SUPERVISOR'S DECLARATION

We hereby declare that we have checked this project and in our opinion this project is satisfactory in terms of scope and quality for the award of the degree of Diploma of Mechanical Engineering.

Signature:
Name of Supervisor: MUHAMMAD AMMAR BIN NIK MU'TASIM
Position: TUTOR
Date:

DESIGN AND DEVELOPMENT OF RABBIT CAGE

NAZRITH BIN ZULKAFLI

A report submitted in partial fulfilment of the requirements
for the award of the
Diploma of Mechanical Engineering

Faculty of Mechanical Engineering
UNIVERSITI MALAYSIA PAHANG

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree of Diploma of Mechanical Engineering.

Signature
Name: NAZRITH BIN ZULKAFLI
ID Number: MB06018
Date:

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ABSTRACT

The study of manufacturing was very important in order to carry out this project to ensure that the student understand on what are needs to do. This project is about designing and fabricating the Mechanical Rabbit Cage to solve problems that most user encounter while keep their love rabbit. This project will ease the user while use it because of it ease to use and ease to clean ability. This project involves designing the rabbit cage by searching in the internet and on local hardware shop. With combine the idea from internet and refer to problem solving, this product design is a new idea. After completing design process, it is made real product by many manufacturing method. This project also require to ensure the safety for the indeed of publishing. Methods and process involve in this project for instance joining using MIG and arc welding, cutting using shearing method and a finishing processes. This project in mainly about generating a new concept of rabbit cage for outdoor use that can protect the rabbit and ease to handling. After all process had been done, this cage may help user to understand the fabrication and designing process that involved in this project.

ABSTRAK

Pembelajaran mengenai pembuatan adalah penting untuk mejalankan projek ini bagi memastikan pelajar memahami mengenai perkara yang perlu dilakukan. Projek ini adalah mengenai merebentuk dan membuat Sangkar Arnab Mekanikal bagi menyelesaikan masalah yang dihadapi pengguna semasa sedang memelihara arnab kesayangan mereka. Projek ini akan memudahkan pengguna semasa menggunakannya kerana mempunyai sifat mudah dibersihkan, mudah alih, dan juga boleh digunakan diluar rumah walaupun cuaca panas. Projek ini melibatkan proses merekabentuk sangkar arnab dengan cara melayari internet atau mencari produk serupa di kedai. Dengan menggabungkan beberapa idea yang didapati daripada internet dan penyelesaian masalah, rekabentuk produk ini adalah merupakan sebuah idea yang baru. Selepas selesai proses merekabentuk, rekabentuk dijadikan produk sebenar dengan beberapa proses pembuatan. Produk ini juga melibatkan ciri-ciri keselamatan bagi pengguna untuk tujuan pemasaran. Kaedah dan proses yang terlibat dalam projek ini bagi penyambungan segera menggunakan proses kimpalan (MIG) dan arka, memotong menggunakan kaedah terikan dan proses penyudah. Projek ini sebenarnya melibatkan proses menjana konsep baru dalam menghasilkan sangkar arnab mekanikal yang dapat melindungi dan mudah digunakan oleh semua pengguna. Selepas semua proses telah terlaksana, sangkar arnab mekanikal ini akan membantu pengguna tentang pemahaman proses merekabentuk dan penghasilan yang terlibat dalam projek ini.

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CHAPTER 1

INTRODUCTION

The title of my project is “Design and Fabricate Mechanical Rabbit Cage”. Fabrication of the Mechanical Rabbit Cage is concern to strength, durability, protecting the rabbit and easy to assemble. New concept is required to improve the durability and easy to assemble.

1.1 Project Synopsis

This project is to design and fabricate of Mechanical Rabbit Cage. This project is made with the roof that can be fold to ease the user if they want place their rabbit outside of house or can fold the roof if keep it inside. The height for this Mechanical Rabbit is very suitable with any age. With the wheel, this cage will be ease the user to displace it anywhere. Bolt & nut has used for in this project also make this cage as an ease assemble cage.

1.2 Project Background

At this moment, rabbit cage in market have various type, specification and shape. Rabbit cage used to put the rabbit on them safely. So, the cage must be have higher protection ability.

We already know that rabbit cage has many type. For example, we can buy the cage at shop with small size. But, usually the cage does not has roof. We also know has cage in large size. This usually made by villagers and it is fix with the land. The advantage for this type is, it has a roof for protect the rabbit from rain and sun light.

So, this project has been made with the roof and can be displace anywhere. With the easy assemble ability, it will ease the user to bring it anywhere.

1.3 Project Objective

The objectives for this project are:

a) Design a Rabbit Cage (mechanical part)
b) Development of a mechanical rabbit cage.
c) To test the model of the designed.

1.4 Project Scopes

The scope of this project will cover:

a) Design easy to use of cage using Solid Work software.
b) Fabricate the mechanical part of system using welding skills.
c) Test the design model using Cosmos software

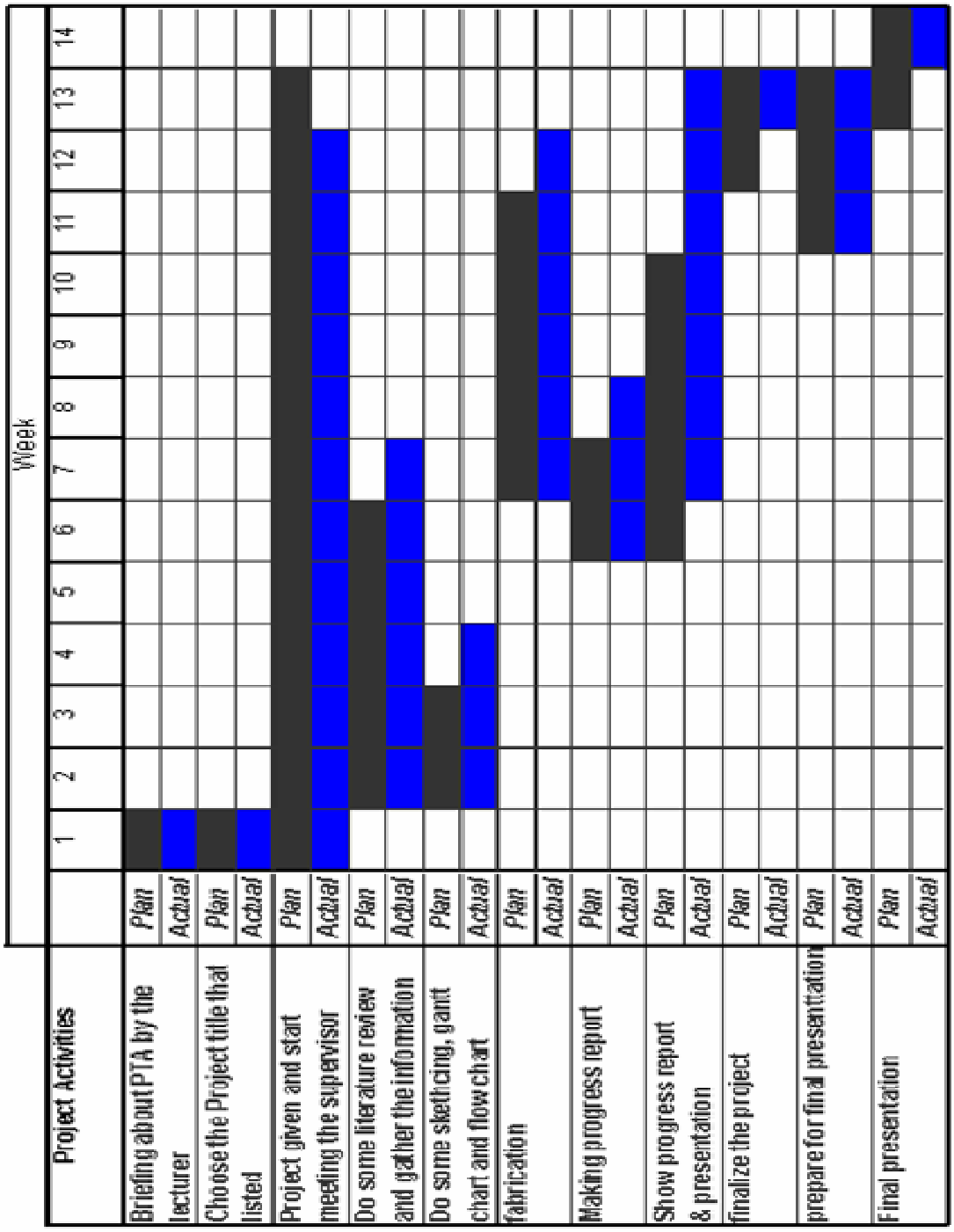
1.5 Problem Statement

Now days, we already known that rabbit cage sold at market usually an indoor cage. So, the user only can place their rabbit in the house. This will make some trouble like smell pollution. For the wood design, it surely has heavy weight ability. This will make the user trouble while want displace it. Some cage that only can put on the floor

