

# MUSICAL BUMPERS USER MANUAL



**SNEHA SWATI**

NATIONAL INSTITUTE OF DESIGN AMRAVATI

**MEIRAV EHRlich**

HOLON INSTITUTE OF TECHNOLOGY



## FOREWORD

### Musical Bumpers Construction and Assembly Manual

Dear User,

Thank you for choosing our product to recreate for your child.

This product was created keeping in mind children with visual impairment and Autism but can be enjoyed by any child under the age of 7. The product is a simple product which can be manufactured right at the comfort of your home. However, discretion and professional aid is advised in certain processes. We hope this product brings joy and empowerment to all the children and parents who use this product for their benefit.

**Designed and Created by** - Sneha Swati and Meirav Ehrlich  
**Guides** - Gad Cherny and Tamar Ish Cassit

**Created Under** - Fixperts 3<sup>rd</sup> Year. Industrial Design

## TABLE OF CONTENTS

01	PRODUCT INTRODUCTION	05
02	PRECAUTIONS AND SAFETY MEASURES	06
03	ASSEMBLY PREPARATION	06
04	WHAT TO EXPECT	07
05	FRONT BUMPER	08
06	BACK BUMPER	18

# MUSICAL BUMPERS



A FIXPERTS PRODUCT



## 01. INTRODUCTION

### 1.1 PRODUCT DESCRIPTION

The product aims at solving problems regarding navigation with children who are visually impaired. With our fixpartner being visually impaired and on the autistic spectrum, it makes the product deal with the subject in an even more sensitive manner. It plays with the concept of sound and protection for children of this nature to enjoy themselves while being in a safe and protected environment by themselves.

The product has been designed keeping in mind the type of products designed for kids and their expensive nature. Thus our product has been kept open source and relatively easy to manufacture to increase its outreach to the people who need such a product. The manufacture and assembly are quick and the components used are easy to source and modify according to the user's requirements

### 1.1 USED SYMBOLS

-  A warning indicates the risk of (serious) damage to the user or the product if the user does not carry out the procedures with care.
-  A notice makes the user aware of convenient functions and additional options.

MB

**MORE THAN A DESIGN**

DESIGN IS FOR PEOPLE, NOT PRODUCTS

## 02. PRECAUTIONS AND SAFETY MEASURES

- ⚠ Processes like welding should be done under supervision of professionals.
- ⚠ Gloves should be worn at all times while cutting metal bits to avoid burrs.
- ⚠ Make sure all sharp edges are filleted to provide extra security for the child.
- ⚠ Create the product as instructed in the manual for best results.
- ⚠ Product should not be disconnected very often, to prevent wearing off of the paint.
- ⚠ Metal edges or the tyres used should be rounded off.
- ⚠ Paint used should be non toxic and children friendly.
- ⚠ Toys should be good quality squeaking toys, for longevity.
- ⚠ Sound checks with the toys should be done beforehand to avoid discomfort.

## 03. ASSEMBLY PREPARATION

### 3.1 TYRE

Acquire the tyre intended for use in the musical bumpers beforehand to buy other materials accordingly. A worn out one with thinner surfaces are ideal.

### 3.2 PIPE CLAMPS

The pipe clamps used in the design should be bought according to the gauge of the bicycle/tricycle's structure hence cycle should be measured before proceeding.

## 04. WHAT TO EXPECT IN THE ASSEMBLY INSTRUCTIONS

### 4.1 STRUCTURE OF THE ASSEMBLY INSTRUCTIONS

Before assembling the Musical Bumpers, separate sub assemblies have to be built and constructed.

The description of every sub assembly in this manual will contain:

- An overview of the needed tools;
- An estimation of the needed time to built the sub assembly;
- The steps;

Every step in this manual will be described using the following structure:

- Cautions and warnings (if applicable);
- The needed parts;
- The actions to perform the step

To make this manual easy to understand, images are used as much as possible.

### 4.2 DIFFERENT PARTS OF THE MUSICAL BUMPER

In this manual, you will read about FRONT bumper and the BACK bumper,. In image 1 these terms are clarified.

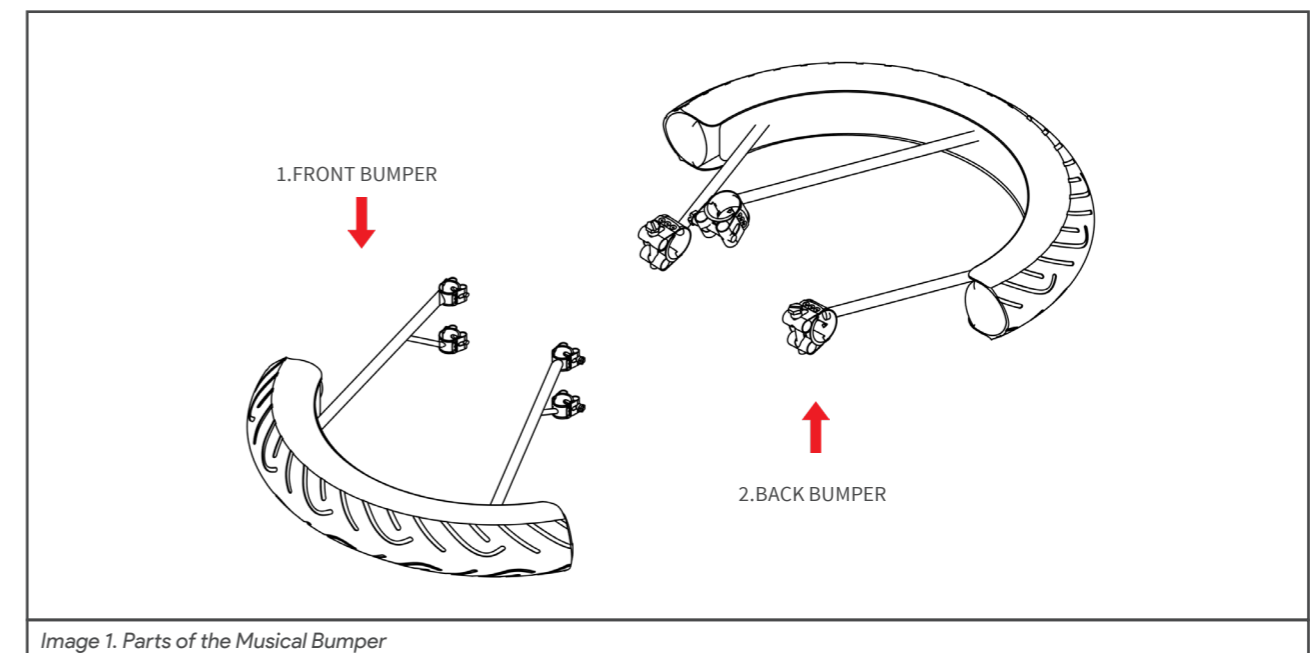


Image 1. Parts of the Musical Bumper

## 05. ASSEMBLING THE MUSICAL BUMPERS- FRONT BUMPER



### 5. FRONT BUMPER

The front bumper will be customized according to the front half of your child's tricycle/ bicycle, and shall be used for the most bumping towards the front!

#### 5.1 Bill of Materials

S No.	Part Name	Dimensions	Quantity	Specification
1.	Tyre	Cut 390 mm Chord from Tyre of Dia.- 420 mm, Thk.-70 mm	1	Holds Toys
2.	Squeaky toys	120 mm to 150 mm	3	Makes Squeaking Noise
3.	Iron Strip	4 mm x 60 mm x 425 mm + extra mm (for bending)	1	Round Bending
4.	Iron Bits	4 mm x 20 mm x 30 mm	9	Cut and Welded
5.	Steel Pipe	12.5 mm OD x 220 mm	2	Cut and Welded
6.	Steel Rods	6 mm OD x 65 mm	2	Cut and Welded
7.	Pipe Clamps	23-25 mm	4	Welded for Connecting
8.	Rubber Ends	70 mm x 70 mm x 40 mm	2	For ending
9.	Screws ( Pan Phillips STS)	25 mm Gauge size 4	2	Screwing endings
10.	Blind Rivets	1/4 dia .376 - .500 cm	9	Riveting Tire to Frame

#### 5.2 Sub-Assembly One ( Metal Frame)

**Time** - 1 1/2 - 2 hours

**Tools** - Circular Bending Machine / Jig  
 Abrasive Saw  
 Metal Sander  
 Gas Metal Arc Welding Machine  
 Sand Blasting Machine  
 Pliers  
 Sanding Paper  
 Measuring tape  
 Pen / Pencil  
 Protractor

## Parts Required -

S No.	Part Name	Dimensions	Quantity	Specification
1.	Iron Strip	4 mm x 60 mm x 425mm + extra mm (for bending)	1	Round Bending
2.	Iron Bits	4 mm x 20 mm x 30 mm	9	Cut and Welded
3.	Steel Pipe	12.5 mm OD x 220 mm	2	Cut and Welded
4.	Steel Rods	6 mm OD x 65 mm	2	Cut and Welded

## Preparation

### Step One - Cutting

All the metal parts should be cut and sanded before proceeding with other steps. 

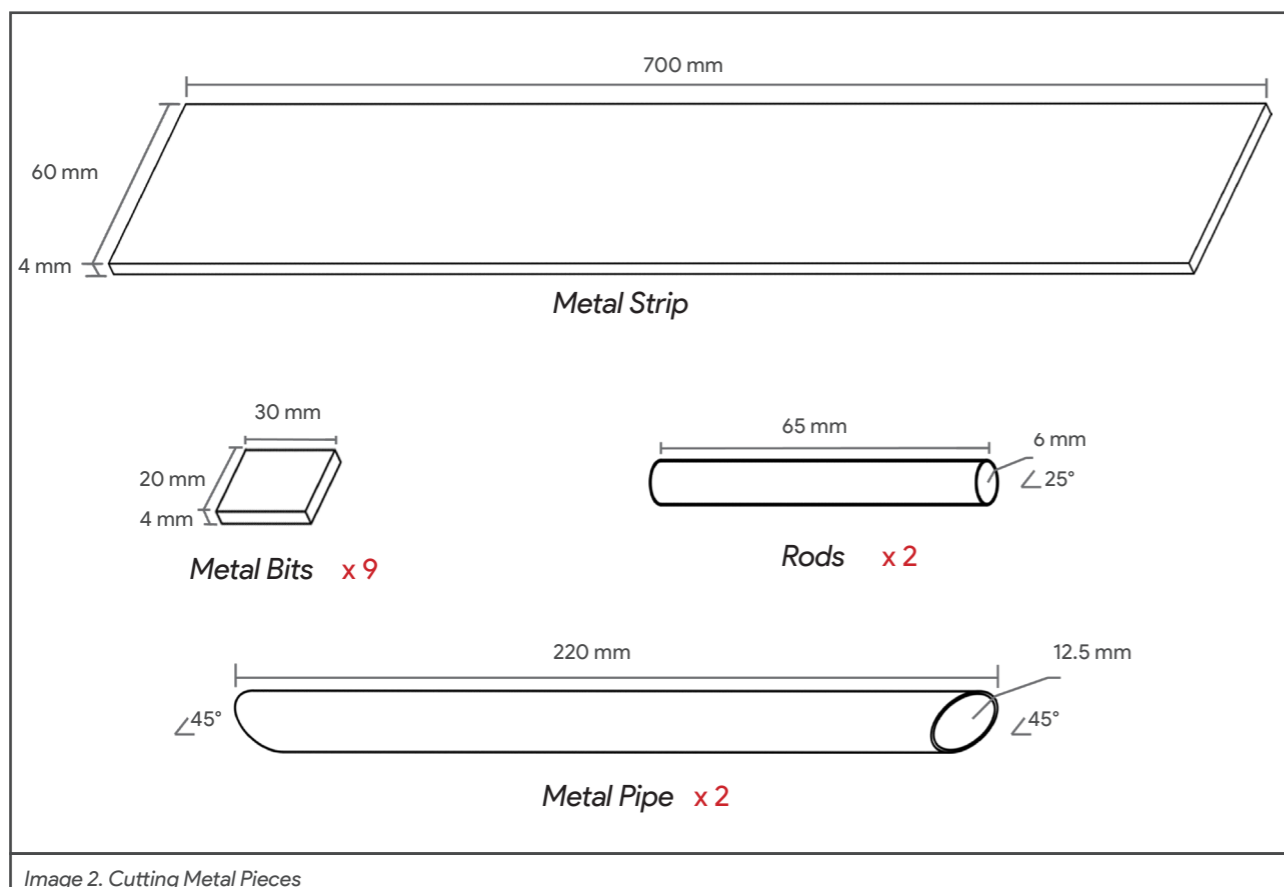


Image 2. Cutting Metal Pieces

- ✦ The 45° angles for the metal pipe should be at right angles to each other
- ✦ The 25° angle for the metal rod should be only be on one side.
- ✦ The metal strip should have some extra length for gripping while bending.

### Step Two - Bending

Bend the metal strip that has been cut with some extra on a Circular Bending Machine.

