

Bag Buddy

**AUTOMATED GUIDED
VEHICLE(AGV) FOR BAGGAGE
MOVEMENT AT A RAILWAY
PLATFORM.**



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Market Analysis



Buggy Transfer



Trolley at airport



**Porter services at
Railways Station**

Problem Statement

page 02

Passenger Baggage Loading/Unloading Points (P/L/P) face significant challenges due to overcrowding, inefficient allocation of resources, and security vulnerabilities in railway stations. These issues result in delays, confusion among travelers, and increased risks of theft or luggage mishandling. Furthermore, inadequate support for passengers with heavy or oversized luggage and poor compliance with weight and size restrictions exacerbate the problem. Current systems lack real-time monitoring, seamless organization, and accessibility solutions, leading to inefficiencies and dissatisfaction among passengers.

Concerns in Handling Baggage in Railway stations

page 03

Baggage handling at railway stations in India often faces challenges due to the sheer volume of passengers, limited infrastructure, and occasional overcrowding. Some common concerns specific to Indian railway stations include:

- ***Overcrowding and Congestion:*** Difficult to navigate with large bags on platforms of busy stations like Dehi, Mumbai, Kolkata and Chennai.
- ***Porters and Trolley Services:*** Porters are available at stations to help with luggage, the system is sometimes informal, with high varying pricing and a lack of regulation.
- ***Inconsistent Quality of Porter Service:*** While some stations have baggage counters or trolleys, they are often insufficient for the high number of passengers.

In the recent years Indian railways is trying to improve the passenger experience by moderanizing stations, however given the size and complexity of India's railway system, these improvements are still a work in progress

Drop **POINT**

WAITS FOR YOU AT BAGGAGE DROP POINT
WHEN YOU COME TO POINT COME TO THE
COUNTER

MAX WAIT TIME 10 MINUTES



SECURITY CHECK PASS

AUTOMATICALLY MOVE TO BAGGAGE DROP POINT



SECURITY CHECK FAIL

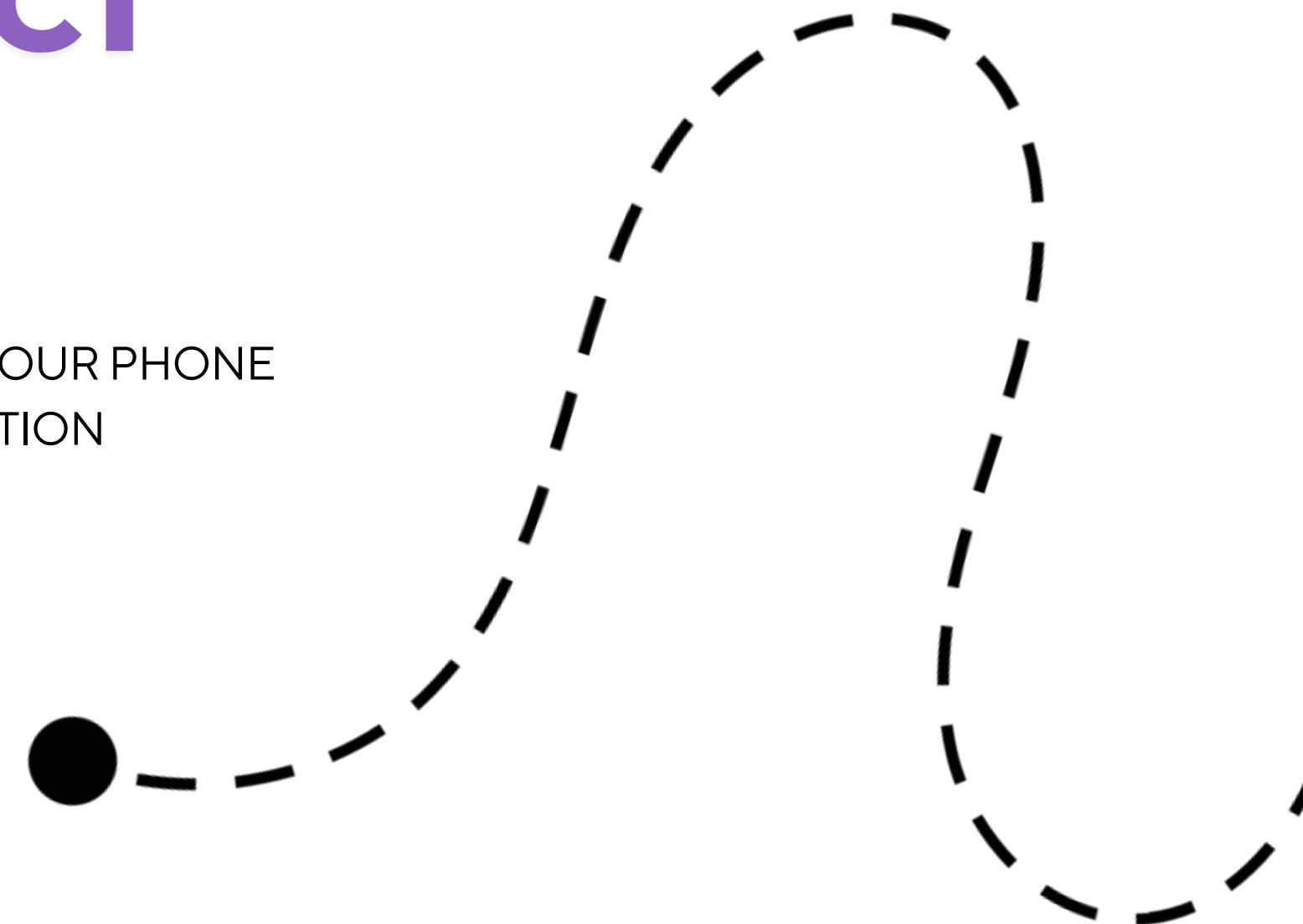
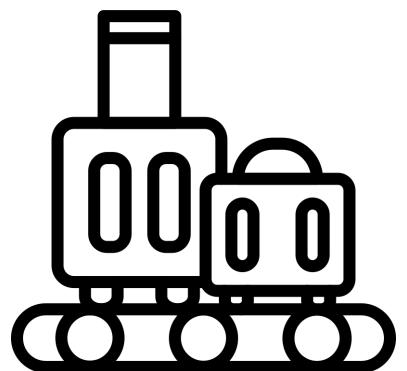
SEND NOTIFICATION TO PHONE TO ATTEND THE
BAGGAGE



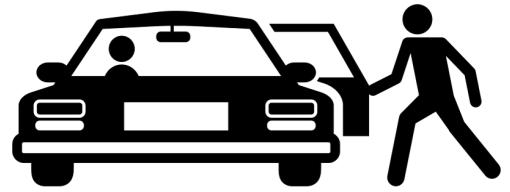
- BOOK A BUDDY
- CONNECT IT WITH YOUR PHONE
- SCAN THE BOARDING PASS/TICKET

Baggage
COLLECT

- BOOK A BUDDY
- CONNECT IT WITH YOUR PHONE
- CHOOSE A DESTINATION



Exit
POINT



WAITS FOR YOU AT CAR POINT
WHEN YOU COME TO POINT COME TO THE
COUNTER
MAX WAIT TIME 10 MINUTES



BAG BUDDY

Product Brief

- connects with your phone
- Follows a preset path only
- In built weighing machine
- In built camera with computer vision
- Gps TRACKING ENABLED with airpot or Railway platform map
- Send NOTIFICATION TO PHONE IF any problem comes up
- Auto docks to charging point after baggage drop

