DESIGN AND FABRICATION OF EASY ASSEMBLE TRICYCLE

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

Faculty of Mechanical Engineering
University Malaysia Pahang

NOVEMBER 2008

SUPERVISOR DECLERATION

I hereby declare that I have read this project report and in my opinion this project report is sufficient in terms of scope and qualify for the award of the Diploma of Mechanical Engineering.

Signature :

Supervisor Name: EN IDRIS BIN MAT SAHAT

Date : …….

DECLARATION

I declare that this thesis entitled *"EASY ASSEMBLE TRICYCLE "*is the result of my own research expect as state in the reference. The thesis has not been accepted for any diploma and is not concurrently submitted in candidature of any other diploma.

Signature :……

Name : MOHD ALI AMRI BIN MUHAMMAD HASSAN

Date : …….

Matrix no: MB06009

DEDICATION

To my beloved parents, Mr. Muhammad Hassan Bin Awang and Mrs. Wan Zaharah Binti Wan Long, family and friends, without whom and his / her lifetime efforts, my pursuit of higher education would not have been possible and I would not have had the change to study for the mechanical course.

Also to my supervisor, Mr. Idris Bin Mat Sahat, and Mechanical staff, because of the guidance without whose suggestions, helpful guidance and direct assistance, it could have neither got off the ground nor even been completed.

ACKNOWLEDGEMENTS

This project was concluded under the supervisor of Mr. Idris Bin Mat Sahat. In the University Malaysia Pahang formely known as KUKTEM. I am very grateful for her patience and her constructive comments that enriched this research project. Her time and effort have been a great contribution during the preparations of this thesis that cannot be forgotten for ever. I would like to thank lecture and technicians at the faculty of mechanical for their valuable comments and sharing their time and knowledge on this research project during the project to submit was carried out. I also grateful acknowledge the assistant of everybody who helped in the execution of this project in University Malaysia Pahang (UMP). I also thank to Mechanical Students for their friendship and help when thinking through problems and for sharing their knowledge of experimental apparatus and computer systems. Finally, I thank to my family for their continuous support and confidence in my efforts.

ABSTRACT

The study of manufacturing was very important in order to carried out this project to ensure that student understand on what are need to do. This project is about designing and fabrication the Easy Assemble Tricycle to give a recommendation for parents to bring out this tricycle wherever they want for their children to play. This project involves the process of designing the tricycle to simplify the children to using it. After the design has complete. It was transformed to its real product where the design is used for guideline. This project also require to ensure the safety for the indeed of publishing. Methods and process involve in this project for instance joining using welding, nut and bolt. This process is mainly about generating a new concept of Easy Assemble Tricycle that would make easier to assemble and easy to bring anywhere. This tricycle also cans reduce a space to store in. After all process had been done, this tricycle may help us to understand the fabrication and designing process that involved in this project.

ABSTRAK

Pembelajaran mengenai pembuatan adalah penting untuk menjalankan projek ini bagi memastikan pelajar memahami tentang perkara yang perlu dilakukan. Projek ini adalah mengenai merekabentuk dan membuat Basikal Roda Tiga Yang Senang Dipasang bagi memberi kemudahan kepada ibu bapa untuk membawanya kemana-mana sahaja untuk anaknya bermain. Projek ini melibatkan proses mereka basikal roda tiga berdasarkan bentuk bagi memudahkan kanak-kanak untuk menggunakannya. Selepas proses ini siap, basikal roda tiga terhasil berdasarkan reka bentuk yang tekah dibuat. Projek ini juga melibatkan ciri- ciri keselamatan bagi kanak-kanak untuk pemasaran. Kaedah dan proses yang terlibat dalam projek ini bagi penyambungan segera menggunakan proses kimpalan, skru dan nat. Projek ini sebenarnya melibatkan proses menjana konsep baru dalam menghasilkan basikal roda tiga yang senang dipasang serta mudah dibawa kemana-mana sahaja. Basikal roda tiga ini juga dapat menjimatkan ruang untuk menyimpannya.

Selepas semua projek ini siap, basikal roda tiga ini akan membantu kite tentang pemahaman proses merekabentuk dan penghasilan yang terlibat dalam projek ini.

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INTRODUCTION

CHAPTER 1

1.1 Project Title

Easy Assemble Tricycle.

1.2 Project Synopsis

The tricycle, often called a trike, is a three-wheeled vehicle. The most common type of tricycle is that often purchased for young children who can't yet master the stability to balance on a bicycle. These tricycles, often made of metal, have two rubber wheels in back and one in front. They can help a child master the art of pedaling without having to rely too much on balance, though any child who can pedal fast enough has probably been able to overturn their tricycle quite easily.

1.3 Project Background

At this moment, bicycle not only to adult. Children also use bicycle to go anywhere or to enjoy with their friend. But the children bicycle is difference from adult bicycle. Its only has three tires and its called tricycle.

Nowadays many design of tricycle was produced. Children can choose what design they need, depend what design they like. The children enjoy playing with tricycle and play wherever they want. But it has problem. After they play, the tricycle needs a space to store it. So it needs a big space to store it.

The second problem is, the tricycle is difficult to bring it. We need a big space to store it in the car or any transport.

So, the easy assemble tricycle is designed to solve this problem. It is easy to assemble and easy to bring out. Its only needs a small space to store it in the car or at the house. You can save a space in your house.

1.3.1 Project Objective

Project objective divide by two. It is general objective and specific objective for the title of the project.

1.3.2 General objective

Diploma final years project objective is to practice the knowledge and skill of the student that have been gathered in solving problem using academic research to born an engineer that have enough knowledge and skill. This project also important to train and increase the student capability to of researching, data gathering, analysis making and then solve a problem using research or scientific research.

The project also will educate the student in communication such as presentation, deals with people and educate them to define their research in presentation. The project also will train the student to gain capability of making a good research report in thesis form or technical writing. This project also can produce and train student doing work with minimal supervisory and more independent in researching.

Nevertheless this project also important to generate and increase interest in research work field.