will make the user difficult to take care for the rabbits. This is because the user must be sit if they want gift the rabbit food or clean the cage. We already known have a cage with a roof. But, usually this cage made by wood and it is fixed on the ground. The user will has trouble while want clean the cage and surely this cage cannot be displace. So, I have made the mechanical rabbit cage with ease to assemble, ease to handling, indoor & outdoor usage, can be fold roof and ease to clean ability. my project also can be displace because it has a wheels. I hope my project will make all of user happy while use this rabbit cage with the special ability.

1.6 Project Planning

GANTT CHART



Project Activities		Week													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Briefing about PTA by the lacturer	Plan														
	Actual														
Choose the Project title that listed	Plan														
	Actual														
Project given and start meeting the supervisor	Plan														
	Actual														
Do some literature review and gather the information	Plan														
	Actual														
Do some sketching, gantt chart and flow chart	Plan														
	Actual														
fabrication	Plan														
	Actual														
Making progress report	Plan														
	Actual														
Show progress report & presentation	Plan														
	Actual														
finalize the project	Plan														
	Actual														
prepare for final presentation	Plan														
	Actual														
Final presentation	Plan														
	Actual														

Table 1: Gantt Chart

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Rabbit cage is use to place pet rabbit and protect in best condition. We already knew that many design and size we can found at market. This literature review will show some type in market and their characteristics. This literature review also show about the process that I have applied while builds my rabbit cage.

2.2 Technical Review

Figure 2.0

The figure 2.0 show about cage made by company from China. It has used iron as the material for the basement and wire for make the cage. It has 59 x 36 x 31.5cm for the dimension. For the surface treatment, it has use plastics-coating, zinc-plating, and chrome-plating. This cage totally eases the user to handling because it is a simple and lightweight cage for rabbit.

Figure 2.1

This cage totally made by wood. It is has 30 kg for the weight and 120 x 68 x 80cm for the dimension. This cage suitable for outdoor usage, but must be displace while rain. Because of it weight and does not has any wheels, it is too hard while want to displace it. Maybe needs 2 man for displace it.

Figure 2.2

This rabbit cage has been made by plastics for the basement and use the black wire for the cage. The dimension for this cage is 30 x 18 x 16.5 inch. This cage has 4 wheels that joint with the basement stand. The wheels have a locking system. So, the cage cannot be move while the rabbit move or play on it.

Figure 2.3

This cage has been made with wood and wire. The dimension for this cage is 36 x 29 x 21 inch. Half of the part make by wood functional as home. It is

protect the rabbit while rain or hot weather. The other part functional as ‘playground’ for the rabbit. So, the rabbit can play on the grass. This cage is suitable as an outdoor usage.

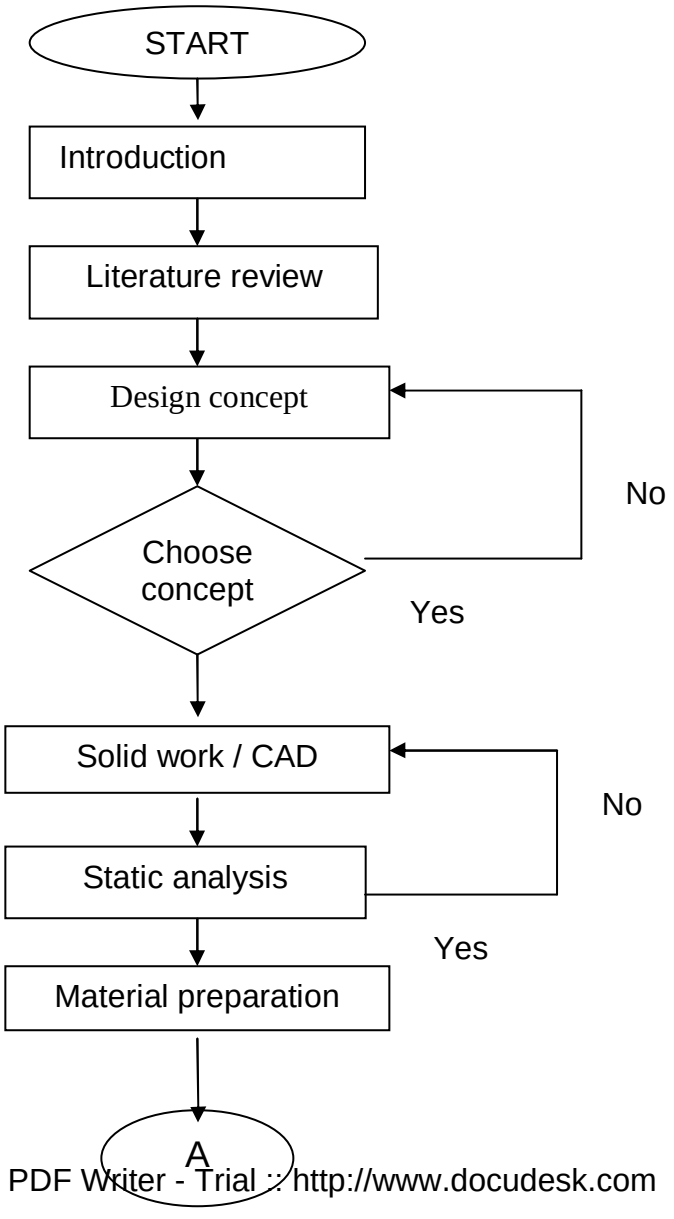
Figure 2.4

This cage has been made by plastics, hollow square steel, wires and wheels. This cage has a nice shape, and good system. Usually the basement functional as rabbits places. But, this product use the basement as the rabbit’s shit catchments area. It is functional like drawer. So, the user can remove the basement easily. This cage also uses the locking system wheels. But, this cage only can use indoor because it does not has any roof or protection.

