STAMFORD UNIVERSITY BANGLADESH

DEPARTMENT OF CIVIL ENGINEERING

A STUDY ON THE COMPARISON BETWEEN FRESH BAR AND WELDED BAR REINFORCEMENT OF A BUILDING

MD.SHAHRIA TANVIR JOY

ID: CEN 070 10486

SULTAN MAHMUD RAKIB

ID: CEN 070 10471

SAIFUL ISLAM

ID: CEN 070 10491

A STUDY ON THE COMPARISON BETWEEN FRESH BAR AND WELDED BAR REINFORCEMENT OF A BUILDING

A project and thesis Presented by

MD.SHAHRIA TANVIR JOY

ID: CEN 070 10486

SULTAN MAHMUD RAKIB

ID: CEN 070 10471

SAIFUL ISLAM

ID: CEN 070 10491

Supervised by

MD. HASNUL HABIB

Lecturer

Department of Civil Engineering

In partial fulfillment of the requirements for the degree of Bachelor of Science (B.Sc.) in Civil Engineering

September, 2023

STAMFORD UNIVERSITY BANGLADESH

DEPARTMENT OF CIVIL ENGINEERING

The project and thesis titled ‘performance **‘A Study on the Comparison Between Fresh Bar and Welded Bar Reinforcement of a Building**’ Some casestudies’ submitted by Md.Shahria Tanvir joy, ID No. CEN 070 10486, Batch No. 70-B, and Md.Sultan Mahmud Rakib, ID No. CEN 070 10471, Batch No. 70-B, and Saiful Islam, ID No. CEN 070 10491, Batch No. 70-C Department of Civil Engineering has been examined thoroughly and accepted in partial fulfillment of the requirements for the degree of Bachelor of Science in Civil Engineering.

____

(**Md. Hasnul Habib**)

Supervisor

Project and Thesis

Lecturer

Department of Civil Engineering

Stamford University Bangladesh

DECLARATION

This is hereby declared that this research work "A Study on the Comparison Between Fresh Bar and Welded Bar Reinforcement of a Building: Some case studies" has been prepared in the fulfillment of the requirements for the Degree of bachelor of science in Civil Engineering under the supervision of Md. HasnulHabib, Lecturer, Department of Civil Engineering, Stamford University Bangladesh.

Neither the thesis nor any part therefore is submitted or is being concurrently submitted in candidature for any degree at any other institution.

We further undertake to indemnify the University against any loss or damage arising from breach and obligations.

MD.SHAHRIA TANVIR JOY
ID- CEN 070 10486

MD.SULTAN MAHMUD RAKIB
ID- CEN 070 10471

SAIFUL ISLAM
ID-CEN 070 10491

DEDICATION

We have dedicated this thesis work to our Parents, Our honorable mentor Md. Hasnul Habib, Senior Lecturer of Civil Engineering Department, and all of our respected Faculties of department of Civil Engineering.

TABLE OF CONTENTS

Page No

CHAPTER: 1 INTRODUCTION

CHAPTER: 2 REVIEW OF LITERATURE

CHAPTER: 3 METHODOLOGY

CHAPTER: 4 DATA COLLECTION AND ANALYSIS

CHAPTER: 5 CONCLUSIONS AND RECOMMENDATIONS

LIST OF FIGURES

Tittle **Page No**

ACKNOWLEDGEMENT

The research work **'A Study on the Comparison Between Fresh Bar and Welded Bar Reinforcement of a Building'** has been conducted in partial fulfillment of the requirements for the degree of Bachelor of Science (B.Sc.) in Civil Engineering.

First of all, we like to show our highest gratitude to the Almighty Allah for His kindness to us that makes it possible to complete the study and preparation of thisproject and thesis. This critical work became possible for us due to the unconditional help and co- operation in different ways by many people. We express our gratitude and thanksto them for their assistance in preparation of this project and thesis.

We are very much grateful to our supervisor, Md. Hasnul Habib, and all of ourteachers of the university for their cooperation and dedicated teaching for the achievement of the degree of B.Sc. in Civil Engineering. Co-operationand assistance of all the officers and staff of the Stamford University Bangladeshare healthfully acknowledged.

ABSTRACT

The study reveals the tensile strength of the bar changes after a fresh bar welded. The 4 specimens of fresh bar were tested and for comparison 4 specimens are welded consecutively at fixed distances and 8 samples are taken at fixed distancefrom weld place. For example, in the present time in construction works bars arewelded for various purposes such as building slabs, beams, column lapping its use of welding. The study would likely involve conducting laboratory tests to evaluate the mechanical properties and corrosion resistance of the two types of reinforcement. These tests would include tensile strength as well as tests to evaluate the bond strength between the reinforcement and concrete. The study would also involve analyzing the structural behavior of reinforced concrete beams, slab and columns using both fresh and welded reinforcement. This would include evaluating the flexural and shear strength of the reinforced concrete elements, as well as their ductility and toughness. Other factors that may be considered in the study include the cost and ease of installation of fresh and welded reinforcement, as well as their environmental impact and sustainability.

CHAPTER 1
INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 General

A study on the comparison between fresh bar and welded bar reinforcement of abuilding would typically involve analyzing and comparing the structural performance and durability of two different types of reinforcement used in the construction of a building. Fresh bars are typically used as reinforcement in the form of individual bars, which are placed and held in position using wire ties or other means. Welded bars, on the other hand, are prefabricated reinforcement mats that are welded together at the intersections to form a grid.

The study would likely involve conducting laboratory tests to evaluate the mechanical properties and corrosion resistance of the two types of reinforcement.These tests would include tensile strength as well as tests to evaluate the bond strength between the reinforcement and concrete. The study would also involve analyzing the structural behavior of reinforced concrete beams, slab and columns using both fresh and welded reinforcement. This would include evaluating the flexural and shear strength of the reinforced concrete elements, as well as their ductility and toughness. Other factors that may be considered in the study include the cost and ease of installation of fresh and welded reinforcement, as well as their environmental impact and sustainability.

1.2 Background of the study

The background and motivation for a study on the comparison between fresh bar and welded bar reinforcement of a building may be as follows.

The reinforced concrete is widely used in the construction of the building due tohigh strength, durability and fire resistance. Increasing the structural performance of the concrete plays an important role in enhancing and traditionally, the bar hasbeen used for this purpose. But the bar that is made for the concrete is 12 m of acertain length. But in the field of work, it needs more lengths. Then lamping or welding is needed, however, in recent years, welding bars have gained popularitydue to the simplicity and low-cost installation

Despite the increasing use of welded bar reinforcement, there is a lack ofcomprehensive research comparing its performance to that of fresh bar reinforcement. This study seeks to address this gap in the literature by providinga comprehensive comparison of the two types of reinforcement, taking into account factors such as structural performance, corrosion resistance, cost, and sustainability.

The results of this study will have important implications for building design andconstruction practices, as well as for the development of future reinforcedconcrete materials and technologies. By providing a clear understanding of the relative strengths and weaknesses of fresh and welded bar reinforcement, this study can help inform decision-making in the construction industry, leading to more efficient and sustainable building practices

1.3 Scopes of the study

- to find the properties like yield strength, extreme quality, and the percentage of reduction.
- To measure the force required to elongate a specimen to breaking point.
- To compare the mechanical properties of the fresh bar and welded bar in reinforcement building .
- To find out how strong a material is and also how much it can be stretched before it breaks.

1.4 Objective of the study

The objective of a study on the comparison between fresh bar and welded bar reinforcement of a building would typically be to evaluate the relative performance, durability, and other important characteristics of the two types of reinforcement when used in building construction. The study would aim to provide a comprehensive comparison of the two reinforcement types, taking into account factors such as Structural Performance. The study would evaluate the structural performance of reinforced concrete beams and columns using both fresh and welded reinforcement. This would include comparing the flexural and shear strength of the reinforced concrete elements, as well as their ductility and toughness.

Objectives:

- ❖ To investigate and compare the mechanical properties of fresh bar and welded bar reinforcement in a building structure .
- ❖ To analyze the structural behavior and performance of fresh bar and weldedbar reinforced building models under different loading conditions .
- ❖ To contribute to the knowledge and understanding of the construction industry on the comparative performance of fresh bar and welded bar reinforcement in building construction.
- ❖ To identify the advantages and disadvantages of fresh bar and welded bar reinforcement methods for building construction. To explore the potential impact of fresh bar and welded bar reinforcement methods on the environment and sustainability of building construction.

Overall, the objective of the study would be to provide a comprehensive comparison of the two types of reinforcement, and to provide recommendations for their use in building construction based on their structural performance, durability, and other relevant factors. The results of the study could be used to inform building design and construction practices, as well as to guide future research and development efforts in the field of reinforced concrete construction.

1.5 Limitation of the study

A study on the comparison between fresh bar and welded bar reinforcement of abuilding may face several limitations, some of which include:

Limited Scope: The study may be limited in scope, depending on the resources and time available for the research. For example, the study may only evaluate a small number of samples or focus on a specific type of reinforced concrete element, which may limit the generalizability of the results.

Variability in Materials and Conditions: The study may be limited by variabilityin the materials and conditions used for testing. For example, the properties of theconcrete used in the study may vary, which could impact the performance of thereinforcement. Additionally, the study may not be able to account for all of the factors that can impact the performance of the reinforcement in real-worldconditions.

Time and Cost Constraints: The study may be limited by time and cost constraints, which could impact the quality and scope of the research. For example, the study may not be able to conduct long-term durability testing, which can impact the relevance of the results to real-world applications.

Lack of Standardization: The study may be limited by the lack of standardizationin testing procedures and performance metrics for reinforced concrete construction. This can make it difficult to compare results across different studiesand to establish best practices for the use of different types of reinforcement.

Overall, it is important for researchers to carefully consider and address potentiallimitations in their study design and analysis in order to produce reliable and relevant results.

1.6 Organization of the Thesis

The outline of the thesis structure is presented in the following flow chart.

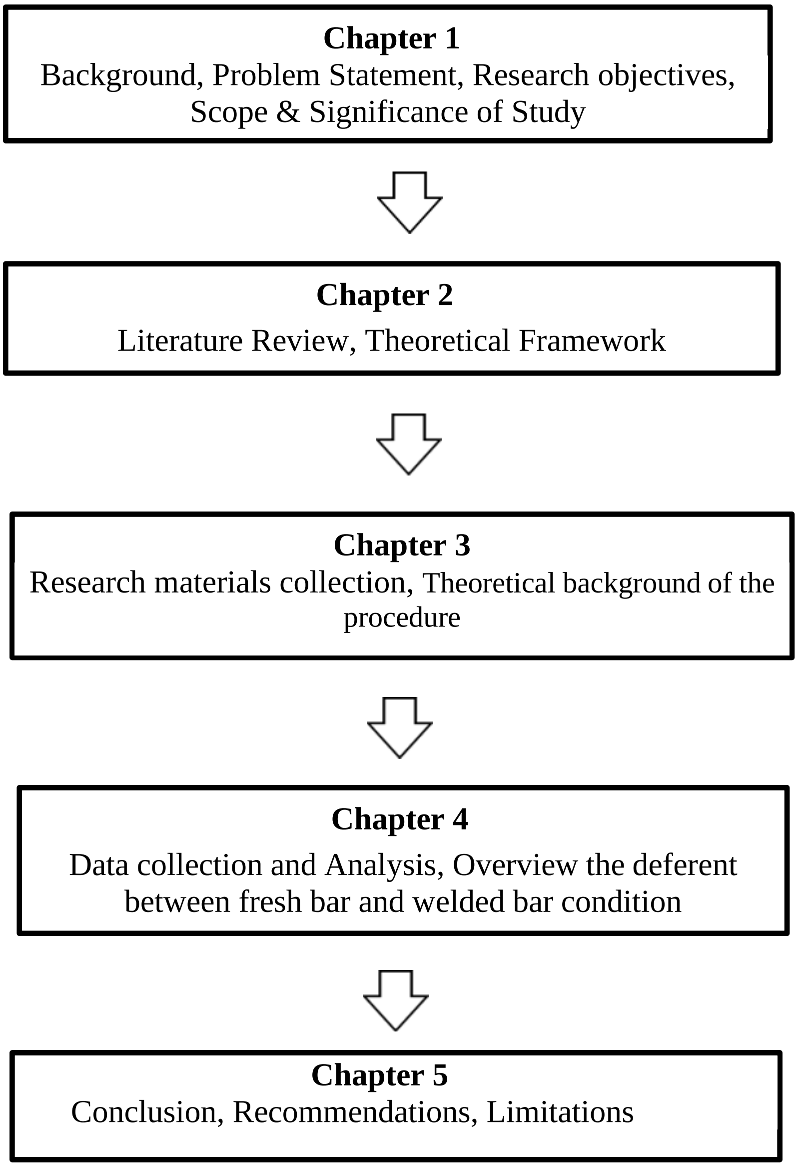


Figure 1.1: Flow chart

CHAPTER 2

REVIEW OF LITERATURE

CHAPTER 2

REVIEW OF LITERARURE

2.1 General

Reinforced concrete construction has been widely used in the construction industry due to its strength and durability. The use of steel reinforcement bars, also known as bar, improves the tensile strength of concrete, making it capableof withstanding high loads and stresses. The design of reinforced concretestructures involves several factors such as the size, spacing, and grade of the reinforcement bars, as well as the type of connection used between the bars.

Reinforced concrete construction is a widely used structural system in the construction industry. It involves the use of steel reinforcement bars (bars) embedded within concrete to increase the tensile strength of the material. The design and construction of reinforced concrete structures depend on several factors, including the size, spacing, and grade of the bars, as well as the type ofconnection used between them.

Previous studies have investigated the use of different types of reinforcement barsin reinforced concrete construction, including fresh and welded bars. Fresh bars are also known as deformed bars and are commonly used in reinforced concrete structures due to their ability to provide better bond strength with concrete. Welded bars, on the other hand, are formed by welding individual bar togetherto create a larger bar. Welded bars are used in certain applications where high- strength reinforcement is required.