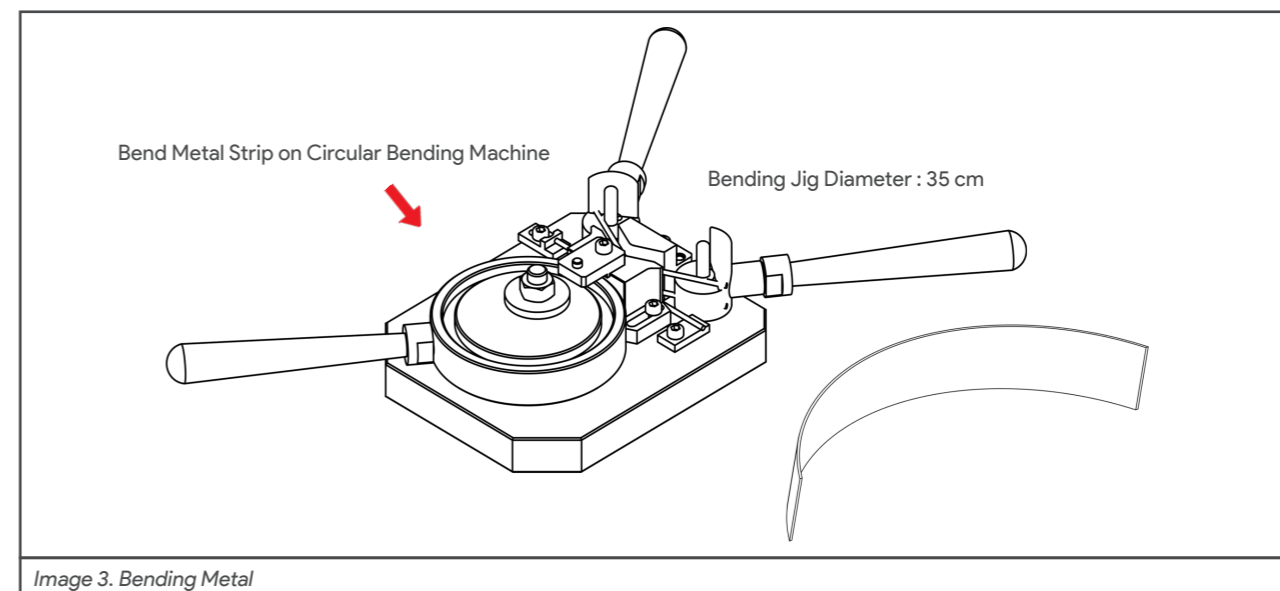


Image 3. Bending Metal

- ✦ The metal strip should be cut to 425 mm length

### Step Three - Filletting and Drilling

Fillet the 9 Metal Bits and the Metal Strips. Drill holes in the Metal bits and a slot in the Pipes.

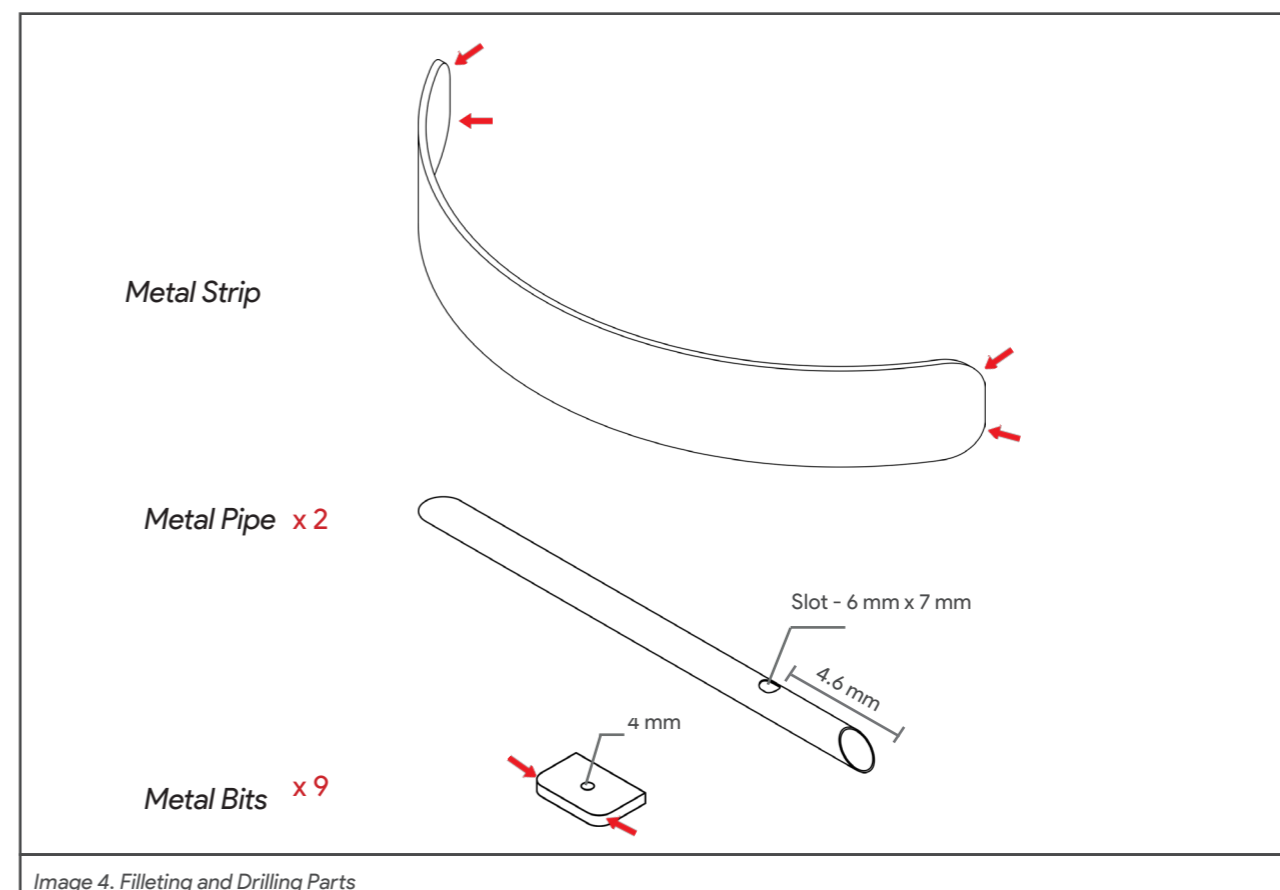
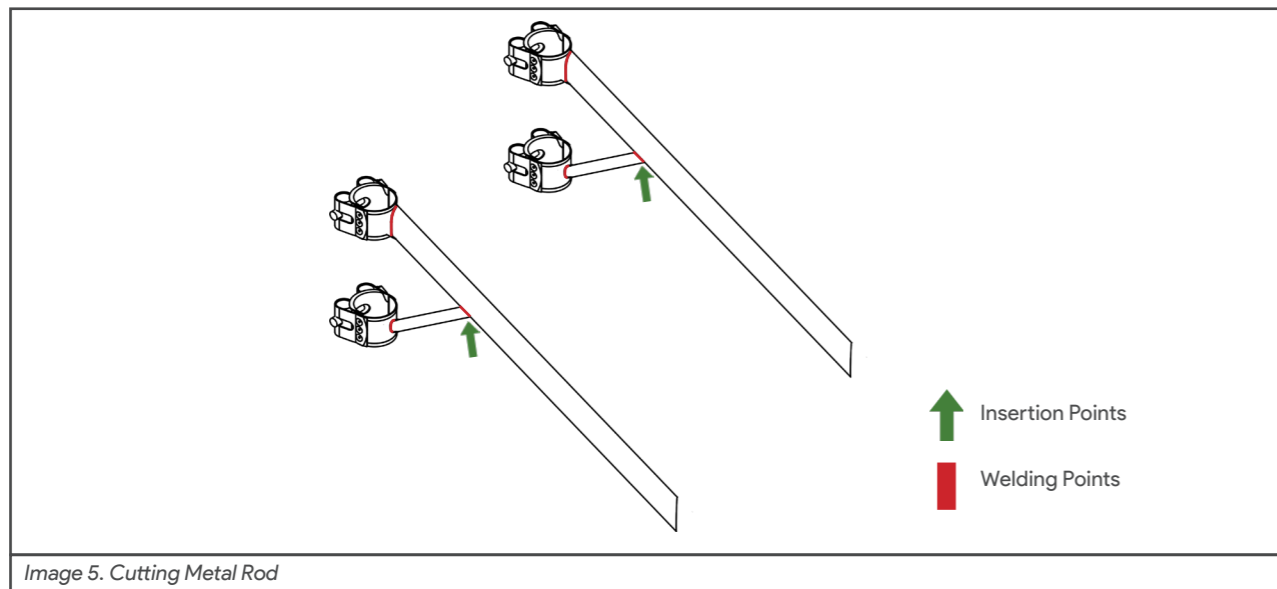


Image 4. Filletting and Drilling Parts

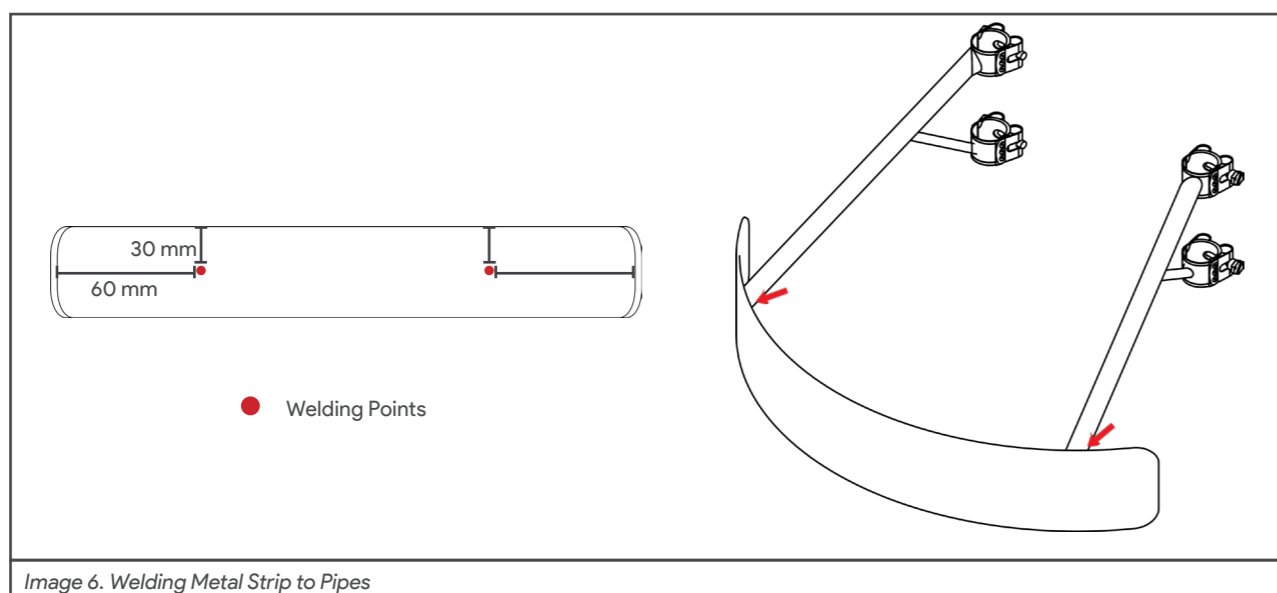
## Step Four - Welding



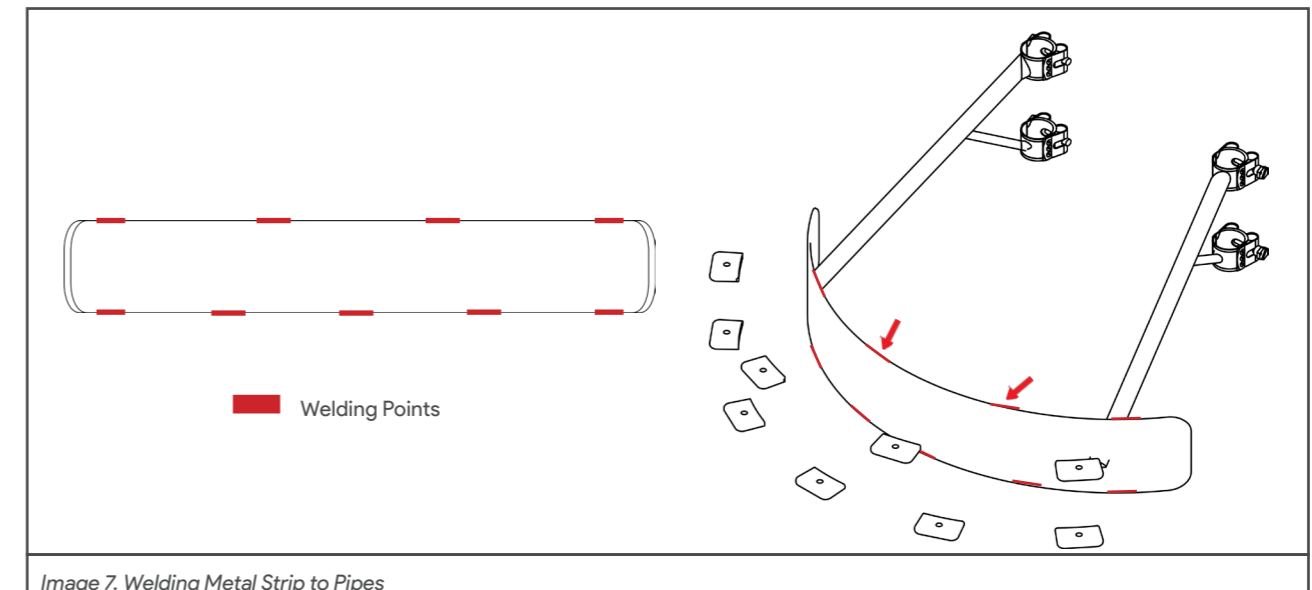
1. Insert the 6 mm rods into the slots and weld to the pipe.
2. Weld the Pipe and Rods to the Pipe Clamps.