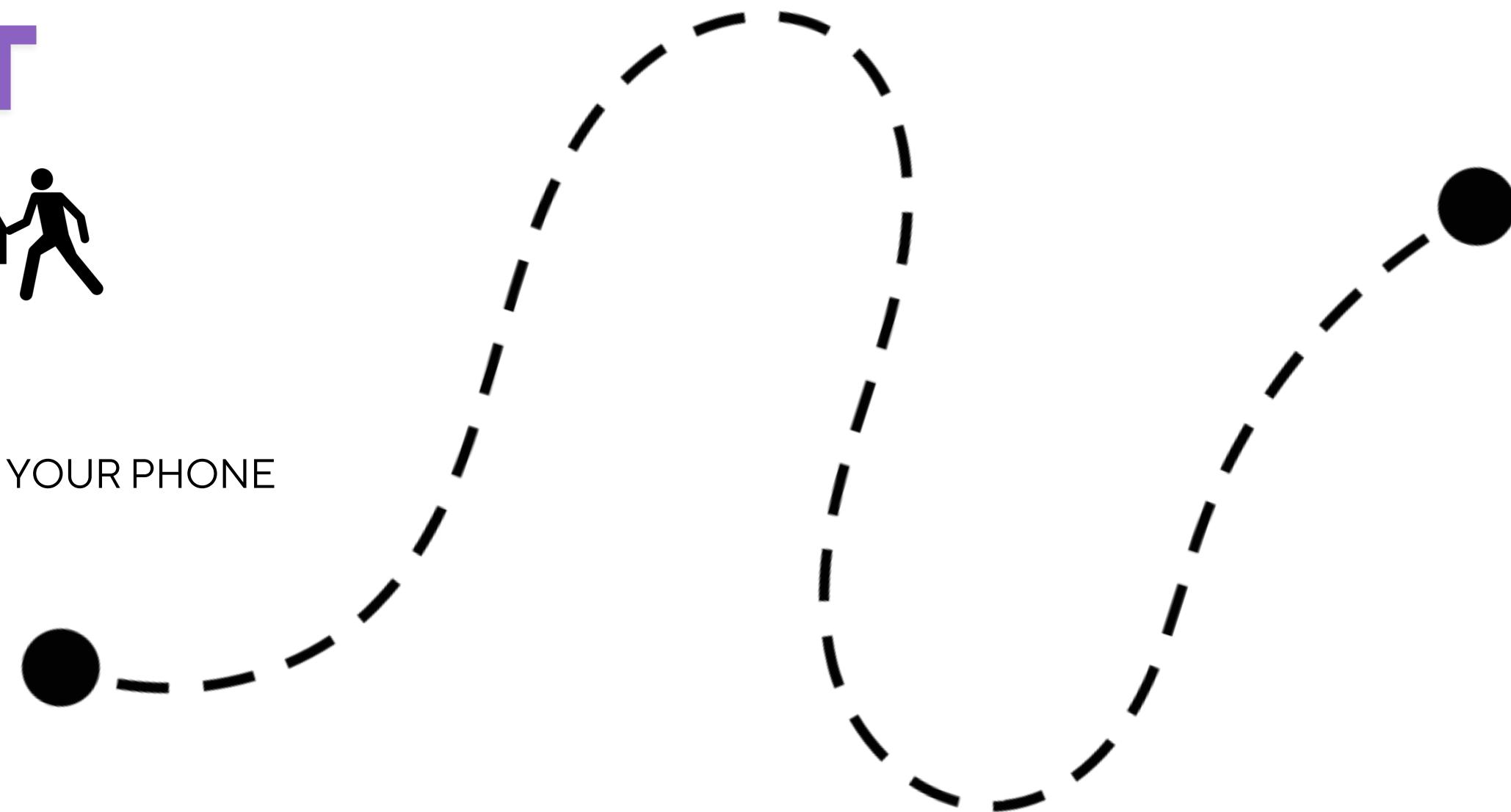


Going to Platform

Drop
POINT



- BOOK A BUDDY
- CONNECT IT WITH YOUR PHONE
- SCAN THE TICKET



- All details available on phone app
- People can follow the vehicle to go to platform
- Can change the platform from app if platform changes suddenly

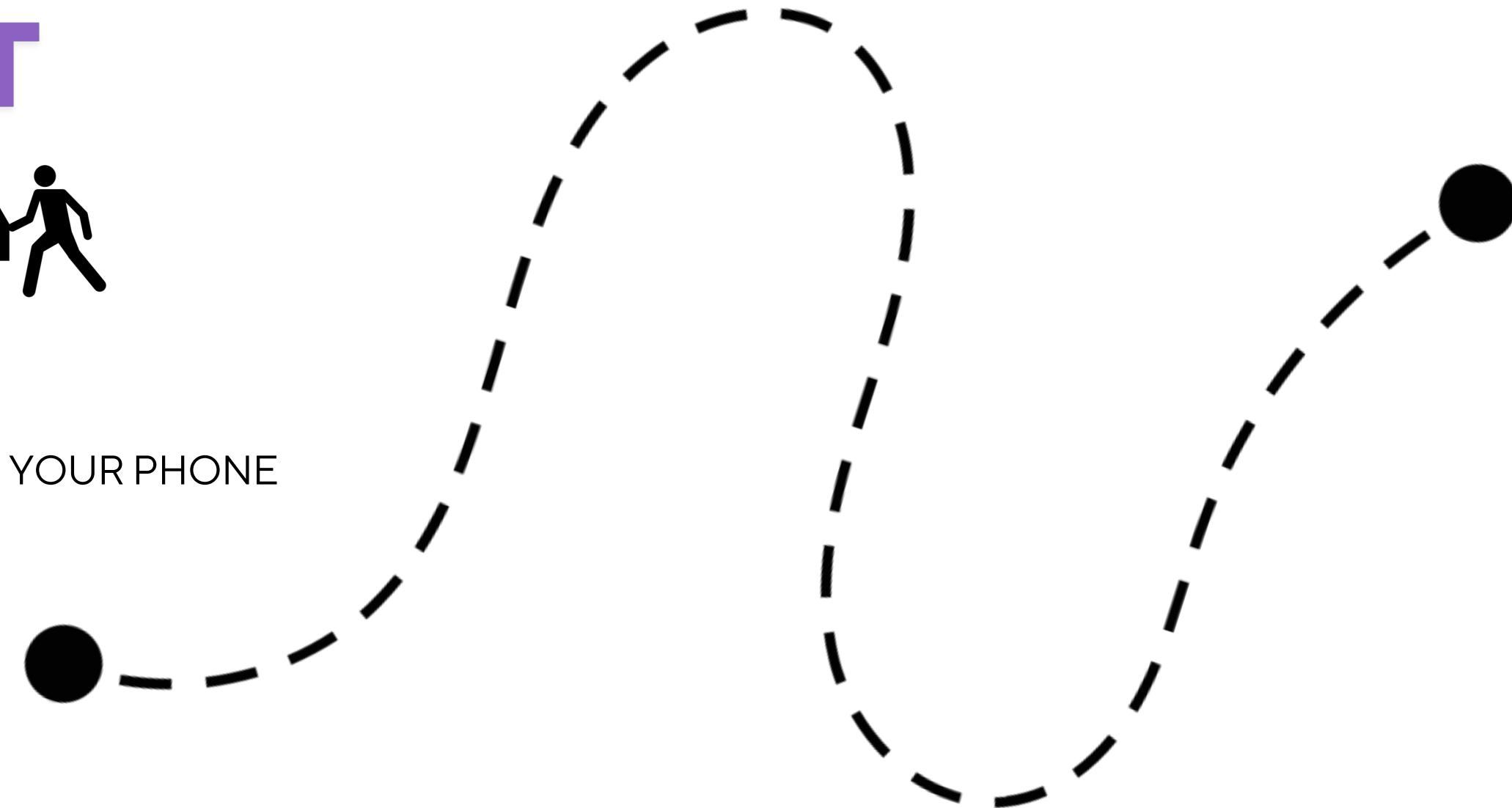


Going to Platform

Drop
POINT

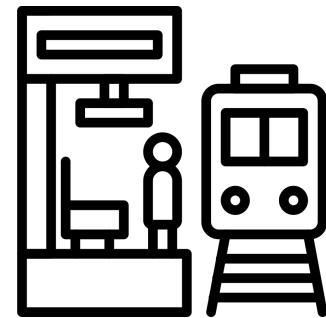


- BOOK A BUDDY
- CONNECT IT WITH YOUR PHONE
- SCAN THE TICKET



- All details available on phone app
- People can follow the vehicle to go to platform
- Can change the platform from app if platform changes suddenly

