

TA212 - Manufacturing Processes

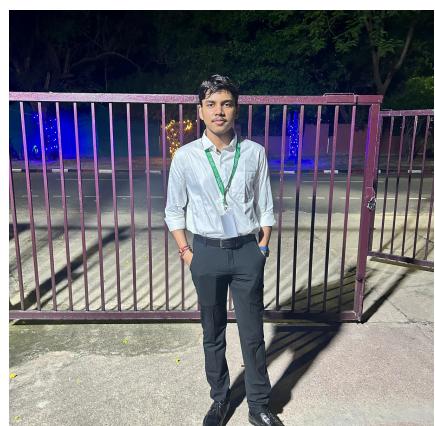
2nd SEM 2024-25

Group No. 13

VENDING MACHINE



Siddhant
Shekhar
231003



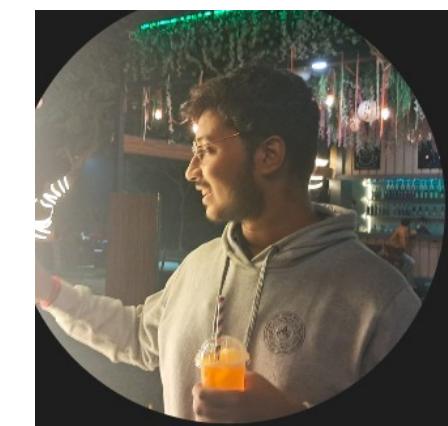
Siddhant
Singh
231004



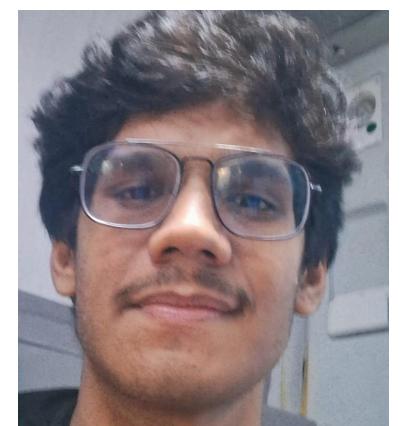
Vikash
Meena
231150



Vishesh
Anand
231164



Yash
Pathak
231188



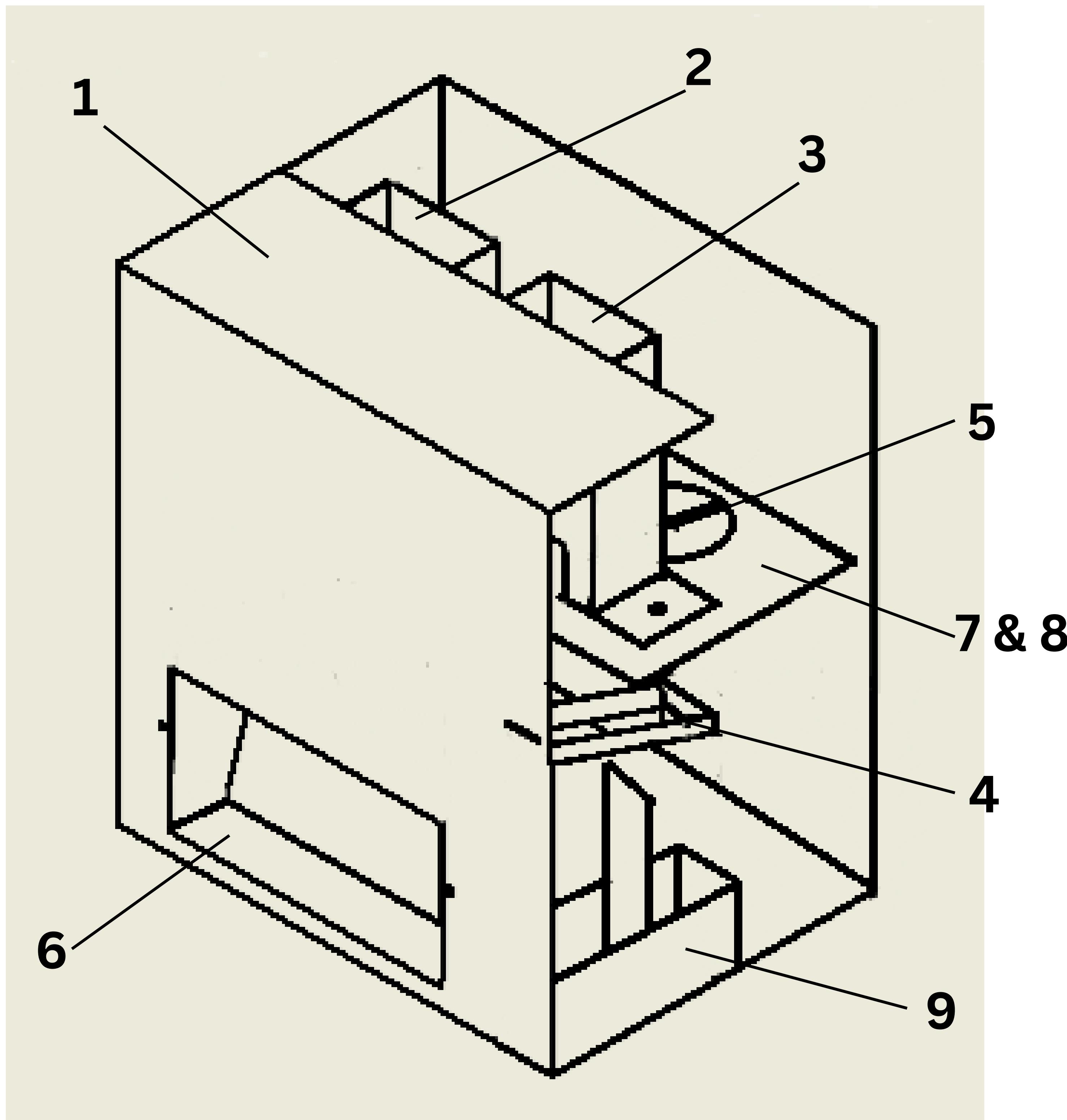
Yugan
Jain
231202

Guide - Mr. Rakesh Thapliyal

Tutor- Abhishek

Course Instructor- Dr. Arvind Kumar





Part List

Part Name	Qty	Type of Material Required	Dimension	Material	Machining Processes Used	Page No.
Front Plate	1	Flat	320*300*2.5	Mild Steel	Cutting, Drillling, Filing	9
Side Plate	1	Flat	320*300*2.5	Mild Steel	Cutting, Drilling, Filing	9
Back Plate	1	Flat	300*300*2.5	Mild Steel	Cutting, Drilling,Filing	9
Hopper1	1	PLA	67*67*120	PLA	3D Printing	10
Hopper2	1	PLA	81*51*120	PLA	3D Printig	11
Coin Sorter	1	PLA	100*38.8*24.9	PLA	3D Printing	12
Container	1	Flat	17.5*6	GI Sheet	Cutting	13
Support Plate	1	Flat	255*204*2.7	Mild Steel	Welding, Cutting	14
Disc	2	PLA	90mm Dia, 5.2mm thick	PLA	3D Printing	15
Piston	2	Rod	100mm*10mm *2mm	Mild Steel	Drilling, Cutting	16
Coin Collector	1	Flat	17.5mm*6.5mm *6mm	Cardboa rd	Cutting	17

Introduction

In recent years, vending machines have become a prominent example of automated retail, offering convenience and efficiency in product dispensing without the need for human supervision. These machines are commonly found in public spaces, educational institutions, and workplaces, providing quick access to snacks, beverages, and other essentials. The objective of this project is to design and develop a simple, coin-operated vending machine tailored to demonstrate fundamental mechanical and electronic principles taught in the TA212 course.

Our vending machine is designed to accept ₹5 and ₹10 coins through two separate slots. Coin detection is achieved using infrared sensors that verify the insertion of a valid coin. Upon successful detection, a signal is sent to an Arduino microcontroller, which acts as the brain of the system. Based on the denomination received, the microcontroller controls a geared DC motor to rotate a pinion gear mechanism that releases the selected item.