CHAPTER 3

METHODOLOGY

3.1 Project Flow Chart



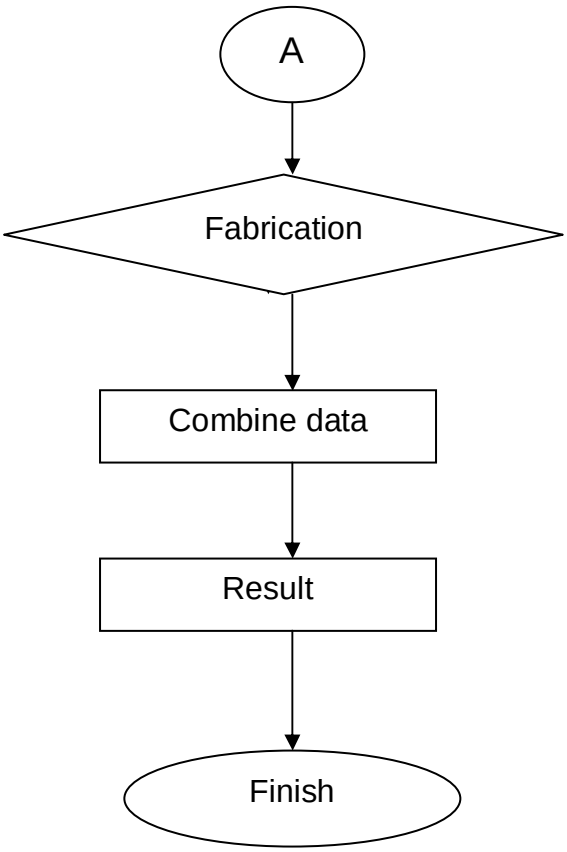


Figure 3.1: Flow chart

3.2 Design

The design of the Mechanical Rabbit Cage must be compliance to several aspects. The design consideration must be done carefully so the design can be fabricated and the parts are all functioning. The aspects that must be considers in designing the Mechanical Rabbit Cage.

3.3 Drawing

a) All the ideas for Mechanical Rabbit Cage are sketched on the paper first to ensure that ideas selection can be made after the selected design choose.

b) Solid Works Application: The design or concept sketched is transfer to solid modeling and drawing using Solid Work application.

3.4 Sketching and Drawing Selection

From the existing idea, only four ideas sketching that had been chosen to be consider as the final idea, which are:

3.4.1 Concept A

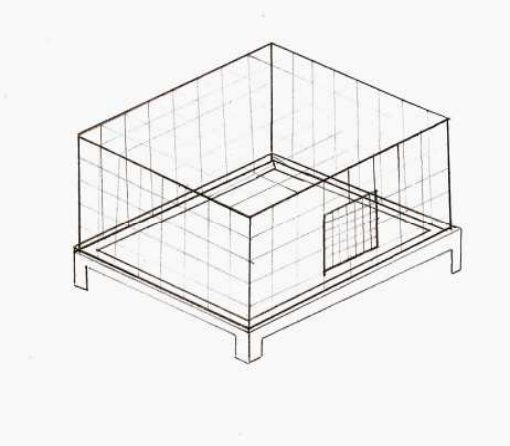


Figure 3.2: Concept A

This is a concept A. It has a simple concept that usually we can find it at any pet shop. This concept has a lightweight, ease to assemble, and ease to handling ability. But, this concept has a low ability in strength and while the user want pick out the rabbit, user must be sit for it.

3.4.2 Concept B

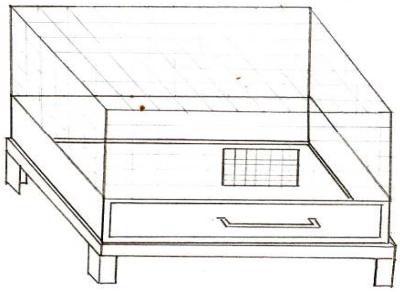


Figure 3.3: Concept B

This is a concept B. It is nearly similar with concept A, but this concept has use a likely drawer system. It will ease the user while want clean the rabbit shit. It is good on lightweight, ease to assemble, ease to handling and moveable, but low ability in strength and the height.

3.4.3 Concept C

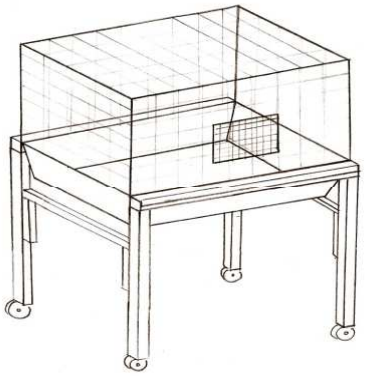


Figure 3.4: Concept C

This is concept C. With the best height, it will make this cage ease to use. Wheels are use while the user want displace the cage on other side. Usually this type will be use at inside house. It has ability on lightweight, ease to assemble (using bolt & nut), and ease to clean. For the disadvantage, this cage cannot be use at outside while bad weather condition.

3.4.4 Concept D

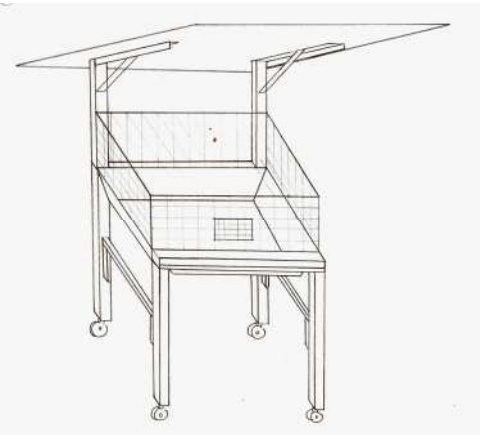


Figure 3.5: Concept D

Using wheel and roof, will make this cage ease to move and can place it outside. This is the best concept and I have chosen this concept as my project.

3.5 Concept Generation and Evaluation

Four concepts for the Mechanical Rabbit Cage were developed. This metric chart is evaluated against of the four concepts.

Criteria	Concept 1	Concept 2	Concept 3	Concept 4	Best concept
Portable	***	***	****	****	3,4
Lightweight	*****	*****	****	***	1,2
Durability	***	***	***	****	4
Ease to manufacture	*****	*****	****	****	1,2
Ease to handling	*****	*****	****	****	1,2
Ease to use	*****	*****	*****	*****	4
Material usage	**	**	***	****	4
Material cost	**	**	***	****	4
Protection for rabbit	**	**	***	*****	4
Strength	**	**	***	****	4
			Total		4

* =bad
** =not bad
*** =good
**** =better
***** =best

Table 2: Metrics Chart

3.6 Computer Aided Design Drawing

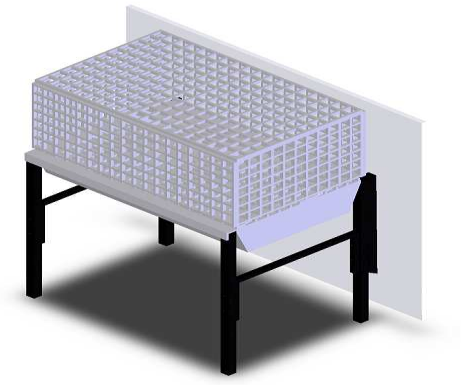


Figure 3.6: Project Design

3.6.1 Basic Part

The basic part of Rabbit Cage dividing by four parts:

a) Basement: Usually made by plastic. But, for my project, I has use aluminum to replace the plastic. Using wire for make the cage. Use rivet, and metal inert gas (MIG) welding for the joining.

b) Leg table: Use the hollow steel because it has good strength and lightweight ability. Has 4 wheels bottom of the legs. Using arc welding and bolt & nut for the joining.

c) Roof: Using zinc for the roof, use the bolt & nut for the joining. The roof can be fold if the user want place the cage outside their house.

d) Cage: The cage build with wire using the MIG weld to make it join with others. "L" shape used as guide to make the shape.

3.7 List Material

Material	Size	Unit / Dimension
Square Hollow Metal	1" x 1"	180 inch
"L" Shape Metal	1" x 1"	50 inch
Aluminum Sheet	30" x 50"	1 unit
Wire	1m x 1.5m	1 unit
Zinc	26" x 36"	1 unit
Square Hollow Metal	½" x ½"	28 inch
Wheel	2 inch diameter	4 units
Hinge	1 inch wide	6 units
Sheet Metal	1 inch wide, 3mm thickness	12 inch
Bolt & Nut	12 mm diameter	12 sets

Table 3: List of Material

3.8 Method Joining Process Review

3.8.1 Basic Theory of Metal Inert Gas (MIG) Welding

This clothesline will be joined by using the permanent joint which is welding process. The method joining that be able to fabricate and assembled the part is Metal Inert Gas (MIG) Welding.