WAITS FOR YOU AT BAGGAGE DROP POINT
WHEN YOU COME TO POINT COME TO THE
COUNTER



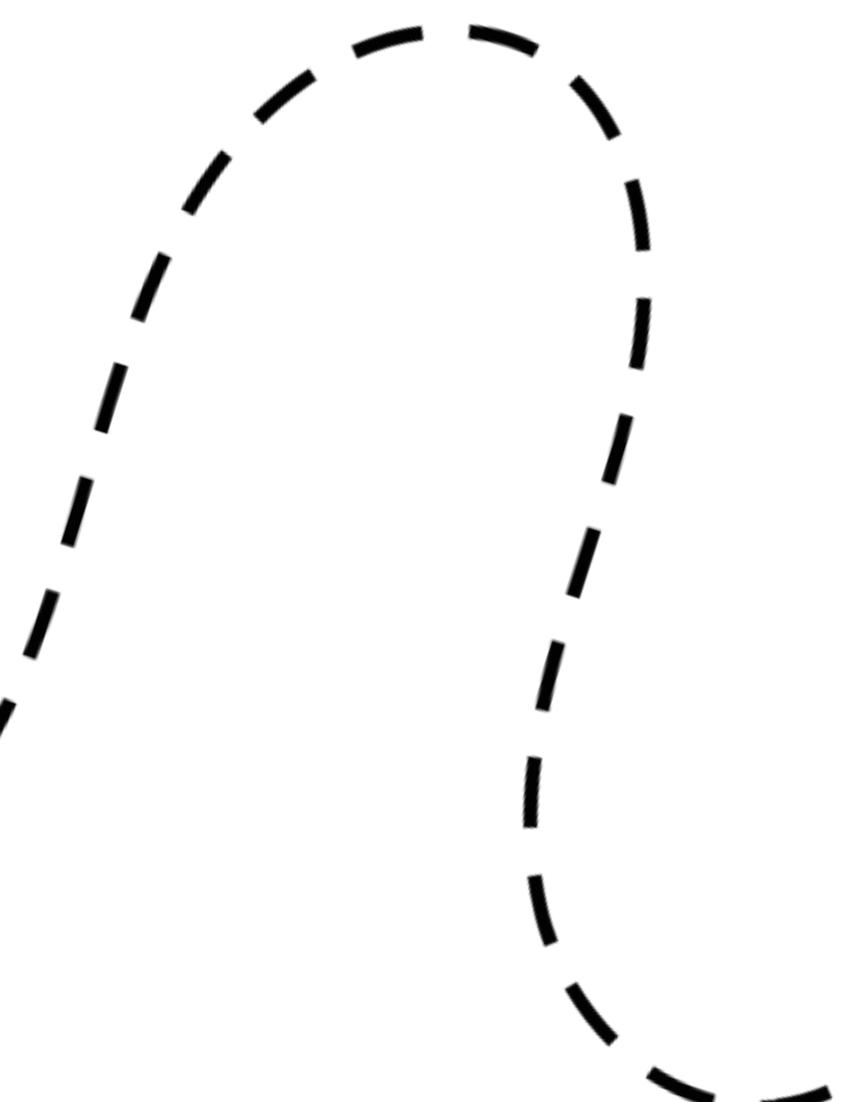
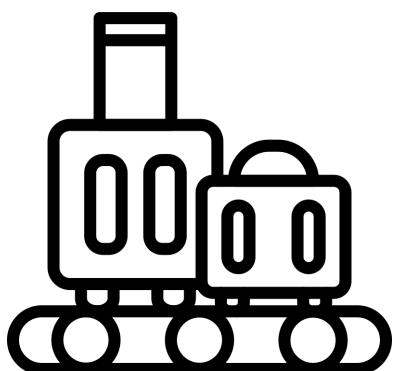
Trasnsfer bag to coach



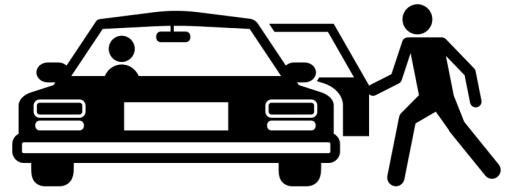
Going out of Platform

Railway
PLATFORM

- BOOK A BUDDY
- CONNECT IT WITH YOUR PHONE
- CHOOSE A DESTINATION



Exit
POINT



WAITS FOR YOU AT CAR POINT
WHEN YOU COME TO POINT COME TO THE
COUNTER
MAX WAIT TIME 10 MINUTES



BAG BUDDY



Range on single charge: **150 km**



- Connects with phone
- 2 operating options
- follow me
- self motion

Performance Targets



Conveyor belt to load and
unload baggage



Inbuilt seat for elder/



Carry load: **120 Kg**



Speed: max **10 km/h**



Performance Targets



Range on single charge: **150 km**

Average Railway platform size: 1 km

3,000 to 5,000 people per hour

*Average distance covered for 1 person: **3 km***

DOES 50 ROUNDS ON A SINGLE CHARGE



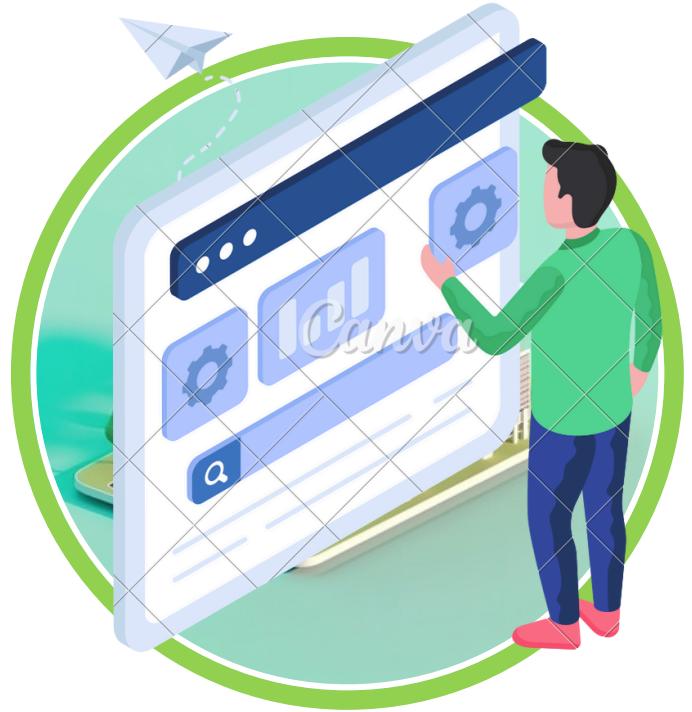
Performance Targets



People face difficulties in loading and unloading heavy bags

Conveyor belt with capacity to move 120 kg load

Conveyor belt to load and
unload baggage



- Connects with phone
- 2 operating options
 - follow me
 - self motion

Performance Targets

Connect to cart

control your cart with phone



Self motion

Get the data through the PNR and auto move to the coach gate
Follows a predefined path

