

Analog

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Abstract

ABSTRACT

There is not much that can compete with preparing and enjoying a meal, cooked to perfection, in the company of friends.

No matter how skilled you are at cooking or baking, it is impossible to achieve the same quality of bread and pizza as in a restaurant since a regular household oven will not generate the temperature or taste needed.

To solve this I set out to design a way for homeowners to achieve the same quality of cooking and baking as if it was made in a bakery or restaurant by providing them with a non-permanent solution for use in their own backyard.

The end product would cater towards the affluent, consumption inclined, quality minded, initiated and well informed homeowners in their late thirties to early forties, with a strong interest in cooking. They are willing and able to spend substantial amounts of money on home and garden decor, furniture and outdoor living products, and are also inclined to pursue specialty interests.

The current market and differences between wood fired ovens and grills were analysed and the insights were framed in a function analysis divided into four groups of *performance, physical, aesthetical and emotive* attributes that served as guidance in ideating and conceptualizing the product.

The process resulted in a useable product accompanied by sketches, 3D visualizations and photographs of both the process and the end product.

During the build phase I came to the conclusion that an experienced crew of fabricators with all materials at hand and all machinery set up and tuned would without a doubt be able to build a small production run in a fraction of the time I have spent building this prototype.

This has proved to be immensely fulfilling and I have attained a deeper understanding of opportunities and difficulties and how to overcome them, in which I see great benefits in having when conducting dialog with fabricators, suppliers and manufacturers in my future profession.

Background

PERSONAL MOTIVATION

I enjoy cooking and I enjoy high quality food. The whole aspect of it, from planning a meal and shopping for groceries to preparing it all with a meticulous mise en place and preparing produce by sous vide, just to finish it off with a quick and intense sear on the grill out in the back yard. I honestly do.

There is not much that can compete with preparing and enjoying a meal, cooked to perfection, in the company of friends.

I also enjoy a thick slice of freshly baked levain. And don't even get me started when it comes to a partly charred pizza made in a wood fired brick oven.

My main gripe is that while I possess all the skill and means for preparing and just about any meal you throw at me, there is still no way for me to achieve the same quality of bread and pizza as in a restaurant since a regular household oven just doesn't cut it. It will not generate the temperature or taste needed.

While I don't have any numbers to support this statement, the sheer amount of titles in

bookstores and magazine racks pertaining to people's interest in cooking, baking and homeowning, along with the vast home and gardening sections at the home improvement stores and garden centers tells me it is a substantial market.

On a personal level, I consider myself quite broad in my design skills and ambitions, and to further establish this I think embarking on a project in this area would increasingly differentiate my portfolio.

RELEVANCE

The interest in grilling, whether it be by gas, charcoal or electricity, is ever increasing, thus making it a substantial market. Although the total sales of charcoal fired grills in Sweden are diminishing, making up a mere 30% of annual sales (Elgiganten, 2016), compared to other grills, the accumulated number of households owning a charcoal fired kettle grill is quite high. The general interest and accumulated sales translate into a significant market for grilling accessories and cookware.

Introduction

PROJECT DESCRIPTION

People like to eat great food. People are also very interested in cooking and baking at home in general and grilling in their own backyard in particular. There is just something profound over the taste of a meal prepared on a charcoal grill or a loaf of bread or a slice of pizza baked in a wood fired oven. While many homeowners have a charcoal fired kettle grill, not many possess a wood fired oven out back or in their house. The prospect of building a brick oven in their backyard just seems daunting to most and only feasible for some.

IDEA

My idea is to create a portable, or at least non-permanent wood fired oven, targeted at the general home owner, for use in their own backyard. The idea is to provide homeowners the means they need to achieve the same quality of baking or cooking as if it was made in a wood fired oven in a bakery or restaurant, without any major or permanent engagement. In the process of doing so I will be trans-

forming an ancient necessity into a modern-day culinary amenity.

DESIGN BRIEF

Design a way for homeowners to achieve the same quality of cooking and baking as if it was made in a bakery or restaurant by providing them with a non-permanent solution for use in their own backyard.

TARGET GROUP

The affluent, consumption inclined, quality minded, initiated and well informed homeowners in their late thirties to early forties, with a strong interest in cooking. They are willing and able to spend substantial amounts of money on home and garden decor, furniture and outdoor living products.

INTENDED OUTCOME

The intended outcome is a working prototype accompanied by sketches, 3D CAD renderings and photographs of both the process and the end product.

Research

THE SIGNIFICANCE OF FIRE

Cooking as a phenomenon can arguably be as old as early hominins learning the art of controlling fire, some 1.9 million years ago (Lawton, 2016). Although this might be a controversial statement that derives from an evolutionary standpoint of *Homo erectus* showing a significant difference in constitution with smaller teeth, smaller bodies and larger brains than their ancestors, primatologist Richard Wrangham argues that these evolutionary changes were driven by ingestion of cooked food (Adler, 2013).

Due to the difficulties of finding evidence that distinguishes a deliberately lit fire from a natural one, archaeologists must resort to finding signs of deliberate usage of fire in caves, by searching for charred bone fragments and early cooking utensils and hearths. Traces of ash found in the Wonderwerk cave in South Africa suggests our human ancestors were controlling fire 1 million years ago, while early findings of hearths are around 400,000 years old (Lawton, 2016).

The earliest evidence of our own species cooking is that of pots and utensils found in China which date back a mere 20,000 years, thus it can arguably be said that cooking by fire is deeply rooted in our lineage and caters to our most primal needs. Beyond being an evolutionary driving force, cooking is also an important social event, as stated by Chris Organ of Harvard University:

"Cooking was a very important social trait for us as humans. We spend a lot of time in every single culture on the planet preparing food and cooking it" (Welch, 2011).

THE MISSION STATEMENT

So, why make an oven? Well, it caters to our primal and inherent need of cooking by fire. The social event of gathering with friends and family around the hearth is as old as humanity itself. The idea is to modernize that event and migrate it into a more contemporary context. From campfire to culinary experience.

Analysis

ANALOG COOKING

So, why did I embark on this project to design a wood fired oven? It caters to our primal and inherent need of cooking by fire, which is analog (Ekstedt, 2016). There are no buttons to push, there are no ways of precisely regulating temperature. It is all about perception, immersion and experience. In return for your efforts you will achieve a new level of culinary experience.

ANCIENT TECHNOLOGY

Eventually we learned to control fire to be able to bake bread, as in the colossal ovens found in Pompeii. The fireplace then moved into our homes, but as we harnessed lightning, fire again moved out of our homes in favor for electrical appliances. Ever since, wood fired cooking has been a leisure activity.

The electric oven, however convenient and consistent it may be, is leaving us unable to bake bread or pizza to any acceptable level of quality. It is just impossible to achieve the heat needed, in a regular household oven.

DIFFERENT WOOD FIRED OVENS

There is a wide range of wood fired ovens, all specialized to attain a certain function or to fulfill a special need. There were the large ovens of Pompeii that served to provide bread for the entire population, and a similar collectively owned German version that was shared by all villagers. There are also the highly specialized Napolitan pizza ovens that bake a pizza in less than 60 seconds, as well as the mozambiquean bakery ovens which are constructed in an entirely different way (Manhiça, 2014).

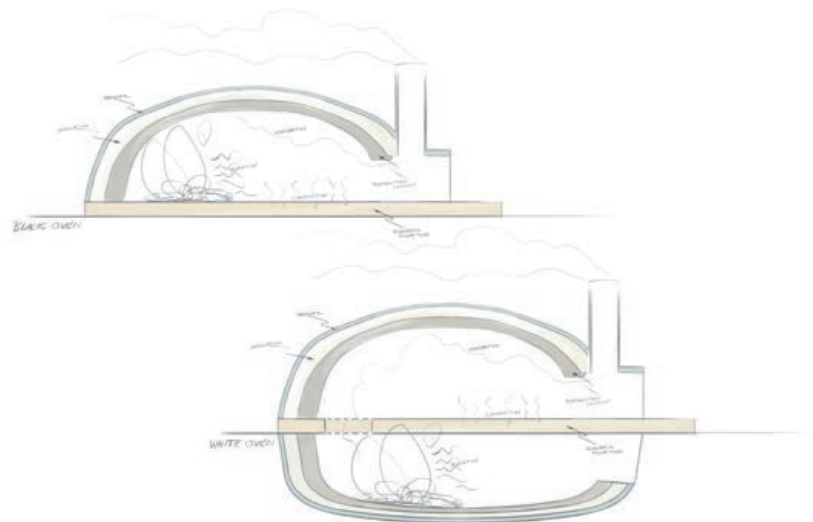
Wood fired ovens can be divided into two major categories, black and white ovens. The main difference between these two is that in the black oven cooking is conducted in the same chamber that contains the heat source, whereas in the white oven food is separated from the heat source by placing it in a separate chamber. The benefit of the heat source being placed in the secondary chamber is that it can be continuously fed without disturbing the primary chamber, making it suitable for high volume baking. The disadvantage would be that



ABOVE An example of an early indoor wood fired oven and stove.

ABOVE RIGHT One of the wood fired ovens found in Pompeii and Herculaneum that were signifiers for the bread loving people of Pompeii.

RIGHT Sectional views of the so called black and white oven types showing the internal structure of the fire chambers giving them their respective names.