2.2 Review of Previous Studies

Several studies have compared the use of fresh and welded bar reinforcement inreinforced concrete construction. A study by Khan et al. (2015) compared the bond strength of fresh and welded bars in reinforced concrete beams. The studyfound that the bond strength of welded bars was higher than that of fresh bars, leading to improved structural performance.

Another study by Al-Mosawe et al. (2020) compared the cost-effectiveness ofusing fresh and welded bars in reinforced concrete structures. The study foundthat welded bars were more cost-effective due to their higher strength and reduced need for additional reinforcement.

bond strength of fresh and welded bars in reinforced concrete beams. The studyfound that the bond strength of welded bars was higher than that of fresh bars, leading to improved structural performance.

Another study by Al-Mosawe et al. (2020) compared the cost-effectiveness ofusing fresh and welded bars in reinforced concrete structures. The study foundthat welded bars were more cost-effective due to their higher strength and reduced need for additional reinforcement.

However, some studies have highlighted potential limitations of welded bar reinforcement .A study by Al-Saidy and Al-Mosawi (2018) found that weldedbars had lower ductility compared to fresh bars, leading to potential brittle failure under certain loading conditions. The study recommended the use of fresh bars for structures with high ductility requirements.

2.3 Standard and Specific Guideline

ASTM International and American Concrete Institute (ACI) are two widely recognized standards organizations that provide guidelines and standards for theuse of fresh bar and welded bar reinforcement in reinforced concrete structures.

ASTM International is an international standards organization that develops andpublishes technical standards for a wide range of materials, products, systems, and services. In the context of reinforced concrete structures, ASTM Internationalprovides standards for materials such as steel reinforcement bars, concrete, and masonry. Some relevant ASTM International standards for fresh bar and weldedbar reinforcement in reinforced concrete structures include.

- ❖ ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement: This standard specifies the requirements for deformed and plain carbon-steel bars for use asreinforcement in concrete.

- ❖ ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement: This standard specifiesthe requirements for deformed and plain low-alloy steel bars for use as reinforcement in concrete requirements for deformed and plain carbon-steel bars for use asreinforcement in concrete.

- ❖ ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement: This standard specifiesthe requirements for deformed and plain low-alloy steel bars for use as reinforcement in concrete.
- ❖ ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement: This standard specifies the requirements for zinc-coated (galvanized) steel bars for use asreinforcement in concrete.

The American Concrete Institute (ACI) is a non-profit technical and educationalsociety dedicated to improving the design, construction, maintenance, and repair of concrete structures. ACI provides guidelines and standards for the use of concrete and reinforcing materials, including fresh bar and welded bar reinforcement. Some relevant ACI standards for fresh bar and welded bar reinforcement in reinforced concrete structures include:

- ❖ ACI 318 - Building Code Requirements for Structural Concrete: This codeprovides minimum requirements for the design and construction of reinforced concrete buildings and other structures.
- ❖ ACI 315 - Details and Detailing of Concrete Reinforcement: This standardprovides guidelines for detailing and placing reinforcing bars in concrete structures.
- ❖ ACI 439 - Stainless Steel Reinforcing Bars: This standard provides guidelines for the use of stainless-steel reinforcing bars in concrete structures.

These are just a few examples of the many standards and guidelines available from ASTM International and ACI for the use of fresh bar and welded bar reinforcement in reinforced concrete structures. It is important for engineers, architects, and contractors to be familiar with these standards and to follow themto ensure the safety, durability, and cost-effectiveness of their concrete structures

2.4 Mechanical reinforcing steel bars

Mechanical reinforcing steel bars, commonly referred to as bars, are a critical component in reinforced concrete structures. These bars are designed to providetensile strength to concrete, which is otherwise weak in tension, and ensure the structural stability of the building.

Bars are typically made of carbon steel and have a high yield strength to resistthe forces acting on the structure. They come in different sizes and shapes, depending on the specific application and design requirements.

In this study, we will investigate the mechanical properties of reinforcing steel bars, specifically fresh bars and welded bars, in a building. The mechanical properties of bars include ultimate strength, yield strength, ductility behavior, and elasticity pattern, among others.

To assess the mechanical properties of bars, we will conduct several tests, including tensile tests, compression tests, and bending tests. These tests will be carried out on both fresh and welded bars to determine if there is any difference in their mechanical behavior.

2.5 Welding of reinforcing steel bars

Welding is a common technique used to connect reinforcing steel bars (bars) in building construction. It involves bending the bars into a specific shape and then welding them together to form a continuous reinforcement bar that fits the design requirements of the building structure.

However, welding can introduce heat into the bars, which can alter their mechanical properties, including their ultimate strength and ductility behavior. This can have important implications for the safety and durability of the buildingstructure. Understanding the welding techniques used in the construction of reinforced concrete structures is crucial for ensuring the safety and durability of the building. By carefully selecting and implementing welding techniques, engineers and builders can minimize the potential negative effects of welding onthe reinforcing steel bars and ensure the long-term structural integrity of the building.

2.6 Comparison of fresh bar and welded bar reinforcement

The choice between fresh bar and welded bar reinforcement in building construction depends on several factors, including the type of structure being built, the load requirements of the structure, and the availability and cost of materials. Fresh bars are unaltered, straight bars, while welded bars are bars that have been bent and welded together to form a specific shape.

In this study, we will compare the mechanical properties of fresh bar and welded bar reinforcement in a building. We will conduct several tests, including tensile tests, compression tests, and bending tests, to measure the ability of the bars to resist being pulled apart, compressed, and bent, respectively.

2.7 Ultimate strength of reinforcing steel bars

Ultimate strength is one of the most critical mechanical properties of reinforcingsteel bars used in building construction. The ultimate strength of a bar refers tothe maximum stress that it can withstand before it fails or fractures.

In this study, we will compare the ultimate strength of fresh bar and welded bar reinforcement in a building. To assess the ultimate strength of the bars, we willconduct tensile tests on both fresh and welded bars. During the test, a load will be applied to the bar until it reaches its breaking point.

The results of the tensile tests will be analyzed to determine if there is any significant difference in the ultimate strength of fresh and welded bars. If a difference is found, we will investigate possible reasons for it, such as differencesin the manufacturing process, material composition, or welding technique.

Understanding the ultimate strength of reinforcing steel bars is crucial for building design and construction. The ultimate strength of the bars used in the building must be able to withstand the expected loads and stresses that the structure will experience during its lifetime.

2.8 Bond strength between reinforcement and concrete

The bond strength between reinforcement and concrete is a crucial factor in the design and construction of reinforced concrete structures. In a recent study, the bond strength between fresh bar and welded bar reinforcement was compared inthe context of building construction.

Fresh bar reinforcement refers to reinforcement bars that are placed in the concrete in their original state, without any pre-fabrication or welding. Welded bar reinforcement, on the other hand, refers to reinforcement bars that are pre-fabricated and welded together to form a larger mesh or panel before being placedin the concrete.

The study found that the bond strength between fresh bar and concrete was higherthan that between welded bar and concrete. This was attributed to the fact that fresh bars have a larger surface area in contact with the concrete, which allows for better adhesion and interlocking between the concrete and the reinforcement.

In contrast, welded bars have a smaller surface area in contact with the concrete due to the presence of the welded joints, which can weaken the bond strength. Welded bars also tend to have higher residual stresses due to the welding process,which can further reduce their bond strength with concrete.

2.9 Welding techniques for reinforcing steel bars

In the context of building construction, welding techniques are commonly used to fabricate reinforcing steel bars into pre-fabricated panels or mesh, which can then be placed in the concrete during construction. In a recent study comparing fresh bar and welded bar reinforcement, various welding techniques were evaluated for their suitability and effectiveness in producing high-quality welded bars.

Figure 2.1: Weld Rod Specimen (E-6013)

One of the most commonly used welding techniques for reinforcing steel bars is electric resistance welding. This involves passing an electric current through the steel bars, which generates heat and fuses the bars together. ERW is a relatively simple and cost-effective welding technique, but it can result in residual stressesin the welded joints that may affect the bond strength between the welded bars and concrete. E stands for electrode.60 stands for tensile strength which is almost 60,000 pounds per inch.

Another welding technique that has gained popularity in recent years is friction welding. This involves rotating one steel bar against another under pressure, generating heat through friction and causing the bars to fuse together. Friction welding has several advantages over other welding techniques, including the absence of residual stresses and a high degree of consistency and repeatability. However, it can be more complex and expensive than other techniques.

2.10 Ductility behavior of reinforcement in buildings

The ductility behavior of reinforcement in buildings is an important factor to consider in the design and construction of reinforced concrete structures. Ductility refers to the ability of a material to deform without breaking or cracking under stress. In the context of reinforcement, ductility is important because it allows the reinforcement to absorb and distribute energy in the event of an earthquake or other extreme event.

In a recent study comparing fresh bar and welded bar reinforcement, the ductilitybehavior of the two types of reinforcement was evaluated. The study found that fresh bar reinforcement generally exhibits higher ductility than welded barreinforcement. This is because fresh bars have a more uniform microstructure andfewer residual stresses than welded bars, which can lead to more consistent deformation behavior and higher ductility.

However, the study also found that the ductility of welded bar reinforcement can be improved through the use of appropriate welding techniques and post-weld heat treatment. For example, friction welding and laser welding can produce welds with minimal residual stresses, which can improve the ductility of the welded bars. Post-weld heat treatment can also be used to relieve residual stresses and improve the ductility of welded bars

CHAPTER 3

METHODOLOGY OF THE STUDY

CHAPTER 3

METHODOLOGY

3.1 Introduction:

When constructing concrete structures, reinforcing them with steel bars is essential to provide strength and durability. There are two common methods of reinforcement: fresh bars and welded bars. While fresh bars are typically used insmaller buildings, welded bars are often used in larger and more complexstructures. Comparing the effectiveness of fresh bar and welded bar reinforcement is crucial in determining the most appropriate method for a given building project.

3.2 Study process:

Steel used in infrastructure is mostly in the form of reinforcing bars.in the current study ,grade-500 steel bars produced from billets of induction furnace(IF) and blast furnace(BF) origin were tested,analyzed and compared.

3.2.1 Tensile strength:

In a study comparing fresh bar and welded bar reinforcement in a building construction project, materials and equipment are key components of the methodology. The quality and consistency of the materials used for both types ofreinforcement are critical to ensuring accurate and reliable results.

The materials used for the study should be representative of those commonly usedin building construction, and should be sourced from reputable suppliers. The type of steel, the grade of steel, and the specific manufacturing process used to produce the reinforcement materials should be specified and documented to ensure consistency across all samples.

The equipment used for the study should also be calibrated and maintained to ensure accurate measurements and reliable results. This may include testing machines, measuring devices, and other equipment required for sample preparation and testing.

In addition to the materials and equipment used for testing, it is also important toconsider the availability and feasibility of obtaining the necessary samples for the study. This may involve obtaining samples from existing buildings, or coordinating with construction companies to obtain samples from ongoing building projects.

3.2.2 Yield point / Yield stress

Yield point or yield stress is an important mechanical property of both fresh bar and welded bar reinforcement used in building construction. Yield point is the stress point at which a material begins to deform plastically, i.e., it undergoes permanent deformation under the application of stress. Yield stress is the stress level at which yield point occurs.

To study the comparison between fresh bar and welded bar reinforcement, yield point/yield stress testing is an important methodology. The test involves applyinggradually increasing load to a sample until it reaches the point of plastic deformation, or yield point. The yield point stress can then be calculated from theload and the cross-sectional area of the sample.

It is important to note that the yield stress is a critical property to consider when selecting reinforcement materials for building construction. If the yield stress of the reinforcement material is too low, it may not provide adequate support to thebuilding structure, leading to potential safety hazards.

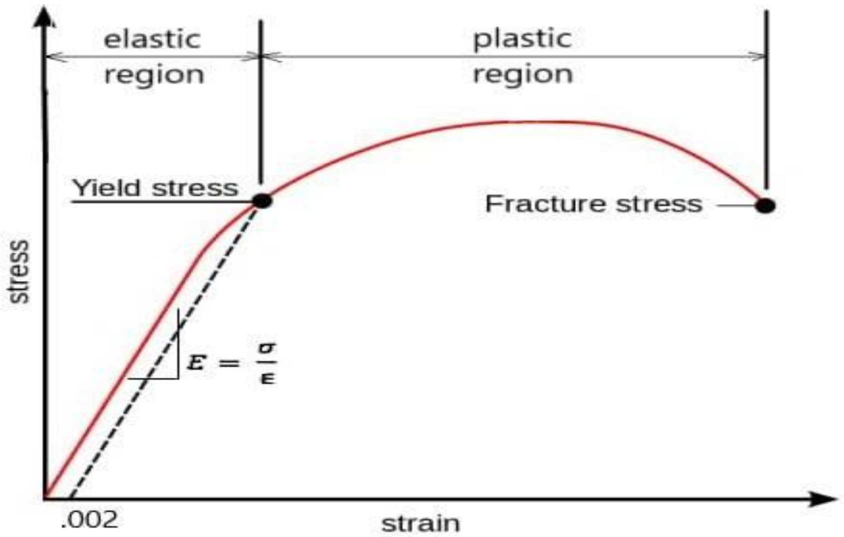


Figure 3.1: Stress & Strain Graph

3.2.3 Ductility Behavior

Ductility behavior is an important aspect of the mechanical properties of buildingmaterials, particularly reinforcing steel bars (bars), as it determines their abilityto undergo deformation before they fail. This characteristic is particularly important in areas with high seismic activity, where buildings need to be able to withstand the forces generated by earthquakes.

In this study, we will compare the ductility behavior of fresh bar and welded barreinforcement in a building. Fresh bars are unaltered, straight bars that are commonly used in construction, while welded bars are bars that have been bentand welded together to form a specific shape.

To conduct this study, we will use a series of tests to measure the ductility behavior of both types of reinforcement. These tests will include tensile tests, which will measure the strength and elongation of the bars, and bending tests, which will measure the ability of the bars to bend without breaking.

