



Havells | Design for Indian Homes

Electric Tandoor Grill for Indian Homes

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Havells overview – History | Facility | Products

Havells India Limited is an Indian multinational electrical equipment company, based in Noida. It was founded by Haveli Ram Gandhi, later sold to Qimat Gupta who was his distributor. Havells India Limited is a leading Fast Moving Electrical Goods (FMEG) Company and a major power distribution equipment manufacturer with a strong global presence. Havells enjoys enviable market dominance across a wide spectrum of products, including Industrial & Domestic Circuit Protection Devices, Cables & Wires, Motors, Fans, Modular Switches, Home Appliances, Air Conditioners, Electric Water Heaters, Power Capacitors, Luminaires for Domestic, Commercial and Industrial Applications. Havells India owns some brands like Lloyd, Crabtree, Standard Electric, Reo and Promptech.



As a manufacturing-oriented organization that works on the principle of 'Make in India', they do not focus on productivity alone. Havells works towards creating harmony between manufacturing output and efficiencies that deliver social, economic and environmental sustainability. They have adopted world-class technology and automation to ensure that we produce our goods efficiently with emphasis on conservation of energy and water in a sustainable manner. They pursue methodology of Total Quality Management to improve product quality and recycle and reuse our waste materials. They lay great emphasis on employee safety and accord it utmost priority. They have created and sustain a work culture that is inspired by the Japanese Kaizen methodology. Each plant works towards energy and process efficiency along with being socially responsible towards the resources of the village or town it is housed in.

Havells overview – History | Facility | Products



ALWAR

Havells industrial and domestic cables are manufactured in Alwar, Rajasthan. It is spread over an area of 404686 square metre & is the largest integrated single location cable plant in the country.

Established: 1996
Plant Area: 404686 square metre
Manufactures: Cables and Domestic Cables



BADDI

We are India's No.1 MCB manufacturer.

Established: 2004
Plant Area: 21254 square metre
Manufactures: Switches and MCB's



FARIDABAD

Havells is India's first ACB with "C3" technology using common height, depth & panel door cut-out.

Established: 1993
Area: 13936 square metre
Manufactures: Havells domestic and industrial switchgear – distribution boards, changeover switches, control panels, switch disconnectors and fuses



HARIDWAR (STANDARD PLANT)

Standard has a wide presence in International markets. Middle East, South East Asian countries, Malaysia, Singapore, South Africa, Kenya, Ghana and Nigeria

Established: 2002 (acquired)
Plant Area: 21600 square metre 'In-house manufacturing Standard brand'
Manufactures: MCB's, RCCB's, Distribution boards, fan assemblies and components, aluminium blades and plastic components for TPW (table, pedestal, wall-mounted) fans.

Havells overview – History | Facility | Products



HARIDWAR

We have the largest integrated fan factory in India located at Haridwar, Uttarakhand.

Established: 2004

Manufactures: Ceiling fans, TPW, Personal fans and Domestic exhaust fans.



NEEMRANA

Our is the largest and most automated water heater plant in India

Established: 2004

Plant Area: 194249 square metre

Manufactures: Lighting fixtures, CFLs, HID Lamps and Motors



SAHIBABAD

Sahibabad is state-of-the-art low voltage power capacitor manufacturing plant at Sahibabad, with machinery from Switzerland.

Established: 2009

Total area: 11149 square metre

Manufactures: Industrial switchgear – ACBs, MCCB, Load banks Capacitors, CFL components



GHILOTH

Highly automated AC plant - The plant is equipped with state-of-the-art injection moulding machines, press shop, robots and automated guiding vehicles.

Established: 2018

Area: 202343 square metre

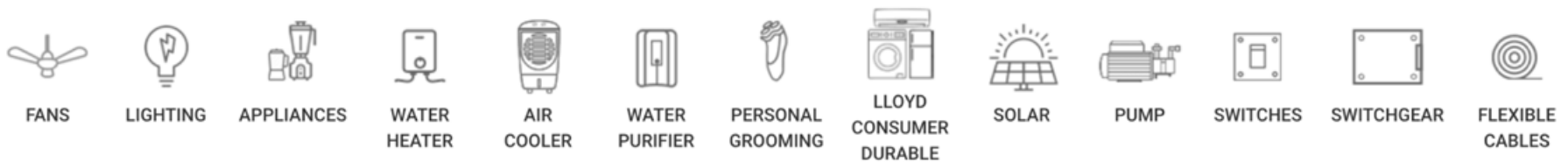
Manufactures: Air Conditioner

Awarded with GOLD rating by “Indian Green Building Council” by IGBC in 2021

Havells overview – History | Facility | Products

Consumer

Havells offers a wide range of smart products that meet the requirements of a modern home. From lighting, switches, electrical circuitry and wiring to home & kitchen appliances, fans, air coolers and water heaters. The eco-friendly and power saving, Havells consumer products provide great functionality and durability, and look stylish to suit the needs of your living spaces.



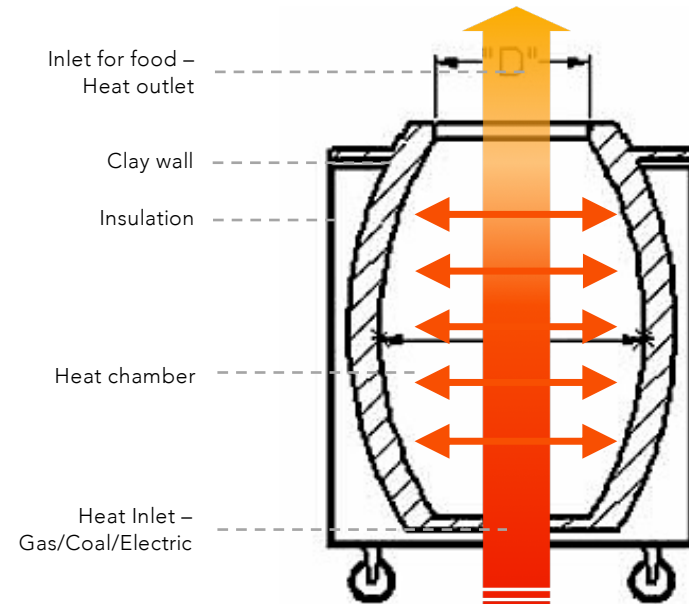
Industrial

Havells has a range of industrial electrical solutions - from circuit protection and surge protection devices, reactive power solutions, HT & LT cables, induction motors, to professional lighting and heavy duty fans. In-house manufacturing and quality certifications give us complete control over quality and consistency.



Traditional Tandoor & Tandoor Grill Explained

Tandoor is currently one of the most important menus in the Indian restaurants around the world. The word Tandoor means a cylindrical oven used for baking and cooking. Traditionally the fuel used in Tandoor is charcoal or firewood. Modern Tandoor ovens use cooking gas or electricity instead of charcoal due to easy maintenance. Modern tandoors are built for portability, cleanability and longevity. The traditional Clay wall enclosure is shielded by a stainless steel insulated walls. This not only provides space for insulation but ensures power efficiency. The steel exterior is easy to clean and protects the fragile clay walls from damaging blows. The traditional element of these modern tandoors is determined by its medium of fuel (heating Element). Charcoal is a traditional way of powering tandoors, and in modern cooking is replaced by gas burners or electric coils. Eliminating coals is also advantageous for the consumer as charcoal cooking might add carcinogens and ash to the food item. It is also difficult to clean and regulate heat.



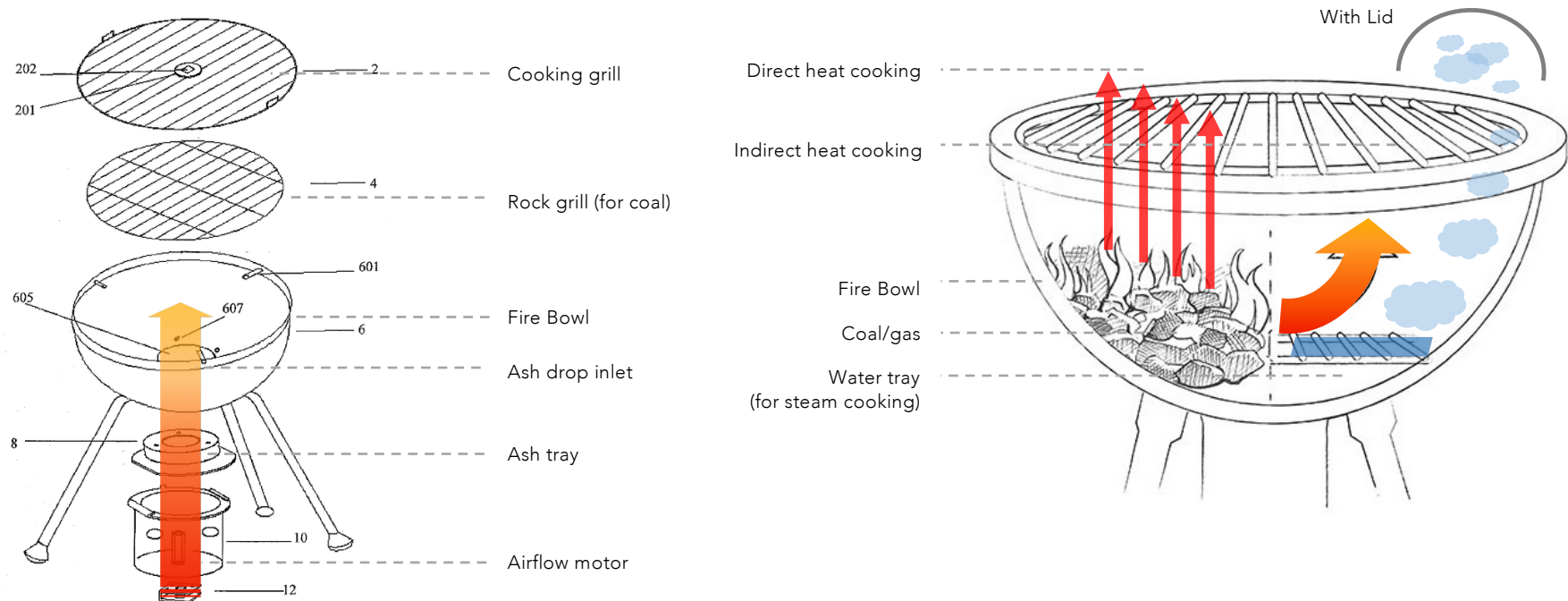
Traditional Tandoor & Tandoor Grill Explained

The Clay wall heats up due to the fuel source below the chamber. Due to its porous nature, Items such as 'naan & roti's' (traditional flat bread) stick to its walls. The heated walls of the clay and the heat within the chamber cooks this bread from both sides. This high heat instant cooking best retrieves the ingredients flavours and texture. It entraps the moisture inside of the bread keeping it soft and moist. The flat bread is pressed onto the clay wall manually using a cloth stuffed pillow. The pillow ensures even contact of flatbread over the clay wall so it cooks evenly and does not fall into the heat source below. The breads are fished out using a long hook to avoid burns. Tandoors are also used for cooking meat/kebabs. The food is stacked on long skewers and is dropped and rotated frequently for even cooking. The tandoors high heat is what gives food its distinct char, texture and flavour. Low sugar marinades are usually preferred for tandoor cooking as sugars can burn extremely fast.



Traditional Tandoor & Tandoor Grill Explained

Tandoor Grills are an innovated version of traditional tandoors made to cater to slightly different food items. These charcoal grills are used to cook and seer food giving an identical taste and texture as the tandoor. They can be smaller in size, easier to clean and are widely available commercially. Similar products such as smokers share the same framework as a tandoor grill, in some cases it is also integrated into one. Traditional tandoors use trapped or residual heat from the source of fuel, in tandoor grills, the food is very close to the heat source and is directly used to cook the food. They are more versatile and cheaper to manufacture. Most tandoor grills use coal as a source of fuel but recently are implementing electric coils. Gas tandoor grills are unlikely to be made commercially as most Indian households already has access to gas powered burners, they are usually made for outdoor applications. Although the names are very similar, a tandoor grill is very much different from a traditional tandoor. The common word 'tandoor' implies cooking directly over a flame. Food is often held together using skewers on an open to the flame grill which replicates the traditional tandoor char.

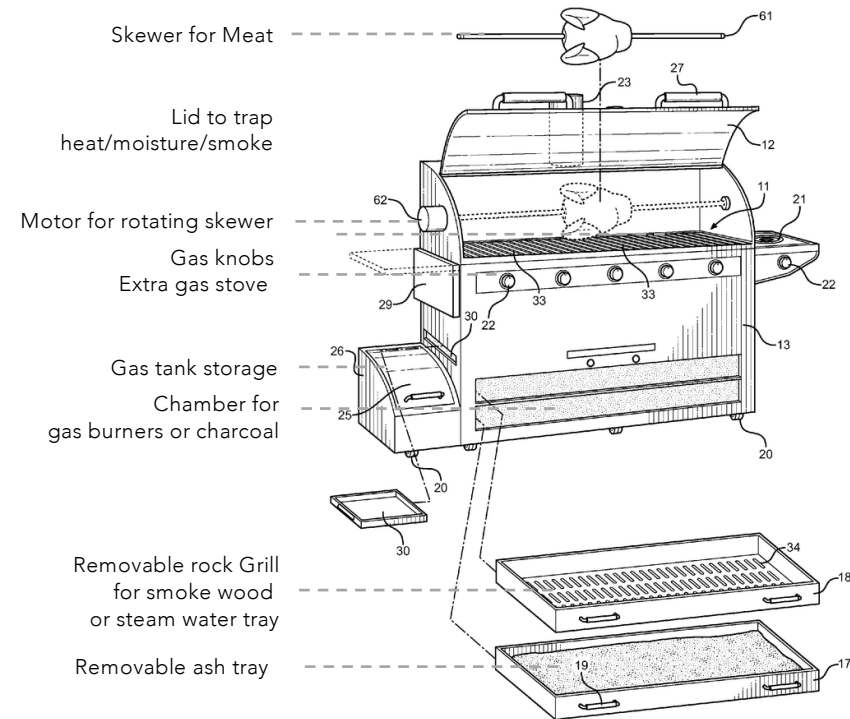


Traditional Tandoor & Tandoor Grill Explained

Tandoor grills are abundantly commercially available to fit needs of a vast consumer base. These grills mainly require outdoor space but some have been engineered for small indoor spaces as well, this is mainly due to the amount of smoke and air it creates/needs and in some cases for safety reasons.

Tandoor grills can be quite complex depending upon the scale of use and type of food. On the right is a common grill design for the American user group designed to smoke and cook large pieces of meat over extended periods time. Most extended timespan grills are powered by gas to keep constant cooking temperatures, it is also easy to clean, operate and assemble/dismantle.

All grills have a concept direct and indirect cooking. Direct heat cooking is meant to give a crust/char to the food item that gives it the distinct tandoor flavour. Indirect heat cooking is used to cook the food item internally for a longer time period similar to steaming or convection. This method is usually used for larger/thicker pieces of meat. On top of this grills include additional features such as an ash tray, a motorised air circulator, a motorised rotation skewer, drip trays, plate holders, extra gas burner etc, depending on the consumer group.



Traditional Tandoor & Tandoor Grill Explained

Tandoor grills are usually made using mild steel sheet metal bending or pressing. The steel is coated using heat proof food safe paint or ceramic coats. High price range smokers/grills use cast iron walls to entrap heat efficiently. The cooking grills are made using cast iron/stainless steel. Cooking grills designed for portability usually have storage for gas tanks or a small electric power source. Industrial grill equipment on the other hand are mainly designed for piped gas and constant AC electric supply. Cleanability is a huge concern for such products as a certain level of hygiene needs to be maintained. Unlike the traditional tandoor, tandoor grills act as a cooking platform preventing food from falling directly into the head source. Regular cutlery such as forks and tongs can be used to handle food over grills. Skewers are also used to evenly cook multiple pieces of food.



Secondary Research – Market Product Study

This research is dedicated towards identifying Tandoor & Tandoor grill products available in the market. It also highlights other products available to mimic their qualities such as electric indoor barbecue grills. This will enable the designed product to maximise utility for a wide range of needs.

Havells product category for to be proposed Electric Tandoor Grill for Indian Households.



AIR FRYER

Satisfy your taste buds without compromising your health with Havells Air Fryers.



INDUCTION COOKER

Reignite your love for fast and optimal cooking with Havells Induction Cookers.



OVEN TOASTER GRILLER

Start your day with a crunch. Havells Oven Toaster Griller is a must have appliance in every household.



SANDWICH MAKER

Prepare delectable sandwiches right at your home with the Havells range of Sandwich Makers.



POP UP TOASTER

Get fresh popping toasts every morning with the Havells range of Pop-up toasters.



ELECTRIC COOKER

Emulsify flavours while you encourage safe cooking with Havells range of Electric Cookers.

Secondary Research – Market Product Study for Electric Grills/Tandoors

Reviewing electric tandoors and grills available in the market.

Touchpoints

- Function
- Price
- Dimensions
- Technology
- Attributes
- Drawbacks

01 Rexmon Indoor/Outdoor Electric Grill/Tandoor Electric Tandoor

| | |
|------------|--|
| Function | Similar to barbeque. Cooks meat on a grill, provides users with an indoor grilling experience. |
| Price | 2999 – 1598 INR |
| Dimensions | 48 X 35.5 X 10 cm |
| Technology | Uses an electric zig zag coil to heat the steel grill cooking surface. Has a simple voltage regulator to increase or decrease heat. 1 light indicator for on/off. |
| Attributes | Has a removable drip tray inside the plastic encasing for better cleaning. The enamel plate also acts as a heat shield between the coil and the plastic body. Thermostat inside auto cuts power when overheated for safety of the user and the product. Has antiskid PVC foot pegs. Has PVC handles for insulation while moving the grill while hot. |
| Drawbacks | Coil is directly exposed to the food above, food particles in contact could burn and smoke making it difficult to clean. Wrong terminology used, not a 'tandoor', just an electric grill. |



Electric BBQ indoor grills available online with identical technologies and attributes. One on the right is a sandwich grill but can perform the same task more efficiently. The following products offer additional attachments such as an outdoor stand or an additional secondary grill surface for low temperature cooking.



02 Niyanta Electric Grill

| | |
|------------|--|
| Function | Similar to a shawarma. Cooks meat around a vertical central coil. |
| Price | 9800 – 4499 INR |
| Dimensions | Not Given (approximately 30cm tall) |
| Technology | Uses an electric central coil to cook food stacked on skewers around it. A steel tube around can be placed to trap heat for faster/even cooking. A steel plate on top suspends all the skewers at once and is removable. |
| Attributes | Each skewer has an individual drip tray. The steel cylindrical cover has plastic handles for insulation. The top steel plate also has a plastic handle. Backlit single button for on/off. |
| Drawbacks | Can only be used for food that can be places on skewers. Only small portions can be cooked at once. Hard to clean 6 different drip bowls. Food can touch the coil and burn. Not a conventional grill, only for kebabs. |



03 AGARO 1600 Watt Barbeque Non-Stick Electric Griller with Toughened Glass Lid

| | |
|------------|---|
| Function | Grilling and roasting over a hot pan. Similar result compared to a pan. |
| Price | 4999 – 3699 INR |
| Dimensions | 19.7" X 11.1" X 4.7" |
| Technology | Uses a half grill half flat iron pan that sits on a coil. Same technology as other grills but has a pan instead of a see through mesh grill. Has a toughened glass lid. Coil V input is higher than other grills mentioned. |
| Attributes | Grill pan is removable and easy to clean. It isolates the heating element eliminating smoke created with coil and food contact. The glass lid is see-through and helps steam or internally cook thicker food items. |
| Drawbacks | Needs slightly more voltage input as pan will take longer to heat. Lit is too shallow hence only meant for relatively smaller food items. |



The above electric grills are slightly expensive to manufacture with the added power cost and the sold metal grill plate. It is still easier to use and clean compared to the previous grills hence consumers go the extra mile to invest in these. These are purely grills and not tandoors.