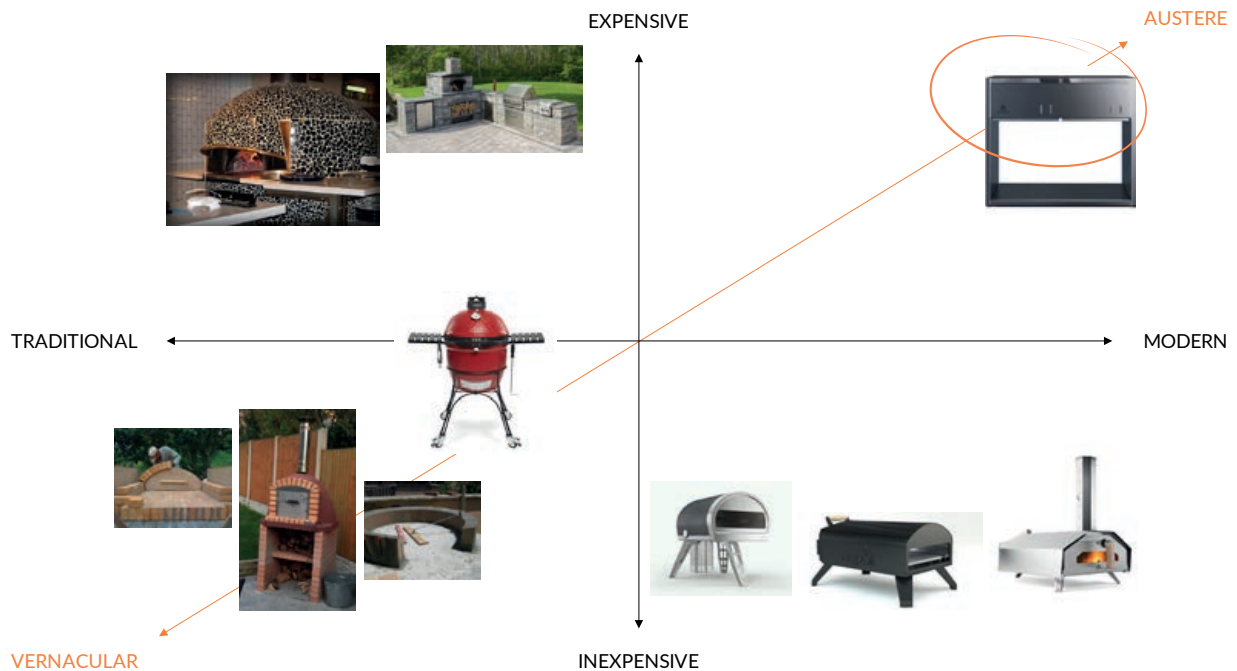
it involves a more complicated and additional construction as compared to the single chamber black oven. These two aspects of volume and mass stand in contrast to my intentions.

The name black oven derives from the initial layer of soot lining the dome that is generated when lighting the fire. That layer of black soot later shifts to a lighter color as temperature rises eventually disappearing completely, which also serves as a visual indication of that the oven is ready for use.

EMBRACING AUTHENTICITY

Should you bow and fold for what is traditional or embrace authenticity? What has become a tradition is, by its very nature, a chain of iteration that has become a convention through the collective agreement. Herein lies the very contradiction. To bow to the tradition without any deeper thought and reflection is to surrender and stagnate. You should rather pay tribute to the origin of the traditional and embrace the spirit of innovation from where it

ANALYSIS



originates and use it as an inspirational driving force to create things that are products of their time and the very context in which you as a designer operate within.

Authenticity is of course important in the actual storytelling and in the process of developing something but is rarely seen in the end product itself. Anyone who invented and produced the first edition of a product probably did not see it as authentic or traditional. It was rather iterative and with the intention of satisfying a need but was thereby either a new innovation sprung from a context, an improvement or further development of what already existed. It is important for that reason not to forget the origin, but at the same time not to be bound by it in an inhibitory way.

Searching deeply within oneself to define one's own interpretation and convictions, and thus to achieve a sense of honesty, I find very important in order to achieve credibility. Otherwise what you do, by the unrestrained following of what traditionality try to uphold, risks being reduced to a pale copy or imitation.

In my work on developing this modern wood-fired stone oven, I have chosen to base the functional design on the insights on the traditional oven's materials and design without becoming too specialized. Since the ambition has been to create a modern product adapted to contemporary living patterns, I have deliberately chosen to renounce the mass of the traditional oven in favor of mobility and accessibility. Thus, I have felt free to replace certain materials with their modern counterparts that provide a similar function and thereby meet the requirements I have set for the product. This independence has also opened up for a more austere and reduced aesthetic.

MARKET SEGMENTATION

To help explain the current market, a few representative products were placed in a sector chart and arranged in the quadrants formed by its opposing axes. The horizontal axis ranges from the traditional to the modern, and the vertical from the inexpensive to the expensive. The quadrants that subsequently were formed

ANALYSIS



Barkman Concrete



Exchange Bar & Grill



Amazon



Amazon



Barkman Concrete

ANALYSIS



Amazon



Amazon



Serious Eats



Röshults

DIRECTLY ABOVE The Neapolitan pizza oven is a colossal dome shaped wood fired oven that easily weighs around 1.500 kilograms. Its overall dimensions, ratios between dome height and hearth diameter, shape and dimension of opening are constrained to tradition and heavily regulated by the official organizations of Associazione Verace Pizza Napoletana (AVPN) and Associazione Pizzaiouli Napoletani (APN) which makes it the least susceptible to change and innovation of all products reviewed in this thesis (Balaj & Ilola, 2016). **LEFT** The Röshults product line all cater towards the affluent and quality minded consumer with their minimalistic ultra-modern sleekness, high build quality, and choice of top quality materials. They show a strong tendency towards innovation by adopting infrasound to light and regulate their line of Booster Charcoal Grills.



Exchange Bar & Grill

ANALYSIS



ANALYSIS



This modern take on the Shaker stove, by Wittus, has really captured the austerity and minimalism that is so characteristic of the Shaker-style design of the 1800s. It derives from their belief system that embraced hard work and freeing oneself from unnecessary desires through restraint and avoidance of ostentatious aesthetics (Mastroeni, 2017). The added linework shows the key geometric features that are indicative of the sophisticated sleekness of the Shaker aesthetics.

outlined the four major market segments: moderate to expensive traditional products in the top left, moderate to expensive modern products in the top right, inexpensive to moderate traditional products and solutions in the lower left and inexpensive to moderately expensive modern mass produced products in the lower right quadrant.

The products that are more inclined to follow a traditional approach, in aspects of both construction and use of materials, tend to be less innovative and aesthetically appealing. All products in the two traditional segments lean toward the vernacular, in the sense of

being informal and aesthetically unrefined, however they all show a tendency to increase those respects the further into the do-it-yourself realm they are placed.

Something interesting happens with the aesthetic expression, and subsequently the perception of the artifact, when we follow the diagonal axis from the vernacular to the austere. Austerity in design is in this case defined as showing traits of restraint, simplicity and refinement in geometry, aesthetic expression and materiality.

The top right sector, the expensive modern quadrant, is the segment where I will focus.



Röshults



Nouw



Marmol Radziner



Architonic



Decorarist

TARGET GROUP

The target group is the homeowner that are inclined to spend substantial amounts of money on home decor, garden furniture and outdoor living products. They are the active, affluent, consumption inclined, quality minded, initiated and well informed homeowners in their late thirties to early forties. They are both highly skilled and interested in cooking and wish to take their culinary experiences to a new level.



Nathanaël Le Berre

FUNCTION ANALYSIS

PERFORMANCE ATTRIBUTES

Reach	450-550°C	<i>Main function</i>
Provide	Radiant heat	<i>Necessary</i>
Provide	Convective heat	<i>Necessary</i>
Provide	Conductive heat	<i>Necessary</i>
Heat up	In 45 minutes	<i>Desirable</i>

AESTHETICAL ATTRIBUTES

Express	Austerity	<i>Main attribute</i>
Exhibit	Simplicity	<i>Necessary</i>
Radiate	Elegance	<i>Necessary</i>
Display	Geometricity	<i>Necessary</i>
Indicate	Sophistication	<i>Desirable</i>

PHYSICAL ATTRIBUTES

Allow	Mobility	<i>Main function</i>
Weigh	Below 225 kg	<i>Necessary</i>
Afford	Firewood storage	<i>Necessary</i>
Being	Ecologically sound	<i>Desirable</i>
Provide	Accessibility*	<i>Desirable</i>

EMOTIVE ATTRIBUTES

Provide	Culinary	<i>Main function</i>
Allow	Preparing	<i>Necessary</i>
Afford	Cooking	<i>Necessary</i>
Afford	Baking	<i>Necessary</i>
Inspire	Socializing	<i>Desirable</i>

*Be accessible to most in use, size and investment (in terms of permanence)

ABOVE The function analysis is divided into four groups of attributes to serve as guidance in determining the direction of, and to help evaluate the outcome of, the creative phase.

FUNCTION ANALYSIS

The function analysis is a versatile tool for providing guidance in ideation and concept generation, and providing the guidelines for evaluation through the creative process.

The respective attributes in each category are hierarchically arranged in regard to being either a main function, a necessity for success or only a desirable outcome. The main functions and the subsequent attributes necessary for their achievement all reflect what was de-

termined in the mission statement, the conceptual idea, the design brief and the needs and aspirations of the target group. Summarizing the main functions will generate a wood fired oven that will reach 450-550°C cooking temperature to provide a culinary experience, that allows mobility, while expressing austerity.

With the result of the function analysis acting as the guiding principles for the ideation and design of the intended product I proceeded to the initial ideation phase.

