



**UNIVERSITI TEKNOLOGI MARA
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MEC 299

**STUDY OF HARDNESS PROPERTIES OF
BUTTWELDED JOINTS USING SHIELD METAL ARC
WELDING (SMAW) ON MILD STEEL PLATE**

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SEM MARCH AUGUST 2022

ABSTRACT

This proposal focused on the SMAW (shield metal arc welding) butt welded joints' hardness properties on mild steel plate. SMAW is one of the most used welding techniques today, despite the fact that this particular form of SMAW welding is tough and challenging. This research article will continue the examination to establish whether this SMAW welding technique is suitable for welding mild steel. In this investigation, the mild steel plate will be welded using SMAW type welding and butt joint type. Using a Vickers hardness machine, the hardness value of the welded sample will be determined.

TABLE OF CONTENTS

CHAPTER 1

1.0 INTRODUCTION	7
1.1 RESEARCH BACKGROUND.....	7
1.2 PROBLEM STATEMENT	9
1.3 RESEARCH QUESTION.....	10
1.4 OBJECTIVE.....	10
1.5 SIGNIFICANT OF STUDY	10
1.6 SCOPE OF WORK	11
1.7 EXPECTED RESULT	12

CHAPTER 2

2.0 LITERATURE REVIEW	13
2.1 SHIELD METAL ARC WELDING (SMAW)	13
2.2 BUTT WELD JOINT	15
2.3 MILD STEEL PLATE	16
2.4 VICKER'S HARDNESS	18

CHAPTER 3

3.0 METHODOLGY	20
3.1 INTRODUCTION.....	20
3.2 RESEARCH DESIGN	20
3.3 SAMPLE	20
3.4 INSTRUMENTS	21
3.4.1 SHIELD METAL ARC WELDING (SMAW).....	21
3.4.2 VICKER'S HARDNESS MACHINE.....	21
3.5 MATERIAL	21
3.5.1 MILD STEEL PLATE	21
3.6 PROCEDURE	22
3.6.1 WELDING	22
3.6.2 VICKER'S HARDNESS TEST	22

CHAPTER 1

INTRODUCTION

1.0 RESEARCH BACKGROUND

Welding is one of the most important technological processes used across numerous branches of industry such as industrial engineering, shipbuilding and many more. Welding is a fabrication process whereby two or more parts are fused together by means of heat, pressure or both forming a joint as the parts cool. Welding is usually used on metals and thermoplastic but can also be used on wood. The completed welded joint may be referred to as a weldment. Weld quality is affected by several different factors. The most important factors include the size and type of weld, edge preparation, metal thickness, reinforcement members and distortion. Each of the above factors can affect and change the process of welding.

There are many types of welding but we will focus on Shield Metal Arc Welding (SMAW). Shield Metal Arc Welding (SMAW) also known as stick welding, is a manual process using a flux coated consumable electrode with a metal rod at the core. Thus, it can perform in any welding position and materials with different thickness. Many possible variations in the composition of the electrode covering and the large selection of core wire chemistry. The process can produce an extensive range of weld metal deposits with desirable mechanical and physical properties, while providing for a smooth arc, uniform metal transfer characteristics, and ease of operations. The flux melts together with the electrode metallic core, forming a gas and a slag, shielding the arc and the weld pool. The flux cleans the metal surface, supplies some alloying elements to the weld, protects the molten metal from oxidation and stabilizes the arc. The slag is removed after solidification. [1]

This research is to study of hardness properties of buttwelded joints using Shield Metal Arc Welding (SMAW) on mild steel plate. A butt weld is the simplest form of welding because it does not require cutting the material that needs to be welded into any particular shape. In this type of welding, two metals are joined by simply placing their ends together and then performing the welding operation. These two objects are nearly parallel and do not overlap. A butt weld is also known as a butt joint. Depending upon thickness of the metal

pieces, different types of grooves can be prepared. Groove preparation is also called weld edge preparation and is necessary for thicker metals. Examples of types of grooves, depending upon their shape are V groove, J groove, and U groove. Groove design changes depending upon full penetration or partial penetration weld requirements. Butt welding is commonly employed in various industry sectors varying from piping systems, automotive, energy, power and many more. Butt joints can be welded using arc welding, resistance welding and high energy beam welding and it can even be part of a brazing operation. As mentioned earlier, various types of butt weld joints are named for their particular shape. The different types of joints include single V, double V, single and double bevel, single and double U, single and double J joints, square butt joints and even combinations of these. It is important to control weld penetration by using a double penetration joint design. [2]

When building metal structures, butt welding has shown how affordable it can be for enterprises. This is due to the fact that it would be more expensive to bend everything and reinforce the structure if they wanted to build something out of metal without welding it. Two pieces of metal are heated, under pressure, or both to create butt welding. When welding, it is critical to maintain metal penetration, which is possible with thin pieces of metal. To prepare the metal, edge preparation could be required for thick sections. Full penetration butt welds are created when smaller or weaker metals are fully welded into the bigger or stronger metal. The butt weld joints with the fewest defects would be the strongest. The kind of welding electrodes the welder uses will affect the weld's quality, including its strength and resistance to corrosion. Electrodes conduct current through the metal being welded in order to join the two parts together. The type of welding needed depends on the metal. The electrodes receive either thick or thin coverings. Highly coated electrodes are frequently used in structural welding because they are substantially stronger and corrosion resistant. Weld quality contributes to cost savings since a product made with quality fabrication will survive a lot longer than one made quickly or with poor craftsmanship. Quality fabrication and welding procedures will result in products that last far longer than those built in a less expensive manner.

In addition, Mild steel, commonly referred to as "low carbon steel," is a form of carbon steel with a little proportion of carbon. Although the exact ranges depend on the source, mild steel normally has between 0.05 and 0.25 percent of carbon by weight, while higher carbon steels are typically said to have a carbon content between 0.30 and 2.0 percent. Steel