04 Weber Q 1400 Electric Grill (Dark Grey)

| | |
|------------|---|
| Function | Grilling and roasting over a coil exposed grill. Similar to previous grills but has more cooking capacity and high heat point. |
| Price | 35145 – 36995 INR |
| Dimensions | 53 cm x 69 cm x 37 cm |
| Technology | High heat retention grill, cooks food evenly and does not burn. Lit to cook thicker pieces of food or to smoke food. The unique cradle like design is made to give an outdoor grill aesthetic. Premium stainless-steel accents. |
| Attributes | Removable grill plate for cleaning. Supports wood smoking for flavour. Bigger handles that support wheel attachment for outdoor use. Mimics a charcoal grill design. |
| Drawbacks | high price point for the Indian market. Exposed coil so not easy to clean internals. Less detachable items hence hard to clean. |



Above are electric tandoors similar to ovens. The heating element here is both above and below the food. This is ideal for baking breads, roti's or pizzas. The closed chamber design keeps heat trapped inside, cooking the food from all directions. It is very similar to ovens but is more portable and adapts a simpler technology.

05 Wellberg iron 2 in 1 Electric Tandoor

| | |
|------------|---|
| Function | Grilling/roasting simultaneously. Grill on top uses the tandoors upper coil as a heating element. |
| Price | 2999 – 3999 INR |
| Dimensions | 32.6 cm x 23.3 cm x 30 cm |
| Technology | Uses 2 heating elements for the tandoor. The top coil also acts as a source of heat for the above grill. A truly 2 in 1 product. |
| Attributes | Removable top grill plate. Can grill and bake at the same time. See through glass window. Plastic handles making it easy to remove. |
| Drawbacks | hard to regulate temperature for tandoor and grill. No grill for tandoor. |



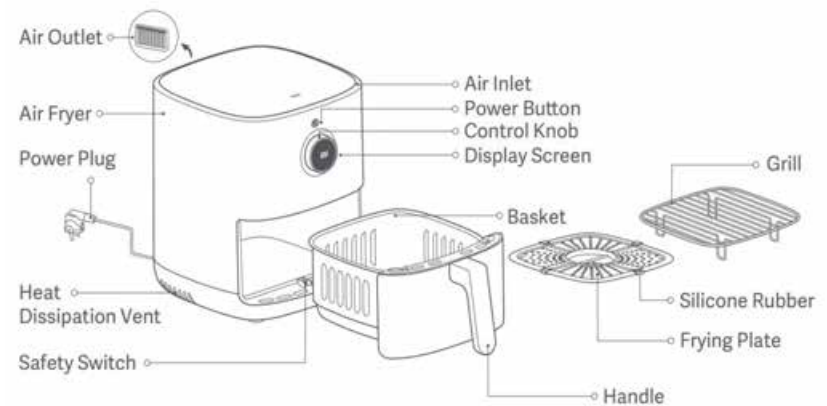
Electric Cooking Appliances overview

Reviewing electric cooking appliances in the market. Overlooking specific Havells products for shared technologies. Exploding current products would help deduce certain user interaction touchpoints such as knobs, displays, buttons etc. Most of the products are extremely mainstream in the market making it tried and trusted, not just from a visual point of view but also function and performance.

1. Air Fryer
2. Induction
3. Microwave & Oven/OTG
4. Sandwich maker & Toaster

01 Air Fryer

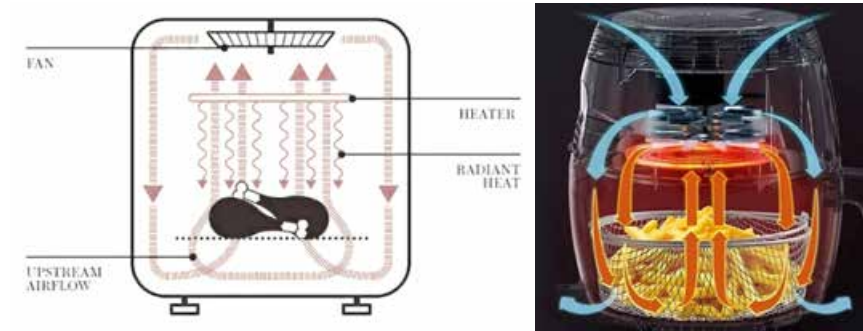
| | |
|------------|---|
| Function | Cook food using radiant heat and circular hot airflow, similar to convection. Creates a crispy crust for the food keeping it moist and cooked inside. Very similar results as frying but no oil is needed. Good for frozen products or meats. |
| Technology | Rapid Air Technology in which a heating element within the top of the machine radiates heat downward, while a fan rapidly circulates air around the food inside to heat it evenly from all angles. Air inlet is placed at the top, mainly central to the food chamber for even dispersion of heat. Heat is dissipated from the side/under the product, carries out some amount of moisture. Basking chamber has open vented walls for airflow. Different attachments cater to different cooking processes such as a frying plate or an elevated grill. Insulated handle for the cooking chamber |



Electric Cooking Appliances overview

01 Air Fryer

Attributes Healthier cooking process, needs oil only to coat the food for flavour but no oil can also work. Compact form, less and easy cleaning as no oily residue. The cooking chamber is relatively isolated hence no splatter. Cleaning challenges similar to microwaves and ovens. Comes in a variety of sizes.

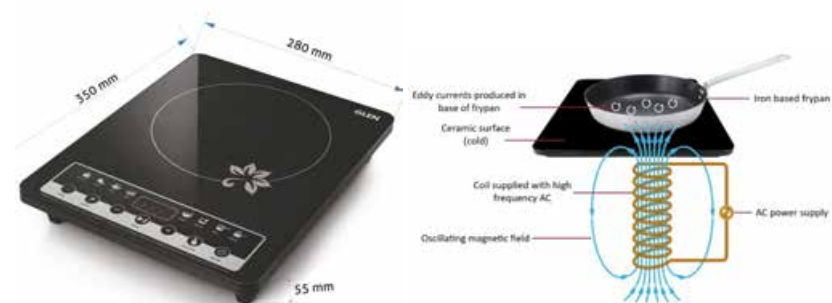


02 Induction

Function Acts as an electric cooking surface for pans/pots. An electric alternative for gas burners.

Technology Using a circular flat coil under the cook pan, the ac power supply creates an oscillating magnetic field generating heat. The ceramic or toughened glass top heats up instantly.

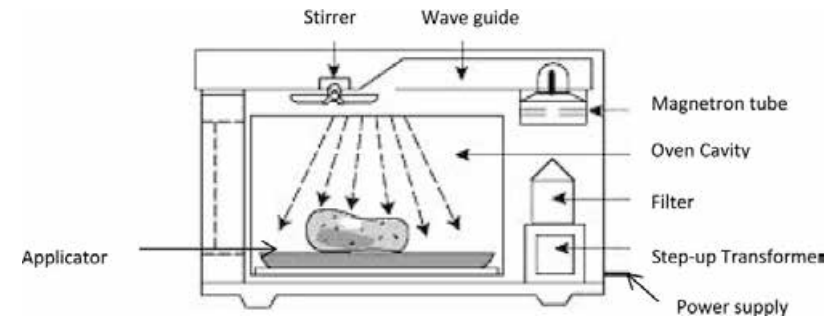
Attributes Has a temperature regulating display and other cooking modes. Is mainly used in households with no direct gas supply or space constraints for a gas cylinder. Easy to use and clean, no grooves or gaps or additional attachments unlike gas burners.



Electric Cooking Appliances overview

03 Microwave & Oven/OTG

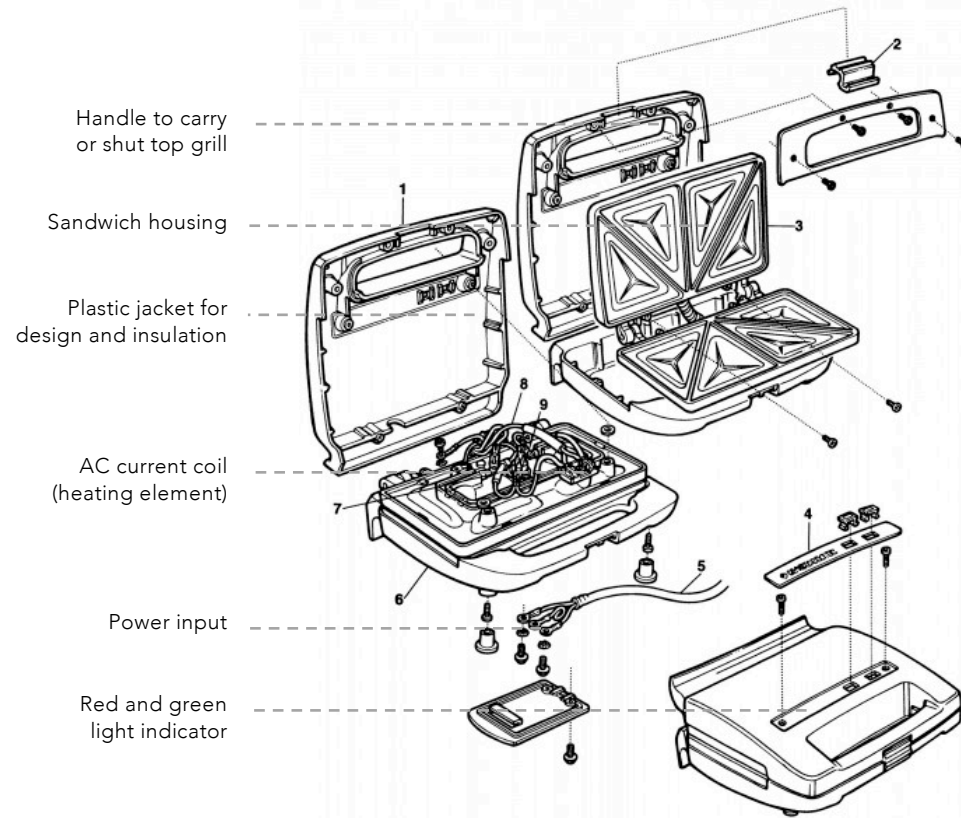
| | |
|------------|---|
| Function | Both microwaves and ovens/OTG's heat food in closed chambers. They are almost a necessity in most households as they are very efficient. Microwaves are more commonly purchased and used in Indian households, Ovens are slightly more expensive but are also safer and can be used for baking. |
| Technology | For microwaves, as the name suggests, it uses microwaves - a form of electromagnetic radiation to heat food. The radiations is capable of passing through glass, plastic, metal and even food. They are an economical heating solution for Indian homes but the radiation can make food unsafe for consumption. Even standing in front of a microwave can affect health sue to the harmful radiations. They are no recommended for homes with babies or to heat baby food. Oven is a general term for a thermally insulated chamber which is used for heating, cooking or baking food. Microwave oven heats food efficiently with safe radiation. OTG refers to as Oven, Toasting and grilling, it uses a traditional heatwaves to cook food using coils. The radiating heat helps cook food safely and evenly. |
| Attributes | Compact but can come in a variety of sizes. Multiple price ranges catering to a large audience. Modular versions maximise space and function for better aesthetics. Have a see through window to monitor the cooking process. The all have thermostats not only for temperature control but also safety. |



Electric Cooking Appliances overview

04 Sandwich Grill & Toaster

- Function** grilling and cooking sandwich's. A slightly hybrid open sandwich grill can be used to toast bread or even kebabs/vegetables. The right diagram refers to a dedicated bread sandwich maker.
- Technology** Uses an electric coil similar to an induction. The coils here are more curvy and are pressed against the heating surface for even coverage due to its shape, unlike the induction where the surface is flat. Most toasters have a fixed temperature, the power source auto cuts once the cook surface has reached that temperature, but most industrial or heavy duty grills have a much higher capacity.
- Attributes** Handel for carrying like a briefcase or to aid opening closing process. Both halves have identical cook surfaces. The bottom half is slightly bigger as it houses additional components such as a small transformer and the power input. The cord can be coiled around a plastic collar extrusion placed under.



Primary Q & A – Age Group 20:60 | Want / Need Assessment

Questionnaire

1. How often do you cook on a weekly basis?
2. What are a few electrical kitchen appliances you currently own? E.g. Microwave, chimney, OTG, kettle, mixer grinder, juicer, air fryer etc.
3. Do you currently own any modular kitchen appliances? E.g. Ovens, Microwaves, Gas burners inbuilt into kitchen cabinets or platforms.
4. Have you faced space constraints/problems while buying electrical cooking appliances?
5. What do you look for when purchasing a kitchen appliance. E.g. Brand, Size, Function, Design, Price. Order these categories from first to last priority.
6. Tandoor items such as naans/rotis and kebabs/tikkas, are only a restaurant delicacy. It is hard to replicate these foods at home as tandoors are big and not home friendly. What are your views on a compact electric tandoor appliance specially designed for Indian homes that is capable of giving traditional tandoor results?
7. If such product (electric Tandoor Grill) was to be launched in the market adhering to your priorities, would you consider purchasing it for a tandoor food experience at home?
8. Buying appliances such as Ovens cater to cooking processes like baking cakes/breads or roasting meats/vegetables. These need considerable prep time. In case of making tandoor food at home, do you think prep time could be a concern for you?
9. Which electrical appliance do you currently own that is the hardest to clean. E.g. Oven, Chimney, Toaster etc. Could you specify what aspect of its cleaning is tedious?
10. Would you rather choose a; multiutility product that slightly compromises on its functions or sperate appliances that maximise function?
11. Although few appliances somewhat replicate cooking processes such as microwaves – ovens, would you go the extra mile to purchase a new product for added authenticity?
12. Would you like to add anything over an electric tandoor and grill product? Features you absolutely expect such as compact size, modern aesthetics, cleanability etc?

Primary Q & A – Age Group 20:60 | Want / Need Assessment

User 01 | Age - 21 | Male

Trait Avidly cooks, food enthusiast, meat-eater, student

1. Almost every day.
2. I own a microwave, coffeemaker, kettle, chimney, rice cooker, mixer.
3. Only the chimney is modular.
4. Yes.
5. Depends, if I am buying for my rented apartment for a limited use lets say 2 years, I would prioritise on price, function, brand, design, size. For home use function, design, brand, price, size. It also depends on how I prioritise the appliances function, would invest more on a good oven rather than a toaster.
6. If it is compact and elegant enough and serves more functions then it could be a useful product specially for tandoori rotis. Kebabs can still be made in pans or ovens.
7. Yes
8. Prep time is there for almost all foods so is not a big concern.
9. The coffee maker is the hardest to clean, it has grooves inside its brewing chamber that are impossible to clean.
10. Depending on my priorities for their purpose I would decide.
11. Yes
12. Most tandoors are big and bulky so a compact design, cleaning should also be an issue.

User 02 | Age - 22 | Female

Trait Cooks often, food enthusiast, vegetarian, working

1. 3 times a week approximately.
2. I own a microwave & kettle.
3. No
4. No
5. Brand, price, function, size, design.
6. I think it is a great idea but only people who absolutely need it will buy.
7. Maybe if it is priced right.
8. No, prep time is needed more for things like baking but people still do it. Depends on the person using it.
9. I only own a microwave and a kettle. I only use the kettle for water, microwave less cleaning.
10. Multiutility, it will save cost and space. I'm sure its function would be apt for majority of the users.
11. Yes
12. Maybe compact, restaurant tandoors are very big. Should not be very messy to use.

Primary Q & A – Age Group 20:60 | Want / Need Assessment

User 05 | Age - 50 | Female

Trait Cooks often, vegetarian, working-professional

1. 3 – 4 times a week but basic cooking.
2. Microwave, chimney, oven, coffee machine, air fryer, toaster, sandwich grill, deep fryer, mixer grinder, hand blender, Kneader, cold press juicer, rice cooker, kettle.
3. Microwave, oven, chimney, deep fryer.
4. Sometimes when it comes to storage.
5. Brand, function, design, price, size.
6. I think it will be a good product.
7. If it can deliver what it promises then yes.
8. No
9. Chimney, sandwich grill, juicer. For these products its hard to clean the internals. Other appliances such as deep fryer and kneader are hard to clean due to the ingredients used, the process is easy.
10. If it caters to my needs then multiutility would be fine as it is a space saver.
11. Yes
12. Areas of the products should be reachable, such as oven internals are hard to clean. As far as I know tandoors are big so people might face space problems.

User 06 | Age - 44 | Female

Trait Cooks every day, food enthusiast, meat-eater, homemaker

1. 3 times a week approximately.
2. I own a microwave, toaster, mixer grinder, sandwich grill.
3. No
4. Yes
5. Brand, price, function, size, design.
6. I don't think it is needed.
7. Maybe.
8. No
9. Toaster because the grill does not come off so u have to clean it carefully with a tissue as u cannot wash it.
10. Multiutility
11. If it is for something me and my family likes then yes.
12. If it is added to an existing product like an oven. A separate product is difficult to buy because I will not use it often. If it is multiutility then it is a good idea.

Primary Q & A – Age Group 20:60 | Want / Need Assessment

User 01 | Age - 26 | Male

Trait Often cooks, food enthusiast, meat-eater, working-professional

1. 4 days a week
2. I own a microwave, kettle, rice cooker, mixer grinder.
3. No
4. No but that is because I don't need many appliances.
5. I don't need a lot of them because I do average cooking. But if I had to buy a new one then design, function brand, price, size.
6. I think there is a good market for it.
7. Not sure, right now I don't have time for complex cooking but maybe in the future.
8. Prep time is not a problem
9. The microwave is the hardest to clean but it doesn't need cleaning very often.
10. Depending on the product, but multiutility would be better as it will save space.
11. Yes
12. The design should be suitable for the kitchen.

Indian Kitchen – Overview

On the right are some kitchen analytics. The work triangle is what is used to determine an efficient kitchen plan, it is not always effective but is a good place to start. Every house has different kitchen sizes and layouts. Heights of cabinets and kitchen countertops are largely universal. This is for the users comfort and have been determined after years of research and study.

India Standard Kitchen Size 8 X 10 feet (6 feet clear distance and 2 feet platform width)

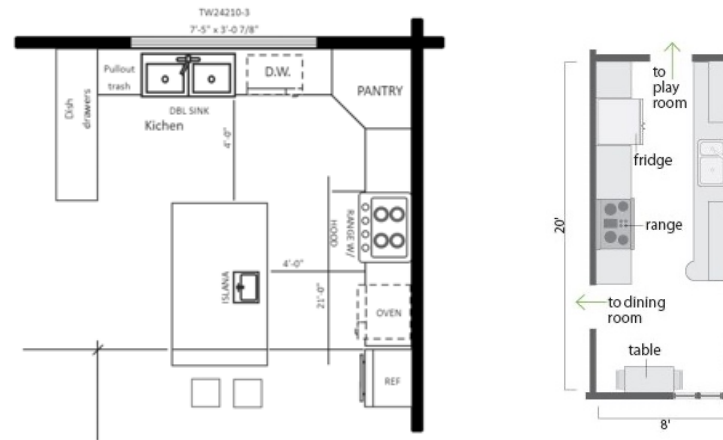
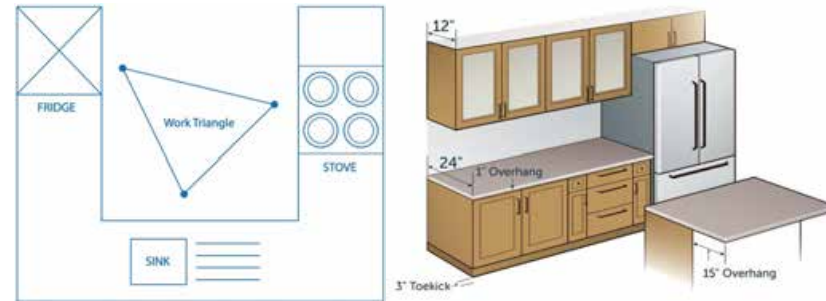
Average kitchen size for homes under 1500 sq. Feet 10 X 10 feet

Kitchen size above 1500 sq. Feet homes 12 X 15 feet

Maximum Kitchen size excluding pantry in top 1% large Indian homes is still not bigger than 20 X 20 sq. Feet.