1.3.3 Specific Project Objective

The objective for this project are:

1. To design a tricycle that easy to assemble and easy to brought anywhere.
2. To fabricate and introduce the new concepts and ideals for future prospect of easy assemble tricycle.
3. To produce a tricycle that needs a small place to store it.

1.4 Problem statement

Today many design of tricycle is difficult to bring it anywhere and needs a big space to store it. So with the development a assemble tricycle. It can solve that problem.

Otherwise, nowadays, have much another design of tricycle that has exist in market. The product or design so complicated and difficult to be assemble and detach. So, with the design of this 'easy assemble tricycle, the problem will being solved.

1.5 Project Scope

The project scope is:

1. This tricycle is suitable for children those 3 years old and below.
2. To produce this easy assembles tricycle using material that available in laboratory.
3. This tricycle can be detached parts by parts and can assemble easily.
4. Size for this easy assemble tricycle is with

Length 690mm x wide 490mm x height 790mm after assembles**.**

1.6 Flow chart

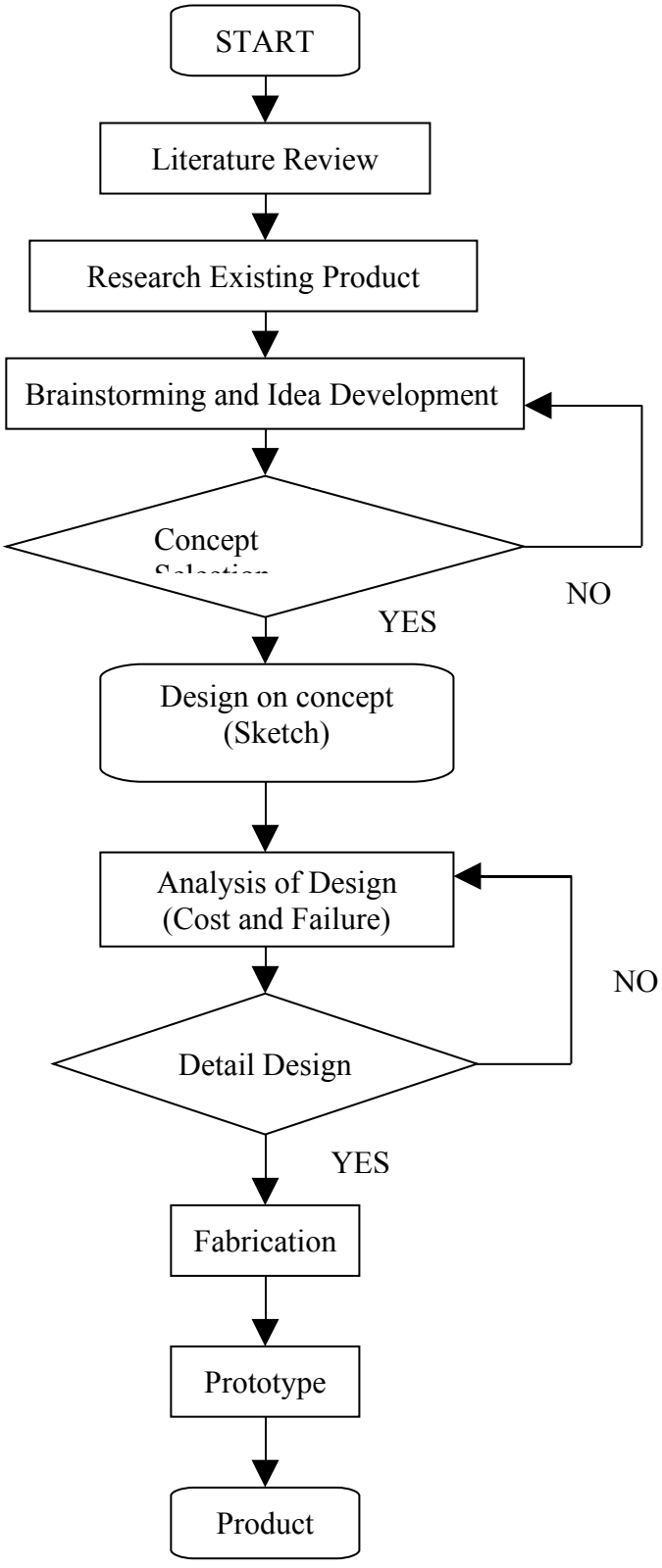


Figure 1.1

1.7 Gant chart

TASK	WEEK														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Literature review															
Research on existing product															
Brainstorming and idea development															
Concept selection and detail design															
Analysis of design, cost and failure															
Fabrication															
Discussion and findings															
Report Writing															
Presentation project															

Table 1.1

= Planning progress

= Actual planning

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction.

At this moment, bicycle not only to using by adult. Children also using bicycle. But the children bicycle is difference from adult bicycle. Its only has three tires and its called tricycle.

Nowadays many design of tricycle was product. Children can choose what design he need, depend what design he like. The children enjoy playing with tricycle and go wherever he wants. But it has problem. After he plays, the tricycle needs a space to store it. So it needs a big space to store it.

The second problem is, the tricycle is difficult to bring it. We need a big space to store it in the car or any transport.

So, The easy assemble tricycle was produce to solve that problem. It is easy to assemble and easy to bring out. Its only needs a small space to store it in the car or at the house. You can save a space in your house.So your children can enjoy playing with tricycle wherever he wants.

2.1.1 Product 1

Figure 2.1

(i) Great outdoor toy for any child
(ii) Tricycle features glossy red paint finish
(iii) Heavy duty hi-tensile steel frame and fork
(iv) 12-hole chrome-plated front rim
(v) 8-hole chrome-plated rear hubs
(vi) Chrome-plated handlebar
(vii) White plastic seat
(viii) White plastic basket
(ix) Direct drive front pedals
(x) Manufacturer's Suggested Age Range: (2) and up

Material: Steel, plastic, alloy, rubber

Advantages:

(i) Suitable for children up to 2 years old.
(ii) Safety not has conner sharp.
(iii) Simple design.
(iv) Stable.
(v) Catchy.

