

DESIGN AND FABRICATION OF LABORATORY PRINTER TABLE

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UNIVERSITI MALAYSIA PAHANG

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BORANG PENGESAHAN STATUS TESIS

JUDUL: DESIGN AND FABRICATION OF PRINTER TABLE

SESI PENGAJIAN: 2012/2013

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I hereby declare that I have checked this project and in our opinion this project is adequate in terms of scope and quality for the award of the Diploma of Mechanical Engineering

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Date : DECEMBER 2012

STUDENT'S DECLARATION

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

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Dedicated to my parents

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ABSTRACT

In this modern era, printer is widely used in offices, homes and everywhere. There are many designs of printer table available in the market. However, all printer tables available in the market are not secured the printer because the table available is exposed for being stealing. The problem had boosted the needs of proper and secured printer table. Therefore, the objective for the thesis is to design and fabricate printer table. There are several steps taken to fabricate the project.

The project has to be design. A few designs have been made based on the design criteria. The concept selection has been made then continued by fabrication process. For the structural three-dimensional solid modelling of printer table was developed by using the SolidWorks engineering drawing software.

For the analysis of the final design, Solidwork Simulation Express has been used to analyse the design. The design has been break into 13 parts for static movement and used stainless steel as a material to be analysed. From the result, it shows that the material is suitable and can be continued for the next process. The fabrication process also undergoes many steps such as material marking, cutting, drilling, welding, grinding and finalizing the printer table by painting. The results of testing the project also discussed in the thesis. Finally, in conclusion the objective designing and fabricating the printer table was reached. The results can also significantly reduce the cost, improve product reliability and customer confidence.

ABSTRAK

Dalam era moden ini, pencetak digunakan secara meluas di pejabat-pejabat, rumah dan di mana-mana. Walaubagaimanapun, ke semua meja pencetak yang terdapat di pasaran tidak selamat untuk pencetak kerana meja yang sedia ada terdedah dengan kecurian. Masalah ini telah mendorong keperluan meja pencetak yang betul dan terjamin. Oleh itu, objektif untuk tesis adalah mereka bentuk dan menghasilkan meja pencetak. Terdapat beberapa langkah yang diambil untuk mereka bentuk dan menghasilkan projek.

Projek ini harus direka bentuk dahulu. Beberapa reka bentuk telah dihasilkan berdasarkan kriteria reka bentuk. Konsep pemilihan telah dibuat dan diteruskan oleh proses fabrikasi. Lukisan struktur tiga dimensi bentuk meja pencetak ini telah direka dengan menggunakan perisian lukisan kejuruteraan yang dinamakan "*SolidWorks*". Bagi analisis reka bentuk akhir, perisian "*Solidwork Simulation Express*" telah digunakan untuk menganalisis reka bentuk.

Reka bentuk telah dibahagikan kepada 13 bahagian bagi pergerakan statik dan menggunakan keluli tahan karat untuk dianalisis. Proses fabrikasi juga telah menjalani langkah-langkah seperti menanda dan mengukur bahan, memotong, penggerudian, kimpalan, mengikir dan akhirnya mencatatkan meja pencetak. Keputusan ujian projek ini juga dibincangkan dalam tesis. Akhirnya, dalam kesimpulan, objektif reka bentuk dan reka jadual pencetak telah tercapai. Keputusan juga berupaya menurunkan kos, memperbaiki kepercayaan produk dan keyakinan pelanggan.

TABLE OF CONTENTS

	Page
BORANG STATUS TESIS	i
SUPERVISOR’S DECLARATION	ii
STUDENT’S DECLARATION	iii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
ABSTRACT	vi
ABSTRAK	vii
TABLE OF CONTENTS	viii
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF SYMBOLS	xiv
LIST OF ABBREVIATIONS	xv
CHAPTER 1 INTRODUCTION	
1.1 Introduction	1
1.2 Problem Statement	1
1.3 Objective	2
1.4 Scope	2
1.5 Project Planning	3
CHAPTER 2 PRODUCT BENCHMARKING	
2.1 Introduction	5
2.2 Printer Table	5
2.3 Design Criteria	6
2.4 Printer Available In The Market	6

2.4.1	International Concept Mission Printer Stand	6
2.4.2	Scout Underdesk Printer Stand	8
2.4.3	Wooden Printer Stand	9
2.4.4	Iceberg Aspira Stand	11
2.5	Summarize Of All Benchmarked Product	12

CHAPTER 3 DESIGN CONCEPT AND SELECTION

3.1	Introduction	13
3.2	Design	13
3.2.1	Design 1	14
3.2.2	Design 2	15
3.2.3	Design 3	17
3.3	Final Concept Selection	19
3.4	Final Concept Drawing	20
3.5	Design Description	20
3.6	Final Design Analysis On The Frame	22
3.7	Selected Materials	23

CHAPTER 4 FABRICATION PROCESS

4.1	Introduction	24
4.2	Fabrication Process Steps	24
4.2.1	Measuring and Marking	25
4.2.2	Cutting	25
4.2.3	Welding	26
4.2.4	Grinding	27
4.2.5	Bending	28
4.2.6	Drilling	28
4.2.7	Riveting	29
4.2.8	Painting	30

CHAPTER 5 RESULT AND DISCUSSION

5.1	Introduction	31
5.2	Guidelines To Use The Printer	31

5.2.1	Using The Printer Table	31
5.2.2	Safety Precautions	31
5.3	Final Product	32
5.3.1	Testing Of The Printer Table	32
5.4	Discussion	35

CHAPTER 6 CONCLUSION AND RECOMENDATION

6.1	Introduction	36
6.2	Conclusions	36
6.3	Recommendations and Improvements	37
6.4	Problem Encountered	37

REFERENCES	39
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APPENDICES	40
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LIST OF TABLES

