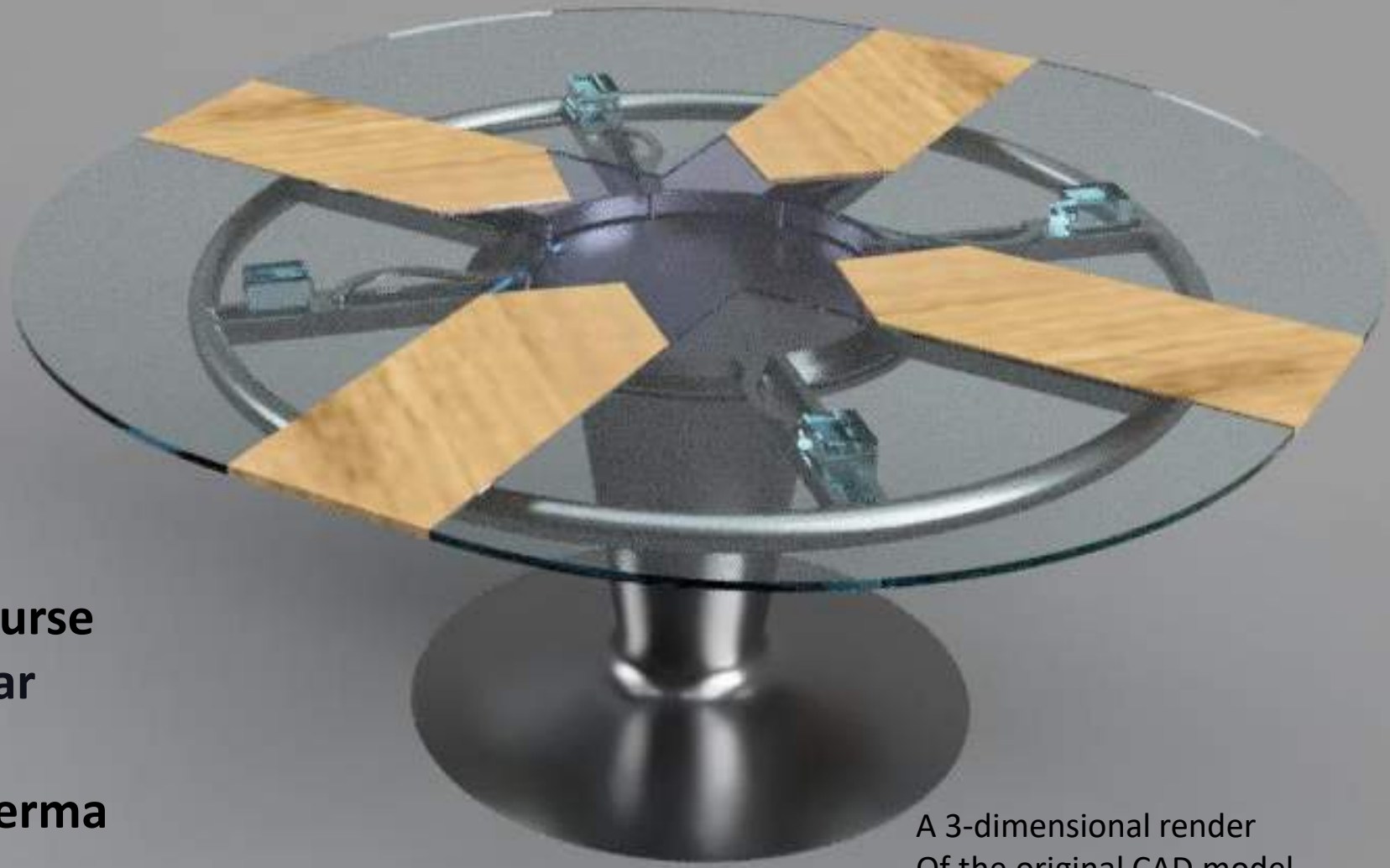
# EXPANDING TABLE

TA 201

## Section W1 G4

**Made under the guidance of Course**
**Instructor : Dr. Shashank Shekhar**
**Tutors : Dr. Vivek Verma**
**Lab in charge: Mr. Anil Kumar Verma**



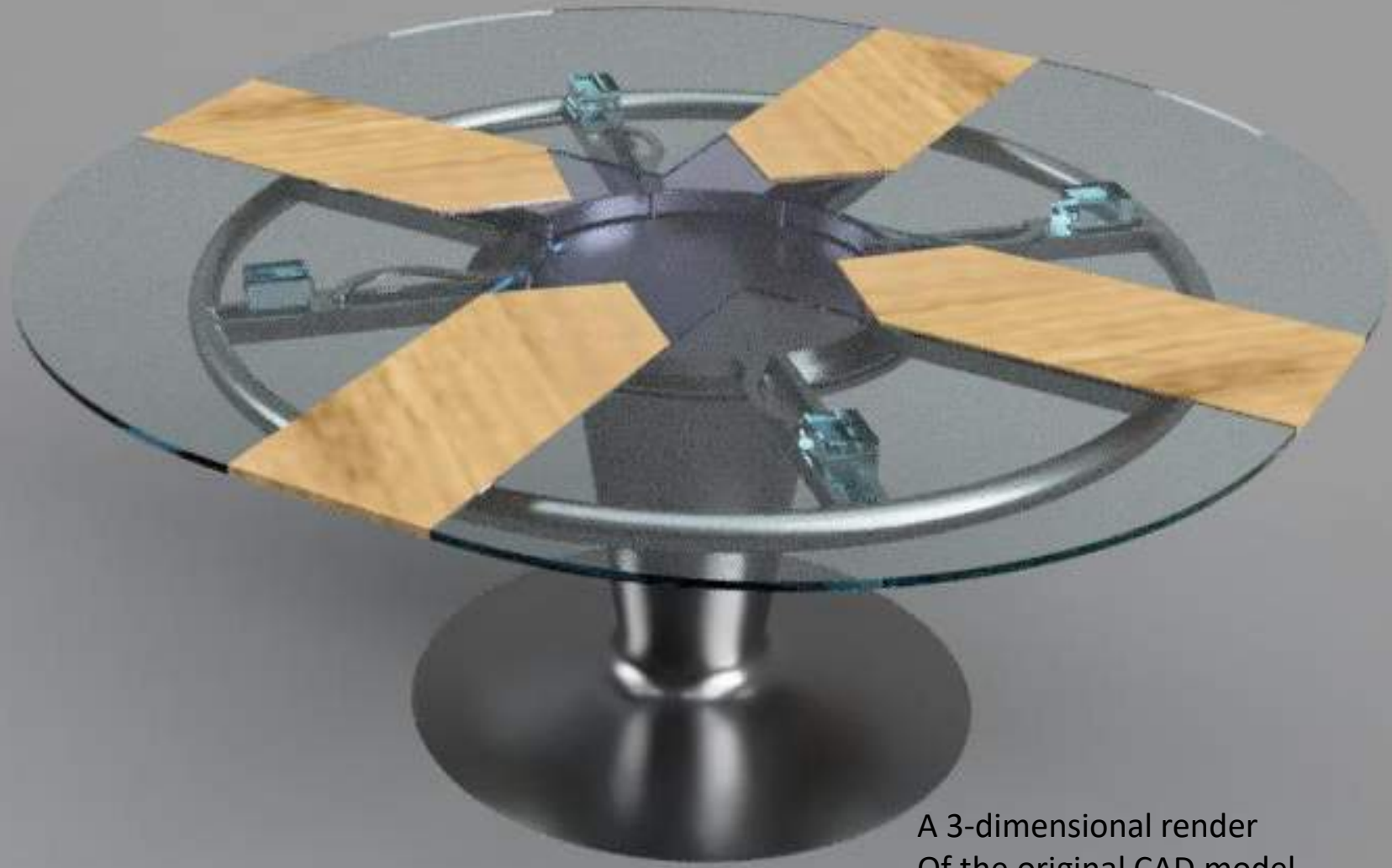
A 3-dimensional render
Of the original CAD model

# EXPANDING TABLE

TA 201

## Group members


| | |
|---|---|
| Raj Verma | 200761 |
| Shloak Bhagat | 200946 |
| Pravalika | 201105 |
| Pratiksha Sharma | 200714 |
| Adarsh Shukla | 200034 |
| Nirmit | 200642 |
| Rustam Pardhi | 200825 |
| Vipul Arora | 201125 |
| Harsh Kumar | 200413 |

A 3-dimensional render
Of the original CAD model

# INDEX

# INTRODUCTION

As the name suggests, an expanding table is a table that has a **572.556 cm²** area when unopened or closed, but when opened or expanded, has an area of **873.757 cm²** area. Over **153%** of its original area.

It has various parts that are interconnected through joints and adhesives. The base roll is the main part on which the entire table is based. It has grooves on which the sliders move, and the table expands.

