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JUDUL: FOLDABLE AND PORTABLE GOALPOST FOR STREET SOCCER

SESI PENGAJIAN: 2006/2009

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DEVELOPMENT OF FOLDABLE AND PORTABLE GOALPOST FOR STREET
SOCCER

MUHAMMAD FAKHRUL BIN HASHIM

A report is submitted in partial fulfillment of the
requirement for the award of the Diploma
of Mechanical Engineering

Faculty of Mechanical Engineering
UNIVERSITI MALAYSIA PAHANG

NOVEMBER 2008

**FAKULTI KEJURUTERAAN MEKANIKAL
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JUDUL TESIS: FOLDABLE AND PORTABLE GOALPOST FOR STREET SOCCER

PROGRAM: DIPLOMA KEJURUTERAAN MEKANIKAL

FAKULTI: FAKULTI KEJURUTERAAN MEKANIKAL

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SUPERVISOR DECLARATION

“I declare that I have read this thesis and in my opinion, this thesis is enough to fulfill the purpose for the award for the Diploma of Mechanical Engineering from the aspects of scope and quality.”

Signature :

Supervisor : En. Idris Bin Mat Sahat

Date :

DECLARATION

I declare that this report entitled “Foldable and Portable Goalpost for Street Soccer” is the results of my own work and research. The report has not been degree and is not concurrently submitted in candidature of any other degree.

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ABSTRACT

The idea to create and build a **portable and foldable goalpost for street soccer** is come from supervisor that gives me this title and task for this project. To design and fabricated this goalpost, it must be compare with other product that maybe available in the market. First, get an idea from internet, magazine, newspaper or other from available data. Form there the information and idea to design and fabricated can be created.

Whole project involves various methods such as collecting data, concept design and fabrication process. The whole project involved various method and process that usually use in engineering such as concept design, analysis process and lastly fabrication process.

This final year project takes one semester to complete. This project is individual project and must be done within this semester. In this project, students must able apply all knowledge during their studies in this Diploma of Mechanical Engineering course. Overall from this project, time management and discipline is important to make sure this project goes smooth as plan and done at correct time.

ABSTRAK

Idea untuk menghasilkan dan membina **tiang gol mudah alih dan boleh lipat untuk bola sepak** jalanan ini datang daripada penyelia yang memberi saya tajuk dan tugas untuk projek ini. Untuk merekabentuk dan pembinaan tiang gol, ia hendaklah dibandingkan dengan produk lain yang mungkin berada dalam pasaran. Langkah pertama, dapatkan maklumat daripada internet, majalah, suratkhbar atau daripada sumber yang lain.

Keseluruhan projek melibatkan pelbagai cara atau kaedah seperti mengumpulan data, rekabentuk konsep dan proses membina. Kaedah yang selalu yang digunakan dalam kejuruteraan seperti proses analisis juga digunakan.

Projek akhir tahun ini mengambil satu semester untuk disiapkan. Projek ini adalah projek individu dan mesti disiapkan dalam semester ini. Didalam projek ini, pelajar mesti berupaya menggunakan segala pengetahuan yang mereka perolehi semasa pembelajaran mereka di dalam kursus Diploma Kejuruteraan Mekanikal ini. Secara keseluruhan daripada projek ini, pengurusan masa dan disiplin adalah penting dalam memastikan projek berjalan lancar dan siap tepat pada waktunya.

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LIST OF SYMBOL

<i>In</i>	inch
<i>N</i>	Newton
<i>Mm</i>	Millimeter
<i>M</i>	Meter
<i>N/mm</i>	Newton per Millimeter
<i>pcs</i>	Pieces

CHAPTER 1

INTRODUCTION

1.1 Introduction

In this final project final project, it involves designing, fabricating and some analysis for the goalpost of street soccer. This final year project takes duration of one semester to develop the goalpost for street soccer that portable and foldable.

This project result may be able to be use as the first step to go further in designing and fabricating more modified goalpost and make it as a product by sell it in the market.

1.2 Project Synopsis

The project title is Foldable and Portable Goalpost for Street Soccer. This goalpost should be able to fold and mobile for street soccer use, but it must be light and able to stand the impacts create by a ball.

Beside, this project development must be concern with material strength, type of material, connection of folding and part the structure of goalpost.

1.3 Project Background

The goalpost for street soccer that we usually find in market is not portable and foldable, that is the main problems. So, in this project I want to make a goalpost which can fix this main problem.

The goalpost that I want make must be light for portable function. For foldable function, in connection must be install with some item that able it to fold so that this goalpost can save space to store it somewhere.

1.4 Problem Statement

As we can see, the conventional goalpost in for street soccer is usually really big and need more space to store it. Furthermore, this goalpost is not portable, so goalpost is stuck to it's place until in it rust. This is not good because goalpost need long lasting usage so people can use it for time to time.

Even so the conventional goalpost in market did not have a standard size because street is not an official game like other type of soccer game. Because of street soccer goalpost doesn't have a standard measure, so I have to set up a measures by myself.

1.5 Project Objective

1.5.1 General objective

The objective of final year project is to develop and practice knowledge and skills that students have obtain during their study Diploma of Mechanical Engineering course.

This project trains the student's capability in problem solving, data gathering, research, designing and fabrication skills. This project also educates the students in communication skills or soft skills in presentation and trains them to defend their research in the presentation.

Otherwise, the students must able to able doing their work independently with minimum supervisory in searching, detailing and expanding the knowledge and experience.

In fabrication process, the students will learn more deeply like how to using a tool or equipment and method to use tools/equipments to fabricated the projects.

1.5.2 Specific project objective

The main objective of this project is:

To design and fabricate the prototype of foldable and portable goalpost for street soccer based on mechanical engineering method

Others objectives also included. There are:

- a) To apply the knowledge by using machine that usually use in mechanical engineering
- b) To provide and improve the idea
- c) Know to solve problem that might be occurred
- d) To create creative and innovative idea

1.6 Project scope of work

1. To analyze of characteristics of successful street soccer goalpost development.
2. To determine of development Process and fabrication of goalpost.
4. To create concept generation.
5. To development of concept selection.
6. To determine about product specification of goalpost.
7. To analyze of product design specification.
8. To make an AutoCAD/Solidwork drawing of goalpost.
9. To produce a prototype of goalpost based industry design method.



FIGURE 1.1: Gantt Chart

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Soccer is a well known sport in the world and another type of soccer; street soccer starts increasing popularity. Goalpost is a one of the important equipments in street soccer.

The term street football encompasses a number of informal varieties of association football (soccer). These informal games do not necessarily utilizes the requirements of a formal game of football, such as a large field, field markings, goal apparatus and corner flags, eleven players per team (with a minimum of seven per team), or match officials (referee and assistant referees).

It is important because goalpost is the only equipment been use and through it we can know the results of a game. Yet in many areas such as community park, playground and other surfaces suitable for playing street is lack goalpost. It is therefore desirable to provide a portable and foldable so that games of street soccer may or can be played in such setting.