Table No.	Title	Page
2.1	Advantages and Disadvantages of Product Review 1	7
2.2	Advantages and Disadvantages of Product Review 2	9
2.3	Advantages and Disadvantages of Product Review 3	10
2.4	Advantages and Disadvantages of Product Review 4	11
3.1	Advantages and Disadvantages of Design 1	15
3.2	Advantages and Disadvantages of Design 2	16
3.3	Advantages and Disadvantages of Design 3	18
3.4	Design Comparison for Three Proposed Design	19

LIST OF FIGURES

Figure No.	Title	Page
1.1	Printer Is Exposed	2
1.2	Project Flow Chart	4
2.1	Design Criteria	6
2.2	Product Review 1	6
2.3	Product Review 2	8
2.4	Product Review 3	9
2.5	Product Review 4	11
3.1	Design 1 (Isometric)	14
3.2	Design 2 (Isometric)	16
3.3	Design 3 (Isometric)	17
3.4	3D Full Drawing	20
3.5	Printer Table Open (Isometric)	21
3.6	Deformation Scale of The Frame	22
4.1	Measuring Tape	25
4.2	Cuts Materials using Bendsaw	26
4.3	Cuts Sheet Metal Using Cutting Machine	26
4.4	Welding The Frame of Printer Table	27
4.5	Grind the Parts	27
4.6	Bend the Sheet Metal	28
4.7	Drill the Part of The Printer Table	29
4.8	Rivet the Part of The Printer Table	29
4.9	Painting the Printer Table	30
5.1	Final Product	32

5.2	Printer That Has Been Successfully Install	33
5.3	Printer Table in Open Mode	33
5.4	Operation of The Table Printer in Lock Mode	34
5.5	Paper Tray Out	34

LIST OF SYMBOLS

kg	Kilogram
m	Meter
mm	Millimeter
Dia	Diameter
H	Height
W	Width
D	Depth
N	Newton
V	Volts

LIST OF ABBREVIATIONS

UMP	Universiti Malaysia Pahang
FKM	Fakulti Kejuruteraan Mekanikal
SMAW	Shielded Metal Arc Welding

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Nowadays, printer is one of the most important machines in our lives. People use it to print their works and other documents. Many design of printer table has been manufactured based on the customer needs. Printer table is one of the most important things in order to keep the tidiness of certain places such as, house, office and others. Thus, printer table are needed by everyone to ensure their printer neatly arranged and safe.

1.2 PROBLEM STATEMENT

In faculty of mechanical engineer in Universiti Malaysia Pahang (UMP) the printer is shared among UMP staffs because every staff's level in consist of 6 rooms is provided with one printer. In order to keep the printer safe, the printer had been placed in one of the staff room. The problem arose when the responsible staff had another commitment that had him to be attending from his office. Therefore, the responsible staff should be standby whenever any other staff at the same level need to use that printer.

To overcome the problem, the printer need to be placed somewhere outside the staff office. However this situation will expose the printer for being stolen because the lab is still accessible by outsider whenever they doing their maintenance

work. As an example, the printer that being used by staff in block 1B level ground floor had been placed in fluid lab as shown in Figure 1.1



Figure 1.1: Printer is Exposed

1.3 OBJECTIVE

The around problem regarding the case of printer in faculty of mechanical engineer in UMP had boost the need of proper and secured printer table to place the printer. Therefore, the main objective for this project is to design printer table. The table should be secured the printer and can be placed at the proper placed.

1.4 SCOPE

In order to achieve the objective, several scopes had been set up. The first scope is doing a benchmarking. The purposed of benchmark is to see the good element in a product at the market. The next scope is to set the design criteria to overcome the problem arose. Next is design concept. Design concept is the idea behind the design. It is generated based on design criteria. The purpose of concept design is to create a few design before evaluate it to be the final design. The fourth scope is final design and the last scope is fabricated the product from final design.

1.5 PROJECT PLANNING

Figure 1.2 is the flow chart of the whole Final Year Project. To start this project, an appointment with the supervisor is done to understand about the project title given and manage the schedule of weekly meeting.

Problems are then indentified and objective and scopes of the project is then fixed. Designing phase starts of by sketching few designs and models using manual sketch on A4 papers. Then, analyse the designs and choose an appropriate design to finalize. Next, propose the design to the supervisor. After that, convert the design to the three dimensional drawing using SolidWorks software.

Following up, is the survey for the materials needed. The modification is done on the design so as the model will operate better. Once receive the materials, start the fabrication of the printer table.

Fabrication starts with the cutting of the materials, welding the parts together, drilling the necessary parts, grinding, riveting, and lastly, painting the printer table.