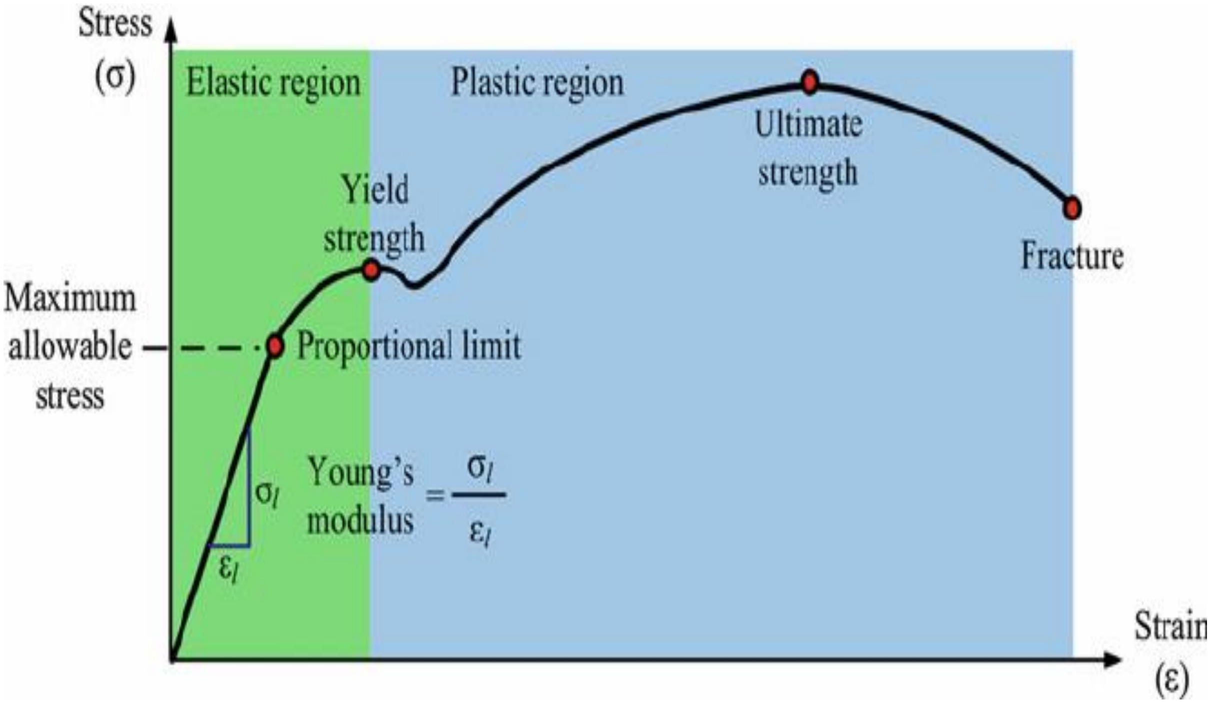


Figure 3.2: Elastic & Ductile curve

3.2.4 Ultimate Strength

Ultimate strength is an important mechanical property of building materials, including reinforcing steel bars (bars). It is the maximum stress a material can withstand before it breaks or fails. In building design and construction, it is essential to have materials with high ultimate strength to ensure that the buildingcan withstand high loads without failure.

In this study, we will compare the ultimate strength of fresh bar and welded bar reinforcement in a building. Fresh bars are unaltered, straight bars commonly used in construction, while welded bars are bars that have been bent and weldedtogether to form a specific shape.

To investigate the ultimate strength, we will conduct a series of tests, including tensile tests and compression tests. Tensile tests will measure the ability of the bars to resist being pulled apart, while compression tests will measure the ability of the bars to resist being compressed.

3.2.5 Elasticity pattern

Elasticity pattern is an important mechanical property of building materials, including reinforcing steel bars (bars). It determines how much a material can deform under stress and then return to its original shape when the stress is removed. In building design and construction, it is essential to have materials withgood elasticity pattern to ensure that the building can withstand loads without permanent deformation or failure.

In this study, we will compare the elasticity pattern of fresh bar and welded bar reinforcement in a building. Fresh bars are straight, unaltered bars commonly used in construction, while welded bars are bars that have been bent and weldedtogether to form a specific shape.

3.2.6 Percentage of elongation

Elongation at break are mechanical properties of a material, they measure different things. The yield strength of a material is the stress at which it begins to deform plastically under tension, whereas the elongation at break indicates how much total deformation occurs before the material breaks. High-yield strength materials typically have a low elongation at break, and vice versa. This is due to the fact that materials with high-yield strengths typically have fewer atomically mobile dislocations and/or fewer slip systems for dislocations to move on. Dislocation pinning usually results in a rise in strength and a fall in ductility. On the other hand, materials with low yield strengths are usually more ductile and can withstand more deformation before breaking.

In this study, we will compare the elasticity pattern of fresh bar and welded bar reinforcement in a building.

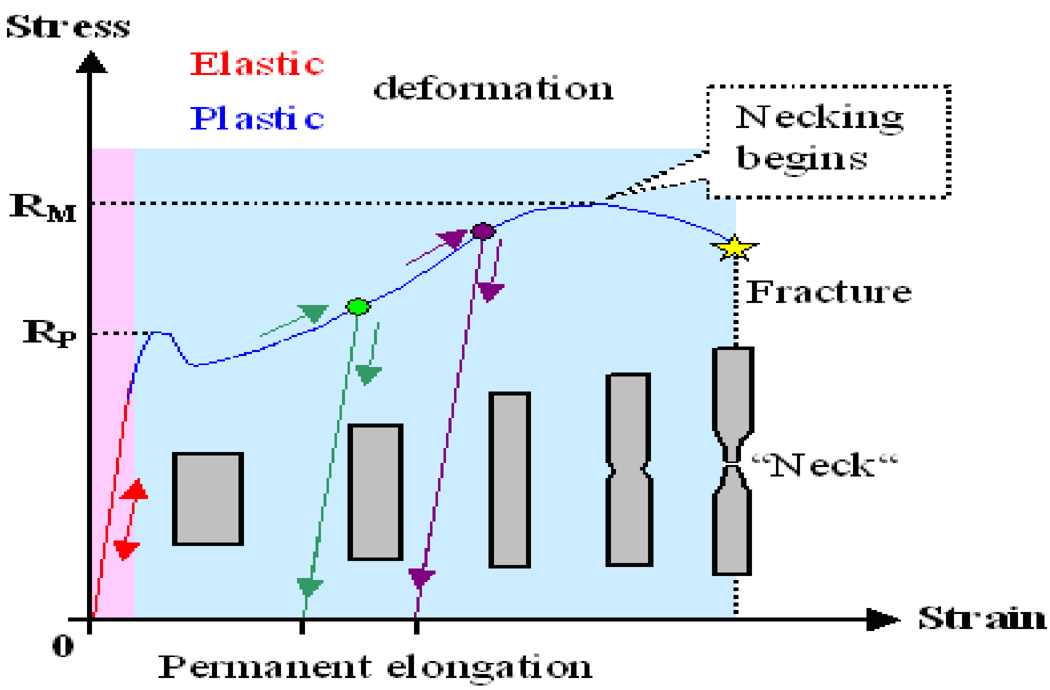


Figure 3.3: tress-strain curve for a metal and shape of the specimen

3.3 Materials and Equipment

In a study comparing fresh bar and welded bar reinforcement in a building construction project, materials and equipment are key components of the methodology. The quality and consistency of the materials used for both types ofreinforcement are critical to ensuring accurate and reliable results.

The materials used for the study should be representative of those commonly usedin building construction, and should be sourced from reputable suppliers. The type of steel, the grade of steel, and the specific manufacturing process used to produce the reinforcement materials should be specified and documented to ensure consistency across all samples.

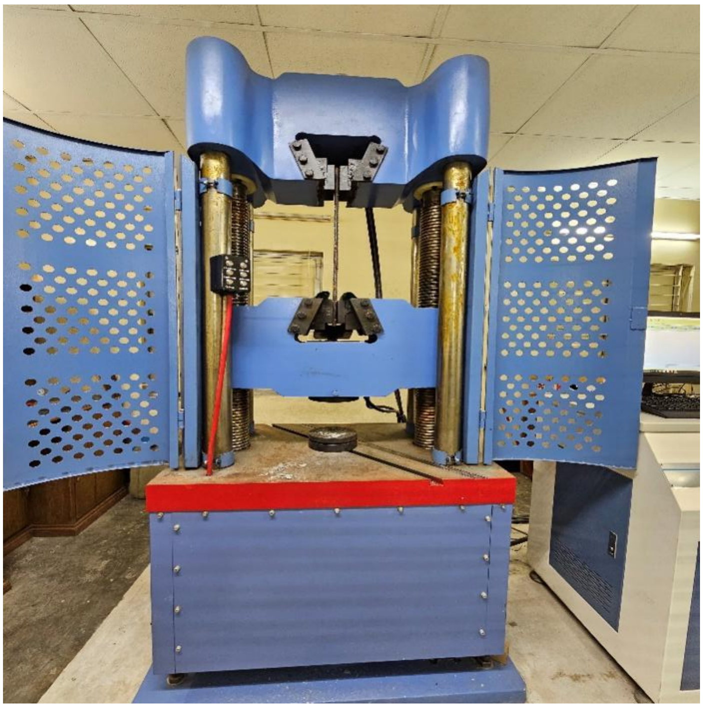


Figure 3.4: Universal Testing Machine (UTM)

The equipment used for the study should also be calibrated and maintained to ensure accurate measurements and reliable results. This may include Universal Testing Machine, measuring devices, Electrode Holder, Grinding machines and other equipment required for sample preparation and testing.

Figure 3.5: Electrode Holder

Figure 3.6: Grinding machines.

Figure 3.7: Measuring devices

In addition to the materials and equipment used for testing, it is also important to consider the availability and feasibility of obtaining the necessary samples for the study. This may involve obtaining samples from existing buildings, or coordinating with construction companies to obtain samples from ongoing building projects.

3.4 Sample Preparation

In a study comparing fresh bar and welded bar reinforcement in a building construction project, sample preparation is a critical component of the methodology. Proper sample preparation is essential to ensuring accurate and reliable results, and can help to minimize variability between samples.

Sample preparation for the study may involve obtaining samples of both fresh barand welded bar reinforcement from a variety of sources, including existing buildings or ongoing construction projects. The Samples was representative of materials commonly used in building construction and taken from reputable suppliers.

Once the samples have been obtained, we did carefully prepare for testing. This may involve cutting the samples to the appropriate length and shape, and removing any surface coatings or contaminants that could interfere with testing.

For tensile testing, the samples may need to be machined to specific dimensionsand carefully aligned in the testing machine to ensure accurate and consistent results. For other types of testing, such as bending or torsion tests, the samples may need to be prepared differently.

It is also important to consider the number of samples required for the study. Thenumber of samples needed will depend on a variety of factors, including the levelof variability between samples, the desired level of statistical significance, and the specific testing protocols being used.

Overall, careful sample preparation is critical to ensuring accurate and reliable results in a study comparing fresh bar and welded bar reinforcement in building construction. By following standardized protocols and taking care to minimize variability between samples, the study can provide valuable insights into the performance of these two types of reinforcement materials.

Figure 3.8: Sample of 12 mm Bar

1. At first, we took a 12 mm 500w rod of the length of which is 39feet 6 inch.

Figure 3.9: Sample Cutting

2. We divided this into four pieces each of which is 7 feet long.

Figure 3.10: Drop pin and Lapping

3. From these four pieces we take two and make drop pin. The drop pin pieces were welded with 7 feet long bar.

Figure 3.11: Processing of Welding

Figure 3.12: C-1 Welded sample

Figure 3.13: Welded Sample Cutting

5. After cutting the C-1.we cut the next 2 feet rod .we named it C-2. And the next 2 feet rod after that whose named C-3.

6. The remaining fresh 11 feet 6 inch rod was cut into four fresh pieces each of which is 2 feet long. Which named them as F-1.

Figure 3.14: Specific Number and Carefully Aligned of Sample

3.5 Procedure

1. We measured the diameter of the specimen at three different sections. Calculate the original diameter by taking average of three readings.

Figure 3.15: Grip length mark of sample

2. We marked the points over the grip length with the punch such that the distance between two consecutive points is half the gauge length.
3. Then We selected a suitable loading range depending on the diameter of specimen Start the UTM and adjust the dead weight of movable heads and then we set the load pointer to zero.
4. Fixed the specimen bar between the grips of top and middle cross heads of loading farm.

Figure 3.16: Fixed the specimen in UTM

5. Attached the extensometer on the rod at the central portion of the rod. The distance between upper and lower pivots of extensometer shall be equal gauge length.
6. Switched on the machine and open the control valve so that the load was increased gradually and at the required rate.

Figure 3.17: Load controller

7. Recorded the load at suitable interval from the digital display unit or the load dial.

Corresponding to loads, noted the readings of extensometer.

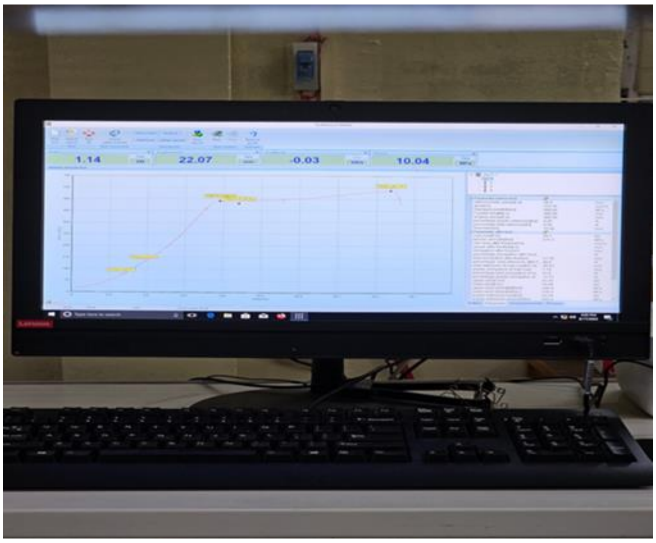


Figure 3.18: Load at the digital display

8. After reached the breaking point ,we collected the rod and measured the diameter of neck by vernier scale .

Figure 3.19: Diameter of neck

9.At breaking point ,F1,C2,C3 occurs ductile failure and C1 occur brittle failure.