SWOT ANALYSIS

STRENGTHS

Perceived value of the product and its offerings
 Unique features and possibilities
 High build quality & materials
 Materiality & aesthetics
 Small commitment¹
 Desirable
 Exclusive
 Small quantity²
 Reinforces socioeconomic status

¹ Compared to more permanent solutions

² Limited availability and high demand

OPPORTUNITIES

Independent
 Novelty brand & product
 First to market⁵
 No competition means no set prices - market demand
 Ship out to influencers, top chefs, magazines
 Medial interest in new products⁶
 It might go viral
 Endorsements

⁵ First to market will make this the original product in the segment

⁶ This may require PR campaign to educate news outlets

WEAKNESSES

Novelty brand & product
 Brand loyalty to more established competitors
 Trustworthiness of brand & product
 Distribution, availability and packaging
 High initial investment
 Marketing³
 User skill level may produce varying results⁴

³ Refers to cost of marketing

⁴ Influencers must be proficient and initiated

THREATS

Competition will react with similar products
 Pricing and demand might change
 Distribution problems
 Production delays
 Quality deficiencies
 Unbecoming reviews due to required skill level

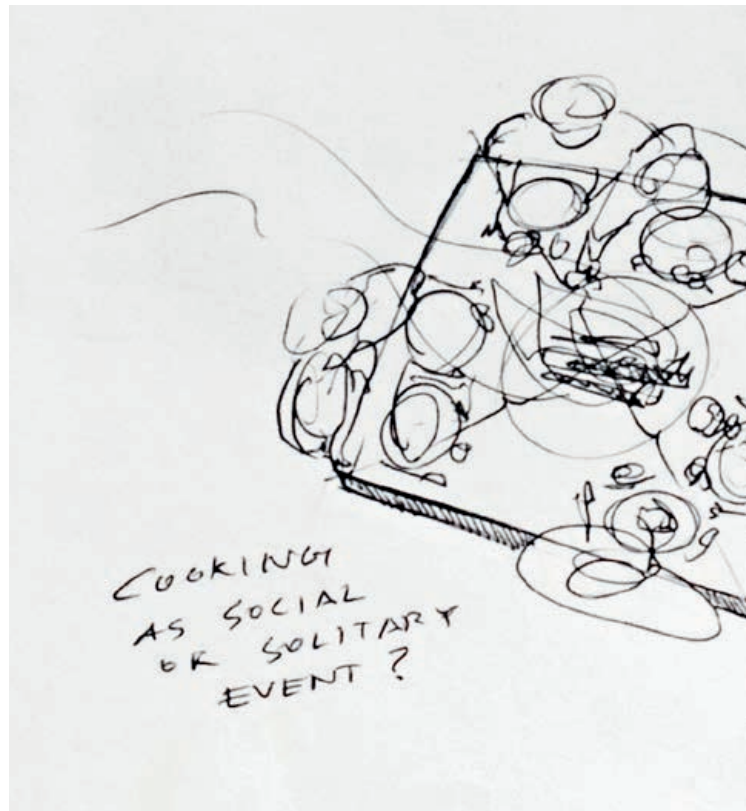
ABOVE The SWOT analysis was conducted to help identify and highlight the internal and external factors that will affect the future outcome and reception of the product (Hill, 2019).

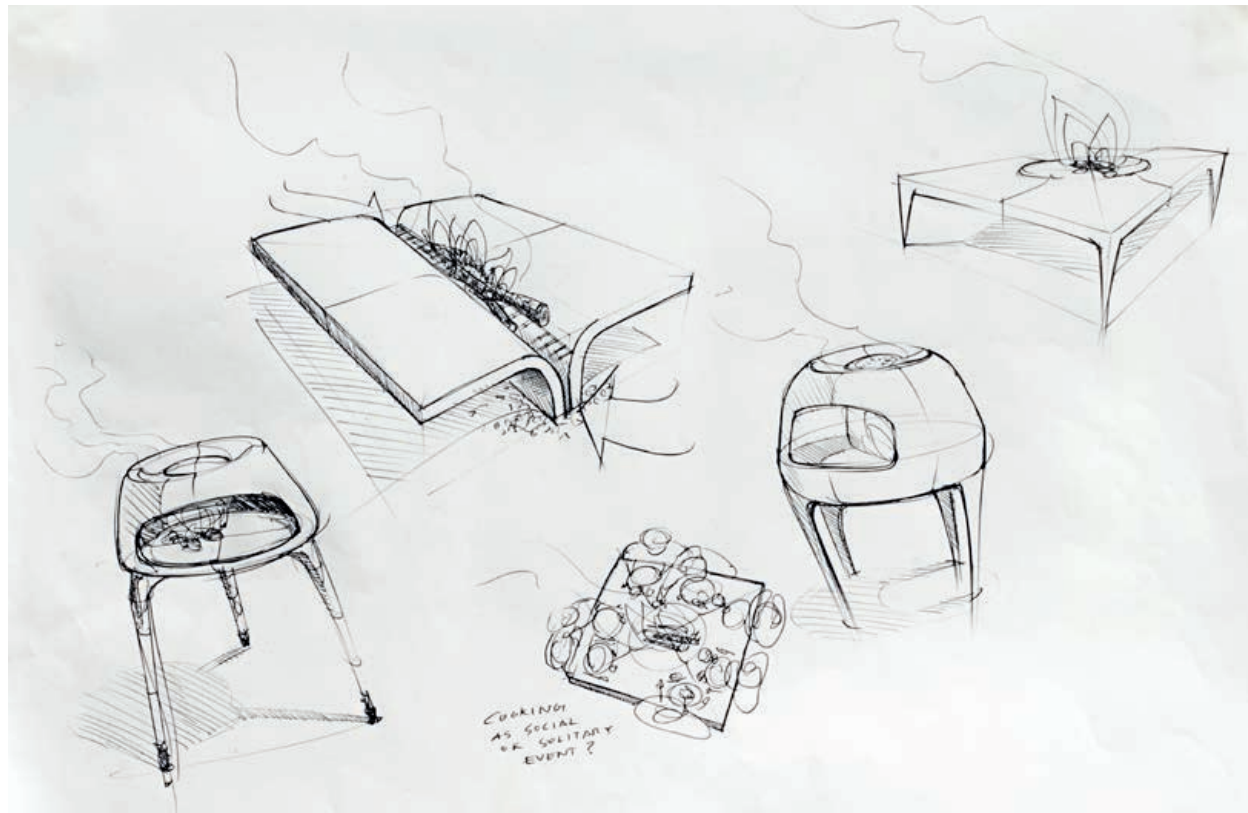
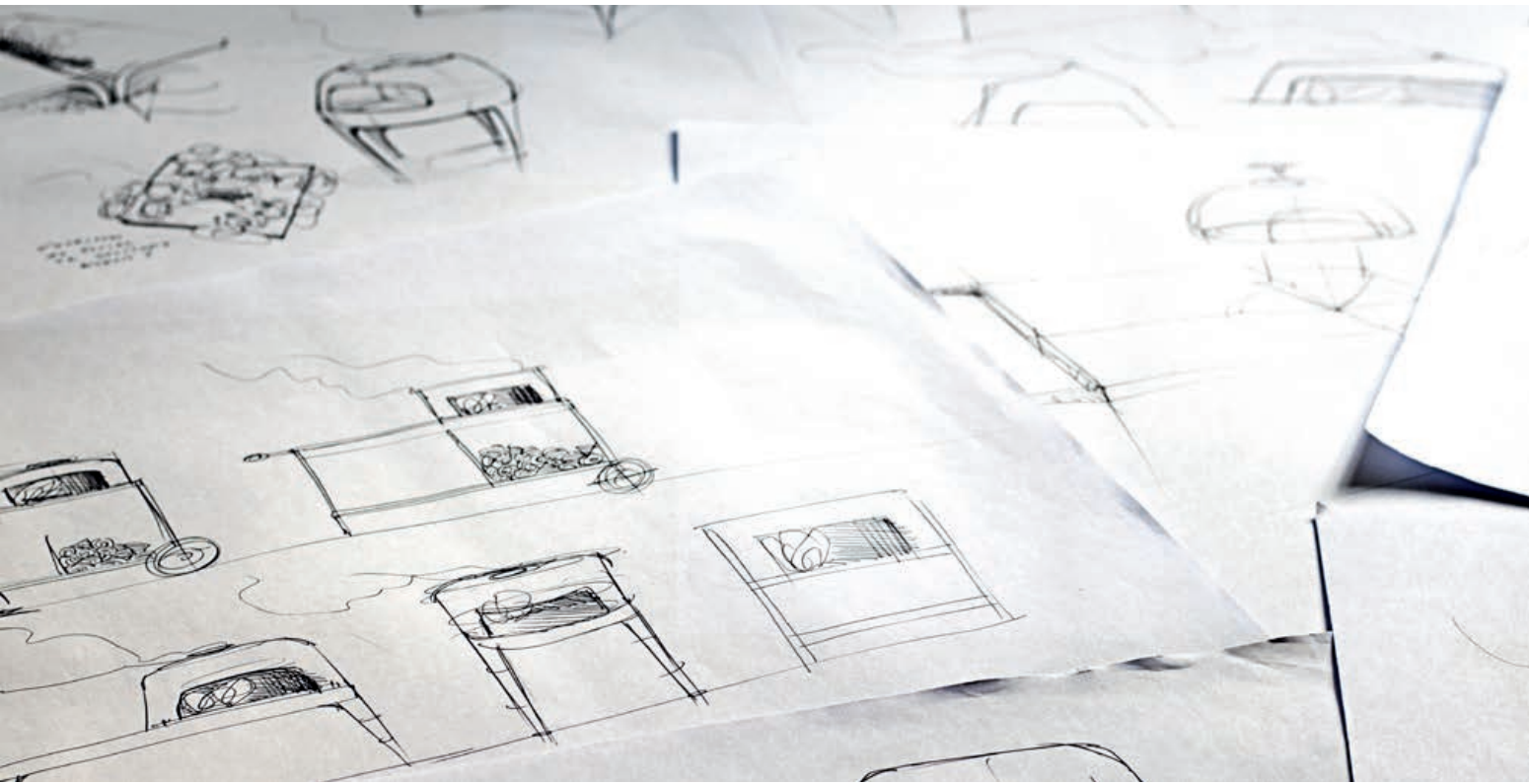
Synthesis

