Shielded Metal Arc Welding

By Matt Scott

Introduction

- SMAW – a “tried and true” process excellent for many applications that is still widely used today!
- SMAW Excellent choice for:
  - Maintenance Work
  - Field Work
  - Pipe Applications (GTAW too)
  - Structural Steel

Shielded Metal Arc Welding (SMAW) Defined

- SMAW is a process where electrical power is converted from high voltage and low amperage into low voltage and high amperage current used to melt the base metal through the electrode arc to make a weld.

Shielded Metal Arc Welding (SMAW)

- The electrodes that are used with SMAW are approximately 14 inches long and will be consumed into the weld.
- These electrodes are flux covered and it's this flux that distinguishes its arc characteristics and its ability to weld out of position.

Shielded Metal Arc Welding (SMAW)

- The electrode flux has several functions that include:
  - Gas shielding
  - Controls Penetration
  - Helps remove oxides
  - Adds Alloys to the weld
  - Provides Arc Stabilizers
  - Increases deposition rates

SMAW Essential Factors

- **Safety**
- **Equipment Selection**
- **Electrode Selection**
- **Set-Up**

SMAW Essential Factors

- Safety
  - Personal
  - Equipment
  - Environment
  - Tool Safety
- Safety Check
- Electrical Safety
- Light (UV, IR, and Intense visible Light)
- Fume Control
- Fire Control

SMAW Essential Factors

Equipment Selection

- Money, money, money
- Input power (220v, 460v, gas/diesel)
- Out Put (Max Amperage and Duty Cycle)
- Output Current (AC, DCRP, DCSP)

Selecting an Electrode

- **Things to Consider**
  - Metal Thickness
  - Position
  - Condition (wet, oily, greasy, painted)
  - Joint design
  - Service Application
  - Part goes into a static or dynamic situation (i.e. how does it handle vibration stresses).
  - Bead Appearance
  - Metal's Susceptibility to Cracking - High carbon content (above0.35% Caron)
  - What does the Welding Procedure Specification (WPS) specify

Electrode Characteristics Chart

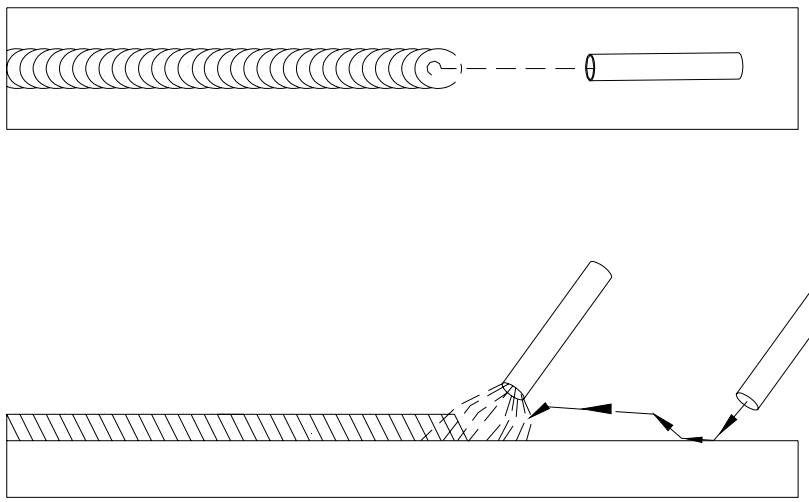
	E6010 or E6011	E7018	E7024
As Welded Strength	60,000 psi tensile strength	70,000 psi tensile strength	70,000 psi tensile strength
Welding Positions	All Position	All Position	Flat and Horizontal
Flux Type	Cellulose	Lime – Fluorine Low-Hyrogen	Rutile
Current Type	6010 = DCRP 6011 = AC or DCRP	DCRP	DCRP
Arc Characteristics	Aggressive	Medium	Soft
Storage Considerations	Room Temperature	Rod Oven	Room Temperature
Slag Consistency	Light	Medium	Heavy
Toughness (vibratory stress)	Good	Excellent	Good
Welding Technique	Whip and Pause	Tight Arc	Tight Arc

SMAW Essential Factors

- **Common Problems**
  - Porosity
  - Undercut
  - Arc blow (finger nailing)

SMAW Essential Factors

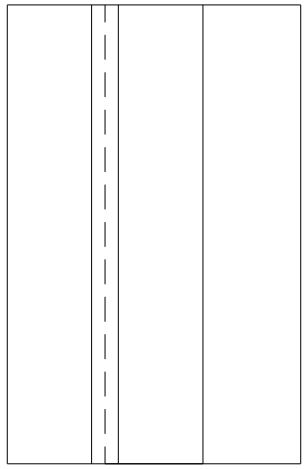
- Technique
  - Striking the Arc (arc strikes)
  - Slag you Drag
  - Oscillation E6010 Vs. E7018
    - Whip and Pause
    - Arc length