Figure 2.1: *Street soccer plays in Plymouth, UK*

2.2 Existing Products

2.2.1 Existing Product 1

In this part, I will show some type of goalpost. Every of these goalpost, I will show their advantages and disadvantage even though some of them do not related to soccer.



*Conventional
street soccer
goalpost*

Figure 2.2

Advantages

- Small – it size is small
- Light – have a light weight so people can bring it anywhere
- Have durability – long lasting because it has been made with steel that can stand rusting

Disadvantages

- Not foldable – this goalpost can not be fold, people may find it hard to bring as it
- Need more space to store it – because this goalpost can not be fold, so it take more space to store it

2.2.2 Existing Product 2

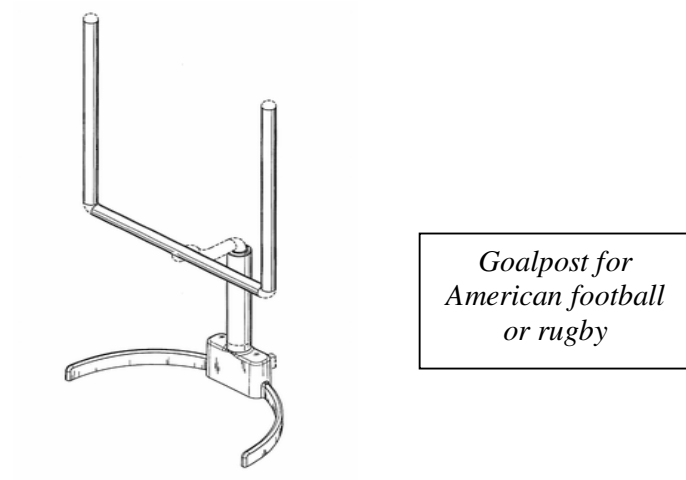


Figure 2.3

Advantages

- Durability –
- Long lasting – can be use for a long time
- Movable or portable – this goalpost can be move to other place

Disadvantage

- Large – it size is large so difficult to move it
- Too high – not suit for street soccer play, suit for rugby
- Too heavy – weight is heavy and difficult to move it

2.2.3 Existing Product 3



*Conventional
goalpost*

Figure 2.4

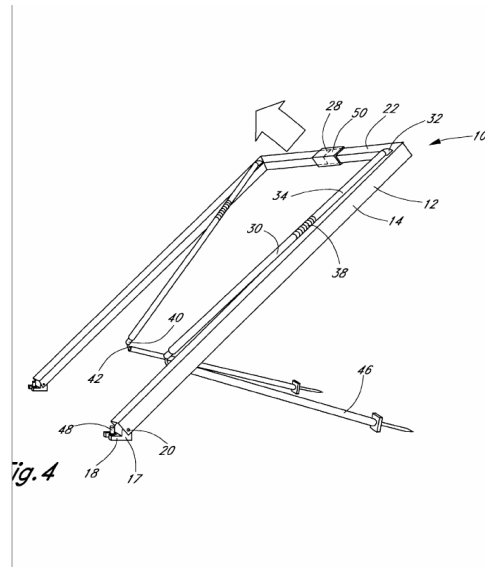
Advantages

- Durable
- long lasting
- Stable – not easily fall to the ground

Disadvantages

- Large – take more space if you want to store it
- Fix to the ground – not easily remove,
- Heavy – take more people if move it; because it's weight

2.2.4 Existing Product 4



*Foldable
goalpost*

Figure 2.5

Advantages

- Foldable – can be fold to save space
- Portable – movable, can be move to other place
- Light – can be carry by one or two people
- Easy to carry – can be carry after been fold

Disadvantages

- Complex structures – use a complex structure on product
- Need more time to install/assemble – because of it's structure, it need time to install it
- High price – because of it's material, complex structure and connection

2.3 Conventional Goalpost for Soccer

The goalpost consists of a post, crossbar, and two uprights. The post that holds the uprights is 10 feet tall and placed approximately 80 feet from the sidelines. The crossbar, which is 18 feet, 6 inches in length, sits atop the post. The uprights extend 30 feet above the crossbar. In shorten words; a football goal is 8 feet, or 2.44m tall, and 8 yards (7.32m) long.

CHAPTER 3

METHODOLOGY

3.1 Project Flow Chart

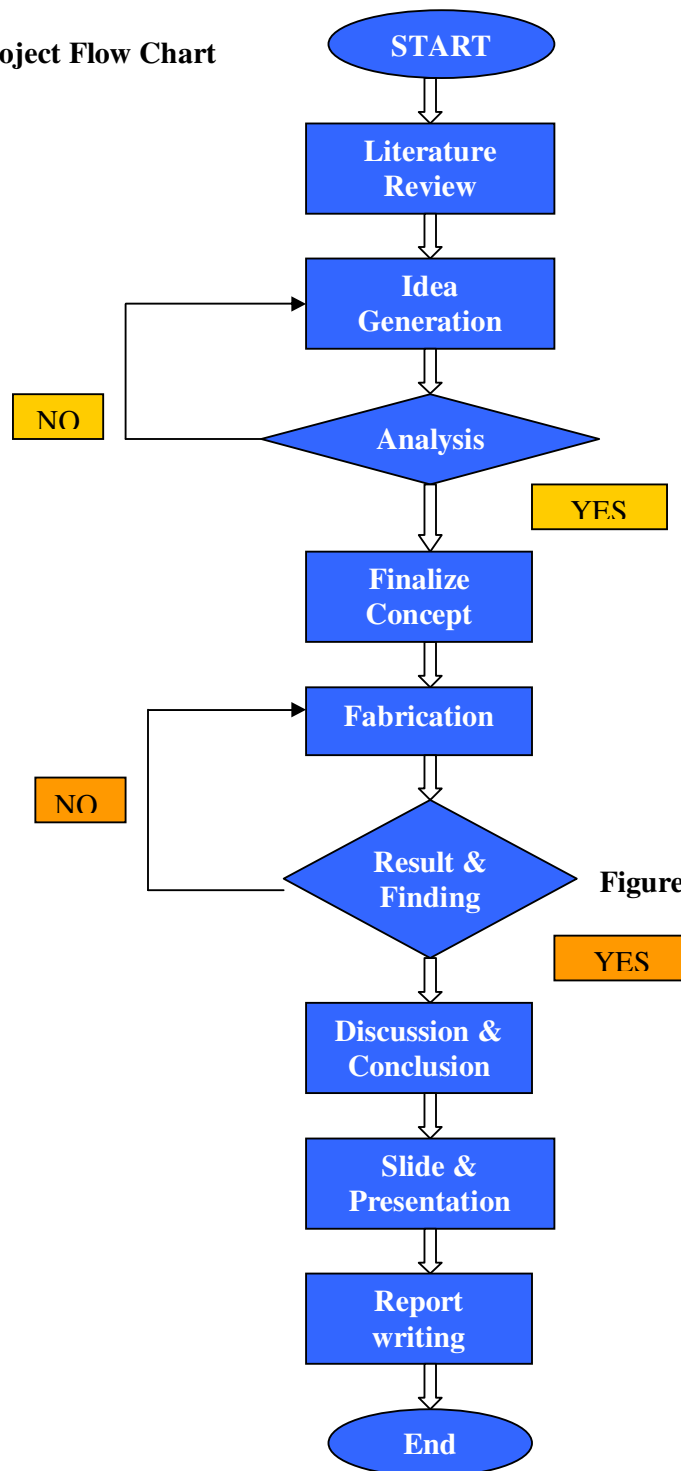


Figure 3.1: Flow Chart

3.1.1 Flow Chart Description

The project starts with data, information collecting and research about the existing product. These can be done through research on the internet, books, magazines and other sources.