INITIAL IDEA GENERATION

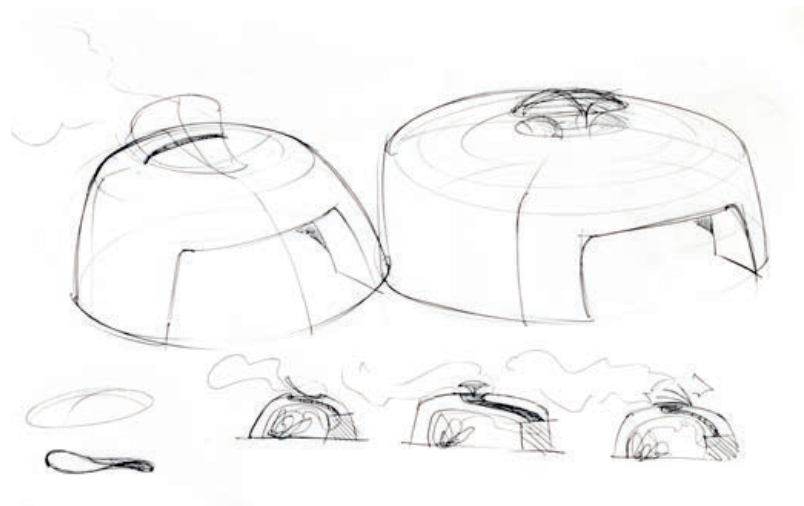
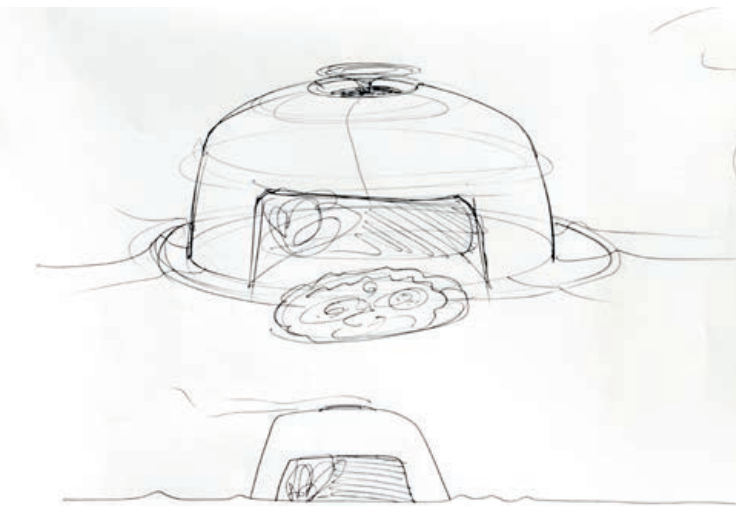
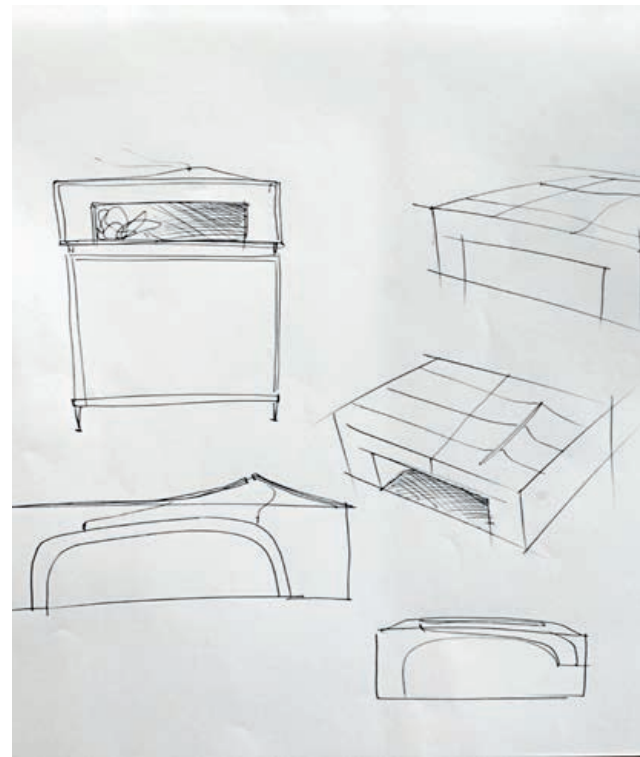
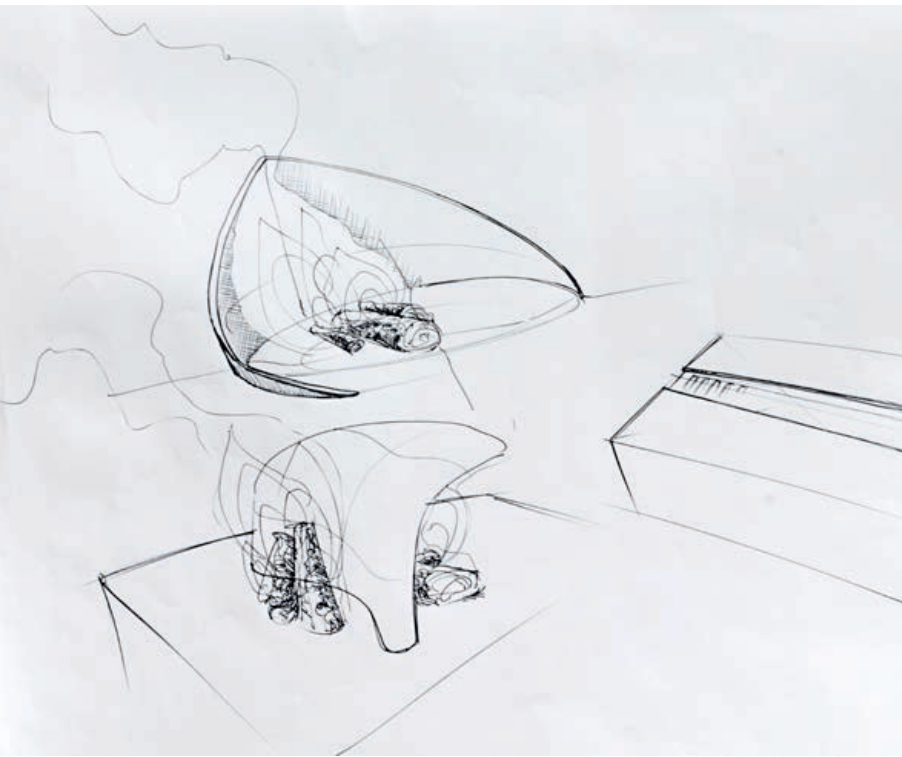
The ideation process started with me putting down a few loose initial ideas, which evolved into a combination of the cast iron stove with the elegance of the serving trolley. At it should be able to be moved (even with some difficulty), as determined in the function analysis, I also investigated aspects such as non-permanence in contrast to being stationary and also whether it should be portable or simply barely moveable.

As the initial sketches, in my opinion, were lacking in the aesthetics I further refined them with support from the function analysis. In doing so I also had to define the geometry of austerity in design for myself to achieve my aesthetic goals. This includes Hyperbolic curves which I find very pleasing and that also provide a calming functionality to the transition between the two chamfers leading into the dome of the oven.

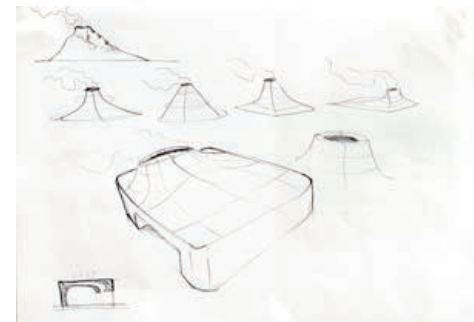


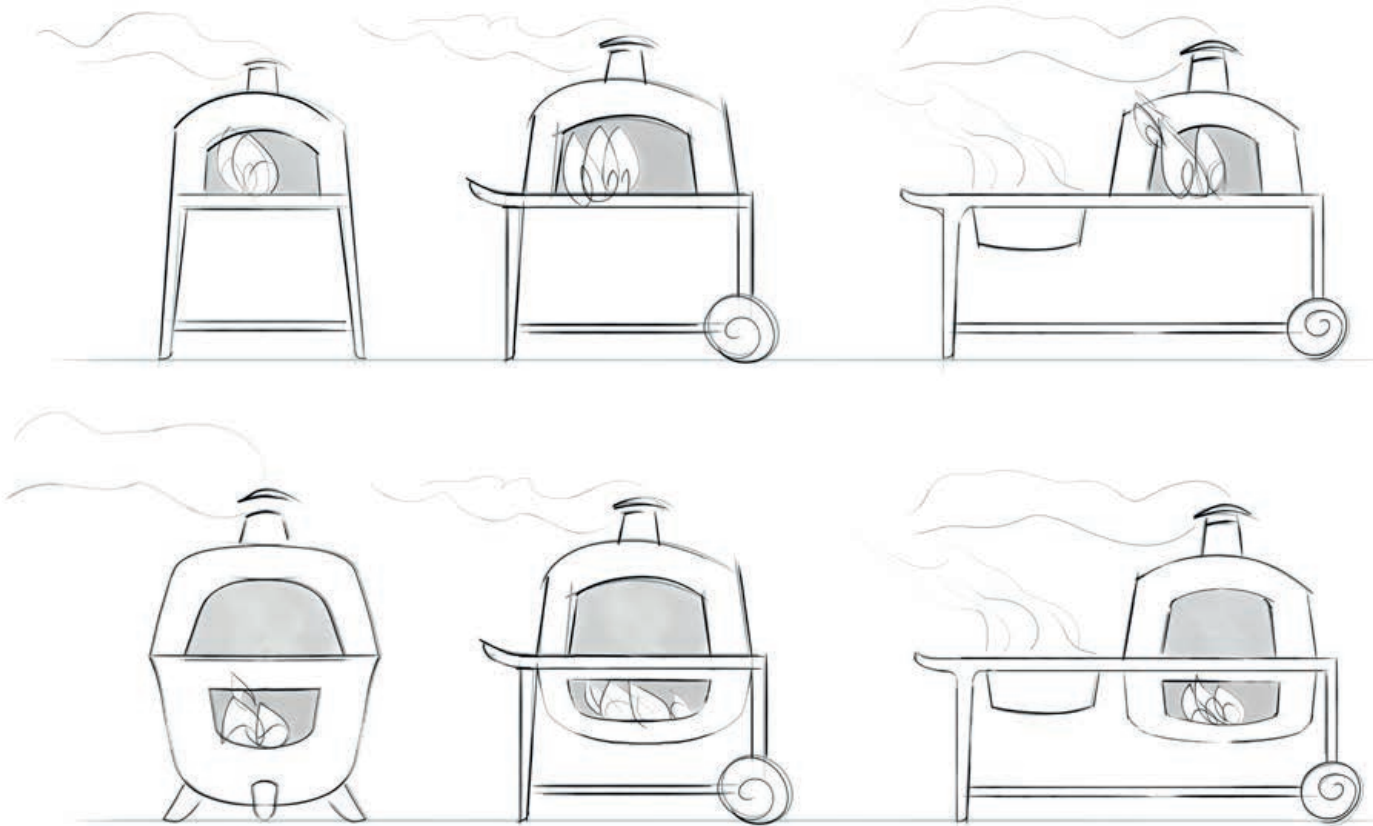


SYNTHESIS



ABOVE Nature-inspired and organic shapes were explored, simplified and stylized in searching for a governing design language. Although some of the designs bear resemblance to traditional Neapolitan dome shapes, they were evaluated as unsuited in regard to the market segmentation and the attributes defined in the function analysis. By adopting a visually traditional dome shape as seen directly above would place the product in the upper traditional quadrant of the market sector chart instead of the upper modern quadrant.