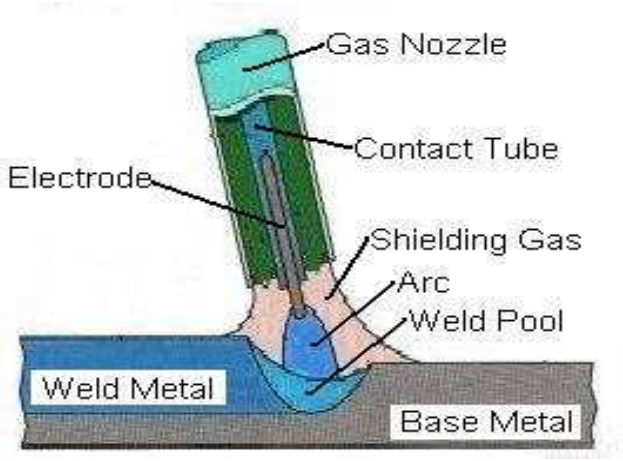


Figure 3.7: Basic Structure of Metal Inert Gas (MIG) Welding

Metal Inert Gas (MIG) Welding: An arc is struck between a consumable electrode and the sheet metal to be weld. The consumable electrode is in the form of continuous filler metal. An inert gas surrounds the arcs and shields it from the ambient to prevent oxidation. Carbon steel, low alloy steels, stainless steels, most aluminum alloys, zinc based copper alloys can be welded using this process.

Gas Metal Arc Welding (GMAW) is frequently referred to as MIG welding. MIG welding is a commonly used high deposition rate welding process. Wire is continuously fed from a spool. MIG welding is therefore referred to as a semiautomatic welding process. The shielding gas, forms the arc plasma, stabilizes the arc on the metal being welded, shields the arc and molten weld pool, and allows smooth transfer of metal

from the weld wire to the molten weld pool. There are three primary metal transfer modes which are spray transfer, globular transfer and short circuiting transfer.

3.8.2 The Advantage of MIG Welding

1) High productivity, because based on this machine the consumer no need to stop their work to change rod or chip and brush the weld frequently.
2) Easy to learn and makes great-looking welds.
3) Can weld on stainless steel and mild steel.
4) This welding process also can be weld in all positions.

3.8.3 The Disadvantage of MIG Welding

1) Can not check watch, count money, or talk to buddy while welding.
2) Costs money of consumable, such as tips and nozzles.
3) Not worth on paint, rust, or dirty surfaces.
4) Not good for thick steel, because it does not get the proper penetration.

3.8.4 Process of MIG Welding

In spray transfer, small, molten metal droplets from the electrode are transfer to the weld area at a rate of several hundred droplets per second. The transfer is spatter-free and very stable. High Direct Current (DC) and voltages and large-diameter electrodes are used with argon or argon-rich gas mixture used as the shielding gas. The average current required in this progress can be reduced by using a pulsed arc, which superimposes high-amplitude pulses onto a low, steady current. The process can use in all welding positions.

In globular transfer, carbon-dioxide-rich gases are utilized, and globules are propelled by the forces of the electric-arc transfer of the metal, resulting in considerable spatter. High welding currents are used, making it possible for greater weld penetration

and higher welding speed than are achieved in spray transfer. Heavier sections commonly are joined by this method.

In short circuiting, the metal is transferred in individual droplets (more than 50 per second), as the electrode tip touches the molten weld metal and short circuits. Low current and voltages are utilized with carbon-dioxide-rich gases and electrode made of small-diameter-wire. He power required is about 2kW.

3.9 Method Joining of Mechanical Fastening

Two or more components may have to be joined or fastened in such a way that they can be taken apart sometime during the products service life or life cycle. Numerous products (including mechanical pencils, watches, computers, appliances, engines and bicycle) have components that are fastened mechanically. Mechanical fastening may be preferred over other methods for the following reasons: ease of disassembly, maintenance, part replacement, or repair, ease in creating design that require moveable joints, such as hinges, sliding mechanism, and adjustable components and fixtures and lastly lower overall cost of manufacturing the product.

The most common method of mechanical fastening is by the use of bolts, nuts, screws, pins, and variety of other fasteners. These operations are known also as mechanical assembly. Mechanical fastening generally requires that the components have holes through which the fasteners are interested. These join may be subjected to both shear and tensile stresses and should be designed to resist these forces.

3.9.1 Hole Preparation

An important aspect of mechanical fastening is hole preparation. A hole in a solid body can be produced by several processes, such as punching, drilling chemical and electrical means, and high-energy beams. The selection of these depends on type of

material, its properties and its thickness. For improved accuracy and surface finish, many of this hole-making operation may be followed by finishing operations, such as shaving, deburring, reaming, and honing. Because of the fundamental differences in their characteristics, each of the hole-making operations produces holes with different surfaces finishes, and surfaces properties.

The most significant influence of a hole in a solid body is its tendency to reduce the components fatigue life by stress concentration. For holes, fatigue life can be improved best by including compressive residual stresses on the cylindrical surface of the hole. These stresses usually are developed by pushing a round rod (drift pin) through the hole and expending it by a very small amount.

3.9.2 Threaded Fasteners

Bolts screw and nuts are among the most commonly used threaded fasteners. Numerous standard and specification (including thread dimension, dimensional tolerances. Pitch, strength and the quality of the materials used to make these fasteners) are described. Bolt and screw may be secured with nuts, or they may be self-tapping-where by the screw either cuts or forms the thread into the part to be fastened. The self tapping method is particularly effective and economical in plastics products where fastening does not require a tapped hole or a nut. If the joint is to be subjected to vibration (such as aircraft, engines, and machineries) several especially designed nuts ad lock washers are available. They increase the frictional resistance in the tensional direction and so inhibit any vibration of the fasteners.

3.9.3 Drilling Machine

Drilling machines are used for drilling holes, tapping, reaming, and small diameter boring operations. The most common machines is drill press, the major components of which are shown in (figure 2.6.1). The work piece is placed on an adjustment table,

either by clamping it directly into the slots and holes on the table, either by clamping it directly into the slot and holes on the table or by using a vise, which in turn is clamped to the table. The drill is lowered manually by a hand wheel power or by power feed at preset rates. Manual feeding requires some skill in judging the appropriate feed rate.

Drill pressed usually are designed by largest wok piece diameter that can be accommodated on the table and typically range from 150 to 250mm. in order to maintain proper cutting speeds at the cutting edges of drills, the spindle speed on drilling machines has to be adjustable to accommodate different drill sizes. Adjustments are made by means of pulley, gear boxes or variable-speed motors.

The types of drilling machines range from simple bench-type drills used to drill small diameter-holes to large radial drills (figure 2.6.2), which can accommodate different large work pieces. The distance between the column and the spindle center can be as much as 3m. The drill head of universal drilling machines include numerically controlled three-axis machines, in which the operation is performed automatically and in the desire sequences with the use of turret punch.

Figure 3.8: Drilling Machine

Figure 3.9: radial drilling machine

3.10 Fabrication Process

After designing phase, fabrication processes take place. These processes are about using material selection and make the product base on the design and by followed the design dimension. Many method can be use to fabricate a product, like welding, fastening, cutting, drilling, grinding and many more method. Fabrication process is a process to make only one product rather then manufacturing process was used at the whole system production. This way include part by part fabrication until assembly to others component.

3.10.1 Process Involve

In order to make the design come reality, fabrication processes need to be done first. The fabrication process starts from dimensioning the raw material until it is finish as a desire product. The processes that involve are:

a) Getting material

Figure 3.10 introduce the material have in UMP mechanical laboratory. This rack has more type of steel L-shape sheet, rectangular hollow steel, rectangular steel and etc.