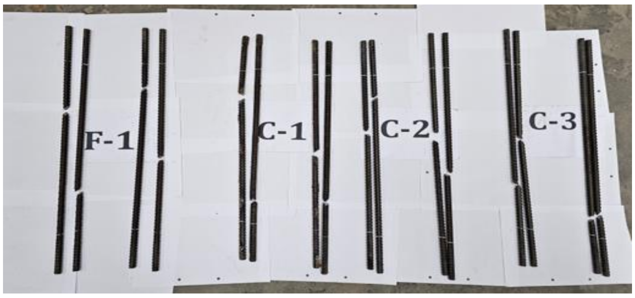


Figure 3.20: Failure specimen

CHAPTER 4

DATA COLLECTION AND ANALYSIS

CHAPTER 4

DATA COLLECTION AND ANALYSIS

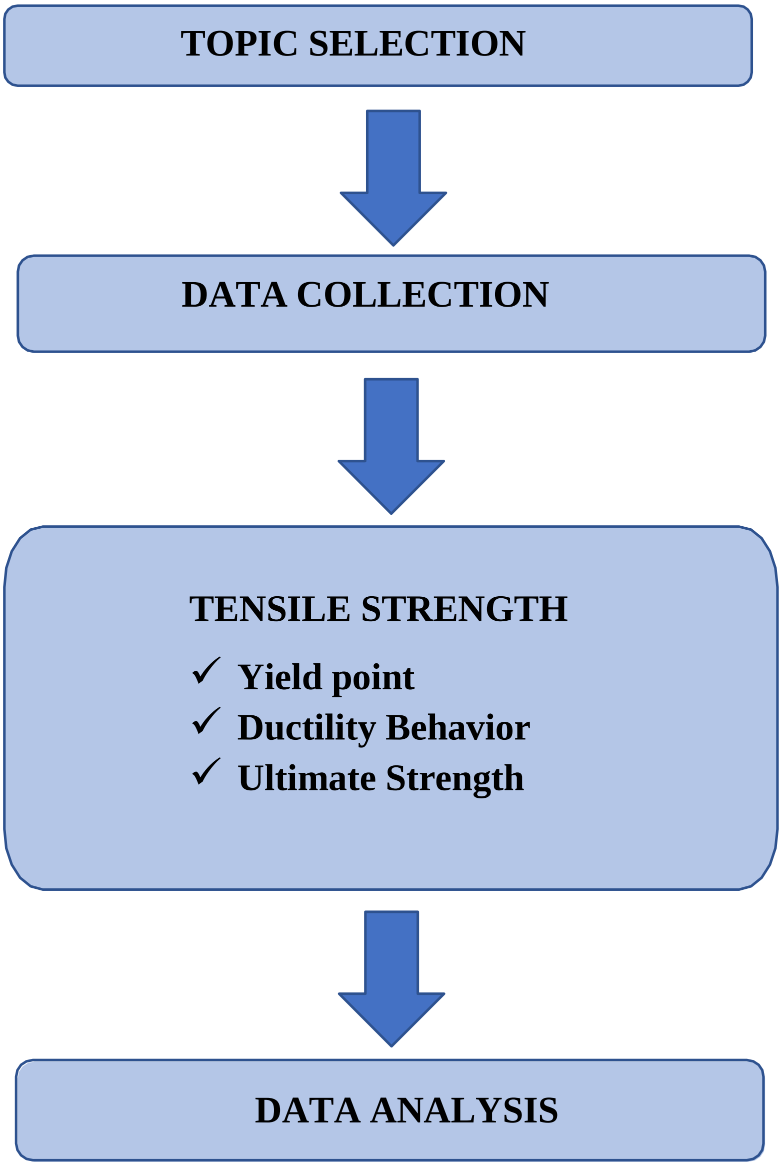
4.1 Introduction

Data collection and analysis are critical components of any research project. In astudy on the comparison between fresh bar and welded bar reinforcement of a building, data will be gathered and analyzed to determine the effectiveness and suitability of each reinforcement method.

The data collection process will involve gathering information on the two methods of reinforcement, including their strengths and weaknesses, as well as any existing research on the topic. This information will be used to formulate a research question and hypothesis that will guide the study.

Various methods will be used to collect data, such as field observations, surveys,interviews, and laboratory tests. The collected data will be analyzed usingstatistical and qualitative techniques to draw meaningful conclusions from the research.

The findings of the study will be used to inform building construction practices and improve the safety and durability of structures. Data collection and analysis play a crucial role in ensuring that research is objective, reliable, and useful in making informed decisions


TOPIC SELECTION
DATA COLLECTION
TENSILE STRENGTH
✓ Yield point
✓ Ductility Behavior
✓ Ultimate Strength
DATA ANALYSIS

4.1.1 Stress

The force per unit area, or the intensity of the forces distributed over a given section, is called the stress on that section (i.e., stress is internal distribution of forces within a body).

Stress is a property of a body under loads. It is a sort of reaction produced in themolecules of a body under some action, which tends to produce some deformation The intensity of these additional internal forces produced per unit area is known as stress. Mathematically stress (σ) is defined as

σ = Limit[$\Delta F/\Delta A$]

$\Delta A \rightarrow 0$

Where ΔF and ΔA are elements of force and surface area respectively.

Stress is defined at a point on a surface. The point can be located on the boundingsurface or boundary of a deformable body or on an internal surface resulting fromthe process of sectioning.

$\sigma = F/A$ This defines the average value of stress over the cross – section

Unit of Stress:

1 psi = 1 pound per square inch

1 ksi= 1 kilo - pound per square inch = 1000 psi1psf =1

pound per square feet

1ksf =1 kilo -pound per square feet =1000 psf

1Pa= 1 Pascal =1 N/m^2 =1 Newton per square meter

1 MPa = 1 Mega Pascal = 1 MN/m^2 = 10^6 Pa =10^6 N/m^2 =1 N / mm^2=145 psi

1 GPa =1 Giga Pascal=1 GN/m^2 = 10^9 Pa = 10^9 N/m^2= 10^3 MPa =10^3 $MN/m^2$1tsf = 1 ton

per square feet = 2 ksf

1kgf/cm^2 =1atm = 100 kN/m^2 = 100 kPa

The Basic Stresses: Only two basic stresses exist

1. Normal Stress / Axial Stress, which always act normal (perpendicular) to thestressed surface under consideration (normal stresses may be either tensile orcompressive) and
2. Shearing Stress / Tangential Stress, which act parallel surface

Other stresses either are similar to thesis basic stresses or are a combination of them. For example, the stresses in a bent beam, in a general way referred to as "bending stresses actually are a combination of tensile, compressive and shearing"torsional stress " as encountered in the twisting of a shaft , is a shearing to the stressed stress .

4.1.2 Strain: Strain refers to the proportional deformation produced in amaterial under the influence of stress.

Unit of Strain: It is measured as the number of meters of deformationsuffered per meter of original length and is a numerical ratio.

Types of Strain:

1. Normal strain axial strain elongation & contraction
2. Shear strain / tangential strain

4.1.3 Tensile strain: This is the type of strain which the fibers of tie memberexperience tensile strain is associated with the elongation of members.

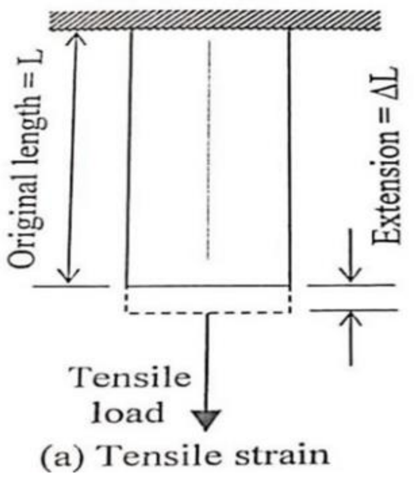


Figure 4.1: Axial or Normal Strain

The numerical value of the strain is not the extension or contraction itself.

$$\text{Normal strain (tensile)} = \frac{\text{Extension in length}}{\text{Original length}} \quad \frac{\Delta L}{L}$$

4.2 Sample Calculation: For F1

Gauge length = 609.6 mm (24 inch) Initial/Original

diameter of Coupon = 12 mm

$$\text{Initial / Original cross - section area} = \frac{\pi(12)}{4} = 113.097\ mm^2$$

4.2.1 Ductility

Original length (L) =406 mm & Length at rupture (L') = 468mm

$$\text{Percentage elongation} = \frac{(\text{Length at rupture} - \text{Original length})}{\text{Original length}} \times 100\ \%$$

$$\%\ \text{elongation} = \frac{(L - L')}{L} \times 100\ \% = \frac{(468-406)}{406} \times 100\ \% = 15.26\ \%$$

Original diameter (d) = 12 mm & Diameter at neck (afterbreaking) = 9.5 mm

$$A = \text{Original cross - sectional area} = \frac{\pi(12)^2}{4} = 113.097\ mm^2$$

$$A' = \text{Minimum cross - sectional area at neck} = \frac{\pi(9.5)^2}{4} = 70.88\ mm^2$$

Percentage reduction in area = $\frac{(A - A)}{4}$

=(113.097−70.88)/ 113.097 x 100 %

= 37.32 %

4.2.2 Yield Strength

Yield Strength = $\frac{Yield\ Force}{\text{Cross sectional area}}$

$= \frac{61.37\ kn}{113.097\ mm2}$

= 0.5426 KN/mm^2

= 542.6Mpa

4.2.3 Ultimate Strength

Ultimate Strength = $\frac{\text{ultimate Force}}{\text{cross sectional area}}$

$= \frac{80.08}{113.097\ 2}$

= 0.70806 KN/mm^2

= 708 Mpa

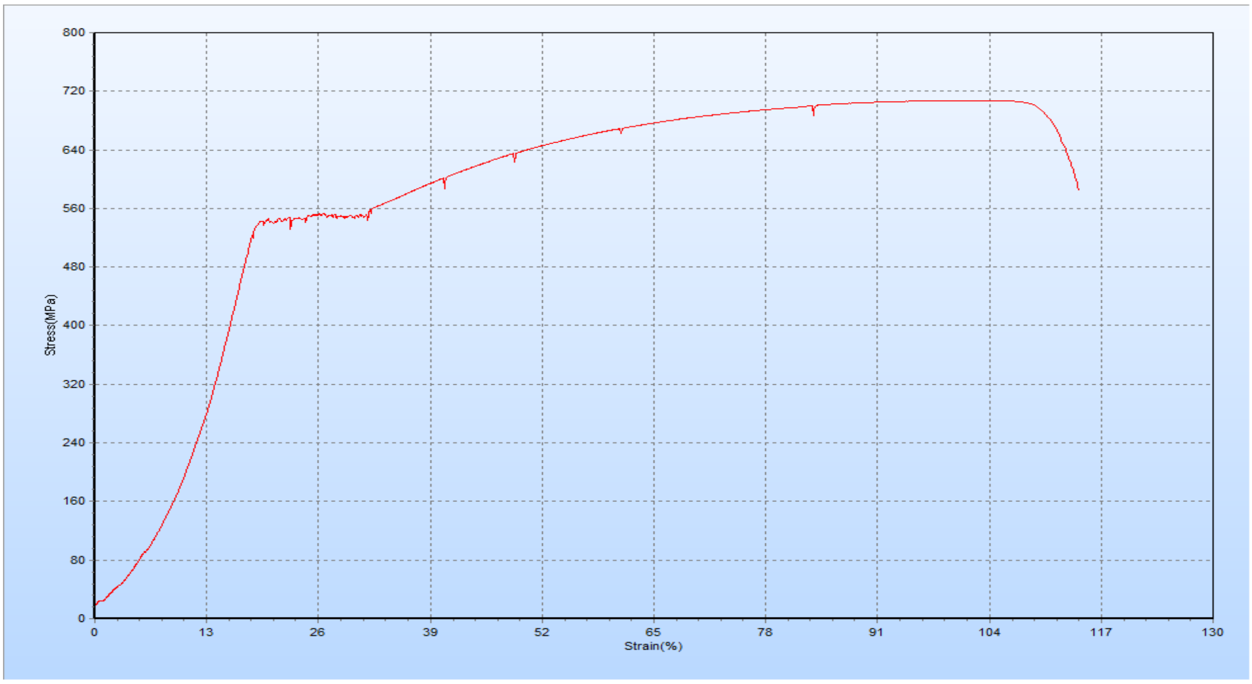


Figure 4.2: F-1-1 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strength (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	61.75	545.9	113.1	707.6	464	60.18	532.1	80	14.5

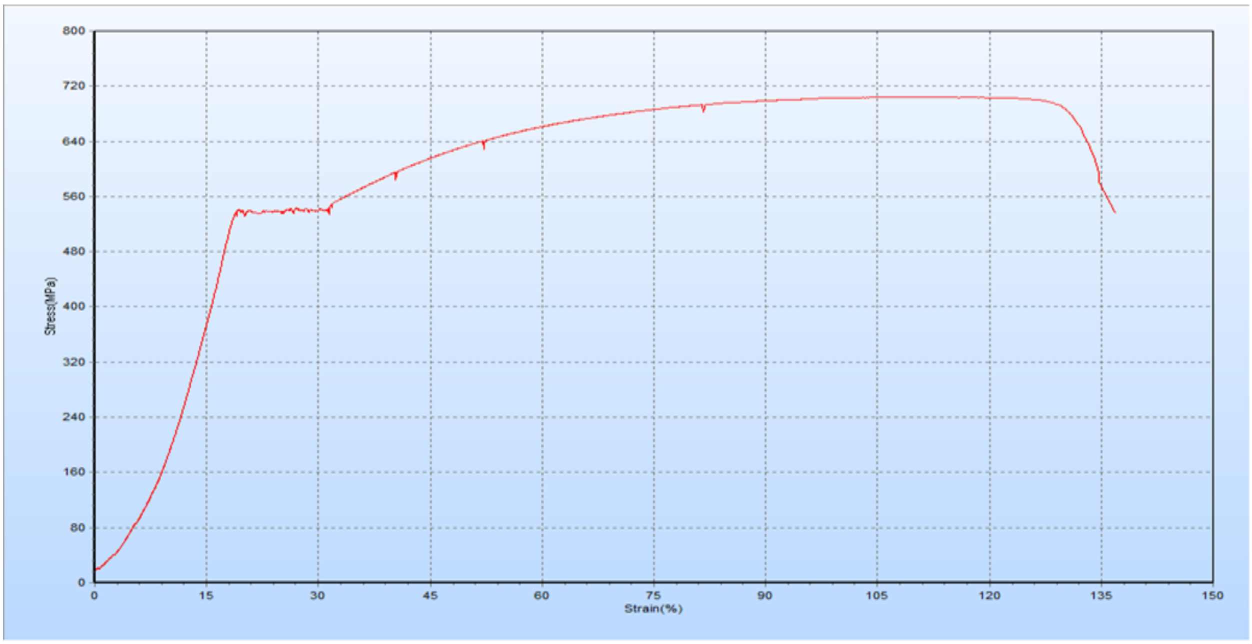


Figure 4.3: F-1-2 Graph .