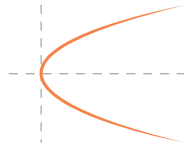


ABOVE The combination of the Neapolitan Dome oven, the cast iron stove and the werving trolley just did not express the level of elegance and sophistication I was searching for.

RIGHT The geometry of austerity in design was defined and helped to guide the artistic expression of the following ideation and also helped me refine certain shapes later in the computer aided visualizations that followed the ideation phase.



Parabolic curve



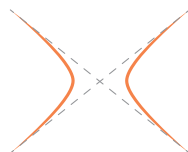
Ellipse



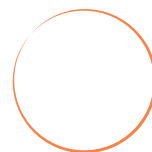
Rectangle



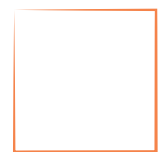
Hyperbolic curve

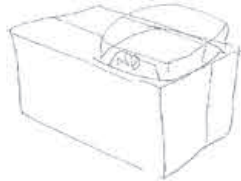
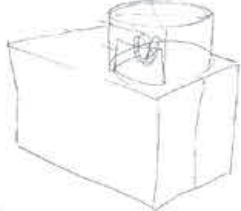
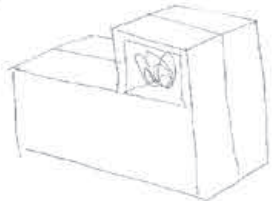
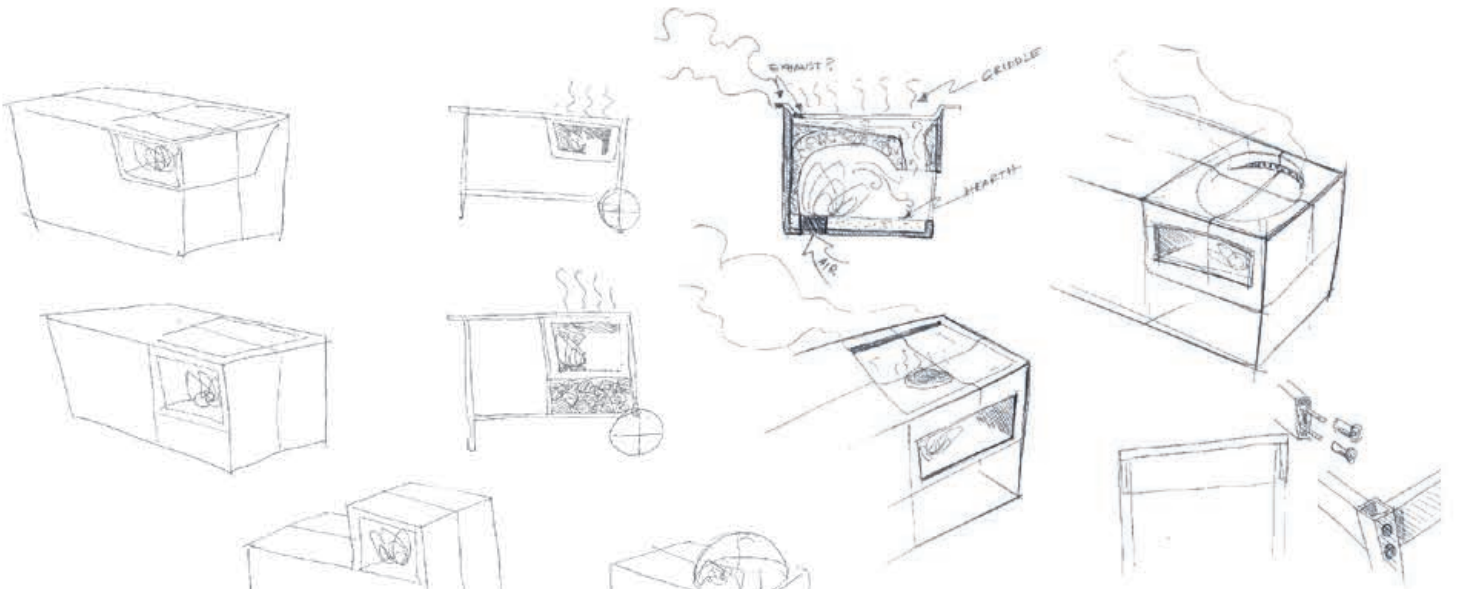


Circle

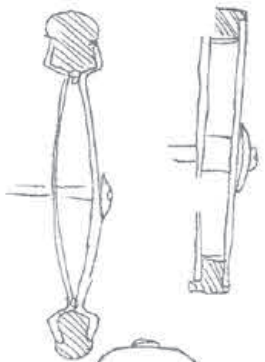
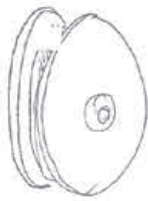
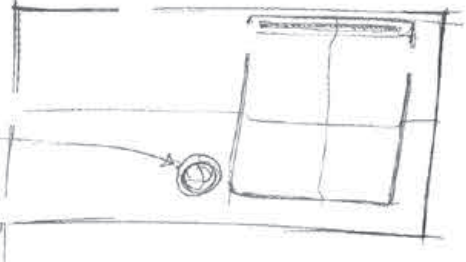


Square





WHAT CART WHEEL



INTEGRATED
SUSPENDED
OVEN WITH
GRIDDLE

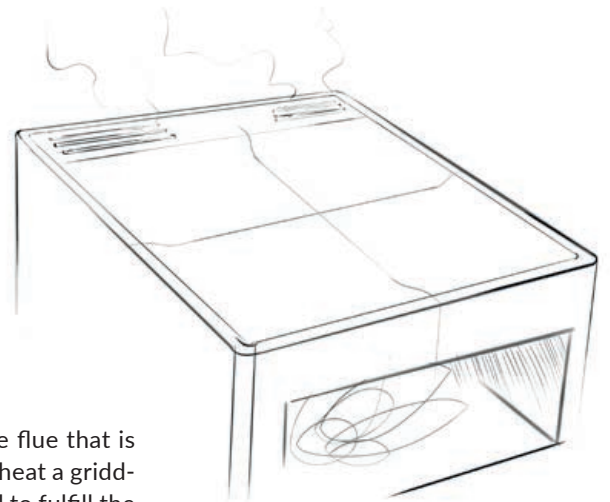
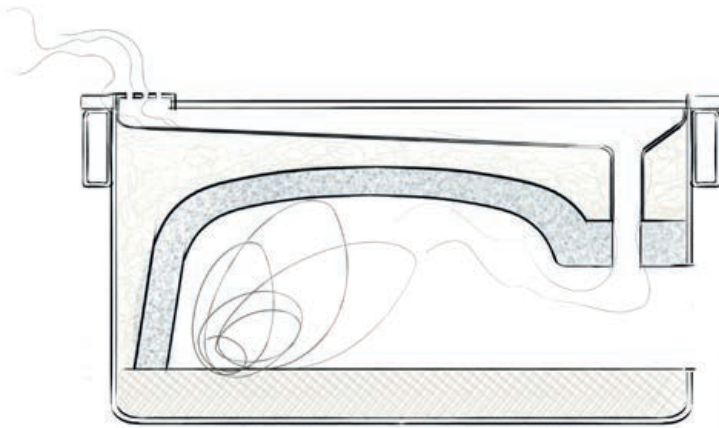
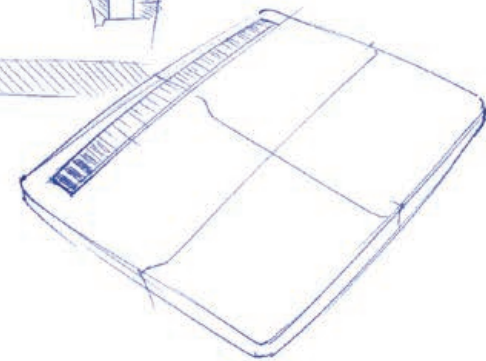
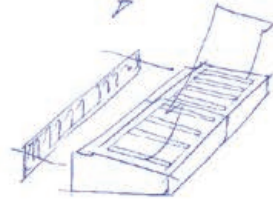
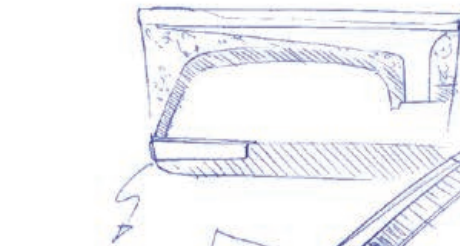
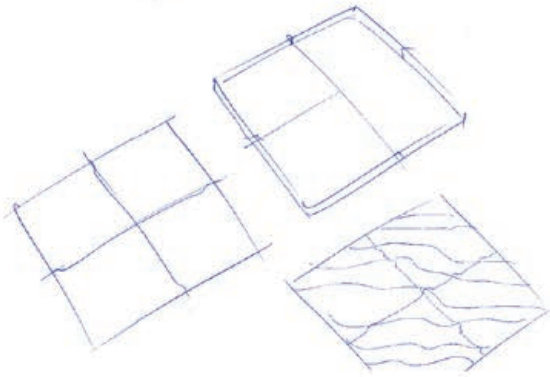
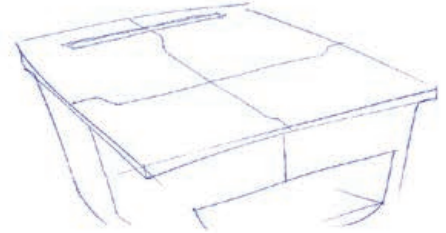
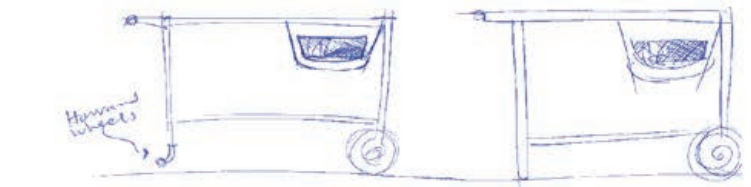
SUSPENDED
OVEN WITH
GRIDDLE