Disadvantages:

(i) Heavy duty hi-tensile steel frame and fork.

(ii) Seat cannot adjustable.

(iii) Expensive.

2.1.2 Product 2

Figure 2.2

(i) It is recommended for children at least 36 inches tall.

(ii) It has a big 3 1/2" wide, 10" tall rear.

(iii) Chevron pneumatic tires for good traction on any hard surface.

(iv) 18" height (adjustable 2") from the ground to the seat

(v) 24" height to the handle grip.

(vi) The furthest distance from seat to pedal: 18".

(vii) 34" length, 22" width. 38 lb. seat is adjustable at 3 positions.

Material: steel, alloy, plastic

Advantages:

(i) Good traction on any hand surfaces.

(ii) Height seat can adjustable.

(iii) Simple design.

(iv) Safety not has conner sharp.

Disadvantages:

(i) Not suitable for children below 36 inches tall.

(ii) Heavy.

(iii) Seat cannot adjustable. (front of or behind)

(iv) Not stable.

2.1.3 Product 3

Figure 2.3

(i) Lightweight Aluxx formed aluminum alloy frame

(ii) Urethane mini-scooter style wheels

(iii) Molded 8-ply wooden rear deck

(iv) Ball bearing headset

(v) Includes bell

(vi) Push bar and pedal blocks sold separately

Material: aluminium, alloy

Advantages:

(i) Lightweight.

(ii) Simple design.

(iii) Safety not has conner sharp.

(iv) Stable.

Disadvantages:

(i) Seat cannot adjustable.

(ii) Design not catchy.

2.1.4 Product 4

Figure 2.4

(i) Wide non-slip pedals.

(ii) Padded adjustable seat.

(iii) Safety steering stop to prevent tipping

(iv) Safety grips.

(v) Wild Hot Wheels graphics AND a real shock absorber on the rear end.

Advantages:

2 Safety steering stop to prevent tripping.

3 Safety grips.

4 Absorber on the rear end.

5 Comfortable seat.

6 More colorful.

Disadvantages:

(i) Heavy.

(ii) Not stable.

CHAPTER 3

METHODOLOGY

3.1 Project Flow chart.

From the flow chart, this project is started with literature review study. In the literature review study, a research on the existing product in the current market in Malaysia is done. The purpose of this research is to compare the advantages and disadvantages of the current market base on the main objective of the project such as strength, material and others.

After the research on the existing product is done. Four existing product in the current market is chosen base on the criteria given. One brainstorming session is done to develop a new idea for each product base on their advantages and disadvantages.

When the final concept is selected, cost and failure analysis of the design is carried out. The purpose of this analysis is to make sure that the product specification of the main objective of the project is followed have reasonable price and material. After the final results of the analysis, one detail design will be develop in 2D or 3D drawing.

For the fabrication of new product, the detail design of the concept must include the measuring and selections of the material to create this product. All the detail process use to develop this product will be written in this chapter. It concludes all the name of the process and the material used.

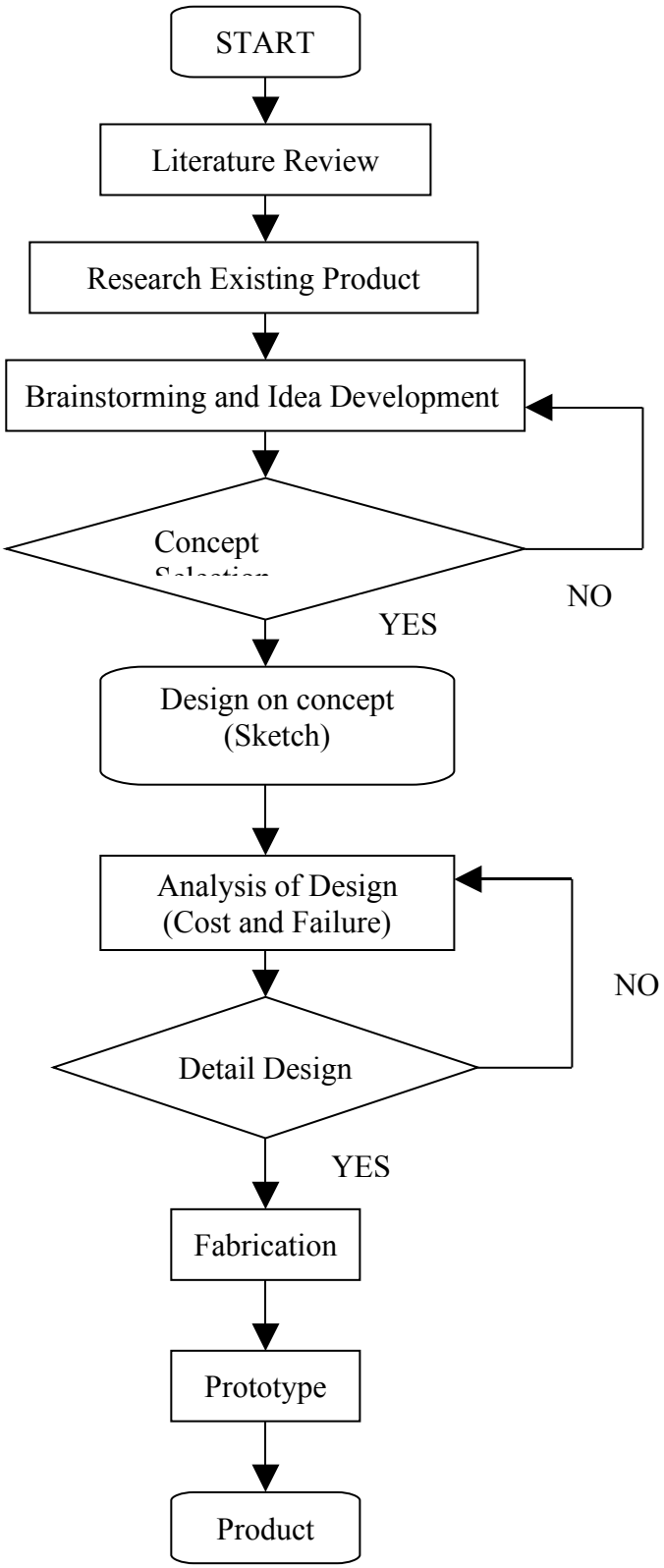

START
Literature Review
Research Existing Product
Brainstorming and Idea Development
Concept
NO
YES
Design on concept
(Sketch)
Analysis of Design
(Cost and Failure)
NO
Detail Design
YES
Fabrication
Prototype
Product