Figure 3.10: Material

b) Measuring and Marking

After get the material, the next step is measurement and marking material. The equipment used in this process is measuring tape and marker pen. The scale is from solid work software and this scale is the true. Figure 3.11 shown about measuring process.

Figure 3.11: Measuring Progress

c) Cutting material

Figure 3.12 introduce the process cutting the material using floor cutter disc after measurement and marking process

Figure 3.12: Cutting process

d) Shearing process

Use the shearing machine to cut the aluminum sheet with the dimension. Figure 3.13 shown introduce about shearing machine.

Figure 3.13: Shearing machine

e) Bending process

After shearing process, the sheet metal will undergo to bending process using Bending Machine to get true shape for the project. Figure 3.14 shown about bending machine.

Figure 3.14: Bending Machine

f) Joining Process

Figure 3.15 (a) and (b) introduce about joining method using ARC & MIG welding. This process is used to joining the legs, and roof. Using bolt and nut, it will assemble the legs for make it ease to assemble. Figure 3.16 introduce about bolt & nut process.

Figure 3.15 (a): Arc Welding Process

Figure 3.15 (b): MIG Weld Machine

Figure 3.16: Bolt & Nut Process

g) Grinding Process

After cutting and welding process, the chip from work piece must be remove using hand grinder before the welding process because it must has smooth surface before it. Be careful, the chip is very sharp. Figure 3.17 show the grinder machine.

Figure 3.17: Grinder Machine

h) Drilling Process

Figure 3.18 shown about drilling process to make the hole for joining process like rivet and bolt & nut. The tool of the drill must be applicable with the size of rivet and bolt.

Figure 3.18: Drilling Process

3.10.2 Process Procedure

Get the material from mechanical UMP laboratory. Measure and mark the material with the size on solid work. I had chosen the hollow steel for make the legs and using the “L” shape steel for make the roof holder. Also, I use the aluminum sheet to make the basement and the rectangle wire for make the cage. Use disc cutter for cut the material. This disc cutter spark is too dangerous. Must be use up the goggle while using this machine. Use the shearing machine for get the specific size of plate. After that, use the bend machine for makes the shape. Bending machine used for make the shape smoothly and clearly. Make hole at the aluminum plate and hollow steel using drill machine for joining process (rivet and bolt & nut). After the drilling process, use rivet to make the join of basement. Use the arc and MIG welding for joining the legs and roof holder. All of part will weld together according on the method joining drawing. For the wheels, MIG weld has been used to join it with the cage legs. After the weld process finished, the entire weld place will be grinded to make sure the entire join surface was smooth from any spatters or sharp edge. Must be equip goggle and glove before do this process. Use the MIG for the joining process to make the cage. Spray all the part with black and silver colors. After that, the roof will be joining using the bolt and nut for ending the product process.

CHAPTER 4

RESULT AND DISCUSION

4.1 Introduction

In this chapter, Mechanical Rabbit Cage will be detail explanation. Also, the material list and some analysis had been shown in this chapter.

4.2 Final Product

The rabbit cage was finish and gets the result after undergoes step by step start with the literature review, design and sketching, technical drawing and solid modeling using Solid Work application, fabrication process with cutting, drilling, joining and assembly.

4.2.1 Result After Finishing

Figure 4.1 (a): while the roof is lifted

Figure 4.1 (b): while the roof is fold.

4.3 Product Specification

For the product specification, there are a lot of factor that can be consider. The product is classified to several categories such as weight, color, wide, height and other else. The product specification is like below. Below is the result for product specification which is:

Table 4: Product Specification

Category	Result
Weight	8kg
Colour	Black & Silver
Wide	650 x 520 mm
Height	850mm
Limit rabbit can be put in	3
Convenience	Ease to assemble

4.4 Discussion

4.4.1 Analysis

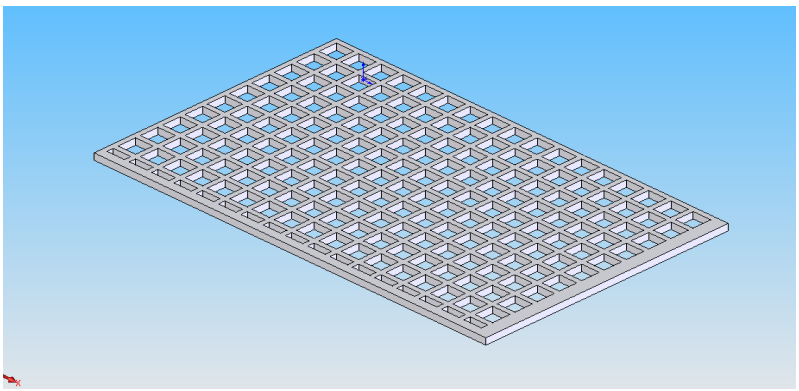


Figure 4.2 (a): wire

Figure 4.2 (a) show a picture for wire. I have made analysis using Cosmos in Solid Work process. About 20N load had been applied at the surface.

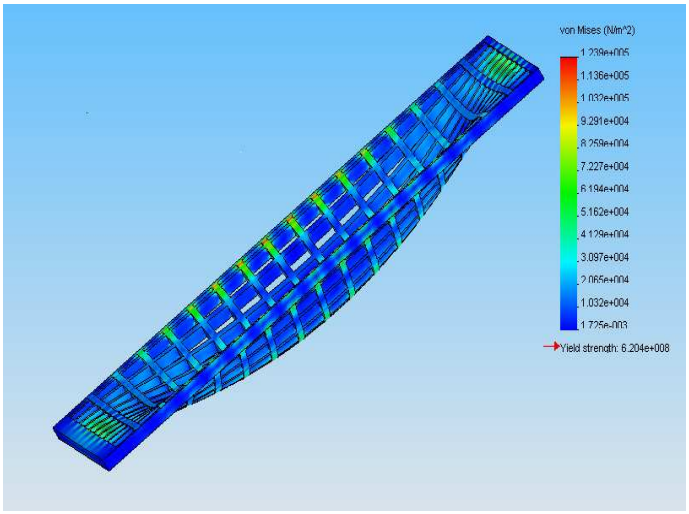


Figure 4.2 (b): Analysis of wire

Figure 4.2 (b) has show about the effect while the 20N load has been applied on it. In this case, this wire is safe for use because it does not show red colour on it. But, this wire not too good because it has show a yellow and orange colour. For make sure this wire not fail while use it, I has use “L” shape for make it strong and ease to make the shape.

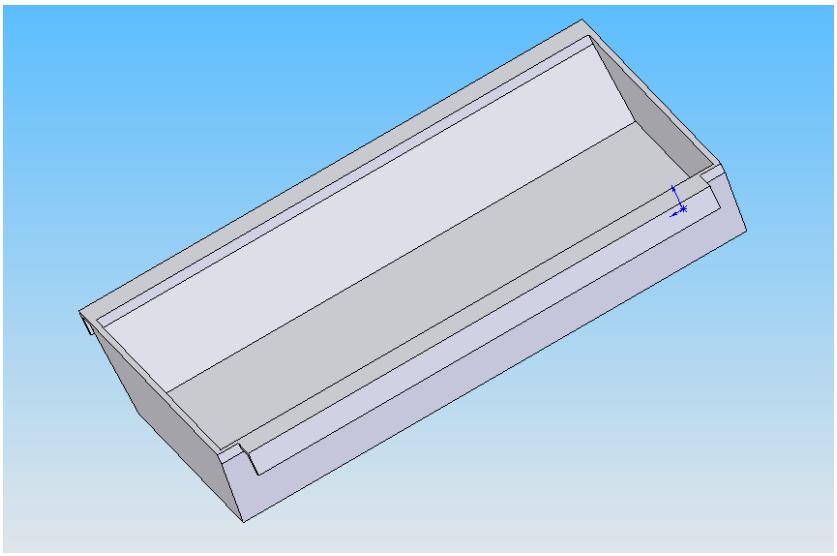


Figure 4.2 (C): Basement

Figure 4.2 (C) show the basement that uses to put in the rabbit. 100N load has been applied while do the analysis. Figure 4.2 (D) will show the result.

