WPS) Yes ☐		PREQUALIFIED QUALIFIED BY TESTING		or PROCEDURE QUALIFICATION RECORDS (PQR) Yes ☐				
Company Name _____		Identification # _____		Revision _____ Date _____ By _____				
Welding Process(es) _____		Authorized by _____		Date _____				
Supporting PQR No.(s) _____		Type—Manual ☐ Machine ☐		Semi-Automatic ☐ Automatic ☐				
JOINT DESIGN USED		POSITION		Fillet: _____				
Type: _____		Position of Groove: _____		Vertical Progression: Up ☐ Down ☐				
Backing: Yes ☐ No ☐ Double Weld ☐		ELECTRICAL CHARACTERISTICS						
Backing Material: _____		Transfer Mode (GMAW) _____		Short-Circuiting ☐ Globular ☐ Spray ☐				
Root Opening _____ Root Face Dimension _____		Current: AC ☐ DCEP ☐ DCEN ☐ Pulsed ☐		Other _____				
Groove Angle: _____ Radius (J-U) _____		Tungsten Electrode (GTAW)		Size: _____				
Back Gouging: Yes ☐ No ☐ Method _____		Type: _____						
BASE METALS		TECHNIQUE						
Material Spec _____		Stringer or Weave Bead: _____		Multi-pass or Single Pass (per side) _____				
Type or Grade _____		Number of Electrodes _____		Electrode Spacing _____				
Thickness: Groove _____ Fillet _____		Longitudinal _____		Lateral _____				
Diameter (Pipe) _____		Angle _____						
FILLER METALS		Contact Tube to Work Distance _____		Peening _____				
AWS Specification _____		Interpass Cleaning: _____						
AWS Classification _____		POSTWELD HEAT TREATMENT		Temp. _____				
SHIELDING		Time _____						
Flux _____ Gas _____								
Composition _____								
Electrode-Flux (Class) _____								
Flow Rate _____								
Gas Cup Size _____								
PREHEAT								
Preheat Temp., Min _____ Max _____								
Interpass Temp., Min _____ Max _____								
WELDING PROCEDURE								
Pass or Weld Layer(s)	Process	Filler Metals		Current		Volts	Travel Speed	Joint Details
		Class	Diam.	Type & Polarity	Amps or Wire Feed Speed			



Not for Resale



Documents

Document Sharing Hub

Copyright American Welding Society

Provided by IHS under license with AWS

No reproduction or networking permitted without license from IHS

Full document details: The professional's advisor on procedure qualification variables 2005

Originated/Compiled by
Kenneth W. Coryell, P.E.
Welding Quality Consultant, Cleveland, Ohio

© 2005 by American Welding Society. All rights reserved
Printed in the United States of America



American Welding Society

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

NOTE: Although care was taken in choosing and presenting the data in this guide, AWS cannot guarantee that it is error free. Further, this guide is not intended to be an exhaustive treatment of the topic; therefore, it may not include all available information, particularly with respect to safety and health issues. By publishing this guide, AWS does not insure anyone using the information contained herein against any liability or injury to property or persons arising from such use.

Table of Contents

Chapter 1—Introduction	1
Chapter 2—Welding Procedure Specifications (WPSs).....	3
Chapter 3—Forms.....	7
AWS B2.1-1-004:2002	8
AWS B2.1:2005.....	12
AWS D1.1/D1.1M:2004	16
AASHTO/AWS D1.5M/D1.5:2002.....	22
2001 ASME IX with 2003 Addenda.....	26
API 1104 Twentieth Edition, 2005	34
Chapter 4—Procedure Qualification Variables—SAW	39
Chapter 5—Procedure Qualification Variables—SMAW	49
Chapter 6—Procedure Qualification Variables—GMAW	59
Chapter 7—Procedure Qualification Variables—FCAW.....	71
Chapter 8—Procedure Qualification Variables—GTAW	83
Chapter 9—Terms and Definitions	93
Annex I—Observations	123
Annex II—Standard Welding Procedure Specifications	127

Additional Credits

Kent Baucher	Vice President, Technicon Engineering Services, Inc., Fresno, CA; Member, Product Development Committee; Member, AWS Board of Directors	Reviewer, General
Harvey H. Castner	Chair, Product Development Committee; AWS Director-at-Large; Past Chair, AWS Welding Handbook Committee; Member, AWS Board of Directors	Reviewer, General
Leonard P. Connor	Consultant, Hollywood, FL; Managing Director, AWS Technical Services (Retired); Member, AWS Board of Directors	Reviewer, Primary
David Landon	Corporate Welding Engineer, Vermeer Manufacturing Company, Pella, IA; Chair, AWS Technical Activities Committee	Reviewer, General
David L. McQuaid	President, D. L. McQuaid & Associates, Bethel Park, PA; Vice Chair, D1 Subcommittee 10 ASSHTO/AWS Bridge Welding	Reviewer, D1.5 (2002)
Ronald C. Pierce	Chair, Welding Engineering Supply Company, Prichard, AL; Advisor, AWS Product Development Committee; AWS Past President	Reviewer, General
Allen W. Sindel	President, Sindel and Associates, Whitehouse, TX; Past Chair, D1 Subcommittee 2 Qualification	Reviewer, D1.1 (2004)
Walter J. Sperko	President, Sperko Engineering Services, Greensboro, NC; AWS Technical Representative to ASME	Reviewer, ASME, IX (2001/2003)
Debrah C. Weir	Secretary, AWS Product Development Committee	General Editor
Mat Wisbrock	QA Materials/QE Test Supervisor, Lockheed Martin Missiles, Dallas, TX; Chair, B2 Committee on Procedure and Performance Qualification	Reviewer, B2.1 (2005)
Robert R. Wright	President, Moody International, Inc. (Retired), Knoxville, TN; AWS Technical Representative to API	API 1104, 20th Edition

Chapter 1—Introduction

This *Professional's Advisor* is intended to provide insight and guidance to the welding professional in the preparation of welding procedure specifications and procedure qualification records. **In no way is this a substitute nor should it be used in lieu of a code or other standards document.** Standards, whether codes or specifications, provide the authoritative and comprehensive requirements for the WPS and PQR.

This *Advisor* has concentrated on the common arc welding processes, including SAW, SMAW, GMAW, FCAW, and GTAW. Documentation and qualification requirements differ somewhat among the various qualification standards. This *Advisor* is not intended to be comprehensive for all applications, but rather is focused on five common standards:

(1) AWS B2.1:2005, *Specification for Welding Procedure and Performance Qualification*

(2) AWS D1.1/D1.1M:2004, *Structural Welding Code—Steel*

(3) AASHTO/AWS D1.5M/D1.5:2002, *Bridge Welding Code*

(4) Section IX, *Welding and Brazing Qualifications*, ASME Boiler and Pressure Vessel Code 2001 with 2003 Addenda

(5) API 1104 2005, *Welding and of Pipelines and Related Facilities*

The American Welding Society and the Welding Research Council have joined in a cooperative effort to generate standard welding procedures for industry. The need for pretested welding procedures that are supported by adequate test data and that satisfy the technical requirements for the commonly used construction codes and specification has been expressed by many individuals and organizations. The purpose of a welding procedure qualification is to provide test data for assessing the properties of a weld joint.