Follow me

Track your phone and follow you while following its set path

*change the platform through phone
if platform change suddenly*

Performance Targets

Free Luggage Allowance (Without Extra Charges)

- Sleeper Class (SL): **40 kg**
- AC 3-Tier (3AC): **40 kg**
- AC 2-Tier (2AC): **50 kg**
- AC First Class (1AC): **70 kg**
- Second Class (General): **35 kg**

Maximum Carrying Limit (With Extra Charges)

- Sleeper Class (SL): **80 kg**
- AC 3-Tier (3AC): **80 kg**
- AC 2-Tier (2AC): **100 kg**
- AC First Class (1AC): **150 kg**
- Second Class (General): **70 kg**

Carry load: **120 Kg**



*With 1.5 Factor of Safety



Performance Targets

Inbuilt seat for **Elder/Children**



1. Large & Crowded Stations
2. High Platforms & Train Boarding Difficulty
3. Heavy Luggage Burden
4. Safety Concerns & Risk of Falls
5. Lack of Seamless Connectivity
6. Comfort
7. Long Waiting Hours & Fatigue

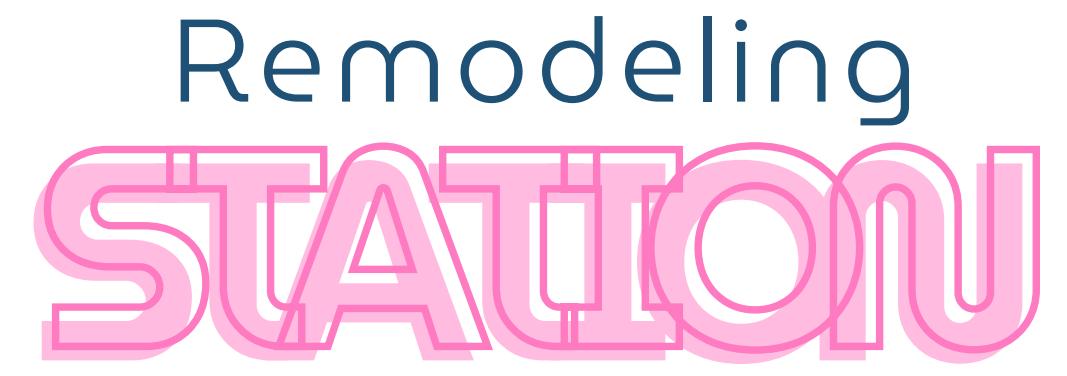
Performance Targets

Average Crowd Speed in Railway Stations

- Normal Walking Speed (Low Crowd Density):
1.1.2 to 1.5 meters per second (4.3 to 5.4 km/h)
2. Observed in less crowded stations or open platforms.
- Moderate Crowd Density (Rush Hour but Moving Freely):
1.0.8 to 1.2 meters per second (2.9 to 4.3 km/h)
2. Common in busy railway stations like Delhi, Mumbai, or Chennai during non-peak hours.
- High Crowd Density (Heavy Rush, Limited Movement):
1.0.3 to 0.8 meters per second (1.1 to 2.9 km/h)
2. Happens during peak hours when passengers are queuing, boarding, or deboarding.
- Extreme Congestion (Stampede Risk, Near Standstill):
1.0 to 0.3 meters per second (0 to 1.1 km/h)
2. Observed in highly overcrowded situations, such as festival seasons or major train delays.

Speed: **max 10 km/h**





Central Platforms

Platform motion

3 lane motion

- Forward motion lane
- Backward motion lane
- Resting lane

use slopes to
climb up

Remodeling
STATION

Island Platforms

Platform motion

3 lane motion

- Forward motion lane
- Backward motion lane
- Resting lane

Crossing Platform motion

2 lane motion

- Forward motion lane
- Backward motion lane
- No stoppage on bridge

*use slopes to
climb up*

PRODUCT SPECIFICATIONS

BATTERY AND CHARGING

- LITHIUM ION OR LEAD ACID BATTERY
- BATTERY CHARGING TIME: 4 TO 8HRS
- BATTERY LIFE: 8 TO 12HRS DEPENDING ON LOAD AND SPEED
- CHARING METHOD
 - AUTOMATICLLY RETURN TO CHARGING STATION AFTER LOW BATTERY AND CHARGE ITSELF

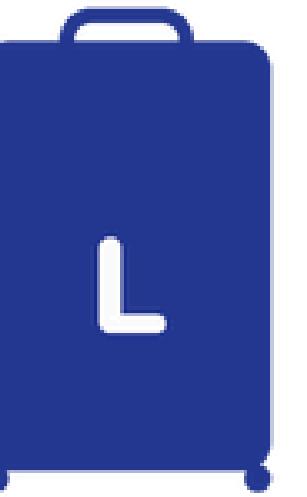
PRODUCT SPECIFICATIONS

SMART CONNECTIVITY

WIRELESS COMMUNICATION: MOST AGVS COMMUNICATE WITH CENTRAL CONTROL SYSTEMS USING WIRELESS PROTOCOLS LIKE WI-FI, 4G, OR 5G.

REAL-TIME TRACKING: COMMUNICATION SYSTEMS ALLOW REAL-TIME TRACKING AND COORDINATION, ENSURING THE AGVS ARE OPERATING AS INTENDED.

Available baggages



Inches

19 - 21

22 - 25

26 - 28

30 - 32

Width

32 - 35 cm

39 - 43 cm

47 - 50 cm

51 - 54 cm

Height
(exc. wheels)

50 - 53 cm

60 - 63 cm

68 - 71 cm

74 - 80 cm

Thickness
(not extended)

22 - 25 cm

24 - 27 cm

26 - 30 cm

30 - 34 cm

Model	Size
	20 L 16" x 8" x 12"
	30 L 18" x 8" x 14"
	40 L 20" x 9" x 14"
	50 L 22" x 9" x 14"
	60 L 24" x 11" x 14"
	80 L 28" x 12" x 16"
	100 L 32" x 12" x 17"
	120 L 36" x 12" x 18"

Carry-On Suitcase

Duffel Bag

Travel Backpack

SIZE



(S)

10-20L

(M)

21-35L

(L)

36-45L

(XL)

46-55L

(XXL)

56-70L

(XXXL)

71-90L

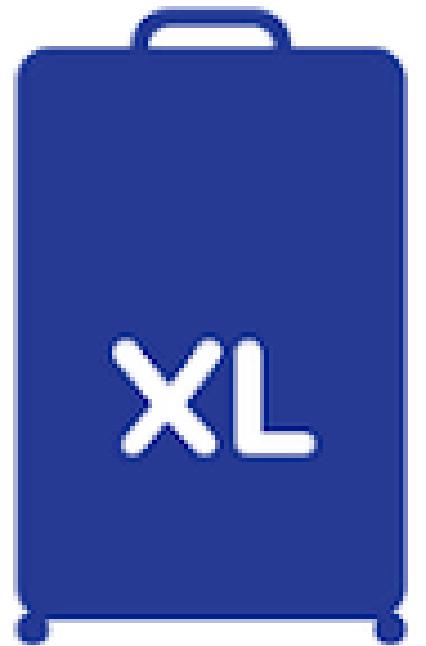
A diagram of a red and grey travel backpack. A vertical line labeled "Height" extends from the top of the backpack to its base. A horizontal line labeled "Length" extends from the front of the backpack to the back. A diagonal line labeled "Width" extends from the side of the backpack to the front. To the left of the backpack, there is a legend with three colored squares: blue for "Height", orange for "Length", and green for "Width".