3. Weld the Connected Pipe structures with connectors to the metal Strip

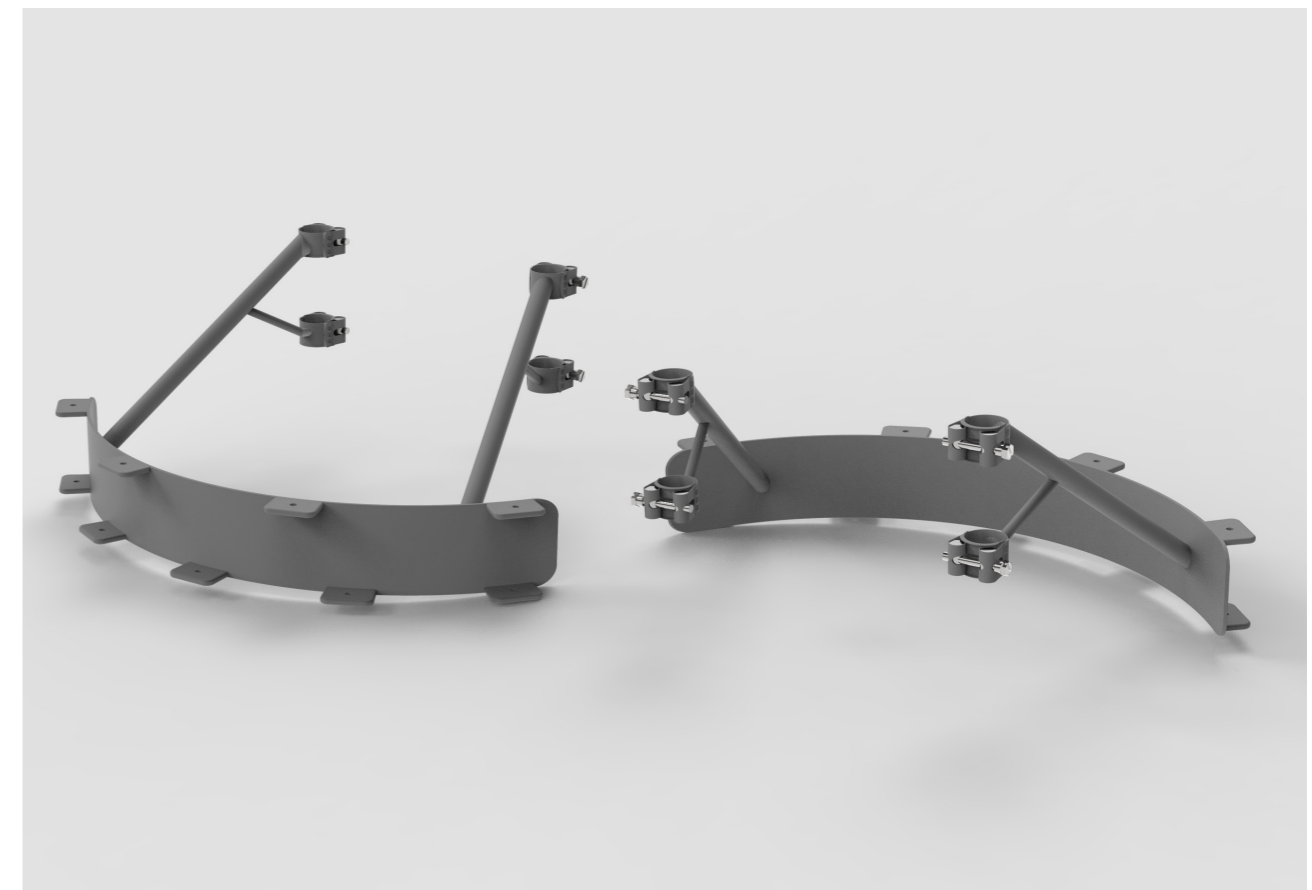


4. Weld the Metal Bits to the Metal Frame, 4 on top 5 on the bottom.



## Step Five - Powder Coating

Post finishing the frame send your frame for powder coating to protect it from rusting and also to give it a colour finish. Your frame should look something like this!  
The powder coating should be done after you finish the frame for the back bumper as well.



### 5.3 Sub-Assembly Two (Front Bumper)

**Time** - 1/2 hour to 1 hour

**Tools** - Miter Saw  
Wire Cutter  
Drill  
Riveter  
Brushes  
Screwdriver

#### Parts Required -

S No.	Part Name	Dimensions	Quantity	Specification
1.	Tyre	Cut 390 mm Chord from Tyre of Dia.- 420 mm, Thk.-70 mm	1	Holds Tyre
2.	Metal Frame	Just Created	1	Attached to tyre
3.	Squeaky Toys	120 mm to 150 mm	3	Makes Squeaking Noise
4.	Rubber Ends	70 mm x 70 mm x 40 mm	2	For ending
5.	Screws ( Pan Phillips STS)	25 mm Gauge size 4	2	Screwing endings
6.	Blind Rivets	1/4 dia 3.76 - 5 mm	9	Riveting Tyre to Frame

### Assembly

#### Step One - Cutting

Cut a Tyre with a Miter Saw to a 39 cm Chord from Tyre of Dia.- 42 cm, Thk.-7 cm

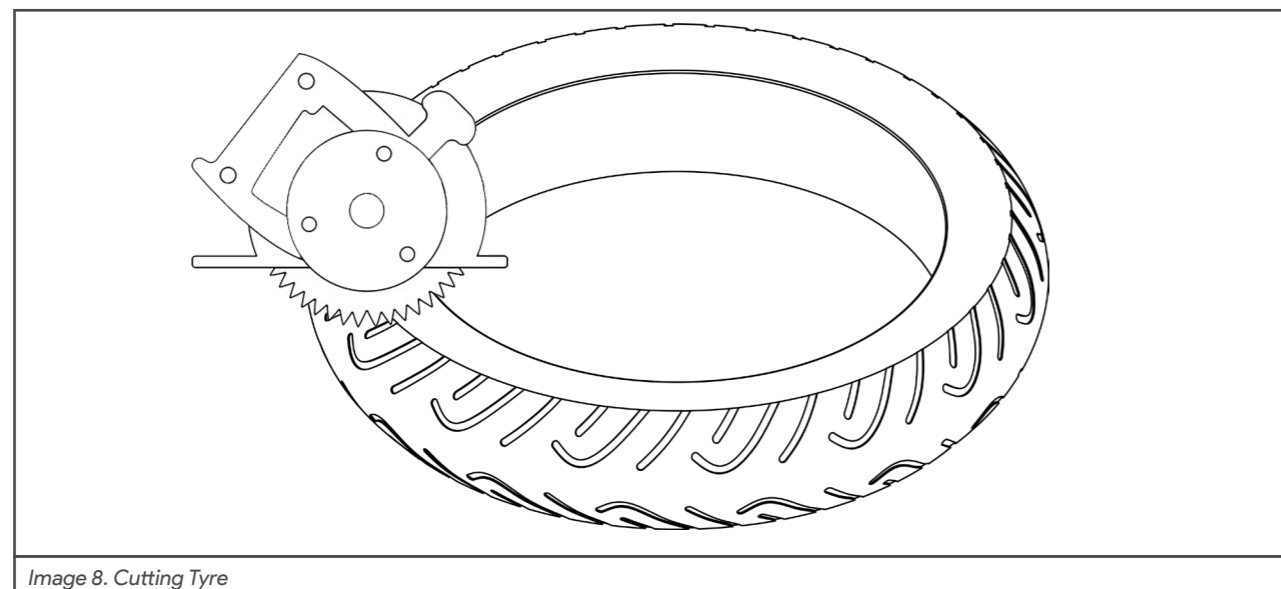


Image 8. Cutting Tyre

#### Step Two - Filleting and Drilling

1. Fillet the ends of the cut tyre to make it safe for the child.
2. Drill 4 mm holes where ever the metal bit's holes coincide with the tyre. ( 9 holes )

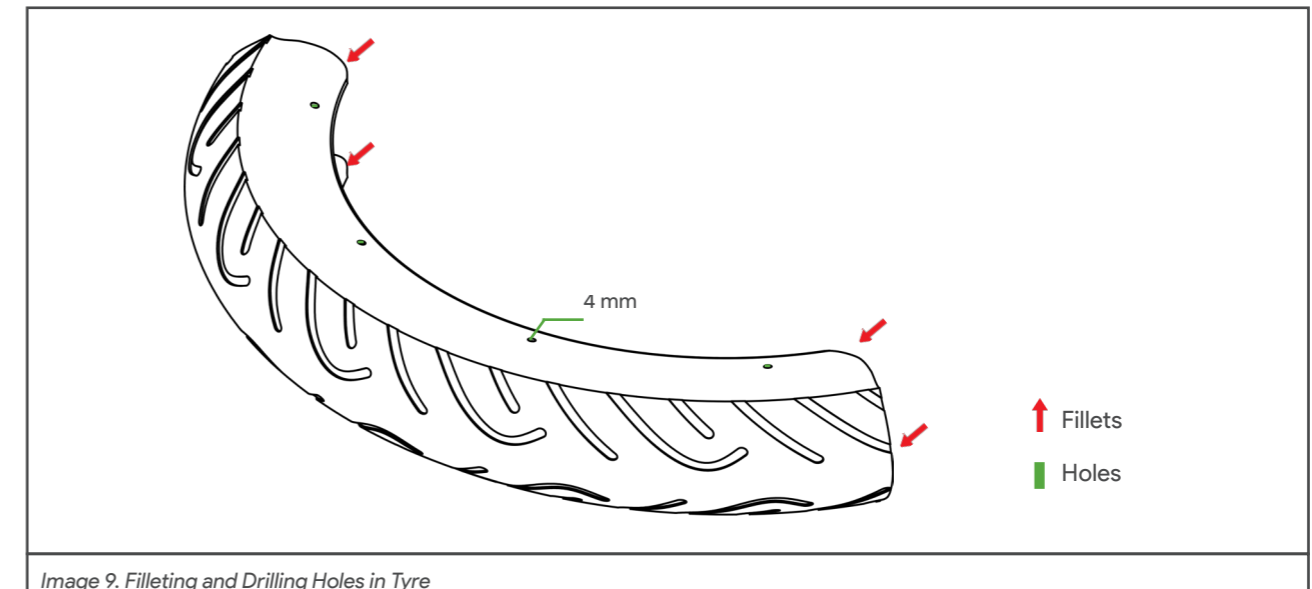


Image 9. Filleting and Drilling Holes in Tyre

\* Most tyres will have a metal wire sticking out which should be removed from the ends .

#### Step Three -

Place toys in the tyre. ( 3 according to measure )

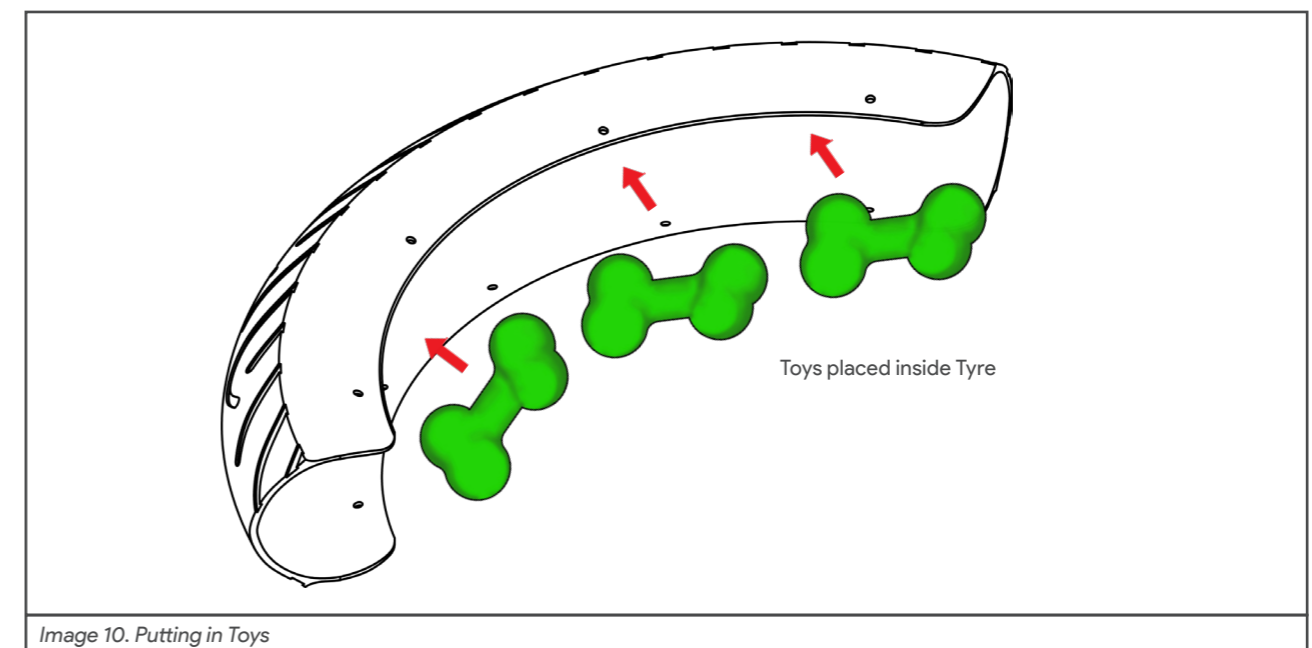
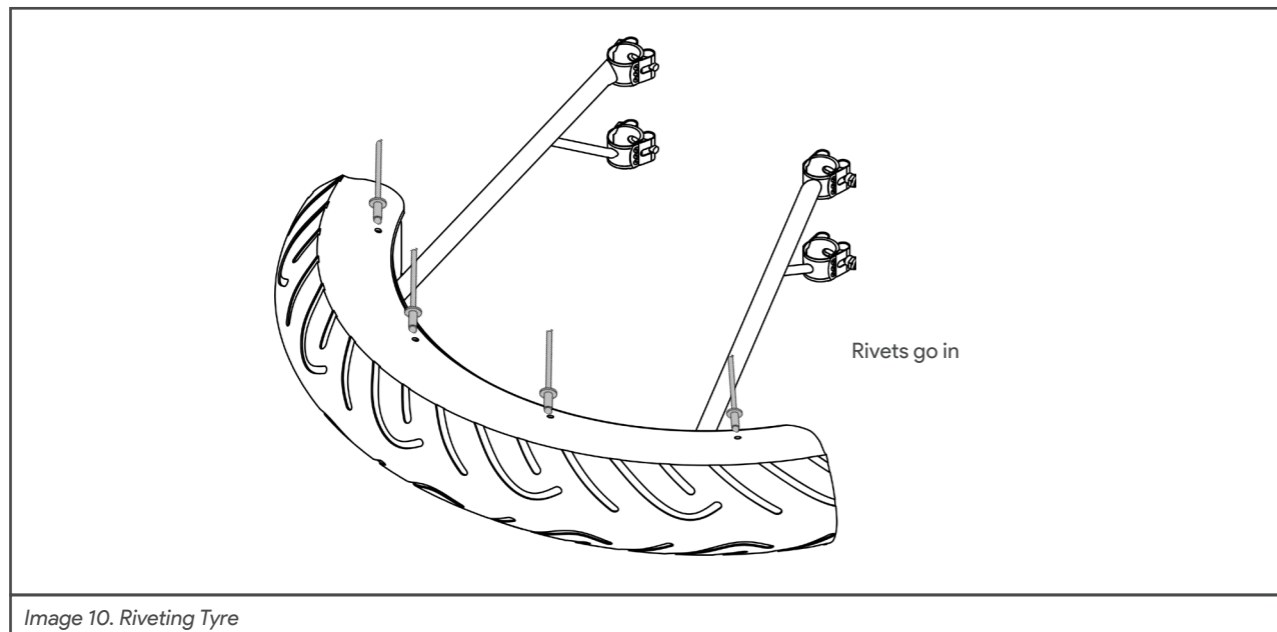


