Experimental Investigation for Strength of Steel Using Arc Welding

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ABSTRACT

Welding is an area in which technological developments out match the developments in its science base which is primarily driven by the phenomenal industrial demand for welded structure. Reliability, Reproducibility and Viability requirements are forcing Technologists to look at weld defects such as distortion, hot cracking, in a systematic and logical approach than on experimental basis. Distortion is an unwanted physical change from specifications in a fabricated structures is caused by non-uniform expansion and contraction of the weld metal during heating and cooling cycle of the welding process many factors viz., material properties, welding process and procedures adopted make accurate prediction of distortion difficult. Groove angle was taken to analyze tensile, compressive, shear, bend and impact strength in butt weld joints

Keyword: - *Shielded metal arc welded joint, Welding processes, Brazing, Soldering*

1. INTRODUCTION

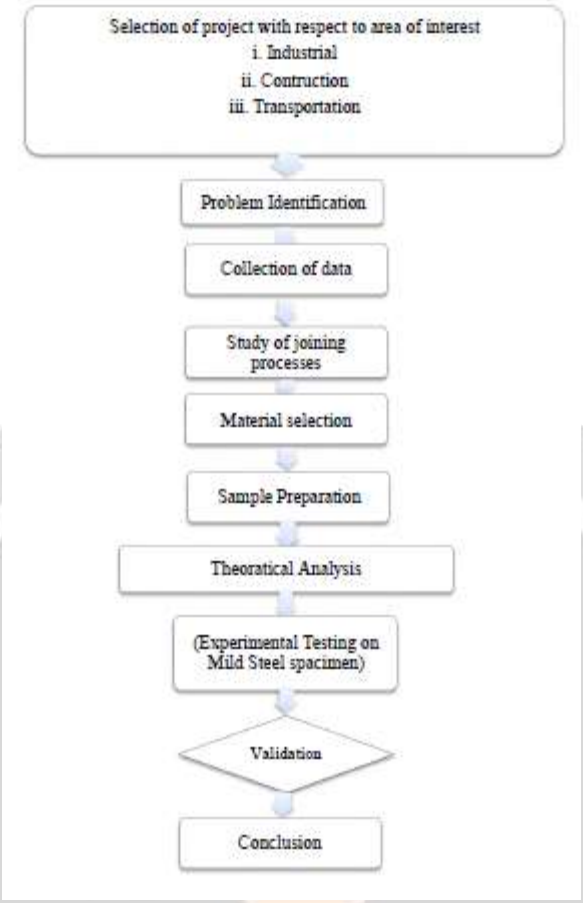
The term joining is generally used for welding, brazing, soldering, and adhesive bonding, which form a permanent joint between the parts. A joint cannot be easily separated. The term assembly usually refers to mechanical methods of fastening parts together. Some of these methods allow for easy disassembly, while others do not. We begin our coverage of the joining and assembly processes with welding, Welding is a materials joining process in which two or more parts are coalesced at their contacting surfaces by a suitable application of heat and/or pressure. Many welding processes are accomplished by heat alone, with no pressure applied; others by a combination of heat and pressure; and still others by pressure alone, with no external heat supplied. In some welding processes a filler material is added to facilitate coalescence. The assemblage of parts that are joined by welding is called a weldment. Welding is most commonly associated with metal parts, but the process is also used for joining plastics. Our discussion of welding will focus on metals. Welding is a relatively new process. Its commercial and technological importance derives from the following: Welding provides a permanent joint. The welded parts become a single entity. The welded joint can be stronger than the parent materials if a filler metal is used that has strength properties superior to those of the parents, and if proper welding techniques are used. Welding is usually the most economical way to join components in terms of material usage and fabrication costs. Alternative mechanical methods of assembly require more complex shape alterations (e.g. drilling of holes) and addition of fasteners (e.g. rivets or bolts). The resulting mechanical assembly is usually heavier than a corresponding weldment. Welding is not restricted to the factory environment. It can be accomplished in the field. [3]

1.1 Objectives

Objective of this study is listed below;

1. Minimize-Cracks
2. Suitable Material:
3. Increasing Welding Strength
4. Minimize cost of welding
5. Suitable Material

1.2 Methodology



2. EXPERIMENTATION

2.1 Sample Material

The experimental study work is to be carried out to investigation and compare TIG and EA welding for impact, tensile and hardness test and distortion of V grooves butt weld joint of MS steel material. The chemical composition of work material is given following Table

Table - 1 Chemical Composition of Work Material MS

Elements	C	Si	Mn	P	S	Cr	Mo	Ni	Al	Ti
Weight (%)	0.03	0.02	0.10	0.006	0.003	0.00	0.004	0.010	0.03	0.002

Table - 2 Experimentation Values For TIG Welding

Specimen No.	**Root Opening** (mm)	**Groove Angle in** Degree	**Bevel Height** (mm)	**Types of Groove**	**Gas Flow Rate** Lit/sec
1	2	35	1	V	10
2	2	45	1.5	V	10
3	2	60	2	V	10

Let,
l = length of w/p, mm
b = breath of w/p, mm
t = thickness of w/p, mm

h = height of weld joint, mm
e = bevel height, mm

Table - 3 Experimentation Values for Electric Arc Welding

Specimen No.	**Root Opening** (mm)	**Groove Angle in** Degree	**Bevel Height** (mm)	**Types of Groove**	**Welding Voltage** V	**Welding Current** A
1	2	35	1	V	35	210
2	2	45	1.5	V	35	210
3	2	60	2	V	35	210