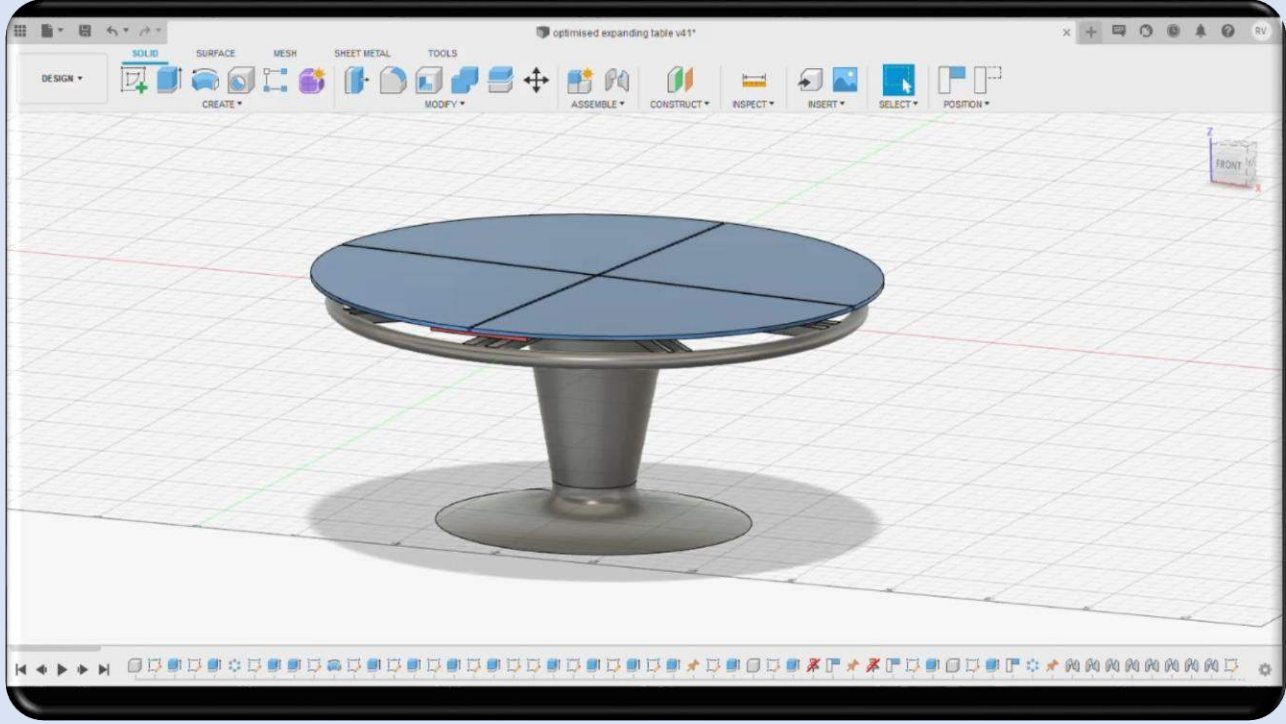
# MOTIVATION

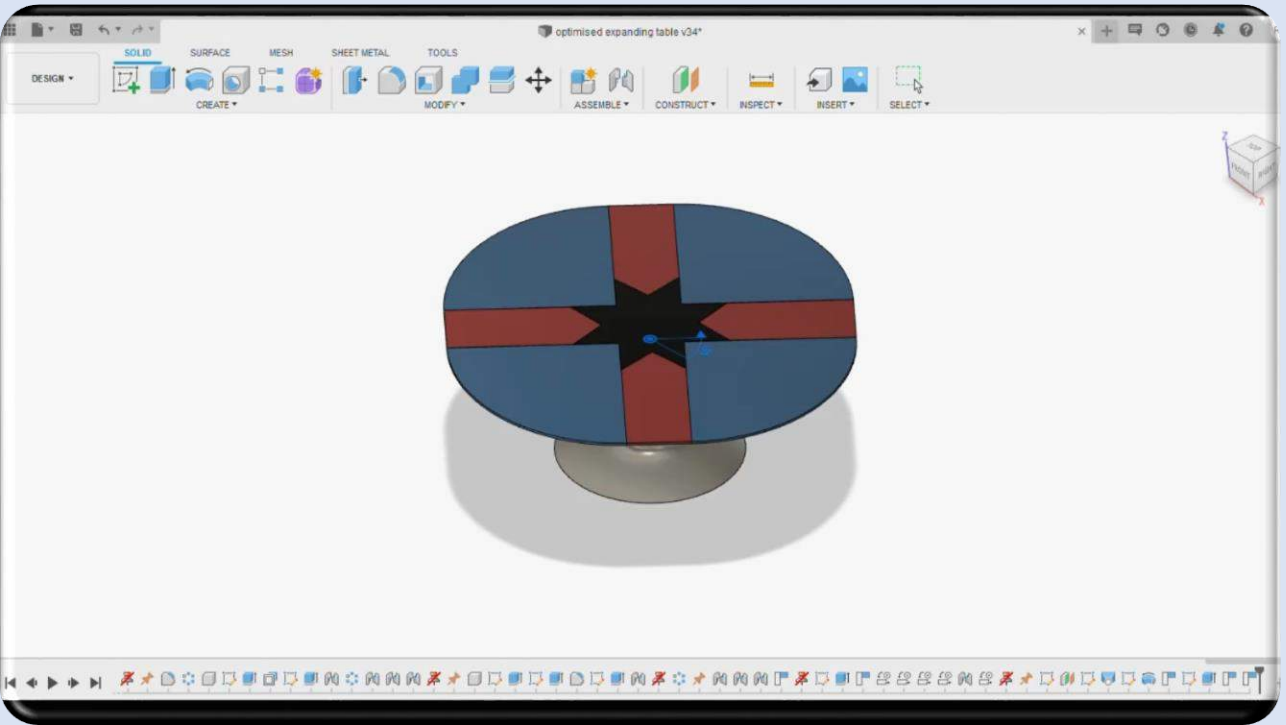
We present an expanding table. This table is designed to expand at the tabletop if an extra area is needed and conveniently closes to save some space. It uses sliders and channels, and tracks to make this possible. This is a lightweight multipurpose table. Our original inspiration was a curtain-style folding door that saves a lot of space but incorporating such a design into a table was difficult. It gave us numerous design challenges. The lack of patents and designs to look upon makes it even challenging but helped us a lot in learning new things. The result was a lovely looking table and when expanded, increasing its area by more than 50%.

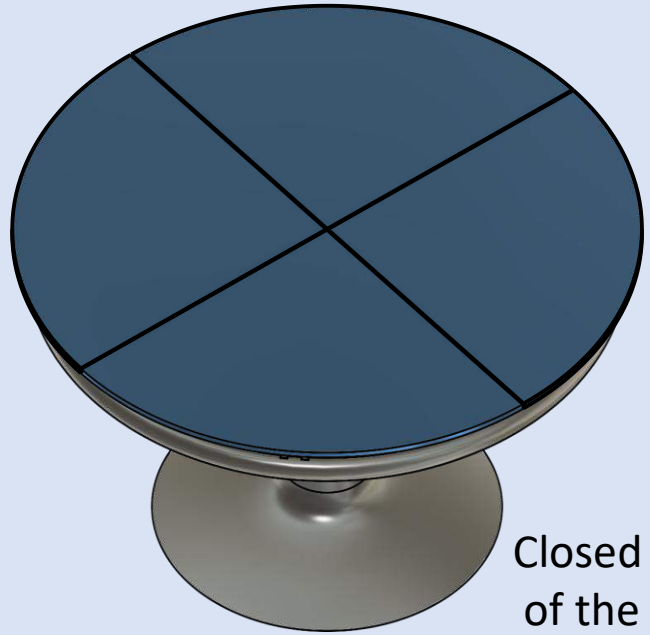
# ACKNOWLEDGEMENT

We want to express our sincere gratitude to our course instructor- **Dr. Shashank Shekhar** tutor- **Dr. Vivek Verma** and our Lab Technical Personnel- **Mr. Gaurav Mishra**, for their support and valuable insights on this project. Their support was essential to the execution of this project.
We would also like to thank Professor Shashank Shekhar, course instructor, for providing us with this opportunity to explore our creativity and design the whole process of manufacturing something through lab processes.
We want to thank our TA's insert name for their valuable guidance.
Any omission in this brief does not imply a lack of gratitude.