The project emphasizes the integration of mechanical design with electronic control systems. It serves as a practical application of classroom concepts, including gear systems, sensors, actuators, and embedded systems. The machine has been designed with cost-efficiency, modularity, and functionality in mind, making it a compact prototype for potential real-world applications.

Acknowledgement

We would like to sincerely thank Mr. Rakesh Thapliyal, our project guide, for his constant support and guidance throughout the project. His practical insights and suggestions really helped us understand and improve our design. We're also grateful to Mr. Arvind Kumar, our TA212 course instructor, for giving us the opportunity to work on this project and for encouraging hands-on learning. A big thank you to the TA212 lab staff as well, for always being helpful and supportive during the various stages of fabrication and testing. Their assistance made it easier for us to bring our ideas into reality.

Abstract

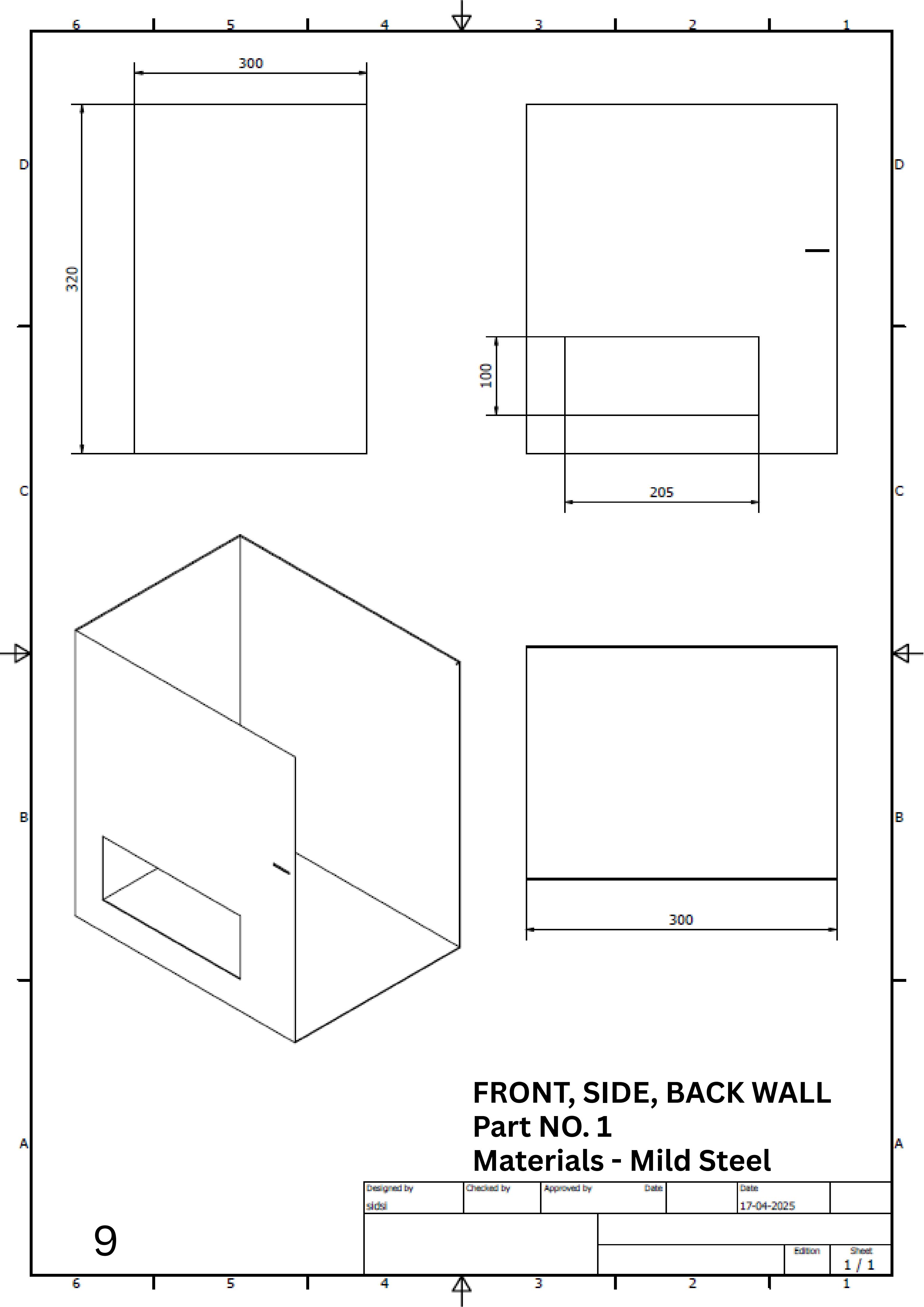
This project involves the design and fabrication of a coin-operated vending machine as part of the TA212 course. The machine is capable of accepting ₹5 and ₹10 coins and dispensing items accordingly. Coin detection is achieved using an infrared sensor, which identifies the denomination based on size or slot placement. Upon validation, an Arduino microcontroller activates a geared DC motor connected to a pinion mechanism that dispenses the item. The system is built with a focus on mechanical simplicity, cost-effectiveness, and practical application of mechatronic principles. Through this project, we aimed to integrate fundamental concepts of mechanics, electronics, and automation to develop a functional prototype that demonstrates real-world relevance in automated retail systems.