Image 10. Putting in Toys



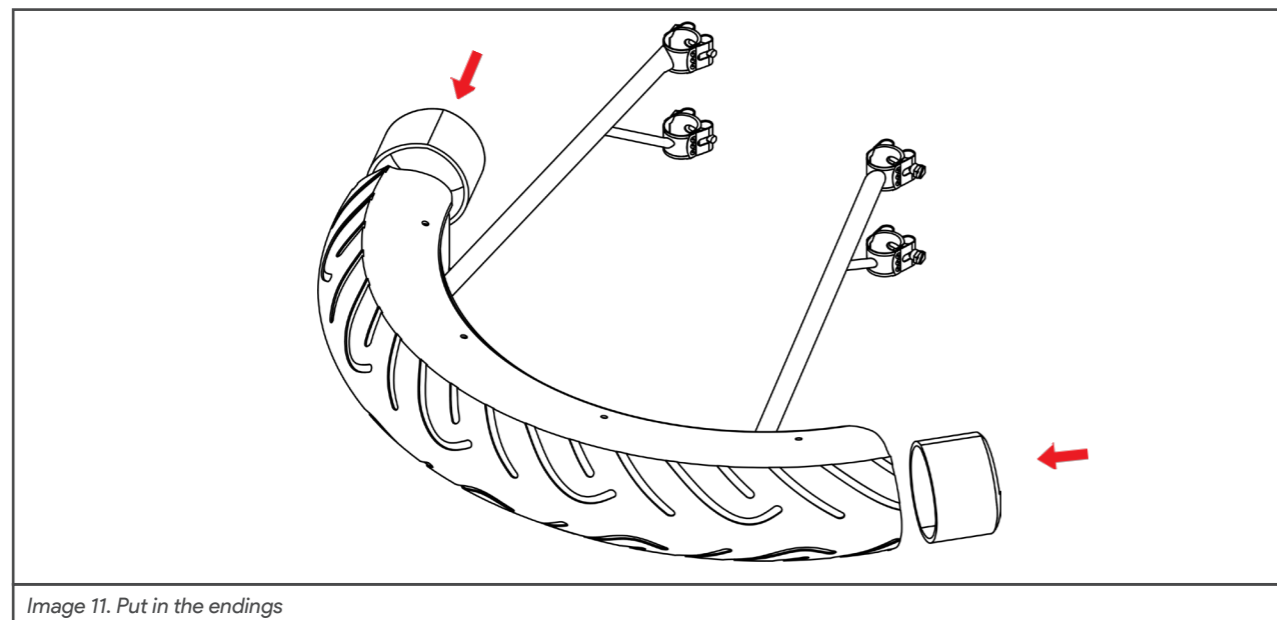
#### Step Four -

Rivet the Tyre to the Frame using Blind Rivets. 9 required.



#### Step Five -

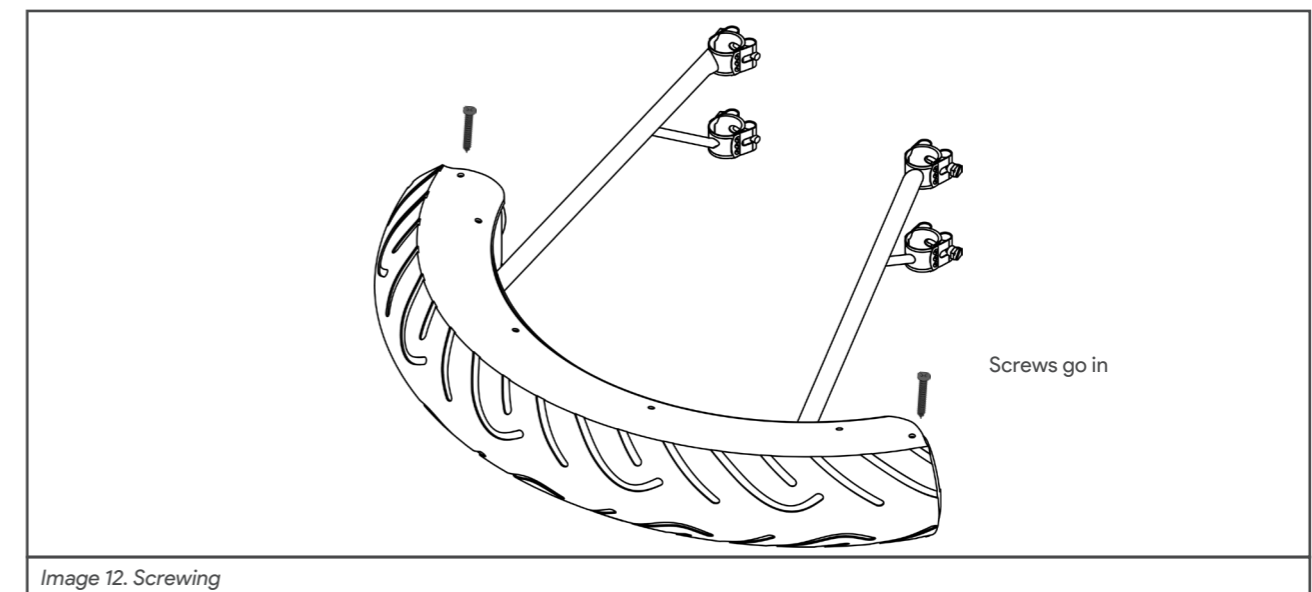
Put in the endings



✳ Squeeze the Endings to go in only till the end of the tyre and not more.

#### Step Six -

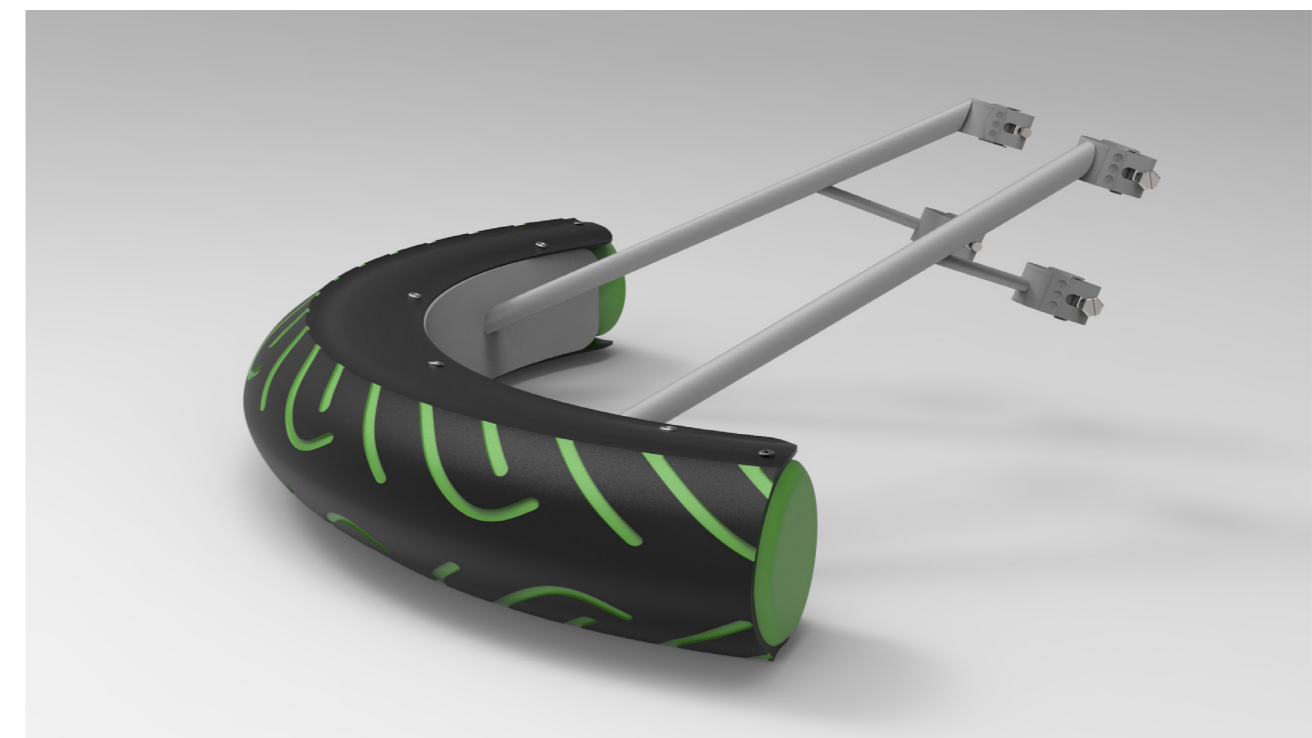
Screw the Endings to the tyre.



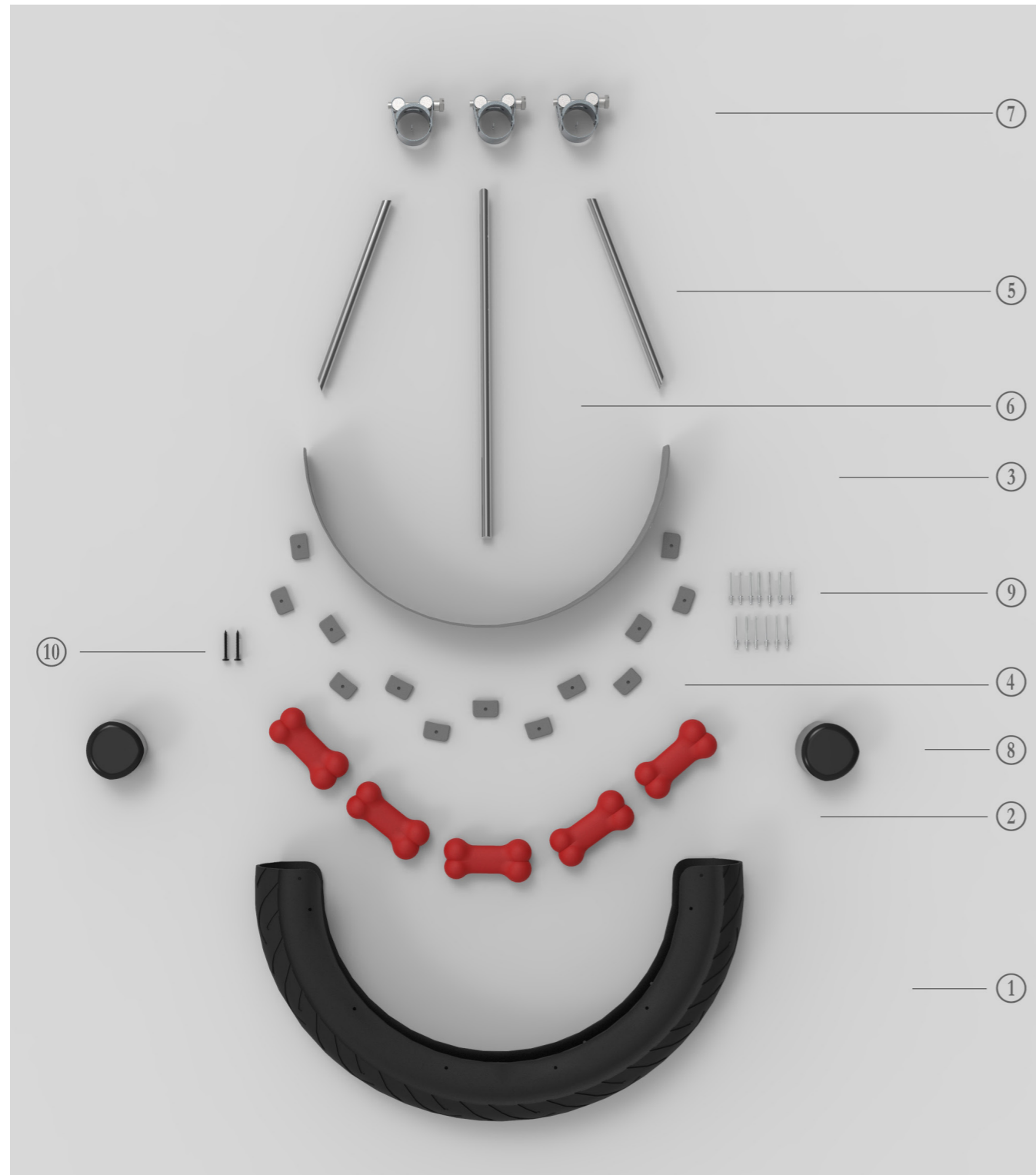
✳ Prefer screws so that toys can be replaced if required.