NOTE: The documentation and qualification requirements from the codes or specifications cited in this *Advisor* are those listed in the specific edition of the code or specification referenced. Documentation and qualification requirements are subject to change in later editions of the reference codes or specifications.

[illegible]

Chapter 2—Welding Procedure Specifications (WPSs)

Data to be Recorded

Welding Procedure Specifications may be prepared in many different ways and may be either brief or long and detailed. Some codes and specifications have suggested forms which provide sufficient information, but will not cover complex welding conditions. More complex and critical applications should have more detailed procedure specifications. These forms may be supplemented with additional notes or instructions or new forms devised to suit the specific requirement. The sample WPSs which follow illustrate examples of formats suggested by AWS B2.1, AWS D1.1, AASHTO/AWS D1.5, ASME IX, and API 1104. Supporting Procedure Qualification Records (PQRs) are also shown. **The data shown is illustrative only, and not the results of actual testing.** It is simply typical of results commonly found and is provided as a guide for preparation of the documents.

The following information is typical of the type of data which is included in a WPS. Additional information may be required, depending on specific applications.

A. Joint Design

1. Joint type and dimensions
2. Treatment of backside, method of gouging/preparation
3. Backing material, if used

B. Base Metal

1. Material number, subgroup
2. Thickness range qualified
3. Diameter (tubular only)

C. Filler Metal

1. Specification classification, F- and A-Number, or if not classified the nominal chemical composition
2. Weld metal thickness by process and filler metal classification
3. Filler metal size or diameter
4. Flux classification
5. Supplemental filler metal
6. Consumable insert and type

D. Position

1. Welding position(s)
2. Progression for vertical welding

E. Preheat and Interpass

1. Preheat minimum
2. Interpass temperature maximum (if applicable)
3. Preheat maintenance

F. Heat Treatment (if applicable)

1. PWHT temperature and time

G. Shielding Gas

1. Torch shielding gas and flow rate range
2. Root shielding gas and flow rate range

H. Electrical

1. Current (or wire feed speed), current type, and polarity
2. Voltage range (except for manual welding)
3. Type and diameter of tungsten electrode

4. Transfer mode
5. A change from pulsed current

I. Variables

1. Welding process and whether manual, semiautomatic, mechanized, or automatic
2. For mechanized or automatic, single or multi electrode and spacing
3. Single or multi pass
4. Contact tube to work distance
5. Cleaning
6. Peening
7. Stringer or weave bead
8. Travel speed range for mechanized or automatic welding

Qualification of WPSs

The purpose of the procedure qualification is to determine, by preparation and testing of standard specimens, that welding in accordance with the WPS will produce sound welds and adequate mechanical properties. The type and number of tests required are designated in the standard. The tests are selected to provide sufficient information on strength, ductility, toughness, or other properties of the joint. The qualification variables are specified to maintain desired properties. When significant changes are made to the WPS qualification variables, the properties of the weld joint may be affected, and requalification or a new WPS is required.

Qualification tests may or may not simulate the actual conditions anticipated for a given project. Usually, such tests involve conventional butt joints on pipes or plates, or fillet welds between two plates. Base metals, welding consumables, and thermal treatments must follow production

welding plans, within specific ranges. However, certain other variables, such as joint geometry, welding position, and accessibility may not be considered to be WPS qualification variables.

The recommended steps in the qualification of a welding procedure are as follows:

- (1) Prepare a preliminary WPS.
- (2) Prepare and weld a suitable test weldment using the preliminary WPS.
- (3) Conduct the nondestructive and destructive tests required by the qualification standard in use.
- (4) Evaluate the results of preparation, welding, and testing.
- (5) Document the results on a PQR.
- (6) Issue approved PQR.
- (7) Issue qualified WPS.

Test of Procedure Qualification Welds

Test specimens are usually removed from the sample joints for examination to determine certain properties. The type and number of specimens removed and test details depend on the particular application, code, or specification. Usually, the tests included tensile and guided bend specimens to determine strength, ductility, and soundness. Additional tests may be specified:

- **Fracture tests** to determine the notch toughness of the weld and the heat-affected zone. Fracture tests are usually conducted at a specified temperature to minimize the risk of brittle fracture above that temperature. Charpy V-notch specimens are most commonly used for such tests, but many other tests, including drop weight and crack-opening-displacement (COD) tests, are sometimes employed.

- **Nick-break tests** to determine weld soundness at selected locations.
- **Free bend tests** to determine the ductility of weld metal.
- **Shear tests** to determine the shear strength of fillet welds or clad bonding.
- **Hardness tests** to determine adequacy of heat treatment, preheat, postheat, and suitability for certain service conditions. Such tests may be performed on surfaces or on cross sections of welds.
- **All-weld metal tension tests** to determine the mechanical properties of the weld metal in the diluted condition.
- **Elevated temperature tests** to determine mechanical properties at temperatures resembling service conditions.
- **Restraint tests** to determine crack susceptibility and the ability to achieve sound welds under restrained conditions.
- **Corrosion tests** to determine the properties needed to withstand aggressive environments.
- **Nondestructive examination** and **macroetch** or **microetch** tests to determine the soundness of the weld.
- **Delayed cracking tests** to detect resistance to hydrogen cracking in high strength, low alloy steels, and some other alloys.
- Others

Recording Test Results

The details of the welding of the test weld, the tests, and the results of all tests and examinations are entered on a Procedure Qualification Record (PQR). Typical record formats follow the sample WPSs provided. **(Remember: The data shown is illustrative only.)** When the qualifier is satisfied that the records and results are accurate, they become certified

when the qualifier signs the PQR. If the results meet the requirements of a job, code, or specification, then the WPS may be finalized and issued for production welding. Since the PQR is a certified record of a qualification test, it *should not* be revised. If information needs to be added later, it can be in the form of a supplement or attachment; records *should not* be changed by revision. A PQR may support several WPSs. Similarly, several PQRs may support a single WPS.

Changes in a Qualified Procedure

If a fabricator has qualified a welding procedure and desires at some later date to make changes in that procedure, it may be necessary to conduct additional qualifying tests. Those tests should establish that the changed welding procedure will produce satisfactory results.

Such requalification tests are not usually required when only minor details of the original procedure are changed. They are required, however, *if the changes might alter properties of the resulting welds*. Reference should always be made to the governing code or specification to determine whether an essential variable has been changed. Typical procedure variables that may require requalification of the WPS are presented in the tables that follow. Variables identified with a “Q” require requalification. Variables identified with a “T” require requalification when toughness testing is required. Variables identified with an “A” require requalification for automatic welding processes.