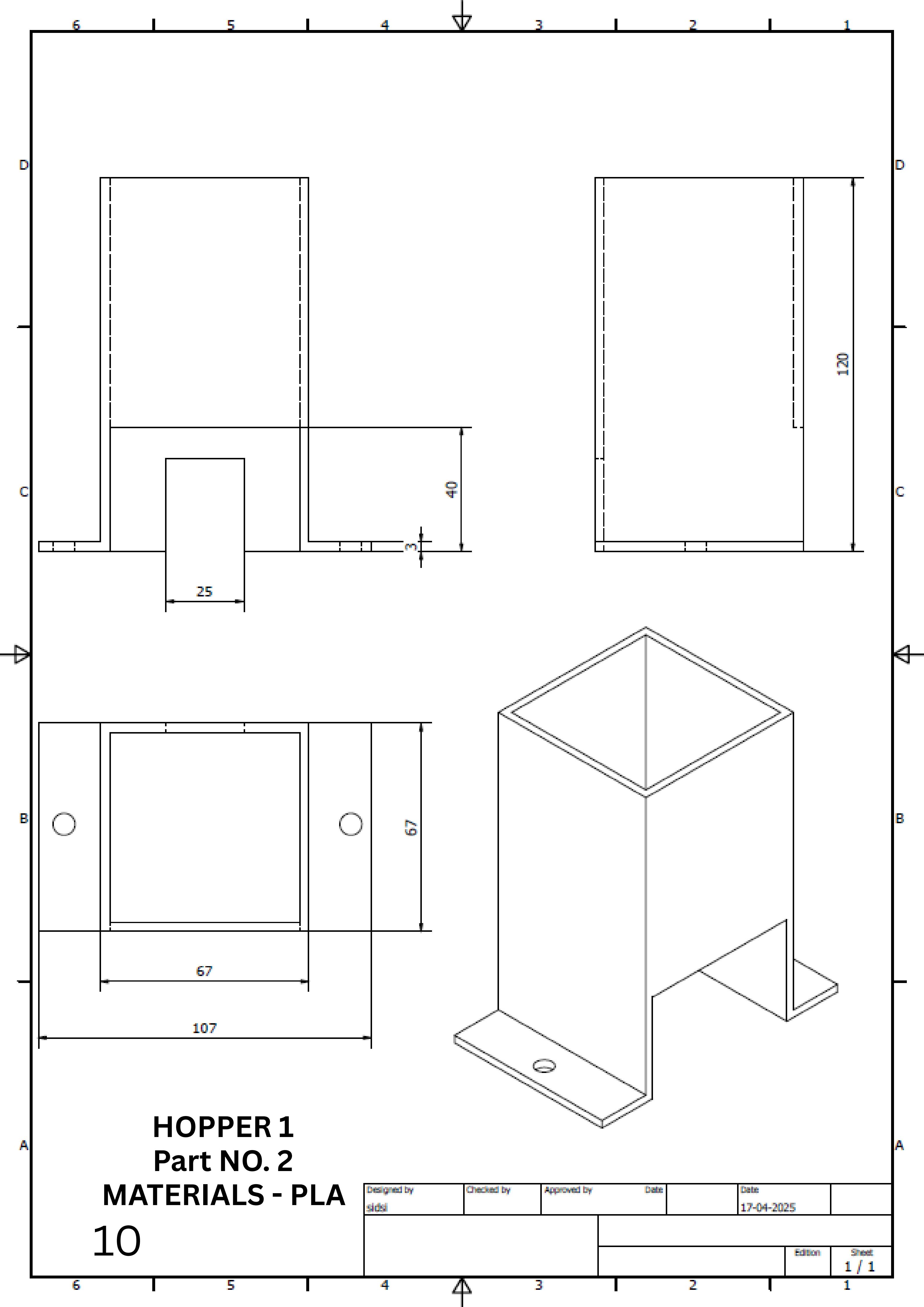
Motivation

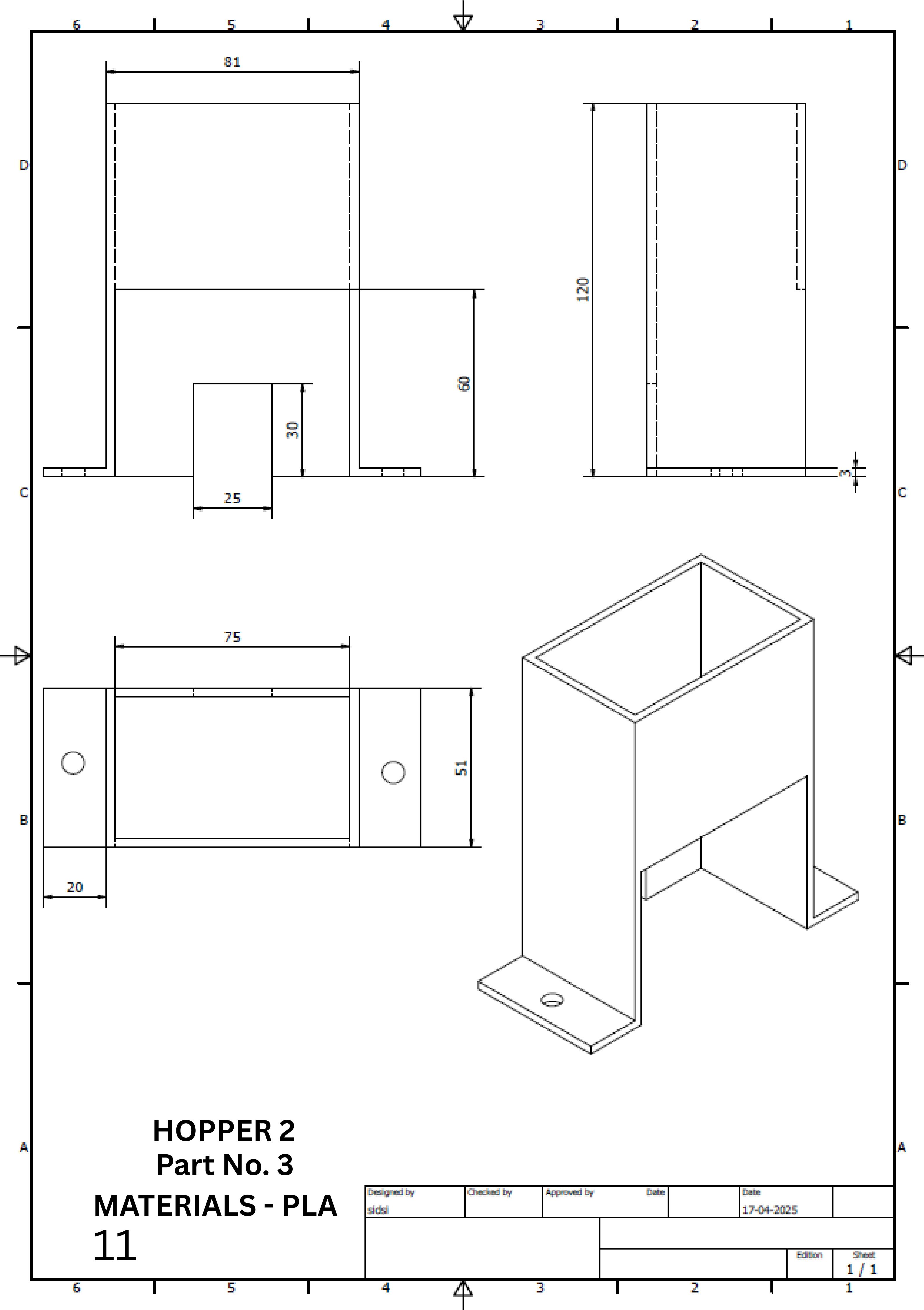
The idea of creating a vending machine comes from the need to develop practical solutions for convenience and accessibility in everyday life.