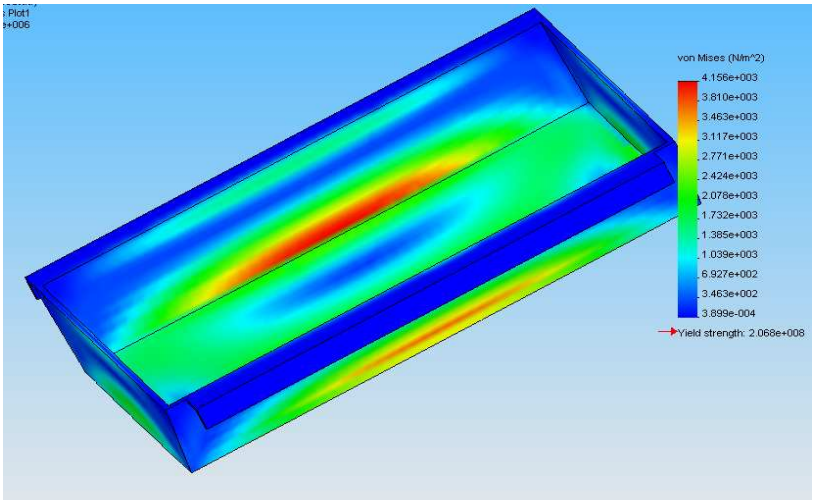


Figure 4.2 (D): Analysis of basement

Figure 4.2 (D) has show about the result while the basement has applied with 100N load. This result shown about the right and left side will fail if overload will apply. So, only 3 rabbits can put in the basement suitable with rabbit comfort.

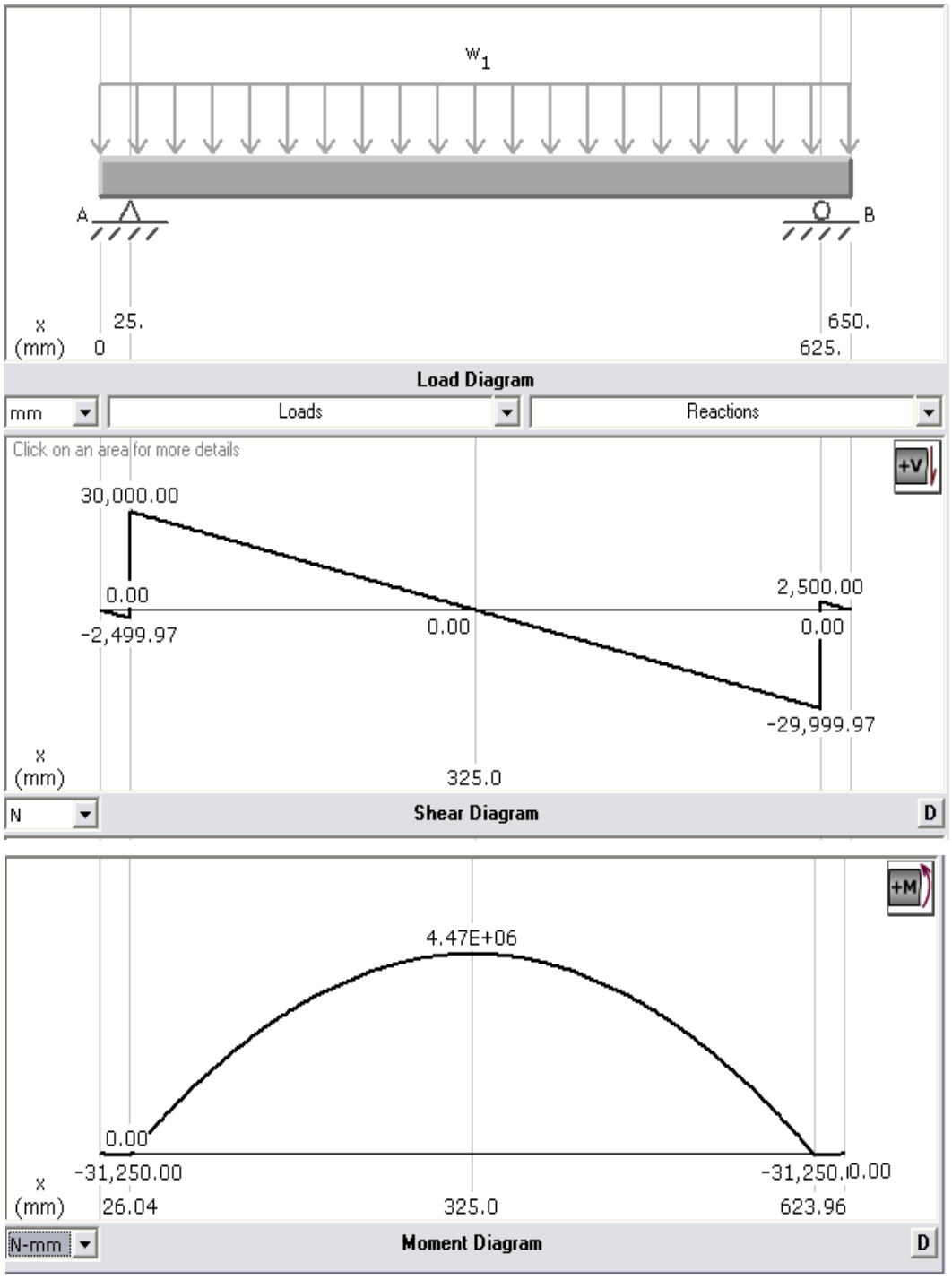


Figure 4.2 (E): Square Hollow analysis

CHAPTER 5

CONCLUSION & RECOMMENDATION

5.1 Introduction

This chapter is mainly about the problems encountered during the whole project completion. In this chapter also will discuss about the conclusion of the project, concluding all the process that involved.

5.2 Project Problem

This side will tell about problems while do the project. Below is shown about the problems:

a) Designing & Sketching: Because of idea were from student directly, so there are no references that can be referred because this is a new product. All the drawing and dimension must be generated by student itself.
b) Fabrication Process: Student need to be given more time to finish fabricating their product because of slackness of training, the joining finishing was not so good but yet can still reliable. The MIG machine has some problem sometimes and this situation totally compelled students waiting to continue their work.

c) Material Preparation: Some of the needed material needs to buy at the hardware shop. University should be prepare the material or either provides the place where the students can obtain the material.
d) Budget Preparation: University must be prepare the budget for students project depend on their project. If the student's project material can get at FKM lab, it does not use to make the budget for them. But, make more budget for others student that make an expensive project.

5.3 Recommendation

Precise planning of work progress will make sure that the project can be done in a shorter time. Having a good time management can guaranty that any of students task to complete in a good ways and also give more time to focus on others subjects. University must be give the project title while students in semester 5 and submit their list material on first or second week while in semester 6 for make sure the material arrive early. For my project, I has suggest some improvement for make my project marketable. Below is my recommendation about the improvement:

a) Use others material for make the basement to reduce the weight and cost such as plastics.
b) Reduce the legs height for make it suitable with children's height. This is because children likely to play with the pet.
c) Replace the square hollow metal with others material with lightweight ability.
d) Make sure the roof not to dangerous. While using zinc as roof, user must be careful about the side of zinc. It is too sharp and can cause the user injured.

5.4 Conclusion

This project has been already achieve the objective for this project. While do this project, students has learn about make decision own self. Students also apply their skill in drawing, while using machines such as drill, arc & MIG weld machines, and disc cutter that they have been learned. Students also learn about how to use the shearing and bending machines. Make the decision is important things on this project. This project has train the student while want make the decision and solve the problem.