The tables present the variables for the SAW, SMAW, GMAW, FCAW, and GTAW processes for five common standards: B2.1, D1.1, D1.5, ASME IX, and API 1104. *The tables should be regarded as illustrative only, since the various standards are revised periodically.*

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Chapter 3—Forms

The sample forms in this chapter (WPSs and PQRs) were taken from the following publications: AWS B2.1, AWS D1.1, AASHTO/AWS D1.5, ASME Boiler and Pressure Vessel Code (Section IX), and API 1104. Each

of these 8-1/2" × 11" forms have been split in half for the purposes of this *Professional's Advisor*, so that the top and bottom half of the forms are viewable as visual spreads, beginning with pages 12 and 13.

Form No.	Source	Title	Page No.
—	AWS B2.1-1-004	Standard Welding Procedure Specification (SWPS) for Gas Metal Arc Welding (Short Circuiting Transfer Mode) of Carbon Steel (M-1, Group 1), 18 through 10 Gauge, in the As-Welded Condition, with or without Backing	8
	AWS B2.1	Suggested Procedure Qualification Record (PQR) Format to Accommodate Provisions of AWS B2.1 (Page 1 of 2)	12
	AWS B2.1	Suggested Procedure Qualification Record (PQR) Format to Accommodate Provisions of AWS B2.1 (Page 2 of 2)	14
E-1 (Front)	AWS D1.1	D1.1-Approved Welding Procedure Specification (WPS) (Qualified by Testing)	16
E-1 (Front)	AWS D1.1	D1.1-Approved Welding Procedure Specification (WPS)	18
E-1 (Back)	AWS D1.1	D1.1-Approved Procedure Qualification Record (PQR) Test Results	20
III-2	AASHTO/AWS D1.5	D1.5-Approved Welding Procedure Specification	22
III-1	AASHTO/AWS D1.5	D1.5-Approved Procedure Qualification Record (PQR) for Qualification, Pretest, and Verification Results	24
E00006 (Front)	ASME IX	QW-482 Suggested Format for Welding Procedure Specification (WPS)	26
E00006 (Back)	ASME IX	QW-482 Suggested Format for Welding Procedure Specification (WPS)	28
E00007 (Front)	ASME IX	QW-483 Suggested Format for Procedure Qualification Records (PQR)	30
E00007 (Back)	ASME IX	QW-483 Suggested Format for Procedure Qualification Records (PQR)	32
—	API 1104	Sample Procedure Specification Form	34 and 35
—	API 1104	Sample Coupon Test Report Form	36 and 37

Standard Welding Procedure Specification (SWPS) for Gas Metal Arc Welding (Short Circuiting Transfer Mode) of Carbon Steel (M-1, Group 1), 18 through 10 Gauge, in the As-Welded Condition, with or without Backing

LIMITATIONS

This procedure is not qualified for Notch Toughness or PWHT applications.

WELDING PROCESSES

Welding Process:
Method of Application:
Mode of Metal Transfer:

GMAW-S (Gas Metal Arc Welding)
Semiautomatic
Short Circuiting Transfer Mode

BASE METALS

Base Metal:²
Thickness Range:³

Carbon Steel, M-1, Group 1 to M-1, Group 1
Groove Weld: 18 ga. (0.0478 in.) through 10 ga (0.1345 in.)
Fillet Weld: 18 ga. (0.0478 in.) through 10 ga. (0.1345 in.)
Uncoated

Coating:

FILLER METALS

Filler Metal Specification:²
A-Number or Chemical Composition:
F-Number:
Classification:
Supplementary Filler Metal:
Supplementary Powder:
Deposit Thickness Range:

AWS A5.18
A Number None, ER70S-6
F Number 6
ER70S-6
Not permitted
Not permitted
Groove Weld: Sheet metal thickness plus reinforcement, maximum
Fillet Weld Leg: Sheet metal thickness, minimum

Maximum Bead Thickness: Sheet metal thickness plus reinforcement

JOINT DESIGNS

Joint Designs: See Figure 1

Backing: Optional

Backing Material: Carbon Steel, M-1. Nonmetallic or nonfusing metal retainers are not permitted.

POSITIONS

Welding Positions: All

Vertical Progression: Uphill or Downhill

GAS

Torch Shielding Gas: 75% Argon, 25% Carbon Dioxide or AWS A5.32, Class SG-AC-25

Flow Rate: 20 to 40 ft³/h

Gas Nozzle Size: 1/2 in. diameter minimum (I.D.)

Root Shielding Gas: None

Trailing Gas: None

PREHEAT AND INTERPASS TEMPERATURE

Preheat Temperature: 50°F minimum, 120°F maximum

Interpass Temperature: No maximum

Preheat Maintenance: Continuous or special heating not required

POST WELD HEAT TREATMENT

Postweld Heat-Treatment: None (not qualified for PWHT)

ELECTRICAL CHARACTERISTICS

Base Metal	Filler Metal		Amperes		Voltage	Current
	Classification	Dia. (in.)	Groove	Fillet	Volts	Type/Polarity
18 ga.	ER70S-6	0.035	60/85	70/90	15/17	DCEP (Reverse)
17 ga.	ER70S-6	0.035	65/92	76/93	15/17	DCEP (Reverse)
16 ga.	ER70S-6	0.035	70/99	81/96	15/17	DCEP (Reverse)
15 ga.	ER70S-6	0.035	75/105	87/100	16/19	DCEP (Reverse)
14 ga.	ER70S-6	0.035	80/112	92/105	16/19	DCEP (Reverse)
13 ga.	ER70S-6	0.035	85/118	98/108	16/19	DCEP (Reverse)
12 ga.	ER70S-6	0.035	90/127	103/112	18/20	DCEP (Reverse)
11 ga.	ER70S-6	0.035	95/132	109/116	18/20	DCEP (Reverse)
10 ga.	ER70S-6	0.035	100/140	115/120	18/20	DCEP (Reverse)

Pulsing Current: Not Permitted
Contact Tube to Work Distance: 1/2 inch nominal
Mode of Metal Transfer: Short Circuiting Transfer Mode

TECHNIQUE

Weave or Stringer Beads: Stringer or weave
Peening: No
Initial Cleaning: Mechanical or chemical, joint shall be dry prior to welding
Interpass Cleaning: Mechanical only
Single or Multiple Electrodes: Single
Single or Multiple Pass: Either

Backgouging:
Repair:

Not required, mechanical or thermal if used
Defects in welds shall be removed by mechanical or thermal methods. The repair cavity may differ in contour and dimension from a normal joint preparation and may present different restraint conditions.