SIZE DIM	(S) 10-20L	(M) 21-35L	(L) 36-45L	(XL) 46-55L	(XXL) 56-70L	(XXXL) 71-90L
Height (in)	13.7-18.9	18.5-21.7	21.6-27.6	25.4-31.5	29.4-37.5	34.6-47.2
Length (in)	11.8-14.6	11.8-14.6	11.8-14.6	11.7-15.8	13.6-17.8	15.7-19.6
Width (in)	5.9-7.9	5.9-7.9	7.8-10	7.7-11.9	9.7-13.8	11.8-15.7

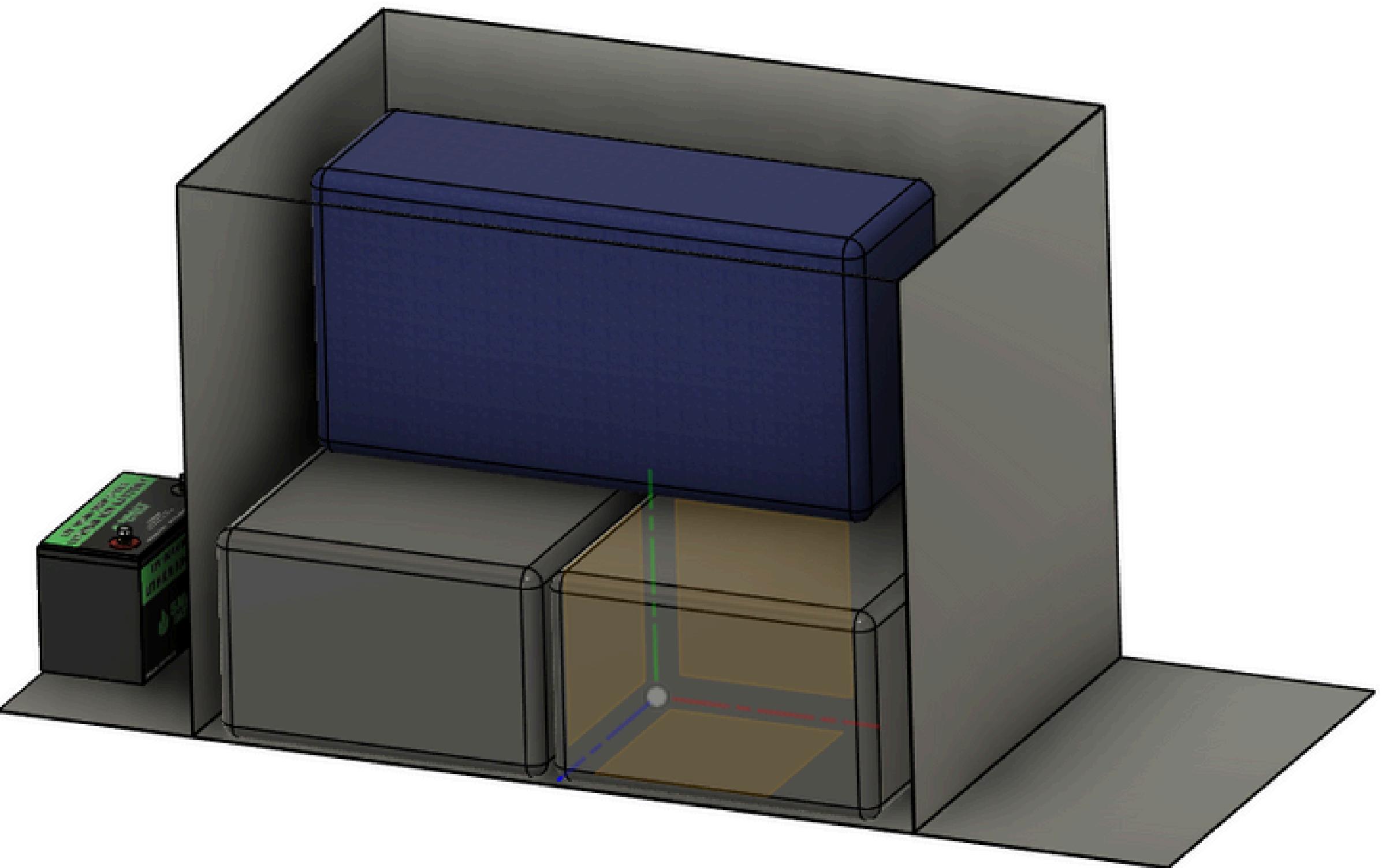
Available baggages

Volume Requirement

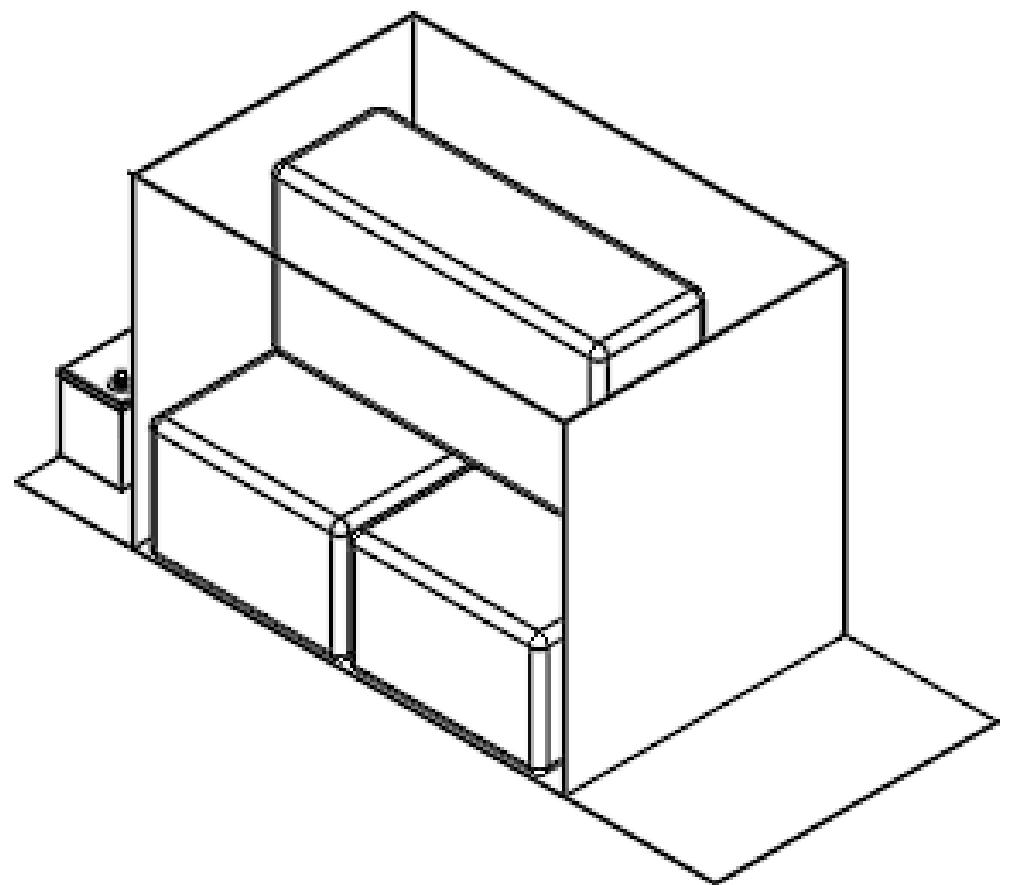
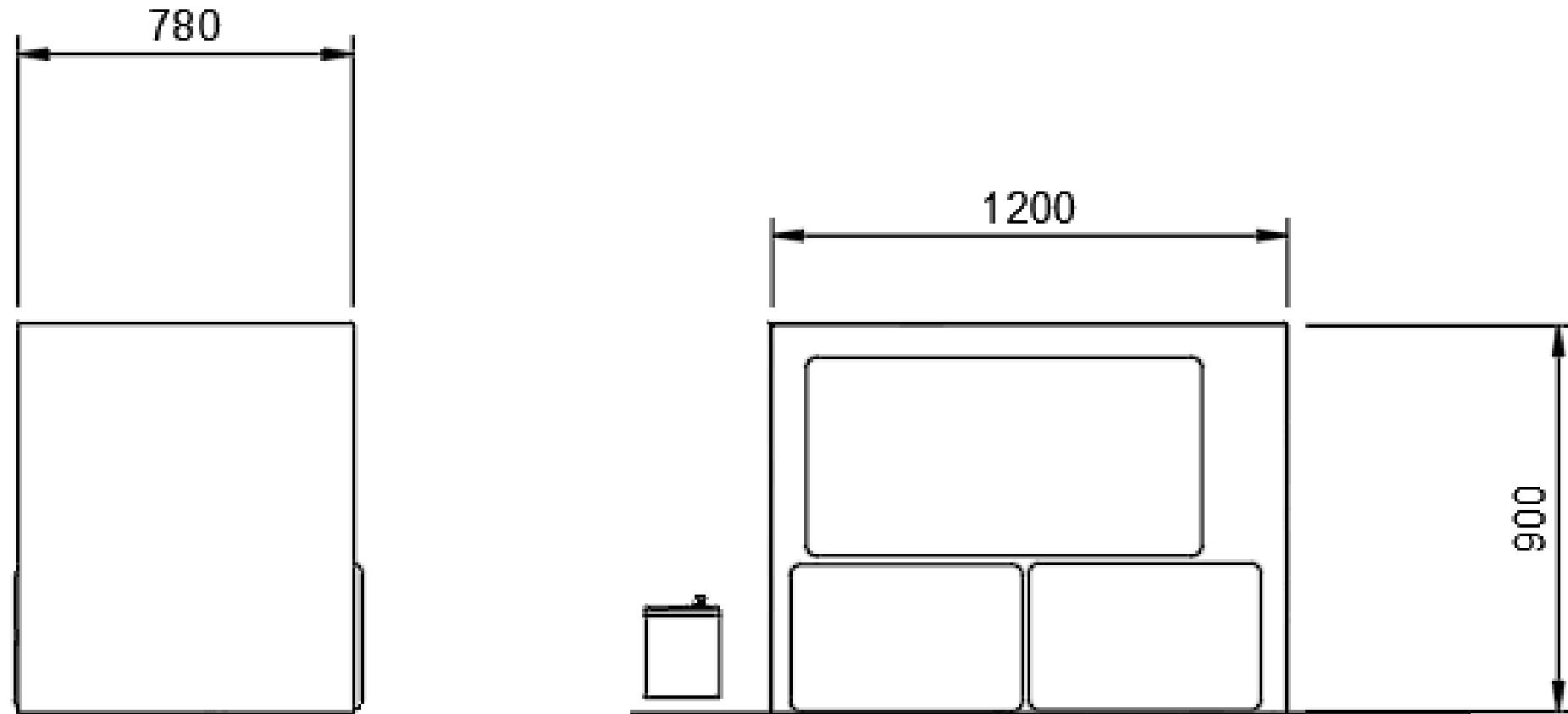
2 XL size Carry on bag
1 120 L duffel bag



30 - 32



Volume Requirement



All dimensions in mm

PRODUCT SPECIFICATIONS

LOADING CAPACITY AND DIMENSTIONS

- MAXIMUM LOADING OF 120KG
- Width : Ranging from 600mm to 900 mm
- Length: 1200mm to 1500mm
- Height: 900mm including covers

Design For mass

2 XL size Carry on bag

1 100 L duffel bag

DESIGN OF ELECTRIC HUB MOTOR

Load Calculation

Mass of Luggage: 120kg

Mass of Battery and cart: ~120kg [Assumption]

Total Mass = 240kg