# WORKING VIDEO OF THE EXPANDING TABLE

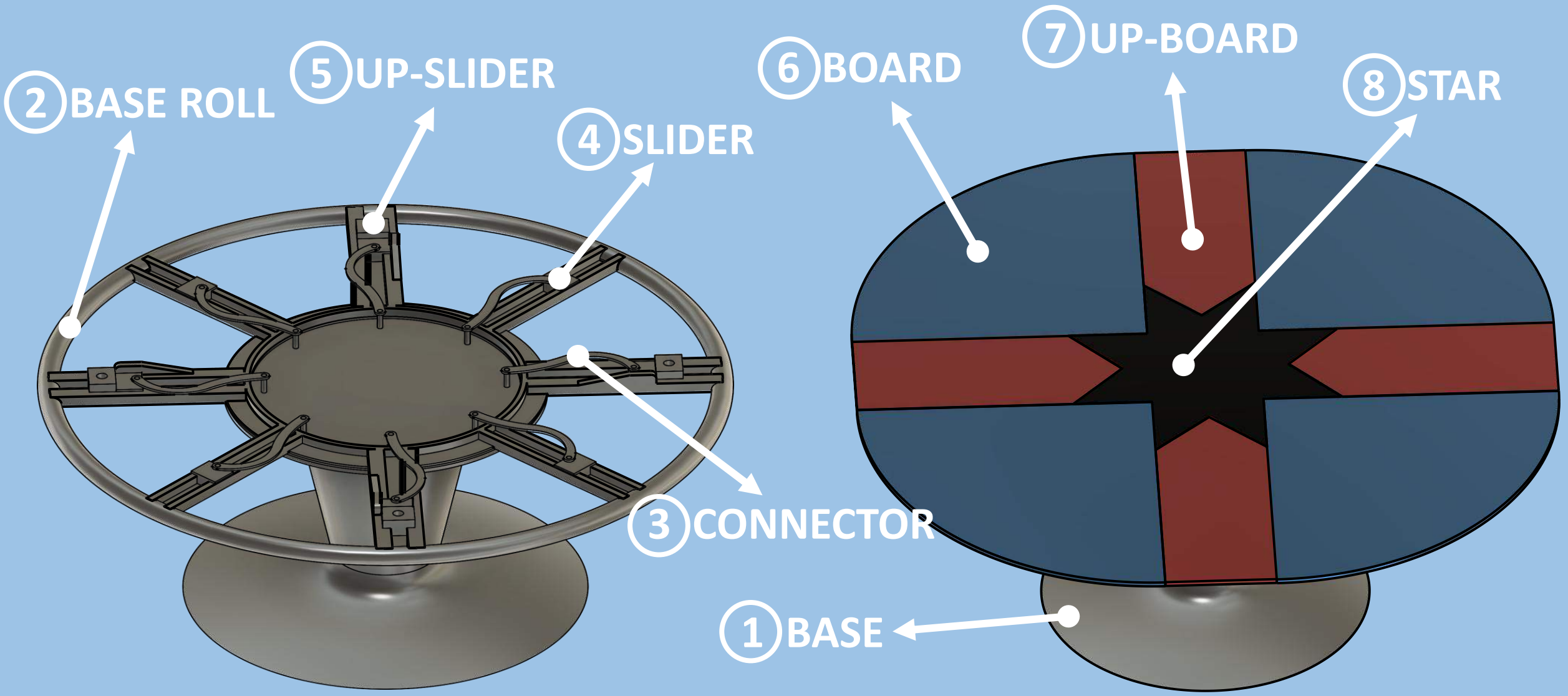


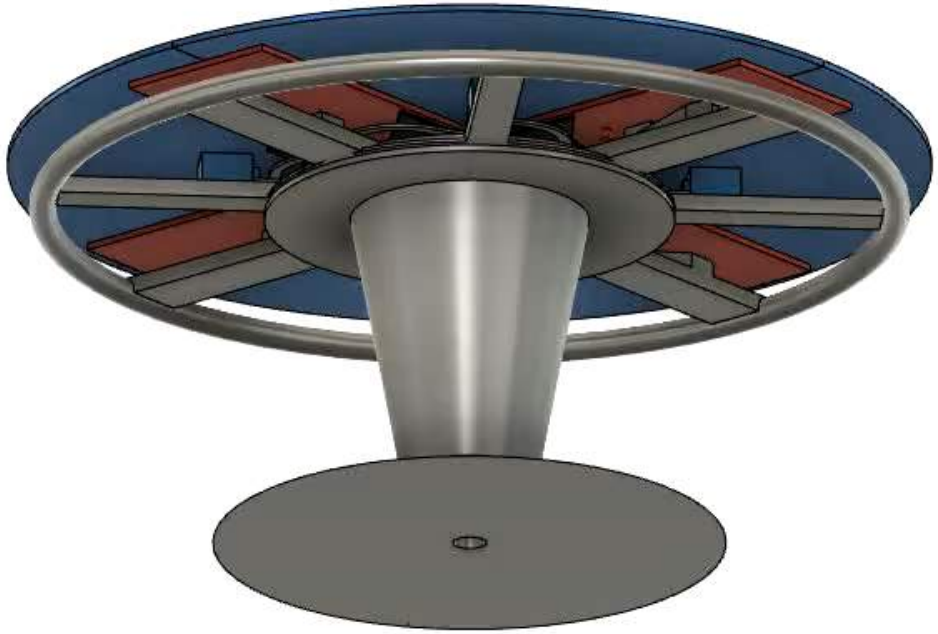



Closed 3D model of the table

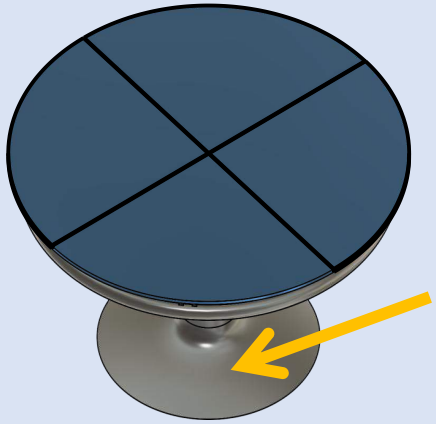
# Isometric drawings

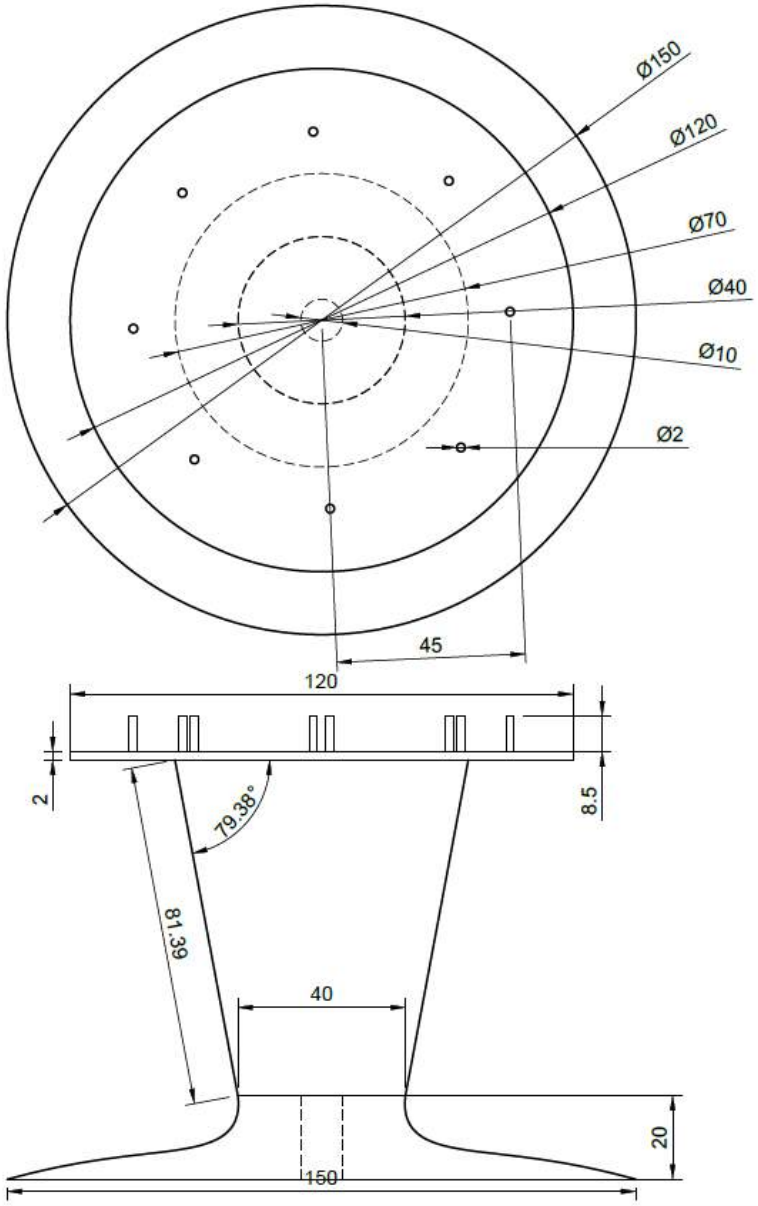


# ASSEMBLY OF THE EXPANDING TABLE



# BASE






**Description :** base of the table relatively heavy than all other parts to avoid spinning.

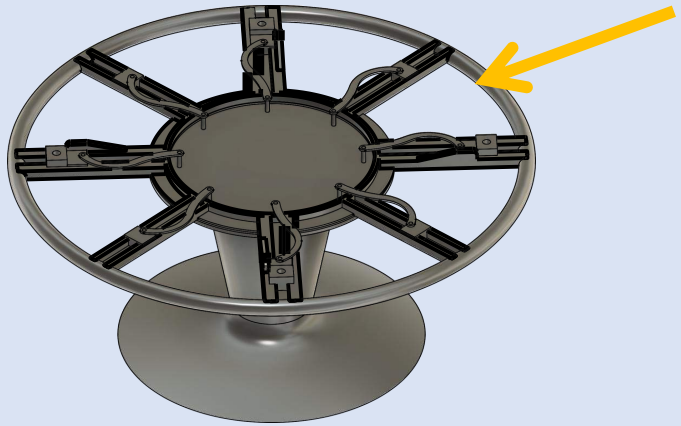
**Quantity : 1**

**Weight :** 2500 grams

**Material used :** Cast Iron, mild steel rod (2mm dia.)

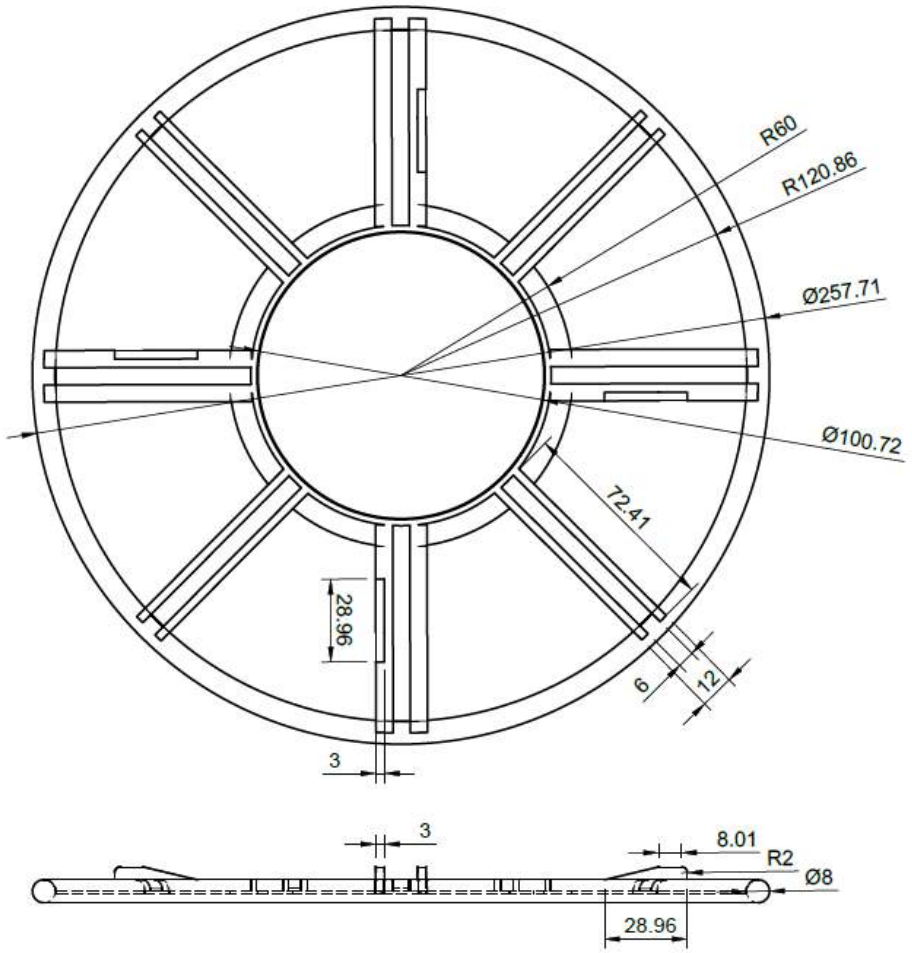
**Manufacturing process :** Casting, welding, cutting.

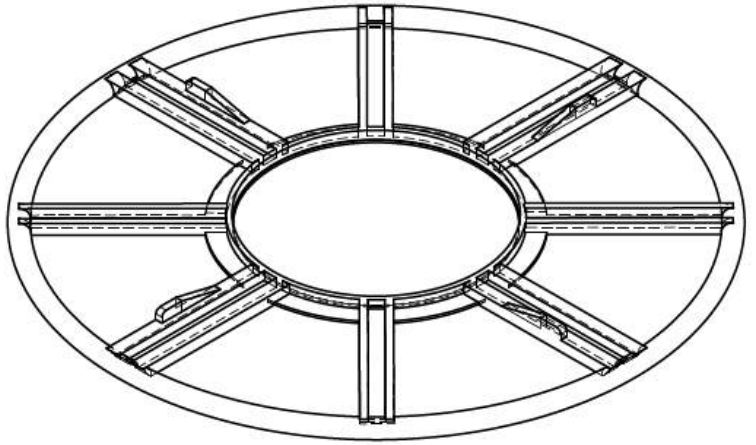
# BASE ROLL

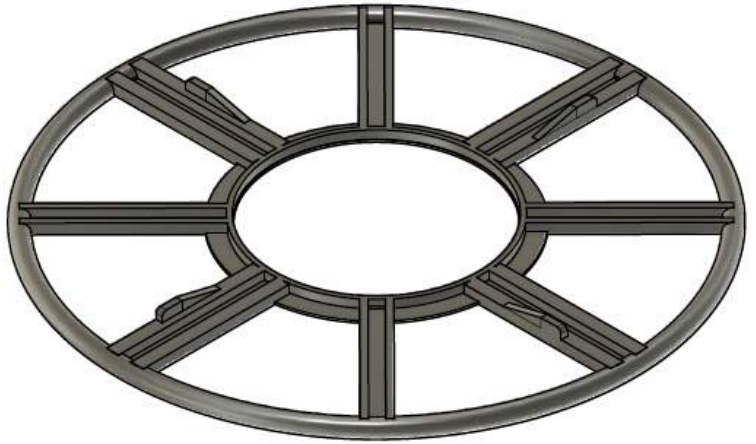


**Description :** crucial component of the table, spins on base.
**Quantity : 1**

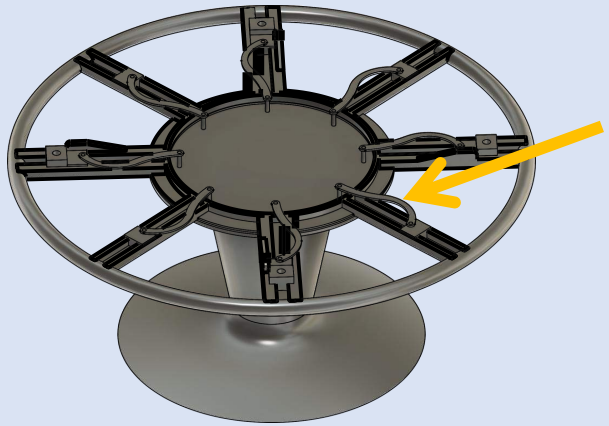
**Weight :** 581 grams
**Material used :** Cast Iron, mild steel sheet (2mm), mild steel rod (8mm dia.)
**Manufacturing process :** Casting, welding, shearing, bending.