COMPANY NAME _____

In the name of the Company stated above, I accept full responsibility for the application of this SWPS for use with:

_____ Dated _____
Fabrication Document(s): (Such as Code, Specification, or Contract Document)

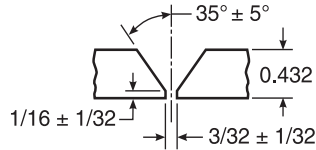
Date _____ Approved By _____ Title _____

Suggested Procedure Qualification Record (PQR) Format to Accommodate Provisions of AWS B2.1

WPS No. Used for Test WPS-101 (Preliminary)
Company Any Welding Company

Welding Process(es) GMAW-S
Equipment Type and Model (sw) _____

JOINT DESIGN USED

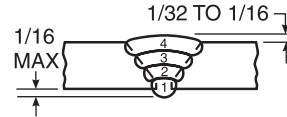


Single ☒ Double Weld ☐
Backing Material N.A.
Root Opening 3/32 Root face dimension 1/16
Groove angle 75° N.A. radius (J-U) N.A.
Backgouging: Yes ☐ No ☒ Method _____

BASE METALS

Material Spec. A53 To A53
Type or Grade A To A
Material No. M-1 To Material No. M-1
Group No. 1 To Group No. 1
Thickness 0.432
Diameter (Pipe) 6 NPS
Surfacing: Material None Thickness N.A.
Chemical Composition N.A.
Other N.A.

WELD INCREMENT SEQUENCE



POSTWELD HEAT TREATMENT

Temp. None
Time N.A.
Other N.A.

GAS

Gas Type(s) CO₂
Gas Mixture Percentage 100% Welding Grade
Flow Rate 25 cfh
Root Shielding Gas None Flow Rate N.A.
EBW Vacuum N.A. Absolute Pressure N.A.

ELECTRICAL CHARACTERISTICS

Electrode Extension 1/2 in.
Standoff Distance 9/16 in.
Transfer Mode (GMAW) Short Circuiting

FILLER METALSWeld Metal Analysis A No. 1Filler Metal F No. 6AWS Specification 5.18AWS Classification ER70S-3Flux Class None Flux Brand N.A.Consumable Insert: Spec. None Class. N.A.Supplemental Filler Metal Spec. None Class. N.A.Nonclassified Filler Metals NoneConsumable Guide (ESW): Yes ☐ No ☐

Supplemental Deoxidant (EBW) _____

POSITIONPosition of Groove 5G Fillet N.A.Vertical Progression: Up ☐ Down ☒**PREHEAT**Interpass Temp., Actual Min 70°FInterpass Temp., Actual Max 150°FElectrode Diameter Tungsten N.A.Type Tungsten Electrode N.A.Current: AC ☐ DCEP ☒ DCEN ☐ Pulsed ☐Heat Input 6720-12075 J/in.EBW: Beam Focus Current N.A. Pulse Freq. N.A.Filament Type N.A. Shape N.A. Size N.A.Other N.A.**TECHNIQUE**Oscillation Frequency N.A. Weave Width N.A.Dwell Time N.A.String or Weave Bead _____ Weave Width As req'dMultipass or Single Pass (per side) MultipleNumber of Electrodes SinglePeening NoneElectrode Spacing N.A.Arc Timing (SW) N.A. Lift N.A.PAW: Conventional ☐ Keyhole ☐Interpass Cleaning Wire brush

Pass No.	Filler Metal Size	Amps	Volts	Travel Speed (ipm)	Filler Metal Wire (ipm)	Slope Induction	Special Notes (Process, etc.)
All	.035"	140-175	20-23	20-25	225-305	N.A.	N.A.

Note: Those items that are not applicable should be marked N.A.

Page 1 of 2

Data included in this suggested PQR format is illustrative only.

Suggested Procedure Qualification Record (PQR) Format to Accommodate Provisions of AWS B2.1 (Continued)

TENSILE TEST SPECIMENS: SUGGESTED PROCEDURE QUALIFICATION RECORD

PQR No. _____

Type Rectangular Tensile Specimen Size: per Fig. II-3A of B2.1:2004 Q225

Groove ☒ Reinforcing Bar ☐ Stud Welds ☐

Tensile Test Results: (Minimum Required UTS 48,000 psi)

Specimen No.	Width, in.	Thickness, in.	Area, in. ²	Max Load, lbs	UTS, psi	Typical Failure and Location
1	0.752	0.432	0.325	23,200	71,400	Base Metal-Ductile
2	0.754	0.432	0.326	23,500	72,100	Base Metal-Ductile

GUIDED BEND TEST SPECIMENS—SPECIMEN SIZE Full width per Figure B2C of B2.1

Type	Result	Type	Result
Side 1	Accept	Side 3	Accept
Side 2	Accept	Side 4	Accept

MACRO-EXAMINATION RESULTS:

None

Reinforcing Bar ☐

Stud ☐

1. _____

4. _____

2. _____

5. _____

3. _____

SHEAR TEST RESULTS—FILLETS:

None

1. _____

3. _____

2. _____

4. _____

IMPACT TEST SPECIMENS

Type None

Size N.A.

Test Temperature N.A.

Specimen Location: WM = Weld Metal; BM = Base Metal; HAZ = Heat-Affected Zone

Test Results:

Welding Position	Specimen Location	Energy Absorbed (ft-lbs)	Ductile Fracture Area (Percent)	Lateral Expansion (mils)

IF APPLICABLE

Hardness Tests: ☐ Values _____

Visual (Special Weldments) ☒

Torque ☐ psi

Proof Test ☐ Method _____

Chemical Analysis ☐

Nondestructive Exam ☒ Process Radiography

Other _____

Mechanical Testing by (Company) Weld Test Lab, USA

RESULTS

Acceptable ☐ Unacceptable ☐

Acceptable ☒ Unacceptable ☐

Acceptable ☐ Unacceptable ☐

Acceptable ☐ Unacceptable ☐

Acceptable ☐ Unacceptable ☐

Acceptable ☒ Unacceptable ☐

Acceptable ☐ Unacceptable ☐

Lab No. Q225

We certify that the statements in this Record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of the American Welding Society *Specification for Welding Procedure and Performance Qualification* (AWS B2.1).

Qualifier Joseph Plunkett

Date 02-15-05

Data included in this suggested PQR format is illustrative only.