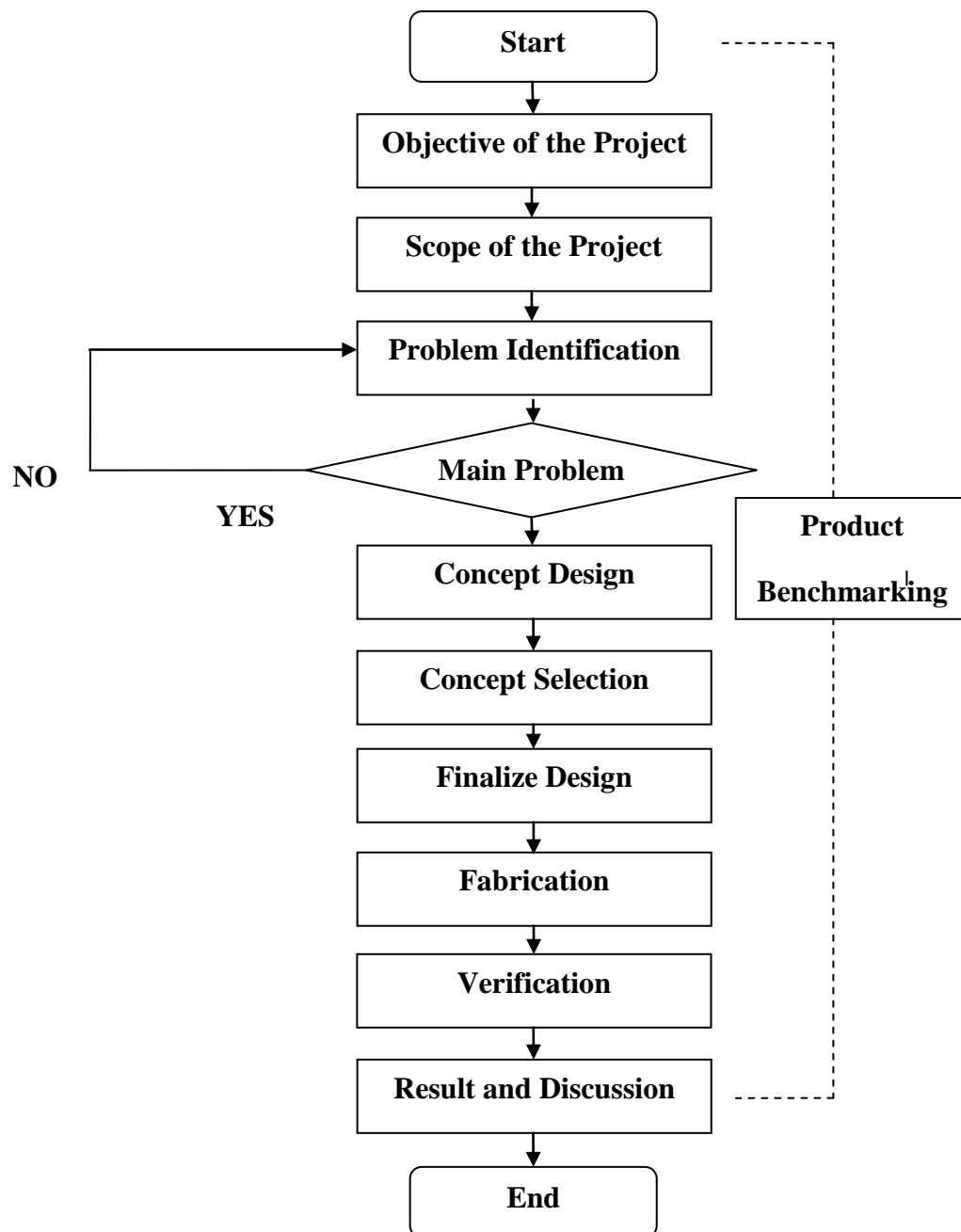


Figure 1.2: Project Flow Chart

CHAPTER 2

PRODUCT BENCHMARKING

2.1 INTRODUCTION

In this chapter, benchmark would be done, which include the printer table available in the market, the design criteria in each printer. The title design and fabrication of a printer table requires an amount of good understanding on the knowledge of the design criteria of the printer table. The information or benchmarking obtained are essentially valuable to assist in the fabrication and specification of this final year project. In this case, it is more to understanding the concept of printer table itself. Printer table available in the market would be compared and printer table simulation software would be explained.

2.2 PRINTER TABLE

Printer table is one of the most important things in order to keep the tidiness of certain places such as; house, office and others. Hence, printer table are widely manufactured in industries all over the world.

As we know, printer table are made using different materials and designated into various designs and looks. There are some printer table that are made from wood, metal, plastic and others. Printer table also are designed based on the customer suitability.

2.3 DESIGN CRITERIA

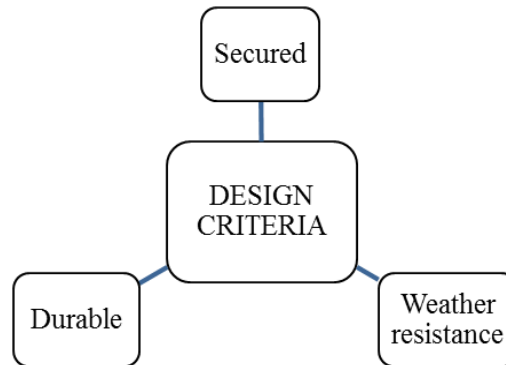


Figure 2.1: Design Criteria

From figure 2.1, the design of the table should be secured so that the printer is secured from being stolen. Next, the table should be durable so that the table can be used for a long time and the last criteria are weather resistance because the printer is going to be placed outside the fluid lab. The last criteria are to protect the printer from wet and hot condition.

2.4 PRINTER TABLE AVAILABLE IN THE MARKET

2.4.1 International Concept Mission Printer Stand

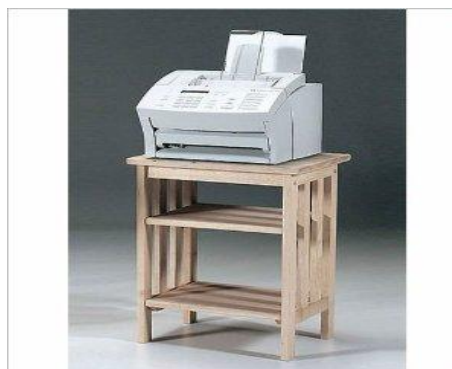


Figure 2.2: Product Review 1

Figure 2.2 shows first product review. It is made from parawood and assembled using screw. The overall dimension for this product is 24" H x 19" W x 14" D and has weight up to 10kg. Table 2.1 shows the advantages and disadvantages of the product.

Table 2.1: Advantages and Disadvantages of Product Review 1

Advantage	Disadvantage
durable	not suitable for outdoor
has paper tray	not secured
easily dissemble	
lightweight	

It has the criteria such as durable but not suitable to put it outdoor. Based on Spring Creek Furniture, parawood is high quality wood and durable that is produce by rubber tree. The wood is light in weight. This printer table can be folded when not in used since it assembled using screw. Even this product is light in weighted, it did not matched the main design criteria that is weather resistance. It means that if this product being used in FKM, it is exposed to bad weather since it is made from wood that can easily rotten.

2.4.2 Scoot Underdesk Printer Stand



Office accessories not included.