Figure 3.1

3.2 Design

The design of easy assemble tricycle must be compliance to several aspect. The design consideration must be done carefully so the design can be fabricated and functioning. The aspects that must be considered in designing the Easy Assemble Tricycle are:

(i) Ergonomic : tricycle must be user friendly as easy to use, assemble and bring anywhere.
(ii) Strength : It is second of important criteria in designing the easy assemble tricycle. This is because the tricycle is for light usage only. However it still important in supported structure the tricycle.
(iii) Material : Available of material is one pf aspects that have been considered. The material available can be used depend on their purpose.
(iv) Cost : The cost of whole system must been not exceed from budget given and also reasonable.
(v) Environment: The Easy assemble Tricycle is suitable to be use in all places such as in home, picnic, camping and etc.

3.3 Drawing.

The drawings are dividing into two categories, which are:

(i) Sketching: All the ideas for Easy Assemble tricycle fabrication are sketched on the paper first to ensure that ideas selection can be made after the selected design choose.
(ii) 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 ideas, only three sketching that had been chosen to be considered as the final ideas,

3.4.1 concept A

Figure 3.2

This concept is the datum concept to generate other concept and make comparison with other concept. This concept is a simple. It has good traction on any hard surfaces. Safety and doesn't has any sharp conner. But it has disadvantages. This tricycle is heavy and not stable. The seat cannot adjustable.

3.4.2 concept B

Figure 3.3

This concept is nearly same like concept A, but the chassis is difference.

It has a simple design and the concept is a lightweight. The disadvantages of the concept are the chassis cannot adjustable and the design looks not catchy.

3.4.3 Concept C

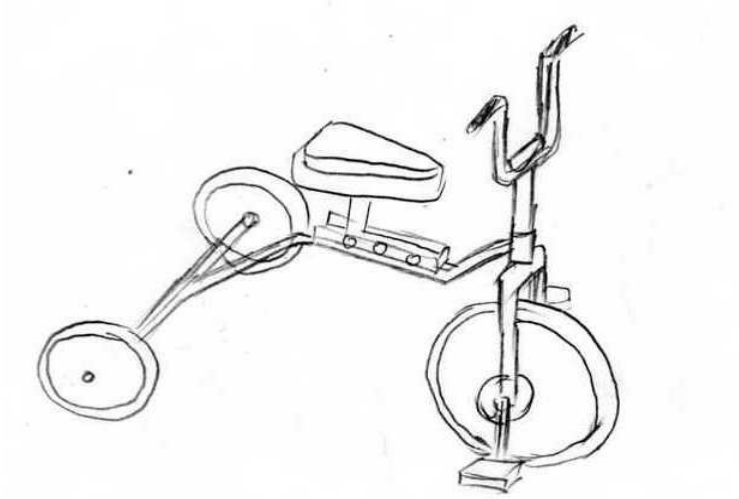


Figure 3.4

This concept is differently from concept A and B. the chassis can be fold and handle can be dismantling from fork. The seat can adjustable. It is easy to assemble and easy to storage.

3.5 Concept generation and evolution.

Three concepts for the easy assemble tricycle were developed. These are evaluated against the datum of the standard tricycle.

Selection criteria	Concepts		
	A (Datum Concept)	**B**	**C**
Safety	**0**	**0**	+
Weight	**0**	**-**	**-**
Adjustable seat	**0**	**0**	+
Easy to assemble	**0**	**-**	+
Design	**0**	**-**	+
Stable	**0**	+	+
Manufacturing cost	**0**	**0**	**-**
∑+	**0**	**1**	**5**
∑0	**7**	**3**	**0**
∑-	**0**	**3**	**2**
Net score	**0**	**-2**	**3**
Ranking	**3**	**2**	**1**

Table 3.1

Notes:

+ = Better than - = Worse than 0 =Same as

From the concept of selection table. The advantages and disadvantages of the design can be outlined. Criteria or characteristic for the product to be fabricated are the important thing to consider, before fabrication process. According to the table, study of the concept selection shows that concept c scores highest positive sign. So that concept c is the best selection to fabricate the Easy Assemble Tricycle.

3.6 Design specification.

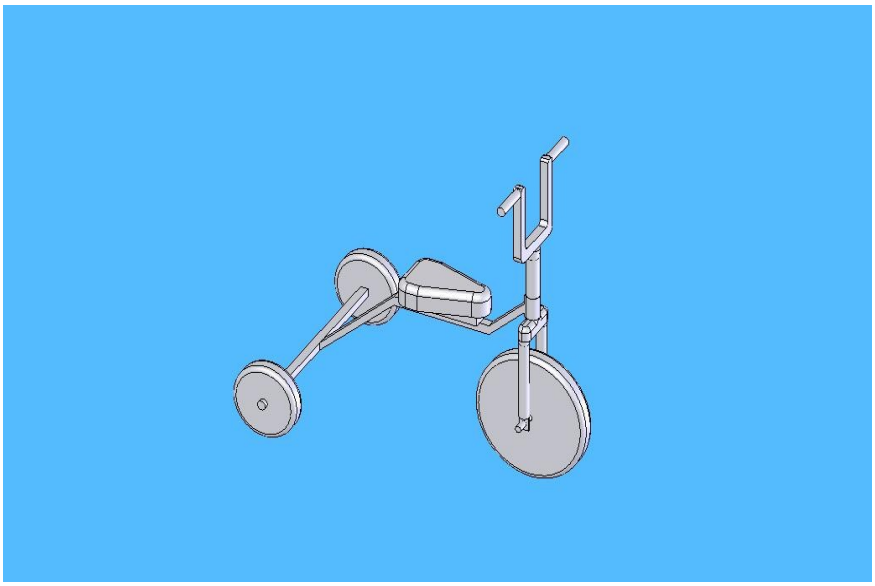


Figure 3.5

3.6.2: Design specification.