Page 2 of 2

D1.1-Approved Welding Procedure Specification (WPS) Yes ☒
Prequalified _____ Qualified by Testing x
or Procedure Qualification Records (PQR) Yes ☐

Company Name RED Inc.
Welding Process(es) FCAW
Supporting PQR No.(s) PQR 231

JOINT DESIGN USED

Type: Butt
Single ☒ Double Weld ☐
Backing: Yes ☒ No ☐
Backing Material: Any Group I steel
Root Opening 1/4" Root Face Dimension —
Groove Angle: 52-1/2° Radius (J-U) —
Backgouging: Yes ☐ No ☒ Method —

BASE METALS

Material Spec. Any Group I steel
Type or (Grade) A
Thickness: Groove 3/4-1 1/2" Fillet —
Diameter (Pipe) —

FILLER METALS

AWS Specification A5.20
AWS Classification E71T-1

Identification # WPS-132
Revision 1 Date 02-15-05 By W. Lye
Authorized by S. McBride Date 02-15-05
Type—Manual ☐ Semi-Automatic ☒
Machine ☐ Automatic ☐

POSITION

Position of Groove: 4G Fillet: —
Vertical Progression: Up ☐ Down ☐

ELECTRICAL CHARACTERISTICS

Transfer Mode (FCAW) Short-Circuiting ☐
Globular ☐ Spray ☒
Current: AC ☐ DCEP ☒ DCEN ☐ Pulsed ☐
Other _____
Tungsten Electrode (GTAW) None
Size: _____
Type: _____

TECHNIQUE

Stringer or Weave Bead: Stringer
Multi-pass or Single Pass (per side) Multipass
Number of Electrodes 1

SHIELDING

Flux — Gas CO₂
 Composition 100% CO₂
 Electrode-Flux (Class) _____ Flow Rate 45-55 cfh
 _____ Gas Cup Size #4

PREHEAT

Preheat Temp., Min 60°
 Interpass Temp., Min 60° Max 350°F

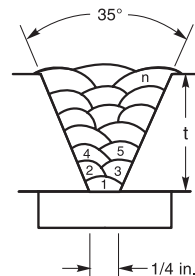
Electrode Spacing **None** Longitudinal —
 Lateral —
 Angle —

Contact Tube to Work Distance 1/2-1"
 Peening **None**
 Interpass Cleaning: Wire Brush

POSTWELD HEAT TREATMENT

Temp. **None**
 Time **None**

WELDING PROCEDURE

Pass or Weld Layer(s)	Process	Filler Metals		Current		Volts	Travel Speed	Joint Details
		Class	Diam.	Type & Polarity	(Amps) or Wire Feed Speed			
A11	FCAW	E71T-1	.045"	DC+	180-220	25-26	8-12 ipm	

Form E-1 (Front)

Data included in this suggested PQR format is illustrative only.

D1.1-Approved Welding Procedure Specification (WPS) Yes ☐
Prequalified _____ Qualified by Testing _____
or Procedure Qualification Records (PQR) Yes ☒

Company Name RED Inc.
Welding Process(es) FCAW
Supporting PQR No.(s) —

JOINT DESIGN USED

Type: Butt
Single ☒ Double Weld ☐
Backing: Yes ☒ No ☐
Backing Material: ASTM A 131A
Root Opening 1/4" Root Face Dimension —
Groove Angle: 52-1/2° Radius (J-U) —
Backgouging: Yes ☐ No ☒ Method —

BASE METALS

Material Spec. ASTM A 131
Type or Grade A
Thickness: Groove 1" Fillet —
Diameter (Pipe) —

FILLER METALS

AWS Specification A5.20
AWS Classification E71T-1

Identification # PQR 231
Revision 1 Date 02-15-05 By W. Lye
Authorized by J. Jones Date 02-15-05
Type—Manual ☐ Semi-Automatic ☒
Machine ☐ Automatic ☐

POSITION

Position of Groove: 4G Fillet: —
Vertical Progression: Up ☐ Down ☐

ELECTRICAL CHARACTERISTICS

Transfer Mode (GMAW) Short-Circuiting ☐
Globular ☒ Spray ☐
Current: AC ☐ DCEP ☒ DCEN ☐ Pulsed ☐
Other _____
Tungsten Electrode (GTAW)
Size: _____
Type: _____

TECHNIQUE

Stringer or Weave Bead: Stringer
Multipass or Single Pass (per side) Multipass
Number of Electrodes 1

SHIELDING

Flux — Gas CO₂
 Composition 100% CO₂
 Electrode-Flux (Class) — Flow Rate 45 cfh
 Gas Cup Size #4

PREHEAT

Preheat Temp., Min 75° (Ambient)
 Interpass Temp., Min 75° Max 350°F

Electrode Spacing

Longitudinal —
 Lateral —
 Angle —

Contact Tube to Work Distance 3/4-1"Peening NoneInterpass Cleaning: Wire Brush**POSTWELD HEAT TREATMENT**Temp. N.A.Time —**WELDING PROCEDURE**

Pass or Weld Layer(s)	Process	Filler Metals		Current		Volts	Travel Speed	Joint Details
		Class	Diam.	Type & Polarity	(Amps) or Wire Feed Speed			
1	FCAW	E71T-1	.045"	DC+	180	26	8	
2-8	"	"	"	"	200	27	10	
9-11	"	"	"	"	200	27	11	
12-15	"	"	"	"	200	27	9	
16	"	"	"	"	200	27	11	

Form E-1 (Front)

Data included in this suggested PQR format is illustrative only.

D1.1-Approved Procedure Qualification Record (PQR) # 231

Test Results

TENSILE TEST

Specimen No.	Width, in.	Thickness, in.	Area, sq. in.	Ultimate Tensile Load, lb	Ultimate Unit Stress, psi	Character of Failure and Location
231-1	0.75"	1.00"	0.75"	52,500	70,000	Ductile
231-3	0.75"	1.00"	0.75"	52,275	69,700	Ductile

GUIDED BEND TEST

Specimen No.	Type of Bend	Result	Remarks
231-2	Side	Pass	
231-4	Side	Pass	Small (< 1/16") Opening Acceptable
231-6	Side	Pass	
231-5	Side	Pass	

VISUAL INSPECTION

Appearance **Acceptable**
 Undercut **Acceptable**
 Piping Porosity **None**
 Convexity **None**
 Test date **02-15-05**
 Witnessed by **Michael Collins**

Radiographic-Ultrasonic Examination

RT Report No.: **D231** Result **Passed**
 UT Report No.: _____ Result _____

FILLET WELD TEST RESULTS

Minimum Size Multiple Pass Maximum Size Single Pass
 Macroetch Macroetch
 1. _____ 3. _____ 1. _____ 3. _____
 2. _____ 2. _____

Other Tests

All-Weld-Metal Tension Test

Tensile Strength, psi 83,100

Yield Point/Strength, psi 72,600

Elongation in 2 in., % 28

Laboratory Test No. PW 231

Welder's Name Dennis McSweny

Clock No. 261 Stamp No. _____

Tests Conducted by RED Inc. & ABC Testing Laboratory _____

Test Number PQR 231

Per D. Miller

We, the undersigned, certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section 4 of AWS D1.1, (2004) Structural Welding Code—Steel.
(year)

Signed RED Inc.
Manufacturer or Contractor

By Sean McBride

Title Q.C. Mgr.