#### Step Seven- Painting

Post Assembly Paint the grooves of the tyre or the entire tyre in any colour you want and enjoy! The Paint used should preferably Optilon synthetic rubber or Chlorinated Synthetic Rubber Paint to keep it long lasting!



## 06. ASSEMBLING THE MUSICAL BUMPERS- BACK BUMPER



### 6. BACK BUMPER

The back bumper will be customized according to the back half of your child's tricycle/ bicycle, and shall be used for the most bumping towards the back and also make them aware

#### 6.1 Bill of Materials

S No.	Part Name	Dimensions	Quantity	Specification
1.	Tyre	Cut 420 mm Chord from Tyre of Dia.- 420 mm, Thk.-70 mm	1	Holds Toys
2.	Squeaky toys	120 mm to 150 mm	5	Makes Squeaking Noise
3.	Iron Strip	4 mm x 60 mm x 660 mm + extra mm (for bending)	1	Round Bending
4.	Iron Bits	4 mm x 20 mm x 30 mm	13	Cut and Welded
5.	Steel Pipe	12.5 mm OD x 240 mm	2	Cut and Welded
6.	Steel Pipe	12.5 mm OD x 410 mm	1	Cut and Welded
7.	Pipe Clamps	40-43 mm	3	Welded for Connecting
8.	Rubber Ends	70 mm x 70 mm x 40 mm	2	For ending
9.	Screws ( Pan Phillips STS)	25 mm Gauge size 4	2	Screwing endings
10.	Blind Rivets	1/4 dia 3.76 - 5.00 mm	13	Riveting Tire to Frame

#### 6.2 Sub-Assembly One ( Metal Frame)

Time - 1 1/2 - 2 hours

**Tools** - Circular Bending Machine / Jig  
 Abrasive Saw  
 Metal Sander  
 Gas Metal Arc Welding Machine  
 Sand Blasting Machine  
 Pliers  
 Sanding Paper  
 Measuring tape  
 Pen / Pencil  
 Protractor

## Parts Required -

S No.	Part Name	Dimensions	Quantity	Specification
1.	Iron Strip	4 mm x 60 mm x 660 mm + extra mm (for bending)	1	Round Bending
2.	Iron Bits	4 mm x 20 mm x 30 mm	13	Cut and Welded
3.	Steel Pipe	12.5 mm OD x 220 mm	2	Cut and Welded
4.	Steel Pipe	12.5 mm OD x 410 mm	1	Cut and Welded

## Preparation

### Step One - Cutting

All the metal parts should be cut and sanded before proceeding with other steps. 

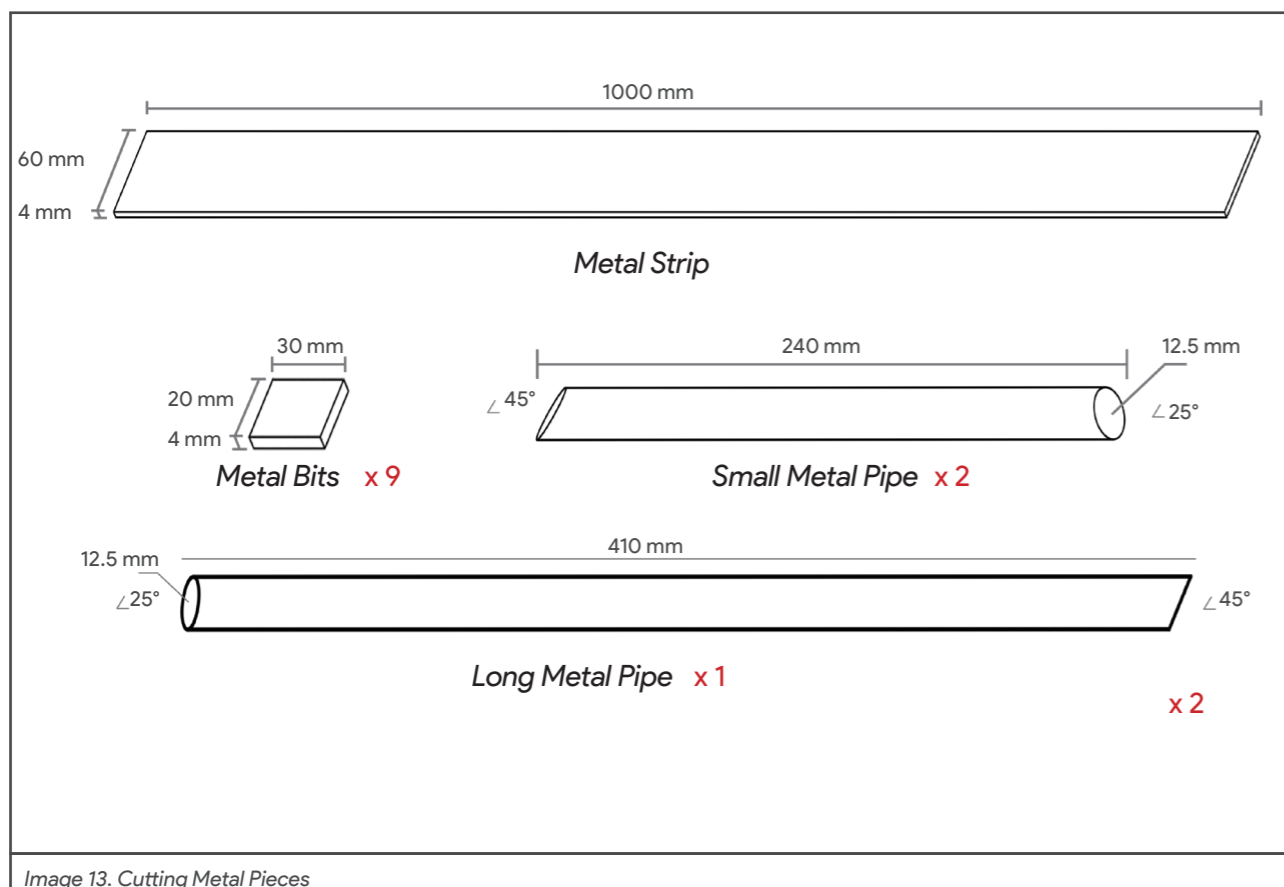


Image 13. Cutting Metal Pieces

✱ The 45° and 25° cut angles should be at right angles to each other for both set of Pipes

✱ The metal strip should have some extra length for gripping while bending.

### Step Two - Bending

Bend the metal strip that has been cut with some extra on a Circular Bending Machine.

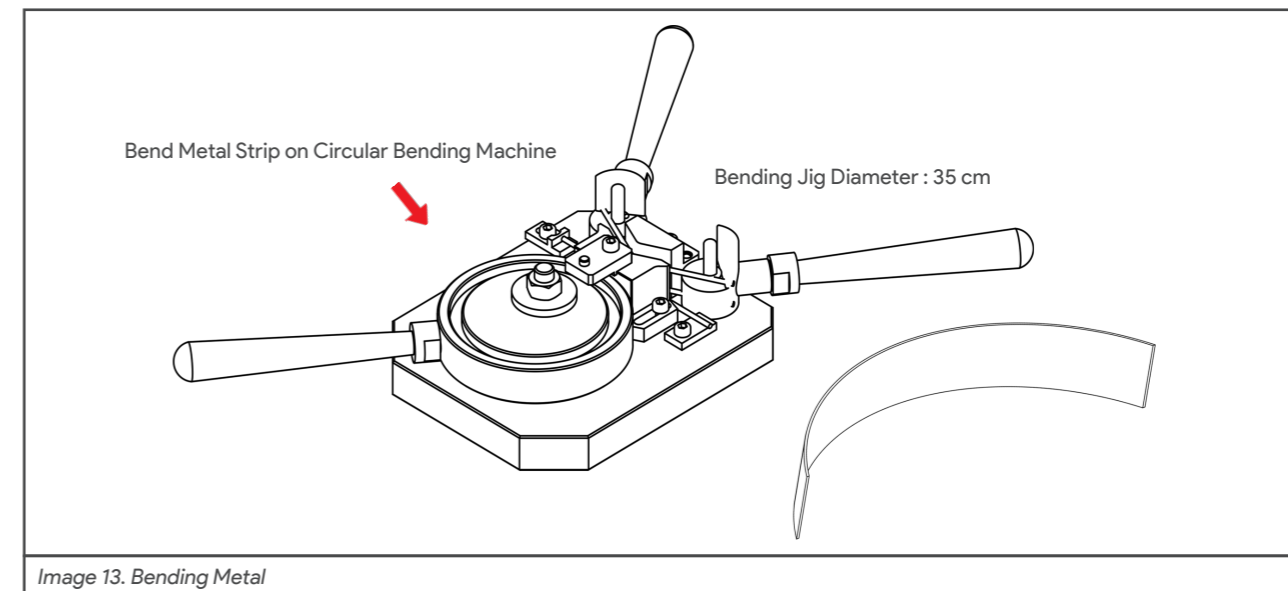


Image 13. Bending Metal

✱ The metal strip should be cut to 660 mm length

### Step Three - Filletting and Drilling

Fillet the 9 Metal Bits and the Metal Strips. Drill holes in the Metal bits and a slot in the Pipes.