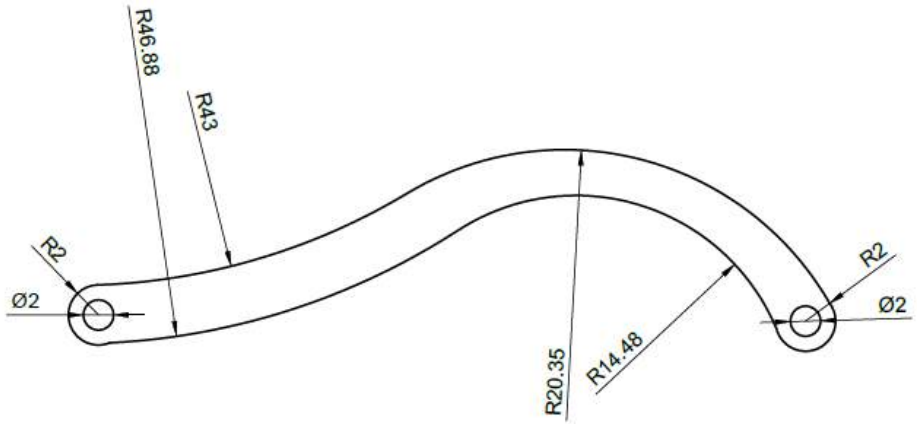


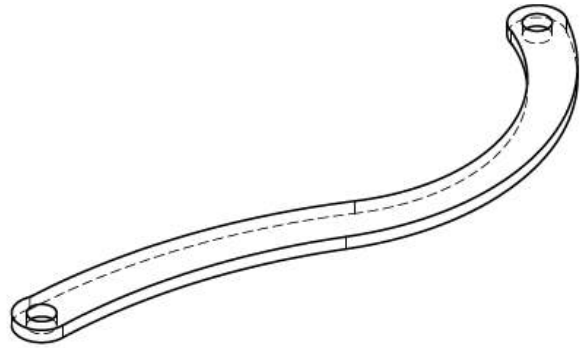



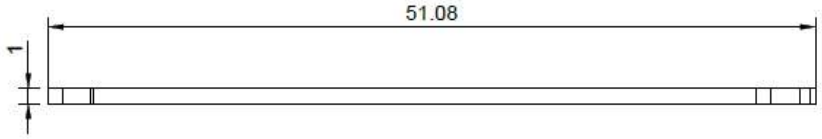


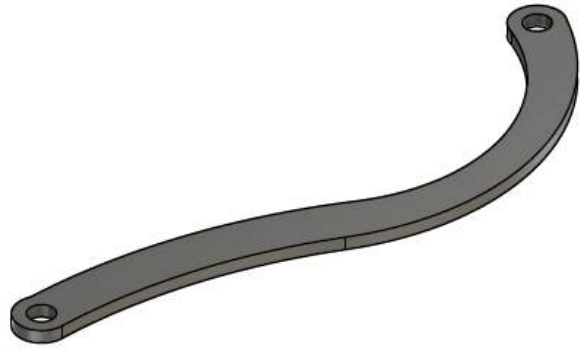
# CONNECTOR







**Description :** connects the slider to the rods extruding from the base and is responsible for motion of sliders.

**Quantity : 8**

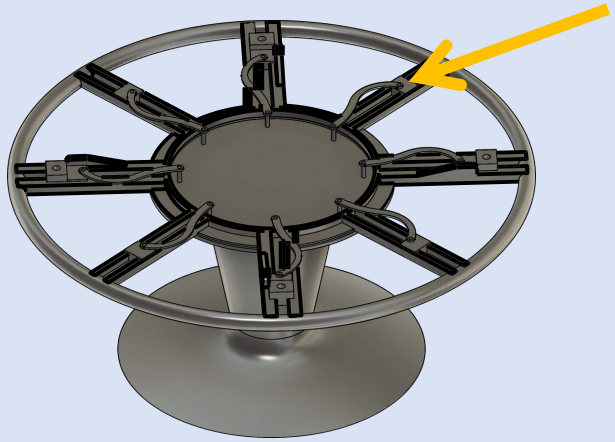
**Weight :** 2 grams (each)

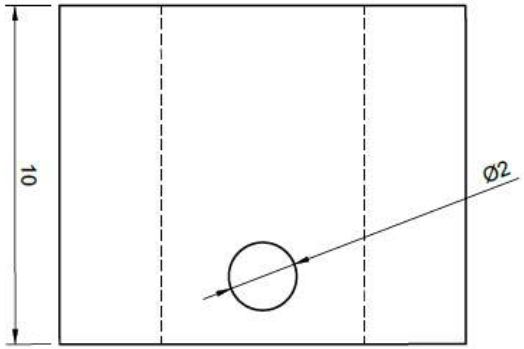
**Material used :** mild steel sheet (1mm)

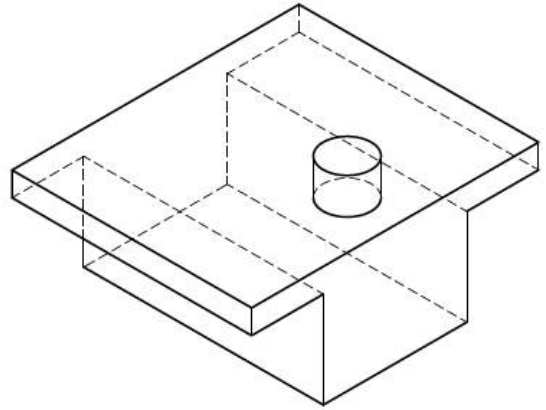
**Manufacturing process :**

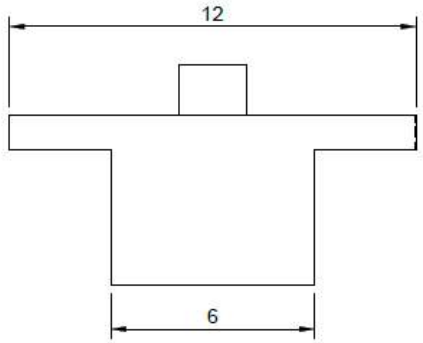
Shearing, punching

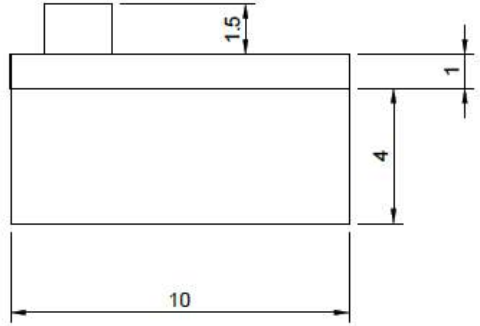
# SLIDER

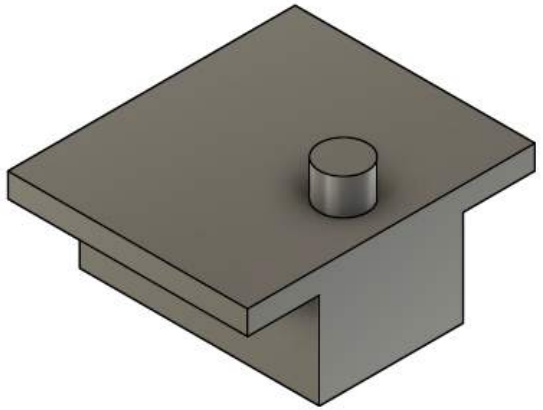






**Description :** slides in and out in the groove on the base roll.

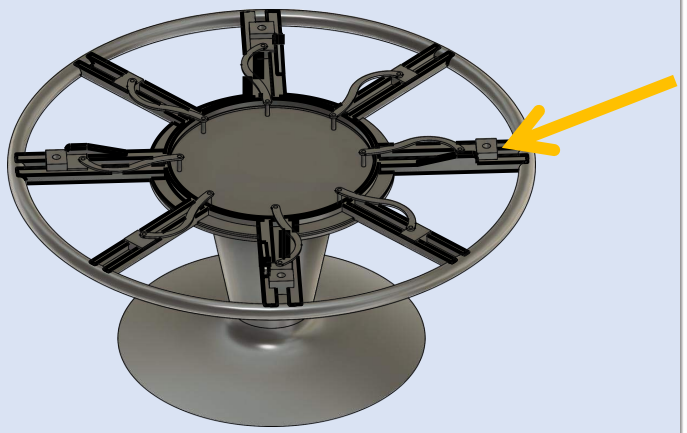
**Quantity : 8**

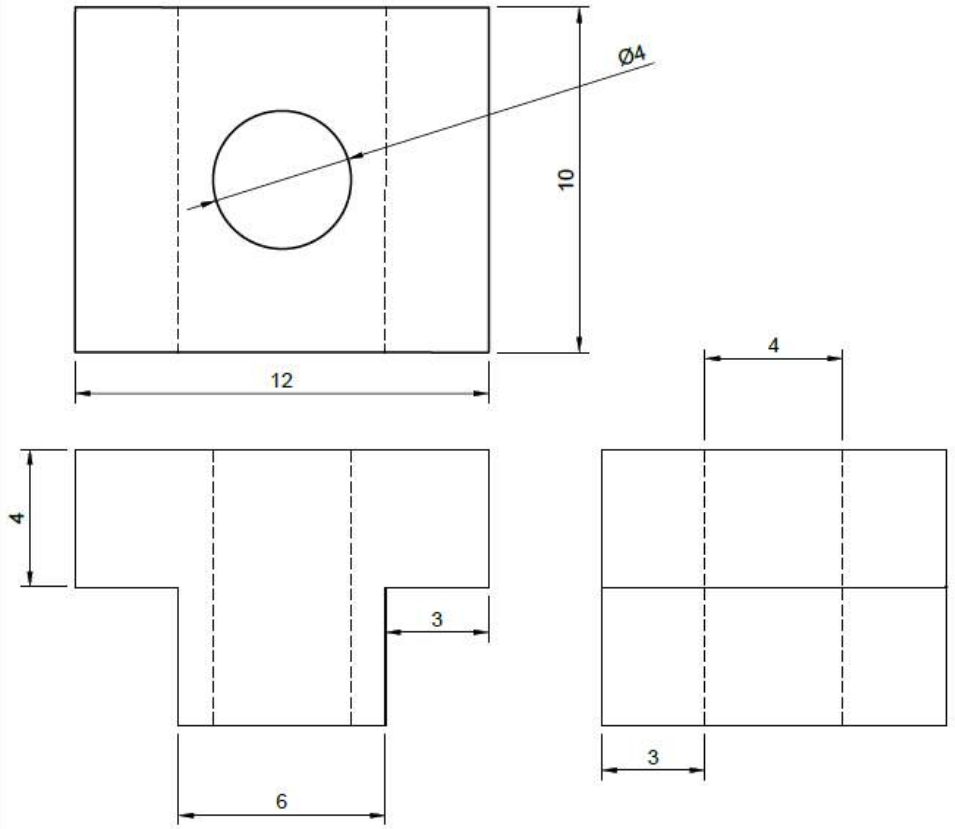
**Weight :** 3 grams (each)