Date 02-15-05

Form E-1 (Back)

Data included in this suggested PQR format is illustrative only.

D1.5-Approved Welding Procedure Specification

Material Specification M270M Gr. 690

Welding Process FCAW-G

Manual or Machine Manual

Position of Welding 1G

Filler Metal Specification AWS A5.29

Filler Metal Classification E110TS-K3-H4

Flux N.A.

Shielding Gas Welding Grade CO₂ (Max Dew Point -40°C) Flow Rate 45 cfh or 21.2 L/min

Single or Multiple Pass Multiple

Single or multiple Arc Single

Welding Current 180-220 amps

Polarity DCEP

Welding Progression N.A.

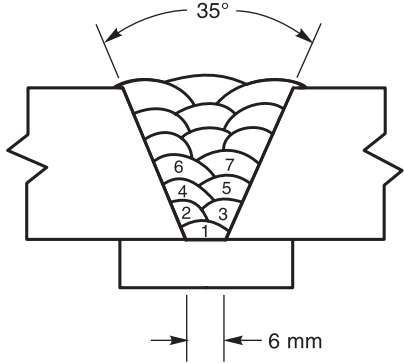
Root Treatment Backing Removed

Preheat and Interpass Temperature 80°C min 200°C max

Postheat Temperature None

Heat Input Min 0.9 kJ/mm Max 1.5 kJ/mm

WELDING PROCEDURE

Pass No.	Electrode Size	Welding Current		mm/min Travel Speed	Joint Detail
		Amperes	Volts		
1	.045	180	26	200	
2-8	.045	200	27	250	
9-11	.045	220	28	280	
12-15	.045	200	27	250	
16	.045	220	28	280	

This procedure may vary due to fabrication sequence, fit-up, pass size, etc., within the limitation of variables given in Section 5.

Procedure No. W44

Contractor Any Welding Company

Revision No. 0

Authorized By James Connolly

Form III-2

Date 02-15-05

Data included in this suggested PQR format is illustrative only.

D1.5-Approved Procedure Qualification Record for Qualification, Pretest, and Verification Results

Contractor **Any Welding Co.**
 Process **FCAW-G**
 Position **1G**
 Electrode(s) Mfg. Designation _____
 Flux Mfg. Designation **None**
 Electrode Extension **3/4 in. or 19 mm**

Test Date **02-15-05**
 Filler Metal **A5.29**
 AWS Classification **E110T5-K3**
 AWS Classification **N.A.**

		Diam.	Current	WFS*	Voltage	Current and Polarity
Electrode	(1)	<u>.045</u>	<u>220</u>	<u>N.A.</u>	<u>28</u>	<u>DCEP</u>
	(2)	_____	_____	_____	_____	_____
	(3)	_____	_____	_____	_____	_____

Calculated Heat Input _____

Shielding Gas **CO₂**

Dew Point **-50°C**

Flow Rate **45 cfh or 21.2 L/min**

Travel Speed **250 mm**

Base Metal Specification and Thickness **M270M Gr. 690 50 mm**

(Attach Certified Copy of Mill Test Report)

Preheat Temp. **80°C**

Interpass Temp. Min **80°C** Max **200°C**

SPECIMEN	TEST RESULTS
All-Weld-Metal Tension (AWMT)	Tensile Strength (MPa) <u>810 MPa</u>
	Yield Strength (MPa) <u>700 MPa</u>
	Elongation in 50 mm (%) <u>20%</u>
	Reduction in Area % <u>40%</u>

Side Bends	1. <u>Accept</u>	2. <u>Accept</u>	3. <u>Accept</u>	4. <u>Accept</u>
Reduced Section Tension	Tension Strength	1. <u>780 MPa</u> 2. <u>770 MPa</u>	Location of Break	1. <u>Base Metal</u> 2. <u>Base Metal</u>
Charpy V-Notch Impact Toughness of Weld Metal	(<u>27J</u> , <u>28J</u> , <u>31J</u> , <u>29J</u> , <u>27J</u>)			
SMAW, SAW, FCAW, GMAW—5 Reg.	Avg. J** <u>28J</u> @ <u>-40</u> °C			
ESW and EGW—8 Reg.	(_____ , _____ , _____ , _____ , _____)			
	Avg. J** _____ @ _____ °C			
	**Discard the highest and lowest values and average the remaining values.			
Chemistry of Deposited Weld Metal	C _____	Mn _____	Si _____	P _____
When Required by Contract	Ni _____	Cr _____	Mo _____	V _____
Documents				S _____ Cu _____
REMARKS	Visual <u>Acceptable</u>	Radiographic Test <u>Acceptable</u>		
*Wire feed may be used in lieu of current when a correlation curve is provided for the same electrode diameter and same electrode extension.				
Test Witness:	<u>Jean McDermott</u>		Agency: <u>Independent Lab, Inc.</u>	
Results Reviewed:	<u>Michael Collins</u>		State Acceptance: <u>Samon Kent</u>	
Form III-1			Date: <u>02-15-05</u>	

Data included in this suggested PQR format is illustrative only.

QW-482 Suggested Format for Welding Procedure Specification (WPS) **(See QW-200.1, Section IX, ASME Boiler and Pressure Vessel Code)**

Company Name **Any Welding Company** By: **Patrick Pearse, Welding Engineer**
Welding Procedure Specification No. **100** Date **02-15-05** Supporting PQR No.(s) **Q211**
Revision No. **-** Date **-**
Welding Process(es) **GMAW-S** Type(s) **Semi-Automatic**
(Automatic, Manual, Machine, or Semi-Auto.)

JOINTS (QW-402)

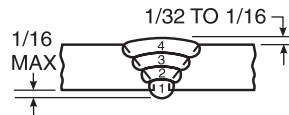
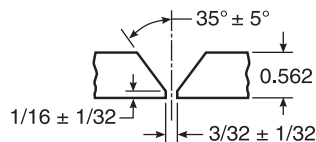
Joint Design **Single-V**
Backing (Yes) _____ (No) **X**
Backing Material (Type) **N.A.**
(Refer to both backing and retainers.)

☐ Metal ☐ Nonfusing Metal
☐ Nonmetallic ☐ Other

Sketches, Production Drawings, Weld Symbols or Written Description should show the general arrangement of the parts to be welded. Where applicable, the root spacing and the details of the weld groove may be specified.

(At the option of the Mfr., sketches may be attached to illustrate joint design, weld layers and bead sequence, e.g. for notch toughness procedures, for multiple process procedures, etc.)

Details



*BASE METALS (QW-403)

P-No. 1 Group No. 1 to P-No. 1 Group No. 1

OR

Specification type and grade N.A.

to Specification type and grade N.A.

OR

Chem. Analysis and Mech. Prop. N.A.

to Chem. Analysis and Mech. Prop. N.A.

Thickness Range:

Base Metal: Groove 3/16-1 1/8 Fillet N.A.