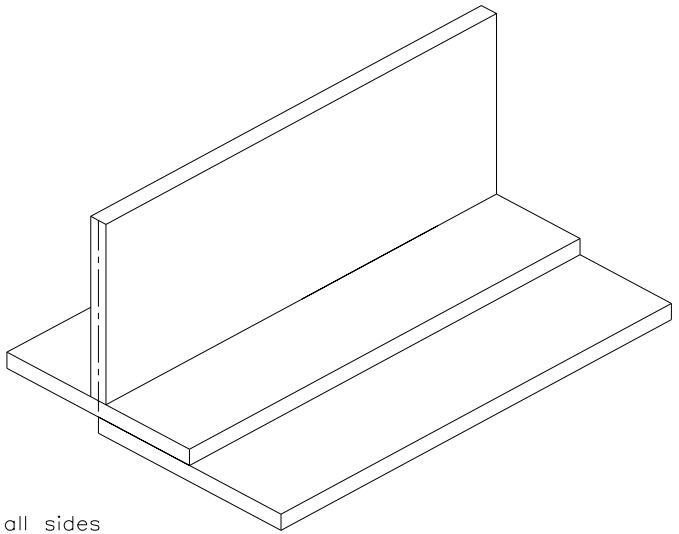


Topic Two – Set it Up

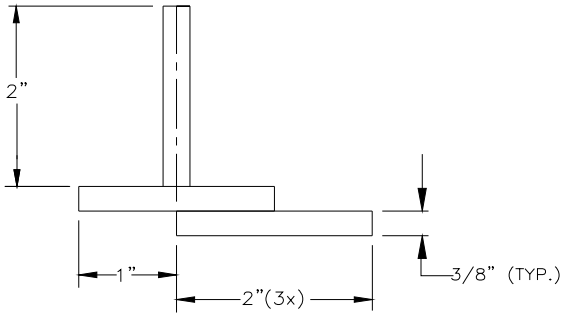
- Safety Scan
- On/Off Switch location
- Polarity Check
- Amperage Adjustment
  - Scrap Metal
  - Ease in starting
  - Puddle fluidity and slag mobility

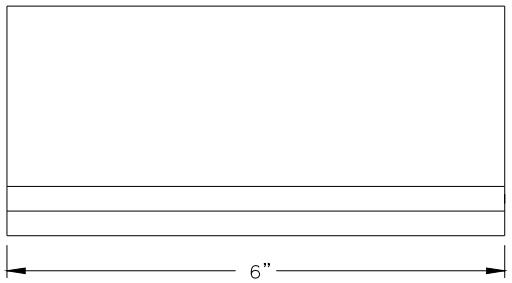
WLD FFA–1
Advance SMAW Mild Steel
Horizontal Position T–Joint (2F)





NOTE: 7018 stick all sides





Inch	MM
1/16"	1.6
1/8"	3.2
1/4"	6.4
1/2"	12.7
1"	25.4

Part	No. Required	Size (WxHxL)	S.I. Conversion

Portland Community College
Welding Technology

Tolerance (Unless otherwise Specified)
Dimensional ± 1/16" Angle ± 5°

Drawn By: John Deering

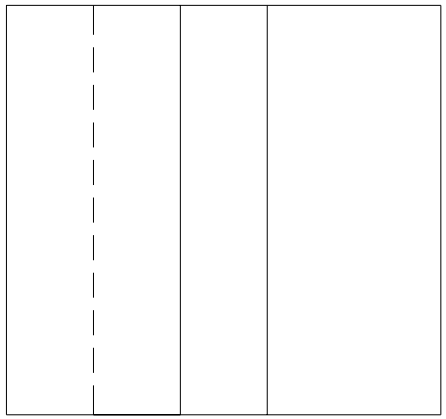
Chk By: Date: 05/10/04

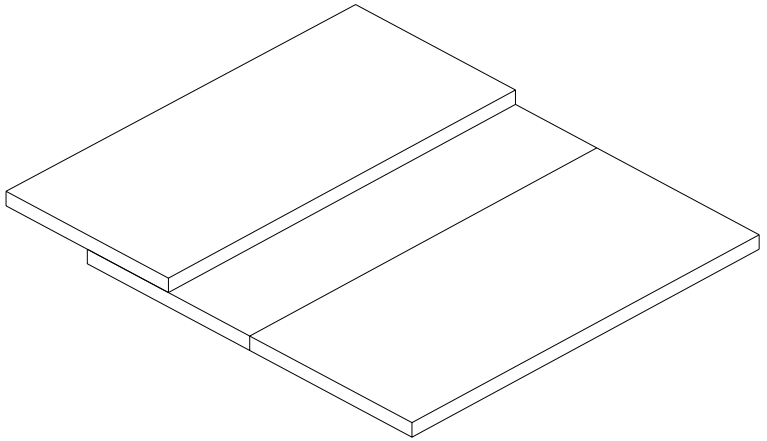
WLD FFA–1

Size: | Qc No. | Rev.

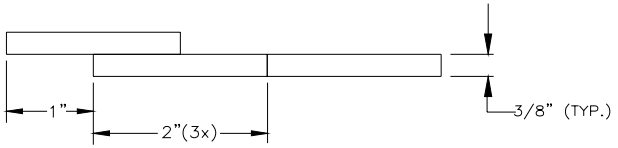
Approve | Date | Sheet

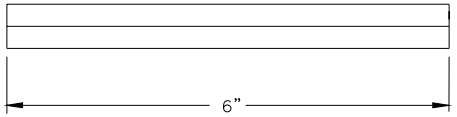
WLD FFA–2
Beginning SMAW
Horizontal Position





NOTE: 6011 stick all sides





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Tolerance (Unless otherwise Specified) Dimensional ± 1/16" Angle ± 5°		WLD FFA–2	
Drawn By: John Deering		Size:	Qc No. / Rev.
Chk By:	Date: 05/10/04	Approve Date	Sheet

Where to Get More Information

- Owners Manual
- Welding Principles and Applications text book
- PCC
- Local Suppliers