On the right you can see 2 kitchen plans of luxury and standard kitchens. One thing common in both areas is the cooking area and the cleaning area. The sink is placed away from the stove. In case of appliances, they are usually placed near to the stove, as the chimney is right above.

The Tandoor grill would be a cooking device similar to a stove hence its size would be determined by its placement in average Indian homes.



Indian Homes Kitchen Setups



User Personas – Product Scenarios

Big families on a weekend spending time and cooking kebabs. It provides the user with hot food directly off the grill.

Younger individuals under the supervision of adults can learn how to cook.



User Personas – Product Scenarios

Younger individuals such as bachelors could enjoy an exotic meal with close friends or colleagues.

College students can interact over leisure time using a portable grill, it takes cooking directly to the entertainment zone eliminating the need to cook or heat food in the kitchen.



User Personas – Product Scenarios

Newly married working individuals can cook effortlessly by saving cooking and cleaning time.

Individuals can spend more personal time and making cooking more inclusive.



User Personas – Product Scenarios

Cooking could be a group interaction, the portable form can help users cook on the dining table. It contributes to the experiential cooking category of the product.

It can be used for indoor/outdoor gatherings such as terrace or backyard dinners. It can also be used for camping with access to a small generator.



Analysing Research

Product Market Study

I would be difficult to replicate a traditional tandoors cooking results using an electric grill. After the market study of existing products, there are several products that either focus on grilling or baking, but there almost no products that do both. As the focus is on grilling kebabs and baking roti's, breaking down technologies of various market products helped understand absolute requirements to execute a product such as an electric tandoor grill.

- Veg Grilling** In case of vegetarian food, high heat is needed to char and cook the food keeping it soft and crunchy inside. Vegetables tend to have less or no marinate during the cook process, the absence of sugars enables it to be cooked quickly over high heat. This retrieves its original flavour.
- Meat Grilling** In case of meat grilling, several charcoal grills were broken down to understand the foods cooking process. Raw meat is evidently noticeable and unappetising when consumed. For this food item, other than exposure to a high heated cook surface, the kebab needs to cook using residual heat. This process is important specially for thicker pieces of meat. Cooking in itself is a skill and once a used understands a particular products performance, they can alter their cooking processes to suite their taste.

The concept of Direct and Indirect Heat

Most grills be it electric or charcoal adapt this technique. It efficiently cooks thicker pieces of food such as steaks or whole birds. It mimics a tandoor is a way, but the heat is not as high as a traditional tandoor. As explained in slide 09, it is important to add this element in the an electric tandoor grill. In this case, the grill would be a source of direct heat meant to char or cook the surface, a lid could be provided to trap the heat to mimic the process. The kebabs could also be put in the tandoor if they are thicker pieces of food, but overall it is the grilling experience that a griddle would provide.

- Roti** For a roti (Indian Flat Bread) to cook efficiently, a detailed study of how it cooks needs to be recorded from the perspective of a traditional tandoor. A tandoor cooks a roti from both sides. The base of the roti is usually slightly crispy than the top, this is because it cooks slower and on a slightly lower temperature. The top on the other hand is exposed to rapid heat that causes it to bubble/air and makes it soft. This process traps moisture inside the roti and stops it from drying out. To replicate this roti cooking process, it needs to be exposed to heat from all sides. This would require heating elements places below and on top of the roti.

Analysing Research

Essentials for Product

1. Griddle for grilling kebabs. Charred grill marks caused by the high heated cook bed visually elevates the food and gives it a smoky flavour.
2. Flat cook surface for more even cooking. Usually used for flat pieces of food such as steaks or cut veg. It could also be used for teppanyaki.
3. Lid to mimic indirect heat. Entraps heat and moisture, advantageous to steam food or cook thicker items. Saves power by reducing heat loss.
4. Completely or partially closed chamber for cooking Roti's, with heating elements placed both below and above. A non stick cook surface for roti to sit on.
5. Removeable components such as the grill surface for better cleanability.
6. Isolated controls to keep hands clean while regulating temperature. The also need to be flushed making them easy to clean.
7. Avoiding the use of corrosive materials as it would be exposed to moisture and elements such as salt in food.
8. Surfaces should not be hard to reach for cleaning.
9. Size should not be bigger than average 3-4 burner stoves.

Designing an electric tandoor grill for the Indian market requires an understanding of the Indian cooking culture and its unique requirements. Tandoor cooking is an essential part of Indian cuisine, and a lot of households and restaurants rely on tandoors to cook various delicacies. A tandoor is a cylindrical clay oven that is traditionally used for cooking Indian bread (naan, roti) and tandoori dishes. However, the traditional tandoor is fuelled by coal or wood, which can be inconvenient and time-consuming to set up and maintain. An electric tandoor grill offers an alternative that is convenient and efficient while still retaining the authentic taste of tandoor cooking.

Next are some considerations that need to be taken into account while designing an electric tandoor grill for the Indian market:

Analysing Research

- **Size and Capacity** The size and capacity of the electric tandoor grill need to be suitable for Indian households and restaurants. It should be compact enough to fit in most kitchens, yet large enough to accommodate the amount of roti's and kebabs that are commonly prepared in Indian households.
- **Power Consumption** Electric tandoor grills consume a significant amount of power, so it is essential to design the grill to be energy-efficient. It should have a heating element that can provide enough heat to cook food quickly and evenly without consuming too much electricity.
- **Temperature Control** Tandoor cooking requires high temperatures (400 – 500 degrees C) to cook food quickly and give it the authentic smoky flavour. The electric tandoor grill should have a temperature control feature that allows the user to adjust the temperature according to the type of food being cooked.
- **Safety Features** Safety is a crucial factor in any cooking appliance. The electric tandoor grill should have features that prevent overheating, such as an automatic shut-off system. It should also have heat-resistant handles, a lid that stays cool to the touch, and a removable drip tray to catch any excess oil or grease. The design should also consider the ventilation requirements to ensure that the tandoor does not pose a risk of fire.
- **Easy to Clean** Cleaning a traditional tandoor can be a time-consuming task, and an electric tandoor grill should be designed to be easy to clean. The grill should have a non-stick coating on the cooking surface, which makes it easy to clean after use. The drip tray should be removable and dishwasher safe.
- **Multifunctional** The electric tandoor grill should be versatile and able to cook a range of dishes, from tandoori chicken to naan and kebabs. The grill should have multiple cooking settings and accessories to cook different dishes.
- **Aesthetics** The design of the electric tandoor grill should be appealing to the Indian market. It should have an aesthetic that fits in with Indian kitchens and restaurants. It should also be made of high-quality materials that can withstand high temperatures and long-term use.
- **Durability** The tandoor should be made of durable materials that can withstand the high temperatures and frequent use. The design should also be such that it is easy to maintain and repair.
- **Cost** The tandoor should be priced affordably, taking into account the purchasing power of the target market in India. The design should also consider the cost of manufacturing and distribution to ensure that the product is priced competitively.

In conclusion, designing an electric tandoor grill for the Indian market requires attention to detail and a deep understanding of the Indian cooking culture. A well-designed electric tandoor grill can provide a convenient and efficient alternative to traditional tandoors while still retaining the authentic taste of tandoori cooking.

HAVELLS
CONSUMER
PRODUCT RANGE

o APPLIANCES

COOKING | FOOD PREPARATION | BREWING | GARMENT CARE

- ↓
AIR FRYER
INDUCTION
OVEN TOASTER
SANDWICH
E-COOKER
TOASTER-POP

- ↓
JUICER MIXER
MIXER GRINDER
CHOPPER - manual
HAND MIXER
BLENDER
JOKER
WET GRINDER
ATTA MAKER

- ↓
COFFEE MAKER
KETTLE - E

- ↓
STEAM IRON
DRY IRON
GARM-STEAMER

CLIMATE OR

- ↓
HEAT CONVECTOR
OIL RADIATOR
MICA CONVECTION
QUARTS HEAT
PTC FAN HEAT
CARBON HEAT
HALOGEN HEATER

ELECTRIC TANDOOR/GRILL

- ELECTRIC COIL
SS GRILL
DIRECT & INDIRECT HEAT
LID
KNOB FOR TEMP
TEMP INDICATOR
PORTABILITY
NO FLAME - NO CHAR
EXPERIENTIAL PRODUCT

- SLEEK
- CLEANABILITY
- CORROSIVE
- SQUARE SKEWERS → MAYBE SLIGHT
- DRIP TRAY UNDER COIL / OR PLATE
- PLAIN SURFACES → PATTERN OR RIDGES OR SOMETHING, TEXTURE

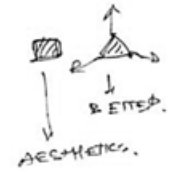
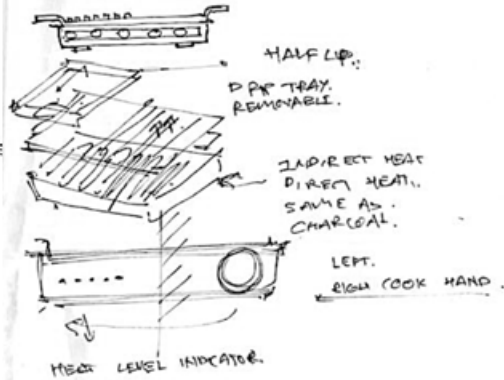
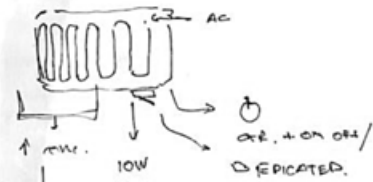
- HAVELLS OVERVIEW ✓
- TANDOOR GRILL? ✓
- SECONDARY R → MARKET STUDY ✓
- PRIMARY Q&A → AGE GROUP → NEED ASSESSMENT
- HIGHLIGHTING MARKET SIGNIFIERS
- NEED/WANT BASED ANALYSIS
- DIMENSIONS & TECHNOLOGY
- 3 IDEATION CONCEPTS
- DETAILING ASPECTS, PEN, PENCIL, COPIES
- SO MODELLING OF COMPONENTS AS PER DIMENSIONS.

6" → 9"

CHARCOAL GRILLS
TEPANYAKI
BOTH.

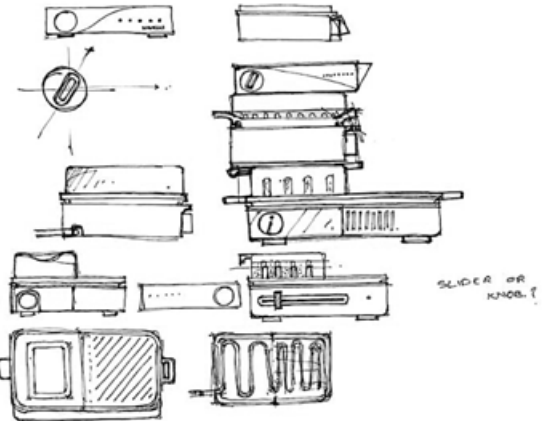
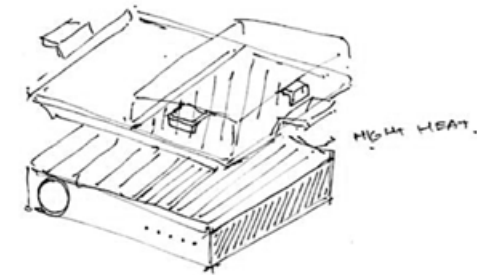
NOTES

- NO DESIGN LANGUAGE, CONSUMER SPECIFIC
- VERY WIDE RANGE OF PRODUCTS, COLOUR PLAY
- AESTHETICS : PRICE POINT
- MATERIAL FINISH : PRODUCT CATEGORY.