Pipe Dia. Range: Groove Unlimited Fillet N.A.

Other _____

*FILLER METALS (QW-404)

Spec. No. (SFA) SFA 5.18

AWS No. (Class) ER70S-3

F-No. 6

A-No. 1

Size of Filler Metals .035 in.

Weld Metal

Thickness Range:

Groove 1-1/4 in.

Fillet N.A.

Electrode-Flux (Class) None

Flux Trade Name N.A.

Consumable Insert N.A.

Other _____

*Each base metal-filler metal combination should be recorded individually.

Data included in this suggested PQR format is illustrative only.

This form (E00006) may be obtained from the
Order Dept., ASME, 22 Law Drive, Box 2300
Fairfield, NJ 07007-2300 (800) 843-2769



Documents

Document Sharing Hub

POSITIONS (QW-405) Position(s) of Groove <u>All</u> Welding Progression: Up <u>X</u> Down <u>X (Last</u> Position(s) of Fillet <u>All</u> <u>Pass Only)</u> PREHEAT (QW-406) Preheat Temp. Min. <u>70°F Min</u> Interpass Temp. Max. <u>250°F Max</u> Preheat Maintenance <u>70°F Min</u> (Continuous or special heating where applicable should be recorded.)	POSTWELD HEAT TREATMENT (QW-407) None Temperature Range <u>N.A.</u> Time Range <u>N.A.</u> GAS (QW-408) <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th colspan="3" style="text-align: center;">Percent Composition</th> </tr> <tr> <th></th> <th style="text-align: center;">Gas(es)</th> <th style="text-align: center;">(Mixture)</th> <th style="text-align: center;">Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td style="text-align: center;"><u>CO₂</u></td> <td style="text-align: center;"><u>Welding Gr.</u></td> <td style="text-align: center;"><u>25 cfh</u></td> </tr> <tr> <td>Trailing</td> <td style="text-align: center;"><u>None</u></td> <td style="text-align: center;"><u>—</u></td> <td style="text-align: center;"><u>—</u></td> </tr> <tr> <td>Backing</td> <td style="text-align: center;"><u>None</u></td> <td style="text-align: center;"><u>—</u></td> <td style="text-align: center;"><u>—</u></td> </tr> </tbody> </table>		Percent Composition				Gas(es)	(Mixture)	Flow Rate	Shielding	<u>CO₂</u>	<u>Welding Gr.</u>	<u>25 cfh</u>	Trailing	<u>None</u>	<u>—</u>	<u>—</u>	Backing	<u>None</u>	<u>—</u>	<u>—</u>
	Percent Composition																				
	Gas(es)	(Mixture)	Flow Rate																		
Shielding	<u>CO₂</u>	<u>Welding Gr.</u>	<u>25 cfh</u>																		
Trailing	<u>None</u>	<u>—</u>	<u>—</u>																		
Backing	<u>None</u>	<u>—</u>	<u>—</u>																		
ELECTRICAL CHARACTERISTICS (QW-409) Electrode Current AC or DC <u>DC</u> Polarity <u>Positive</u> Amps (Range) <u>140-175</u> Volts (Range) <u>20-23</u> (Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below.) Tunsten Electrode Size and Type <u>None</u> (Pure Tungsten, 2% Thoriated, etc.) Mode of Metal Transfer for GMAW <u>Short Circuiting</u> (Spray Arc, Short Circuiting Arc, etc.) Electrode Wire Feed Speed Range <u>225-305 ipm</u>																					

TECHNIQUE (QW-410)String or Weave Bead String and WeaveOrifice or Gas Cup Size 1/2 in.Initial and Interpass Cleaning (Brushing, Grinding, etc.) Wire BrushingMethod of Backgouging NoneOscillation Manually Controlled as Necessary to Fill GrooveContact Tube to Work Distance 1/2 in.Multiple or Single Pass (per side) MultipleMultiple of Single Electrodes SingleTravel Speed (Range) 5-20 ipmPeening NoneOther N.A.

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	Travel Speed Range	Other (e.g., Remarks, Comments, Hot Wire Addition, Technique, Torch Angle, etc.)
		Class	Dia.	Type Polar.	Amp. Range			
A11	GMAW-S	ER70S-3	0.035	DCEP	140-175	20-23		

Data included in this suggested PQR format is illustrative only.

QW-483 Suggested Format for Procedure Qualification Records (PQR)
(See QW-200.2, Section IX, ASME Boiler and Pressure Vessel Code)
Record Actual Conditions Used to Weld Test Coupon

Company Name Any Welding Company

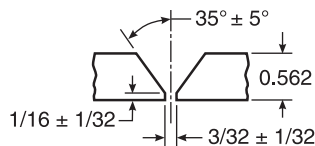
Procedure Qualification Record No. Q211 Date 02-15-05

WPS No. 100

Welding Process(es) GMAW-S

Types (Manual, Automatic, Semi-Auto.) Semi-Automatic

JOINTS (QW-402)



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

BASE METALS (QW-403)

Material Spec. ASME SA53

Type or Grade A

P-No. 1 to P-No. 1

Thickness of Test Coupon 0.562 in.

Diameter of Test Coupon 24 in.

POSTWELD HEAT TREATMENT (QW-407) None

Temperature N.A.

Time N.A.

Other N.A.

Other N.A. 	GAS (QW-408) <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 30%; text-align: center;">Gas(es)</th> <th style="width: 30%; text-align: center;">Percent Composition (Mixture)</th> <th style="width: 10%; text-align: center;">Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td style="text-align: center;">CO₂</td> <td style="text-align: center;">Welding Gr.</td> <td style="text-align: center;">25 cfh</td> </tr> <tr> <td>Trailing</td> <td style="text-align: center;">None</td> <td style="text-align: center;">—</td> <td style="text-align: center;">—</td> </tr> <tr> <td>Backing</td> <td style="text-align: center;">None</td> <td style="text-align: center;">—</td> <td style="text-align: center;">—</td> </tr> </tbody> </table>		Gas(es)	Percent Composition (Mixture)	Flow Rate	Shielding	CO₂	Welding Gr.	25 cfh	Trailing	None	—	—	Backing	None	—	—
	Gas(es)	Percent Composition (Mixture)	Flow Rate														
Shielding	CO₂	Welding Gr.	25 cfh														
Trailing	None	—	—														
Backing	None	—	—														
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">FILLER METALS (QW-404)</td> <td style="width: 60%;"></td> </tr> <tr> <td>SFA Specification</td> <td style="text-align: center;">5.18</td> </tr> <tr> <td>AWS Classification</td> <td style="text-align: center;">ER70S-3</td> </tr> <tr> <td>Filler Metal F-No.</td> <td style="text-align: center;">6</td> </tr> <tr> <td>Weld Metal Analysis A-No.</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Size of Filler Metal</td> <td style="text-align: center;">.035</td> </tr> <tr> <td>Other</td> <td style="text-align: center;">N.A.</td> </tr> <tr> <td>Weld Metal Thickness</td> <td style="text-align: center;">0.562</td> </tr> </table>	FILLER METALS (QW-404)		SFA Specification	5.18	AWS Classification	ER70S-3	Filler Metal F-No.	6	Weld Metal Analysis A-No.	1	Size of Filler Metal	.035	Other	N.A.	Weld Metal Thickness	0.562	ELECTRICAL CHARACTERISTICS (QW-409) Current DC Polarity Electrode Positive Amps 145-170 Volts 21-22 Tungsten Electrode Size N.A. Other Wire Feed Speed: 300-450 ipm
FILLER METALS (QW-404)																	
SFA Specification	5.18																
AWS Classification	ER70S-3																
Filler Metal F-No.	6																
Weld Metal Analysis A-No.	1																
Size of Filler Metal	.035																
Other	N.A.																
Weld Metal Thickness	0.562																
POSITION (QW-405) Position of Groove 5G Weld Progression (Uphill, Downhill) Downhill root pass Other N.A. Balance uphill	TECHNIQUE (QW-410) Travel Speed 22-23 ipm String or Weave Bead Both-As Required Oscillation N.A. Multipass or Single Pass (per side) Multiple Single or Multiple Electrodes Single Other Short Circuiting Metal Transfer																
PREHEAT (QW-406) Preheat Temp. 70°F Interpass Temp. 250°F max Other N.A.																	