Weight = $m \times g = 240 \times 9.81 = 2.35\text{KN}$

Since the load or weight has to be moved on the flat surface with 4 wheels. This weight has to be distributed over 4 wheels = $2.35\text{KN}/4 = 588.6\text{N}$

Force required to overcome the friction is given as $588.6\text{N} \times 0.3 = 177\text{N}$ [assuming friction factor = 0.3) per wheel

Power required is given by Force x Velocity = $177\text{N} \times 2.8 \text{ m/s} = 495 \text{ watts}$ [Assuming Max speed of 10kph = 2.8m/s]

Assuming efficiency losses in the motor, considering a factor of safety of 1.5 gives $495 \times 1.5 = 745 \text{ watts}$ for each motor.

If we assume to use the Hub motor for each wheel, then Hub motor wattage required is 745W

WHEEL DESIGN & TYPE

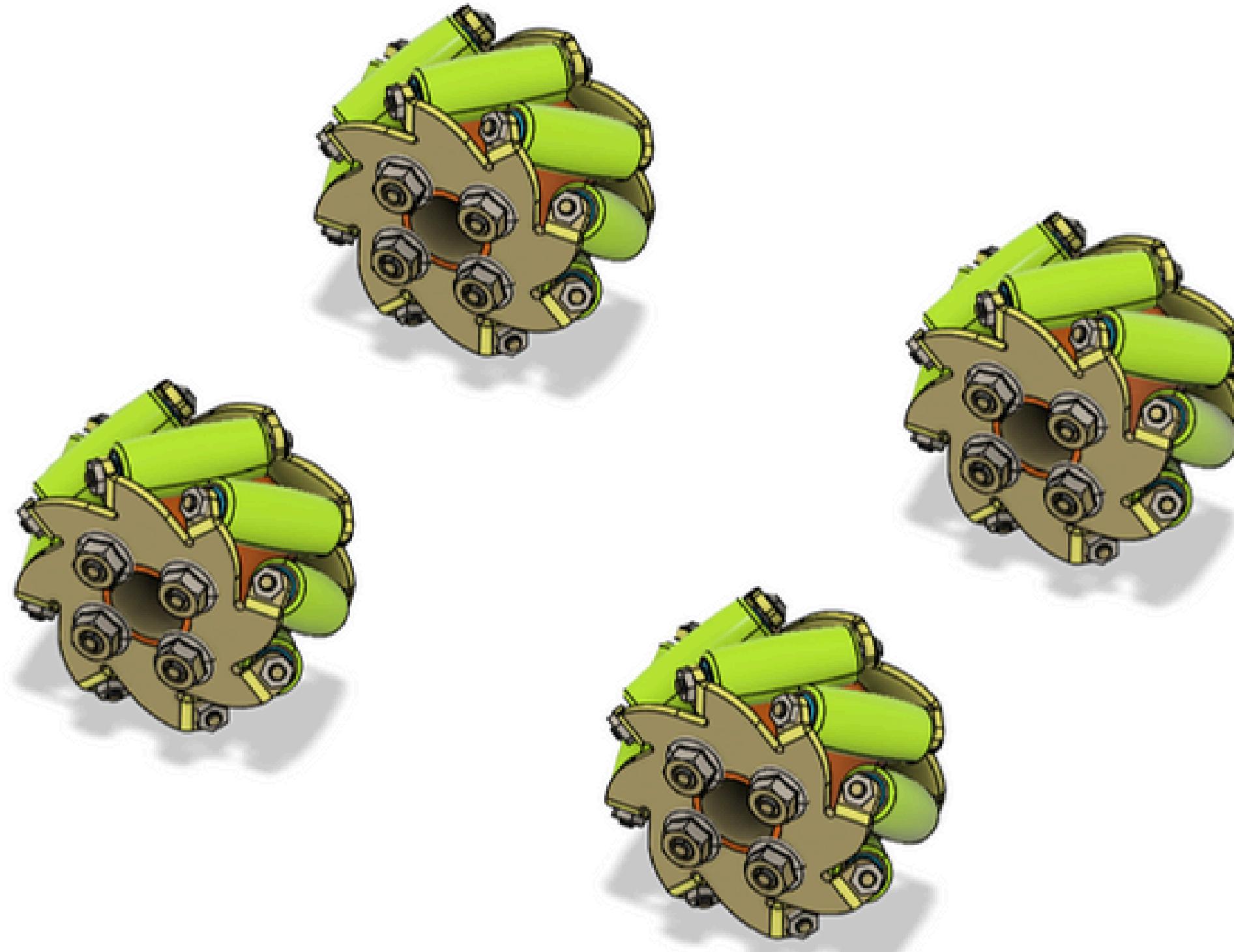
WHEEL TYPE: THE MECANUM WHEEL IS A TYPE OF OMNIDIRECTIONAL WHEEL THAT ALLOWS VEHICLES TO MOVE IN ANY DIRECTION WITHOUT CHANGING THE ORIENTATION OF THE CHASSIS.