Based on the drawing and sketching selection, after generate and evaluated the best concept selection. The concept D is the best design that can be fabricate.

Parts	Material	Type	Size(mm)	Quantity
1	Steel	Square hollow	607 x 25 x 25	1
2	Steel	Square hollow	450 x 25 x 25	1
3	Steel	Square hollow	500 x 25 x 25	1
4	Steel	Square hollow	440 x 25 x 25	1
5	Steel	Rod hollow	Ø34 x 134	2
6	Steel	Rod hollow	Ø29 x 234	1

Table 3.2: Material selection

3.7 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.

3.8 Process involves.

The fabrications process starts from dimensioning the raw material until it is finish as a desire product. The processes that involve are:

(i) Getting material

The materials have in UMP mechanical laboratory or get from hardware shop.

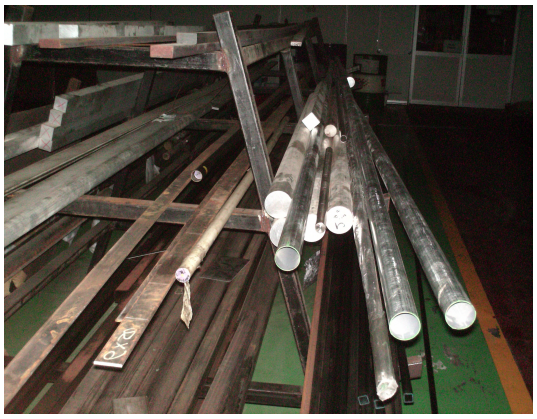


Figure 3.6

(ii) Measuring and marking.

Figure 3.7

(iii) Cutting material.

The process cutting the material using floor cutter disc.

Figure 3.8

(iv) joining process

Using MIG welding. This process to joining the part using steel.

Figure 3.9

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Final products

The easy assemble bicycle was finish and get result after undergoes step by step start with literature review, design and sketching, technical drawing and solid modeling using Solid Work application, fabrication process with cutting, drilling, joining and assembly

4.1.1 Results after finishing

Figure 4.1: tricycle before assemble

Figure 4.2: tricycle after assemble

4.2 Product Specification

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

Category	Result
Weight	5kg
Colour	Orange
Height	79cm
Maximum forces can be load	Maximum 20 kg
Convenience	Easy to assemble and easy to bring anywhere

Table 4.1: Product specification

4.3 Discussion

Discussion is dividing by two parts. Firstly is discussion about types of defect on the final product. Second, is about the problem in progress start with literature review until fabricate and finish this project.

4.4 Testing.

This tricycle is safe for children. The maximum load is 30kg

Figure 4.3

Testing using Cosmos application

Result after testing. This final result show the maximum limit this chassis can be applied is 30 kg.

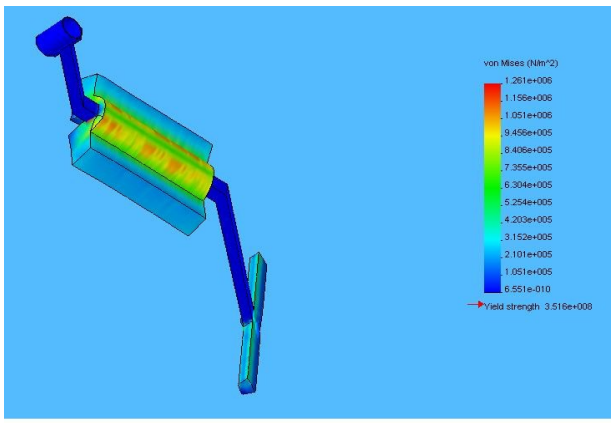


Figure 4.4

4.5 Type of defect.

There are so many things that happen in fabrication process such defect. This defect happen because lack of skills to operate a machine such as when handling MIG welding machine. This defect can see after fabrication process is finished.

4.5.1 Not parallel

This defect happen cause by less skill when process weld the chassis tricycle.

Figure 4.4: Chassis not parallel

4.5.2 Bead

The bead is not trim from welding process. The voltage when welding process is not suitable for this material. Insufficient experience to handle also caused of the defected.

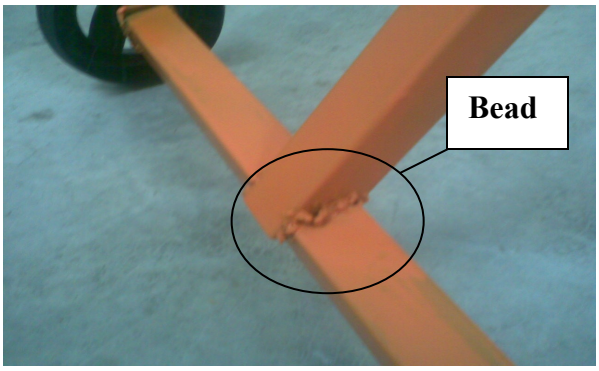


Figure 4.5: Bead

4.6 Problem in progress

Many problems occur in progress to design and fabrication of this table such as gather raw data and literature review, design and fabrication.

4.6.1 Literature review problems

The problem during literature review is mainly about the difficultly to know about the title such scope, concept and how to fabricate it into reality. Raw material also the problem encountered during this step because the raw material at UMP Mechanical Lab not available for the first design the project. The whole design was change to suitable with material available in Mechanical Lab and the problem is like limited resources to get relevant and suitable material such as books and internet connection problem.

4.6.2 Design Problems.

The problems also occur at this step. The problems came during decision making to design that suitable with available machine in UMP Mechanical Lab. After a design is selected, another problem encountered is details dimension should suitable with scope of the project and after all part and material use the dimensional was suitable with project scope.