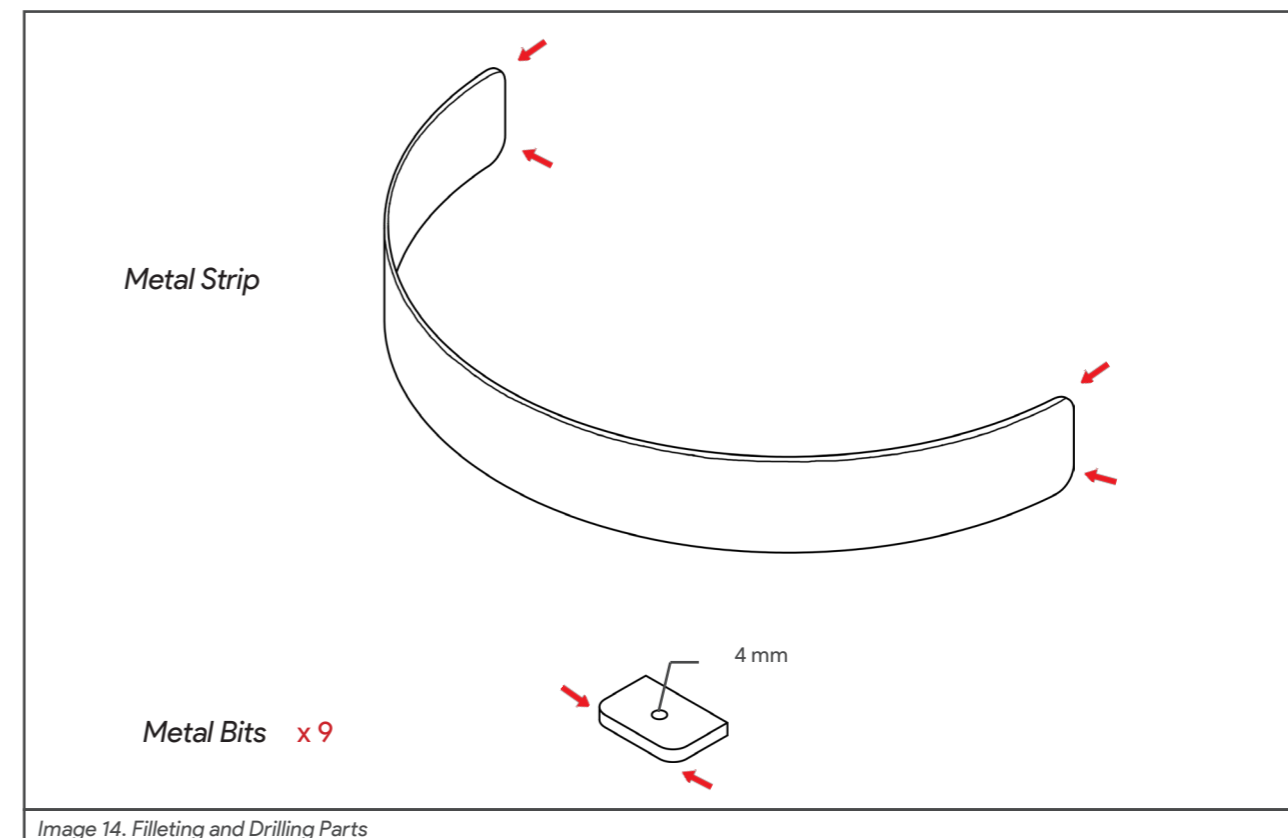


Image 14. Filletting and Drilling Parts

## Step Four - Welding



1. Weld the Pipes to the Pipe Clamps.

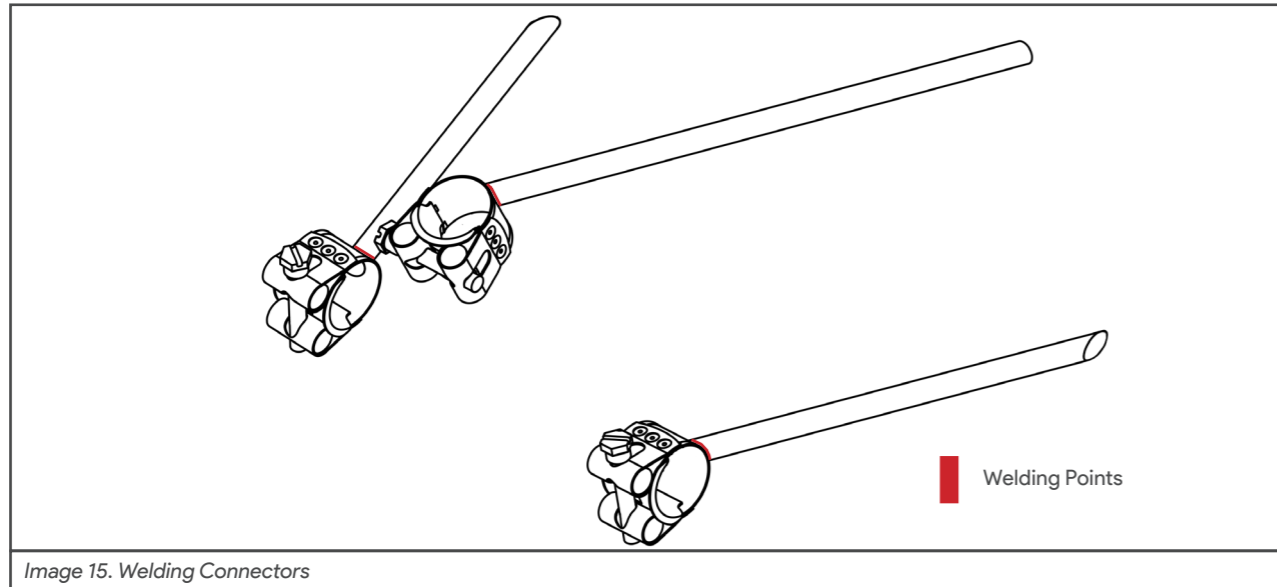


Image 15. Welding Connectors

2. Welding the Connected Pipes to Bended Metal Strip.

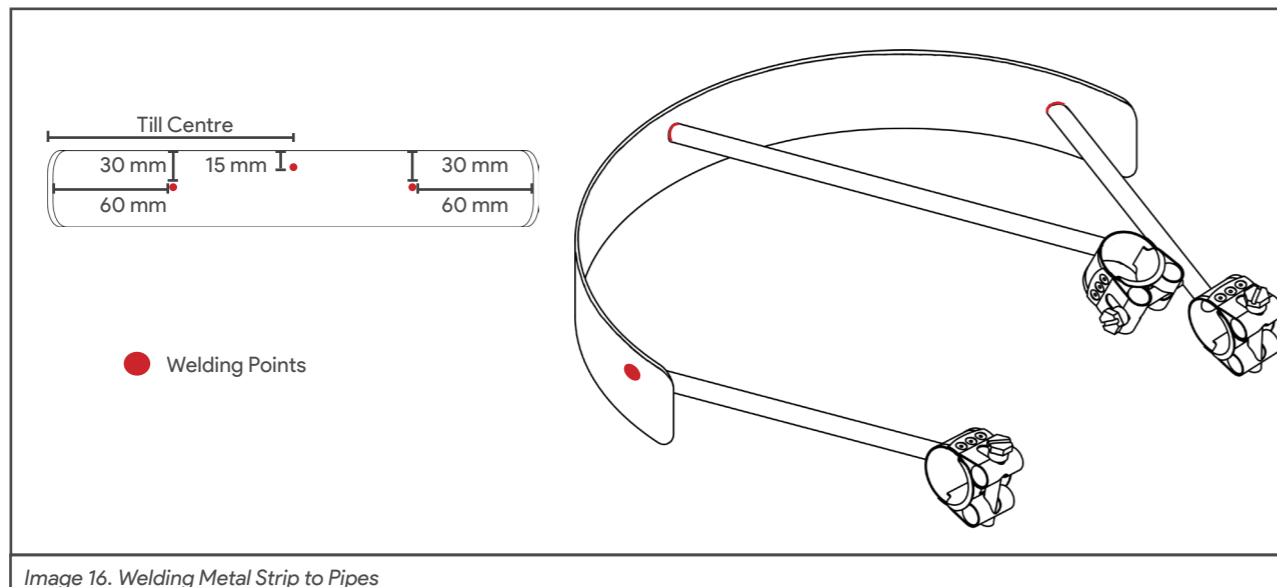


Image 16. Welding Metal Strip to Pipes

- ✦ Make sure the angles align to the Connectors and Metal Strip
- ✦ Left to Right 45°, 25°, 45° towards the Metal Strip.

3. Weld Metal Bits to Metal Strip at alternate points on both sides. 6 on top 7 on the bottom.

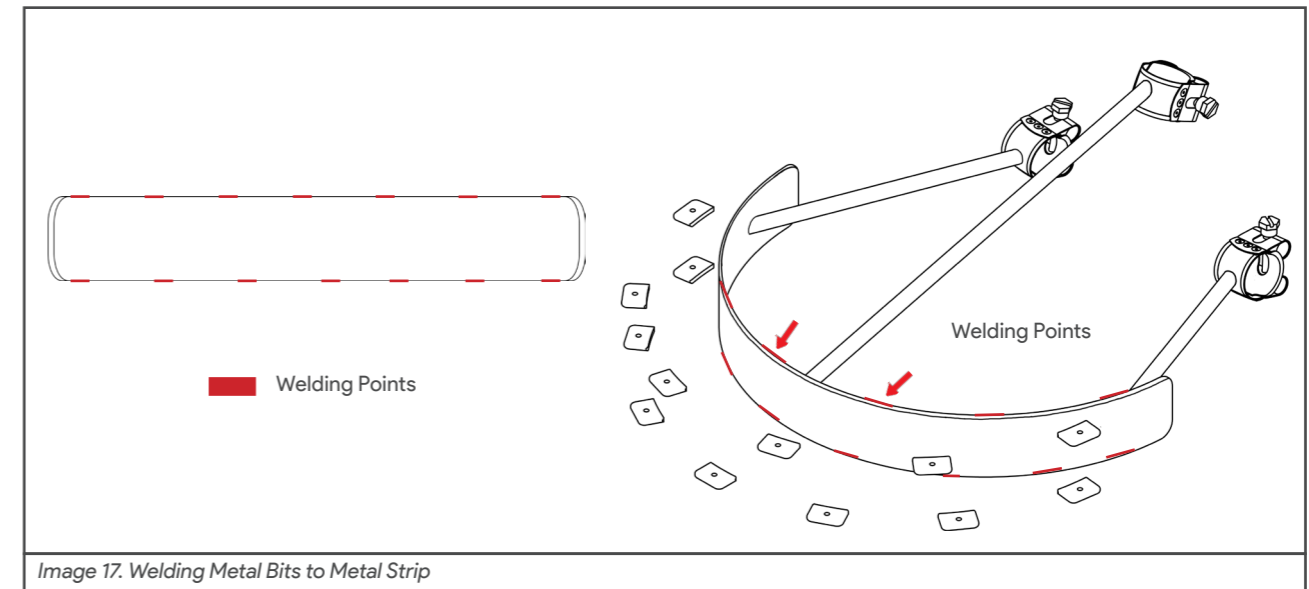
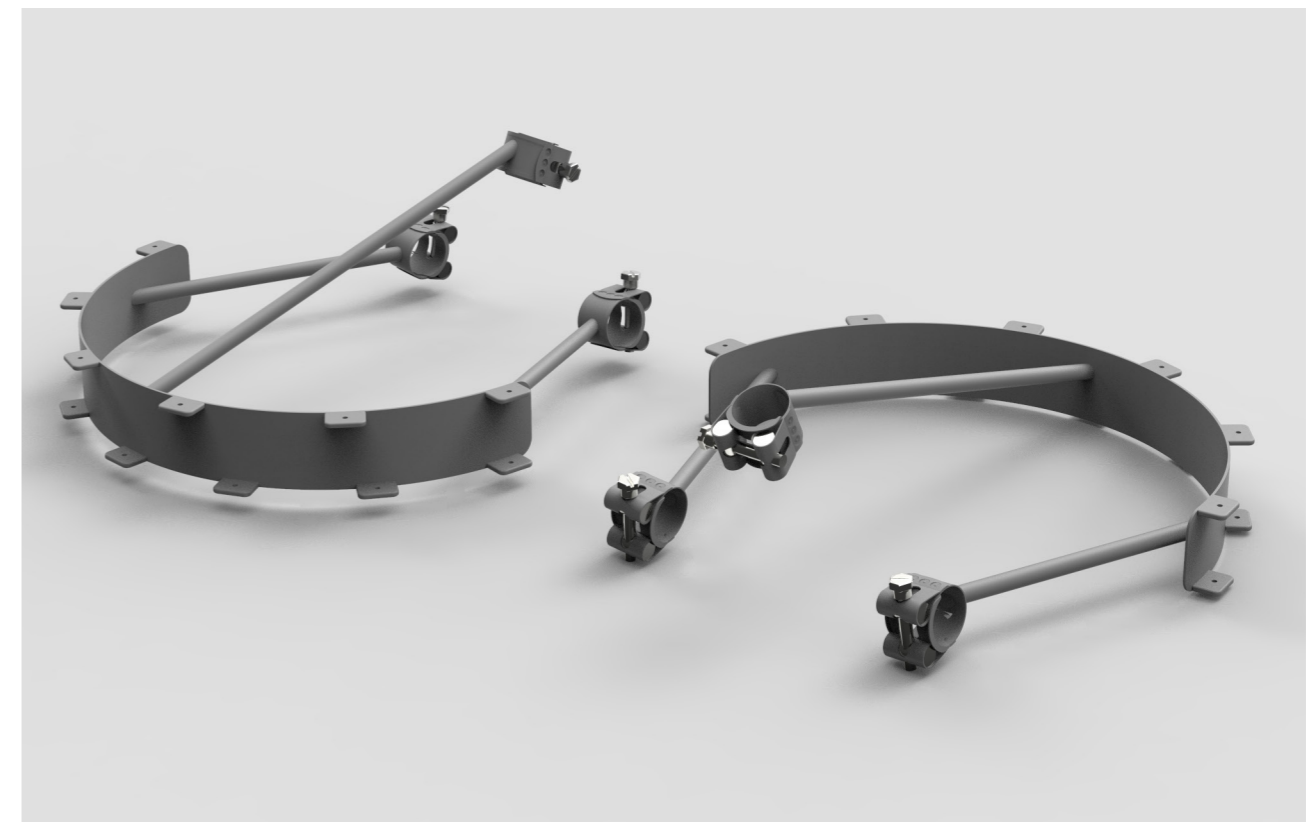


Image 17. Welding Metal Bits to Metal Strip

## Step Five - Powder Coating

Post finishing the frame send your frame for powder coating to protect it from rusting and also to give it a colour finish. Your frame should look something like this!