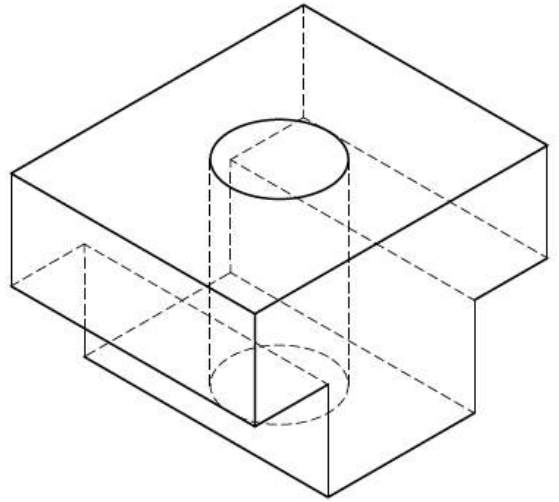
**Material used :** Cast Iron

**Manufacturing process :** Casting

# UP-SLIDER

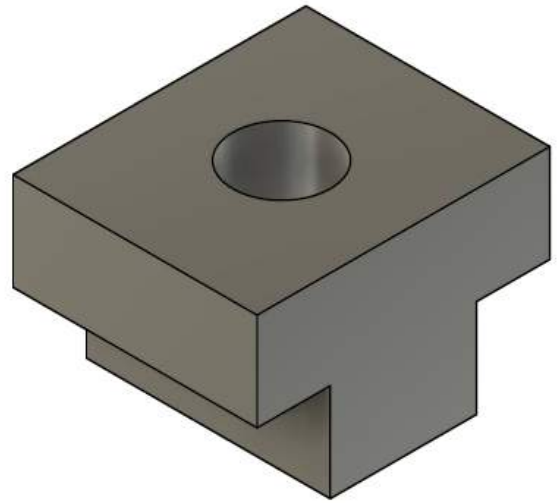




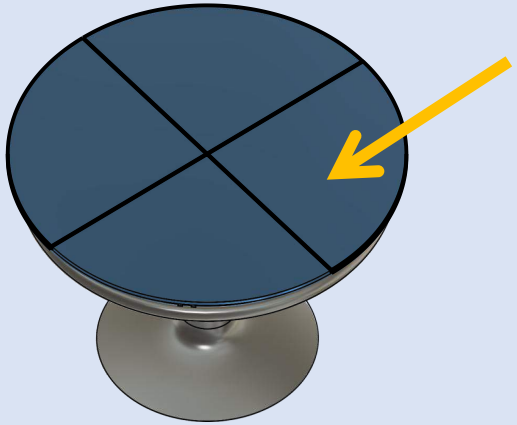



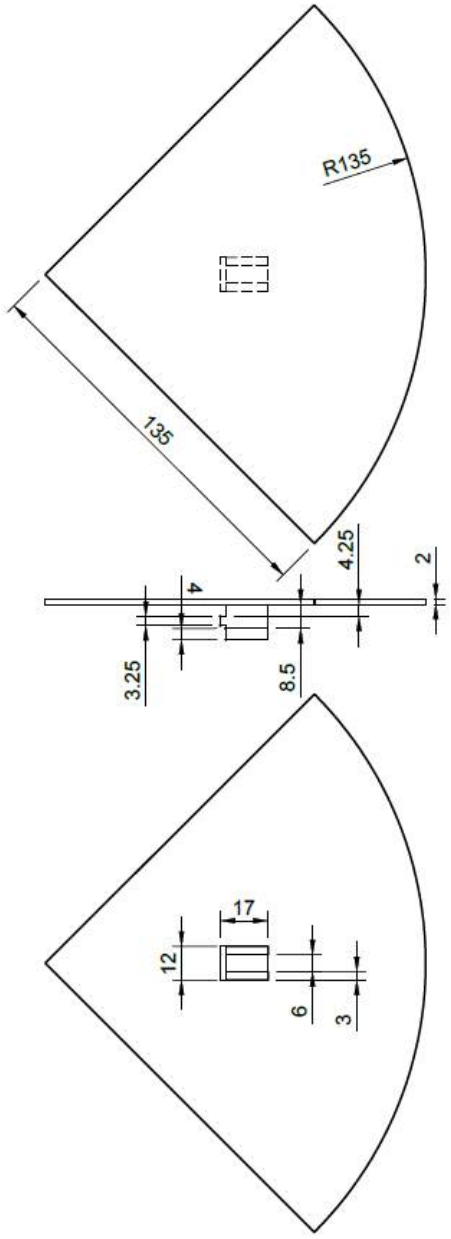
**Description :** responsible of up and down motion of the up-board.
**Quantity : 4**

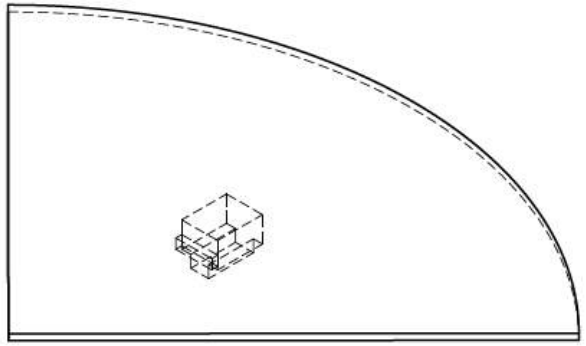
**Weight :** 5 grams (each)
**Material used :** Cast Iron
**Manufacturing process :** Casting

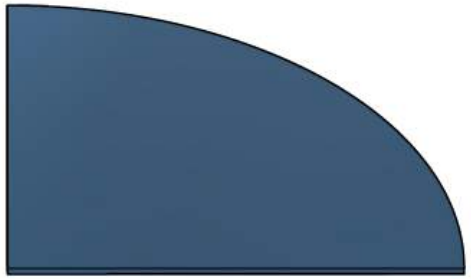


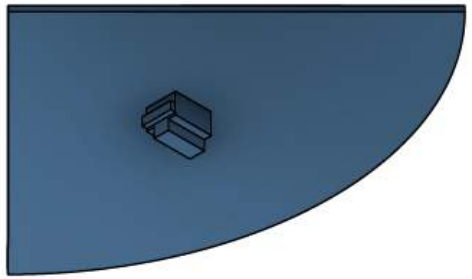
# BOARD









**Description :** top board of the table remains on top when the table is closed.

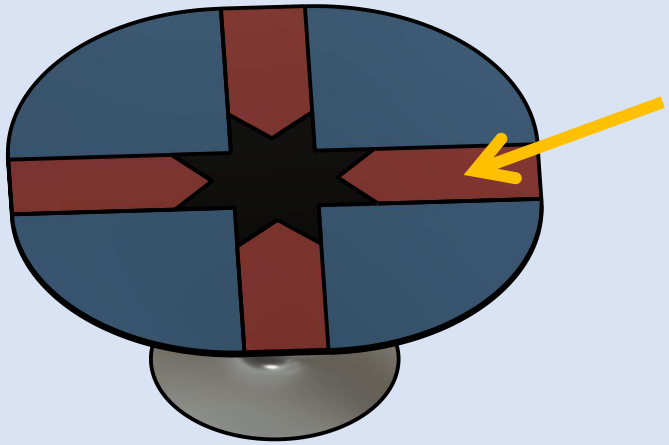
**Quantity : 4**

**Weight :** 240 grams (each)

**Material used :** Cast Iron, mild steel sheet (2mm)

**Manufacturing process :** Casting, welding, shearing.

# UP-BOARD



**Description :** up-board moves out and come out when the table is opened.

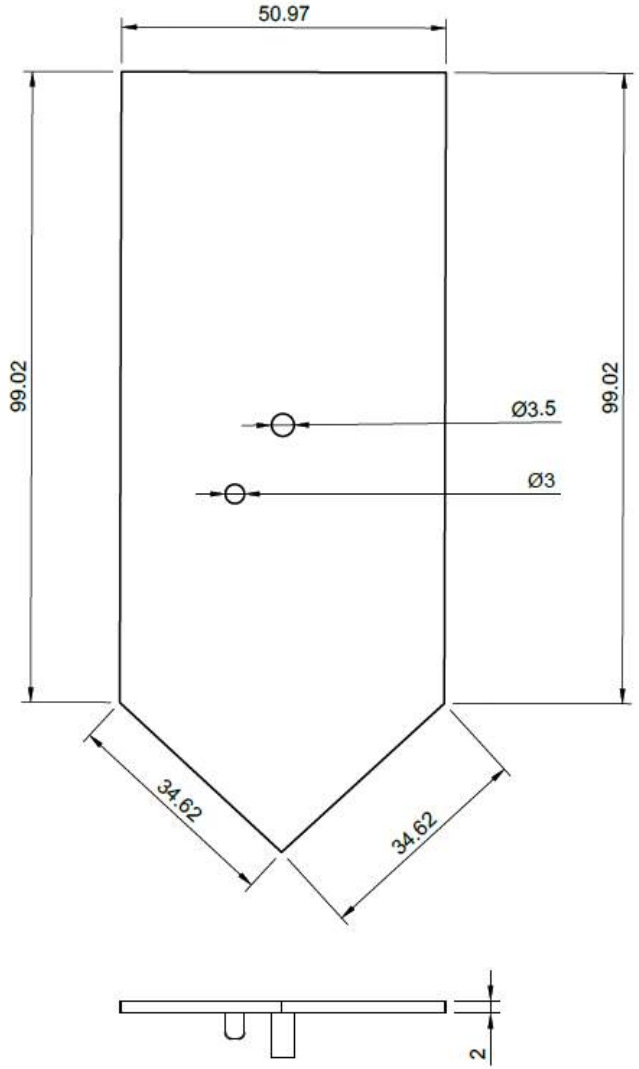
**Quantity : 4**

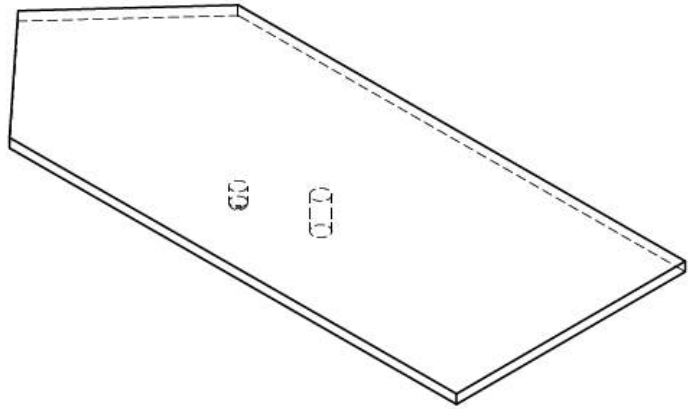
**Weight :** 90 grams (each)

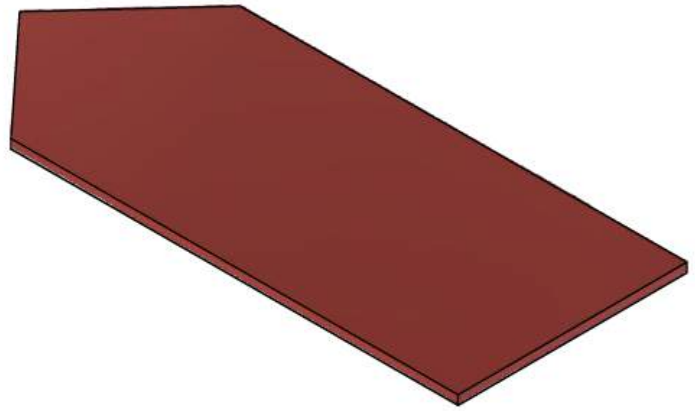
**Material used :** mild steel sheet (2mm), mild steel rod(3mm), mild steel rod(3.5 mm)

**Manufacturing process :**

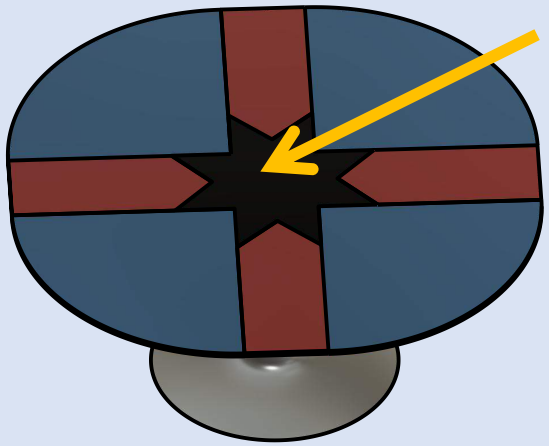
Shearing, Welding, grinding.