After done with literature review, then generate ideas of the design. In this step, the information that has been gathering before was being applied to make a sketched design that suitable for the project.

Analysis each early design before choose the suitable design. If one from the designs is suit for the project, then make some improvements to the design. Transferred the selected design to solid modeling and engineering drawing using SolidWorks software.

From the detailed drawing, design or concept as guidance to fabricate according to the detailed design by using some manufacturing method. The manufacturing process is which may can be use is cutting, drilling, welding, and others.

After done with fabricating process, the result must be test whether it is functioning or not. From the finding, do some analysis about the project.

After all process mention above is done and by the guidance of supervisor, prepare the slide for presentation and also do report writing after all material being gathered. The project ended after the submission of the report and the slide presentation has been present.

3.2 Design

The design of street soccer goalpost must be included with several aspects. The design must be carefully considerate so the design can be fabricated and the product well functioning. The aspects of design that must be considerate are:

- a) Durability: The street soccer goalpost frame must be durable so the frame can stand the ball force when playing street soccer.
- b) Cost: The cost of whole project must be reasonable. Many of materials for the project have been provided by UMP Mechanical Lab.
- c) Material: Material that will be used must be suit for making street soccer goalpost.
- d) Shape of design: the design should be able the user to use ease.

3.2.1 Drawing/ Sketching

The drawings are divided in two phases, which are:

- a) Sketching: all the ideas for Foldable and Portable Goalpost for Street Soccer are sketched on the paper first, ideas selection can be made from these sketched ideas.
- b) SolidWorks application: the selected design or concept is then transfer to 3D modeling and drawing using this computer aided design application.

a. Sketching and drawing selection

Firstly, sketched as many designs that has been think, then finalized at least four best designs which has been chosen.

3.2.1.1 Sketching A

This concept can be considered as the datum concept/drawing to generate other concept/drawing. This concept can not be fold but portable, it just uses a simple frame of design. Easy to fabricate.

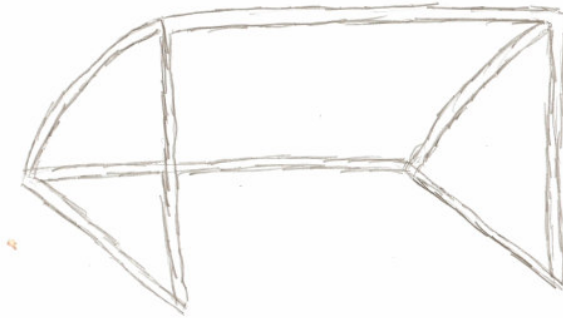


Figure 3.2: *Concept A*

3.2.2.2 Sketching B

Use a connections that able it to fold. The concept is nearly same as Drawing A. It is not easy to fabricate.

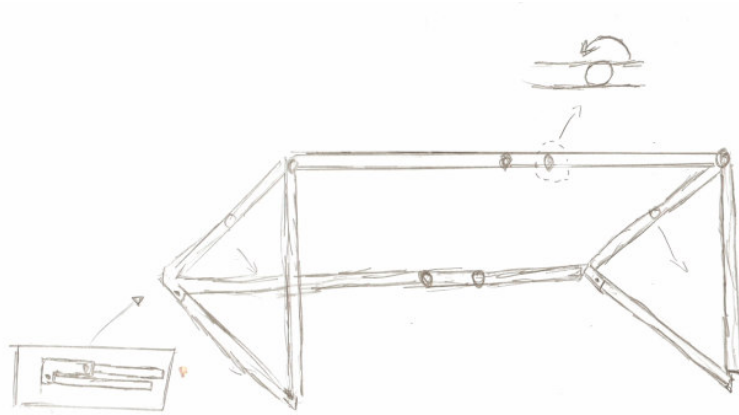


Figure 3.3: *Concept B*

3.2.2.3 Sketching C

This concept is able the goalpost to be 'small' that use some kind of connection which is same as television or radio antenna. This connection is use a bars of different size that able them to fit in each other.

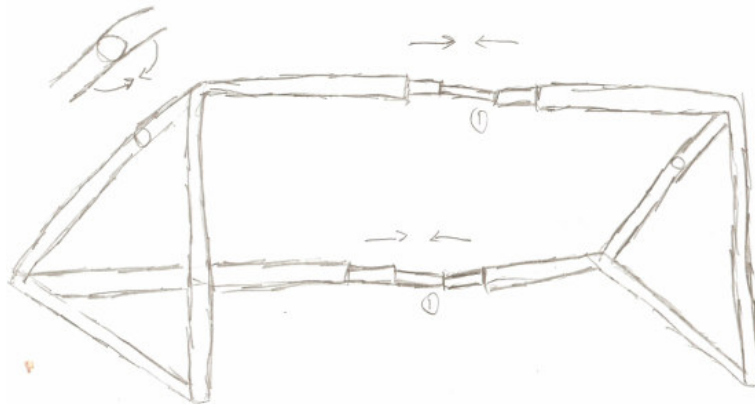


Figure 3.4: *Concept C*

3.2.2.4 Sketching D

This sketched design is nearly same as drawing B. do not have too much connection that able it completely fold, also use a connection that have function like human bone.

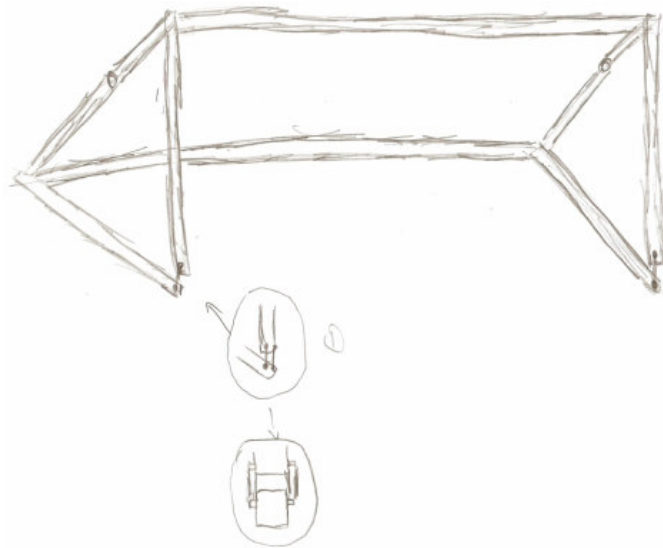


Figure 3.5: *Concept D*

b 3D computer drawing

Build 3D or solid drawing by using SolidWorks application. All dimensions must be followed and build solid design based on choose design.