4.6.3 Fabrication Problems

Problem during this stage is very critical that make the actual progress not follow project planning schedule. First, the problem is to find material that suitable for the title of the project. The suggestion material to produce easy assemble bicycle is not available such as rod hollow steel was finish. After consider all problems about

material available design for the project, we suggest to get the material outside from UMP mechanical Lab.

The problems also come during fabrication process. The cutting tool was available usually broken and lost such as grinding tool. So the solution for this problem is buying our self the grinding tool. This project have a problem when to welding parts by parts of project because gas for MIG welding was finish and forced wait for several day to get new gas for MIG welding.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introductions

This chapter is about problems the project encounter before, during and after project. This chapter also will discuss about the conclusion of the project. Problem that will be discussed entire problem encountered in every task in the project.

5.2 Conclusion

The conclusion, the project to fabricate the easy assemble tricycle was achieves the objectives successfully. The objective to produce the tricycle that easy to assemble was achieved, this tricycle is easy to assemble and easy to detach. Otherwise, this tricycle also easy to brought anywhere. It cans storage in the car and need a small place to store it. So it can save a space to other things.

The second objective also was achieved. To fabricate and introduce the new concept and ideals for future prospect of easy assemble tricycle. It can be a new design for future to produce many concept of tricycle that easy to assemble.

The third objective also was achieved, to produce a tricycle that needs small places to store it. This product is just needs a small place to store it. It is because this tricycle can be reassembling for parts by parts. So it doesn’t needs a big space to store it.

This project was done around fourteen week included the report, almost all the step such as literature review, design, fabrication process. To complete this project was follow with the planning and Gantt chart.

5.3 Recommendation

Several recommendations to express for myself and the faculty for future final year project are:

a) The task for the every student must be explaining more detail within first and second week by supervisor. This information will briefly the student about the project progress.
b) The planning schedule and Gantt chart of the project must be done before the project started.
c) The involvement of the student must be observed more efficient.
d) More time given to the project, it include statement the final year student should more focus on final year project, this could make the result of the project finish on time and have better result.

5.4 Future work

Future planning for the easy assemble tricycle is to add the function and more comfortable for the children when he using the easy assemble tricycle. If the additional can be done for the easy assemble tricycle, the project will be complete. This project can be used by the student to gain knowledge and understanding of mechanical response in process to make product and could helpful in the study of process machining such as drilling machine, cutting machine, welding and etc.

To be efficient, the upgrade should involve, using good material (example stainless steel – light and good strength). Add more accessories for more comfortable such as absorber, soft seat, and upgrade the safety for children when he using the tricycle. If the upgrade can be done the tricycle can have better performance, more

safety, good strength, more comfortable and life longer. In the future the tricycle it must more ergonomic, light, more function or useful and good from tricycle before.