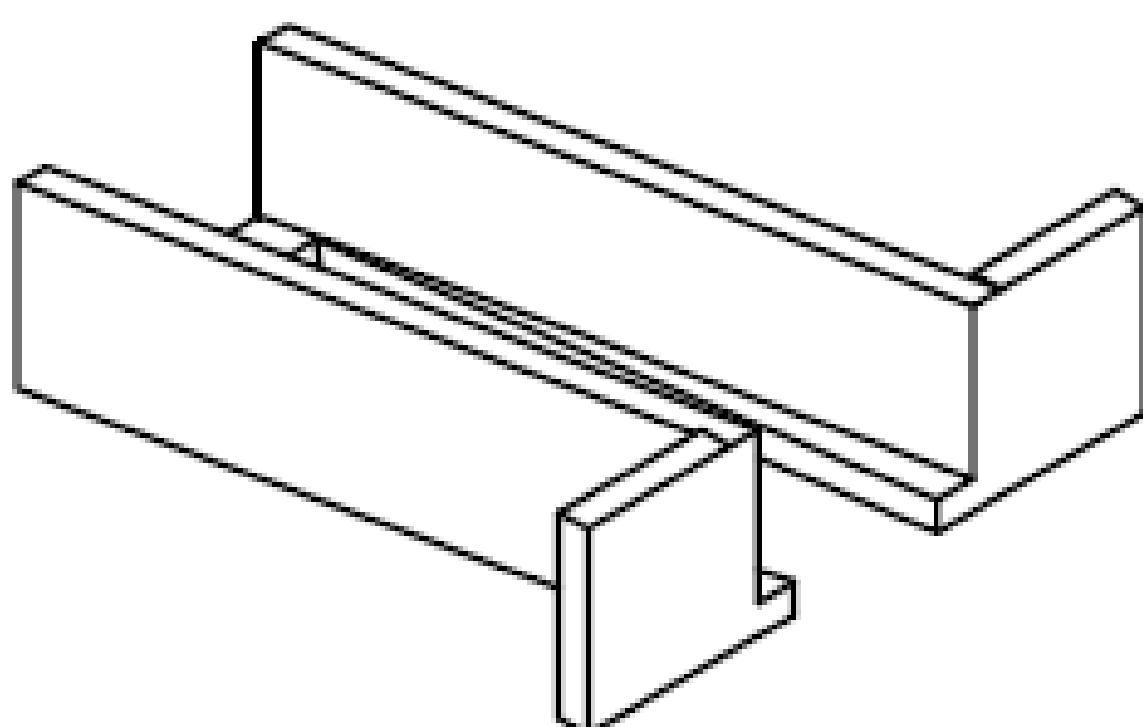
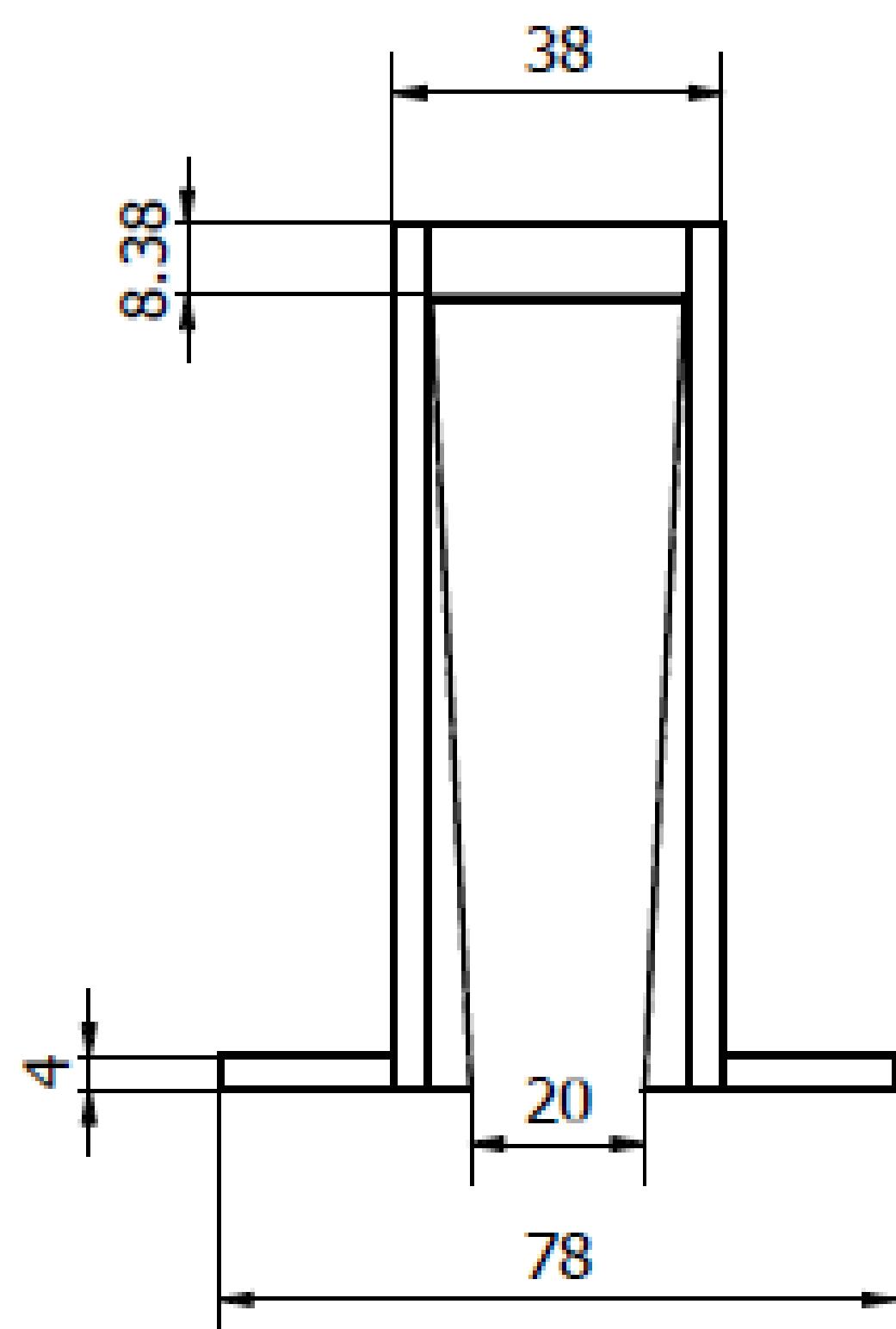
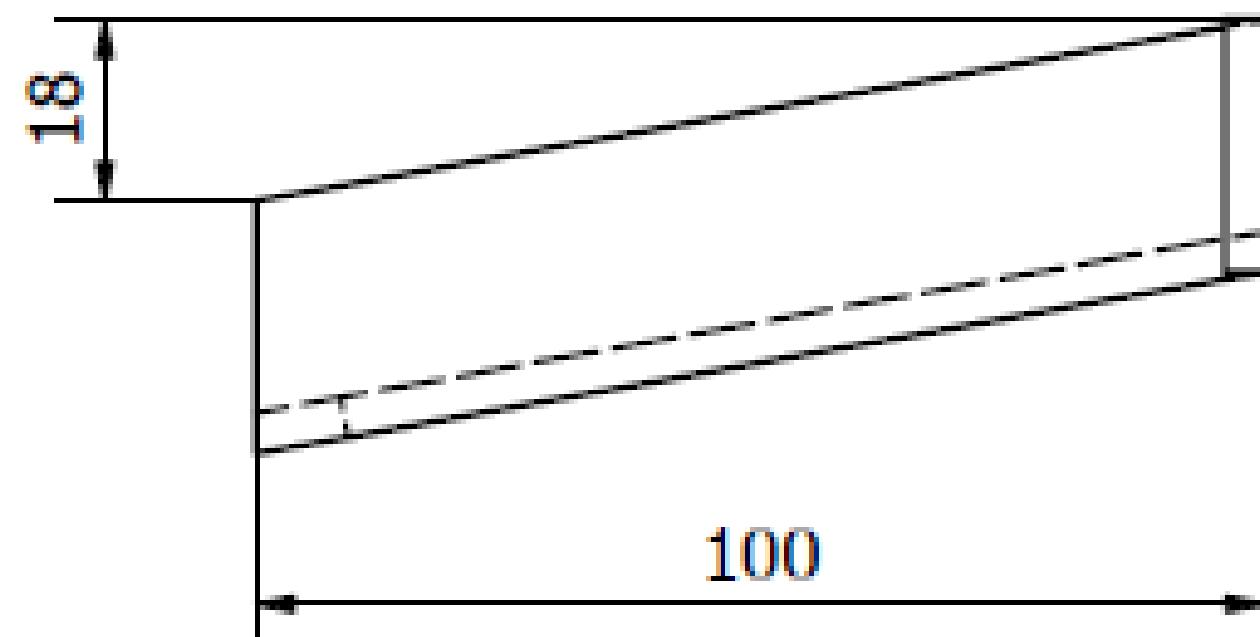
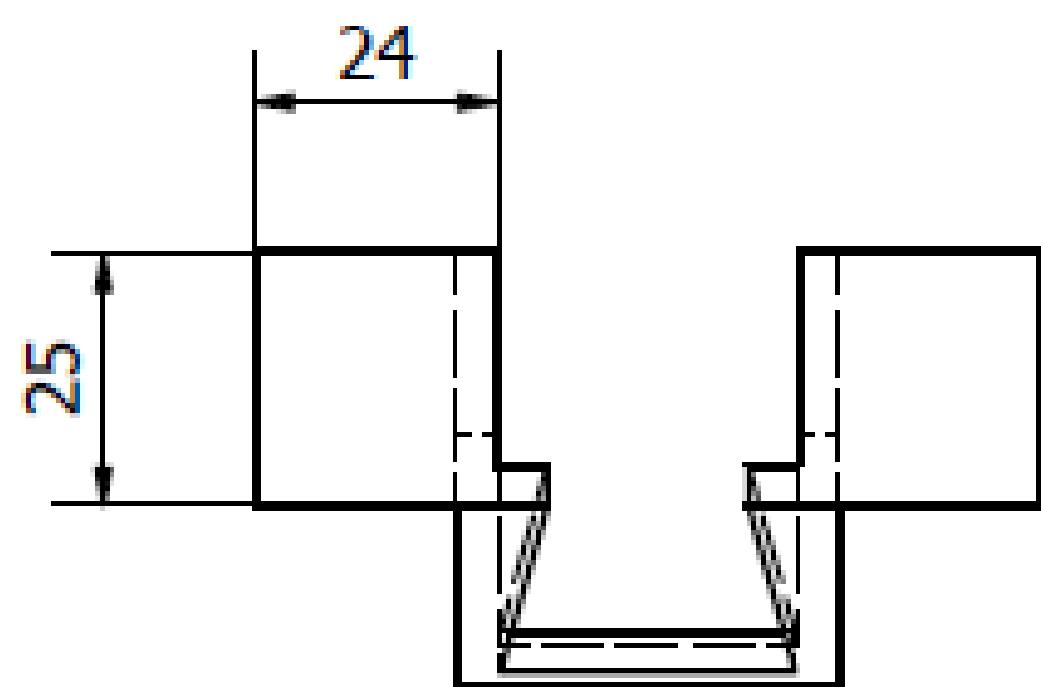
Vending machines are a great example of automated systems that serve people efficiently without requiring constant human supervision.