3.3 Computer aided design

After done with the sketching, the next phase is choosing one of from the drawing to do a computer aided drawing done with the measure or dimensioning. Drawing B has been chosen for the project, do some changes to the drawing but the concept must be relevant. The dimensioning must be relevant but before that does a rough drawing or engineering drawing. Then draw the design using SolidWorks application. Firstly, do the drawing part by part according to a dimensioning and then create the assemble based on

sketching or engineering drawing before. All parts is converted into orthographic view to gets its engineering detail.

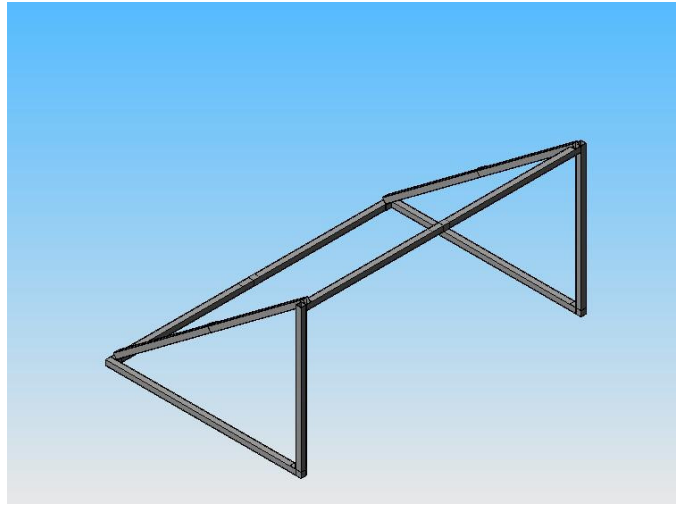


Figure 3.6: Overall view of the design

3.4 Bill of Materials

No.	Materials	Size	Quantity/ Length
1.	hollow bar	1in x 1in	1pcs/ 6m
2.	hollow bar	0.8in x 0.8in	0.2m
3.	Hinge	Small	6
4.	Lock bar	Small	2

Table 3.1: Bill of Materials

3.5 Fabrication

After the designing process is the fabrication process. The raw material has is been using to do a fabrication process and fabricate the project based on the design by using welding, drilling, cutting and fastening process. Fabrication process philosophy is difference from manufacturing in term of product quantity.

Fabrication process is a process that make only one product rather then manufacturing process that focus large scale production. In other word,

the fabrication process is an experimental process in metalworking. This fabrication process is just to make prototype of product.

3.5.1 Fabricate processes

In making this concept become real, several process of manufacturing has been used to fabricate the project.

3.5.1.1 Measuring and marking

Measure and mark the material after getting the materials. Measuring tape and marking pen is equipments used to do this job.



Figure 3.7: *Measuring and marking*

3.5.1.2 Cutting

Floor cutting disc machine is the equipment that is mainly used for this process.



Figure 3.8: *Cutting material*

3.5.1.3 Joining

This method is using TIG and arc metal welding to join the part.

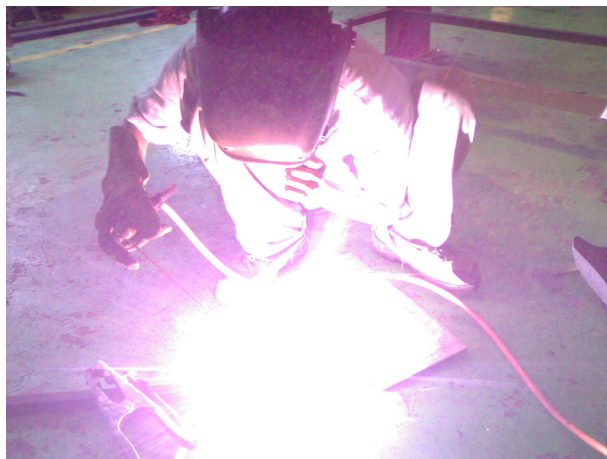


Figure 3.9: *Welding*

3.5.1.4 Grinding and filing:

The chips from cutting process must be removed because it is very dangerous. This method also can be use to remove some metals from welding process before to do a correction to the joining.



Figure 3.10: *Grinding*

3.5.1.5 Drilling

Drill at the marking point to make a hole for screw and nut. Drilling tolls must be applicable with the size of fastening tools.



Figure 3.11: *Drilling*

3.5.1.6 Fastening

The fastening such as screw, nut or rivet must be suitable with the hinge.



Figure 3.12: *Fastening*

3.5.1.7 Painting

Paint with white colour to attract people



Figure 3.13: *Painting*

3.6 Fabrication procedures

Measure the material into the require dimensions, refer to the design. This measuring process is done by using L shape, measuring tape and steel marker.

After the marking is done, cut the materials according to the dimensions by using floor cutting disc machine. Do some adjustment to the materials by using hand grinder. Make sure before proceeding, wear the PPE or protective personal equipment such goggle and glove but if you to be more protective wear ear plug. Weld the materials according to the design.

This task is done by using MIG (Metal Inert Gas). Weld the hinge to the sub parts so that the every part is able to fold. Make sure before weld, every part must be accurately place in position so welding process can be done perfectly. Cut off some metal from the upper part of goalpost with metal saw (based on dimensions), finishing the surfaces using hand grinder.

Drill hole onto crossbar parts, then install sliding bar on the crossbar by fastened it with rivet pop. After these parts are done, cut the hypotenuse parts of goalpost. Install it with hinge, the below parts also must be install with hinge so the parts can be fold.

Make sure drill the hole on the side of goalpost hypotenuse so sliding bars on crossbar can lock up these parts. After all machining process is done, assembled all parts according to design.

The next step is painting process. This process started with cleaning process. All parts must be cleaned by using sand paper to scrape off rust. All part is paint with white colour. Do not paint it with thick layer, just a thin layer is enough, but do it continuously. After painting, dry the goalpost under the sun.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The results and analysis of goalpost frame structure is done using the fundamental of engineering analysis according on physic laws and fundamental of engineering analysis. The analysis will use theoretical and computer software. Problem that also will be discuss in this chapter are the prominent problem encounter in every stage of the project.

4.2 Results

After complete the fabrication process, the product must be gone through the analysis process. At this stage, all data about the product is gathered. It is important to classify the product before it enters market.



Figure 4.1: *Finalize product*

4.2.1 Product Specification

Every product must have its own specification. In this project, the product will be classified in several categories such as length, colour, weight and others.

Category	Results
Length	1.3metre
Height	0.75metre
Colour	White
Weight	20kg
Wide	0.75metre
Other specifications	Can be separate into two parts and be fold

Table 4.1: Product Specification

4.2.2 Defects

After the fabrication process is finish, there are many types has been found and created. It happens because of wrong technique and weakness of using machines and tools. The cause of it also came from the materials. From this weakness, one can get more experience and knowledge.

4.2.2.1 Joint

Joint that has been use in this project is not suitable for street soccer. For example, a hinge that has been use is not strong enough.