Figure 2.3: Product Review 2

Figure 2.3 shows the 2nd product reviews. This under desk printer stand from Safco is an easy way to free up desk space. This table will accommodate most desktop printers and other small office machines. The reduced size allows it to be tucked under a desk to save space in office. The stand is also very mobile with 4 casters, and 2 of them lock to keep supplies in place when needed. This printer table has black laminate top and the steel frame is powder coated. The overall dimensions is 14.5 H x 20.5 W x 16.5 D. Table 2.2 shows the advantages and disadvantages of the product.

Table 2.2: Advantages and Disadvantages of Product Review 2

Advantage	Disadvantage
durable	not secured
has paper tray	not suitable for outdoors
powder coated	
lightweight	
save space	

This printer table is durable because the frame used steel as material and can stand from wet since it is powder coated but not secured to put it outside of the room because the printer will be exposed for being stolen. Even this product is light in weight, it did not matched the main design criteria that is weather resistance. It means that if this product being used in FKM, it is exposed to bad weather since it didn't have cover to protect the printer. Besides that, this product also not suitable for outdoors since it is design in small size for indoor use.

2.4.3 Wooden Printer Stand

**Figure 2.4:** Product Review 3

Figure 2.4 shows the 3rd product reviews. It is made from wood and manufactured by J&J Woodcraft. The printer stand has dimension 20 inches wide X 20 inches deep X 30 inches high and weight 25kg. Table 2.3 shows the advantages and disadvantages of the product.

Table 2.3: Advantages and Disadvantages of Product Review 3

Advantage	Disadvantage
durable	not suitable for outdoor
has paper tray	heavy
has aesthetic	

This printer stand is durable since it used Winsome wood as the material and not easy to carry since it weight is heavy up to 25kg. This wood is sturdy composite material and very good quality according to Amazon.Com. Even this product is durable, it did not matched the main design criteria that is weather resistance. It means that if this product being used in FKM, it is exposed to bad weather since it is made from wood that can be rotten for a longer period.

2.4.4 Iceberg Aspira Stand



Figure 2.5: Product Review 4

Figure 2.5 shows the 4th product reviews. It is manufactured by BizChair.com. It is durable and made by blow-molded high density polyethylene construction. It has good looking as any metal finish it carries the added bonus of being scratch and rust proof. The desk can be washes easily and the surface accommodates most printers 2 wire shelves for paper or small supplies. This table can supports up to 45kg. It is suitable placed in the office. Table 2.4 shows the advantages and disadvantages of the product.

Table 2.4: Advantages and Disadvantages of Product Review 4

Advantage	Disadvantage
durable	not suitable for outdoor
has paper tray	not secured
good looking	
scratch and rust proof	
lightweight	

Even this product is light in weight, it did not matched the main design criteria that is secured. It means this product is exposed to be stealing since it doesn't have any protection for the printer. Besides that, this product also is not suitable for outdoors since it is design in small size for indoor.

2.5 SUMMARIZE OF ALL BENCHMARKED PRODUCT

Based on the all products available in the market, all the design has the criteria such as durable for the long time used, has paper tray for customers convenient to install paper, lightweight for the easy movement to place the table and aesthetic value. The main reason why all the products are not suitable to overcome the problem is they do not have the criteria such as secured for the printer and weather resistance. All the products cannot protect the printer from being stolen since the product is exposed and bad weather. To overcome this situation, the final design should have printer cage to protect the printer from being steal and bad weather. But, the good element can be extract from the benchmarked products are durable which can support the weight of the printer and long lasting, has paper tray for people to keep papers and aesthetic value. The design concept should have this entire element so that the problem in the FKM can be solved.

CHAPTER 3

DESIGN CONCEPT AND SELECTION

3.1 INTRODUCTION

In this chapter, concept design would be done, which include a few design of printer table that has been design based on the design criteria. The title design and fabrication of a printer table requires an amount of good understanding on the knowledge of the design criteria of the printer table. The designs made are essentially valuable to assist in the fabrication and specification of this final year project. Printer table design would be compared and concept selection of the printer table would be explained.

3.2 DESIGN

The design of printer table must be compliance to several aspects. The aspects that must be considered in designing the printer table is security of the table, durability of the design, cost, and ease of design. Finally, the design of the printer table should be easy to fabricate and assemble.

3.2.1 Design 1

Figure 3.1 shows the isometric view of concept design 1. The design is based on the problem statement and design criteria because it solved the problem arose and have all the design criteria. The material that has been used for the design is square beam stainless steel for the body and small plate bar for the cage. It is because the material is suitable for the table after been analyse using Solidwork Simulation Express. The total body measurement for the table is 1000mm X 420.8mm X 420.8mm. Besides that, the design is come out with paper tray to convenient user to keep paper. Not only that, it has printer cage on the upper side so that the printer will always secured from steal. The total body for this design used welding as joint and rivet for the paper tray.

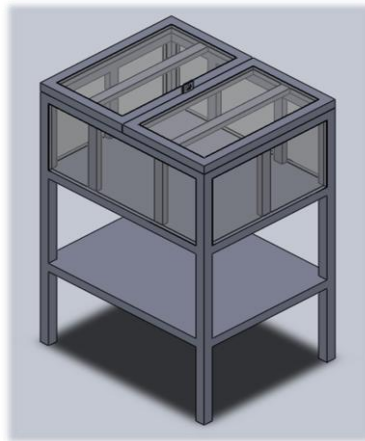


Figure 3.1: Design 1(Isometric)

Table 3.1: Advantages and Disadvantages of Design 1

Advantage	Disadvantage
Printer secured	Difficult to move the table
Has paper tray	Not protect the paper tray from bad weather
Very durable	
Protect printer from bad weather	

Table 3.1 shows the advantages and disadvantages of Design 1. Even this design has a few disadvantages, this is one of the simple designs that are easy to fabricate. The disadvantage like cannot protect paper tray from bad weather because there are no material covered the lower part can be solved by riveting the outer part using aluminium and adding roller to solve the difficulty of the table move.