Building one helps explore how mechanical components, electronics, and user-friendly design can come together to solve real-world problems, like providing products quickly and securely in public or private spaces. The project also encourages creativity, problem-solving, and teamwork, while offering a hands-on way to understand the process of designing functional, reliable, and efficient machines.







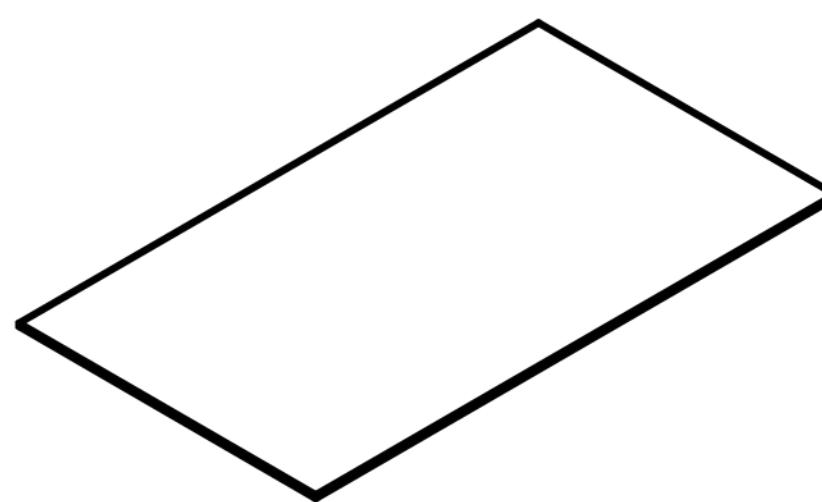
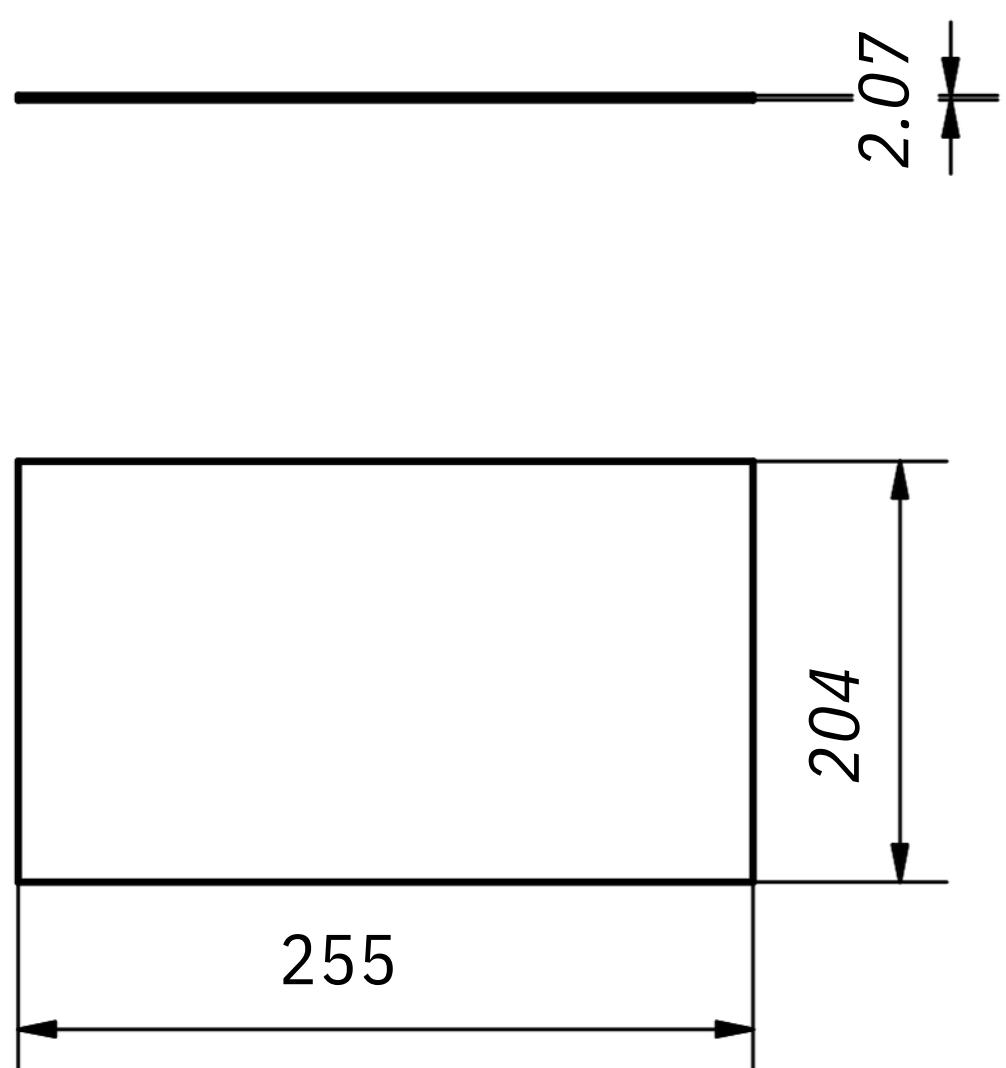