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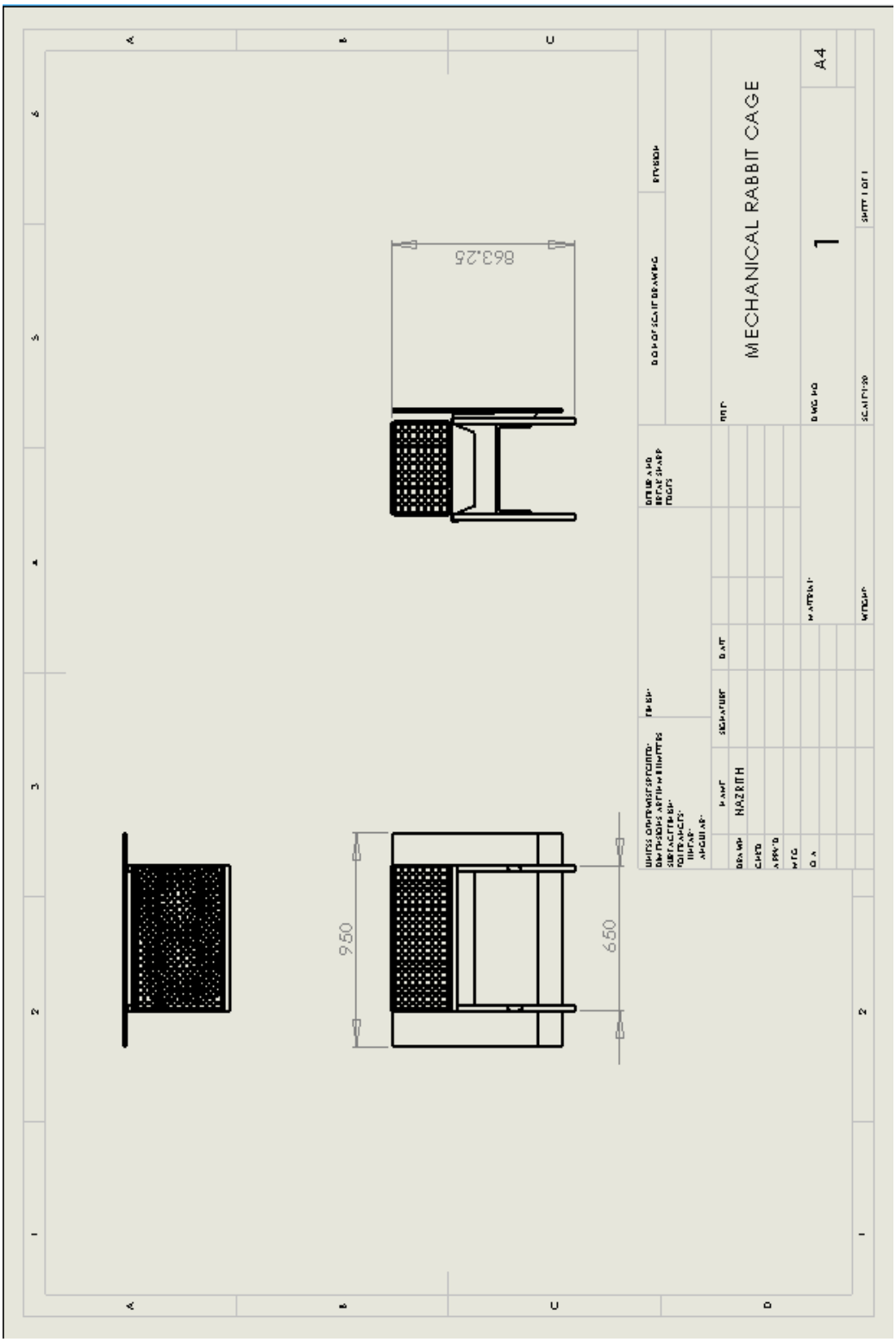
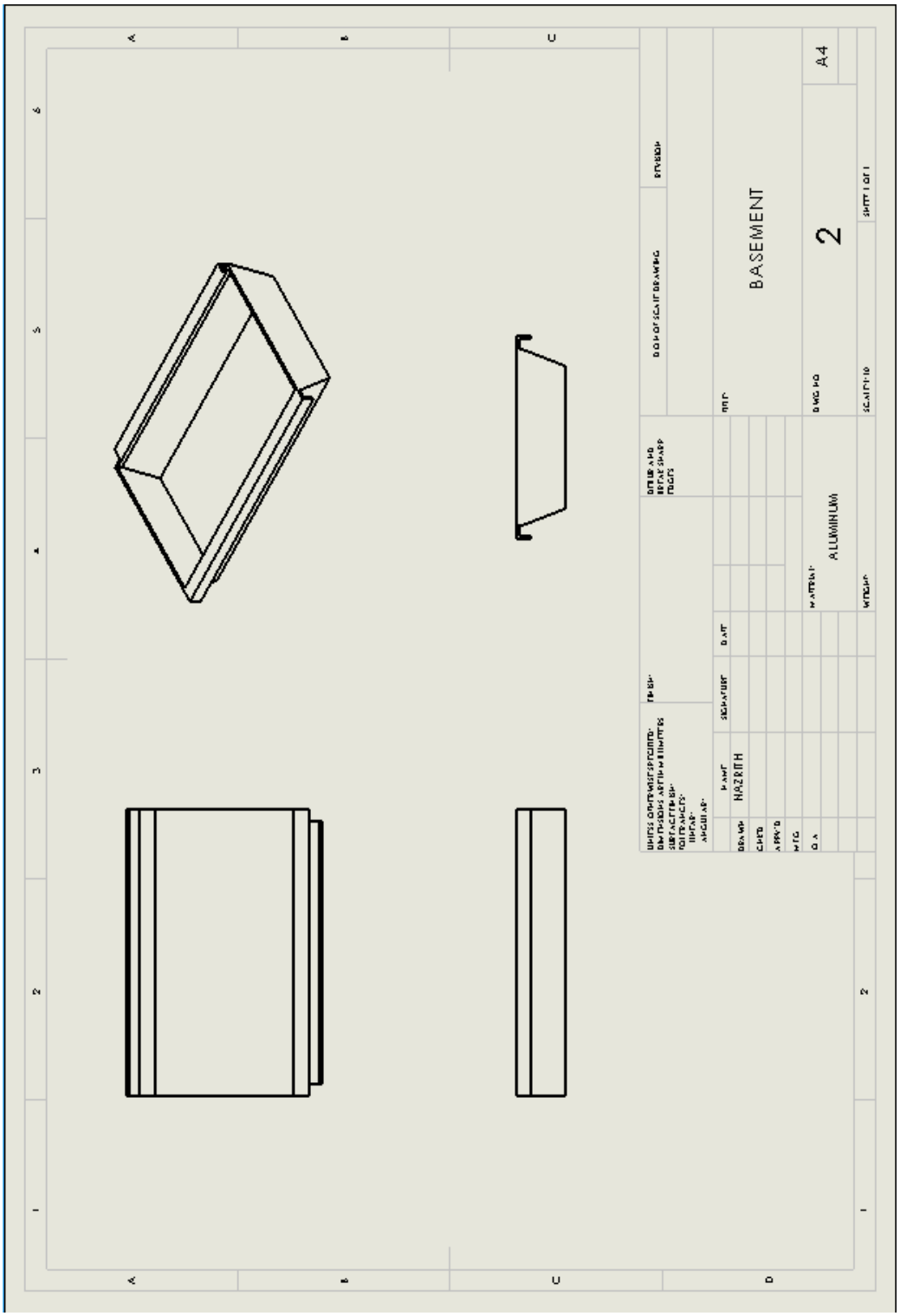
5. http://www.craft-supplies-online.com/productsearch.asp