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strength (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	61.14	540.6	113.1	704	474	60.16	532	79.6	16.5

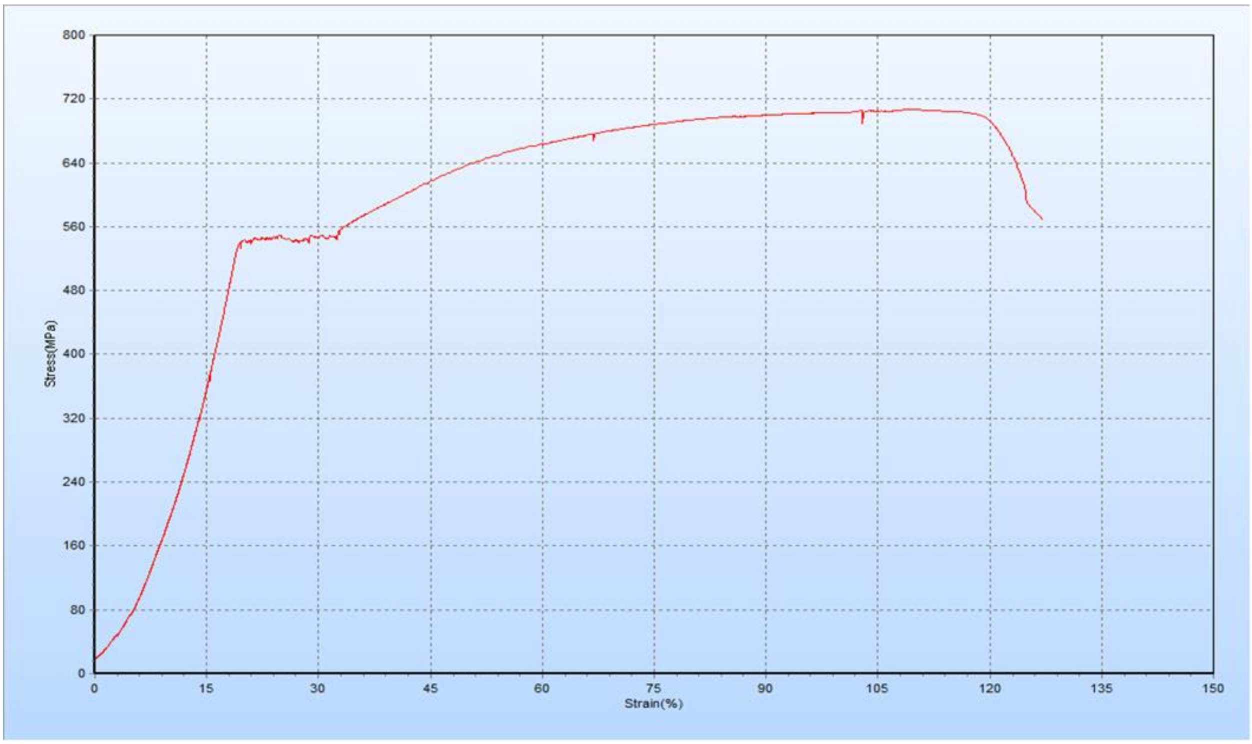


Figure 4.4: F-1-3 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	61.52	543.9	113.1	706.9	469	60.9	538.5	79.9	15.5

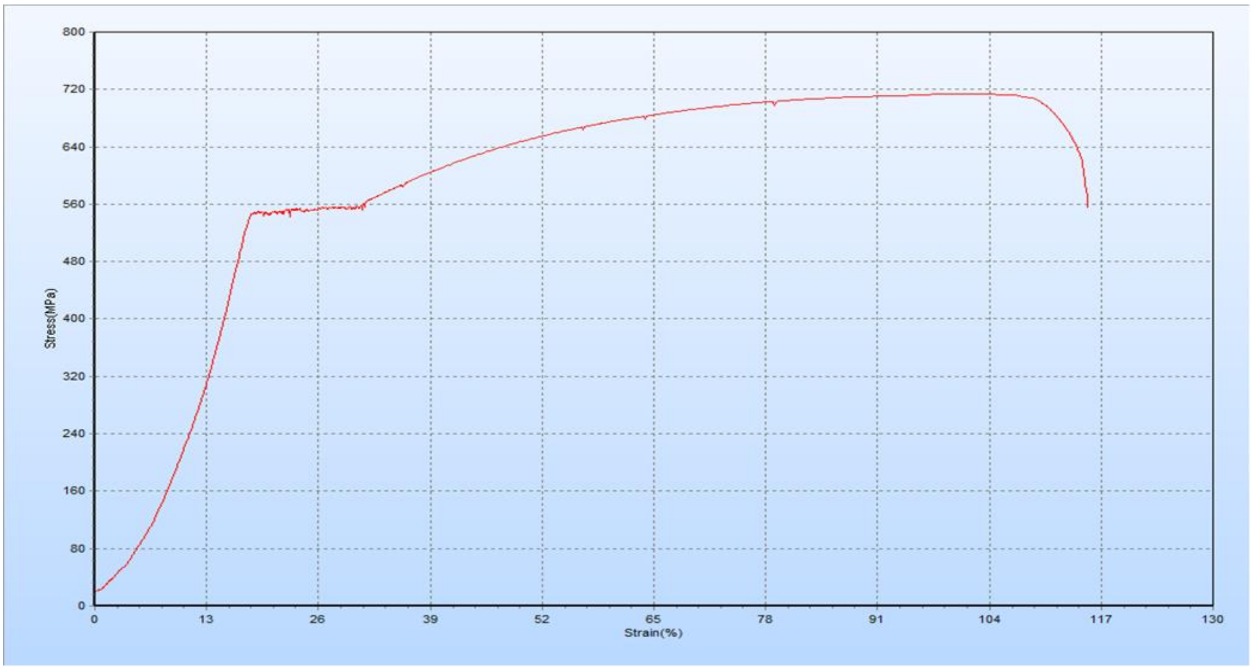


Figure 4.5: F-1-4 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	62.21	550.1	113.1	714.2	465	61.36	542.5	80.8	14.5

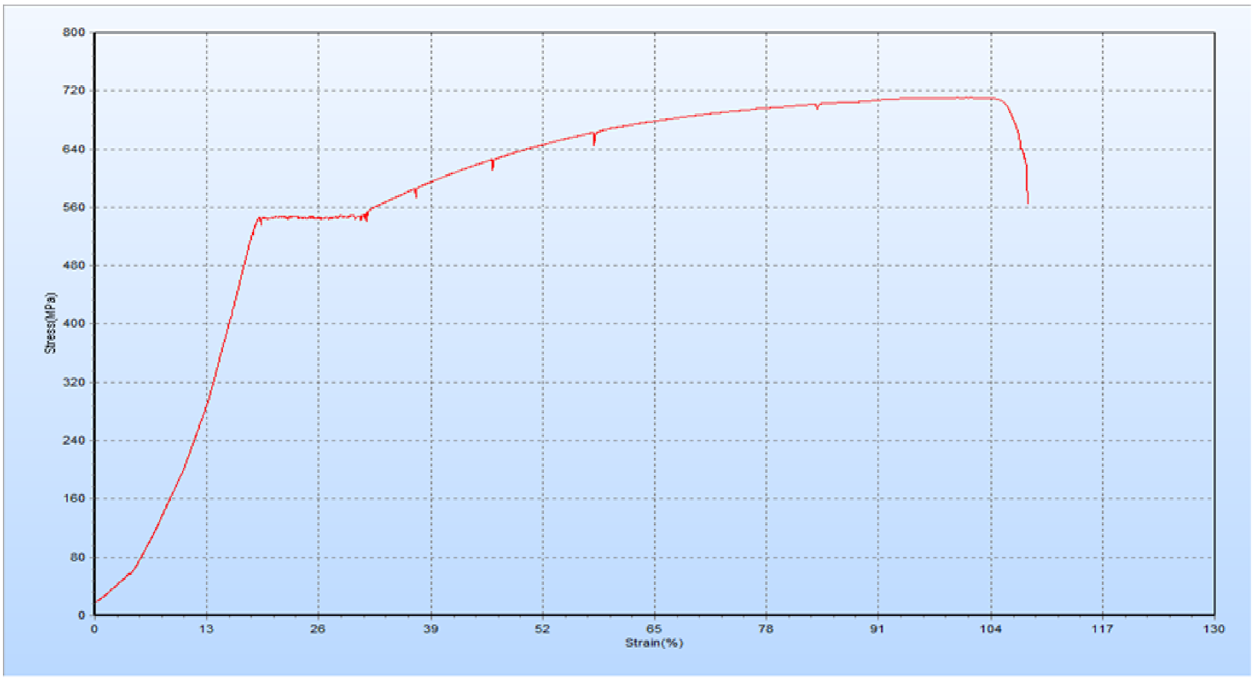


Figure 4.6: C-1-1 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	61.85	546.8	113.1	611.3	428	59.99	530.4	69.1	5.5

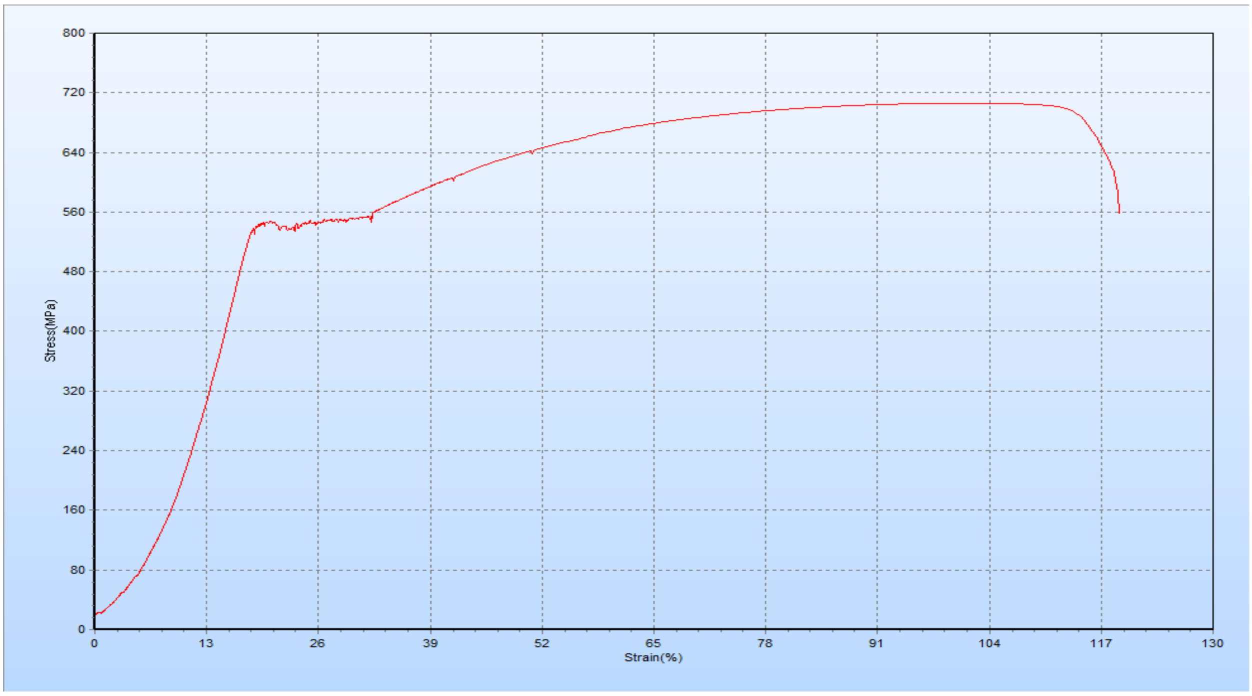


Figure 4.7: C-1-2 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strength (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	62.18	549.8	113.1	670.7	437	62.03	548.5	75.9	7.5