3.2.2 Design 2

Figure 3.2 shows concept design 2. The design is based on the problem statement and design criteria because it solved the problem arose and have all the design criteria. The material that has been used for the design is only galvanize iron 3mm for the whole body including the cage. It is because the material is suitable for the table after been analyse using Solidwork Simulation Express. The maximum force that can be hold by the sheet metal is 220N while the printer is only 106N after been analyse. The total body measurement for the table is 1000mm X 420.8mm X 420.8mm. This design came out with paper tray to convenient user to install paper.

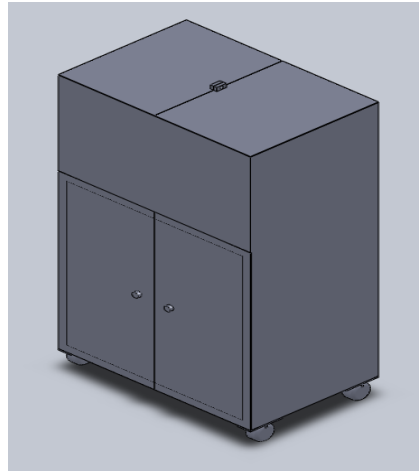


Figure 3.2: Design 2 (Isometric)

Table 3.2: Advantages and Disadvantages of Design 2

Advantage	Disadvantage
Printer secured from steal and wet	Difficult to install
Has paper tray	
Durable	
Protect paper tray from bad weather	

Table 3.2 shows the advantages and disadvantages of Design 2. This design is heavy because the whole body used galvanize iron. Not only that, the design come out with door for the paper tray to protect paper from getting wet and also has roller. The total body for this design used only rivet as joint. This design is easy to fabricate since it only use galvanize iron as a material. To solve the disadvantage like difficult to install paper, adding a hinge so that the printer cage can be open 2 ways that is on the upper and front part.

3.2.3 Design 3

Figure 3.3 shows isometric view of concept design 3. The material that has been used for the design is square beam stainless steel for the inner part and aluminium for the outer part. The total body measurement for the table is 1000mm X 420.8mm X 420.8mm. This design also come out with paper tray to convenient user to install paper and has door for paper protection. This design is heavy and very durable because the body used square beam and sheet metal. Not only that, the design come out with roller and the printer cage can be open 2 ways that is on the upper and front part. The total body for this design used welding to join the square beam and rivet for aluminium which can increase the durability of the design.

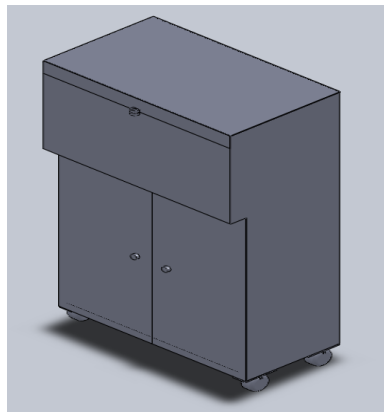


Figure 3.3: Design 3 (Isometric)

Table 3.3: Advantages and Disadvantages of Design 3

Advantages	Disadvantages
Printer secured from steal and wet Has paper tray Very durable Protect paper tray from bad weather Aesthetics value	Not protect the paper from steal

Table 3.3 shows the advantages and disadvantages of Design 3. This design is a little bit difficult to fabricate because the stainless steel has to be welding first then rivet the aluminium sheet metal to cover outer part of the design. Even it is a little bit difficult to fabricate, this is the most durable design and has aesthetics value. To solve the disadvantage like paper protection from steal, adding a latch can solve the problem.

3.3 FINAL CONCEPT SELECTION

Table 3.4: Design Comparison for Three Proposed Designs

Criteria	Concepts						
	1		2		3		
Criteria	Weight	Rating	Weight score	Rating	Weight score	Rating	Weight score
Roller	5%	0	0	0	0	0	0
Paper tray	15%	2	0.15	4	0.15	4	0.15
Ease to fabricate	10%	5	0.10	4	0.10	3	0.10
Durable	20%	4	0.20	3	0.20	5	0.20
Printer cage	20%	2	0.20	4	0.20	4	0.20
Ease for printer maintenance	20%	4	0.20	2	0.20	2	0.20
Protection for paper	10%	3	0.10	4	0.10	4	0.10
Total score			3.1		3.2		3.4
Rank			3		2		1
Continue ?			No		No		Develop

Legend:

Rating

0-very bad **1**-bad **2**-poor **3**-good **4**-very good **5**-excellent

From table 3.4, the weight mean the important of the design criteria that has been take in order to fabricate the printer table. It shows the durability, printer cage and ease for printer maintenance is the most important criteria. The rating of the criteria has been rate according to the suitability. Besides, the weight score is given by see if the design has same criteria with the design criteria. Finally, the total scored

is calculated by summation the total of rating multiply by weight score of the total criteria. It was shown that concept 3 was selected as the concept to be fabricated. It scores the highest marks in design comparison and proves to be able to be fabricated in the time frame given. Compared to the other designs, it has an advantage in durability. The durability of the design is the most important in this project. Therefore, an improved product will be fabricated based on the criteria that have been chosen from each concept.