Figure 4.2: *Joint*

4.2.2.2 Bead

This type of defect is usually cause by wrong technique of welding process. Amateur find it hard to do welding process, so the results of welding maybe is not good and strong. The cause of it also might be of the voltage doesn't suit the electrode or material.



Figure 4.3: *Bead*

4.3 Problems in Project

4.3.1 Literature Review Problems

While literature review in progress, there are problems encounter. It is mainly about most of existed product does not have a specific dimension and specifications and there is no much information from magazine, books and internet about goalpost for street soccer. A raw material also is the problem happen during this stage. These problems have limited the resources of information on the project.

4.3.2 Design Problems

At this stage, the problems came during decision making to select best design to fabricate. Many concept designs have been found out but one must consider the design criteria. After a design is selected, another problem is encounter is dimensioning the design; the dimension should suitable with scope of the project. Because of street soccer goalpost did not have a specific dimensions, and so this goalpost project must be suit for street soccer style of play.

4.3.3 Fabrication Problems

Process fabrication is a very critical stage because you need to follow the project planning schedule. The main problem is the material that wants to use is out of stock. So the project needs to be delayed for awhile. To avoid delayed, some materials need to be buy. Some tools or machines have been lost, because of this problem students need to buy some tools or machines so the progress not delayed, and too much people for one tool.

4.3.4 Overall Project Problems

- i) Literature Review: The concept and idea review these projects are not very wide because it is not widely modified by the manufacturer. Students should come with their ideas on the project.
- ii) Designing and Sketching: Because of the idea were from the student directly, so there are no references that can be referred. All the drawing and dimension need to generate by student itself.
- iii) Fabrication Process: Students need to be given more time to finish fabricating their product because of slackness of training; the joining finishing was not so good but can still reliable.
- iv) Material Preparation: Some of the needed material needs to buy at the city. University should prepare the material or either provides the place where the material can be obtained from.
- v) Budget Preparation: It is no so effective to use student's money to get the materials. University should provide budget at first stage so that student's expenses are not interface.

4.4 Analysis

These analyses are done by using CosmosExpress and MD Solid software. The load that has been applied is 200N as the maximum load. This load is not a real one and it is just an assumption. All of this is just calculation whether this product can hold off the load or not.