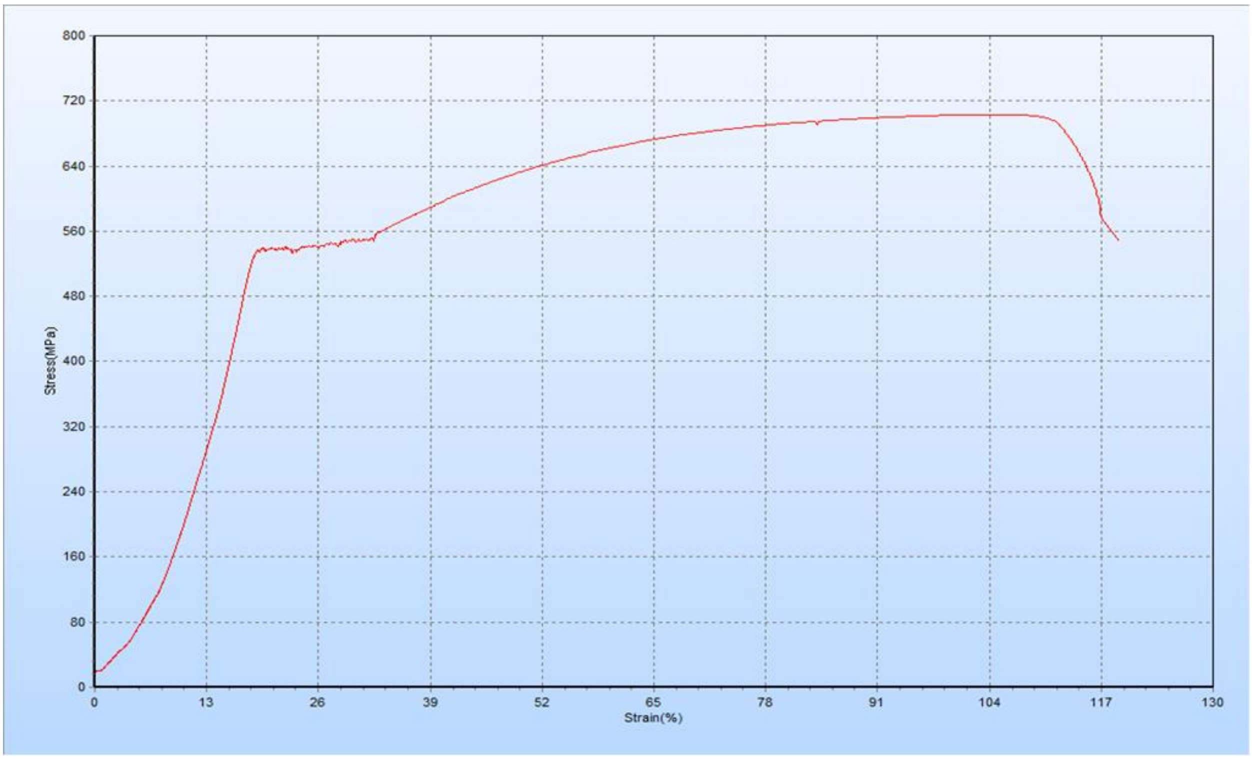


Figure 4.8: C-1-3 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strength (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	62.18	549.8	113.1	670.7	437	62.03	548.5	75.9	7.5

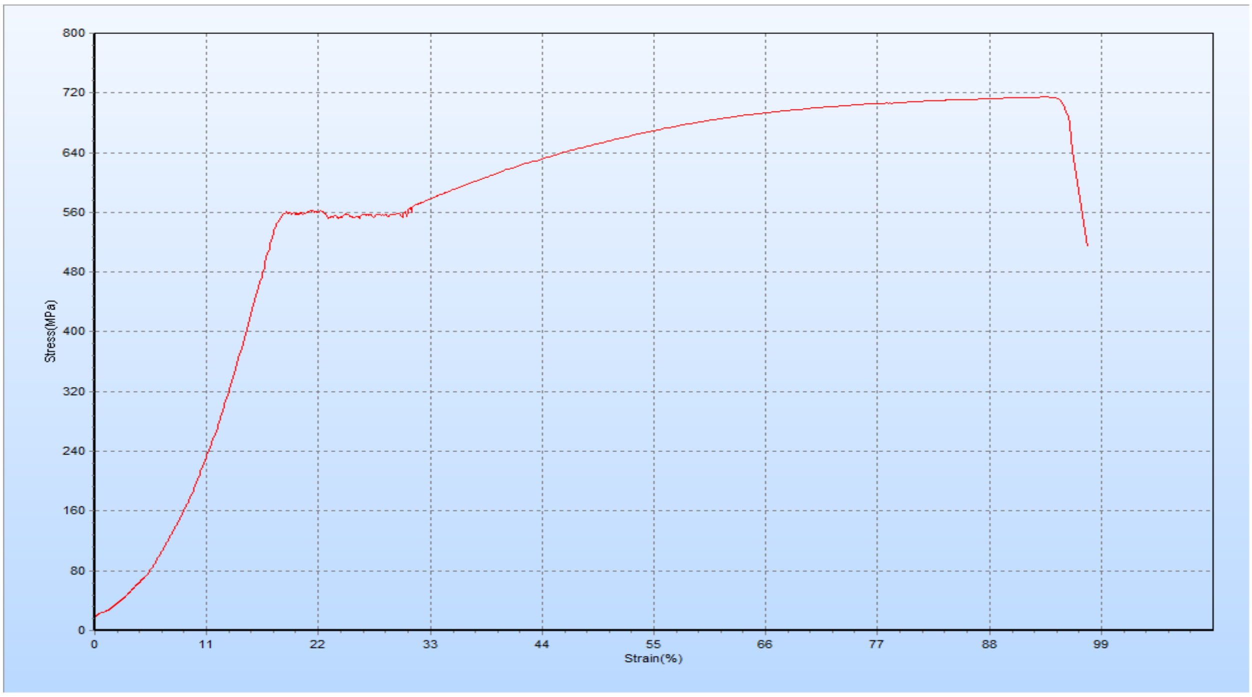


Figure 4.9: C-1-4 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	61.46	543.4	113.1	655.5	436	60.56	535.5	74.1	7.5

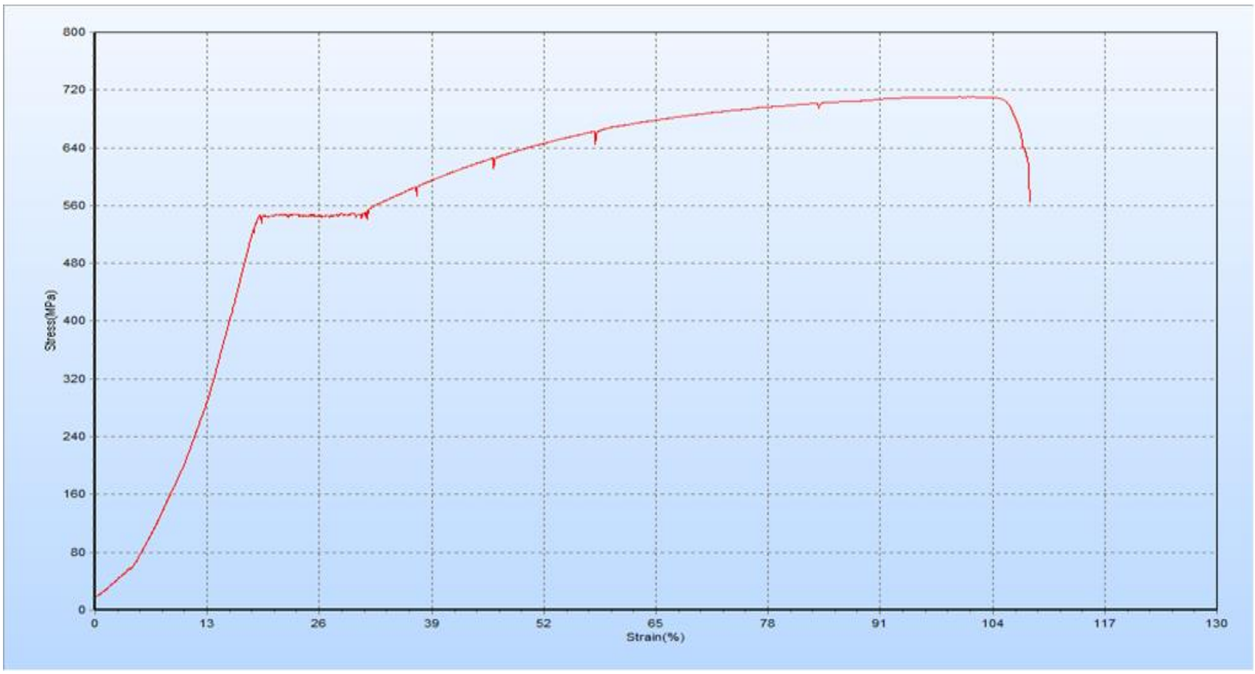


Figure 4.10: C-2-1 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	61.8	546.4	113.1	710.4	461	61.17	540.8	80.3	13.5

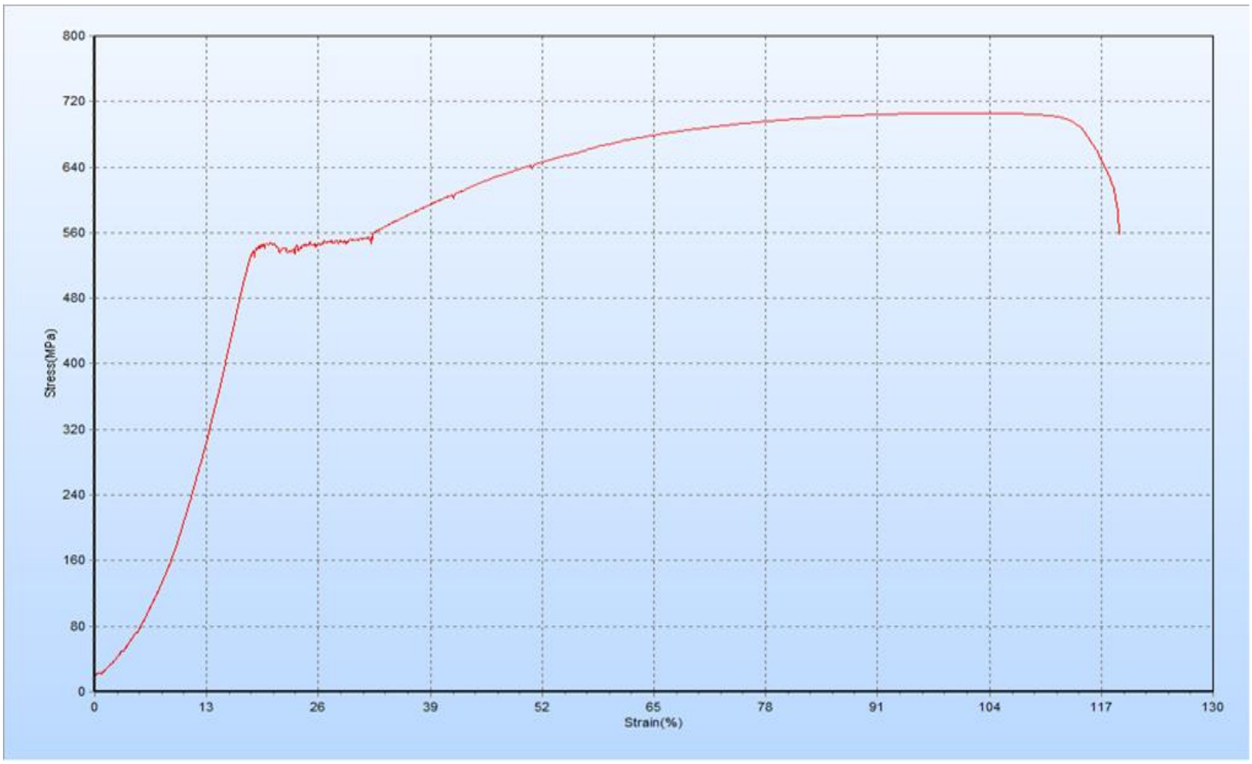


Figure 4.11: C-2-2 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	62.01	548.3	113.1	706.2	466	60.48	534.8	79.9	15

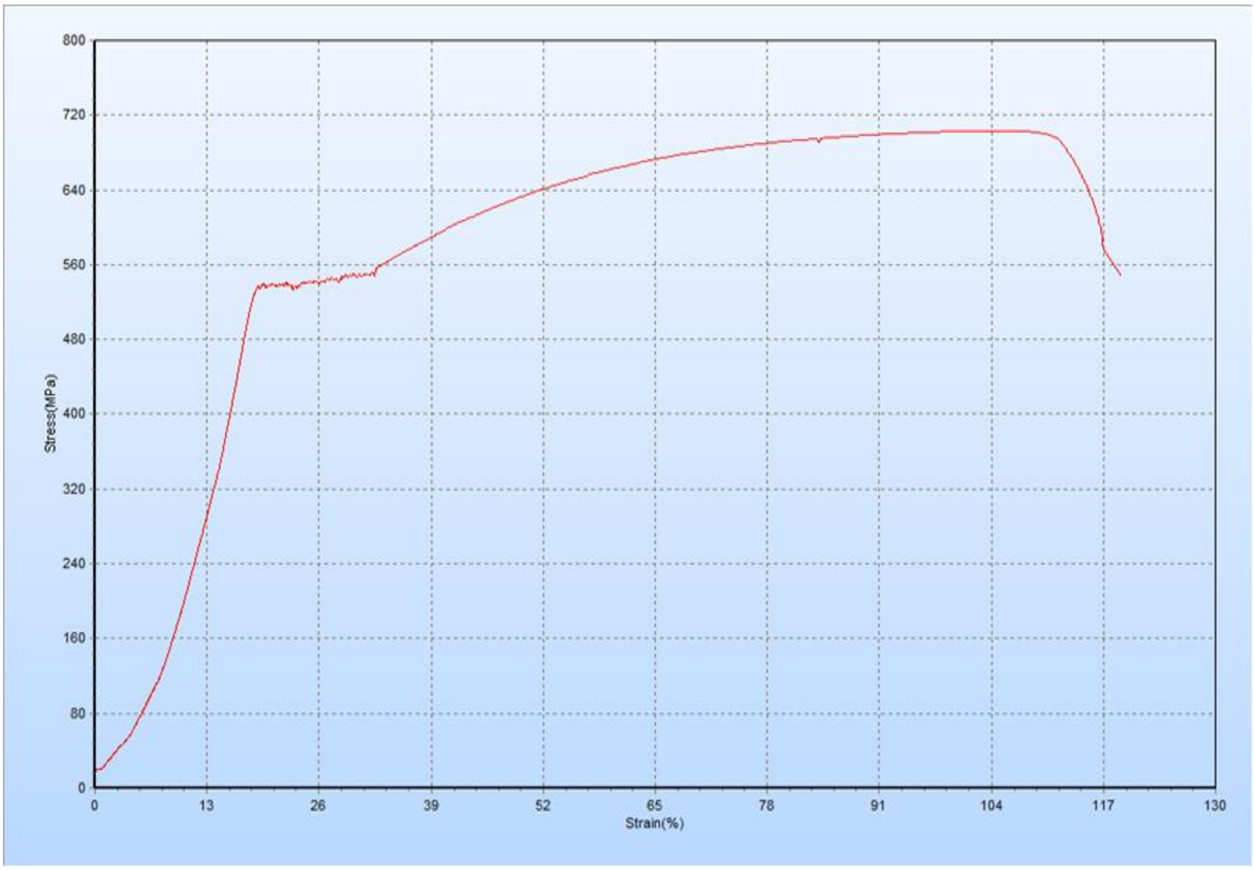


Figure 4.12: C-2-3 Graph

Data table from UTM

extensometer grange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	60.99	539.3	113.1	703.2	465	60.32	533.4	79.5	14.5