3.4 FINAL CONCEPT DRAWING

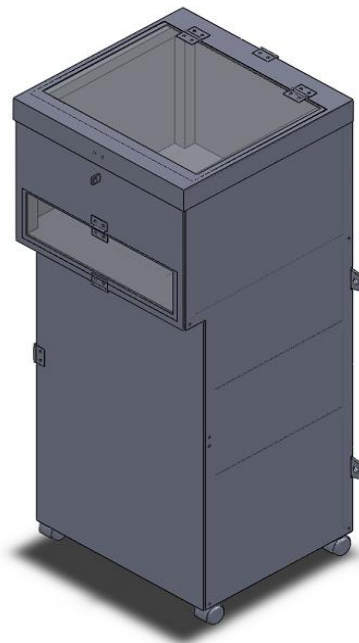


Figure 3.4: 3D Full Drawing

2D full drawing would be shown in Appendix D,

3.5 DESIGN DESCRIPTION

Based on the design concept, the final design has been made. A few good criteria have been taken from the concept design. For an example from concept design 1, the good element such as protection for printer has been used to design the

final design. Next, for concept design 2, the element such as moveable has been took so that the final design can be moveable for ease of placing the table. For concept design 3, the good element that has been taken was ease of people to do maintenance work on the printer. Not only that, the element such as protection for paper tray also has been taken. Besides that, there was additional element that has been added to improve the final design. For an example, all the concept design has printer cage but cannot be operate when the cage is locked. So, an improvement has been made by cut the front and top sheet metal cage so that the printer can easily operate while it is locked inside the printer cage. The printer table also can be permanent because it has hole that can be screw on the wall or can be moveable. Figure 3.5 shows the printer table in when it is open.

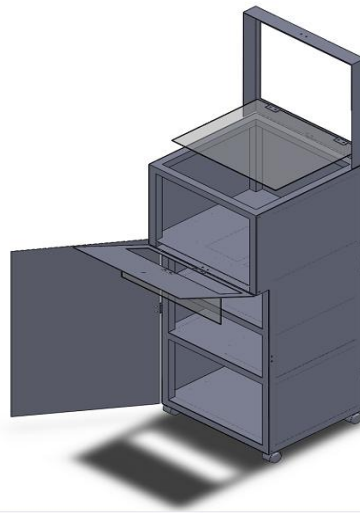


Figure 3.5: Printer Table Open (Isometric)

3.6 FINAL DESIGN ANALYSIS ON THE FRAME

Figure 3.2 shows the deformation scale of the frame. Based on the analysis that has been done using solidworks simulation express, the material that is square beam stainless steel is very suitable to fabricate the main part of the printer table. The static displacement (-Res disp-) shown that there are no red part in the material when the main part of the printer table (printer cage) is applied with the weight of printer that is 106N that is 10.8kg. The red part means that the material will be break. The deformation occurs shown by deformation scale in the printer cage is not critical that is $1.556e-7$ mm. This project can be continued because the deformation occurs is too small.

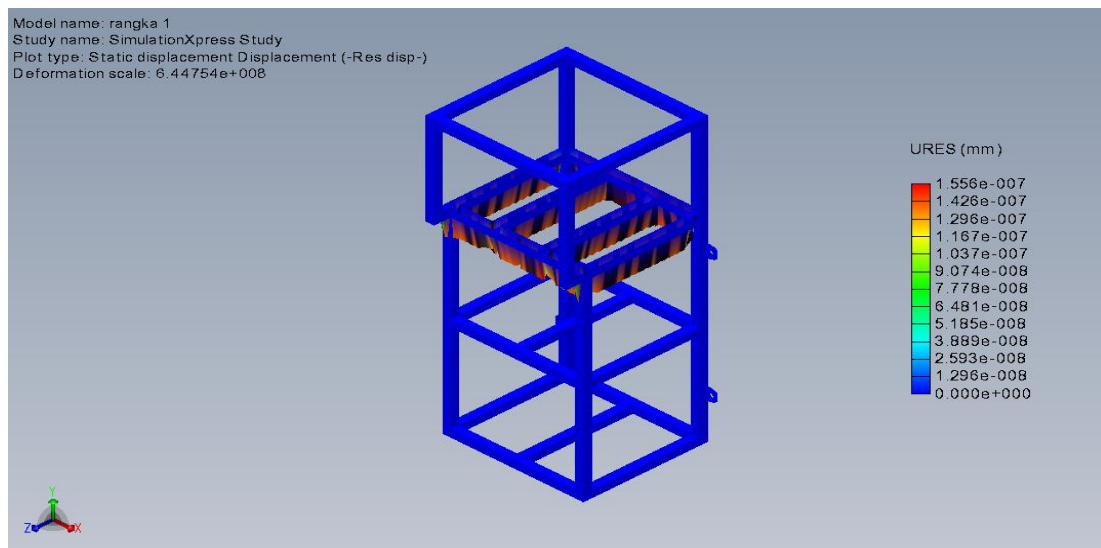


Figure 3.6: Deformation Scale of The Frame

3.7 SELECTED MATERIALS

For this final year project, stainless steel would be used the frame of the printer table. The only part that would be using sheet metal aluminium would be the cover of the frame. This is so to strengthen the printer table. Stainless steel is chosen because it is the suitable and easiest material to fabricate the main part while providing durability for the structure after been analyse. The use of stainless steel as the main material would save a lot of cost as buying materials from outside shop wouldn't be necessary. The bill of material would be shown in Appendix B.

CHAPTER 4

FABRICATION PROCESS

4.1 INTRODUCTION

Fabrication process is the process to make or built the part / model of the project. This process needs to follow the exact dimension according to the drawing design.

4.2 FABRICATION PROCESS STEPS

In making the design to be completed, several processes have been used to fabricate the printer table, which are:-

- i. Measuring : Measure the material. (Measuring Tape)
- ii. Cutting : Cut the material. (Bendsaw Machine/Cutting Machine)
- iii. Welding : Assemble the frames of the printer table. (SMAW)
- iv. Grinding : To remove the over melt welding parts. (Grinder Machine)
- v. Bending : Bend the aluminium sheet metal. (Bending Machine)
- vi. Drilling : Drill to make the hole. (Bosch Driller)
- vii. Riveting : Rivet the sheet metal to the frame. (Riveter)

4.2.1 Measuring and Marking

Figure 4.1 shows the measuring tape used to measure the material used for the project. It is important to measure first before joining the material or move to the next process. This is to prevent material waste. The fabrication process starts with measuring and marking the materials into the dimension needed according to the design. The measuring and marking process is done by using steel ruler, measuring tape, L-shape ruler and steel marker.