Wheel Diameter	Typical Load Capacity per Wheel	Common Applications
2 inches (50 mm)	50–150 lbs (23–68 kg)	Light-duty carts, small equipment
4 inches (100 mm)	150–500 lbs (68–227 kg)	Medium-duty carts, machinery
6 inches (150 mm)	500–1,000 lbs (227–454 kg)	Heavy-duty equipment, industrial use
8 inches (200 mm)	1,000–2,000 lbs (454–907 kg)	Heavy machinery, large industrial equipment
10 inches (250 mm)	2,000+ lbs (907+ kg)	Extra-heavy-duty applications

VERDICT: THE 4-INCH (100 MM) MACCNUM WHEEL, WITH A LOAD CAPACITY OF 150–500 LBS (68–227 KG), IS SUITABLE FOR YOUR EV BAG BUDDY APPLICATION AS ITS PER-WHEEL LOAD REQUIREMENTS FALL WITHIN THIS RANGE AND OPERATIONAL CONDITIONS ALIGN WITH MEDIUM-DUTY USE (E.G., CARTS OR MACHINERY).

Mecanum Wheel

**Move in any direction
without changing
orientation**



Final Battery Pack Dimensions (Approximate)

Layout	Width	Height	Length	Best For
Flat (Single Layer)	23.4 cm (9.2 in)	6.5 cm (2.56 in)	145.8 cm (57.4 in, 4.8 ft)	Underfloor, Low-profile
Stacked (Compact)	23.4 cm (9.2 in)	13 cm (5.1 in)	72 cm (28.3 in, ~2.4 ft)	More compact build

PRODUCT SPECIFICATIONS

SAFETY AND SECURITY

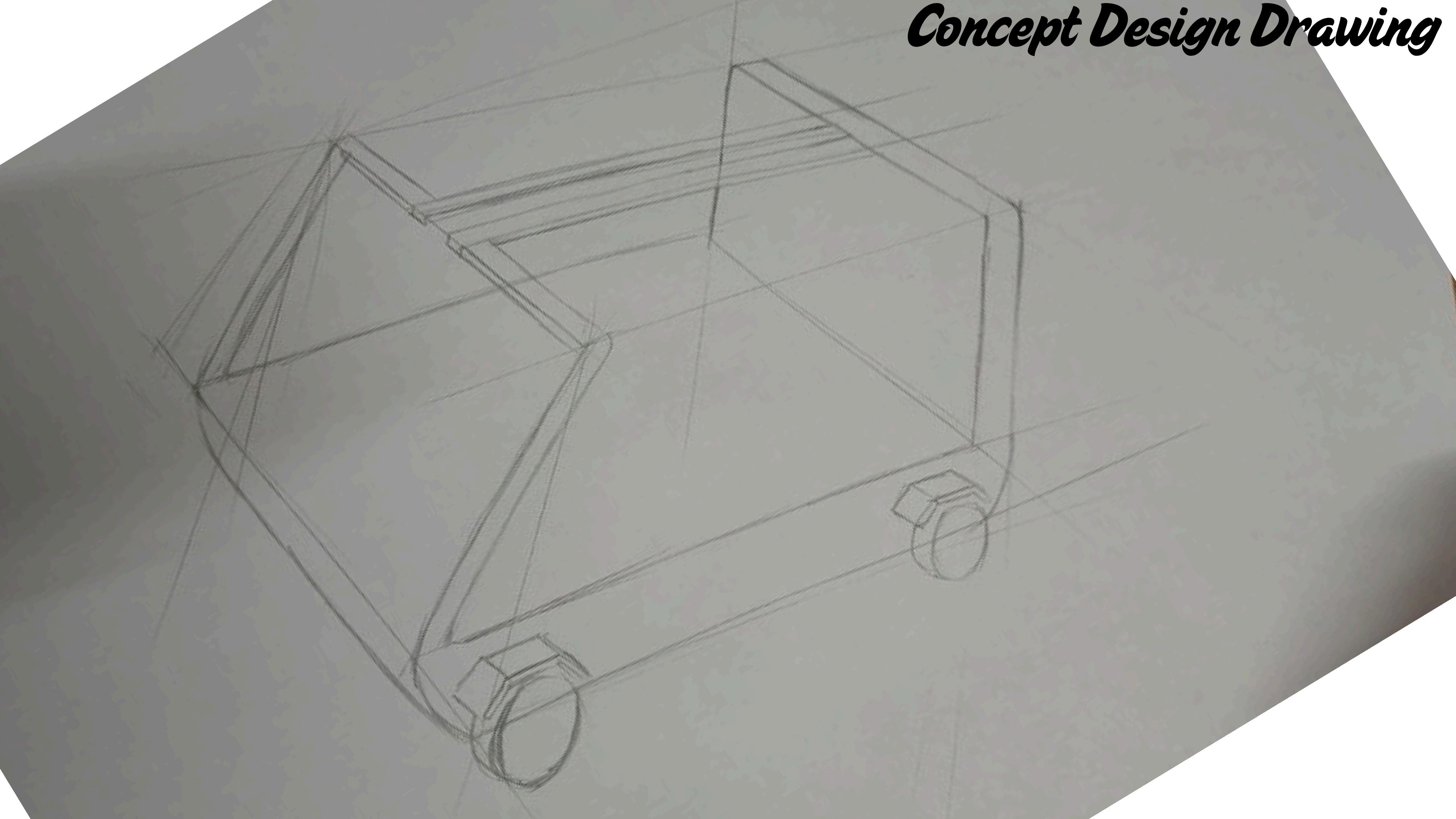
- CAMERA AND VISION SYSTEMS
- ULTRASONIC AND LIDAR SENSORS
- EMERGENCY STOPPING BUTTON
- SAFETY ZONE SENSORS