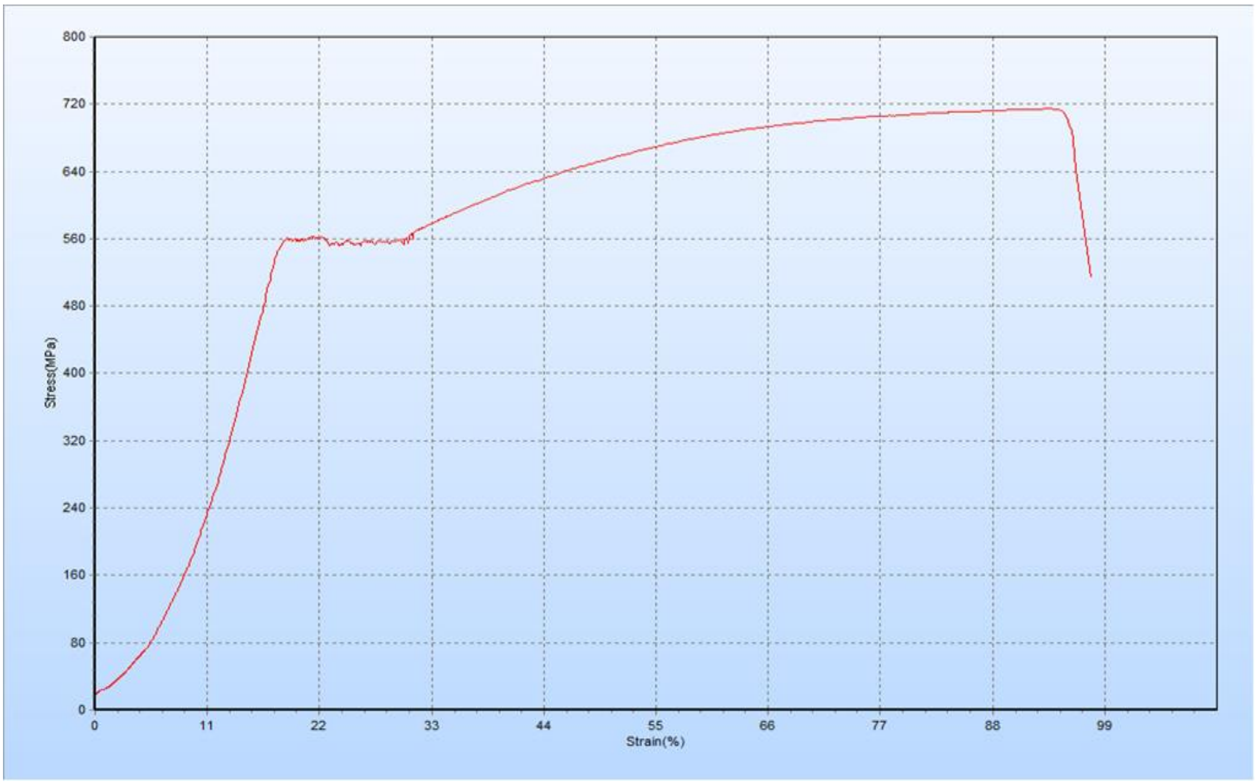


Figure 4.13: C-2-4 Graph

Data table from UTM

extensometer grange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	63.42	560.7	113.1	714.7	455	62.36	551.4	80.8	12

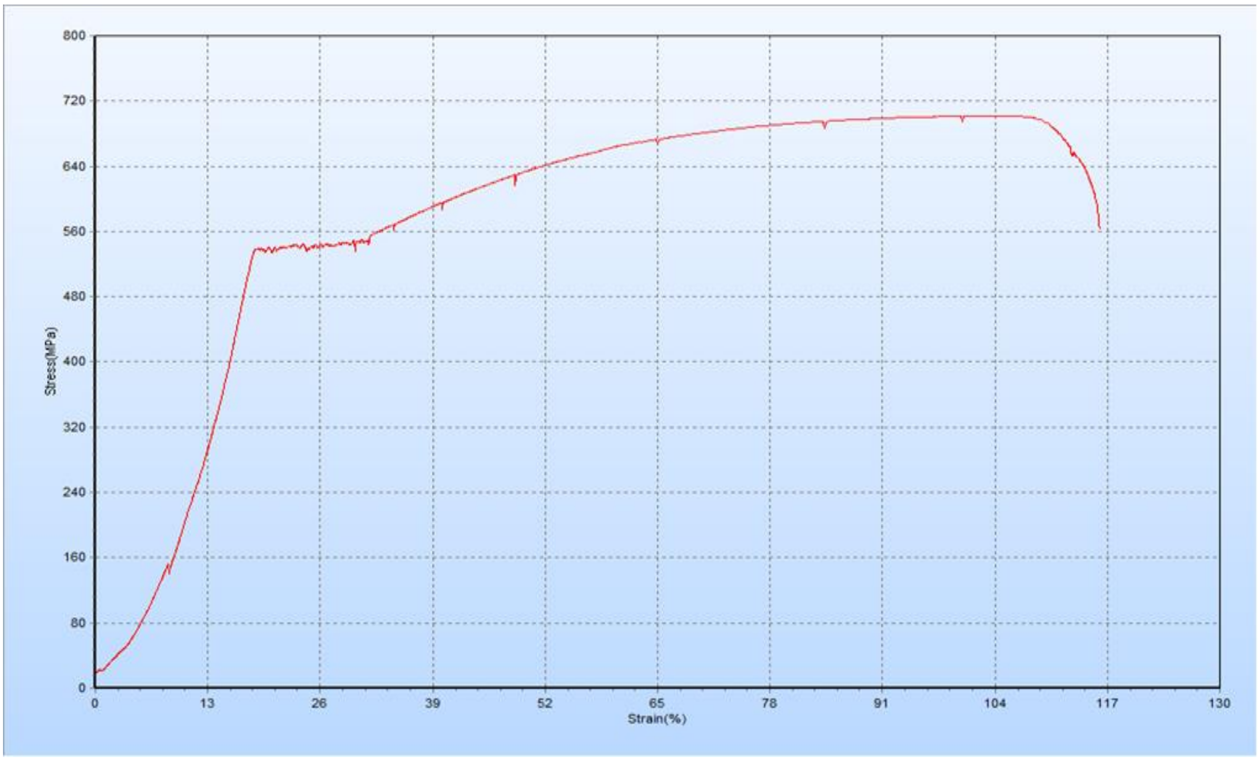


Figure 4.14: C-3-1 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	61.01	539.4	113.1	702	464	60.48	534.8	79.4	14.5

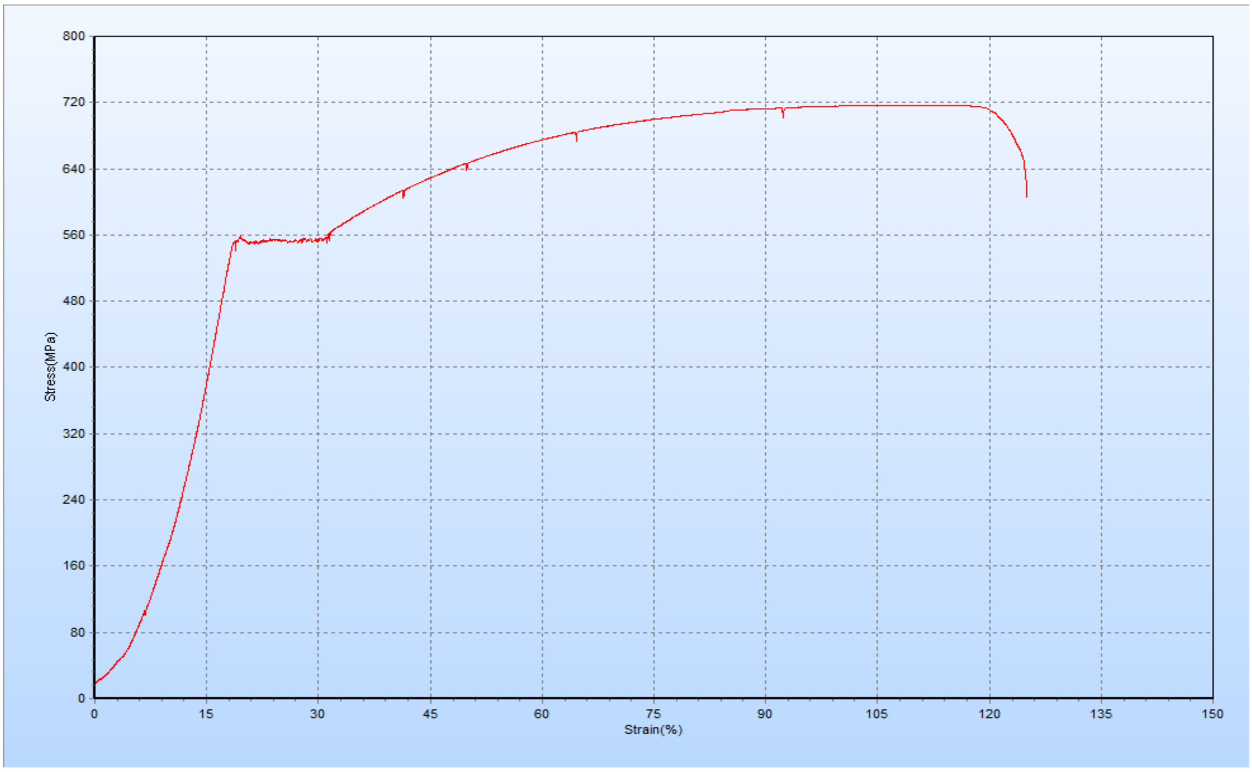


Figure 4.15: C-3-2 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	61.01	539.4	113.1	702	464	60.48	534.8	79.4	14.5

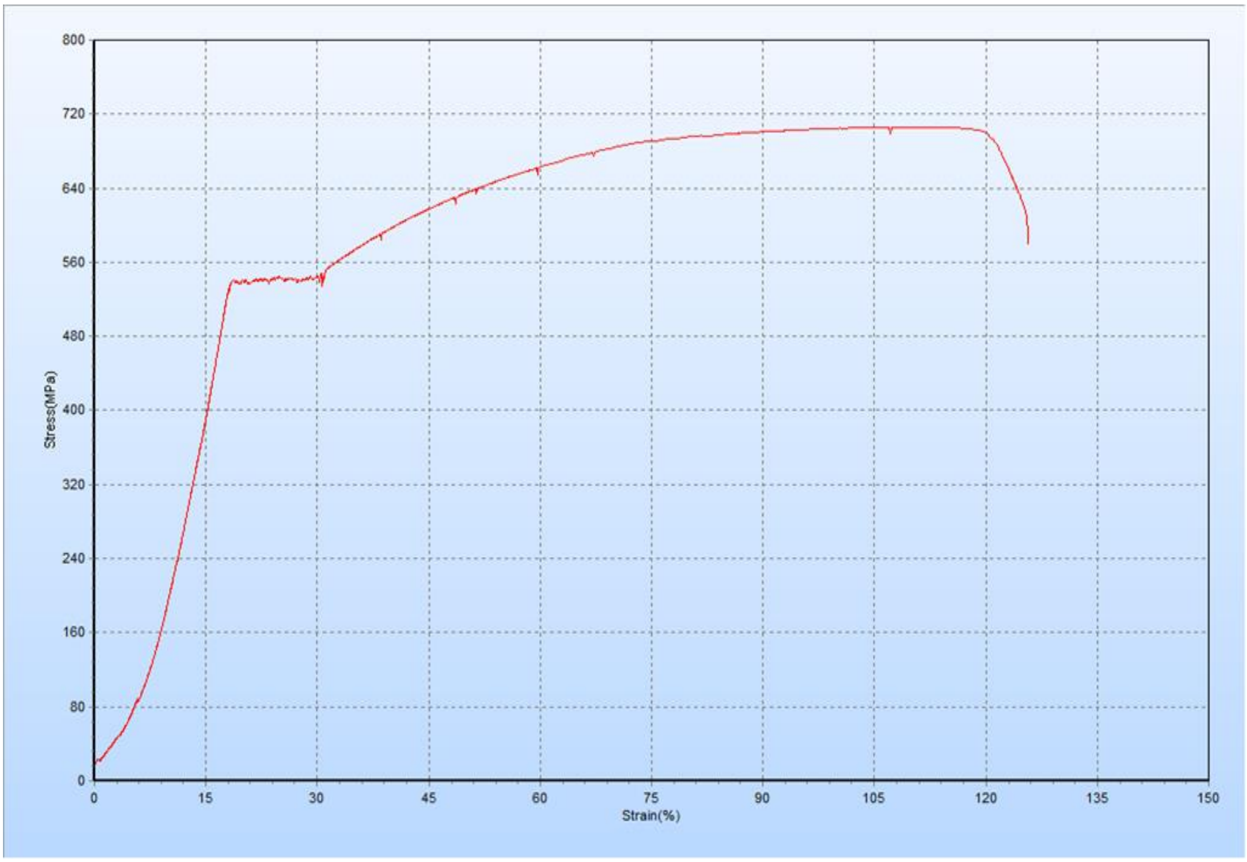


Figure 4.16: C-3-3 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	61.17	540.8	113.1	706.2	469	60.44	534.4	79.9	15.5