Figure 4.1: Measuring Tape

4.2.2 Cutting

Figure 4.2 shows the bandsaw machine used for material cutting for the frame of the printer table. The bandsaw machine is used because it can cut the material precisely. After measuring and marking process has been done, the materials will be cut according to the marked by using bandsaw machine and hand saw. Figure 4.3 also shows the cutting machine used to cut the aluminium sheet metal. The cutting machine is used because it can cut the sheet metal precisely and nicely.



Figure 4.2: Cuts Materials using Bandsaw



Figure 4.3: Cuts sheet metal using Cutting Machine

4.2.3 Welding

Figure 4.4 shows the welding process. After cutting, the fabrication process continues by assembling all the parts by using welding process. The welding that used for this fabrication is shielded metal arc welding (SMAW). It is because this type of welding is suitable for the stainless steel. The voltage used for the joint is 80 to 90V. Above than this range can cause the material melt and the steel will have hole. This can decrease the durability of the main part. Safety tools and wears for welding is shown in Appendix C.



Figure 4.4: Welding the frame of the printer table

4.2.4 Grinding

Figure 4.5 shows the grinding process using the Bosch grinder. After finished welding, the next step is grinding to dispose the over limited and melted welding parts. This is one of the ways to make the prototype looks clean and attractive.

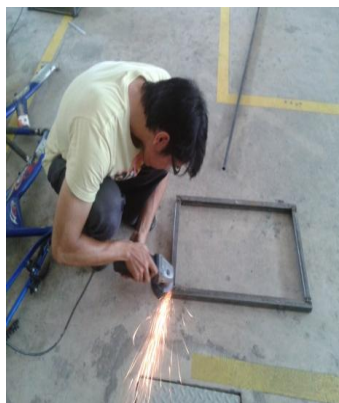


Figure 4.5: Grind the Parts

4.2.5 Bending

Figure 4.6 shows the bending process using bending machine. After finished grinding, the next step is bending the sheet metal that is aluminium 2mm. This process must be done carefully so that the bending part is neatly bent. Other purpose of bending process is to strengthen the sheet metal. Shear stress occur at the bend part can strengthen the material.



Figure 4.6: Bend the sheet metal

4.2.6 Drilling

Figure 4.7 shows the use of drilling machine to drill the work piece. After finish cutting the material into the pieces that needed, process is continued with drilling process to make the holes at the piece of steel for the rivet. The drill bit used is 5.5mm diameter.



Figure 4.7: Drill the Part of the Printer Table

4.2.7 Riveting

Figure 4.8 shows the use of riveting to the project. After finish drilling the main part and the sheet metal, process is continued with riveting the sheet metal into the main part. The rivet that has been used is 5.5mm diameter. This size is strong enough for the joint.



Figure 4.8: Rivet the Part of the Printer Table

4.2.8 Painting

Figure 4.9 shows the painting of the printer table. After finalizing the project, the table would be painted. This is one of the ways to avoid the printer table from corrosion. Besides that, the printer table will also look more attractive. The paint that has been used is aerosol paint.



Figure 4.9: Painting the Printer Table

CHAPTER 5

RESULT AND DISCUSSION

5.1 INTRODUCTION

Chapter 5 would discuss solely about the final product which has been fabricated. Each and every part that has been fabricated would be explained and showed in this chapter. Other than that, the testing of the product would also be done whereby the printer table will be tested by install the printer into the table.

5.2 GUIDELINES TO USE THE PRINTER TABLE

5.2.1 Using the Printer Table

For using it,

- i. Place the table at the suitable place
- ii. Screw the table on the wall
- iii. Open the top part first then the front part to install the printer
- iv. Patch the front part to the magnet and close the top part
- v. Secure the printer by locked the cage

5.2.2 Safety precautions

Safety precautions that must be followed when to install the printer

- i. Make sure the front part of the printer cage is patched to the magnet

- ii. Do not put heavy object on the top of the printer cage to prevent the perspex from crashed
- iii. Place the table at the suitable place

5.3 FINAL PRODUCT

Figure 5.1 shows the final product of the final year project. It was completed within the time given. The products was met the design criteria and has been improved based on design concept.



Figure 5.1: Final Product

5.3.1 Testing of The Printer Table

Figure 5.2 shows the printer that has been successfully installed to the printer cage. The printer cage is accurately following the dimension and there was no problem faced during the installation.



Figure 5.2: Printer That Has Been Successfully Install

Figure 5.3 shows the printer table in open mode. The printer can be easily installed from the front part of the printer cage. The dimension is precised according to the actual dimension.



Figure 5.3: Printer Table in Open Mode

Figure 5.4 shows the operation of the printer table in lock mode. The top part is the paper out. The table is successfully operated while it was locked. The above button of the printer also is easy to push.



Figure 5.4: Operation of The Table In Lock Mode

Figure 5.5 shows the paper tray out while the printer cage is locked. The paper tray is easy to install and uninstall since the dimension is accurate. Not only that, the front button of the printer also can be push easily.



Figure 5.5: Paper Tray Out

5.4 DISCUSSION

The printer table was successfully operated. The use of perspex was the best idea to operate printer table while the cage is being locked. The use of woods and sheet metals to replace the perspex had been tried and problem occurred where the printer cannot be seen.

The other problem faced was the weight of the printer table. The original design has 3 parts for the paper tray. This caused the printer table to be too heavy and has difficulty in moving. Therefore, the paper tray has to be reduced to two parts so that the table is more light in weighted.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 INTRODUCTION

This chapter concludes a finding achieved in this project. However there were problems faced during the course of this project. The measures taken to rectify these problems have been identified and applied. There will be recommendations form future project of the same kind to improve it so that a more complete understanding and enhanced application steps can be attained.

6.2 CONCLUSIONS

In conclusion, the project objectives were achieved. The objective of designing and fabricating the printer table was reached. The best design was chosen and fabricated within the time limit given. The fabrication process required many skills that have been learnt in previous mechanical laboratory such as material measuring, marking, cutting, drilling, riveting, welding and grinding. The fabrication process provides the experience to develop the skills and the ways to operate the machines to complete the project. Besides that, problem solving skills during the designing and fabrication process was also learnt. It acts as a motivator in facing the challenges as a professional engineer in this globalised era.