- RADIANT HEAT
- EXHAUST & PLACEMENT

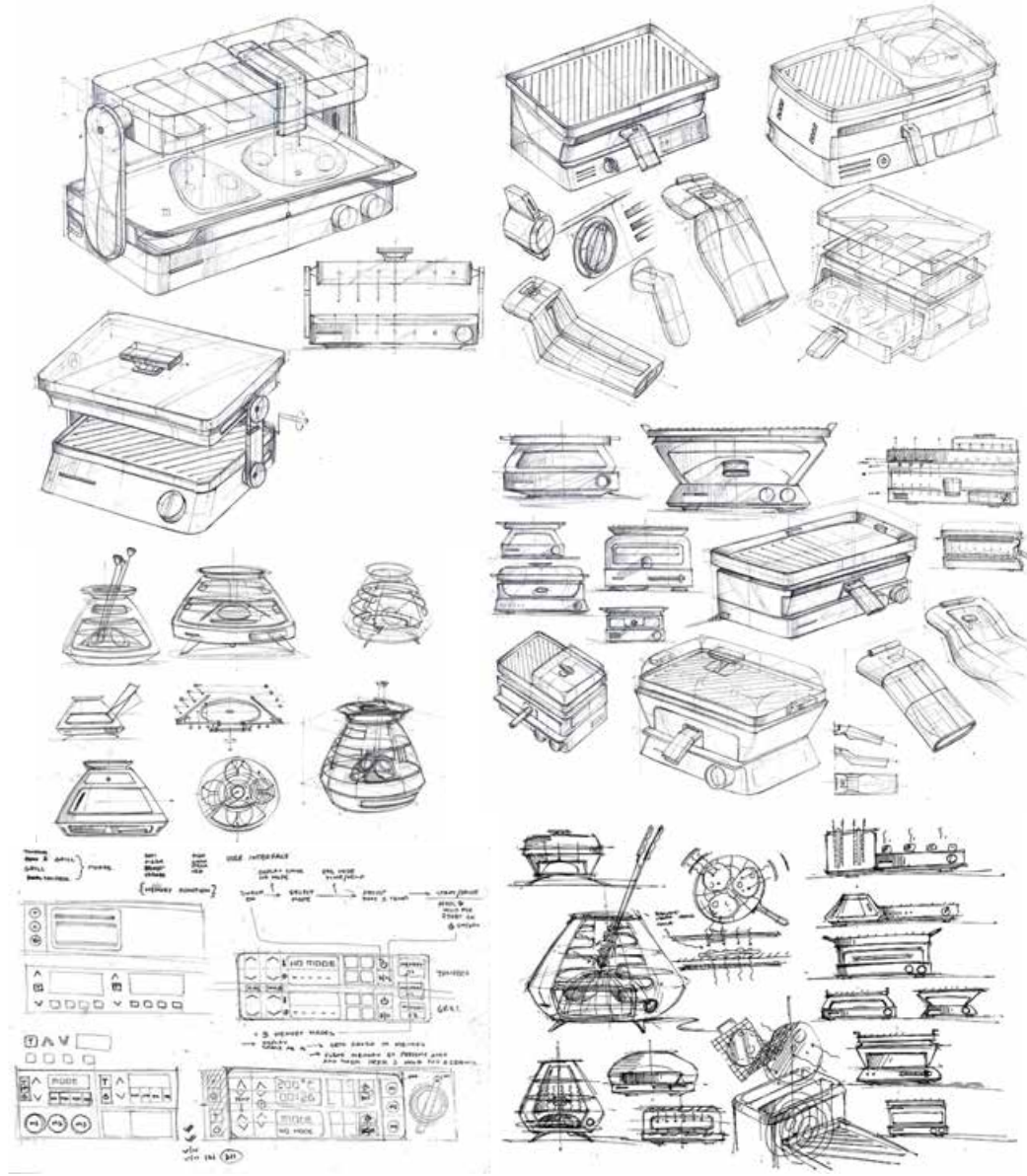
- BAR ✓
- PARTY ✓
- FAMILY ✓
- OUTDOORS ✓
- MOVIES ✓
- COUPLE COOKING ✓

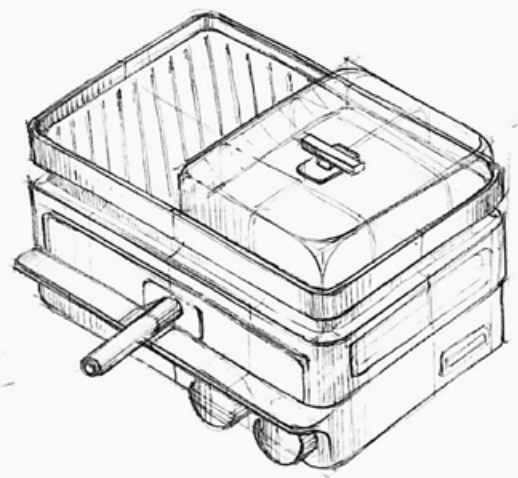
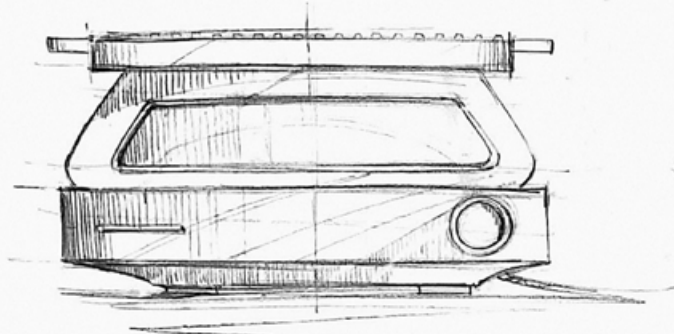
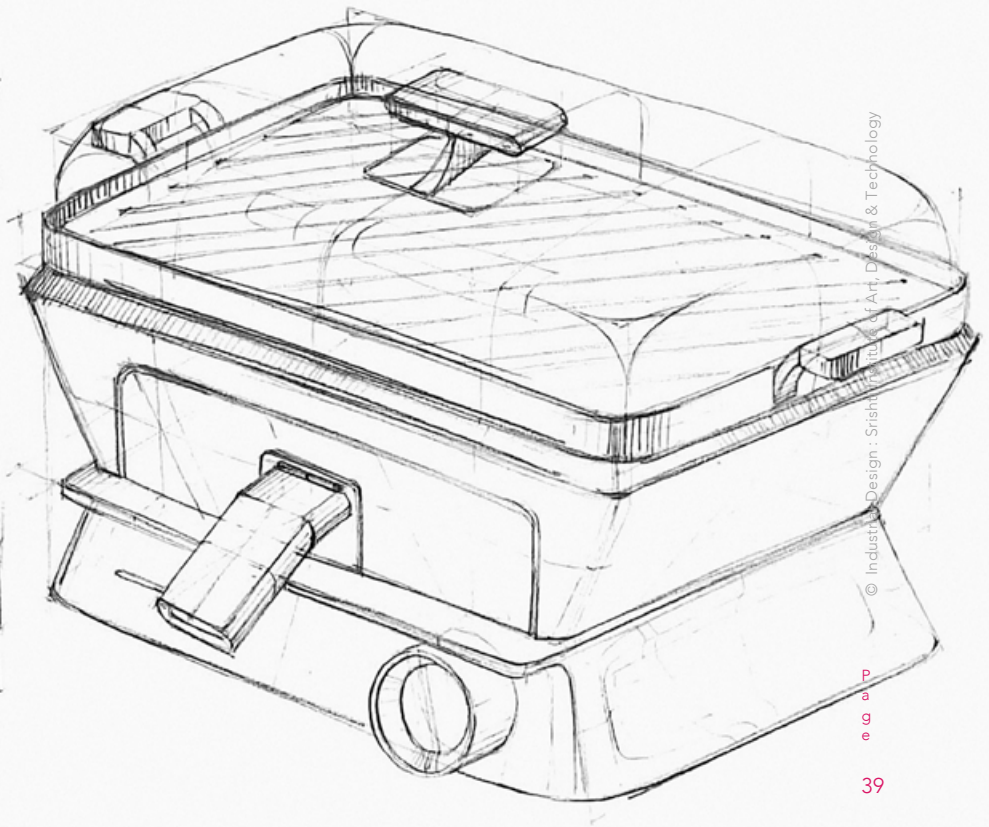
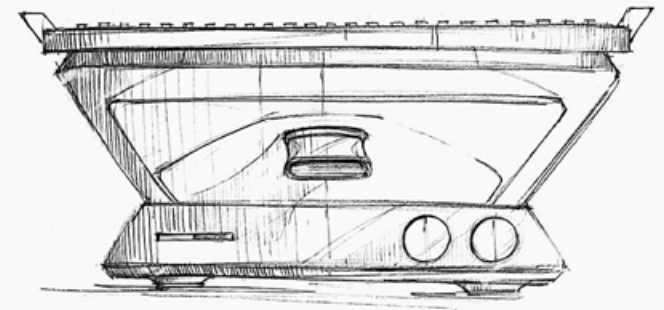
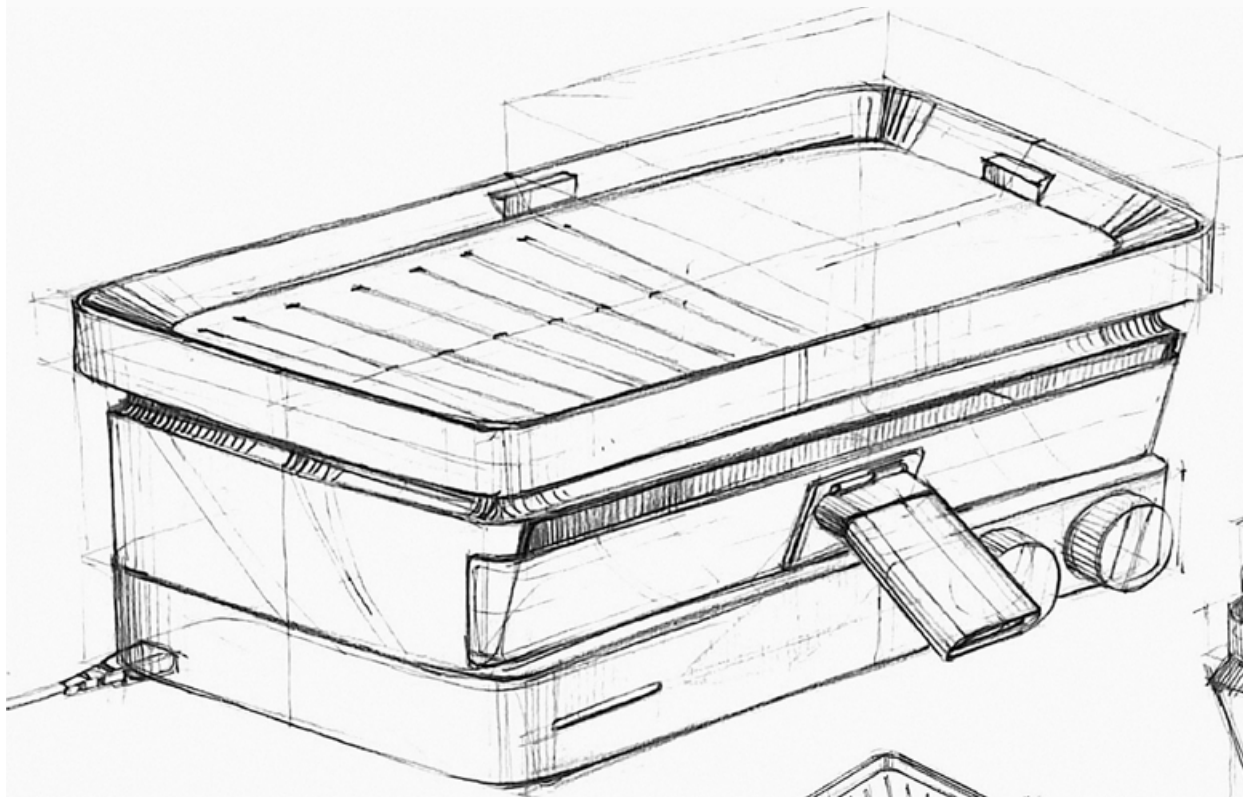


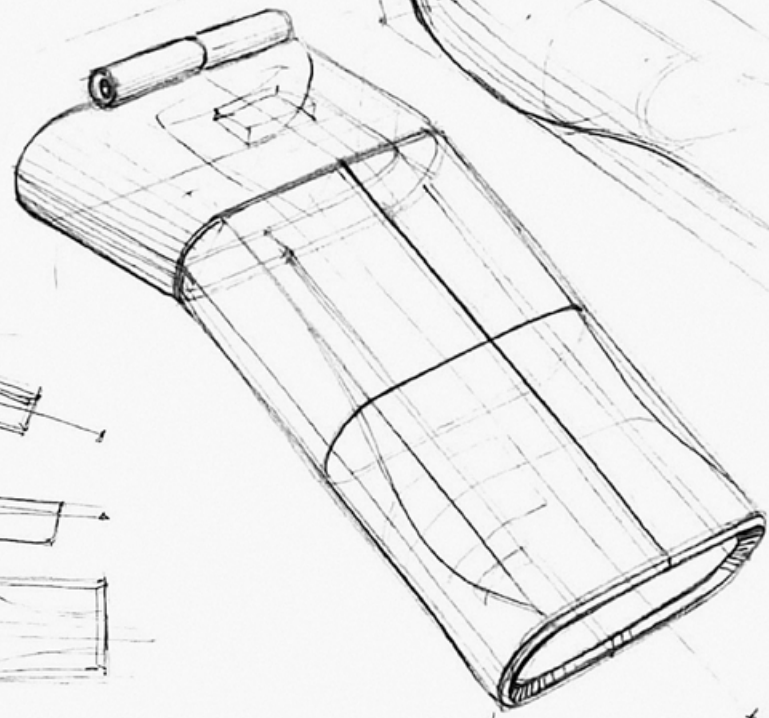
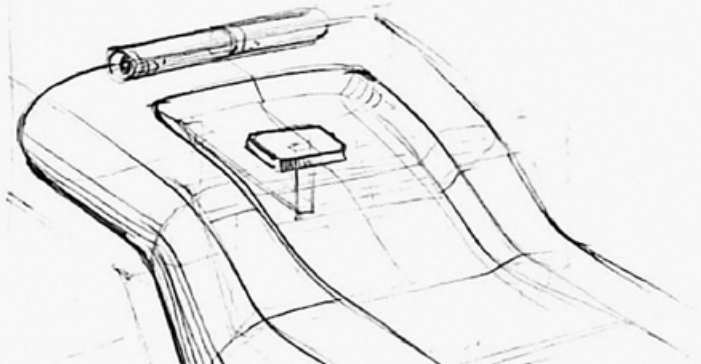
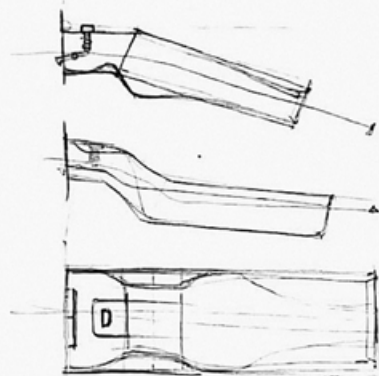
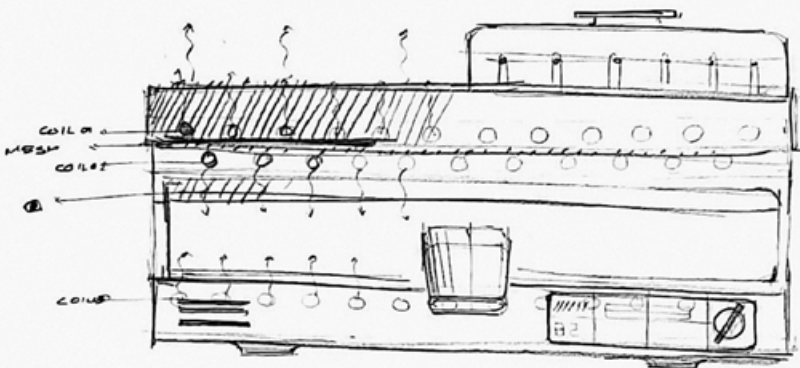
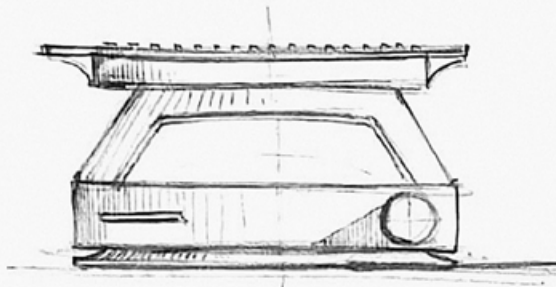
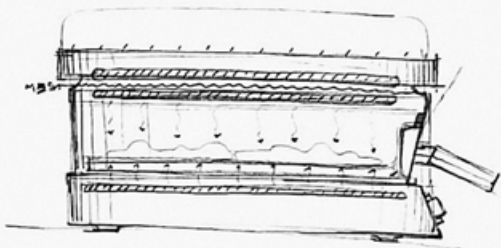
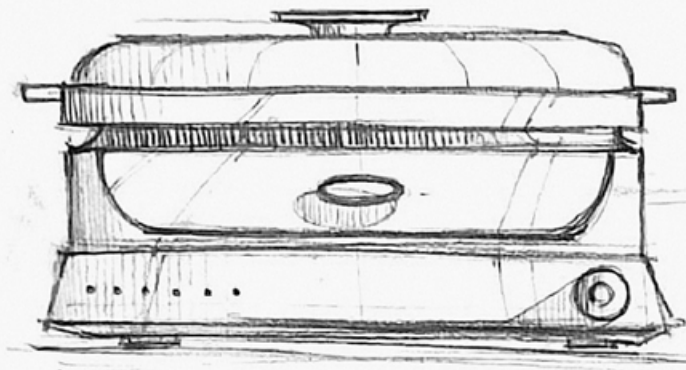
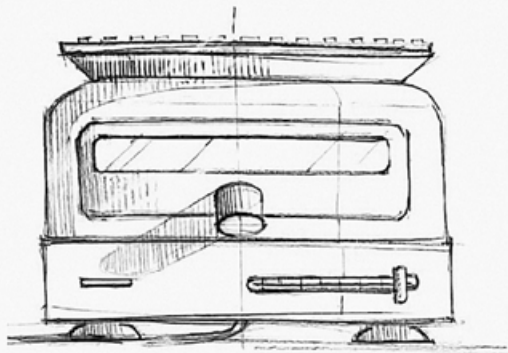
ID : 01 Concept Ideation

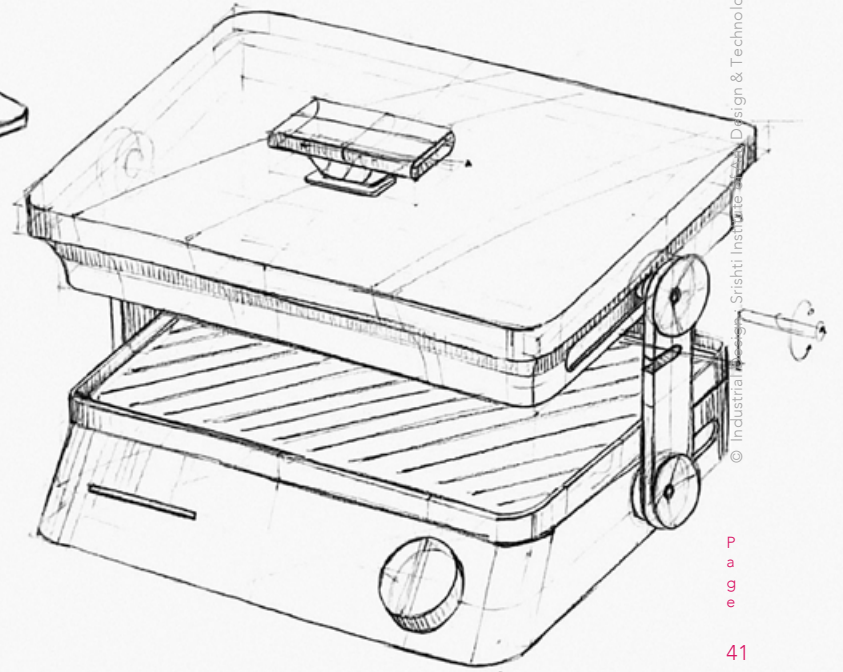
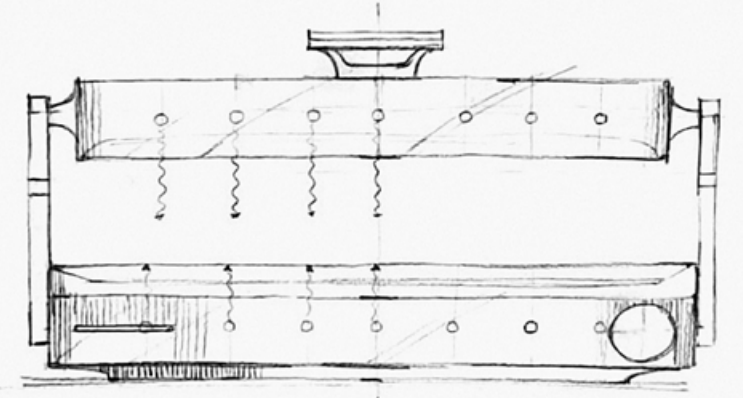
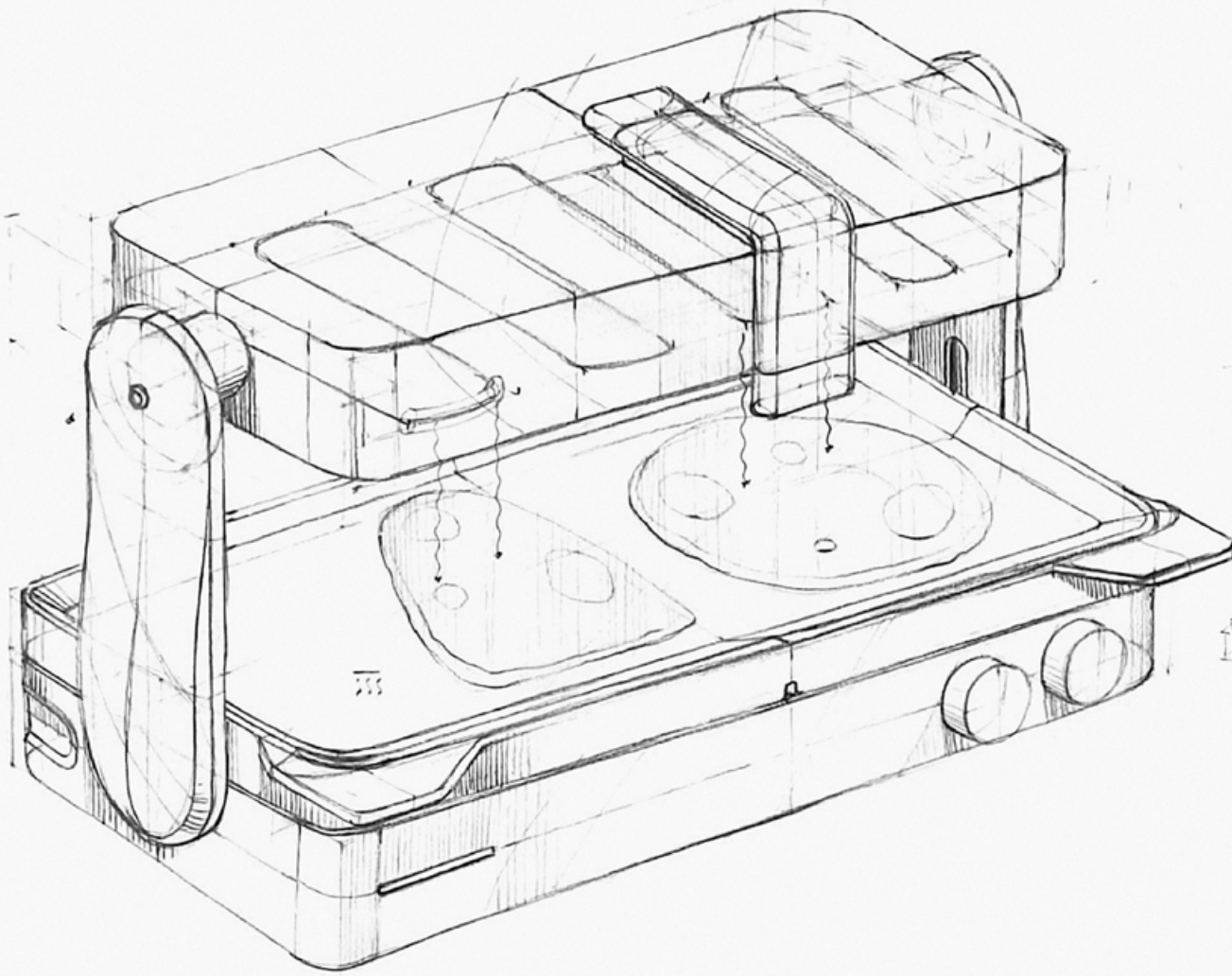
A1 Cartridge Sheet Freehand Pencil Sketches