2.2 Sample Geometry

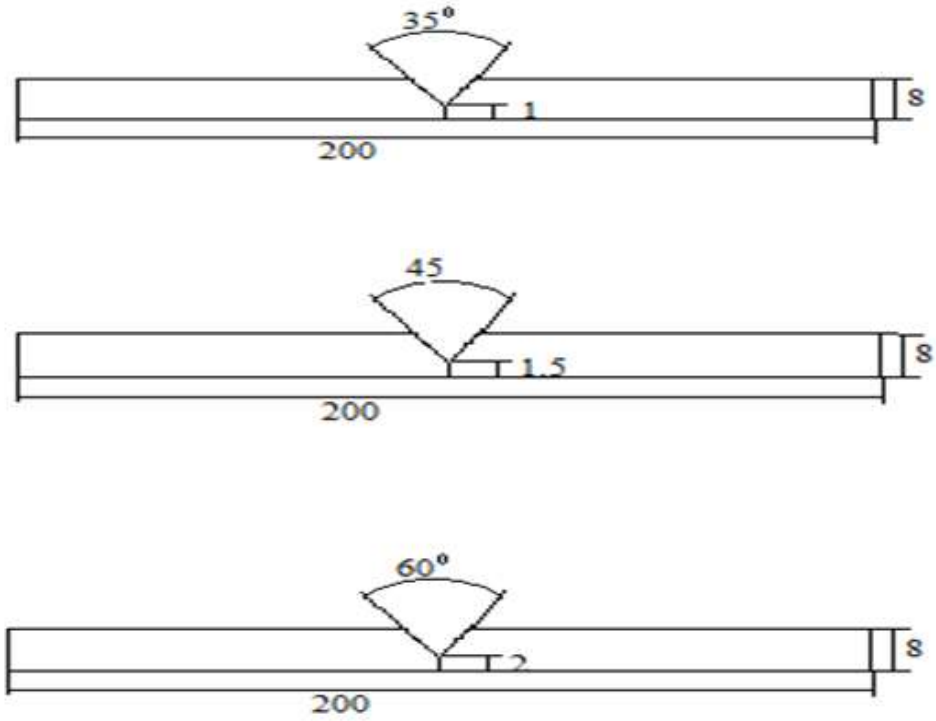


Fig - 1 Sample Geometry For TIG Welding

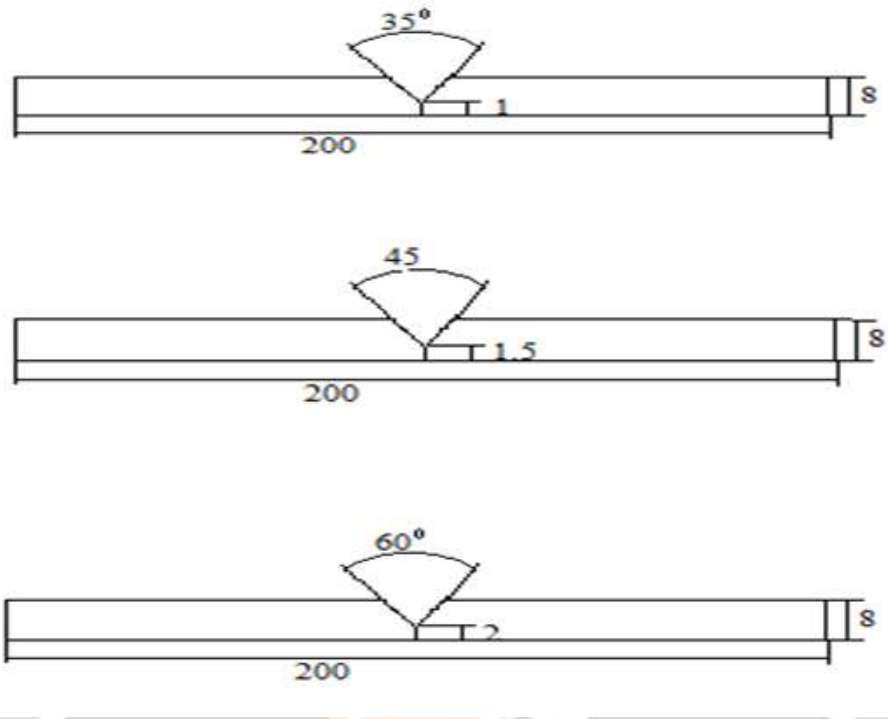


Fig - 2 Sample Geometry for SMAW Welding

3. EXPERIMENTAL RESULTS

Table - 4 Experimental Results

Sr. No.	Sample Identification	Tensile Strength (MPa)	Bending Strength (N)	Hardness in HV	HAZ Length in mm
1	35^0 TIG Weld Sample	446.58	7644.00	200.7	2.90
2	45^0 TIG Weld Sample	420.71	5145.00	194.0	3.00
3	60^0 TIG Weld Sample	486.40	9711.80	196.0	3.22
4	35^0 SMAW Weld Sample	302.55	4214.00	193.0	2.44
5	45^0 SMAW Weld Sample	296.18	6811.00	173.0	2.50
6	60^0 SMAW Weld Sample	472.27	4018.00	186.0	2.38

4. CONCLUSION

1. A strong joint of mild steel is produced by using the TIG as compare to SMAW technique.
2. Experimental investigation result of TIG and SMAW has observed effect on tensile strength of V-butt weld joint. Maximum tensile strength is 486.40 Mpa for TIG welding at 60°.
3. Experimental investigation of TIG and SMAW has observed effect on bending strength of V- butt weld. Maximum bending strength is 9711.80N for TIG welding is more than SMAW.
4. Observed the effect of the TIG and SMAW to the hardness in HAZ of V-butt for TIG welding is 3.22mm at $60^0$is more than SMAW.

5. It is observed that 60^0 groove angle is best for maximum tensile and bending strength both for TIG and SMAW welding and distortion for plate welding application.

5. REFERENCES

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