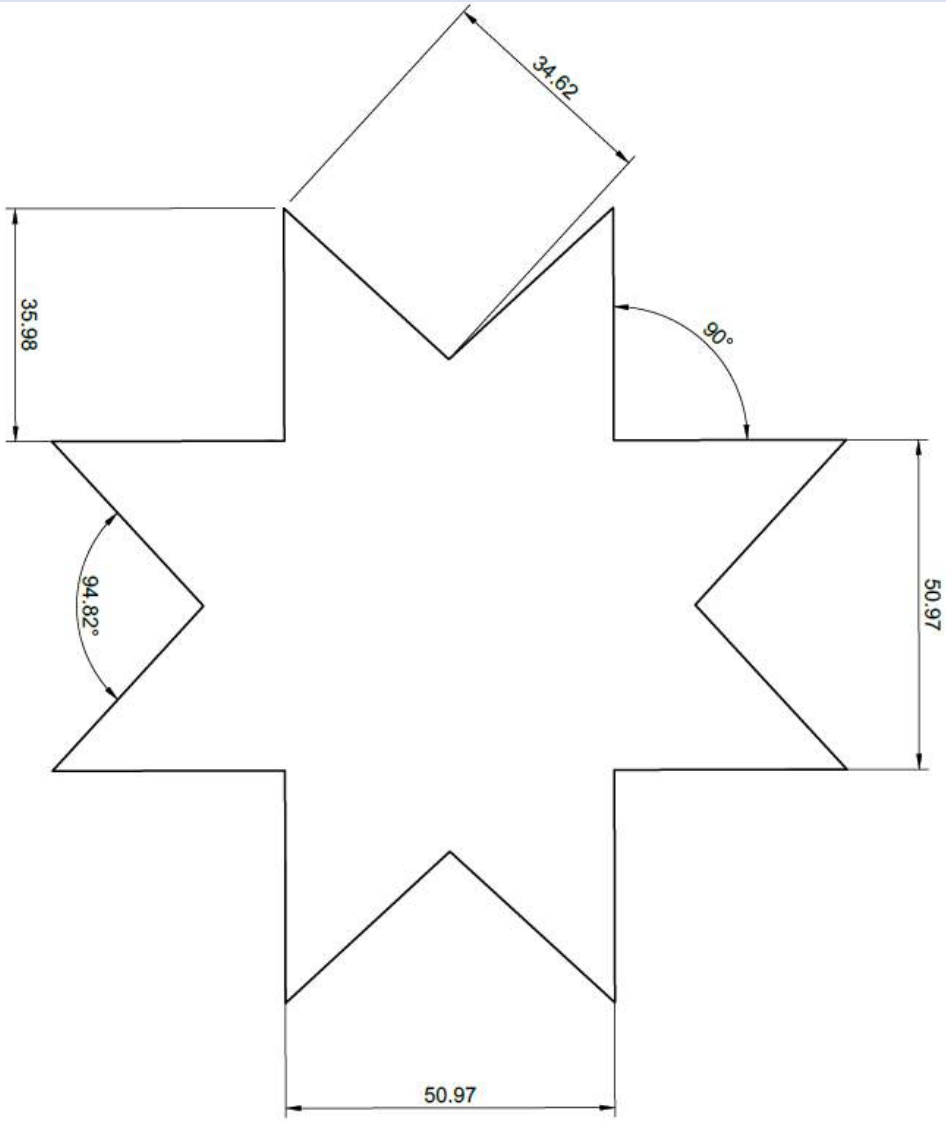


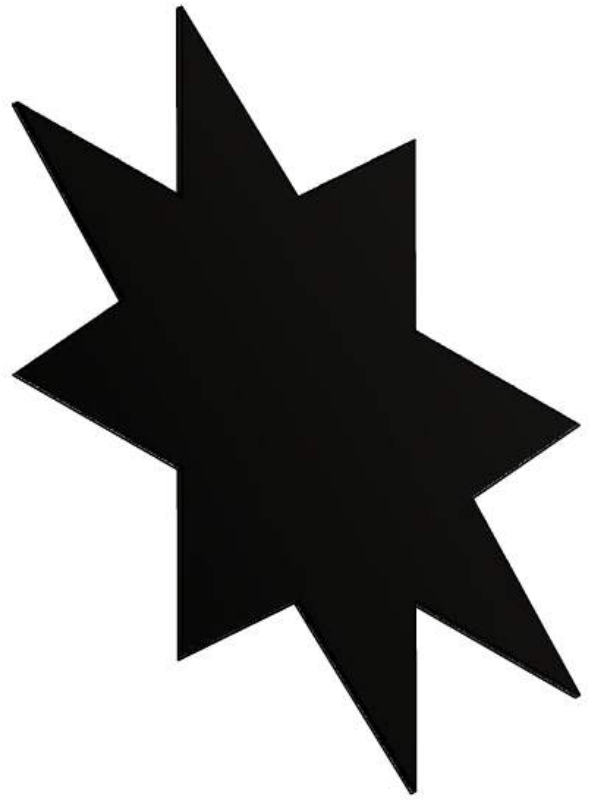





# STAR





Isometric view

**Description :** star lies at the below board and up-board an comes in level of them once table is opened.

**Quantity : 1**

**Weight :** 60 grams

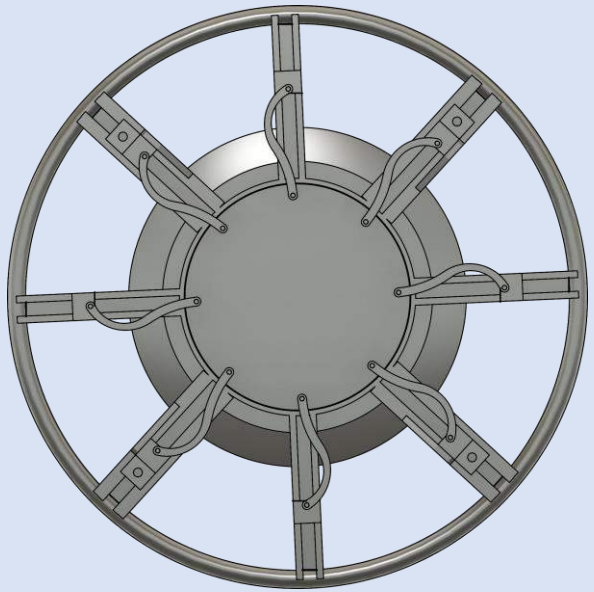
**Material used :** mild steel sheet(1mm)

**Manufacturing process :** Shearing

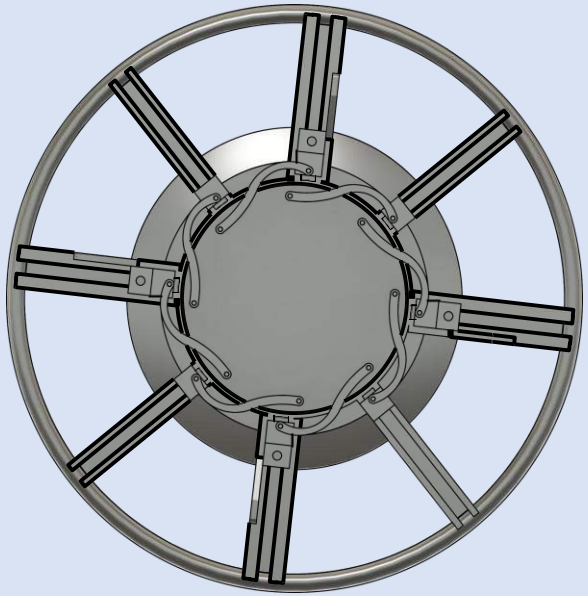
# MECHANISM

## Radial in-&-out mechanism :

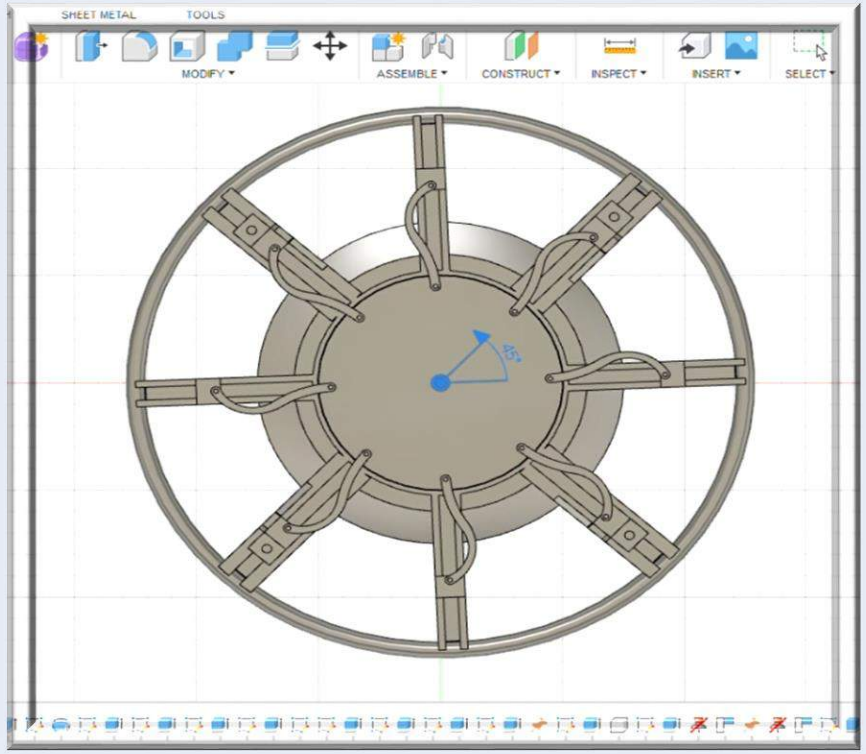
The video shows the mechanism involve in radial motion of Board and Up-Board. The table shows a full range of radial motion on a rotation of 54°. The connector is designed in such a manner that it allows complete closing of the table and the up-boards are designed in such a manner that they don’t obstruct the motion of other components