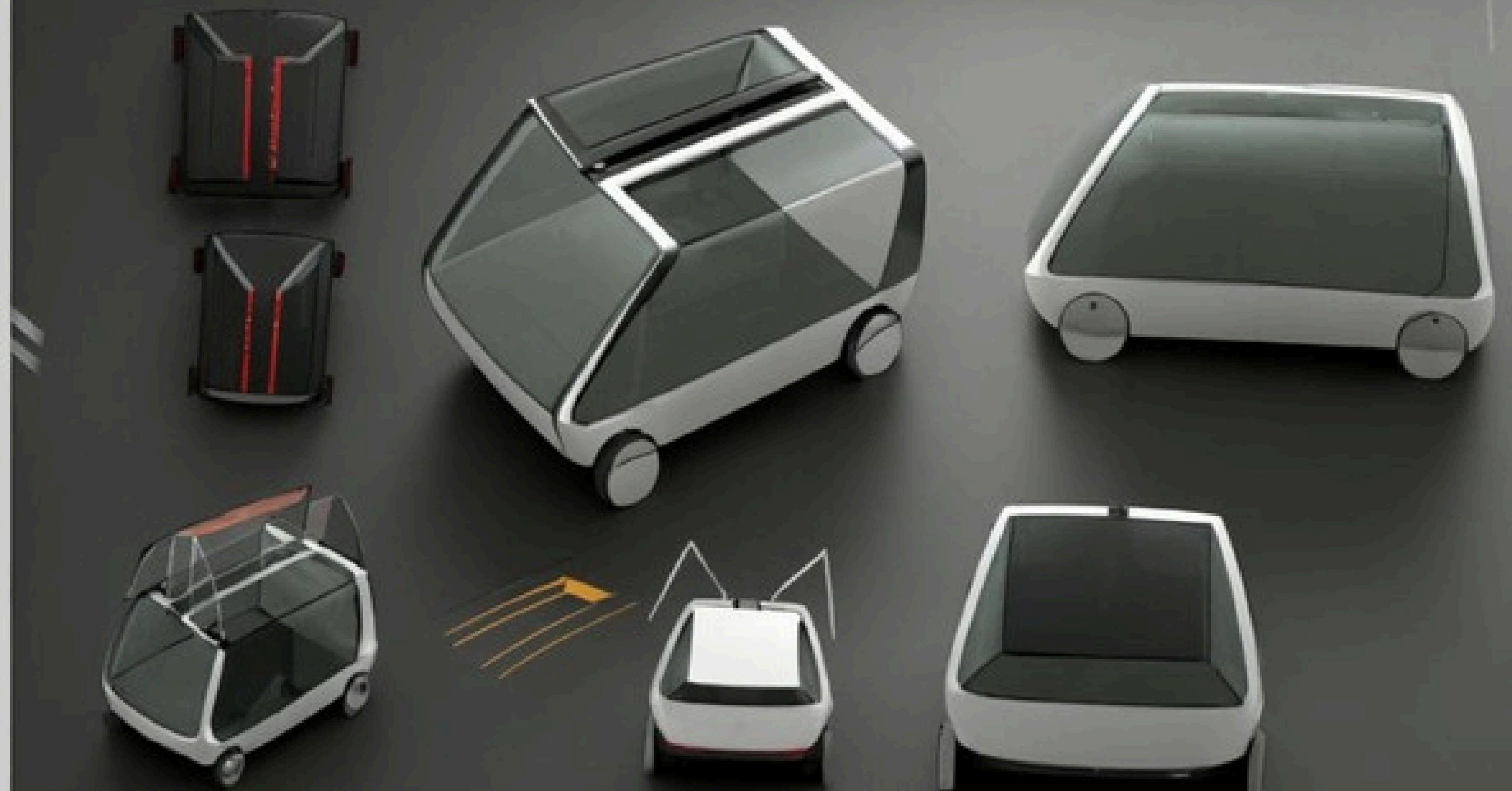
Unique selling point

- AGV
- AUTOMATIC TRAVEL FROM PARKING TO SECURITY CHECK AND THEN TO BAGGAGE DROP

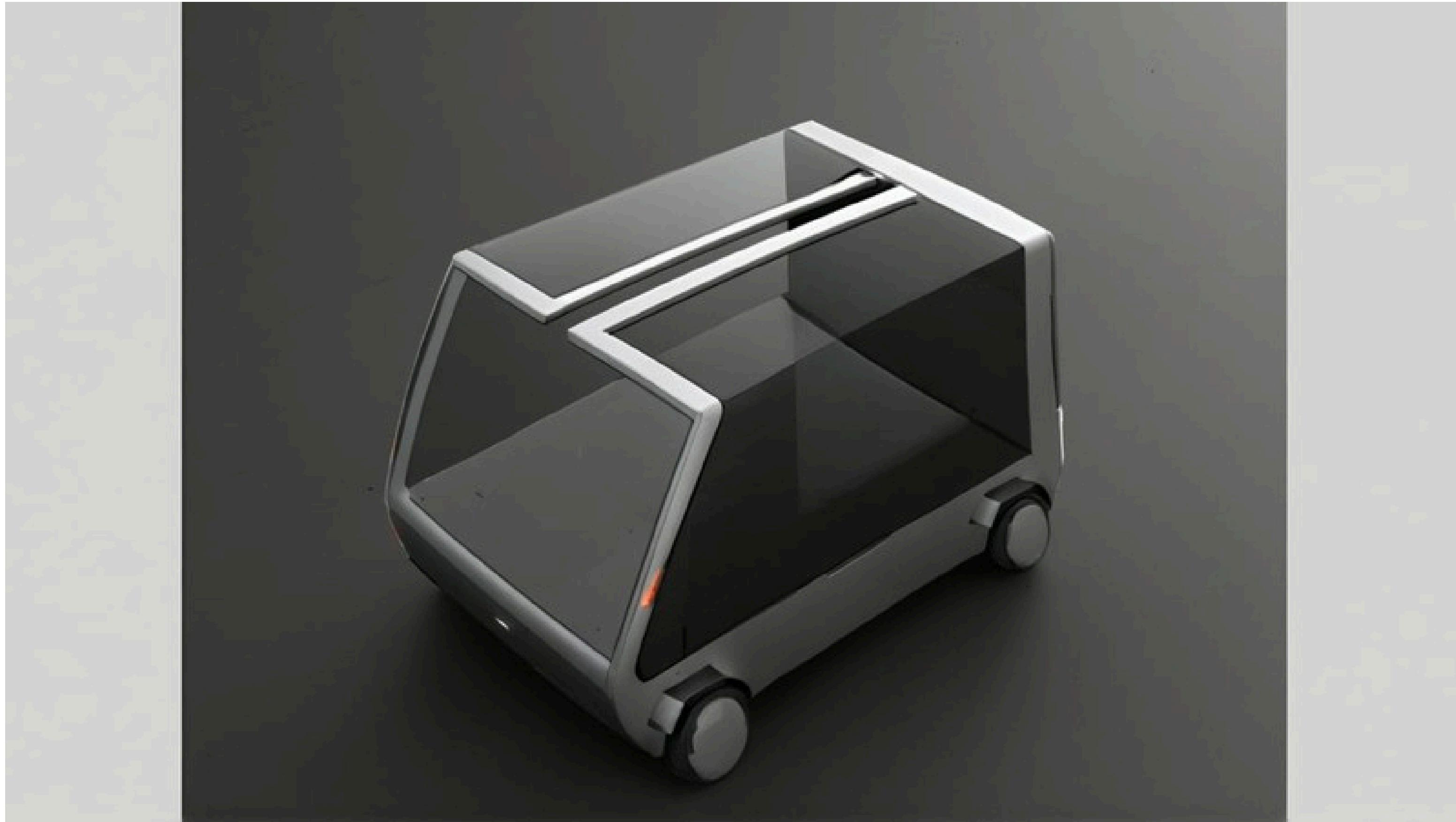
Concept Design Drawing



Concept Design



Finalised Rendered Design



“Thank you”