TOP MOUNTED
CUPOLA

Two
Functionality

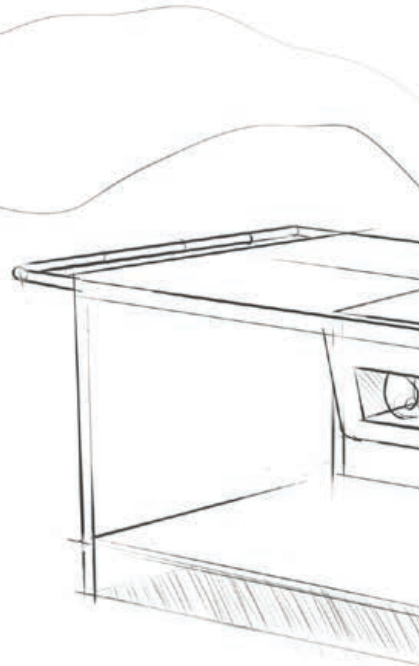
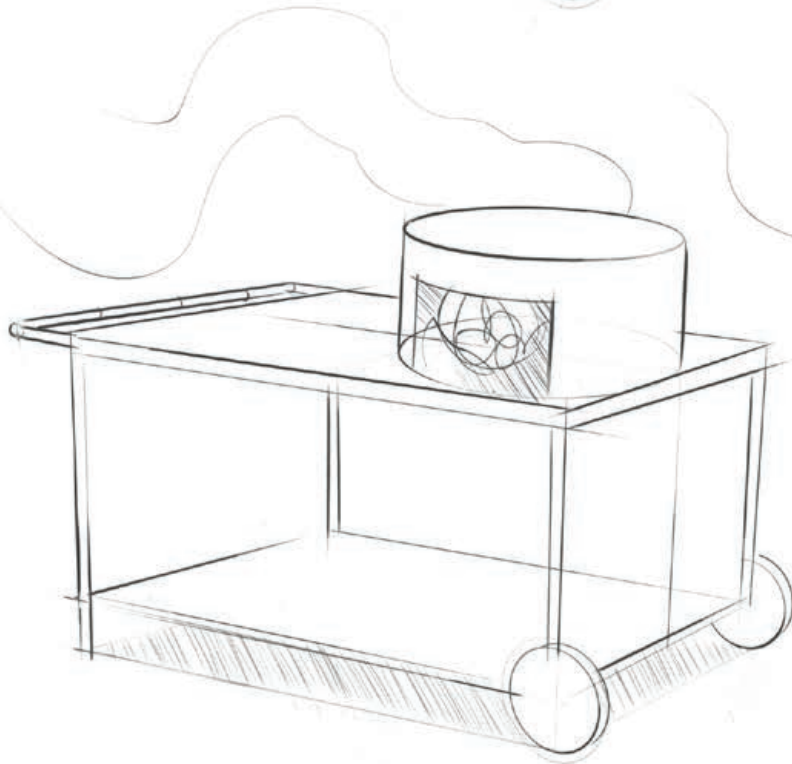
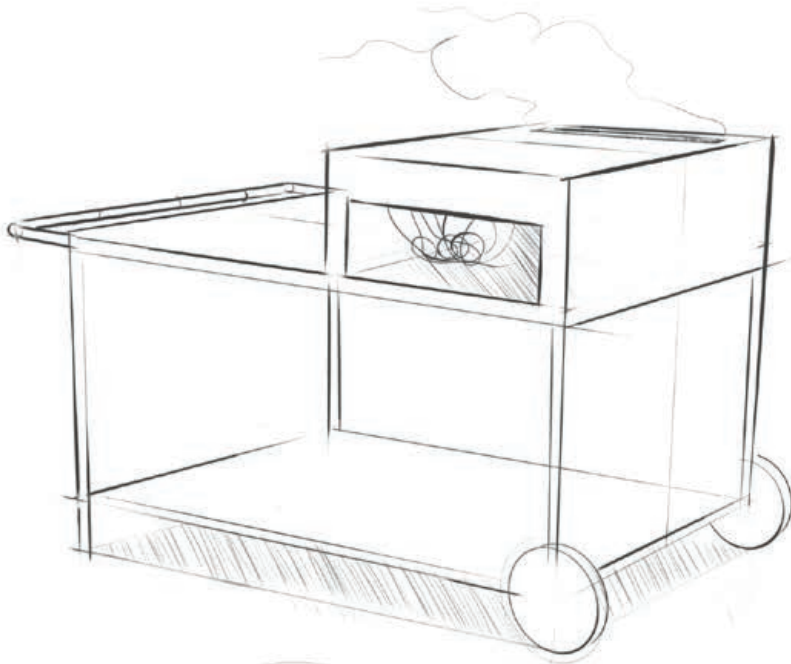
Three
Functionality

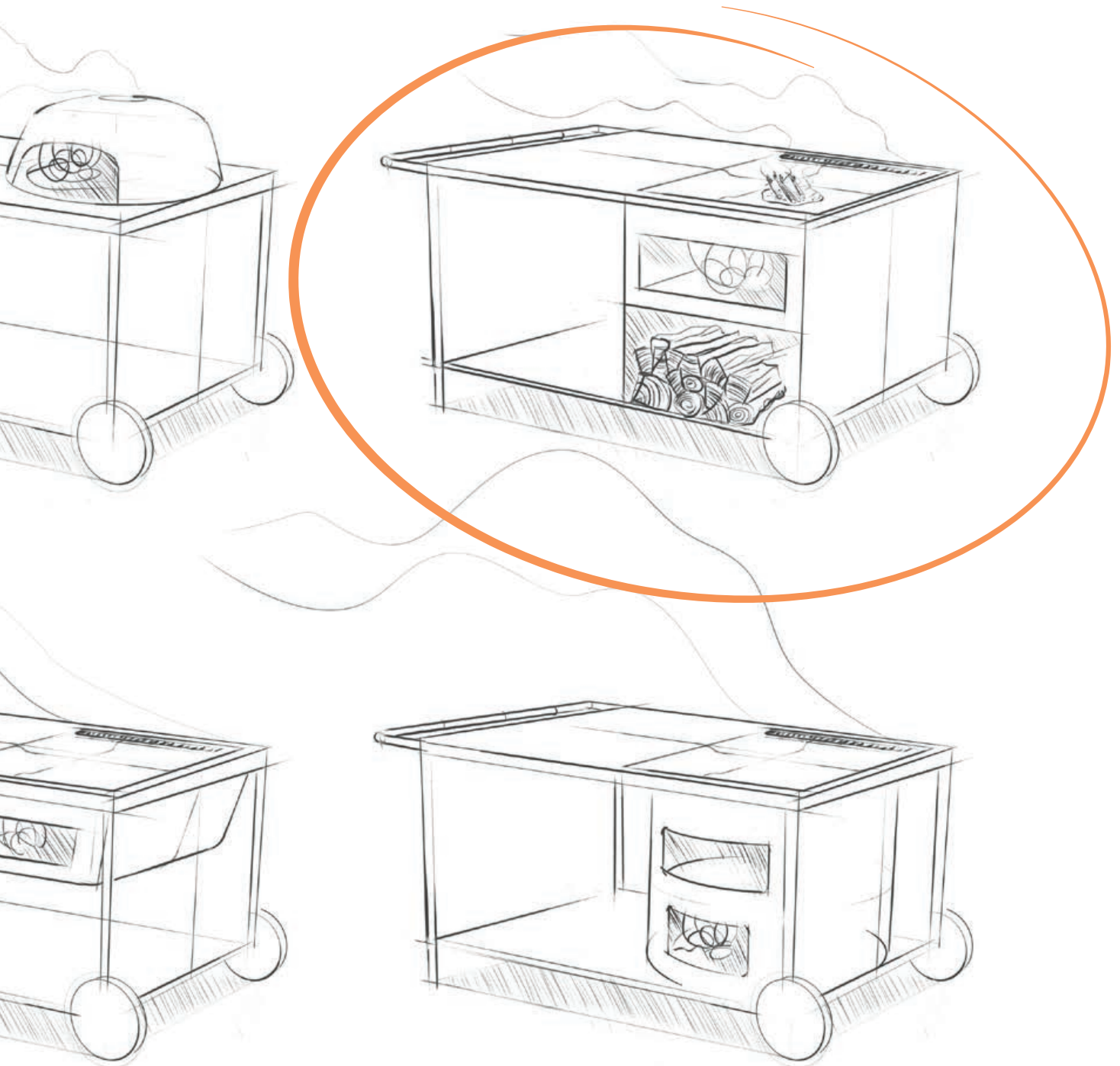
Single
Functionality



ABOVE & RIGHT By placing the dome inside a square cabinet, the flue that is used to extract the heated exhausts from the fire can be utilized to heat a griddle placed on top. The aesthetics and added functionality serves well to fulfill the governing design principles of austerity, functionality and elegance.