**Open table (expanded)**



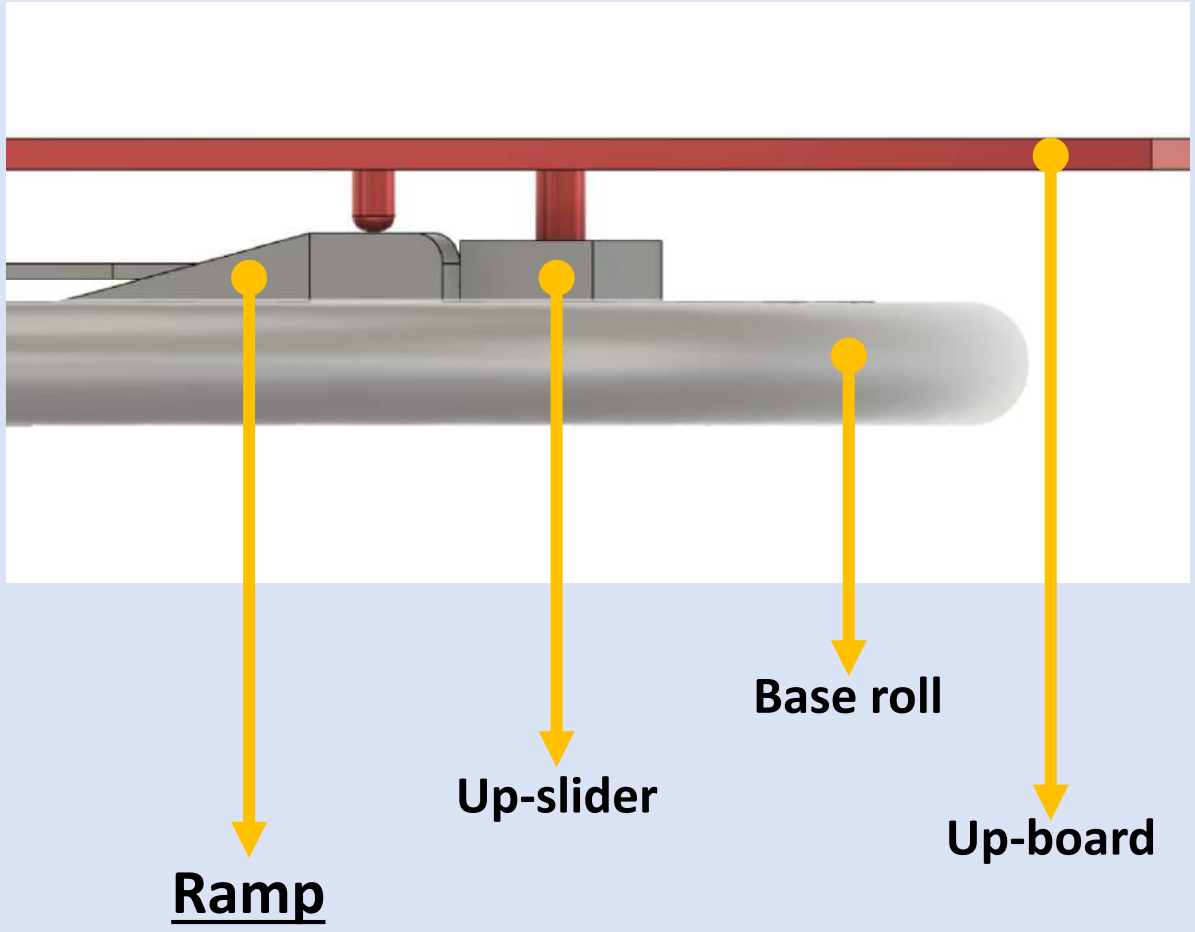
**Closed table (collapsed)**

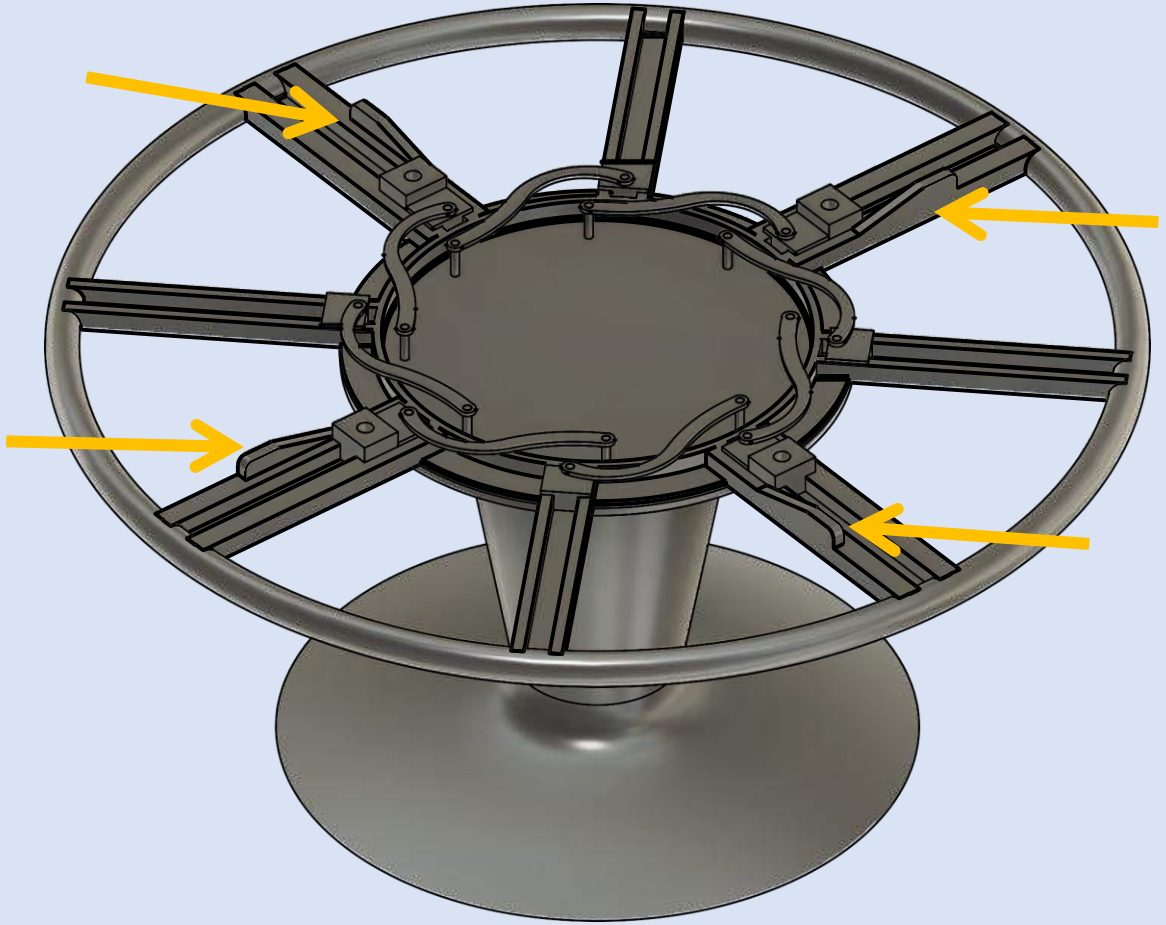


# Up-board lifting mechanism :

The up-board along with performing a radial motion also has a vertical motion that means it also needed to pop up as table opens.

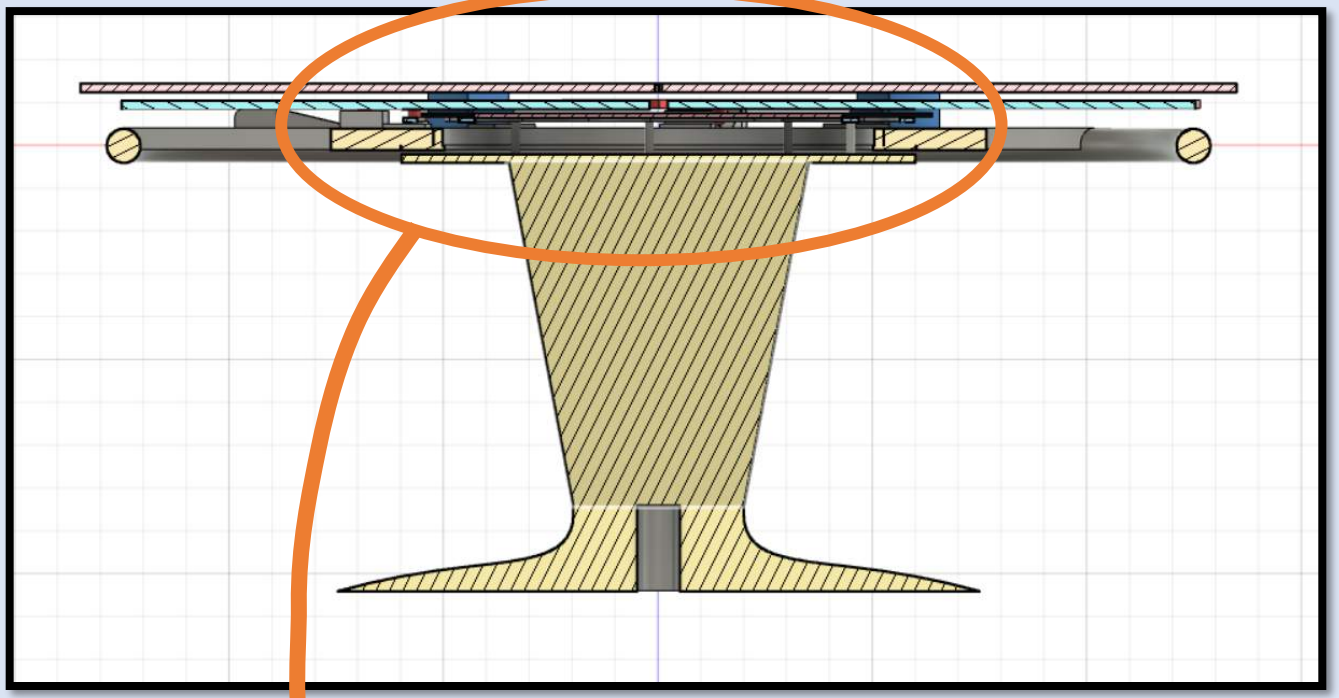
For this, the base roll is designed with ramps on alternate arms that enables the up-board to pop up when the table expands.