APPENDIX A

Solid Work Drawing 3D and 2D

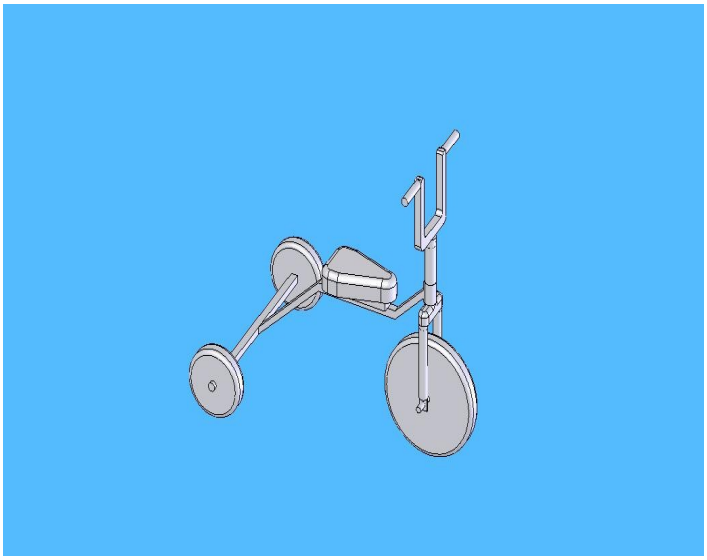


Figure A1: Isometric view

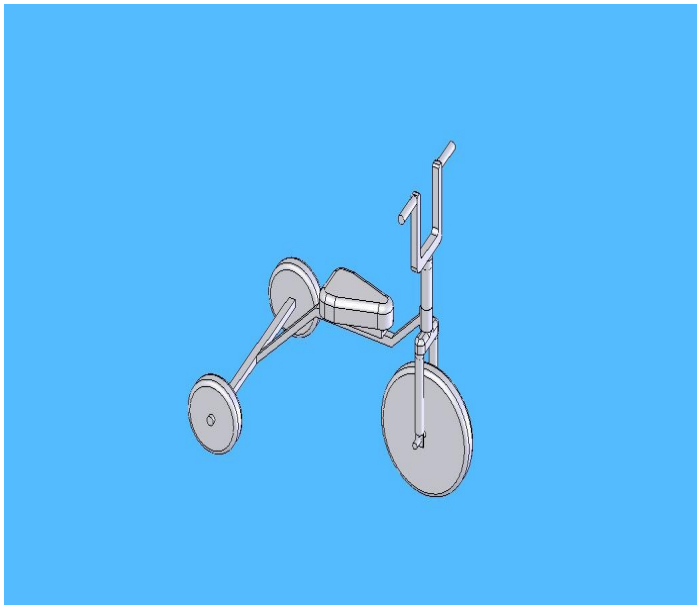
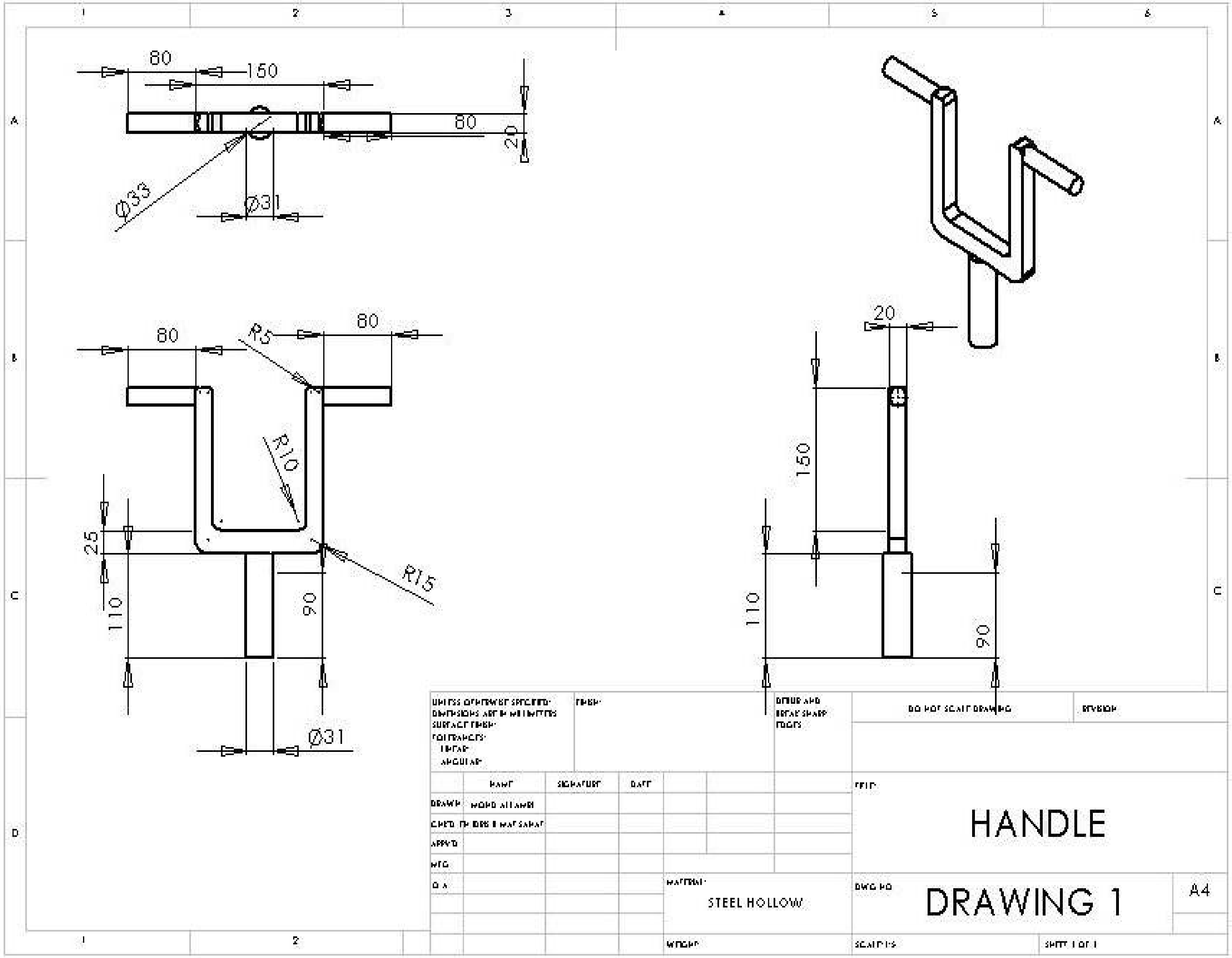