COIN SORTER

Part No. 4

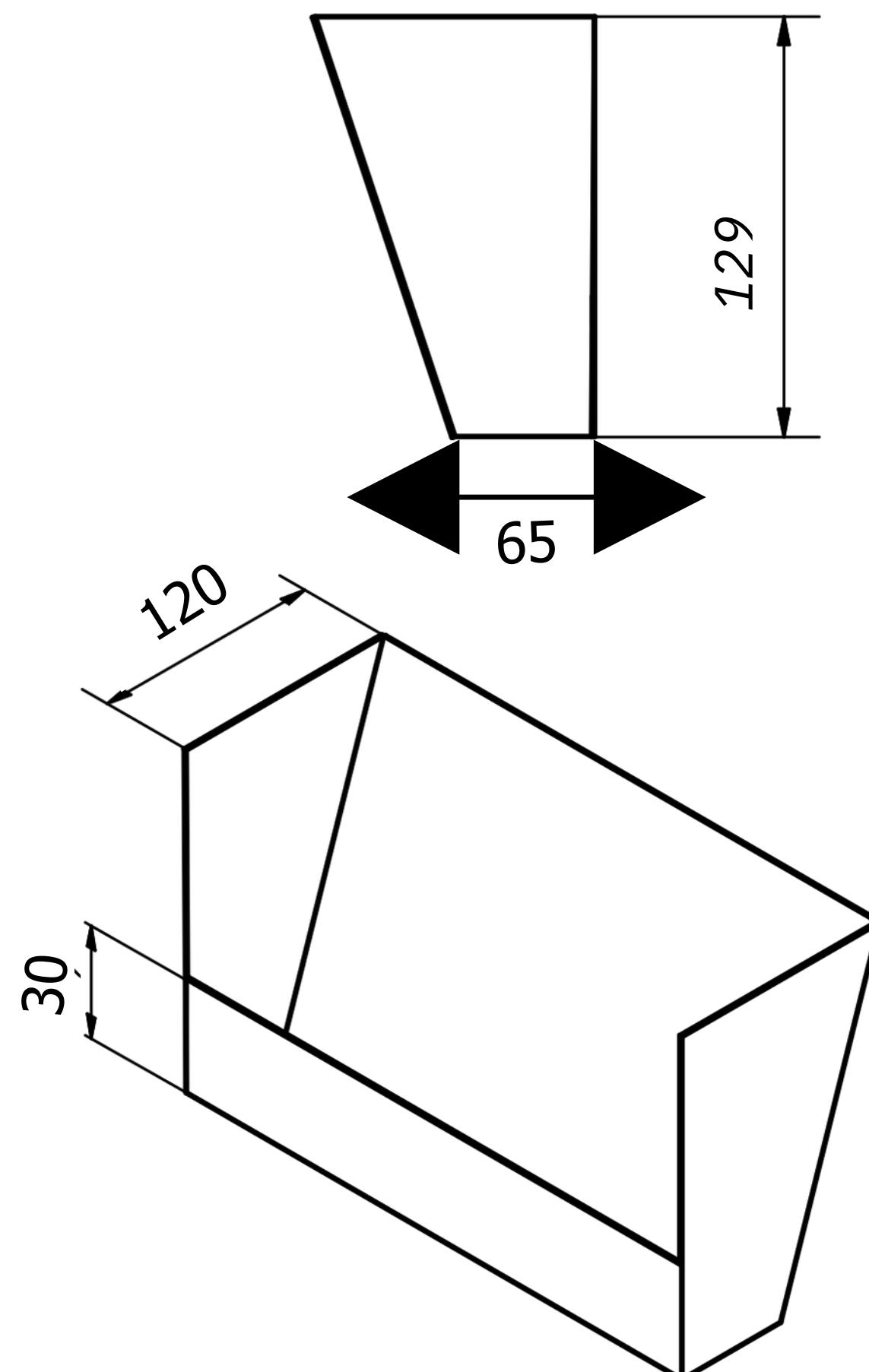
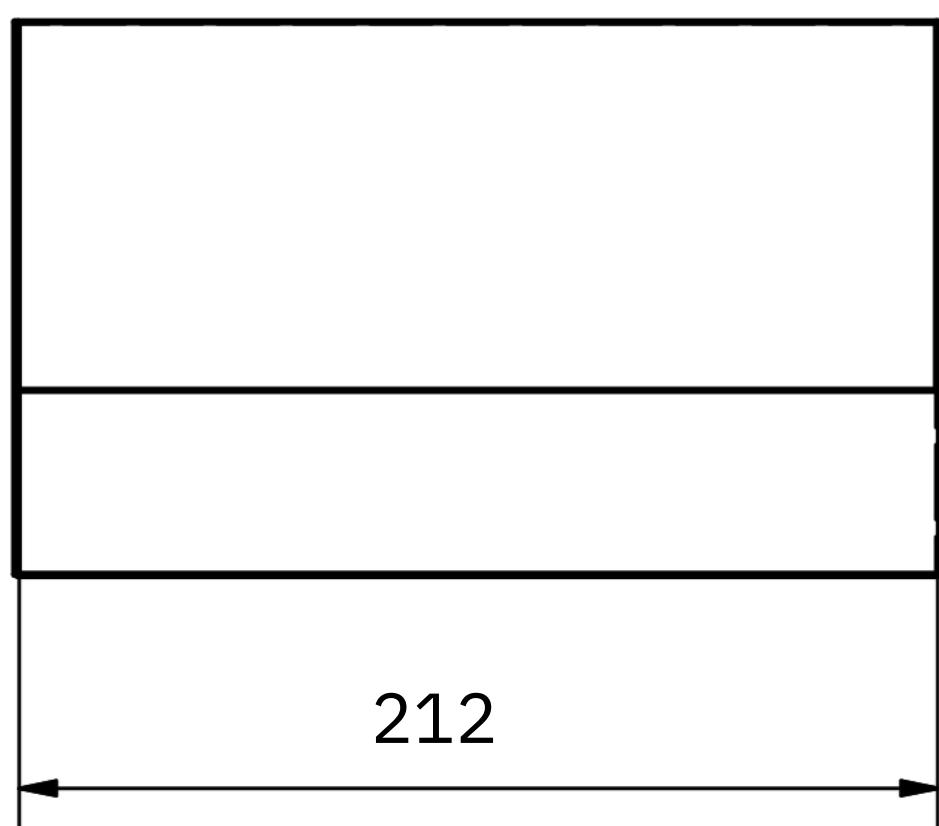
MATERIALS - PLA

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			Edition		Sheet 1 / 1