SYNTHESIS





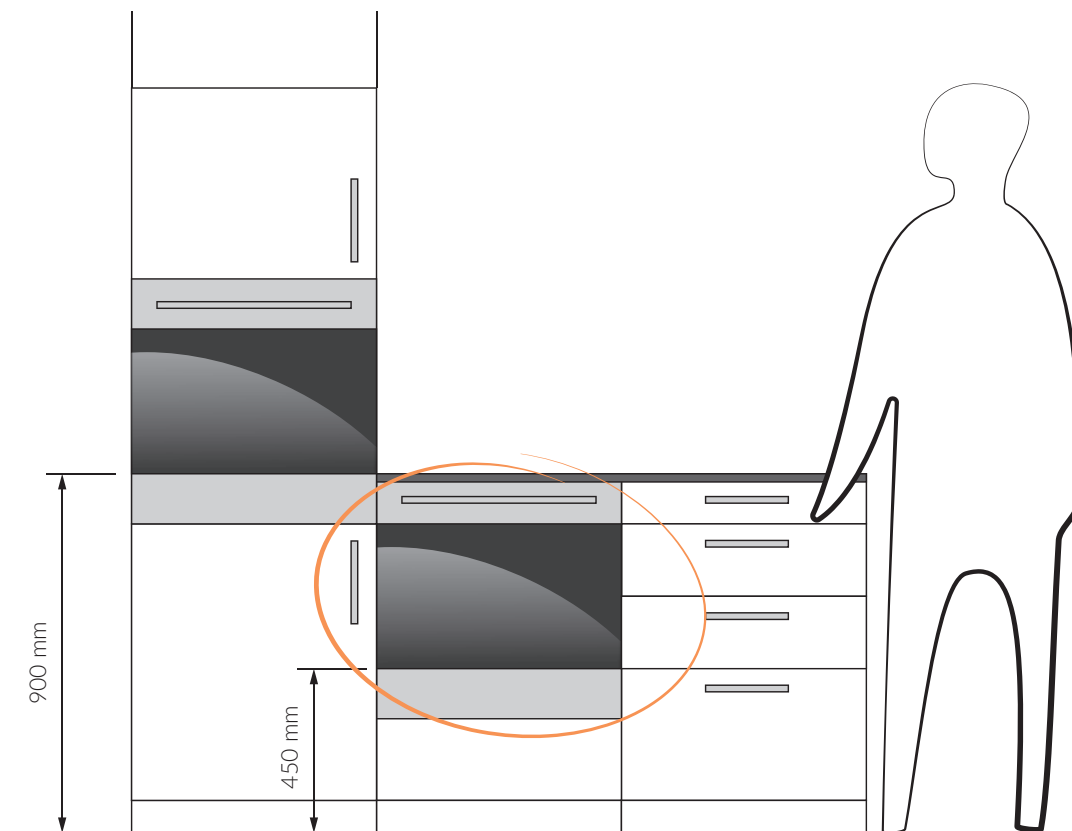
TOP RIGHT The final sketch concept that was chosen has the oven in the below countertop position, with the dual functionality of a countersunk griddle and a generous storage area beneath.

SYNTHESIS



ABOVE & RIGHT In order to validate that it is possible to move a product like this with an oven on it, I built a wooden cart and with the help of a few willing and able volunteers easily moved around 270 kg.





ABOVE The dimensioning of the product is based on standard kitchen cabinet sizes and the recommended installation height of below countertop ovens.

VALIDATION

In order to validate that it is possible to move a product like this with an oven on it, I built a wooden cart and with the help of a few willing and able volunteers easily moved around 270 kg. Construction grade lumber in the nominal dimension of 45x95mm was used to build the cart, but was dimensionally reduced in a thickness planer to correspond to North American nominal dimensions to fit the Simpson Rigid Tie Connectors used to tie the whole construction together.

The end product is estimated to weigh around 200 kg, and even though it will be slightly smaller than the test cart, this proves the validity of the concept.

DIMENSIONING

The dimensioning of the cart is based on standard kitchen cabinet sizes and standard height recommendations. The nominal height of most floor standing cabinets are 900mm from floor to top of work surface. Installation height recommendations for ovens are in the range of either 900mm to lower slots in the racks, for a waist high installation, and 450mm for a below countertop installation, which was chosen due to a lower center of gravity.

The reasoning behind this decision is that the height is a standardized compromise between both male and female anthropometrics and provides dimensioning that most customers are used to.



3D-CAD CONCEPTUALIZATION

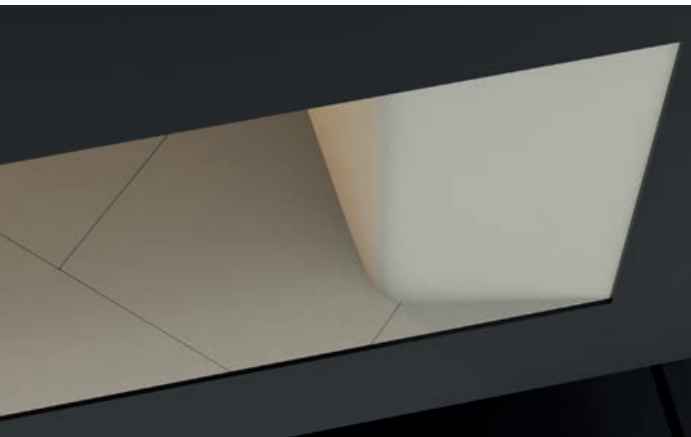
The final sketch concept was after evaluation and further scrutinization in regards to the function analysis visualized using 3D CAD software.

Autodesk Fusion360 was chosen for the task, based on availability and user-friendly interface. The digital model was constructed with real world production methods in mind, which means that all profiles are hollow tube cut to

length and assembled digitally. Most parts are modeled individually and assembled in a separate model, which facilitates iterative alteration. This means that if the dimensions are changed to one of the steel tubes, those changes are updated to all linked instances in the entire model. Likewise, different dome designs can be visualized by importing iterations into the assembly model. By extension, accurate technical drawings were easily generated.



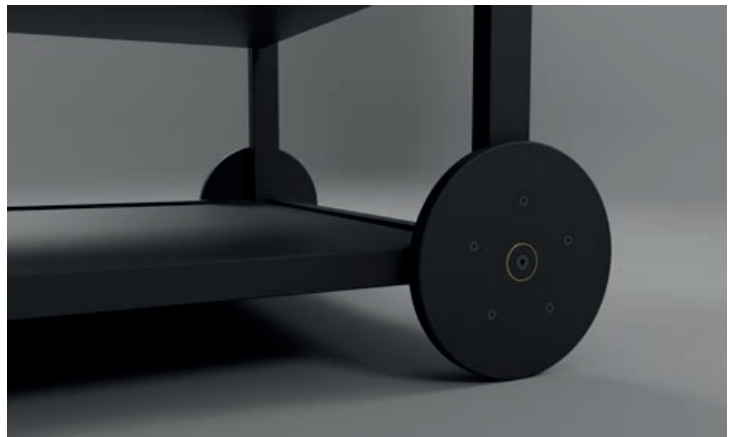
SYNTHESIS



ABOVE The inlet to the dome is tapered by 10° and 160° and a hyperbolic curve that is tangent to these two faces makes for an elegant transition. This edge treatment will further enhance the visual appearance of the dancing light cast from the fire within.

ABOVE LEFT Detail view of wheel and brass ringed hub cap.

LEFT Exploded view of wheel, bearing, spacer and brass ringed hub cap. The two slates are assembled by five countersunk hex head M5 bolts. The assembled wheel attaches to the axle by a single M8 countersunk hex head bolt.



MATERIALS & FEATURES

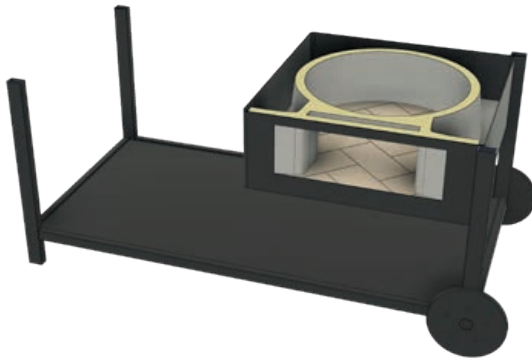
The frame is constructed from mild steel rectangular tubes in the dimensions of 50x30mm for all four vertical bars, 50x25mm for all upper horizontal and 35x25mm for all lower horizontal stretchers and crossmembers. All tubes are of 2-3mm thickness for structural integrity and weldability.

The slight dimensional difference of 5mm between vertical and horizontal allowed for an all around recession of all horizontal bars by 5mm. While this might seem insignificant I believe this detail enhances the overall appearance of elegance and sophistication.

The oven enclosure is made from 2mm, or 14 gauge carbon steel sheet metal. All four vertical corners are bent 90° to a radius of 15mm.

All other corners are to be ground and blended after welding to a radius correlating to that of the steel tubes.

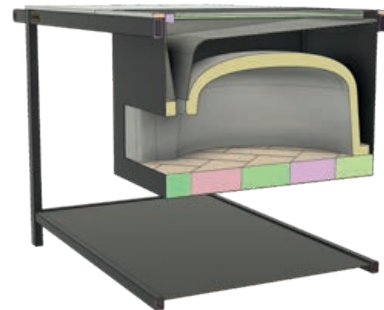
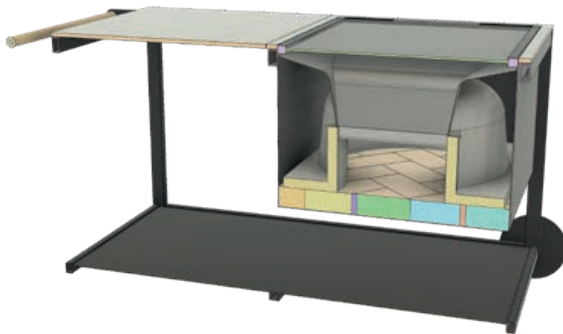
The hearth is laid in a herringbone pattern to prevent pizza peels and skillets catching on uneven edges. While it is easy to rush to conclusions that the brick needs to be of the refractory kind, the temperature of 500°C is far from high enough to motivate such a choice. More importantly the thermal conductivity, especially of the high quality Höganäs refractory bricks, is just too high at around 1.2 W/mK and preferably Italian Biscotti at 0.4 W/mK should be used to prevent the bottom crust of pizzas from burning (Balaj & Ilola, 2016). The bricks used in this oven has an estimated thermal conductivity of 0.6 W/mK .



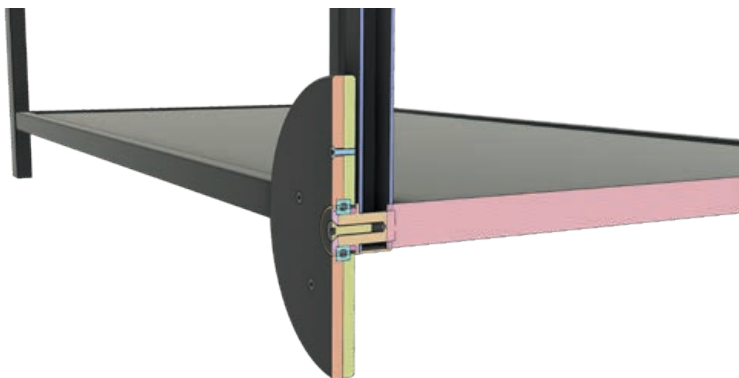
LEFT This section analysis shows the geometry of the internal dome in the XY plane cross section. The void between the dome and the enclosure will be filled with refractory insulation.