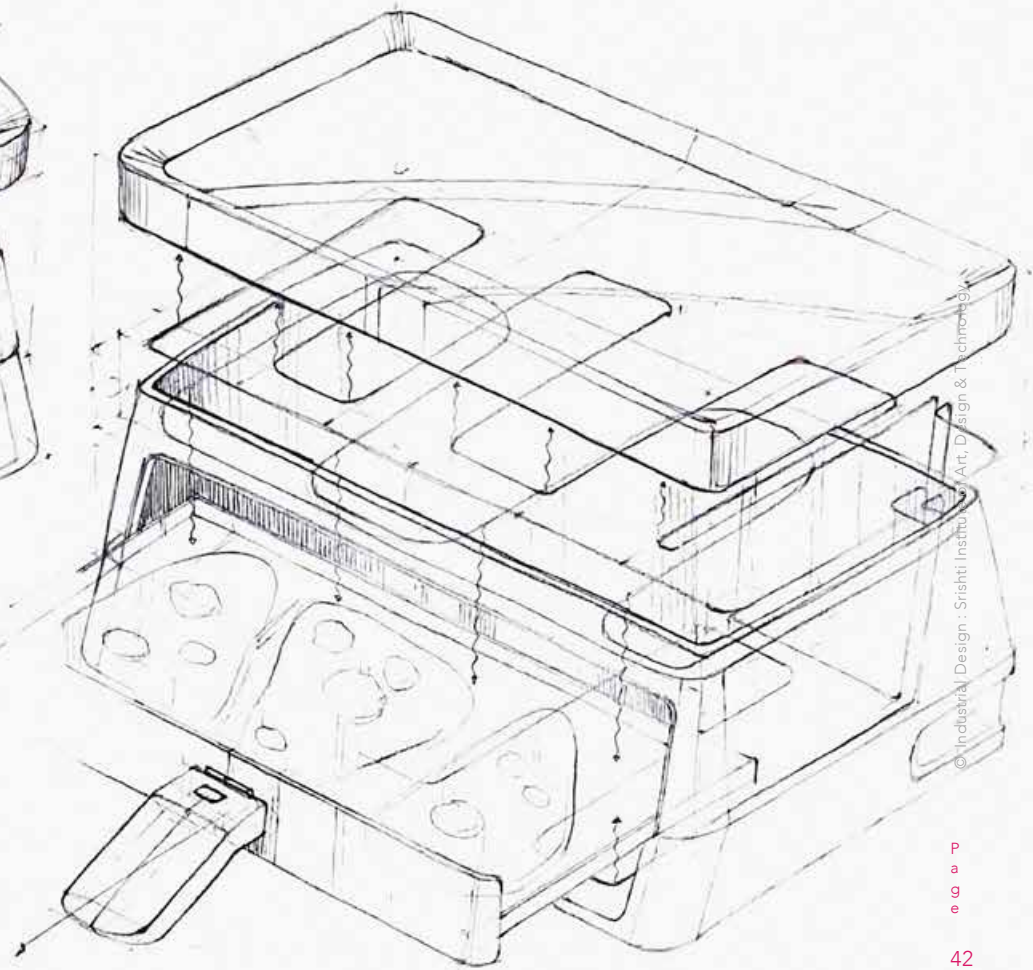
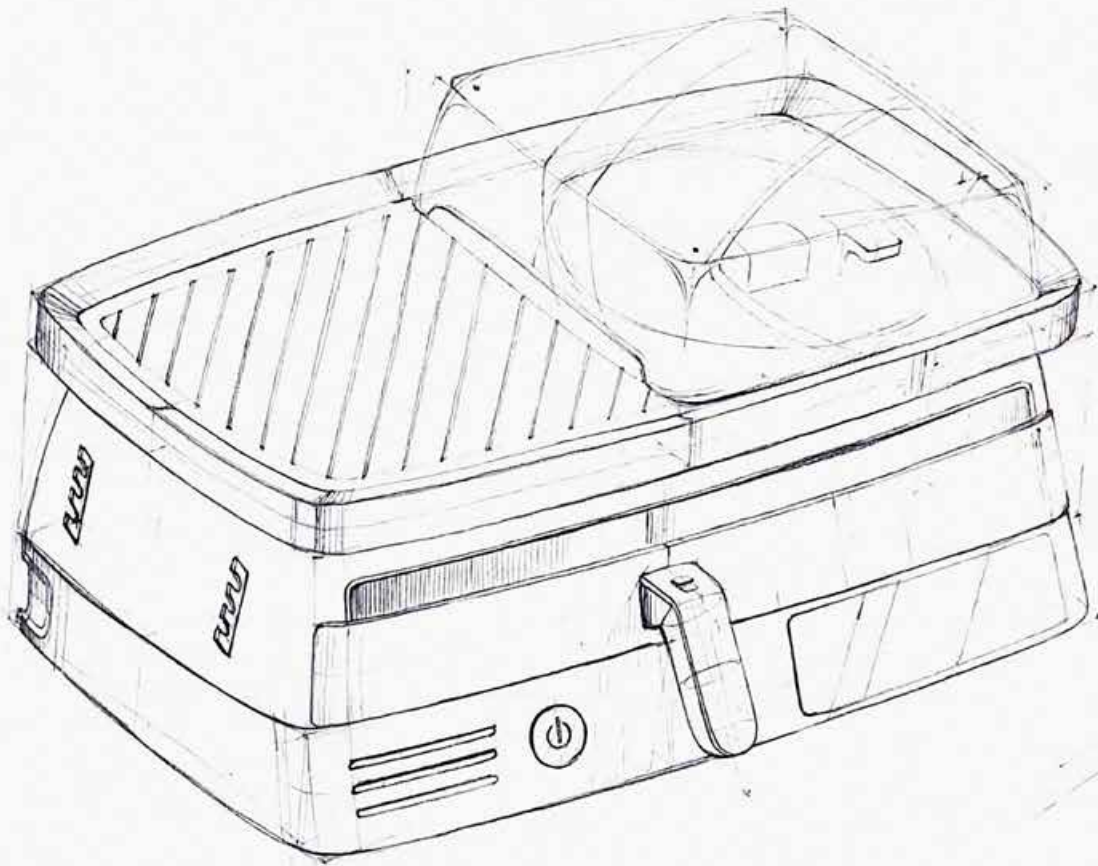
Understanding and implementing technologies through design, studied during the research phase. The Ideation was executed keeping in mind, ergonomics of form, storage, usability and aesthetics from the perspective of existing kitchen appliances. Strong emphasis was given to the realistic making of this conceptual product, that included manufacturability, scale and most importantly its function.

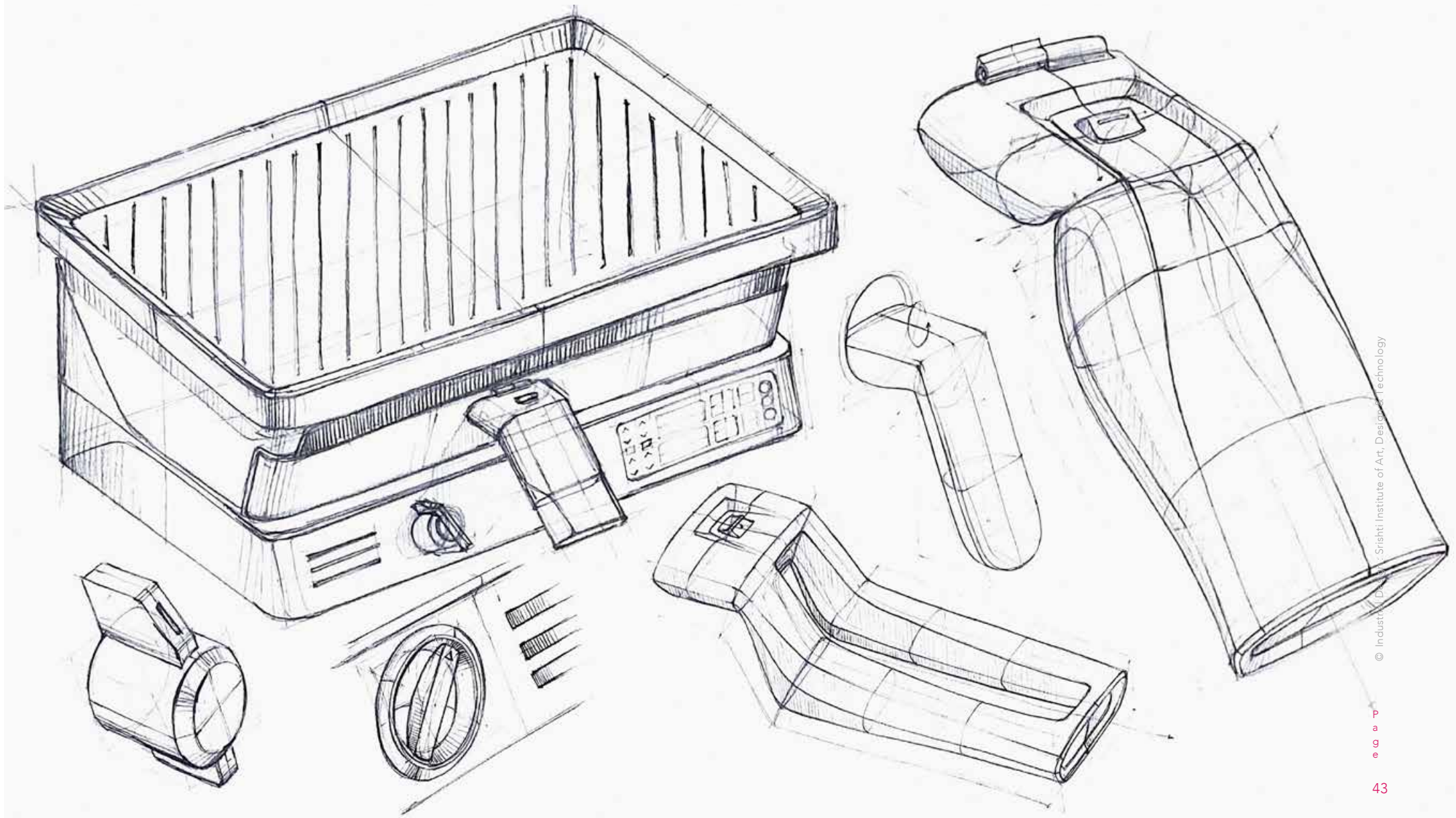






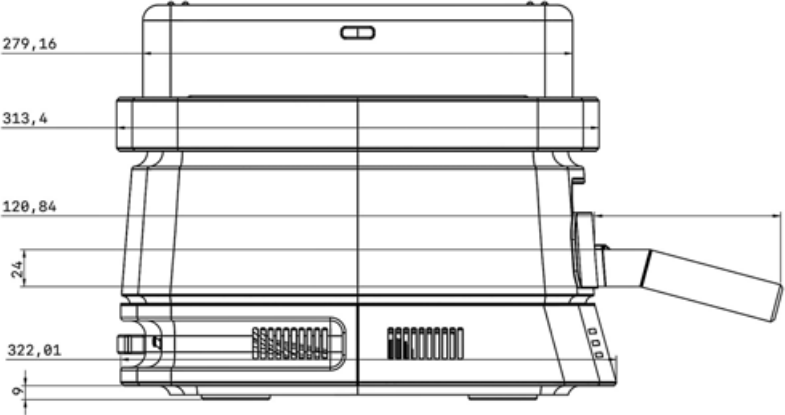
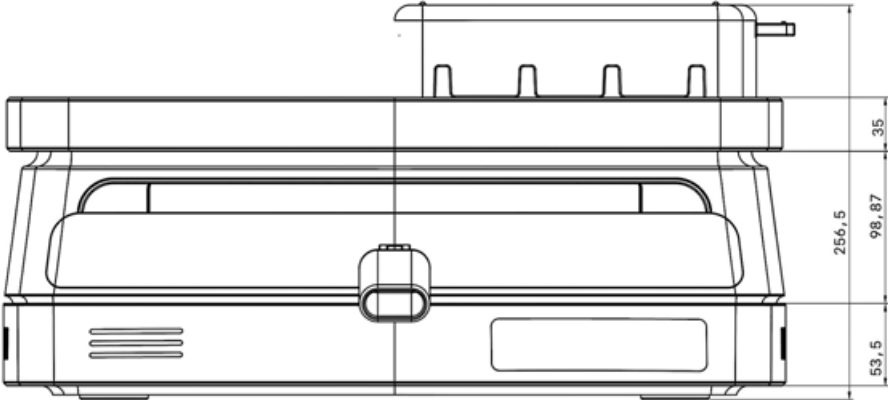






Technical Drawings

ID : 01



Rendered Elevations

ID : 01

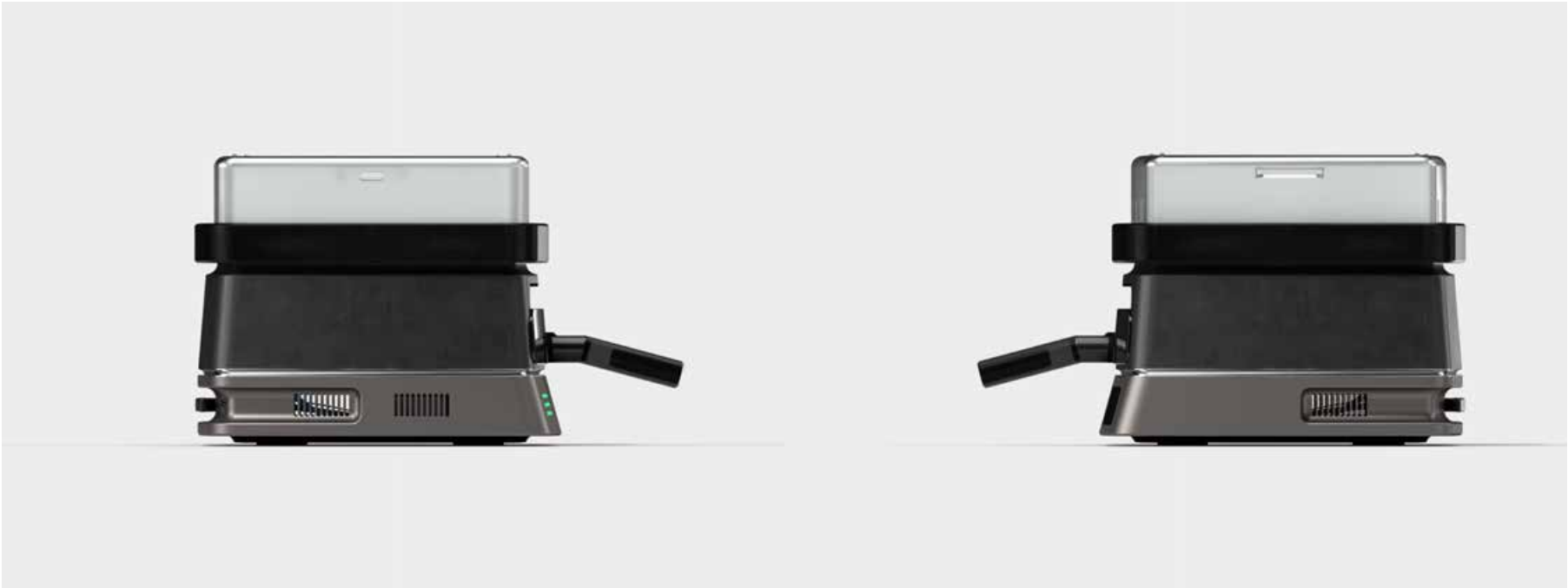


Front Elevation Rendered

Rear Elevation Rendered

Rendered Elevations

ID : 01



Left Elevation Rendered

Right Elevation Rendered

Rendered Elevations

ID : 01



Top Elevation Rendered

Bottom Elevation Rendered

Rendered Concept ID : 01



A front Elevation Render of ID : 01, Depicting the Tandoor Chamber in use, with LED indicator bars on the left signifying each heating element.

Rendered Concept ID : 01

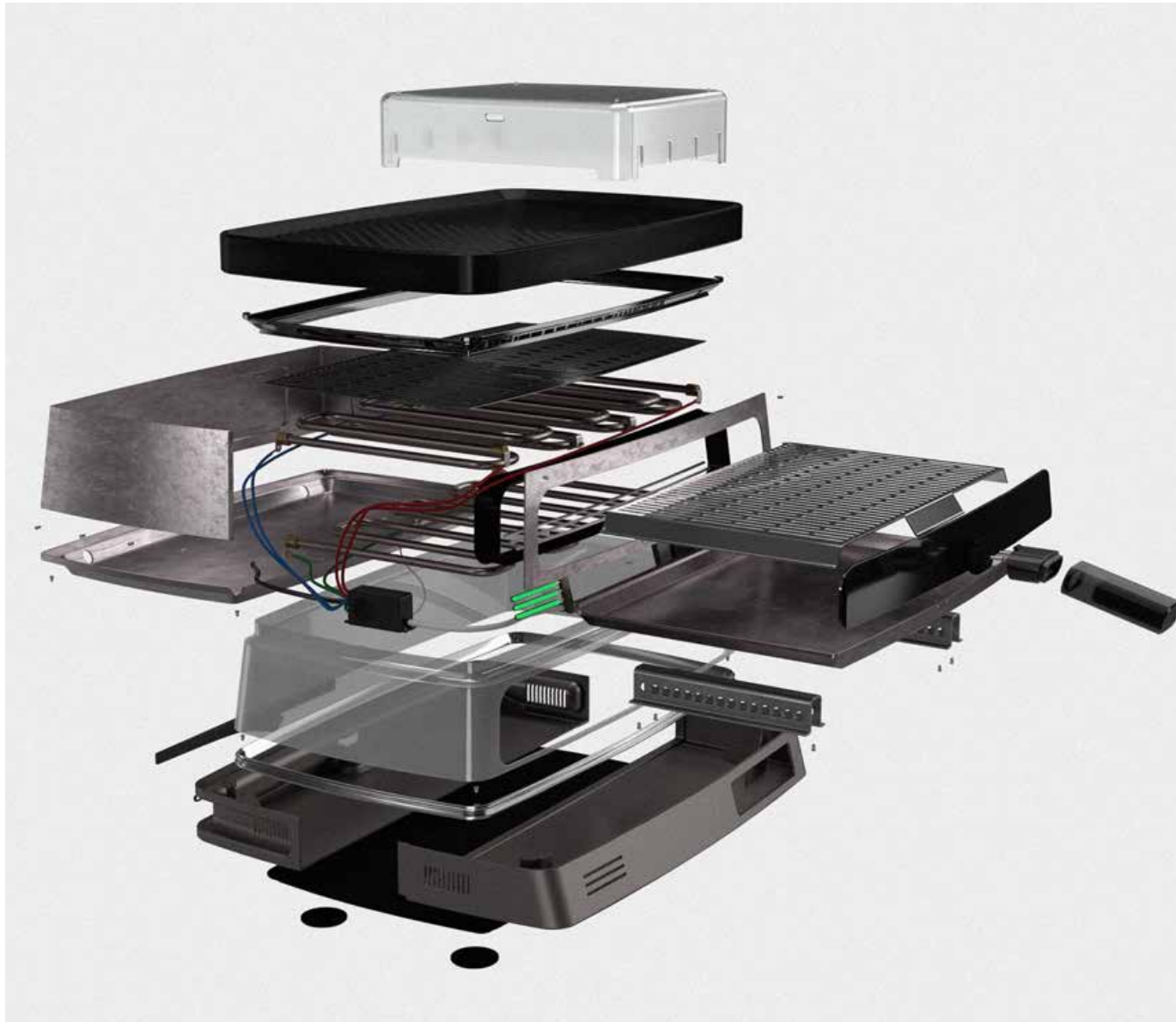


Above render shows the sliding tray with a grill top designed to bake Tandoori Roti's, Naan's or Pizza's (Ideally Flat Breads). The LED indicators on the left represents the top tandoor grill element not in use hence glowing green.

