A BASIC GUIDE OF ARC WELDING ELECTRODES

by Bruce Bauerlein

INTRODUCTION

There are many different types of electrodes used in the shielded metal arc welding, (SMAW) process. The intent of this guide is to help with the identification and selection of these electrodes.

ELECTRODE IDENTIFICATION

Arc welding electrodes are identified using the A.W.S, (American Welding Society) numbering system and are made in sizes from 1/16 to 5/16 . An example would be a welding rod identified as an 1/8" E6011 electrode.

The electrode is 1/8" in diameter

The "E" stands for arc welding electrode.

Next will be either a 4 or 5 digit number stamped on the electrode. The first two numbers of a 4 digit number and the first 3 digits of a 5 digit number indicate the minimum tensile strength (in thousands of pounds per square inch) of the weld that the rod will produce, stress relieved. Examples would be as follows:

E60xx would have a tensile strength of 60,000 psi E110XX would be 110,000 psi

The next to last digit indicates the position the electrode can be used in.

1. EXX1X is for use in all positions
2. EXX2X is for use in flat and horizontal positions
3. EXX3X is for flat welding

The last two digits together, indicate the type of coating on the electrode and the welding current the electrode can be used with. Such as DC straight, (DC -) DC reverse (DC+) or A.C.
I won't describe the type of coatings of the various electrodes, but will give examples of the type current each will work with.

ELECTRODES AND CURRENTS USED

- EXX10 DC+ (DC reverse or DCRP) electrode positive.
- EXX11 AC or DC- (DC straight or DCSP) electrode negative.
- EXX12 AC or DC-
- EXX13 AC, DC- or DC+
- EXX14 AC, DC- or DC+
- EXX15 DC+
- EXX16 AC or DC+
- EXX18 AC, DC- or DC+
- EXX20 AC ,DC- or DC+

- EXX24 AC, DC- or DC+
- EXX27 AC, DC- or DC+
- EXX28 AC or DC+

CURRENT TYPES

SMAW is performed using either AC or DCcurrent. Since DC current flows in one direction, DC current can be DC straight, (electrode negative) or DC reversed (electrode positive). With DC reversed,(DC+ OR DCRP) the weld penetration will be deep. DC straight (DC- OR DCSP) the weld will have a faster melt off and deposit rate. The weld will have medium penetration.
Ac current changes it's polarity 120 times a second by it's self and can not be changed as can DC current.

ELECTRODE SIZE AND AMPS USED

The following will serve as a basic guide of the amp range that can be used for different size electrodes. Note that these ratings can be different between various electrode manufactures for the same size rod. Also the type coating on the electrode could effect the amperage range. When possible, check the manufactures info of the electrode you will be using for their recommended amperage settings.

Electrode Table

ELECTRODE DIAMETER (THICKNESS)	AMP RANGE	PLATE
1/16"	20 - 40	UP TO 3/16"
3/32"	40 - 125	UP TO 1/4"
1/8	75 - 185	OVER 1/8"
5/32"	105 - 250	OVER 1/4"
3/16"	140 - 305	OVER 3/8"
1/4"	210 - 430	OVER 3/8"
5/16"	275 - 450	OVER 1/2"

Note! The thicker the material to be welded, the higher the current needed and the larger the electrode needed.

SOME ELECTRODE TYPES

This section will briefly describe four electrodes that are commonly used for maintenance and repair welding of mild steel. There are many other electrodes available for the welding of other kinds of metals. Check with your local welding supply dealer for the electrode that should be used for the metal you want to weld.

E6010 This electrode is used for all position welding using DCRP. It produces a deep penetrating weld and works well on dirty,rusted, or painted metals

E6011 This electrode has the same characteristics of the E6010, but can be used with AC and DC currents.

E6013 This electrode can be used with AC and DC currents. It produces a medium penetrating weld with a superior weld bead appearance.

E7018 This electrode is known as a low hydrogen electrode and can be used with AC or DC. The coating on the electrode has a low moisture content that reduces the introduction of hydrogen into the weld. The electrode can produce welds of x-ray quality with medium penetration. (Note, this electrode must be kept dry. If it gets wet, it must be dried in a rod oven before use.)

It is hoped that this basic information will help the new or home shop welder identify the various types of electrodes and select the correct one for their welding projects.

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