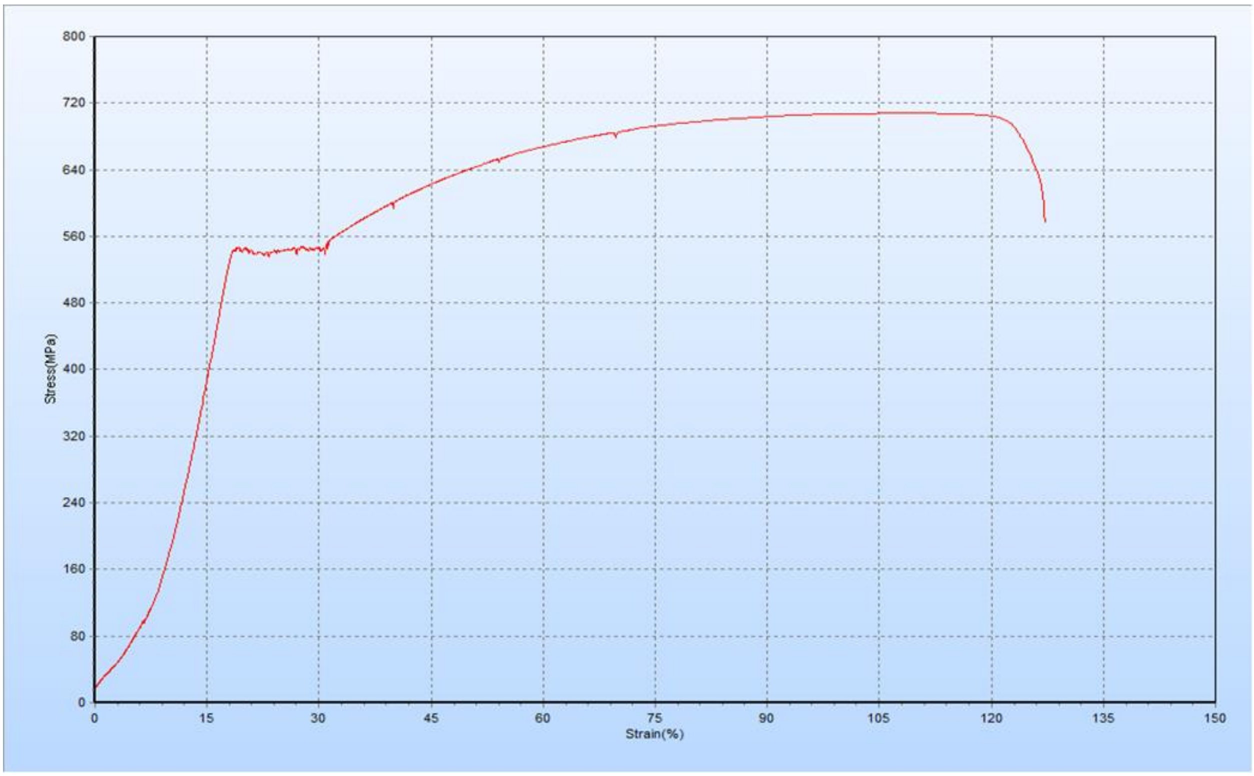


Figure 4.17: C-3-4 Graph

Data table from UTM

extensometer gange length (mm)	original gauge length (mm)	yield force on (KN)	upper yield strength (Mpa)	diameter (mm)	tensile strength (Mpa)	final gauge length after fracture (mm)	lower yield point (KN)	lower yield strengt h (Mpa)	maximum force (kn)	percentage elongation (%)
50	406	61.86	546.9	113.1	708	470	60.53	535.2	80.1	16

4.3 Results at a Glance:

Name	F1	C1	C2	C3
Upper Yield Strength(MPa) Lower Yield Strength(MPa)	545.13 536.28	542.6 536.2	548.67 540.1	546.27 538.4
Yield Force(KN) Maximum Force(KN)	61.65 80.08	61.37 72.35	62.06 80.13	61.78 80.1
Original Gauge Length(mm) Final Gauge Length after Fracture(mm)	406 468	406 433	406 461.75	406 468
Diameter(mm) Diameter of Neck(mm)	12 9.5	12 11.63	12 9.74	12 9.01
Ultimate Tensile Strength(MPa)	708.17	639.68	708.63	708.2
Lower Yield Point	60.65	60.64	61.08	60.89
Percentage Elongation	15.25	13.75	13.75	15.37
Percentage Reduction in area	37.28	5.76	33.86	43.57

Steel Tensile Test Result													
F1													
No.	Extensometer gange length (mm)	Original Gauge length (mm)	Yield force (KN)	Upper Yield strength (Mpa)	Diameter (mm)	Tensile strength (Mpa)	Final gauge length after frature (mm)	Lower Yield point (KN)	Lower Yield strength (Mpa)	Diameter of Neck (mm)	Maximum Force (KN)	% of Elongation	% of reduction
F-1-1	50	406	61.75	545.9	12	707.6	464	60.18	532.1	9.8	80	14.5	33.3
F-1-2	50	406	61.14	540.6	12	704	474	60.16	532	9.3	79.6	16.5	39.93
F-1-3	50	406	61.52	543.9	12	706.9	469	60.9	538.5	9.6	79.9	15.5	35.99
F-1-4	50	406	62.21	550.1	12	714.2	465	61.36	542.5	9.3	80.8	14.5	39.93

Steel Tensile Test Result													
C1													
No.	Extensometer gange length (mm)	Original Gauge length (mm)	Yield force (KN)	Upper Yield strength (Mpa)	Diameter (mm)	Tensile strength (Mpa)	Final gauge length after frature (mm)	Lower Yield point (KN)	Lower Yield strength (Mpa)	Diameter of Neck (mm)	Maximum Force (KN)	% of Elongation	% of reduction
C-1-1	50	406	61.85	546.8	12	611.3	428	59.99	530.4	11.8	69.1	13.5	3.3
C-1-2	50	406	59.99	530.4	12	621.2	431	59.99	530.4	12	70.3	15	0
C-1-3	50	406	62.18	549.8	12	670.7	437	62.03	548.5	12	75.9	14.5	0
C-1-4	50	406	61.46	543.4	12	655.5	436	60.56	535.5	10.75	74.1	12	19.74

Steel Tensile Test Result													
C2													
No.	Extensometer gange length (mm)	Original Gauge length (mm)	Yield force (KN)	Upper Yield strength (Mpa)	Diameter (mm)	Tensile strength (Mpa)	Final gauge length after frature (mm)	Lower Yield point (KN)	Lower Yield strength (Mpa)	Diameter of Neck (mm)	Maximum Force (KN)	% of Elongation	% of reduction
C-2-1	50	406	61.8	546.4	12	710.4	461	61.17	540.8	9.25	80.3	13.5	40.58
C-2-2	50	406	62.01	548.3	12	706.2	466	60.48	534.8	9.7	79.9	15	34.69
C-3-3	50	406	60.99	539.3	12	703.2	465	60.32	533.4	9.2	79.5	14.5	41.22
C-3-4	50	406	63.42	560.7	12	714.7	455	62.36	551.4	10.8	80.8	12	18.99

Steel Tensile Test Result													
C3													
No.	Extensometer gange length (mm)	Original Gauge length (mm)	Yield force (KN)	Upper Yield strength (Mpa)	Diameter (mm)	Tensile strength (Mpa)	Final gauge length after frature (mm)	Lower Yield point (KN)	Lower Yield strength (Mpa)	Diameter of Neck (mm)	Maximum Force (KN)	% of Elongation	% of reduction
C-3-1	50	406	61.01	539.4	12	702	464	60.48	534.8	9.1	79.4	14.5	42.49
C-3-2	50	406	63.11	558	12	716.6	469	62.11	549.2	9.2	81	15.5	41.22
C-3-3	50	406	61.17	540.8	12	706.2	469	60.44	534.4	8.9	79.9	15.5	44.99
C-3-4	50	406	61.86	546.9	12	708	470	60.53	535.2	8.85	80.1	16	45.6

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

In conclusion, the comparison between fresh bar and welded bar reinforcement of a building is an important area of study for the construction industry. The choice of reinforcement type can have a significant impact on the durability, strength, and overall safety of the building. While fresh bars offer some advantages in terms of flexibility and ease of installation, welded bars provide a more secure and long-lasting solution. Ultimately, the choice between these two types of reinforcement will depend on the specific needs and requirements of the building project. It is crucial for engineers and construction professionals to carefully evaluate the pros and cons of each option and make an informed decision to ensure the safety and stability of the building.

5.2 Conclusion

From the study, it is observed that:

1. In conclusion, this study on the comparison between fresh bar and welded bar reinforcement in a building structure has highlighted the importance of understanding the mechanical properties and durability of these two types of reinforcement. Through a detailed analysis of the results, it was found that welded bars offer greater strength and resistance to corrosion compared to fresh bars. Additionally, the welded bar reinforced building models showed better overall performance in terms of durability and load-bearing capacity.
2. The findings of this study can guide engineers and construction professionals in selecting the most appropriate reinforcement method for a building project, based on the specific requirements and constraints of the project. overall, this study highlights the importance of carefully considering the structural behavior and performance of different reinforcement methods in order to ensure the safety and longevity of a building. Further research can be conducted to investigate other factors that may impact the selection of reinforcement methods, such as environmental sustainability and cost

3. This study on the comparative performance of fresh bar and welded bar reinforcement in building construction has made a significant contribution to the knowledge and understanding of the construction industry. By conducting a comprehensive analysis of the mechanical properties, durability, and structural behavior of fresh bar and welded bar reinforced building models, this study has shed light on the advantages and disadvantages of each reinforcement method.
4. This study on the advantages and disadvantages of fresh bar and welded bar reinforcement methods for building construction has shed light on the potential impact of these methods on the environment and sustainability of building construction. Through a detailed analysis of the mechanical properties, durability, and structural behavior of fresh bar and welded bar reinforced building welded bar reinforcement offers greater strength and resistance to corrosion compared to fresh bar reinforcement, it also has a higher carbon footprint due to the energy-intensive welding process. Fresh bar reinforcement, on the other hand, is more flexible and easier to install,but it may not provide the same level of structural integrity as welded bar reinforcement.

The use of weld in building is increasing day by day. As a result of weld, high voltage electricity enters inside the rod and the rod gets burnt, thus reducing the flexibility of the rod. Mild steel is used in the concrete of the building so that if the concrete falls due to any reason, the elasticity of the mild steel will give a signal before it fails. But due to the reduction of elasticity due to welding in steel,this signal ta cannot be obtained which is a risk. So the use of weld should be reduced.

5.3 Limitations

The overall study has some limitations. These are identified as follows:

5.3.1 Provide data unconsciously

We had to remove lots of survey data for conflict of similarity. Users were not concern when they filled up data.

5.4 Recommendation

Based on the objective, scope and limitation of the study (*stated in chapter I*) few recommendations can be proposed for further studies:

- Careful consideration should be given to the specific requirements and constraints of a building project when selecting the appropriate reinforcement method. For example, if the building is located in a corrosiveenvironment or is expected to be subjected to heavy loads, welded bar reinforcement may be the better choice.
- The potential impact of fresh bar and welded bar reinforcement methods on the environment and sustainability of building construction should be carefully considered when selecting the appropriate method. Engineers andconstruction professionals should strive to select reinforcement methods that balance structural integrity with environmental sustainability.
- Further research can be conducted to explore ways to mitigate the environmental impact of welded bar reinforcement, such as using renewable energy sources for welding. Additionally, research can beconducted to explore the potential of new and innovative reinforcement methods that offer a balance between structural integrity and environmental sustainability.
- To ensure the safety and longevity of a building, it is important to conduct regular inspections and maintenance of the reinforcement system. This includes monitoring for signs of corrosion and addressing any issues promptly.
- Fresh bar has more tensile strength than welded bar, tension zone shouldn’t be welded.

Finally, it is recommended that construction professionals undergo training and certification in the proper installation and maintenance of reinforcement systems to ensure that they are installed correctly and maintained properly over the life of the building.

REFERENCES

- Alk, A., Savvopoulos, P. and Dimitrov L., 2001. “Design Problems in Lap Welded Joints of Reinforcing Steel Bars”, Greece: Department of Mechanical Engineering and Aeronautics, University of Patras.

- American Concrete Institute, 2003. ACI408R-03 “Building Bond and Development of Straight Reinforcing Bars in Tension”, USA: 38800 Country Club Drive Farmington Hills, MI 48331, ACI.

- American Concrete Institute, 2011. ACI318-11 “Building Code Requirements for Structural Concrete and Commentary”, USA: 38800 Country Club Drive Farmington Hills, MI 48331, ACI.

- American Institute of Steel Construction, 2005. “AISC-LRFD Specification for Structural Steel Building: Load & Resistance Factor Design”, Chicago, AISC.

- American Society for Testing and Material, 2005. ASTM A706-05a Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement, USA: ASTM International.

- American Society for Testing and Material, 2009. ASTM A615M-09b Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement, 09b edn. USA: ASTM International.

- American Society for Testing and Material, 2010. ASTM A370-10 Standard Test Methods and Definitions for Mechanical Testing of Steel Products, USA. ASTM International.

- American Welding Society, 2010. AWS A3.0/A3.0M-10 Standard Welding Terms and Definitions: AWS.

- American Welding Society, 2011. AWS D1.4/D1.4M:11 Structural Welding Code-Reinforcing Steel: AWS.

- Bahman, A. and Alialhosseini , E., 2010 “Change in Hardness, Yield Strength and UTS of Welded Joints Produced in ST37 Grade Steel”, Indian Journal of Science and Technology, 3(12), pp. 1162-1164.

- Bohler Welding, 2005. 'Welding Guide’, Schwei B Technik Austria, [online] Available at: <http://www.boehler- welding.com> [Accessed: June 2014].

- Concrete Reinforcing Steel Institute, (2004) CRSI, “Assembling Reinforcing Bars by Fusion Welding in the Fabricating Shop”, USA, , 933 N. Plum Grove Rd., Schaumburg, Illinois 60173-4758,CRSI.

- Germanischer Lloyd Aktiengesellschaft, 2000. GL-00 “Materials and Welding.