4.4.1 Stress Distribution

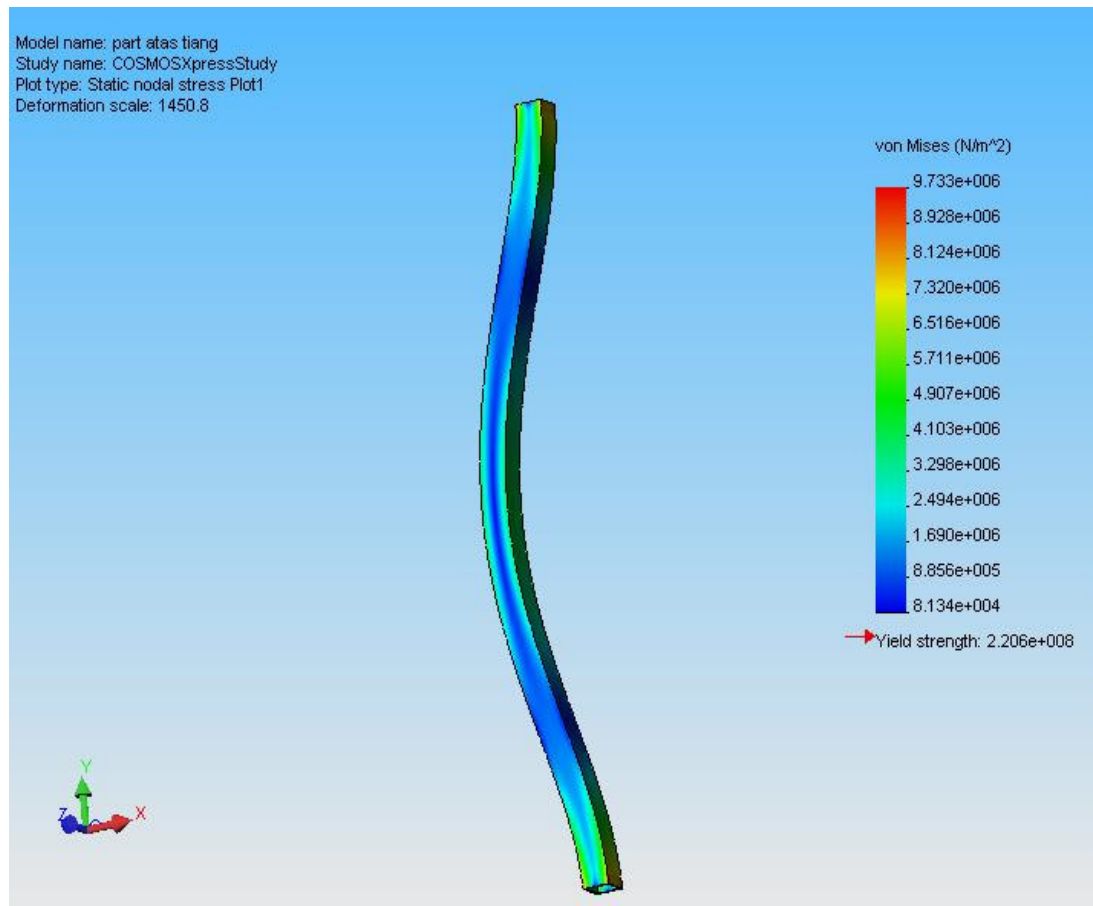


Figure 4.4: *Stress Distribution*

4.4.2 Displacement Distribution

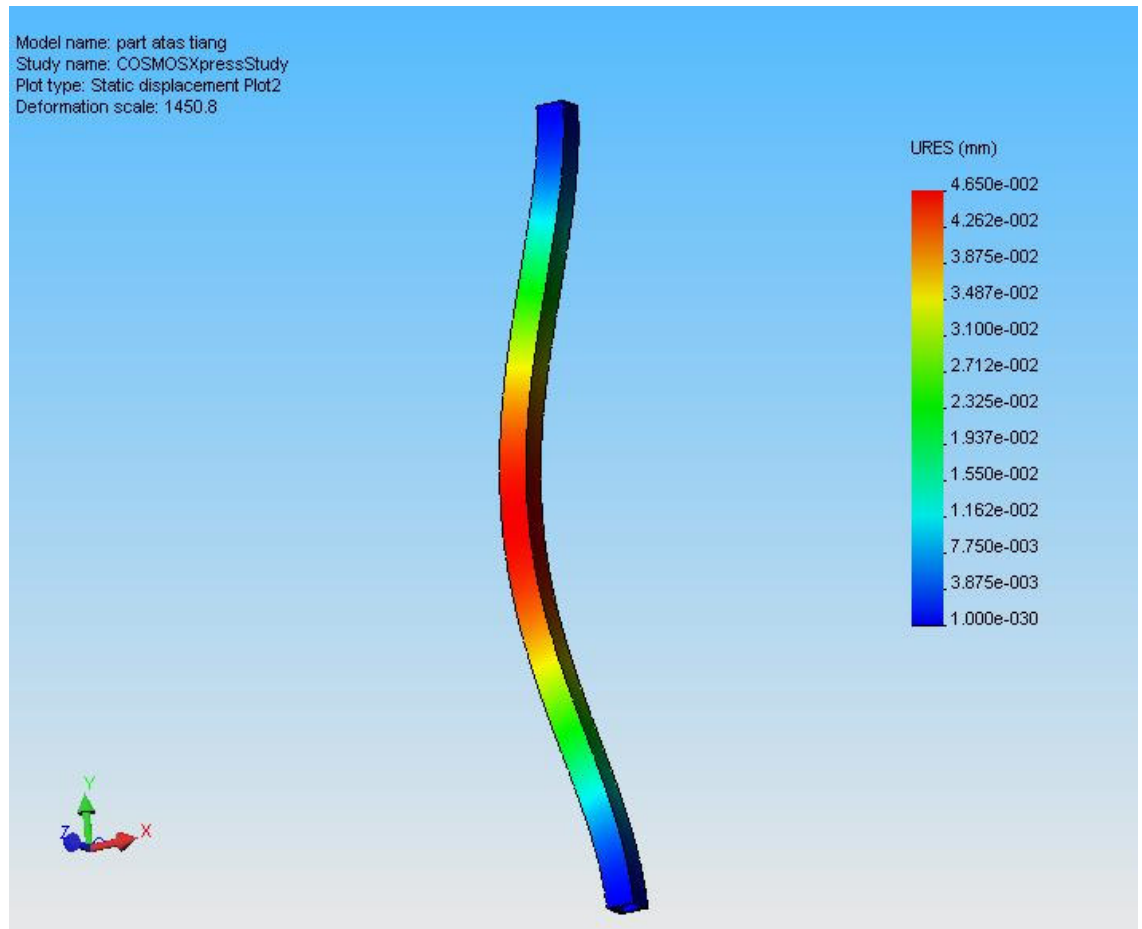


Figure 4.5: *Displacement Distribution*

4.4.3 Deformation Shape

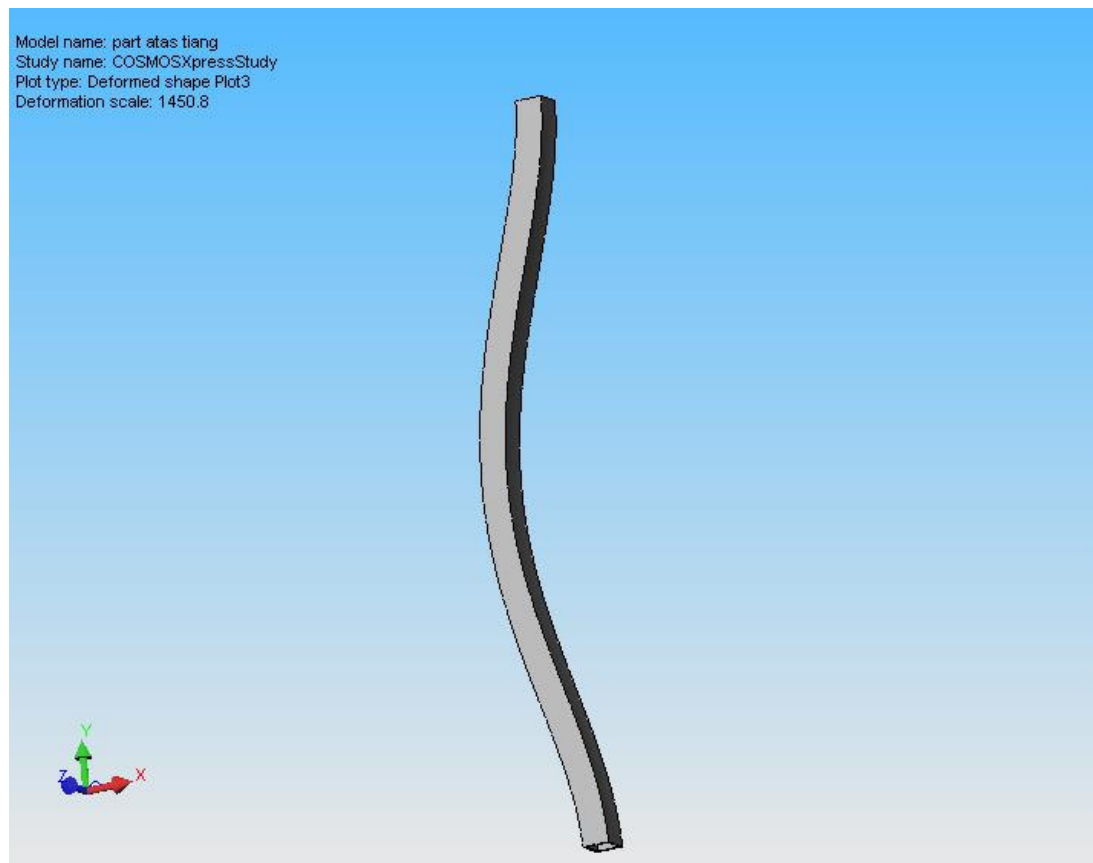


Figure 4.6: *Deformation Shape*

4.4.4 Load Analysis

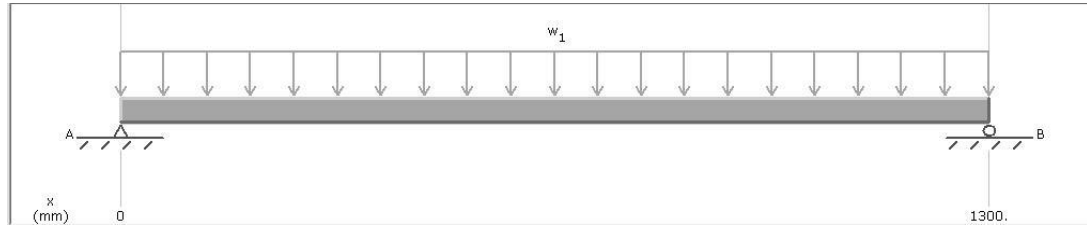


Figure 4.7: *Distribution Load*

The total magnitude of the distributed load in this region is 0.1962 N/mm, acting DOWNWARD. The area under the load diagram between $x = 0.00$ mm and $x = 1,300.00$ mm is -255.06 N (i.e., $-0.196 \text{ N/mm} \times 1,300.00 \text{ mm}$). The change in shear between $x = 0.00$ mm and $x = 1,300.00$ mm is equal to the area under the load diagram between these two points. At $x = 0.00$ mm, the shear force is 127.53 N.