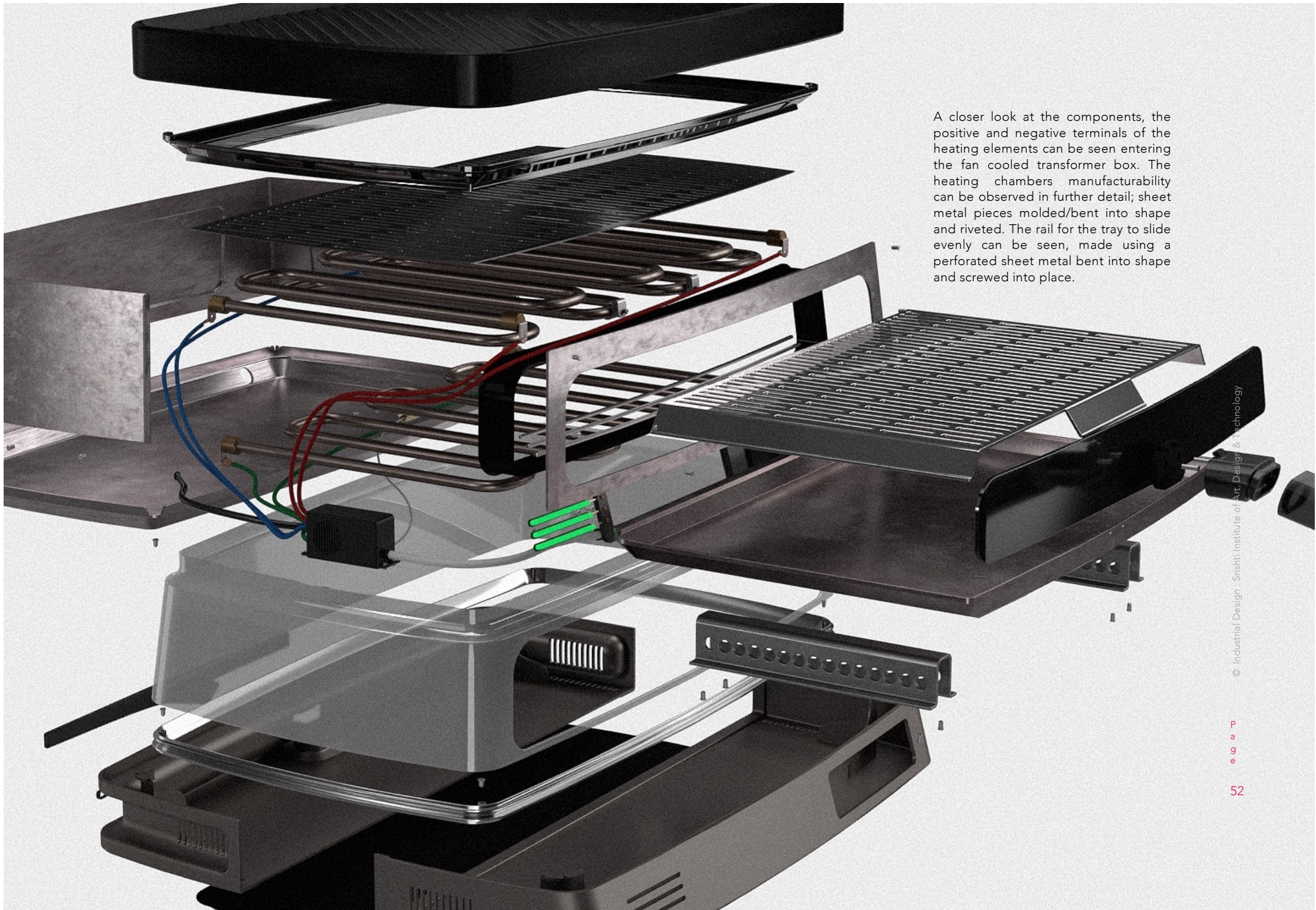
Rendered Concept ID : 01



The above render represents the Tandoor Grills storage, a foldable handle reduces the products depth by up to 35%. This feature could also be used to free up counter space in front of the product while in use.



Here is an Exploded View showcasing every internal and external component of this Electric Tandoor Grill. The view depicts the different components of the heat chamber and the plastic jacket that goes around the product. Placement of electrical wires, screws and rivets can be observed giving a clear idea of the products Manufacturability and Assembly.



A closer look at the components, the positive and negative terminals of the heating elements can be seen entering the fan cooled transformer box. The heating chambers manufacturability can be observed in further detail; sheet metal pieces molded/bent into shape and riveted. The rail for the tray to slide evenly can be seen, made using a perforated sheet metal bent into shape and screwed into place.

User Representation

ID : 01



The UI panel magnified depicting this specific use case scenario.

The above render is a representation of the Electric Tandoors Grill Plate in use. It can be used to cook and char marinated meats over skewer sticks. Using the interaction panel on the right, one can control the temperature of the grill top manually or select a preset to cook specific food items.

User Representation

ID : 01



The half and half grill top enables the user to simultaneously grill and use the other half as a regular cast iron pan.

User Representation

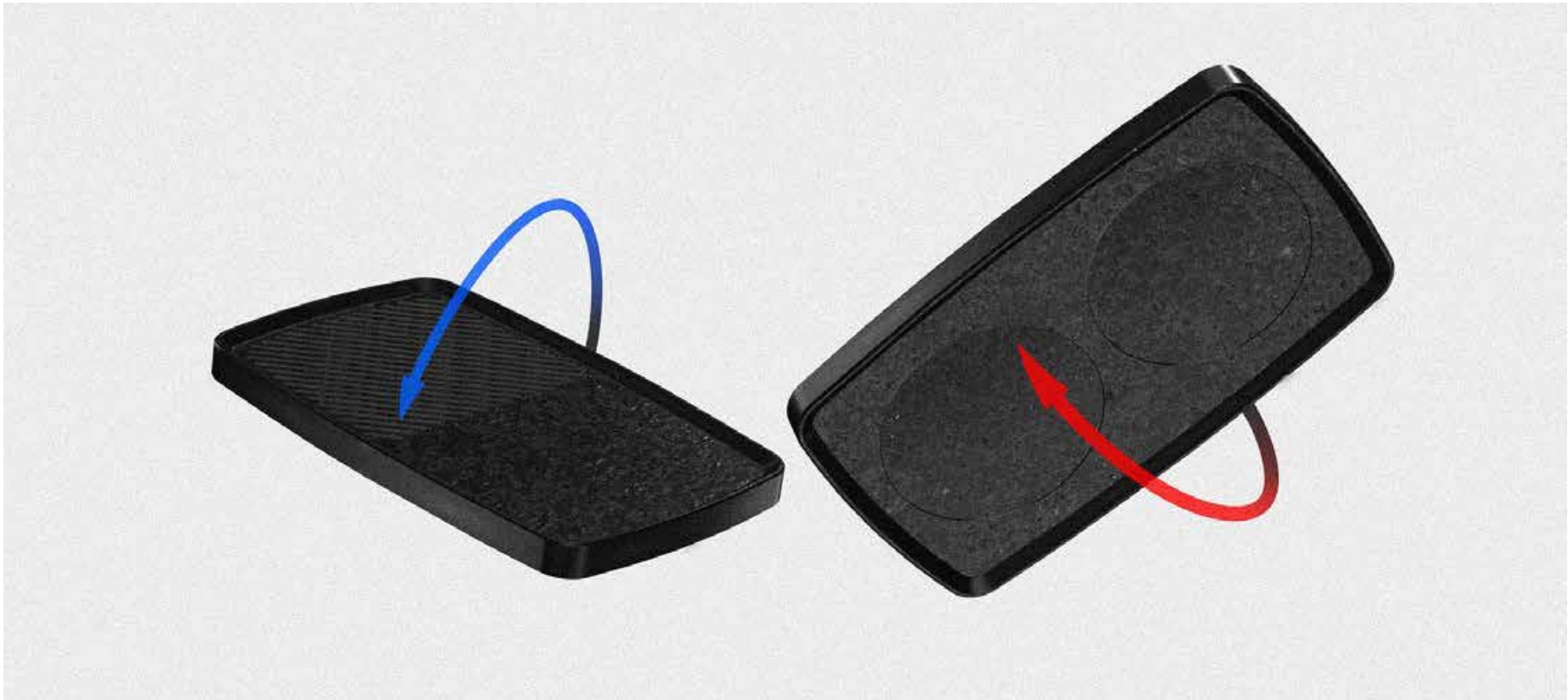
ID : 01



Heating elements placed at the bottom and top of the tandoor chamber efficiently replicate traditional tandoori results. One can directly use integrated cooking presets or customize and save a setting with the help of a smart memory feature.

User Representation

ID : 01



For an Indian demographic, this two grill plate caters to more than on need, for example the half grill side could be used to sear meats or vegetables where as the circular dented plate side could be user to make Dosa's or to toast flatbreads.

User Representation

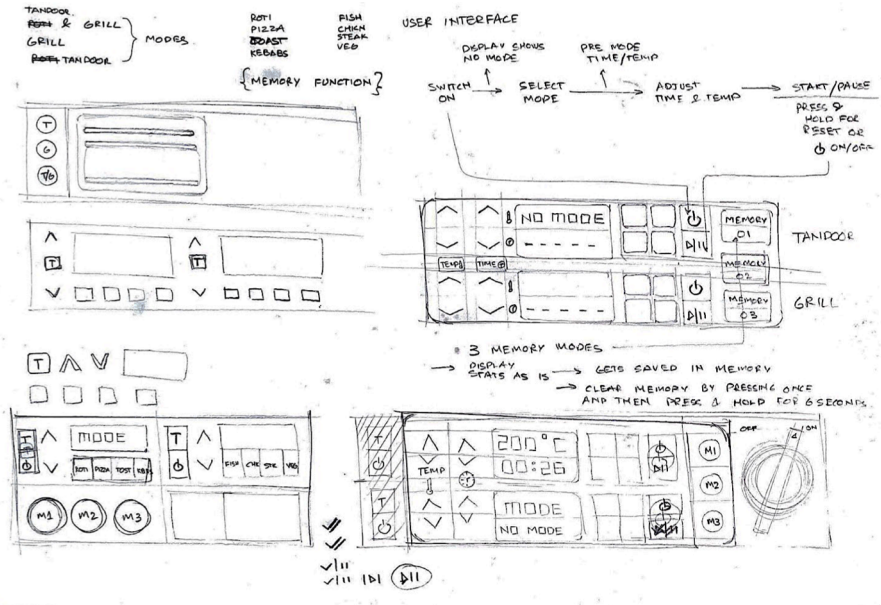
ID : 01



The grill top can be lifted and flipped anytime provided the surface exposed to the heating element is residue free. Its removability makes it easier to clean, easier to store and can also act as a teppanyaki pan on direct flame.

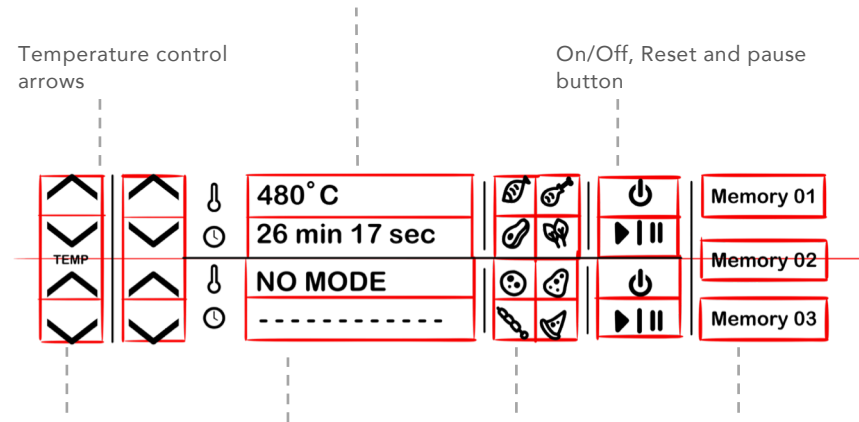
User Interface Task Flow

ID : 01



Above is a rough planning of a UI Panel specifically designed for this Electric Tandoor Grill to maximize ease of use.

Top row is for the first heating element that uses the cast iron grill top. The bottom row is for the tandoor chamber that controls 2 heating elements. The main center display dynamically showcases the set temperature and remaining time. When either of the coil pairings are not in use, the display shows NO MODE when turned on. The memory function captures settings for both rows at once.



Time control arrows

Temperature and time display

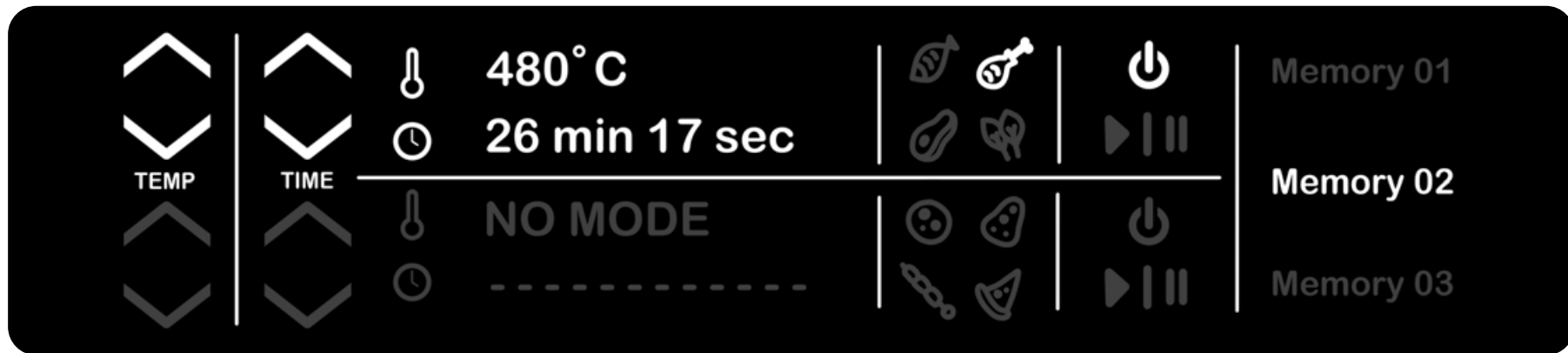
Cooking Presets
Fish, Chicken, Steak, Vegetables
Roti, Naan, Kebabs, Pizza

3 Memory modes to store custom presets according to the users frequent requirements.

UI Task Flow

ID : 01

Below is a flattened interface panel that helps the Tandoor Grill function efficiently. The following UI display showcases the cast iron grill top in use, with the first row activated, and NO MODE in row 2. The Meat preset has been selected and the setting has been stored in memory 2. The settings not in use glow partially and the ones in use stand out by glowing brighter.



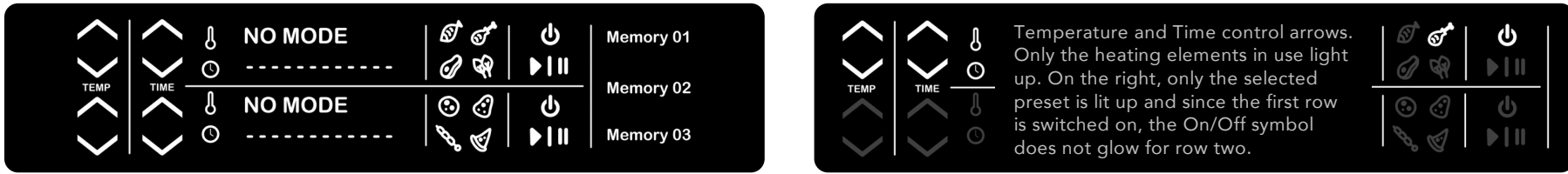
The flushed glass UI panel adds to the modern aesthetic of the product and ensures easy cleanability. Since the product has insulated handles and walls, the need to wear oven mittens is nil, hence the interface has been optimally designed to be used bare handed.

The Interface can be depicted using a basic task flow diagram. Here it states various possibilities and the sequence the interface can execute.

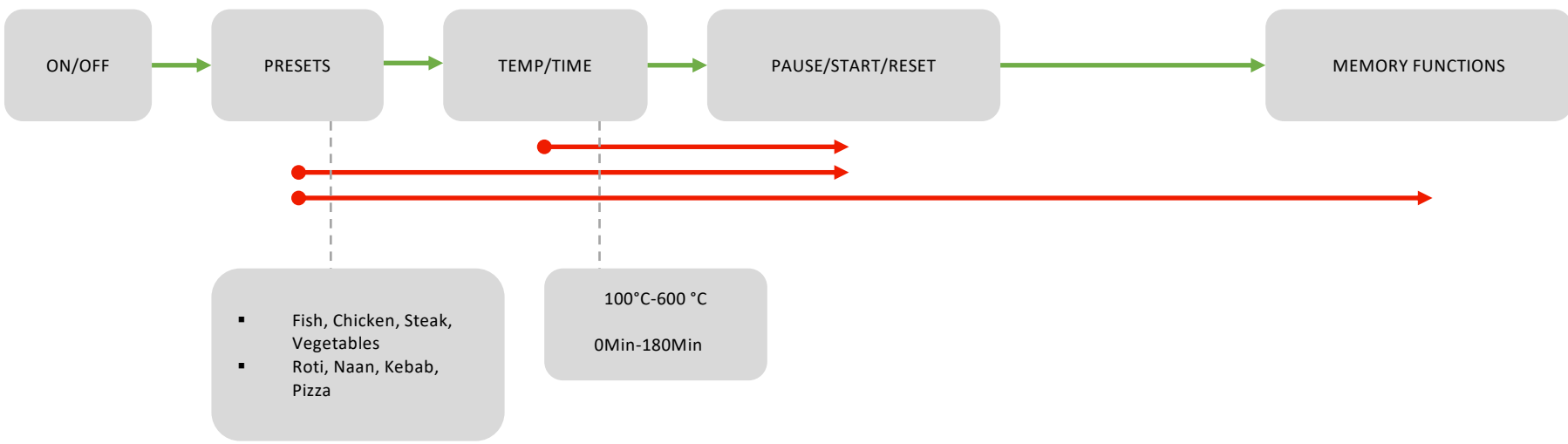
UI Task Flow

ID : 01

The Interface can be depicted using a basic task flow diagram. Here it states various possibilities and the sequence the interface can execute.



Below the task flow diagram uses arrows to show the correct sequence to use the interface. Commands that can be skipped to a different function are shown using red arrows.



1:1 Low Fidelity Mock-Up

ID : 01

Cardboard, Corrugated Sheets, Bond Paper, Glue.



1:1 Low Fidelity Mock-Up

ID : 01

Cardboard, Corrugated Sheets, Bond Paper, Glue.



1:1 Low Fidelity Mock-Up

ID : 01

Cardboard, Corrugated Sheets, Bond Paper, Glue.



