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Study Of Weldability And Feasibility On SS304 Metal With SMAW

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Abstract- *GTAW is a high quality welding process commonly used to join thicker plates into load-bearing components.SMAW is a form of arc welding using a welded metal electrode. In research, we focus primarily on the study of the SMAW methodology.*

Keywords - *SMAW, Welding, SS304.*

I. INTRODUCTION

The objective of this project work is the analysis of quality stainless steel SMAW welding parameters (SS304). We will perform SMAW welding in SS304. SMAW is an arc welding that uses a covered and consumable metal electrode to protect the solder. The electrode is covered by a coating of flux that melts when the welding is positioned, thus releasing a vapor that protects the welding from atmospheric pollution. The samples are prepared in accordance with the ASME codes. All welding samples must be tested under tension, hardness, microstructural changes, chemical composition and DPT for cracks identification. In this research work, our main objective is the study of welding technologies. We are investigating what type of welding rods, filling material, flow and protection gases have been used. We are investigating the factors influencing the selection of the welding procedure.

Welding is a process of permanent union of similar or different metals with or without the application of heat and pressure. Welding has a great industrial use to combine metals.

The various factors that influence the selection of the welding process are listed below,
- Metal: thermal expansion of thickness, melting point
- Availability of consumables
- Terms of Service
- Precision required

II. INTRODUCTION TO SMAW WELDING

Armored metal arc welding is the oldest and most used process used for production. It is an arc welding process in which the heat for welding is produced through an electric arc configured between a flow of paint electrode and work piece. The flow coating decomposes due to arc heat and performs many functions, such as welding metal protection, arc stability, etc. The inner core of the electrode supplies the filler material for welding.

In this process, we can use both CA and CC. The constant current DC supply is invariably used with all types of electrodes independently of the base metal (ferrous and non-ferrous). However, the AC may not be suitable for a certain type of electrode and base materials. Therefore, the CA must be used in light of the manufacturer's recommendations for electrode application. In the case of direct current welding, the heat released in the anodes is generally greater than the arc column and the cathode side. the amount of heat generated on the anode and the cathode can differ significantly depending on the composition of the coating flow, the base metal, the polarity and the nature of the arc plasma in the case of DC welding, the polarity determines the distribution of the generated heat in the cathode and anode they consequently influence the melting speed of the electrode and the penetration into the base metal.

The heat generated by the welding arc is indicated by H and is given by,
$H = I \times V \times 60 / S$ in joules per inch
where is it,
Soldering current I
Welding voltage V
S welding speed in inches per minute

❖ **SMAW WELDING TECHNIQ**

During welding, a clean and clean solder must be present. To facilitate this process, it is important to choose steels that work well with SMAW welding techniques.

Once you have selected your steel, be sure to clean the edges to get a clean weld. This means removing paint, rust, moisture and oils. If the coupling could not be cleaned, use an E6010 or E 6011 electrode with a slow travel speed to make sure the gases burst before the pool solidifies.

The quality problems that may arise from the SMAW welding process include the porosity caused by the gas in the weld that does not escape before the metal solidifies, leaving the weld weak due to gas bubbles, splashes caused by low oltage or high amperage, poor melting of dirty metal or low power, superficial penetration caused by a too fast travel time, too low current or too large electrode, and cracks caused by the aforementioned problems, as well as not allowing movement in welding while working and use inadequate metals in the piece.

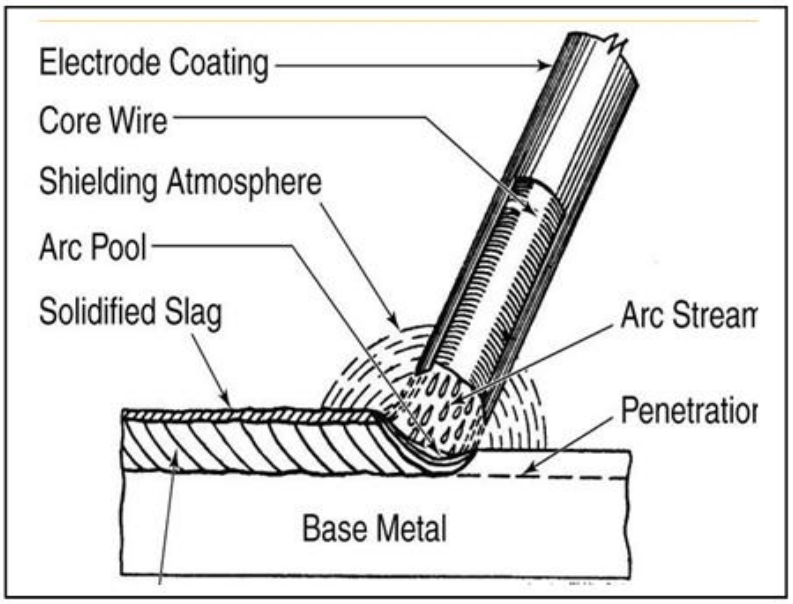


FIG. ARC ZONE IN SHIELDED METAL ARC WELDING (SMAW)

The coating functions in several ways, as shown in fig.