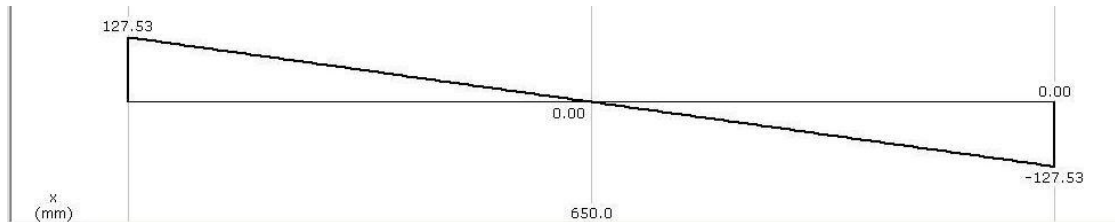


Figure 4.8: *Slope of the Shear Curve*

The slope of the shear curve is equal to the magnitude of the distributed load w ($w = -0.196 \text{ N/mm}$). Since its slope is constant, the shear curve is linear in this region.

Starting at $x = 0.00$ mm where $V = 127.53 \text{ N}$, the shear must change by -127.53 N to reach the horizontal axis. Divide -127.53 N by the slope -0.1962 N/mm to compute the distance from $x = 0.00$ mm to the point of zero shear. This distance equals 650.00 mm.

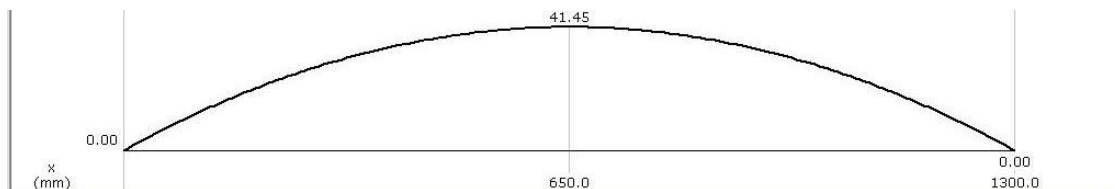


Figure 4.9: *Moment Curve*

In this region, the moment curve is parabolic, starting with a relatively large positive slope and growing increasingly flatter.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Summary

Final chapter of this report is to discuss about the conclusion and recommendation. This project had been achieved in purpose to the student. Students need to be creative on solving the problems that students encounter during project in progress. All the work such as concept review and development, designing, fabrication and testing need to be done by students self. It begins from the start of the project planning of the project. Lastly is recommendation about recommendation about the project for use in the future. This is very important to make improvements in the future.

5.2 Summary of the Project

5.2.1 Literature Review Process

In literature review process, all information needs to be finding from magazines, books, internet and others. All this information is important to know about existing products.

5.2.2 Designing Process

In designing process, all information or knowledge gathered for literature review is use to make a sketch for project. Every sketched design need to be it specification, then one of sketched design is choose. The choosed design is then transferred to 3D design modeling by using SolidWorks software.

5.2.3 Fabrications Process

The detailed design is use as guide and reference by following the measurements and dimensions. Cutting, welding, grinding, drilling is some of the processes involved.

5.3 Conclusion

For the conclusion, the project achieves all objectives. Due to some problem, the project was started late but still to finish on time. Project management is very important to achieve the objective of this project. After all, the project is functional and ready to be test as prototype. I hope this portable and foldable goalpost for street soccer will open a new in page in football history especially street soccer.

5.4 Recommendations for Future Work

5.4.1 Material

Many types of material can be used in fabricating a foldable and portable goalpost for street soccer but the material should be considered such as strength, durability, toughness and others. Mild steel hollow bar that has been used for this project may not suitable because it too heavy for a small goalpost. Maybe aluminium alloy or stainless steel is suit for this goalpost for

it weight, durability, do not rust and it's toughness. Also the hinges need to be strong enough to endure the force.

5.4.2 Fold ability

For the future work, maybe the goalpost able to fold many times so space use for storing can be save efficiently.

5.4.3 Market

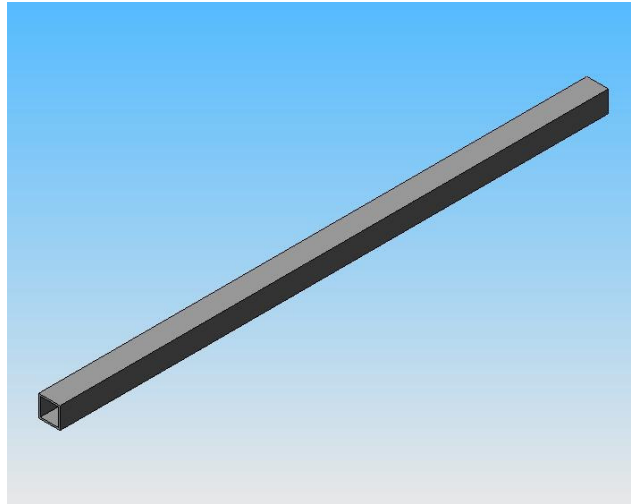
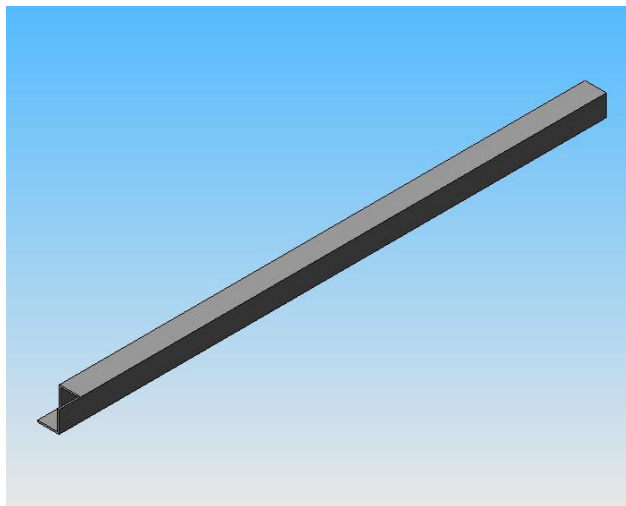
In the future, this goalpost may enter the enter market because there not many goalpost like this in the market and usually goalpost that can be fold not for street soccer game.

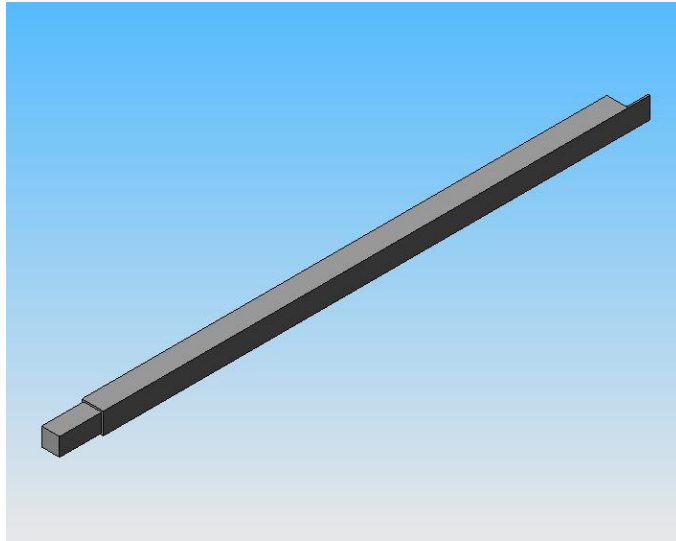
5.4.4 Dimension

Street soccer goalpost must have it's own dimension. This goalpost need to consistent it's dimensions all over the world.