This form (E0007) may be obtained from the Order Dept., ASME, 222 Law Drive, Box 2300, Fairfield, NJ 07007-2300, (800) 843-2763.

Data included in this suggested PQR format is illustrative only.

QW-483 (Back)

Tensile Test (QW-150)

PQR No. **Q211**

Specification No.	Width	Thickness	Area	Ultimate Total Load lb	Ultimate Unit Stress psi	Type of Failure & Location
5G-0	0.752	0.550	0.414	36,400	88,000	Ductile-Base Metal
5G-180	0.754	0.550	0.415	37,100	89,500	"

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
45 Side Bend QW-463.2	Acceptable-No Visible Defect
135 " "	" "
225 " "	" "
315 " "	" "

Toughness Tests (QW-170)

Specimen No.	Notch Location	Specimen Size	Test Temp.	Impact Values			Drop Weight Break (Y/N)
				ft-lb	% Shear	Mils	
None Required							

Fillet-Weld Test (QW-180)

Result—Satisfactory: Yes **N.A.** No _____ Penetration into Parent Metal: Yes _____ No _____
Macro—Results _____

Other Tests

Type of Test **Visual Examination**
Deposit Analysis **N.A.**
Other **N.A.**

Welder's Name **Edward Daly** Clock No. **17** Stamp No. **W23**
Tests Conducted by: **Weld Test Lab, USA** Laboratory Test No. **211-AWC**

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Manufacturer **Any Welding Company**
Date **02-15-05** By *Patrick Pearse*

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)

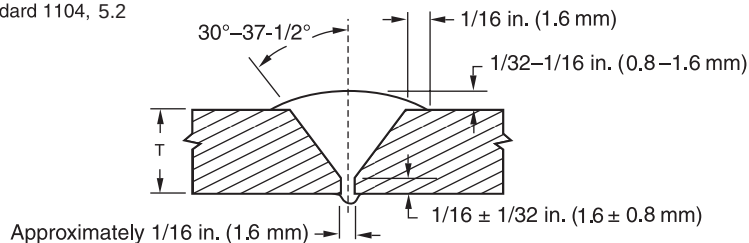
Data included in this suggested PQR format is illustrative only.

Reference: API Standard 1104, 5.2

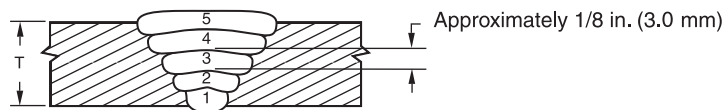
PROCEDURE SPECIFICATION NO. Sample

For Manual SMAW Welding of 5L-X52 Pipe and Fittings
Process Shielded Metal Arc Welding
Material API 5L Std. Line Pipe Gr. X-52
Pipe Outside Diameter and Wall Thickness 4 1/2-12 3/4 in. dia. 3/16-3/4 in. Thickness
Joint Design Single Vee Groove-See Sketch
Filler Metal and No. of Beads See Sketch and Table Below
Electrical or Flame Characteristics DCEP
Position Fixed-Pipe Axis Horizontal (5G)
Direction of Welding Downhill
No. of Welders One
Time Lapse Between Passes Unlimited
Type and Removal of Lineup Clamp None
Cleaning and/or Grinding Grinding/Wire Brush to Remove Slag
Preheat Stress Relief None
Shielding Gas and Flow Rate External-Must complete 70% of weld before removal
Shielding Flux N.A.
Speed of Travel _____
Plasma Gas Composition _____ Plasma Gas Orifice Size _____ Plasma Gas Flow Rate _____
Sketches and Tabulations Attaches _____
Tested Dolan Shamrock Welder John Gargas
Approved Michael Brandon Welding Supervisor Michael Brandon
Adopted John Doe Chief Engineer John Doe, P.E.

Reference: API Standard 1104, 5.2



Standard V-Bevel Butt Joint



Sequence of Beads

NOTE: Dimensions are for example only.

ELECTRODE SIZE AND NUMBER OF BEADS

Bead Number	Electrode Size and Type	Voltage	Amperage and Polarity	Speed
1	1/8" E6010	26	115 DCEP	N.A.
2	1/8" E7010	26	115 DCEP	N.A.
3-5	5/32" E7010	25	135 DCEP	N.A.

Data included in this suggested PQR format is illustrative only.

API-Approved Coupon Test Report

Date 02-15-05 Test No. 485
 Location New York
 State NY Weld Position: Roll ☐ Fixed ☒
 Welder John Gargas Mark (Enter Welder's Symbol)
 Welding Time 30 minutes Time of Day 9:00 a.m.
 Mean Temperature 70°F Weld Break Used None
 Weather Conditions Indoors
 Voltage 24-27 Amperage 110-120
 Welding Machine Type DC Generator Welding Machine Size 300 amp
 Filler Metal E6010 Root, E6010 Fill
 Reinforcement Size 1/32"-1/16"
 Pipe Type and Grade API 5L-X 52
 Wall Thickness 0.203 Outside Diameter 8 in.

	1	2	3	4	5	6	7
Coupon Stenciled	A	B					
Original Specimen Dimensions	0.945 x 0.203	1.022 x 0.203					
Original Specimen Area	0.192	0.207					
Maximum Load	15,300	16,500					
Tensile Strength per square inch of Plate Area	79,700	79,700					
Fracture Location							