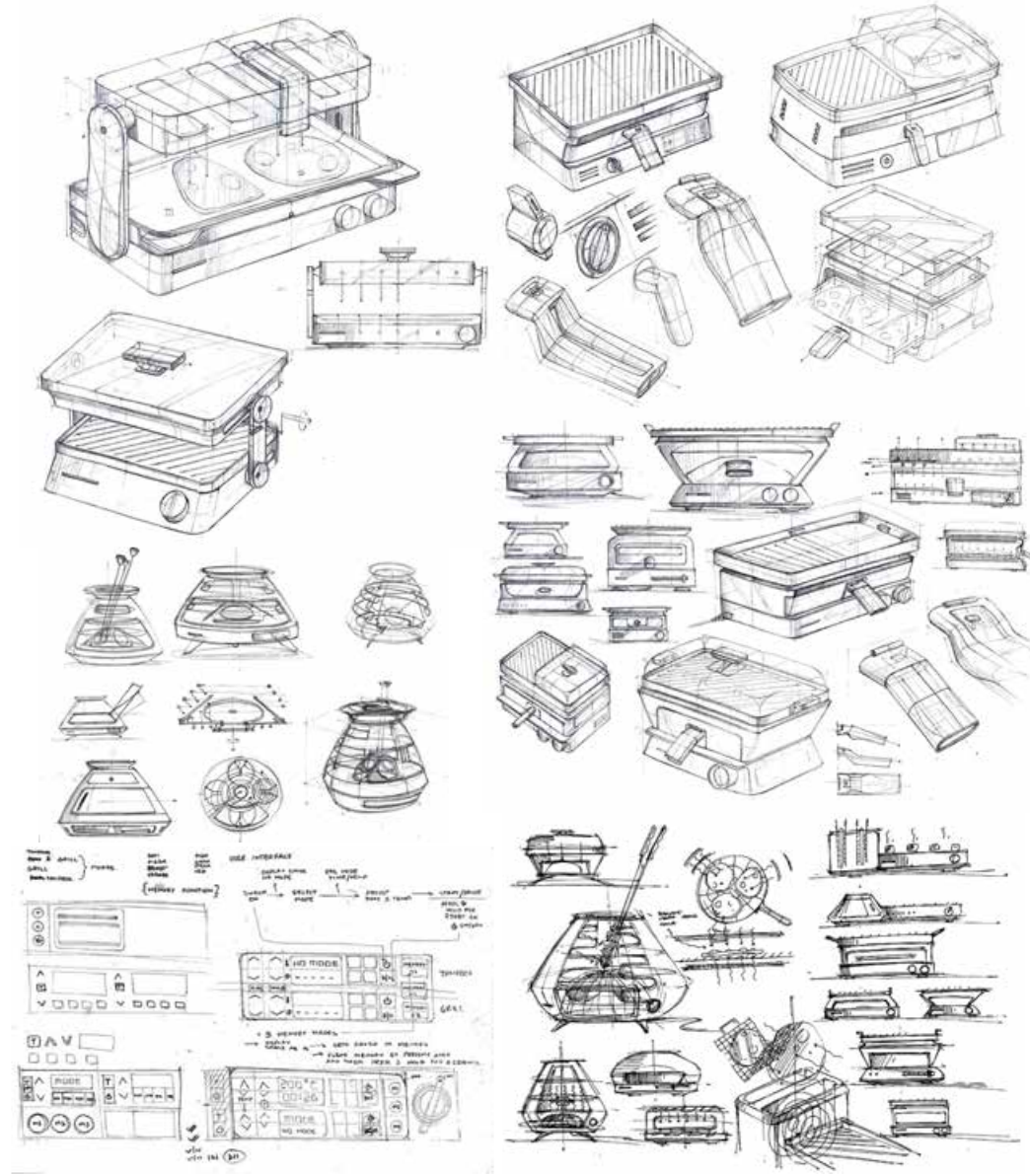


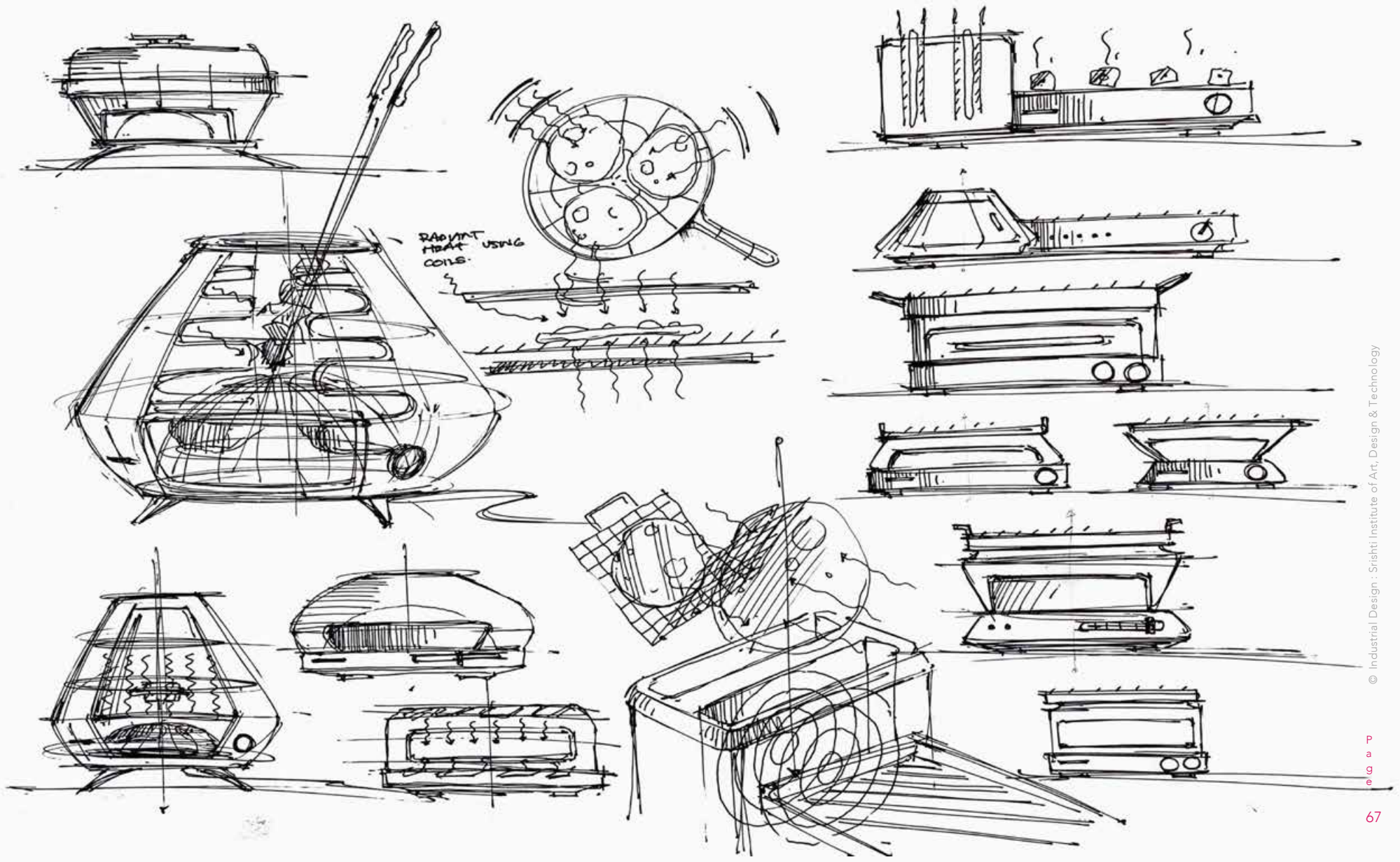


ID : 02 Concept Ideation

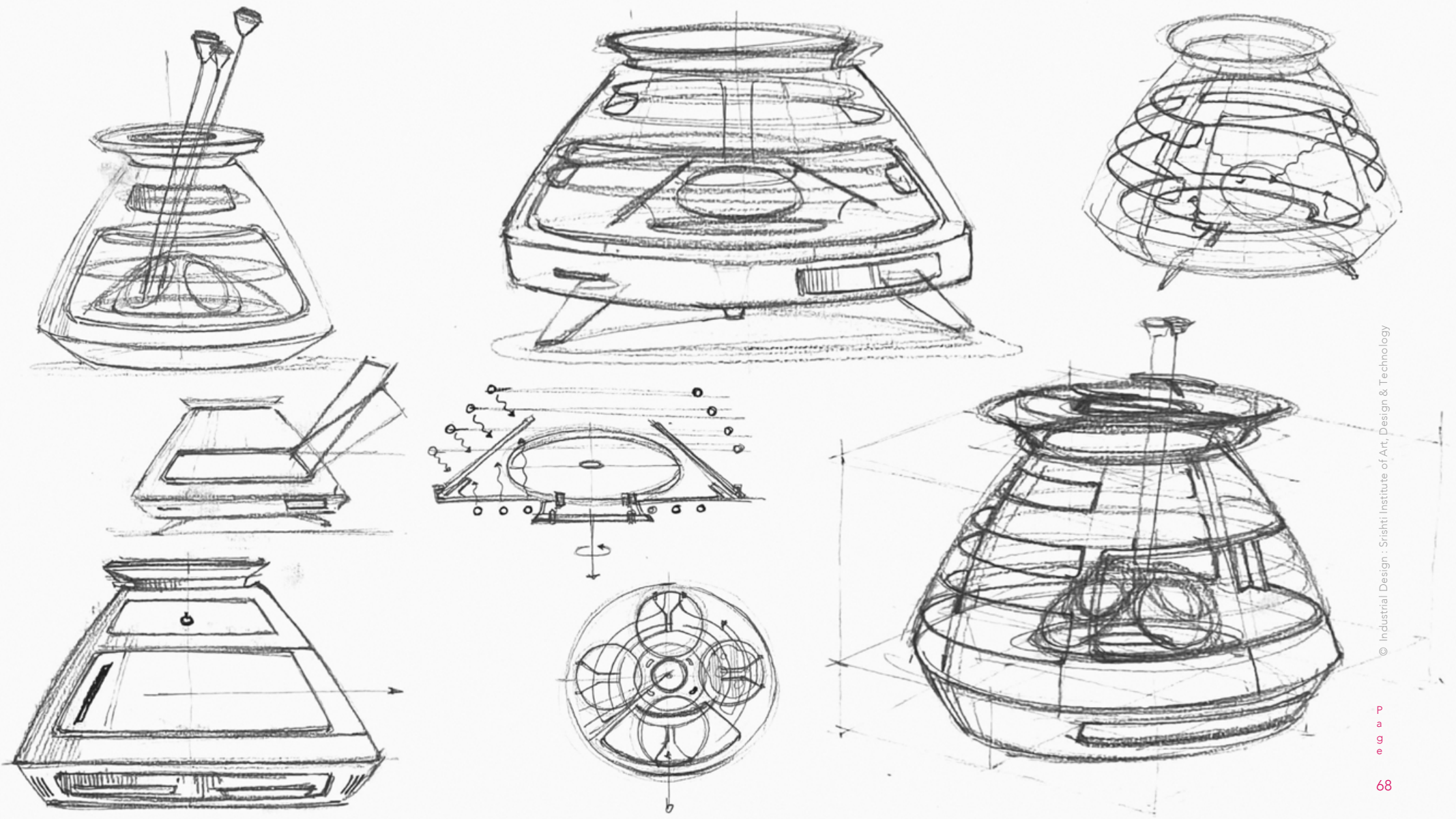
A3 Cartridge Sheet Freehand Pen & Pencil Sketches

Understanding and implementing technologies through design, studied during the research phase. The Ideation was executed keeping in mind, ergonomics of form, storage, usability and aesthetics from the perspective of existing kitchen appliances. Strong emphasis was given to the realistic making of this conceptual product, that included manufacturability, scale and most importantly its function.



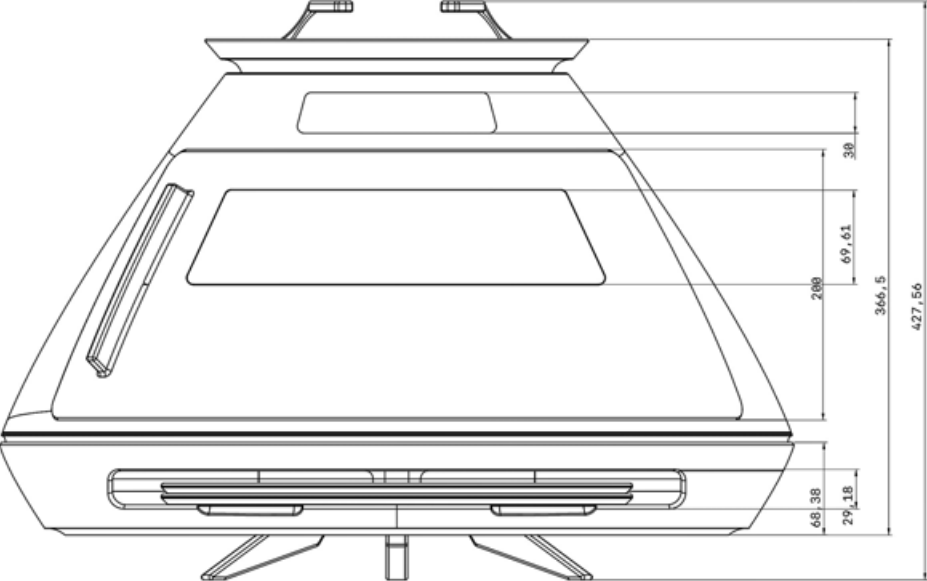
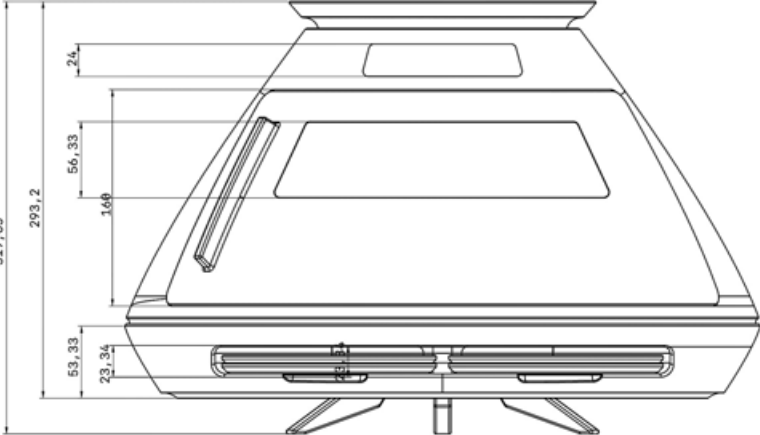


RADIANT HEAT USING COILS.



Technical Drawings

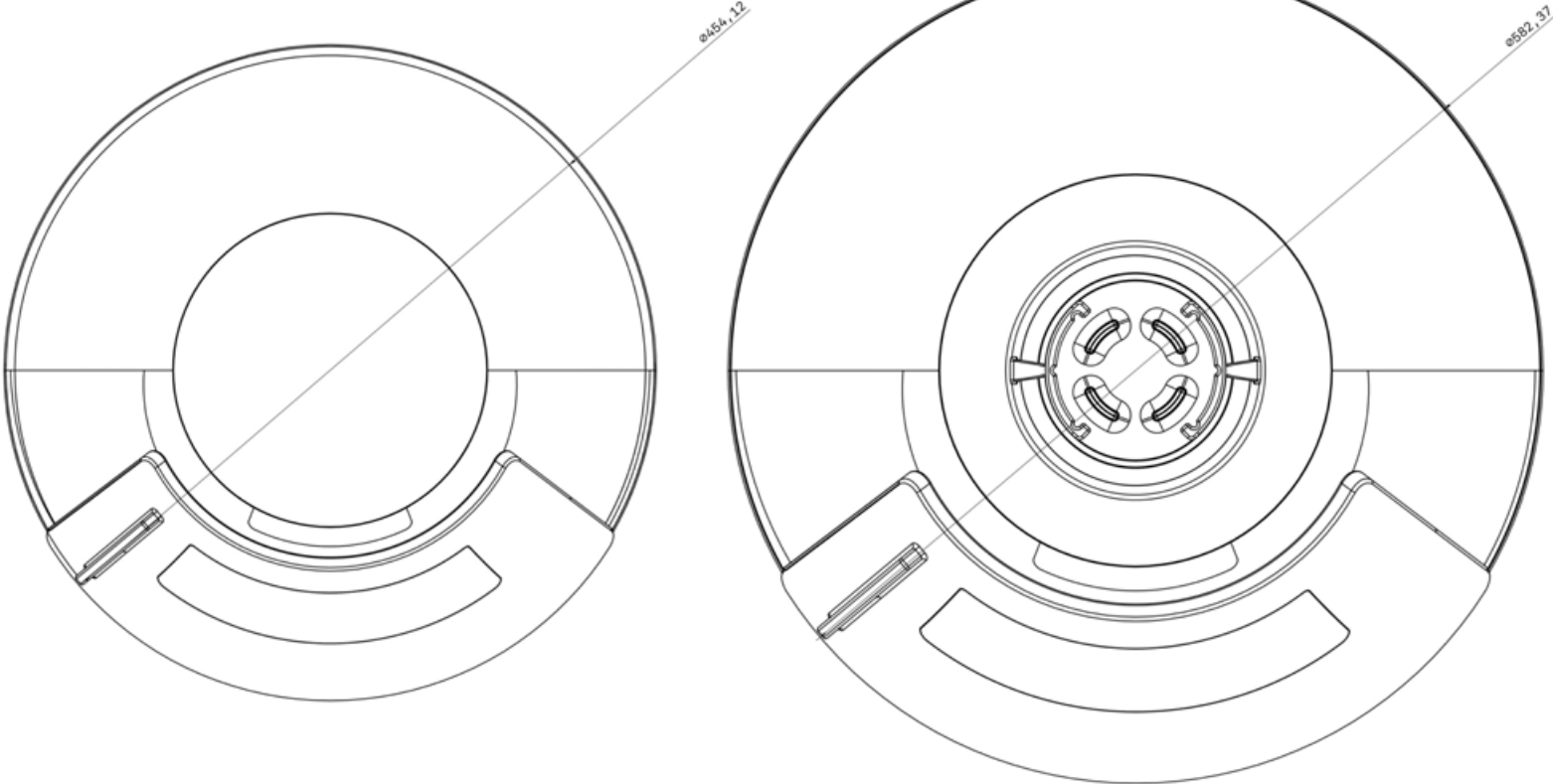
ID : 02



SCALE 1:2

Technical Drawings

ID : 02



Rendered Elevations

ID : 02



Front Elevation Rendered

Rear Elevation Rendered

Rendered Elevations

ID : 02



Left Elevation Rendered

Right Elevation Rendered

Rendered Elevations

ID : 02



Top Elevation Rendered

Bottom Elevation Rendered

Rendered Concept ID : 02



A front Elevation Render of ID : 03, Showing 2 different size tandoors each unique in its own way through a perspective of storage, functionality and experience. A see-through window allows the user to view the cook on the food inside without opening the door fully, this prevents significant heat loss.

Rendered Concept

ID : 02



This open door view shows the coil placement inside. The heating elements taper alongside the walls staying equidistant from the inclined roti plate. The 4 plate design leaves enough room in the middle to comfortably house 4 kebab or tikka sticks.

Concept Multiutility

ID : 02

While the grill plate and roti plate is in use, skewers cannot be dropped down as they would act as obstacles preventing rotation. At any given time, one of the two hot plates would be in use hence the shelf helps store the extras.



Stackable Plates

The plate holder also houses a half and half grill plate that is convenient to grill both big and small pieces of meat. The split design of the grill plate enables it to be used while baking roti's as well. While the grill plate and roti plate is in use, skewers cannot be dropped down as they would act as obstacles preventing rotation

Scale & Efficacy

ID : 02



The Number of Roti hot plates and their angle of inclination strongly affects the scale of the product. Switching from a 4 plate to a 3 plate arrangement makes the product smaller, more compact and easy to store and also leaves more free countertop space in the kitchen, but this eliminates the top action kebab skewers as there is inadequate room between the plates.

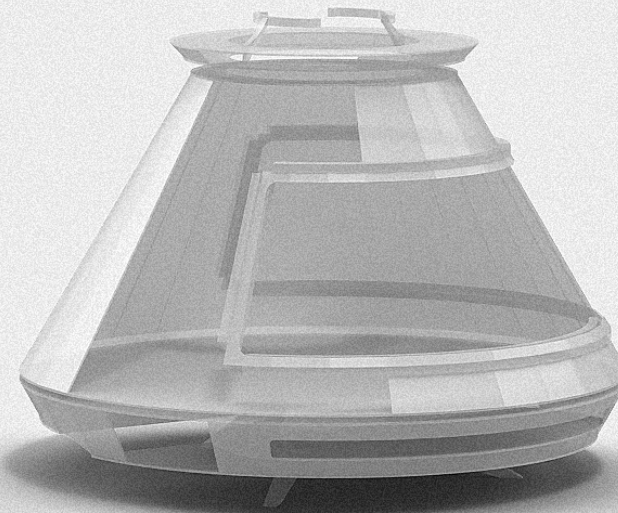
These overlapping drawbacks and advantages enabled me to introduce 2 variants of the same product. Both being equally functional, they priorities of one aspect more than the other. The Diameter marked in red is either too big or too small making it unfit for domestic use from a storage and functionality point of view respectively. The diameters marked blue and green are adequately sized and carry out the tandoors function efficiently.