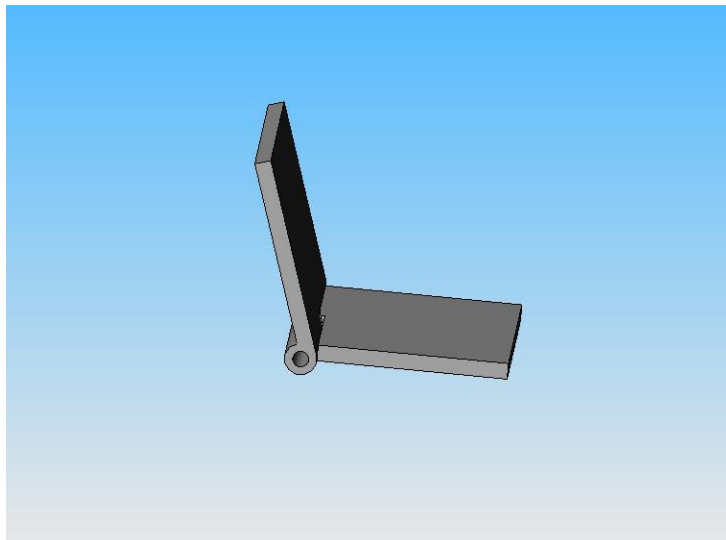
5.4.5 Machines and Tools

Machines and tools must be always in good condition. This is because some machines and tools not in good condition and some of its has been lost.

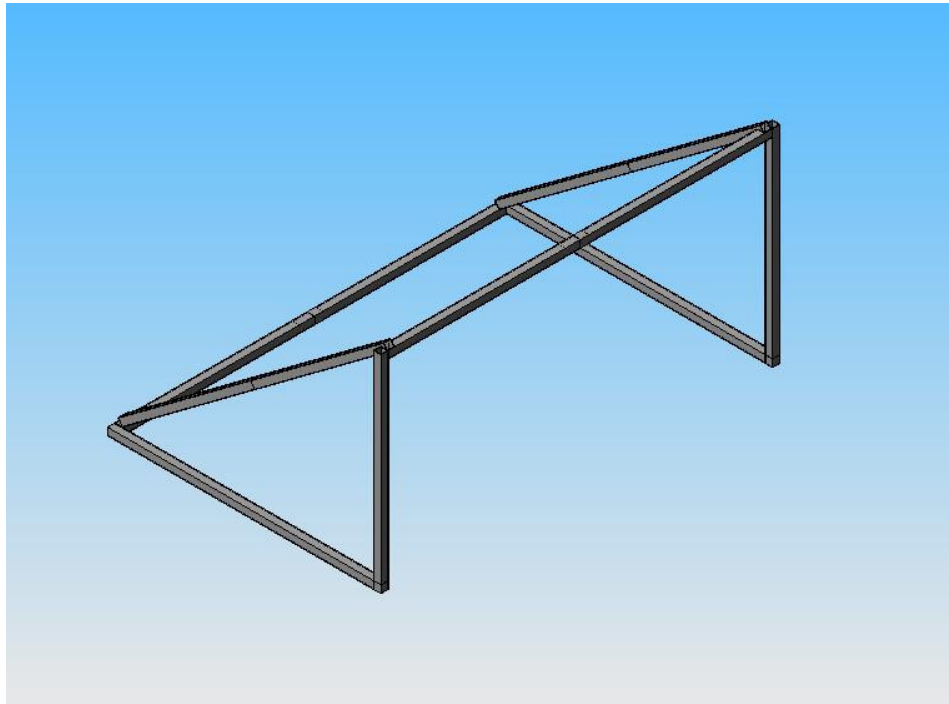
APPENDIX A**DESIGN PARTS****Hollow Bar****Small Cut Hollow Bar**



Small Cut Hollow Bar with Attached Small Solid Bar

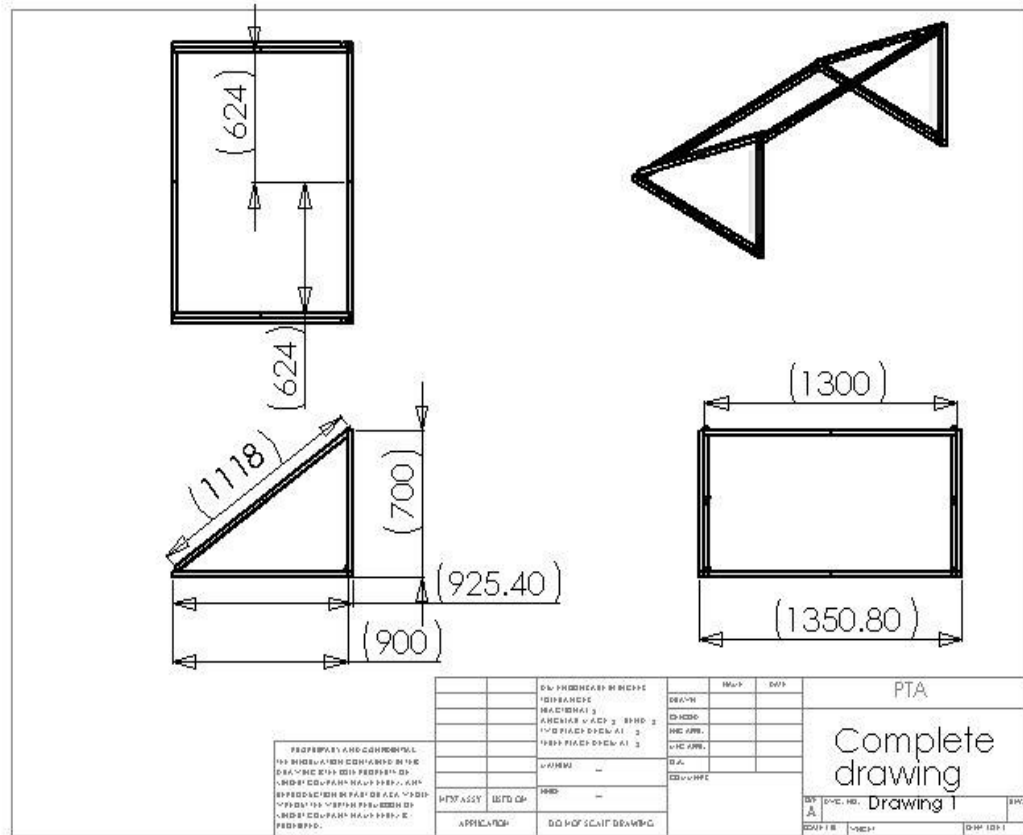


Hinge

APPENDIX B**PART OF ASSEMBLY**

APPENDIX C

ORTHOGRAPHIC VIEW



APPENDIX D**COMPLETED PRODUCT**