1. Electrode material burns off faster than the outer flux, forming a “crucible” that partially shields the from the atmosphere .
2. Impurities are removed from the molten metal by the fl
3. A gaseous envelope is form by the decomposition of the ingredients in the covering. This excludes the oxygen and nitrogen in the air form contact with the molten weld pool.
4. The slag formed on top of the weld metal acts as a protective covering against contamination by the atmosphere as the weld cools and serves to control
   shape of the weld pool
5. It provides alloy additions to the weld metal.

❖ **Base Metal:**

Our base metal is SS304 which is belong from steel family. It is widely use in machinery parts. Its weldability is calculated in weldability section. It leverage high strength and toughness, but offer some difficulty in welding. Its chemical composition are as below,

❖ **Chemical Composition:**

Element	Composition (%)
C	0.070
Si	0.257
Mn	0.39
S	0.011
Ph	0.025
Ni	8.19
Cr	18.4
Mo	0.141
V	0.052
Ti	0.005
Cu	0.343
Al	0.01

❖ **Mechanical Properties:-**

Tensile Strength(MPa)	**515**
Yield Strength(0.2% Proof)Mpa	**205**
Elongation(% in 50mm)	**40**

❖ **Weldability Review:**

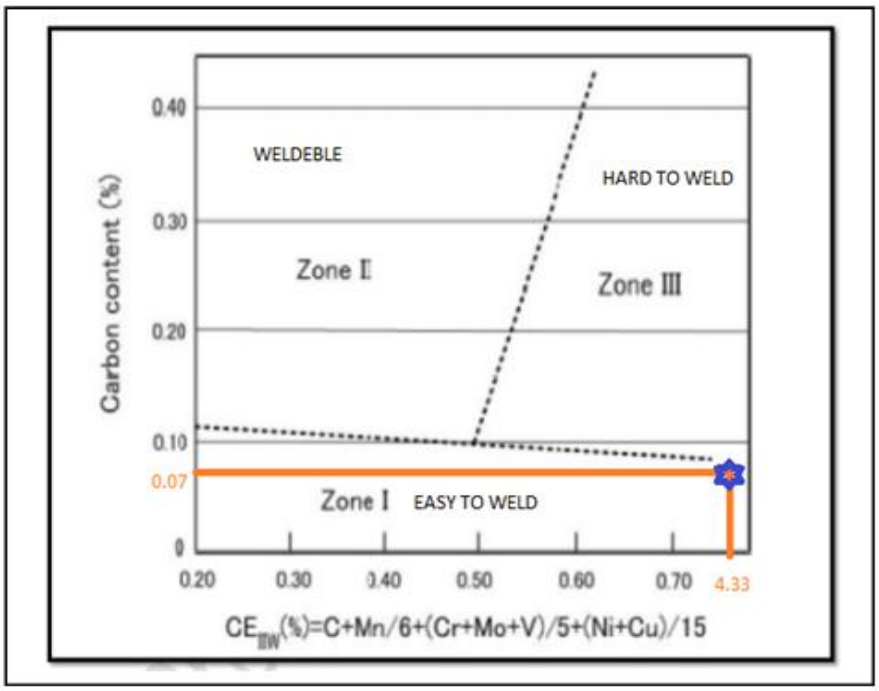
To check the weldability we are using Carbon Equivalent Method.

❖ **CE Calculation:**

There are several formulae for calculating the CE of any ferrous material, by using some of them to derive CE,

$CE_{IIW} = C + Mn/6 + (Cr+ Mo + V)/5 + (Cu+ Ni)/15$
$CE_{IIW} = 4.36$

$C_{eq} = C+ Mn/6+ Si/24+ Ni/40+ Cr/5+ Mo/4$
$C_{eq} = 4.1329$



CE value and carbon content are marked on gravelle welding diagram. It comes in easy to weld region .

❖ **Electrode**

Electrodes for SMAW are selected first on the basic of alloy composition. In SMAW on ss304 we use SS 308L-16 electrode for welding. The electrode coating are generally lime base or titania base materials depending on the type of welding to be done and the type of power supply used.

SS 308L-16 is resistant to atmosphere and resistant to grain disinterration of operating tem to 350 manufactured consistent high quality standard the electrode are placed in moisture proof re- sealable packs these coated electrode deposit weld metal of very low carbon level for the successful welding and operating of high quality stainless steel structure vessel and container suitable for welding ASTM 304 and 304 L stainless steel.

❖ **Chemical composition:**

Element	Content(%)
C	0.02
Si	0.32
Mn	1.70
P	0.011
S	0.009
Cr	20
Ni	10

❖ **Mechanical Property:**

Yield Strength(Mpa)	393
Tensile Strength(Mpa)	599
Elongation (%)	34

❖ **Application of SS304:**

I. Food industries: machine containers, sterilizers and storage and transport tanks, including pipes, valves, milk trucks and rail cars.

II. Household utensil - sink, countertops, refrigerator, kitchen appliances, pots pans, container for chemicals, a and heat exchangers

III. Springs, nuts, bolts and screws.

IV. Production equipment for tubes, dairy products, food products and pharmaceuticals.

V. Architectural, sanitary and rear panels.

CONCLUSION

We study SMAW welding process & their different parameters.

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