### 6.3 Sub-Assembly Two (Back Bumper)

**Time** - 1/2 hour to 1 hour

**Tools** - Miter Saw Machine / Jig

Wire Cutter

Drill

Riveter

Brushes

Screwdriver

#### Parts Required -

S No.	Part Name	Dimensions	Quantity	Specification
1.	Tyre	Cut 420 mm Chord from Tyre of Dia.- 420 mm, Thk.-70 mm	1	Holds Tyre
2.	Metal Frame	Just Created	1	Attached to tyre
3.	Squeaky Toys	120 mm to 150 mm	5	Makes Squeaking Noise
4.	Rubber Ends	70 mm x 70 mm x 4 mm	2	For ending
5.	Screws ( Pan Phillips STS)	25 mm Gauge size 4	2	Screwing endings
6.	Blind Rivets	1/4 dia 3.76 - 5.00 cm	13	Riveting Tyre to Frame

### Assembly

#### Step One - Cutting

Cut a Tyre with a Miter Saw to a 42 cm Chord from Tyre of Dia.- 42 cm, Thk.-7 cm

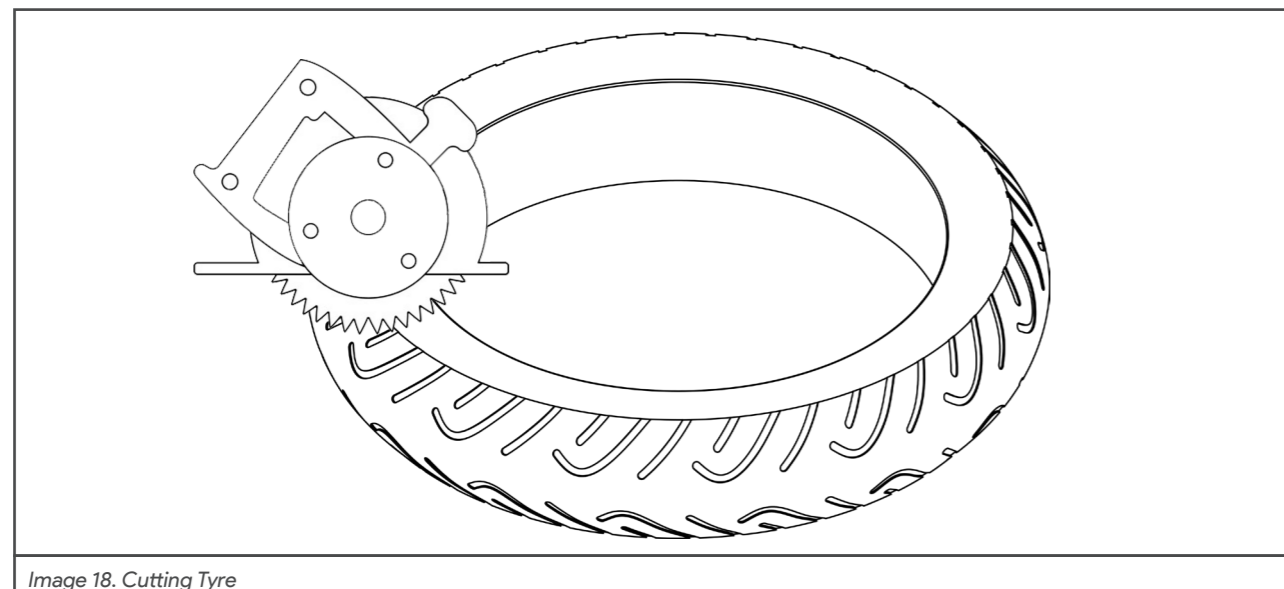


Image 18. Cutting Tyre

#### Step Two - Filletting and Drilling

1. Fillet the ends of the cut tyre to make it safe for the child.
2. Drill 4 mm holes where ever the metal bit's holes coincide with the tyre. ( 9 holes )

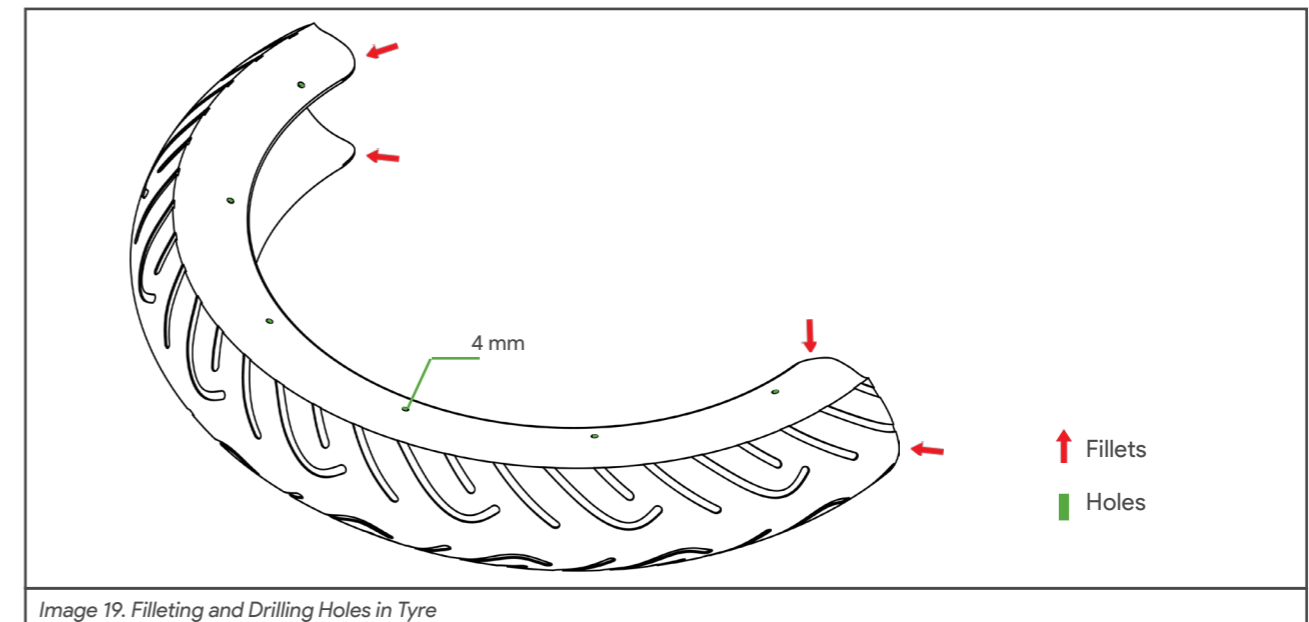


Image 19. Filletting and Drilling Holes in Tyre

#### Step Three -

Put in toys in the tyre. ( 5 according to measure )

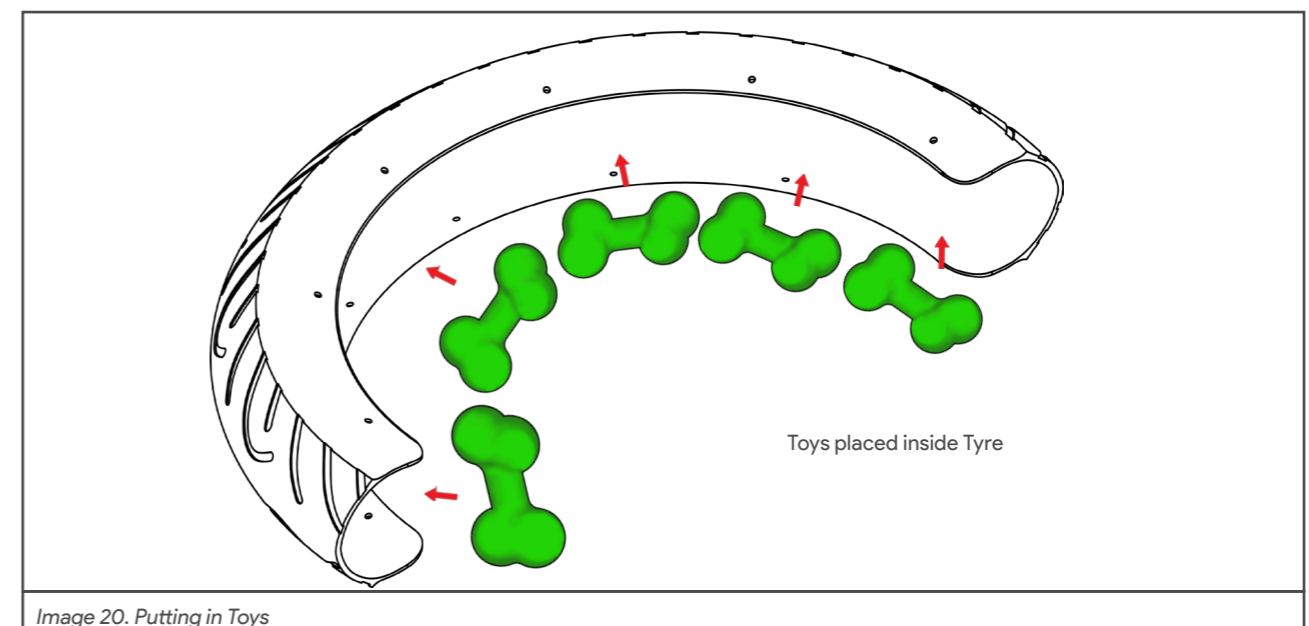
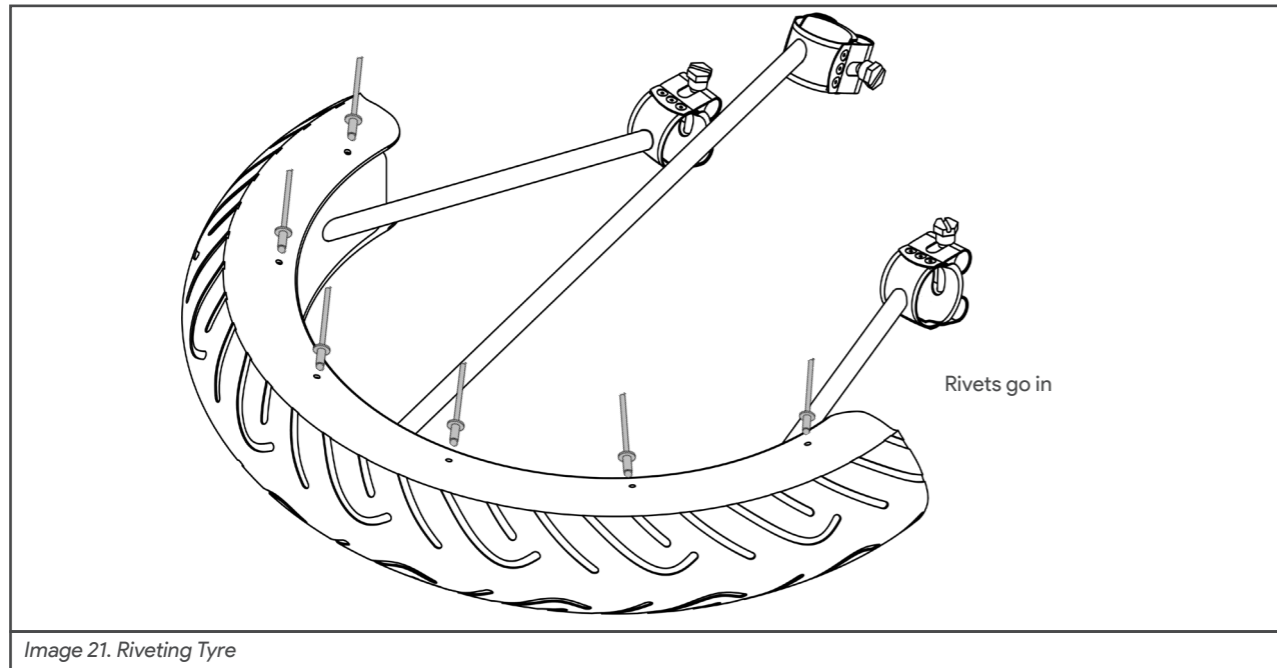


Image 20. Putting in Toys

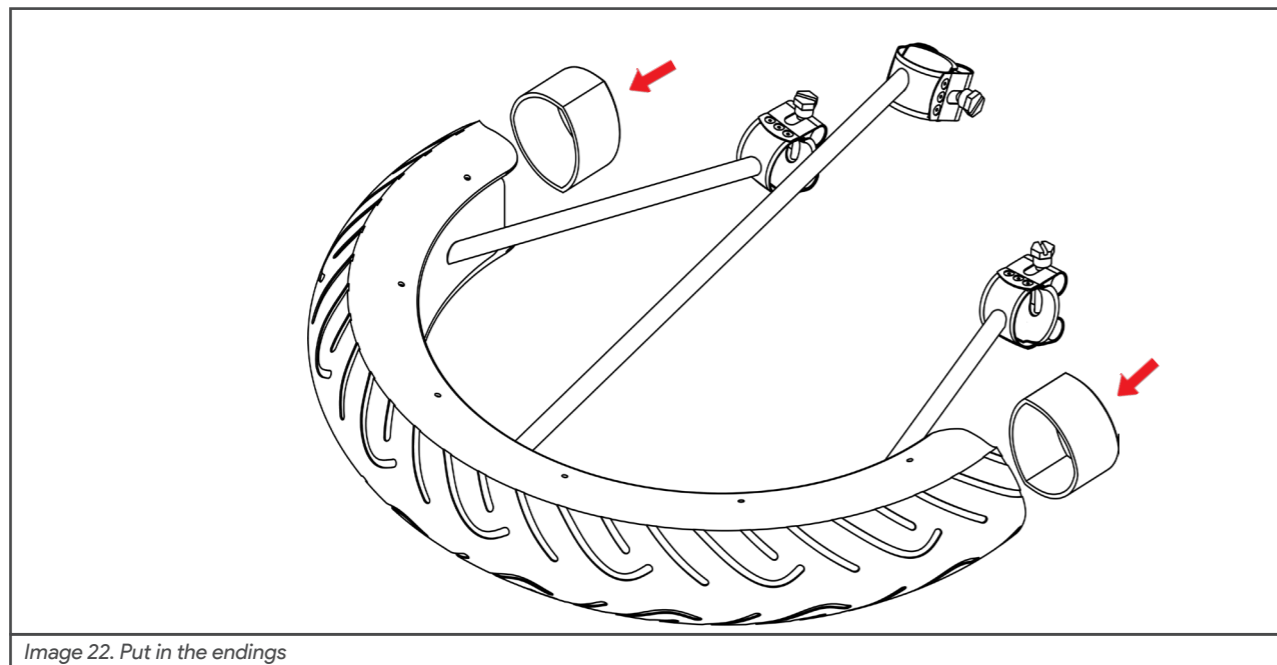
#### Step Four -

Rivet the Tyre to the Frame using Blind Rivets. 9 required.