Figure A2: Diametric view


80
150
80
20
Ø33
Ø31
80
R5
80
R10
25
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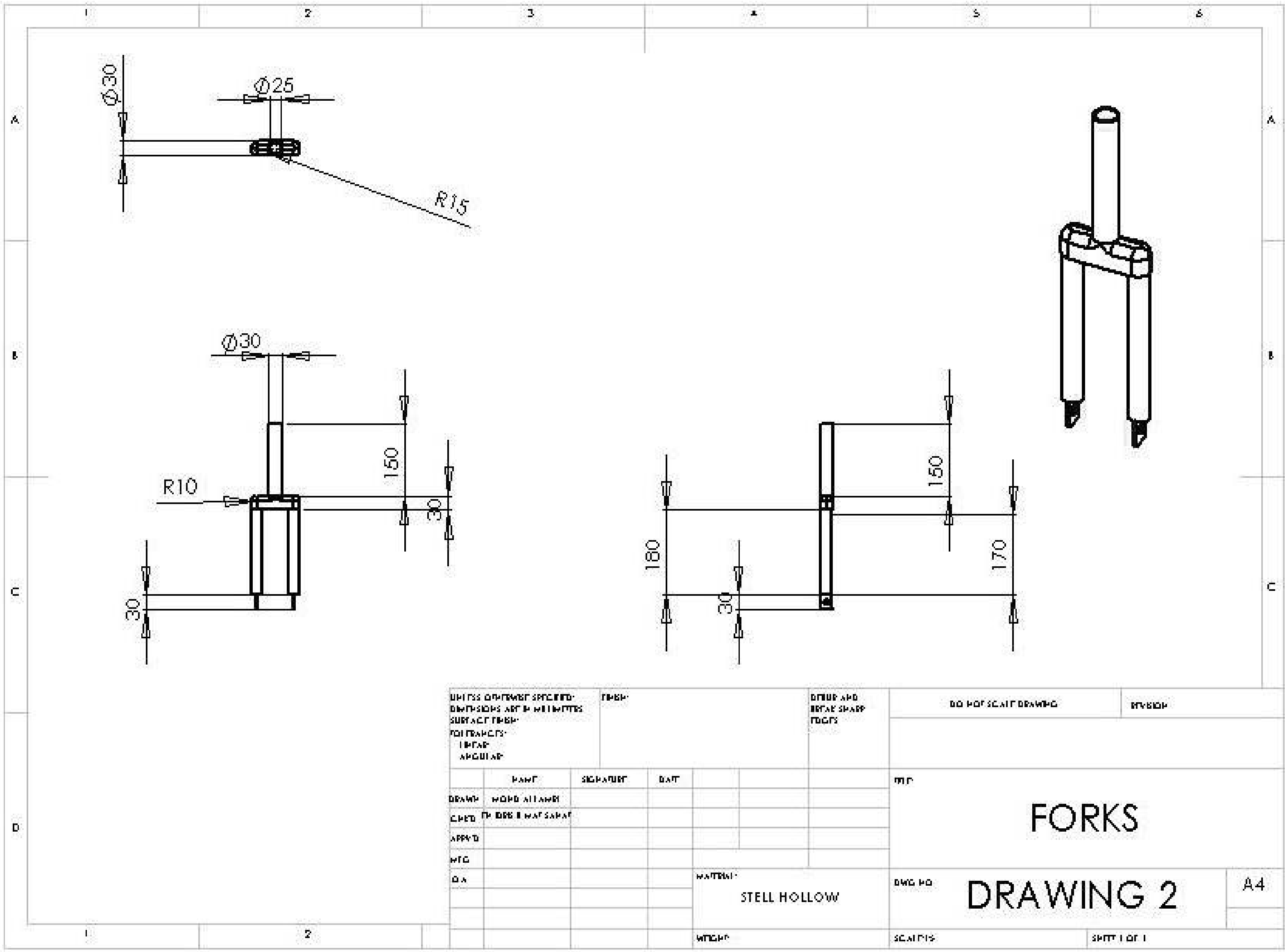
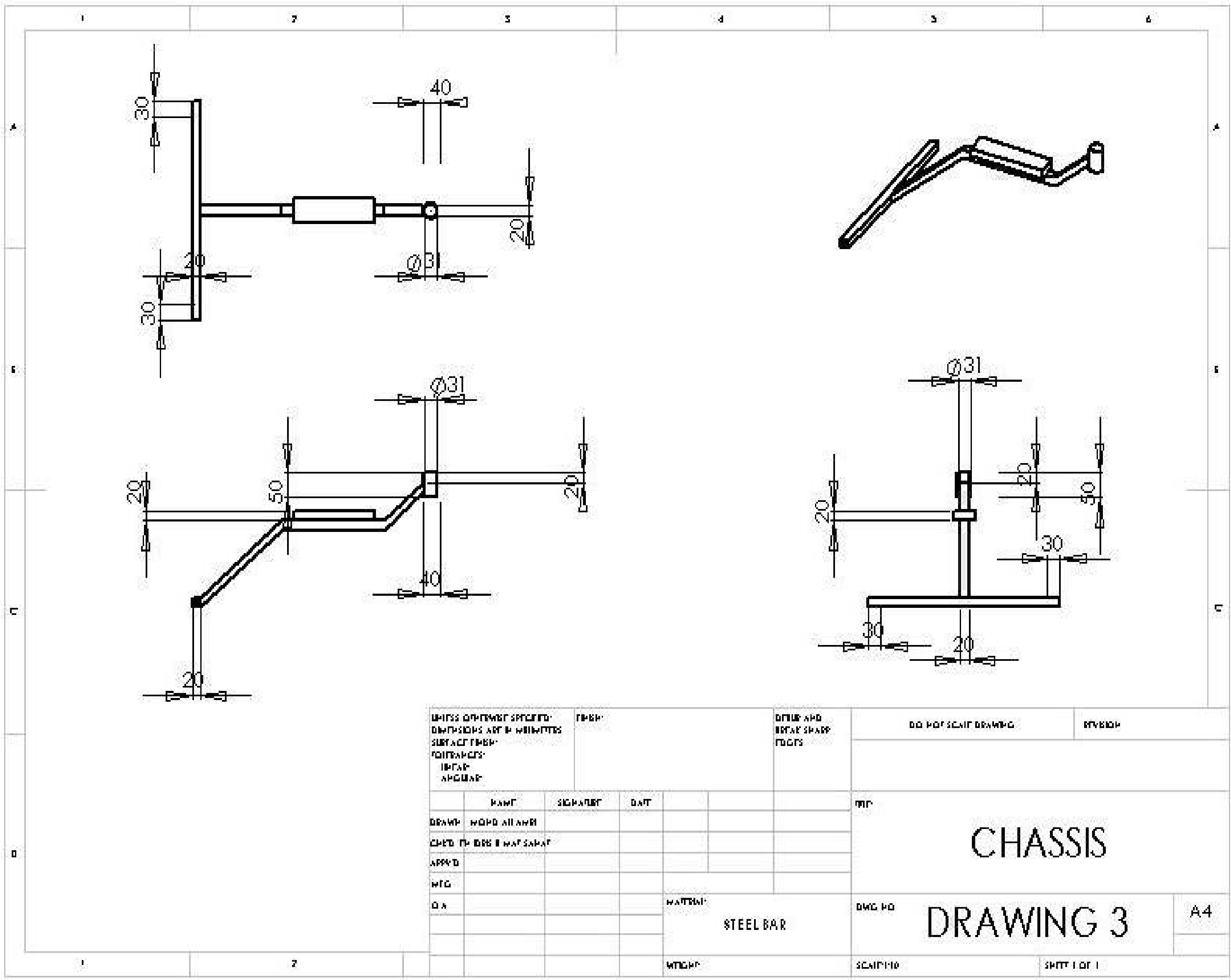
110
90
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH:
TOLERANCES:
LINEAR:
ANGULAR:
FINISH:
DEBUR AND BREAK SHARP EDGES
DO NOT SCALE DRAWING
REVISION
NAME
SIGNATURE
DATE
DRAWN
CHK'D
APPV'D
MFG
Q.A
TITLE:
HANDLE
MATERIAL:
STEEL HOLLOW
DWG NO.
DRAWING 1
A4
WEIGHT:
SCALE:1:5
SHEET 1 OF 1



Ø30
Ø25
R15
Ø30
R10
150
30
30
180
150
170
30
DO NOT SCALE DRAWING
FORKS
DRAWING 2
A4
MATERIAL:
STELL HOLLOW



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APPENDIX B

Figure B1: Floor disk cutter.

Figure B2: Grinding Machine

Figure B3: Apparatus MIG Welding Machine

Figure B4: Portable Hand Drill