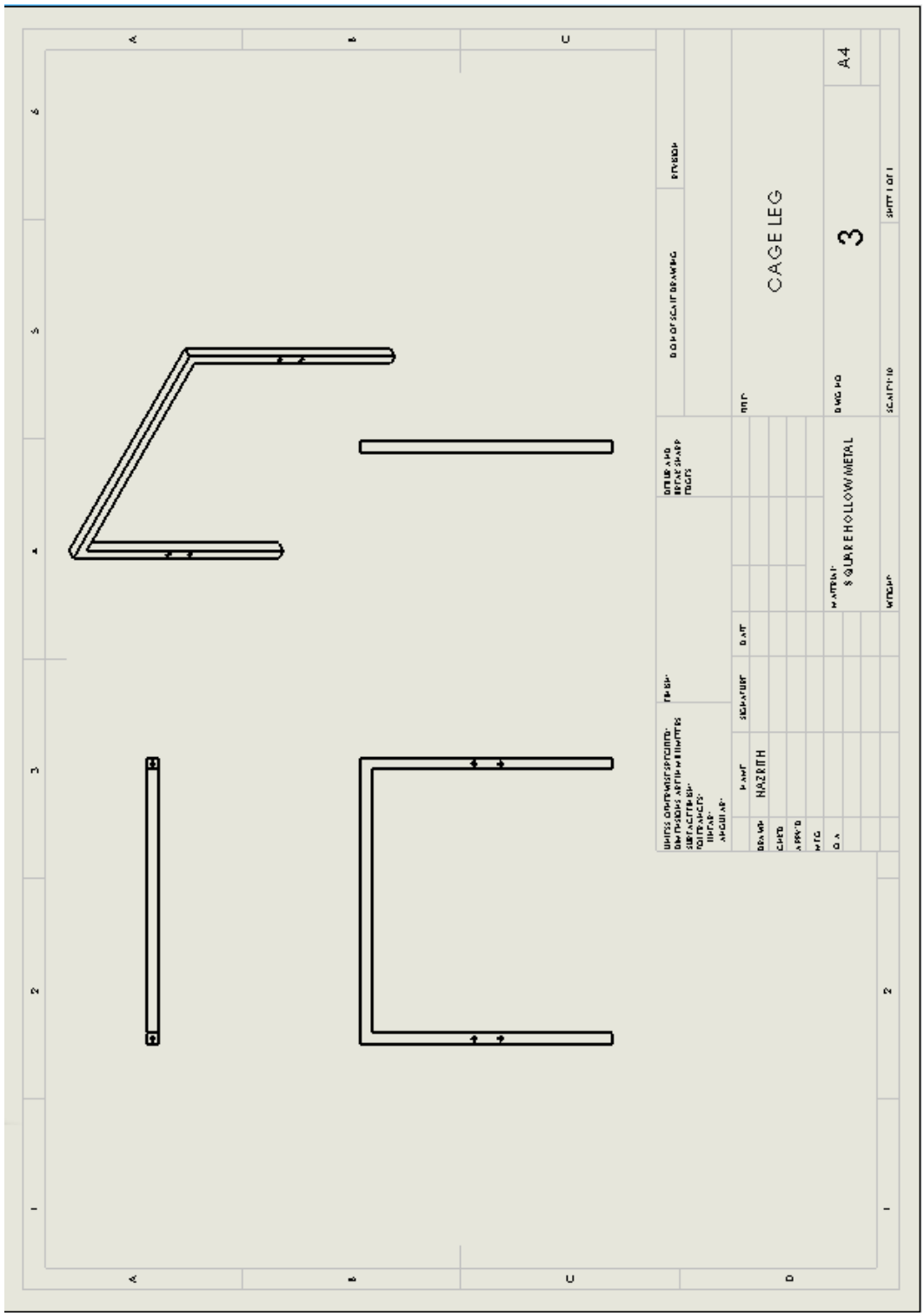
APPENDIX A



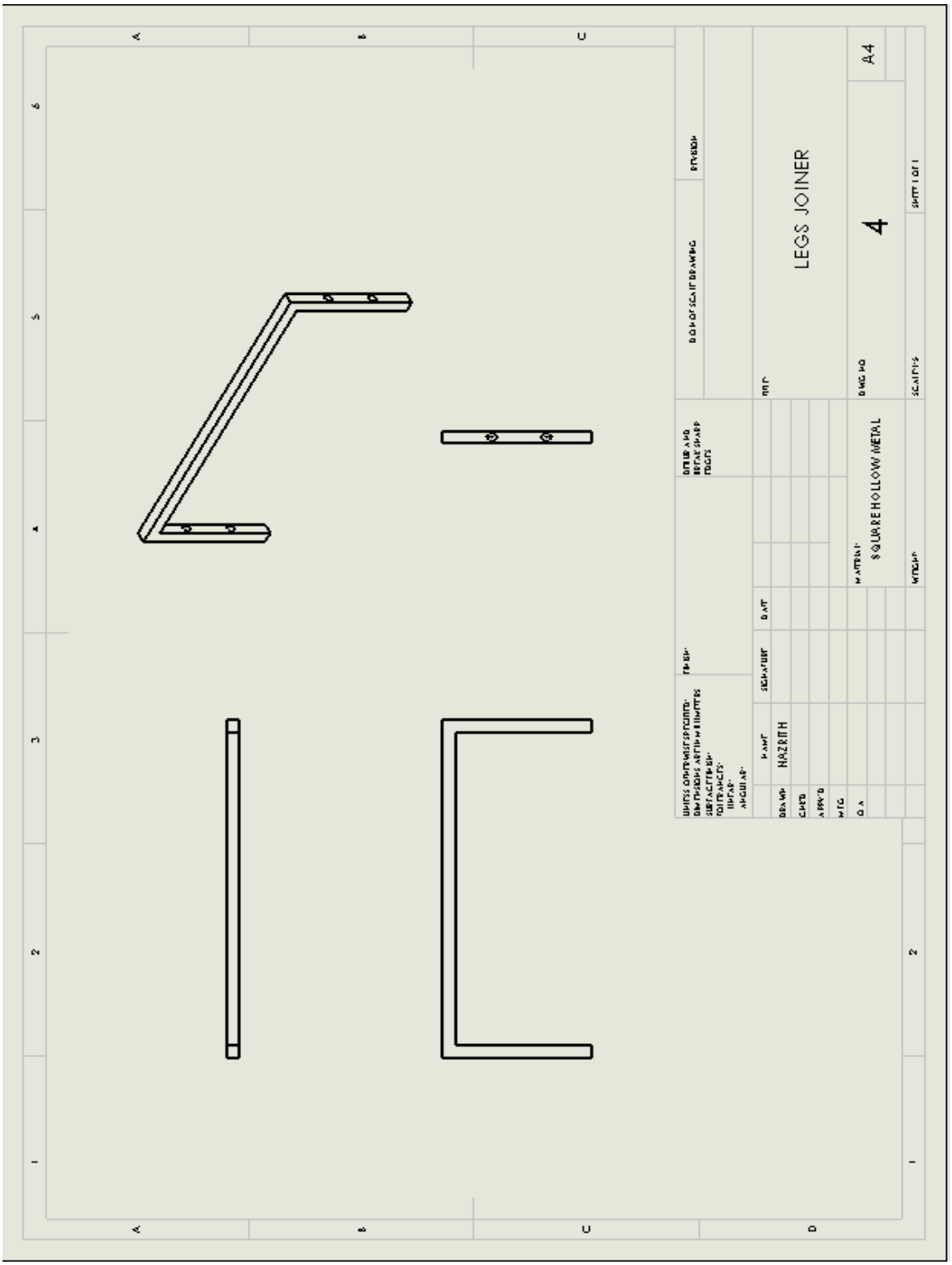
APPENDIX B



APPENDIX C



APPENDIX D



APPENDIX E