1:1 Low Fidelity Mock-Up

ID : 02

The model consists of cardboard and paper pieces digitally created accurately down to its thickness of 1mm. Since the curvature of an actual cone is hard to flatten and pre determine, the shape was mocked using several strips of paper. The paper interlocks into a cardboard base making assembly easier. It also provides a stronger bond for the glue as it seeps through the interlocks and fills gaps.

For thicker pieces extruding on a single axis, multiple variants of the shape were laser cut and stacked together to reduce making time. The complex geometry of the door rail was also modelled tediously with strips of paper just over 3mm wide and 1 mm thick.



A digital 3D dimensional model of the low fidelity mock-up was made to accurately laser cut cardboard and paper. This ensured a perfect too scale final outcome.

1:1 Low Fidelity Mock-Up

ID : 02 Pro

Cardboard, Corrugated Sheets, Bond Paper, Glue.



1:1 Low Fidelity Mock-Up

ID : 02 Pro

Cardboard, Corrugated Sheets, Bond Paper, Glue.



1:1 Low Fidelity Mock-Up

ID : 02 Pro

Cardboard, Corrugated Sheets, Bond Paper, Glue.





1:1 Low Fidelity Mock-Up

ID : 02 Lite

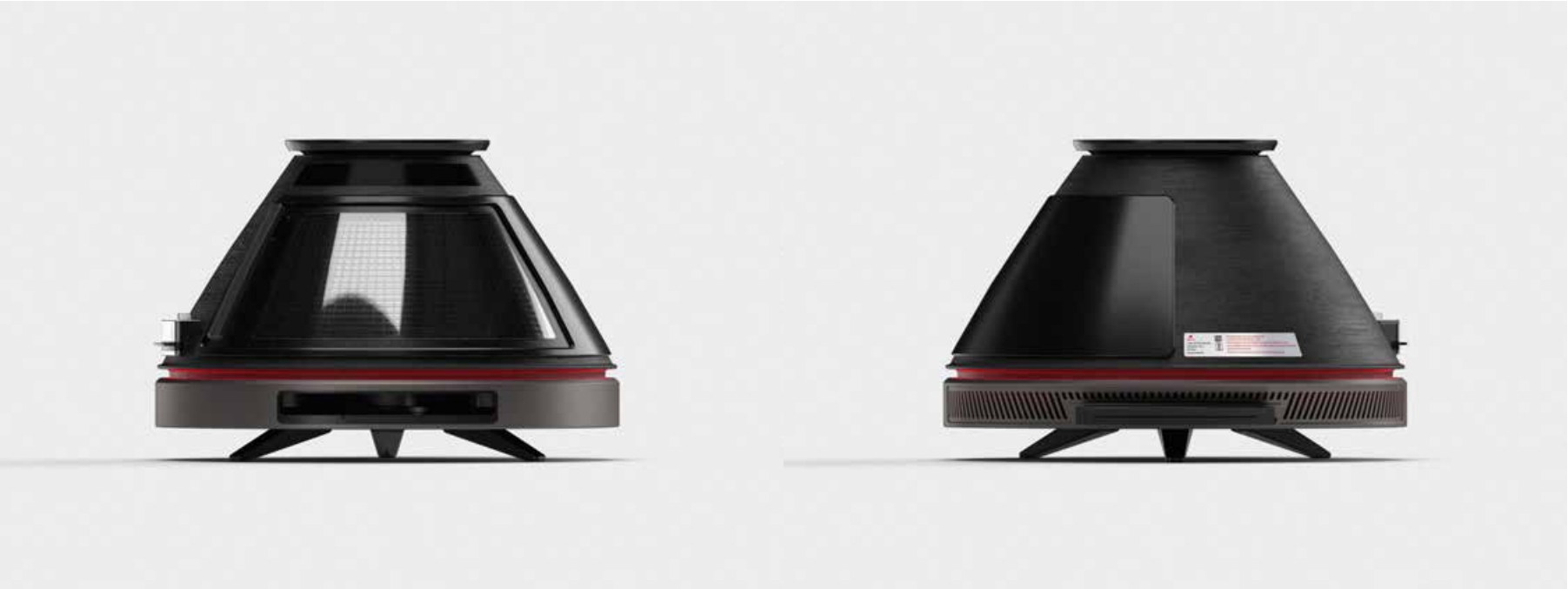
Cardboard, Corrugated Sheets, Bond Paper, Glue.





Rendered Elevations

ID : 02 Version 02 (Detailed)



Front Elevation Rendered

Rear Elevation Rendered

Rendered Elevations

ID : 02 Version 02 (Detailed)

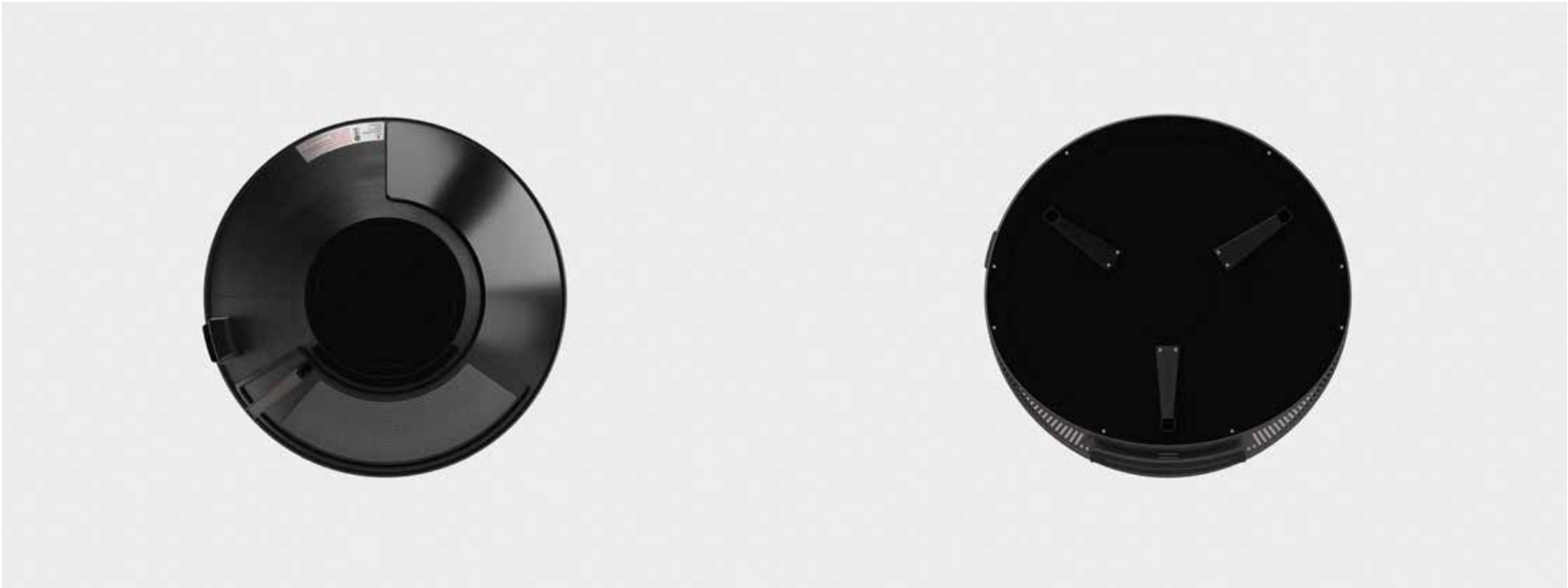


Left Elevation Rendered

Right Elevation Rendered

Rendered Elevations

ID : 02 Version 02 (Detailed)



Top Elevation Rendered

Bottom Elevation Rendered

Rendered Concept

ID : 02 Version 02 (Detailed)



A still view of the improvised ID – 02 concept that features higher functionality and an elevated aesthetic.

Rendered Concept

ID : 02 Version 02 (Detailed)



A dynamic led ring elevates the users experience depicting various heat levels inside the chamber.

Rendered Concept

ID : 02 Version 02 (Detailed)



The version 02 showcases a concealed sliding door along with a more snug coil placement for added safety.

Rendered Concept

ID : 02 Version 02 (Detailed)



The sheet metal surrounding the heat chamber encompasses each coil into its walls providing additional interior volume.

Rendered Concept

ID : 02 Version 02 (Detailed)



With adequate vents at the rear, directly placed up close to the fan cooled transformer box keeps the motor chamber cool eliminating the need to place vents under the Tandoor Grill. The sealed off bottom shields the internals from contaminants making it compatible for outdoor ground use.

Concept Multiutility

ID : 02 Version 02 (Detailed)



The advanced shelf design comfortably houses all grill plates and prevents smaller plates from sliding inside out of reach. Since the kebab grill plate has a significantly larger diameter, it also has a lower thickness allowing it to slide all the way to the back, it does so due to the variable volume inside the shelf that creates dedicated spaces for the plates.

Concept Multiutility ID : 02 Version 02 (Detailed)



The bottom coil is now hinged to the back of the heat chamber allowing the user to lift it up for easy cleanability. Notice that this action is portrayed with the led ring glowing green, in order to do so the coils need to be completely cold to ensure the users safety. The center plate interlocks into the rotating platform and can be lifted and removed for cleaning.

Concept Utility

ID : 02 Version 02 (Detailed)



The added feature of a smoke box elevates the users food experience. The box can hold up to 6 ounces of woodchips enough to add a smoky flavor to the condiments placed inside. A sliding door enables the user to open and close it with ease along with an ash tray that slots right under the base grill. The smoke passes through a small tunnel that cuts through the products outer jacket and the interior sheet metal wall.

Rendered Concept Internals

ID : 02 Version 02 (Detailed)



A look at the clean internals of the Electric Tandoor Grill. The bends in the sheet metal not only encompass the heating elements but also provides structural integrity to the walls of the chamber. The flat top of not only adds to the aesthetic appeal mimicking a traditional earthen tandoor but also acts as a platform to place plates or small bowls.

Rendered Concept Internals

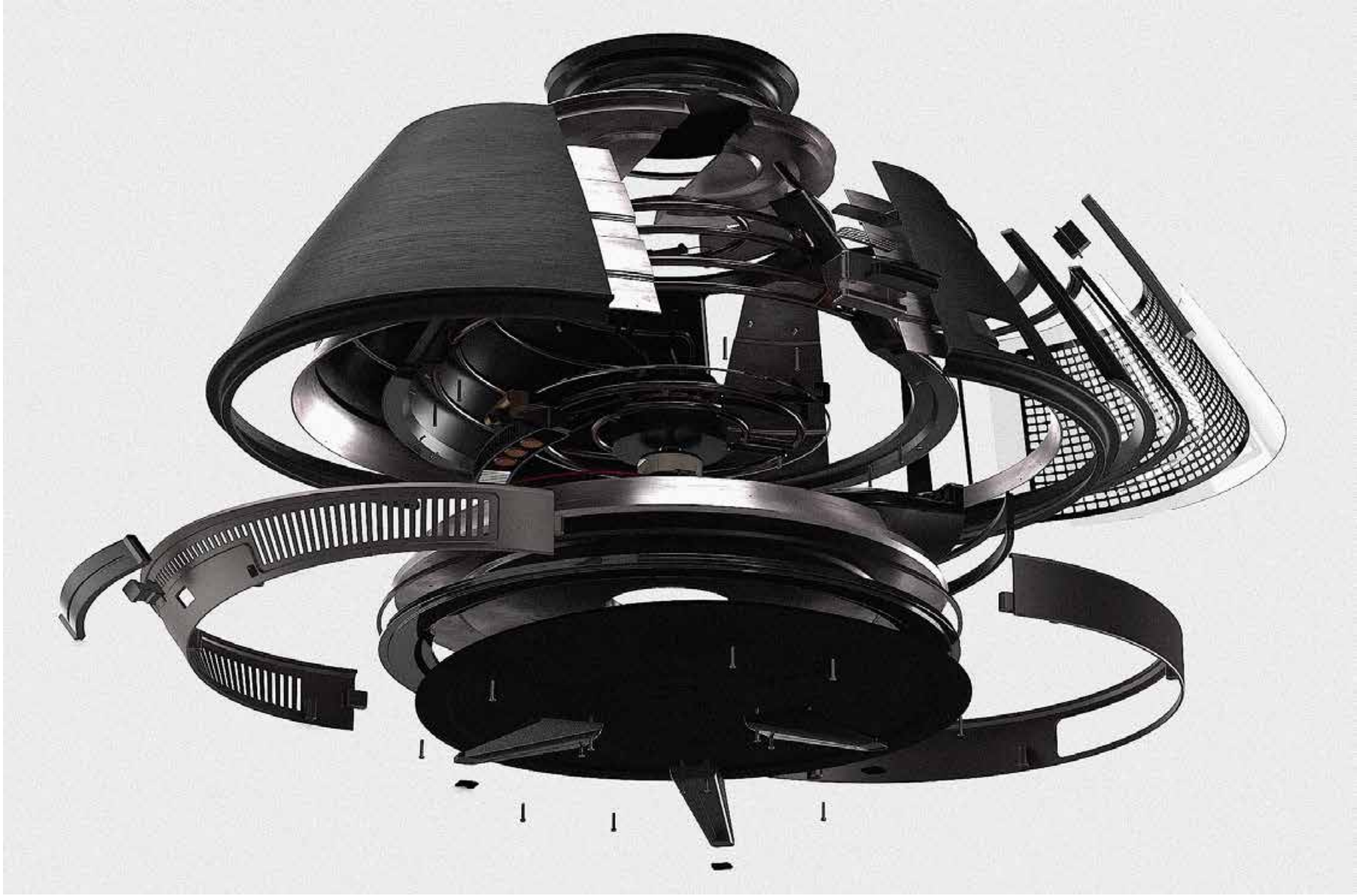
ID : 02 Version 02 (Detailed)



Intricate joineries such as interlocks and screw fixtures can be viewed in the base of the product. The copper-wound transformers under the black box can be seen, connecting to the main AC power source.



Here is an Exploded View showcasing every internal and external component of this Electric Tandoor Grill. The view depicts the different components of the heat chamber and the plastic jacket that goes around the product. Placement of electrical wires, screws and rivets can be observed giving a clear idea of the products Manufacturability and Assembly.



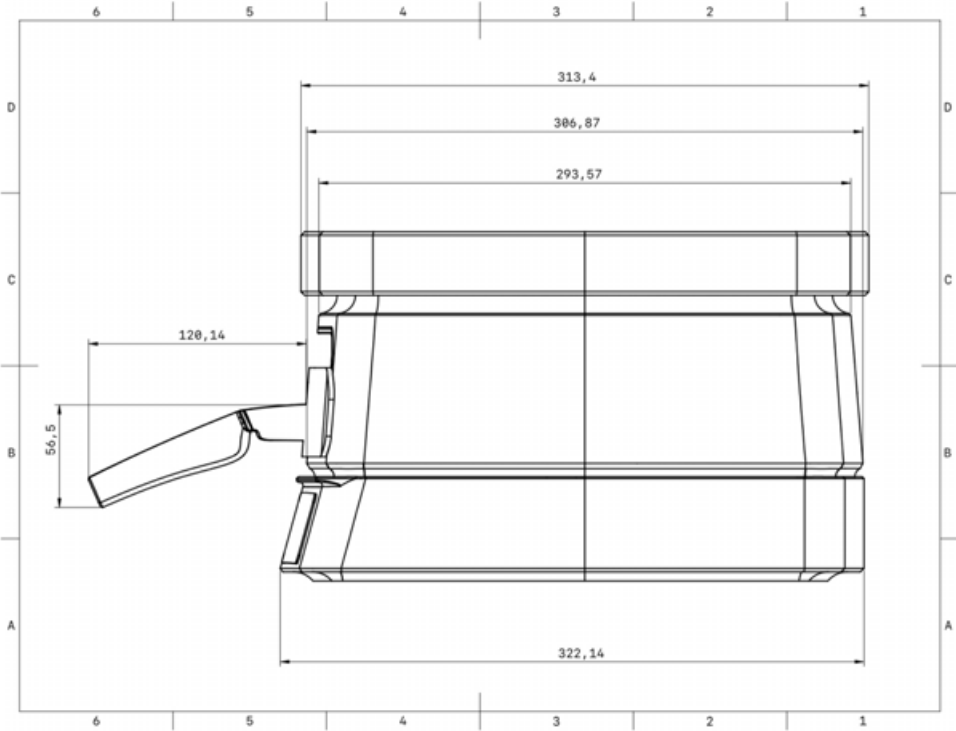
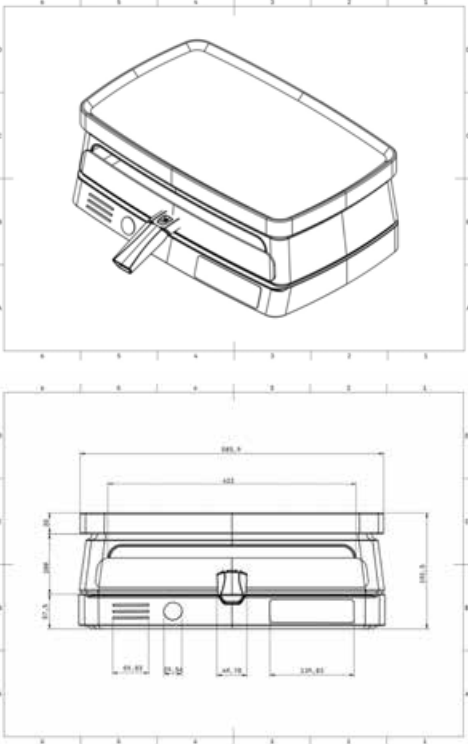
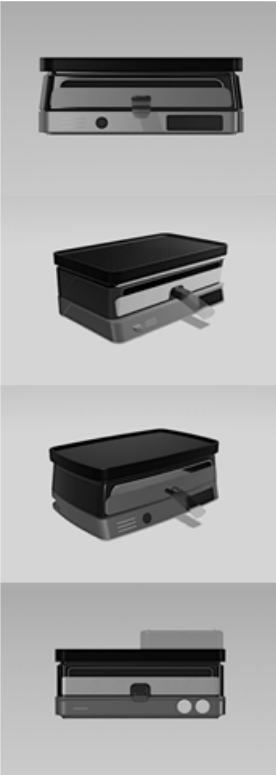
All Process

Low Fidelity 3D Models, Renders and Physical Mock-Ups



All Process

Low Fidelity 3D Models, Renders and Physical Mock-Ups



Reflection

We started off with a clear goal, to design and develop a never before seen product for the Indian demographic. Out of the two choices, one being Travel Grooming Kit and the other being Electric Tandoor Grill, my interests inclined towards the electric kitchen appliance. Having previously designed kitchen appliances along with real time experience working with heating elements, the choice offered me a strong base to build upon. Since it was a completely new product, I approached it from two perspectives; Functionality and Uniqueness. Over this 03 month course I was able to generate three solid outcomes. Learning from my pre-thesis, I was able to plan these three months smoothly giving enough time to execute each of the tasks. Being a company project, I would say my approach towards the project was more direct and to the point, focusing only on the absolutes. Because a finished working prototype was not expected from us, it gave me time to indulge into the manufacturability aspect of the product, something I have been unable to achieve in detail due to time constraints. It gave me time to deconstruct the product fully, looking at every single component and how they come together. By now I had developed a style of work, not just from the perspective of the outcome but also the process. As always I enjoyed every moment that defined me as a designer, an enjoyable thesis from start to finish.

The field visit prepared me for what comes next after this four year journey. This ultimatum of a project was more than just a submission, it was a test to gauge my learning. What matters is the journey and the experience it creates but pairing it with this complete piece of work makes it worth looking back at. A great end to a great journey, I thank all individuals who have generously contributed to my progress and motivated me to only vouch for nothing but The Best.

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To view projects follow the link below



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