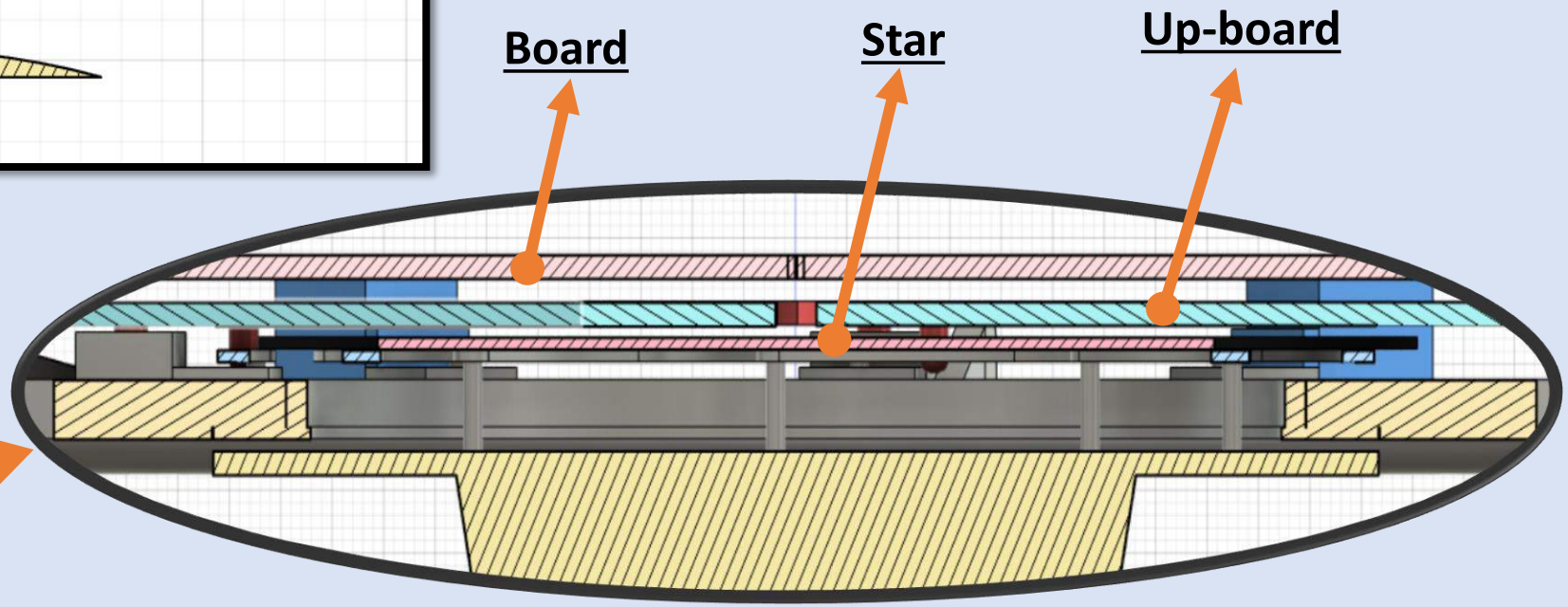



Arrows indicating ramps on alternate arms

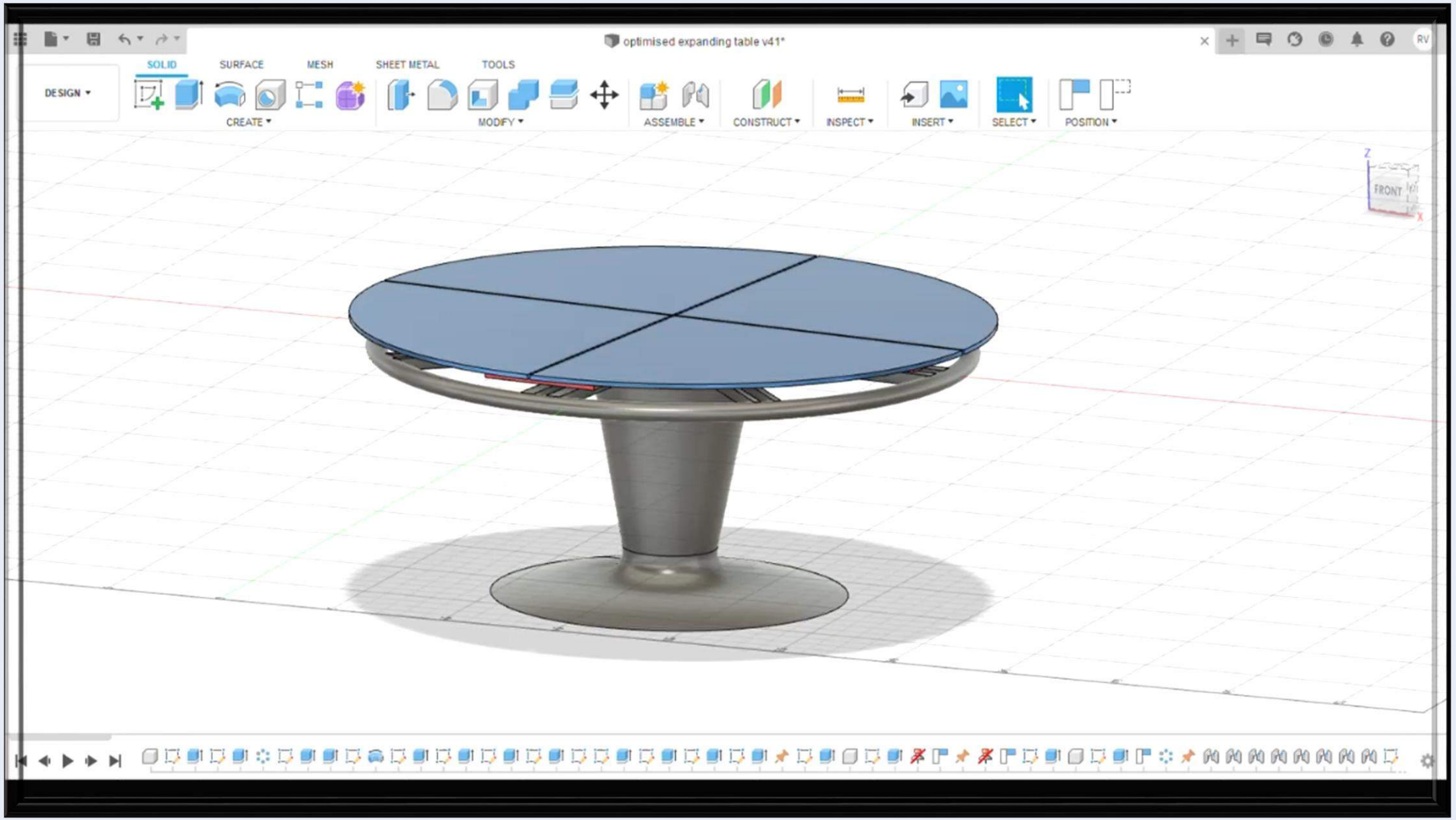
# Location of parts when table is closed



The adjacent image and the image below shows the section view of the table when it is closed and all the components along with it.



# Result :


optimised expanding table v41*
DESIGN
SOLID
SURFACE
MESH
SHEET METAL
TOOLS
CREATE
MODIFY
ASSEMBLE
CONSTRUCT
INSPECT
INSERT
SELECT
POSITION
FRONT

# Group Members & work distribution

| Member | Roll no. | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 |
|---|---|---|---|---|---|---|
| **Raj Verma** | **200761** | Discussion on 4 ideas and finalizing one. | Worked on base roll, connector's design and discussing better design ideas with team members. | Isometric drawing of component and the material to be used, assembly of all the parts, making a working CAD model, design solutions | Tackling various design difficulties and making the final CAD design, updating the components where required, materials used. | Animated assembly video, screen recordings and final presentation. |
| **Shloak Bhagat** | **200946** | Discussing ideas and finalizing one, given the final idea. | Worked on star, discussed design ideas. | Isometric drawing of component and the material to be used. | Worked on various design possibilities. | presentation |
| **Pravalika** | **200034** | Discussion on 4 ideas and finalizing one. | Worked on board. (blue color board) | Isometric drawing of component and the material to be used. | Manufacturing and joining process of various components. | |
| **Pratiksha Sharma** | **201105** | Discussion on 4 ideas and finalizing one. | Worked on upboard. (red color board) | Isometric drawing of component and the material to be used. | Cost analysis of various process and materials. | presentation |

# Group Members & work distribution

| Member | Roll no. | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 |
|---|---|---|---|---|---|---|
| **Adarsh Shukla** | **200034** | Discussion on 4 ideas and finalizing one. | Worked on board. (blue color board) | Isometric drawing of component and the material to be used. | Material used and various new design ideas | |
| **Vipul Arora** | **201125** | Discussion on 4 ideas and finalizing one. | Worked on Up-slider | Isometric drawing of component and the material to be used. | Design ideas and joining processes | |
| **Rustam Pardhi** | **200825** | Discussion on 4 ideas and finalizing one. | Worked on Base of the table. | Isometric drawing of component and the material to be used. | | |
| **Nirmit** | **200642** | Discussion on 4 ideas and finalizing one. | Worked on Slider | Isometric drawing of component and the material to be used. | | |
| **Harsh Kumar** | **200413** | Discussion on 4 ideas and finalizing one. | Worked on Base of table | Isometric drawing of component and the material to be used. | | |

# Material used & process involved

| COMPONENT | QUANTITY | MATERIALS USED (each) | DETAILS (each) | MANUFACTURING PROCESS | JOINING PROCESS |
|---|---|---|---|---|---|
| **BASE** | **1** | • Mild Steel sheet (2 mm)<br>• Mild Steel rod (2mm dia.)<br>• Cast Iron | 114 $cm^2$<br>68 mm<br>2 kg | Shearing<br>Cutting<br>Casting | Welding |
| **BASE ROLL** | **1** | • Mild Steel sheet (2mm)<br>• Mild Steel rod (8mm dia.)<br>• Cast Iron | 50 $cm^2$<br>76 mm<br>400 grams | Shearing<br>Cutting, Bending<br>Casting | Welding |
| **CONNECTOR** | **8** | • Mild Steel sheet (1mm) | 6 $cm^2$ | Shearing, punching | - |
| **SLIDER** | **8** | • Cast Iron | 3 grams | Casting | - |
| **UP-SLIDER** | **4** | • Cast Iron | 5 grams | Casting | - |
| **BOARD** | **4** | • Mild Steel sheet (2mm)<br>• Cast Iron | 144 $cm^2$<br>50 grams | Shearing<br>Casting | Welding, Mechanical fastening |
| **UP-BOARD** | **4** | • Mild Steel sheet (2mm)<br>• Mild Steel rod (3mm dia.)<br>• Mild Steel rod (3.5mm dia.) | 121 $cm^2$<br>4 mm<br>8 mm | Shearing<br>Cutting, grinding<br>Cutting | Welding |
| **STAR** | **1** | • Mild Steel sheet (1mm) | 160 $cm^2$ | Shearing | - |

# Weight & Cost Analysis

| COMPONENT | QUANTITY | MATERIALS | WEIGHT (each) | TOTAL WEIGHT Quantity × Weight | COST* |
|---|---|---|---|---|---|
| BASE | 1 | Iron | 2500 grams | 2500 | ₹113 |
| BASE ROLL | 1 | Iron, Mild Steel | 581 grams | 581 | ₹27 |
| CONNECTOR | 8 | Mild Steel | 2 grams | 16 | ₹10 |
| SLIDER | 8 | Iron | 3 grams | 24 | ₹10 |
| UP-SLIDER | 4 | Iron | 5 grams | 20 | ₹10 |
| BOARD | 4 | Mild Steel, Iron | 240 grams | 960 | ₹44 |
| UP-BOARD | 4 | Mild Steel | 90 grams | 360 | ₹17 |
| STAR | 1 | Mild Steel | 60 grams | 60 | ₹10 |

**TOTAL : ₹241**

* Price of iron/mild steel : ₹45/kg

# Process & Labour Cost Analysis

| PROCESS | COST/UNIT TIME | ESTIMATED TIME | NET COST |
|---|---|---|---|
| **Sand Mould Casting for Iron** | ₹ 150/hr | 2 hour | ₹300 |
| **Welding** | ₹ 100/hr | 1.5 hour | ₹150 |
| **Shearing, Punching** | ₹ 50/hr | 1 hour | ₹50 |
| **Bending** | ₹ 50/hr | 0.5 hour | ₹25 |
| **TOTAL** | | | ₹525 |
| **GRAND TOTAL COST** | | | ₹766 |

# THANK YOU!