Part No. 5
SUPPORT PLATE
DIMENSION: 255*204*2.07
MATERIAL: MILD STEEL

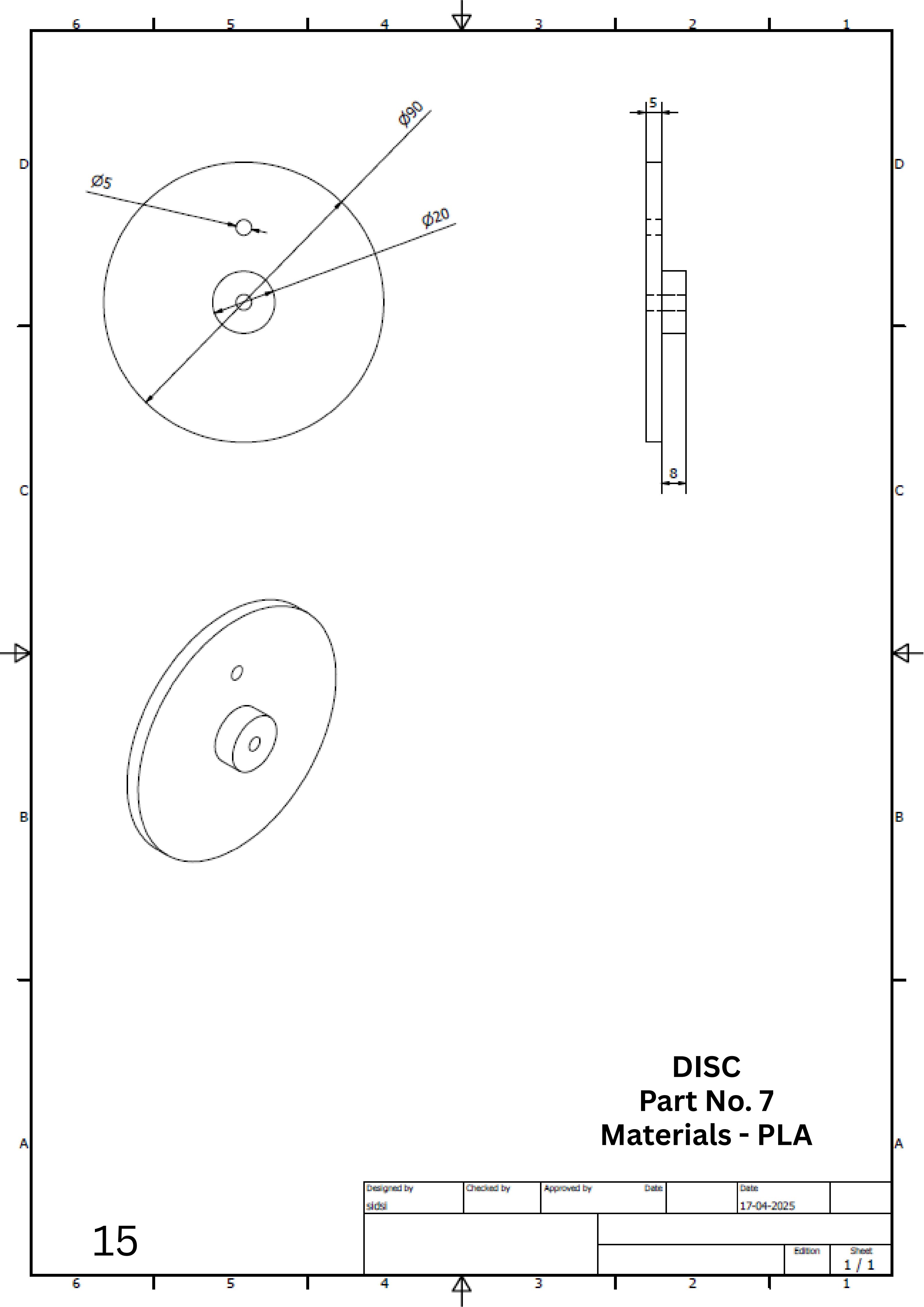
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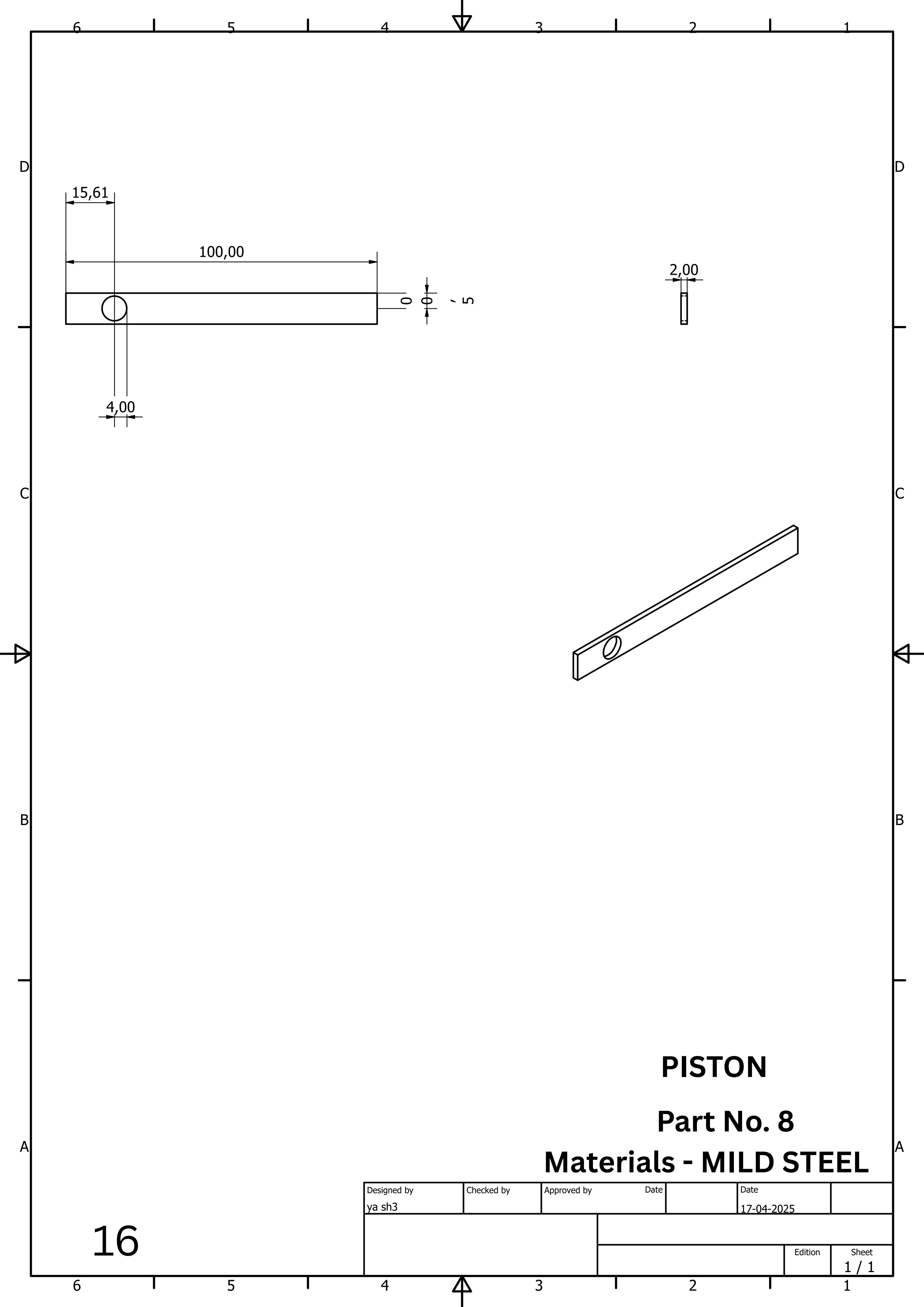


