FLAWLESS STEEL WELDING

Welding Procedures Training Guide

Understanding Welding Procedure Specifications (WPS)

Date: 2024 | Required Reading for All Welders

Introduction to Welding Procedure Specifications (WPS)

A Welding Procedure Specification (WPS) is a written document that provides direction to the welder or welding operators for making production welds to code requirements. The WPS contains all the essential variables and nonessential variables that must be followed to ensure proper weld quality and code compliance.

Key Points:

- WPS documents are legally binding requirements for welders
- All production welding must follow approved WPS guidelines
- Deviations from WPS parameters can result in weld rejection
- Understanding WPS is essential for quality and safety compliance

Sample WPS: E-7018/SMAW-3/8-3G

WPS Identification & Specifications

Parameter	Specification	Details
WPS Number	E-7018/SMAW-3/8-3G	Unique identifier for this procedure
Welding Process	SMAW (Shielded Metal Arc Welding)	Stick welding process
Base Metal	Carbon Steel (A36)	Structural grade steel
Filler Metal	E-7018	Low hydrogen electrode
Position	3G (Vertical)	Vertical welding position
Joint Design	Groove Weld	Full penetration butt joint

Process & Classification Details

SMAW (Shielded Metal Arc Welding) Process

Also known as "stick welding," SMAW uses a consumable electrode coated with flux to lay the weld. The flux coating provides shielding gases and slag protection during welding.

E-7018 Electrode Classification

- **E** - Electrode designation
- **70** - Minimum tensile strength (70,000 PSI)
- **1** - All position welding capability
- **8** - Low hydrogen, iron powder coating, AC/DC operation

Joint Design & Preparation Requirements

Material Preparation

- Base metal thickness: 3/8 inch
- Joint type: Complete joint penetration groove weld
- Bevel angle: 30° ± 5° each side (60° total)
- Root opening: 1/8" ± 1/32"
- Root face: 1/16" ± 1/32"
- Backing: Steel backing bar (removable)

Surface Preparation

- Remove all oil, grease, paint, and contaminants
- Grind joint faces to bright metal
- Inspect for cracks or defects before welding
- Ensure proper fit-up with minimal gaps

Welding Parameters

Pass	Electrode Size	Amperage Range	Voltage (Arc Length)	Travel Speed (IPM)	Technique
Root Pass	1/8" (3.2mm)	90-120 Amps	Short Arc	6-8 IPM	Straight bead, no weave
Fill Passes	5/32" (4.0mm)	140-180 Amps	Medium Arc	8-12 IPM	Slight weave, max 3x electrode diameter
Cap Pass	5/32" (4.0mm)	160-200 Amps	Medium Arc	10-14 IPM	Weave pattern for profile

Temperature Requirements

Preheat Specifications

Material Thickness	Minimum Preheat	Interpass Temperature	Maximum Interpass
3/8" A36 Steel	70°F (21°C)	Maintain preheat minimum	400°F (204°C)

Temperature Control Requirements:

- Use calibrated temperature measuring devices
- Measure temperature 3 inches from weld area
- Never weld on frozen or wet surfaces
- Allow gradual cooling - no forced cooling methods

Critical Safety Information

MANDATORY SAFETY COMPLIANCE

- **Amperage Compliance:** Never exceed specified amperage ranges
- **Temperature Monitoring:** Verify preheat and interpass temperatures
- **Visual Inspection:** Inspect each pass before proceeding
- **PPE Requirements:** Proper welding helmet, gloves, and protective clothing
- **Ventilation:** Ensure adequate ventilation for fume extraction

Inspector Expectations Checklist

Pre-Weld Inspection

- ■ Welder qualification current and valid
- ■ WPS approved and available at workstation
- ■ Base metal identification verified
- ■ Joint preparation meets requirements
- ■ Fit-up within specified tolerances
- ■ Preheat temperature verified
- ■ Electrode classification confirmed
- ■ Welding machine calibrated and settings correct

During Welding Monitoring

- ■ Welding parameters within specified ranges
- ■ Proper welding technique being followed
- ■ Interpass temperature maintained
- ■ Each pass visually acceptable before proceeding
- ■ Proper electrode angle and travel speed

Post-Weld Inspection

- ■ Visual inspection shows acceptable weld profile
- ■ No visible cracks, porosity, or undercut
- ■ Weld size meets drawing requirements
- ■ Proper fusion and penetration achieved
- ■ Surface finish meets specifications
- ■ Documentation completed and signed

Welder Responsibilities

As a qualified welder at Flawless Steel Welding, you are responsible for:

- Following all WPS requirements exactly as written
- Maintaining current welding qualifications
- Reporting any issues or concerns immediately
- Participating in ongoing training and certification programs
- Upholding the highest standards of quality and safety

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For questions about this WPS or welding procedures, contact your supervisor or quality department.