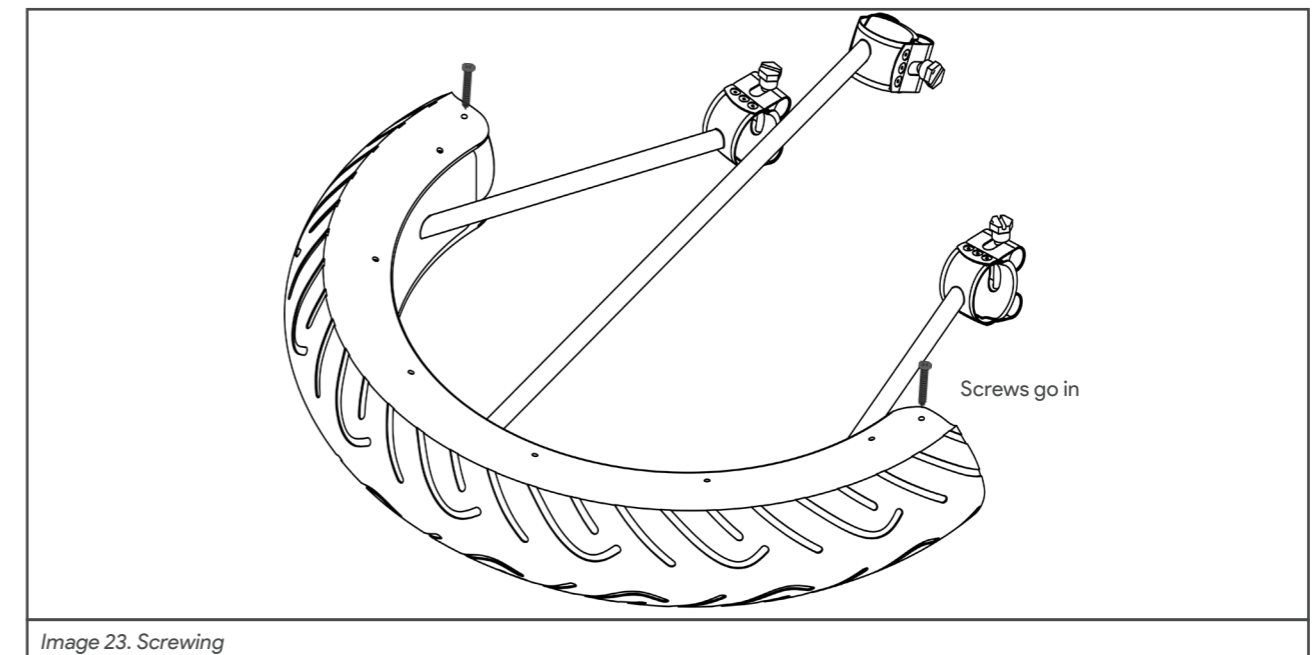
#### Step Five -

Put in the endings



#### Step Six -

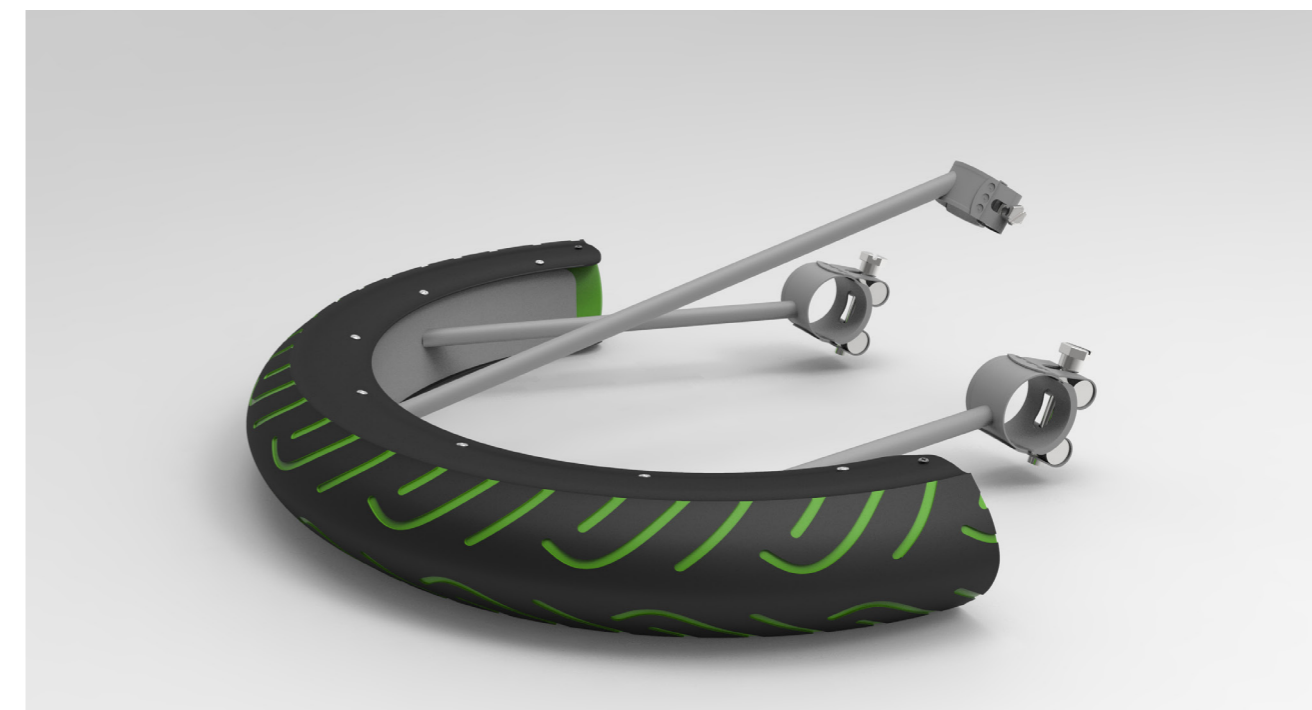
Screw the Endings to the tyre.

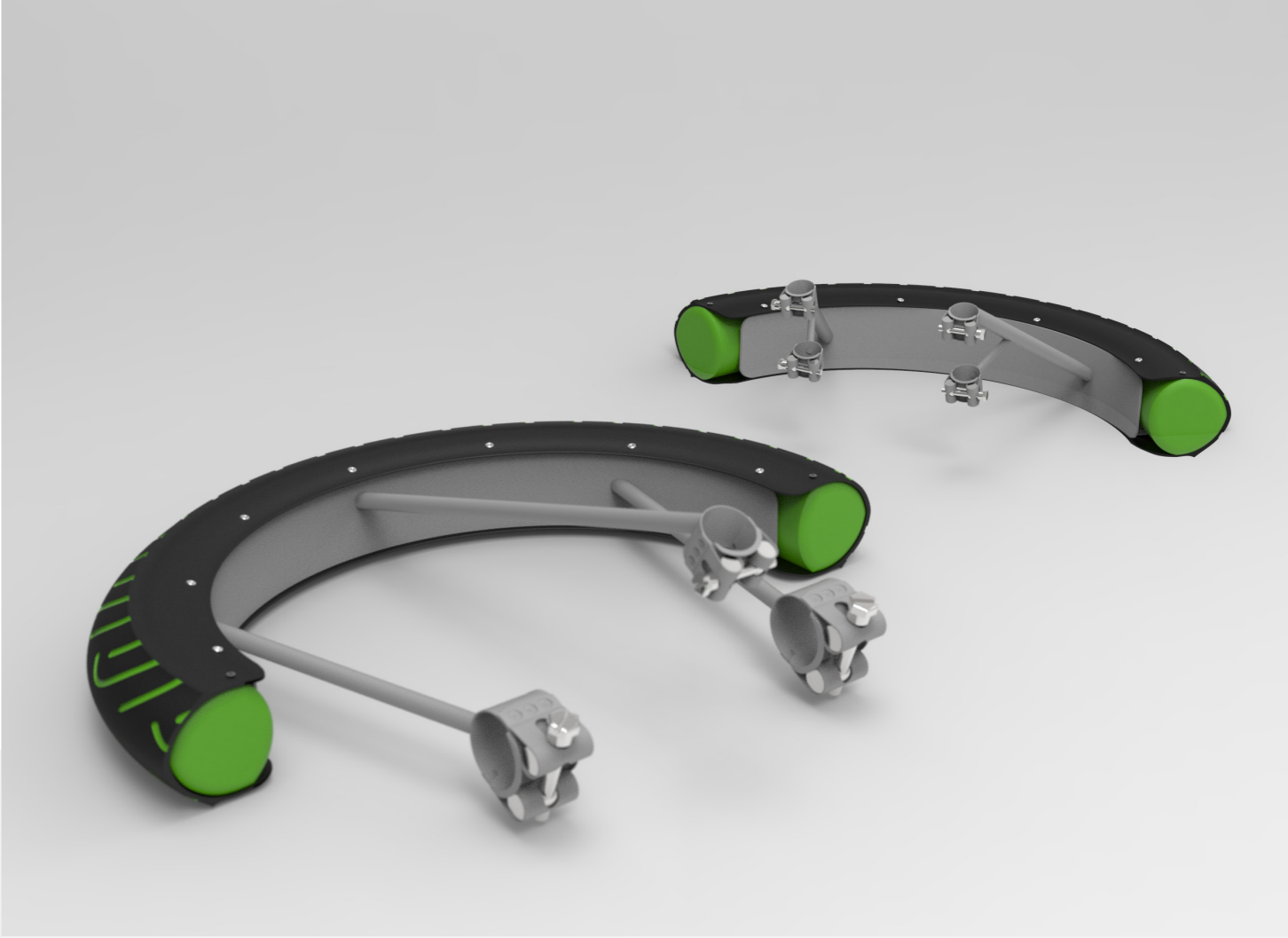
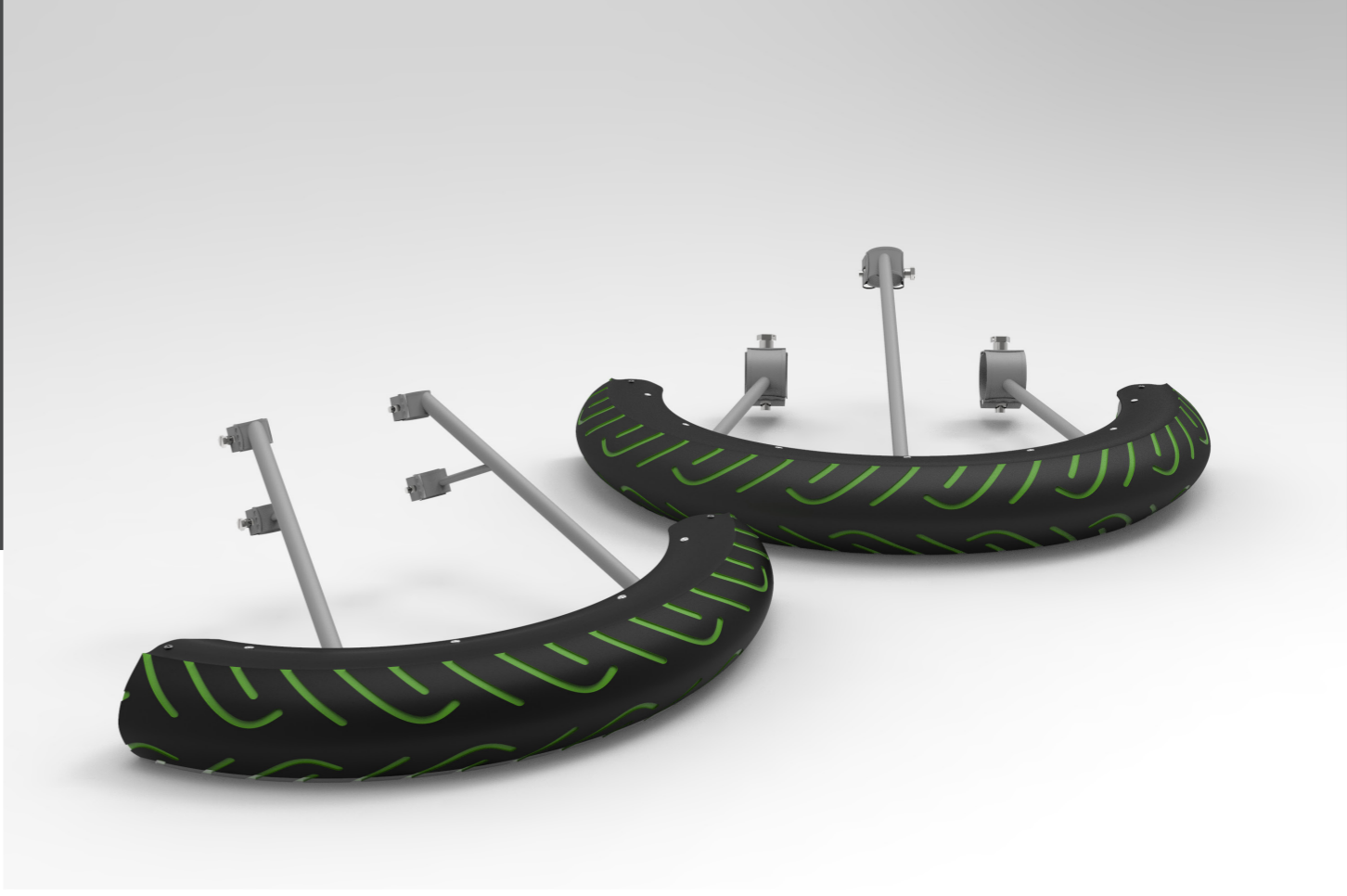


★ Prefer screws so that toys can be replaced if required.

#### Step Seven - Painting

Post Assembly Paint the grooves of the tyre or the entire tyre in any colour you want and enjoy! The Paint used should preferably Optilon synthetic rubber or Chlorinated Synthetic Rubber Paint to keep it long lasting!





FIXPERTS

**Hit**  
מכון טכנולוגי חולון  
Holon Institute of Technology

**id**  
राष्ट्रीय डिजाइन संस्थान  
NATIONAL INSTITUTE OF DESIGN  
AMARAVATI