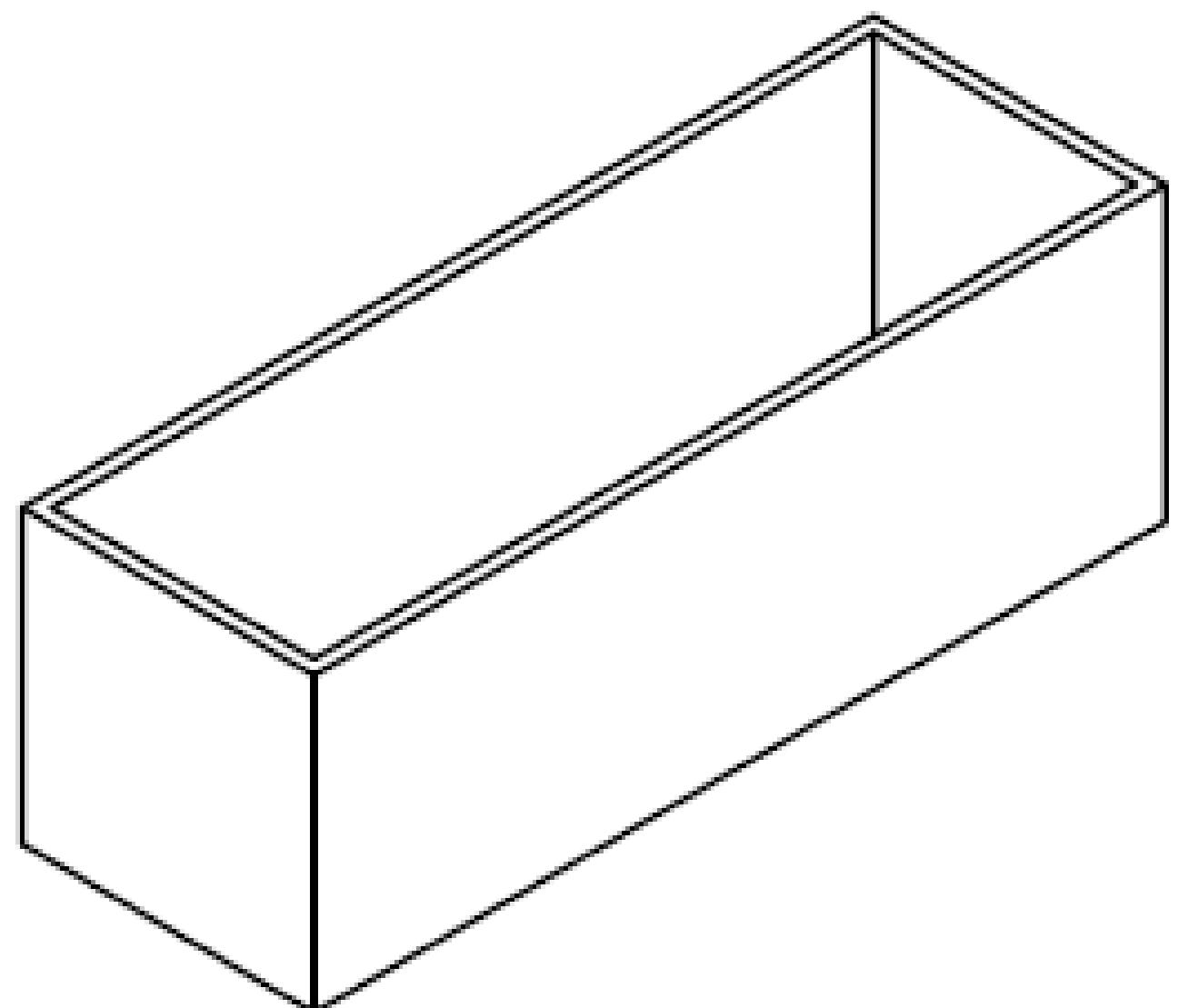
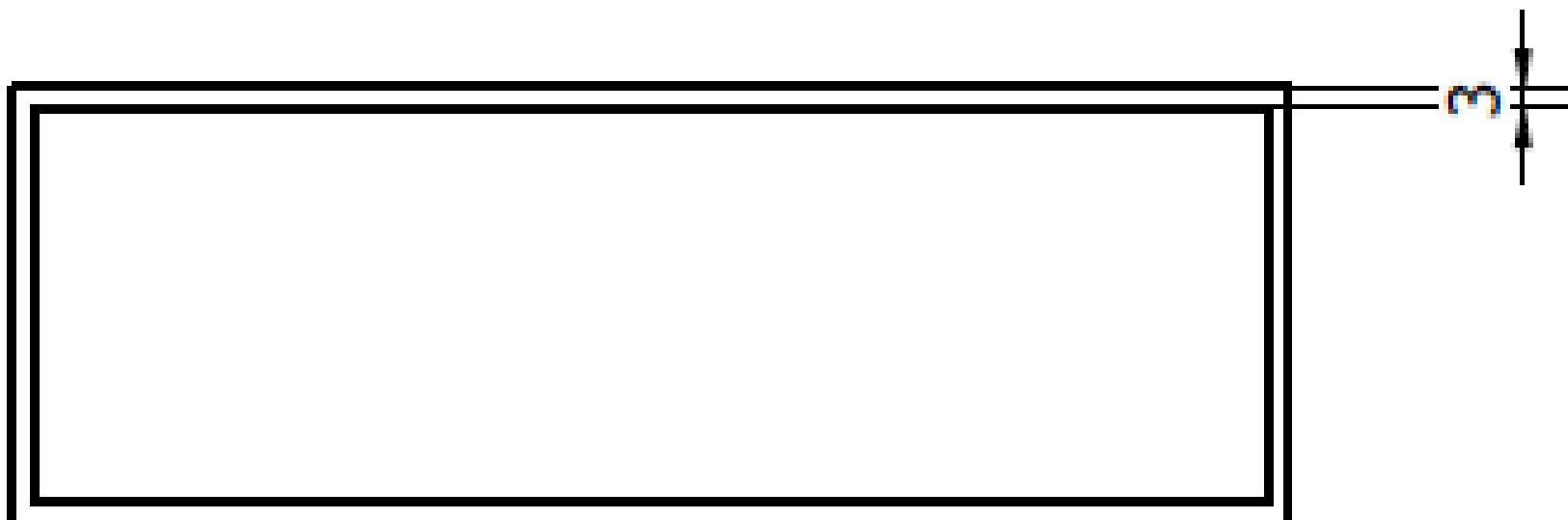
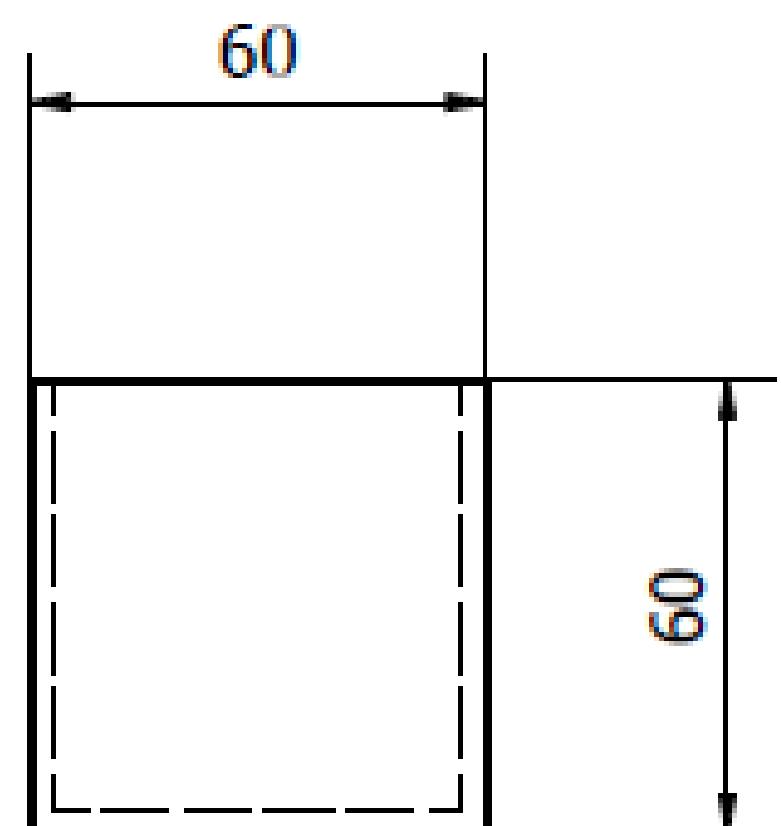
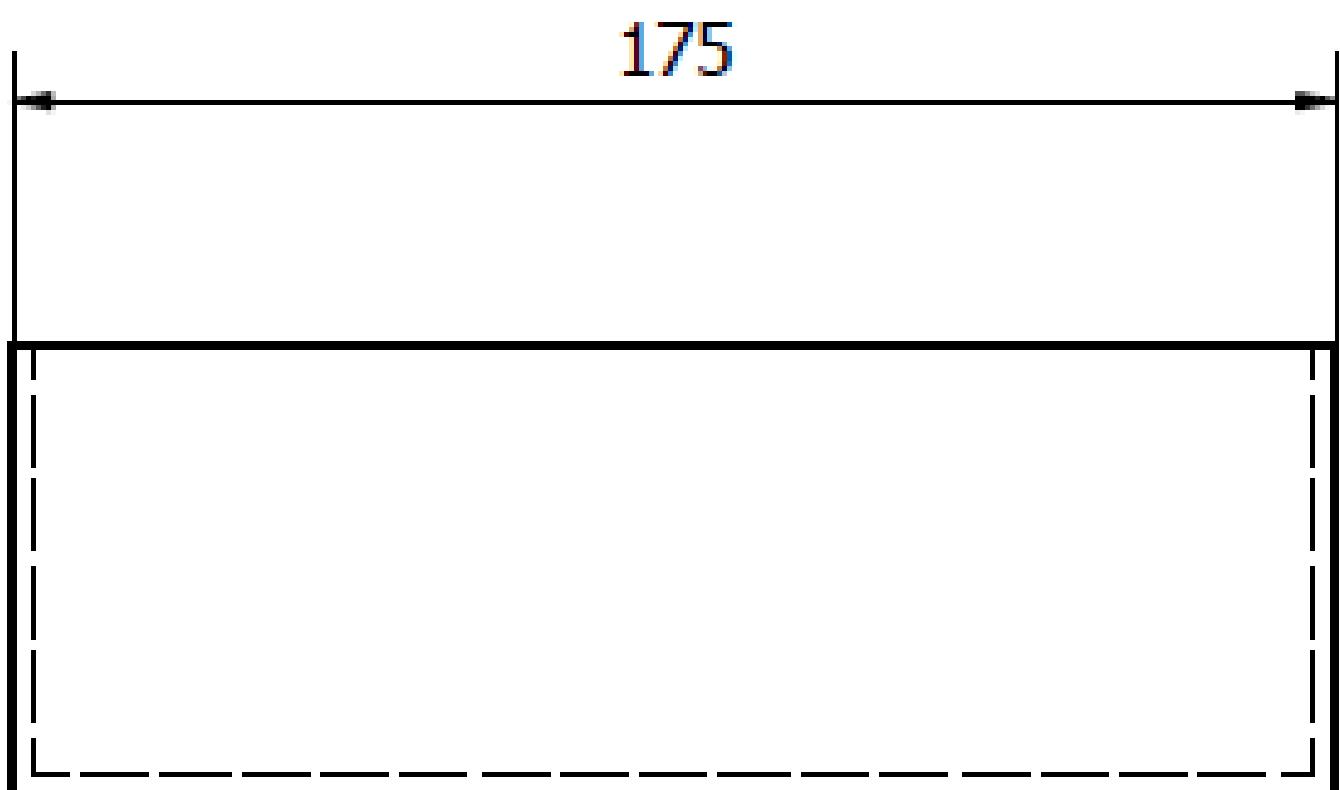
Part No. 6

MATERIAL: GI SHEET
CONTAINER

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container		Edition		Sheet 1 / 1	







COIN COLLECTOR

Materials - Cardboard

Part No. 9

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17			Edition	Sheet 1 / 1	

Motor Required

Maximum Torque of Motor: 2 N-m

Total Rotation: 2π

Power Required: $2 * w = 2 * 2 * \pi = 12.56 \text{ W}$

Cost Estimation

Mild Steel: Rs. 525 (5.83 Kg)

Angle and Folds: Rs. 126 (1.05 Kg)

Nut Bolt: Rs. 39 (0.3 Kg)

GI Sheet: Rs. 25 (0.27 Kg)

3D Printing: Rs. 2100 (7 hrs)

Drilling: Rs. 33 (20 min.)

Cutting: Rs. 30 (30 min.)

Electronics kit: Rs. 3200 (Double Motor)

Labour Cost: Rs. 7147 (Unskilled Labour
88 hrs total)

TOTAL: Rs. 13225