6.3 RECOMMENDATIONS

Recommendations to similar projects in the future are as follows. First of all, the main part should be welded carefully so that the printer table is stable and strong to support the printer. The welding skilled should be practiced more often so that the result for the joining is strong.

Other than that, the weight of the table can be reduced by using sheet metal aluminium 1mm so that the table can be easily moved when to change places for the table.

Moreover, the table should be design more bigger in size so that it can be used for all type of printer.

Finally, the future project also can be improved by improving the material selection to fabricate the project. Materials that suit the design has to be attained rather than selecting low cost and readily available material with inapplicable dimensions.

6.4 PROBLEM ENCOUNTERED

During the design and fabrication process of the printer table, many obstacles were faced. Firstly was the lack of knowledge in printer table that has been manufactured by manufacturer. The lack of exposure in this field caused a problem as the information of printer table was hard to attain either from the internet or the library.

The next problem faced was availability of the material for the main part and the sheet metal. The material for the main part that is stainless steel square hollow beam 1 inch is not enough in the lab. The material has to been bought at the grill shop at Jaya Gading. The sheet metal also that has been used is aluminium 2mm. The

actual plan for the sheet metal used is aluminium 1mm so that the table is not too heavy.

The last problem encountered was the bending machine in faculty (Faculty of Mechanical Engineering) is having problem and cannot be used until the 4 weeks of the semester.

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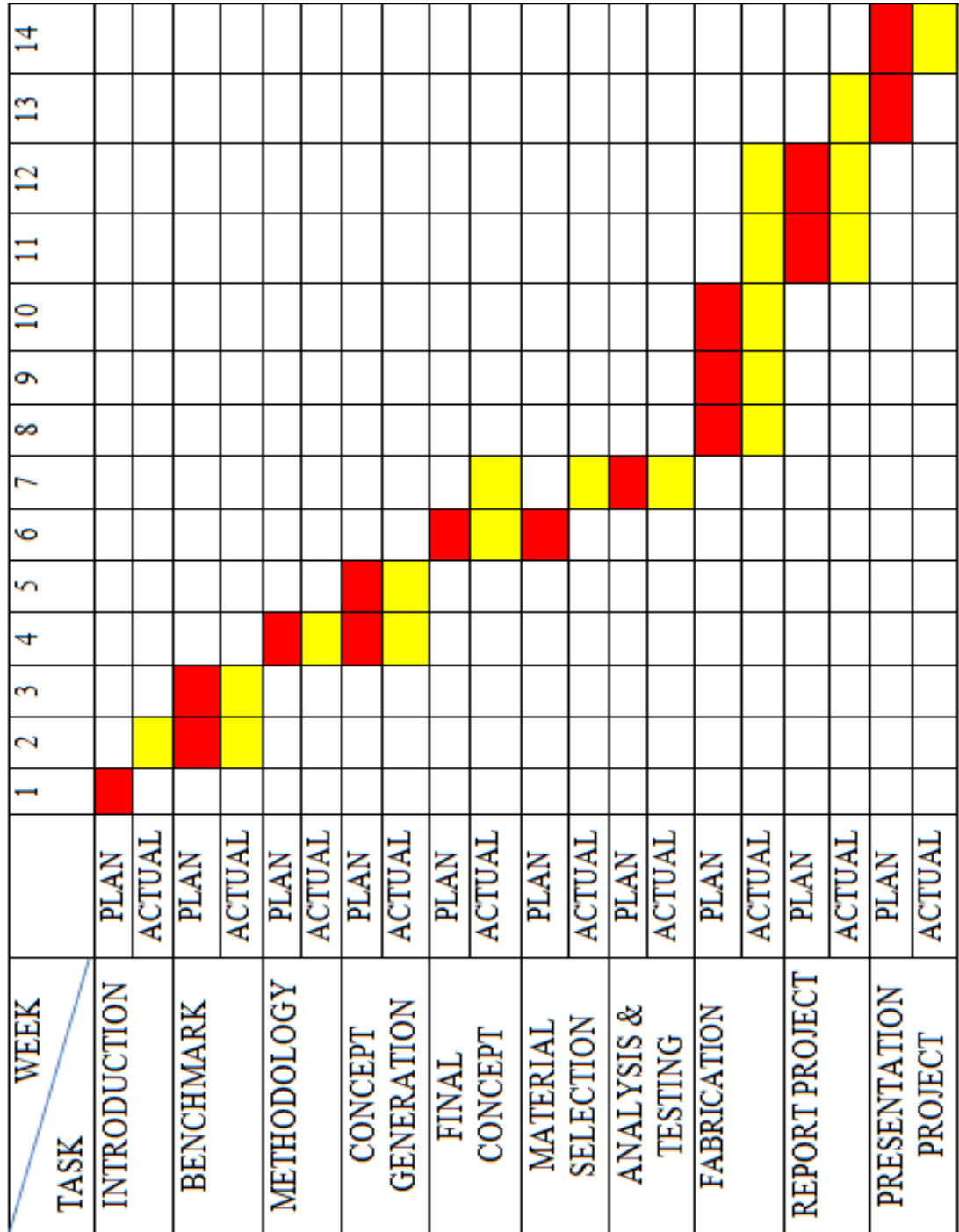
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APPENDIX A

Gantt Chart



APPENDIX B**BILL OF MATERIALS**

No.	Size(mm³)	Material	Numbers of item needed
1	25.4x25.4x14000	stainless steel	1
2	6000x4000	aluminium sheet metal	1.5
3	600x400	perspex	1
4	1 set	roller	4
5	1 set	hinge	6

APPENDIX C

Figures of Safety Tools / Wears



Welding shield



Gloves

APPENDIX D**DRAWING**

D1 shows 2D drawing for final design.