LEFT This section analysis shows the geometry of the internal dome in the XZ plane cross section. The sides lean inwards by 6° and a tangent hyperbolic curve forms the curvature of the dome.



ABOVE This section analysis shows the geometry of the internal dome and flue in the YZ plane cross section. The evacuation port is situated below the highest point of the dome which forces the heated gasses from the fire to fill the cupola before evacuation. The flue is folded to heat the griddle on top of the enclosure.



LEFT This YZ plane cross section shows the construction of the wheel and axle assembly.



The dome is made from refractory cement and high temperature resistant aggregate since the direct radiant heat from the fire will rapidly deteriorate regular concrete. The basalt reinforcement is also especially well suited for refractory applications.

The dome will be covered in Fiberfrax® Durablanket® ceramic fiber refractory insulation rated for temperatures in excess of 1250°C with a melting point of 1760°C. This insulation is normally used in refractory furnaces. The impact this will have on the working temperature of the outer wall of the enclosure will later be determined through testing.

The flue that normally connects to an external chimney is in this oven an all internal solution, that will make use of the exhausts

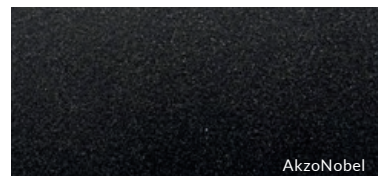
to heat the countertop griddle before evacuating them through the six ventilation slots in the top aft of the enclosure's top frame.

The lower platform is a flanged piece of sheet metal that rests on the middle crossmember and four additional supports, and is tucked neatly into the lower frame.

The wheels are made from two discs of solid 10mm aluminum that house the bearings and are assembled by five M5 countersunk hex head bolts.

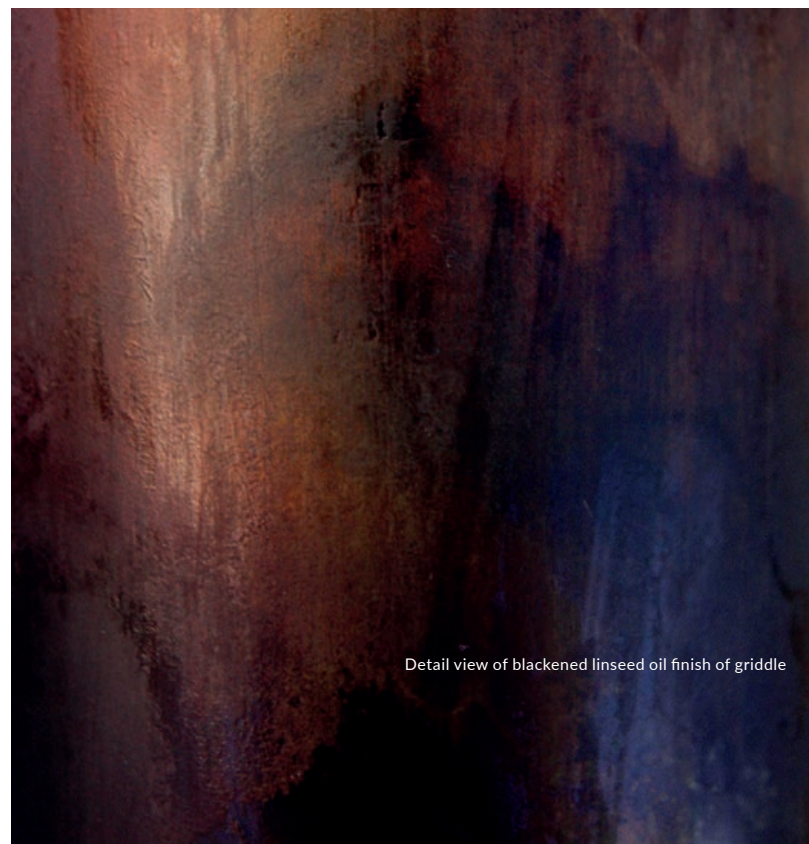
Brass detailing is used in select positions to enhance the level of exclusivity.

The range of countertops that will be offered are all ceramic in 12mm thickness for their heat resistant properties and are supplied through DFI-Geisler of Denmark.



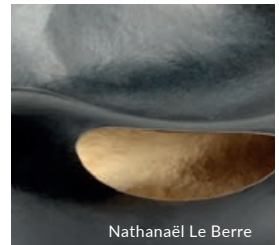
The oven will primarily be offered in a charcoal or graphite gray sand textured powder coat in satin semi-gloss. The choice of color will enhance the connection between its appearance and its main function on a semiotic level. If possible a clear coated burned linseed oil finish as seen to the immediate right will be offered.

Powder coating is one of the most environmentally sustainable choices of finishes available due to its durability and negligible volatile organic compounds, hazardous air pollutants and absence of solvents compared to industrial wet paints. Most of the excess powder from overspray can be reduced and reused. The curing agent in most powders are considered non-toxic and has been safely in use for the past 40 years (Powder Coating Institute).

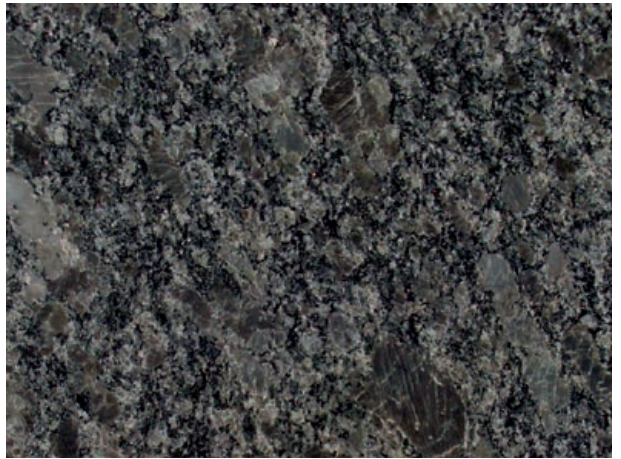
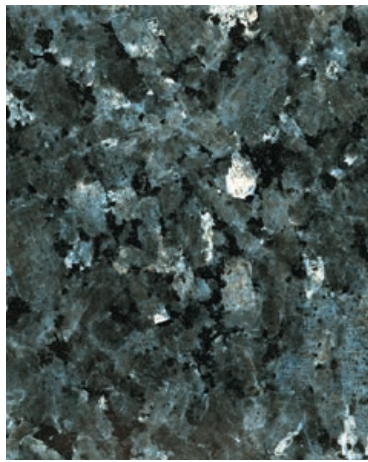


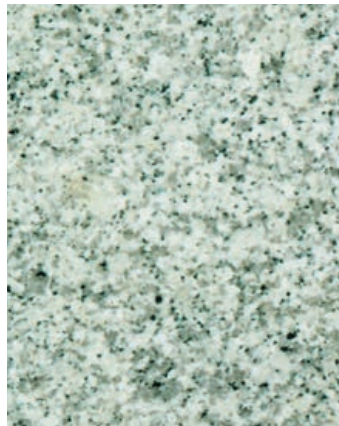
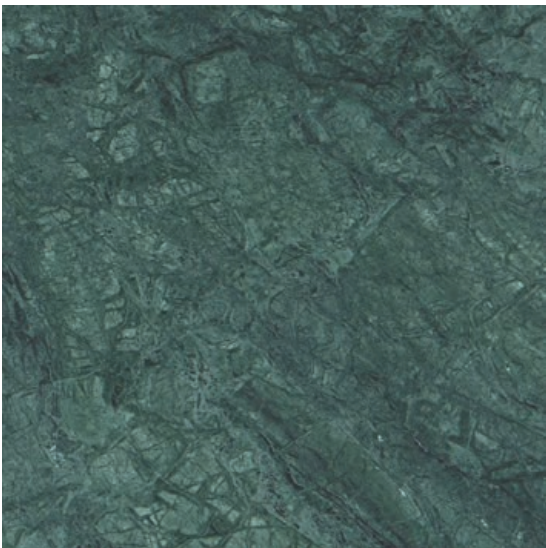
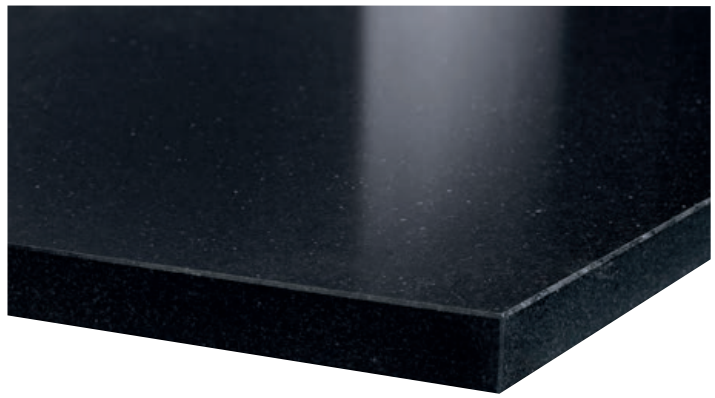
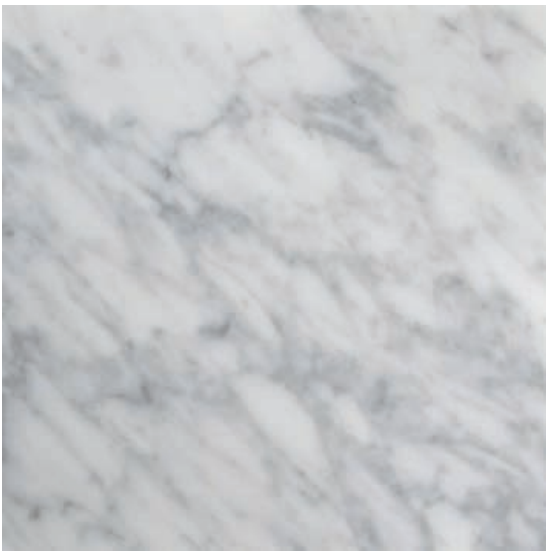
SYNTHESIS





SYNTHESIS





All imagery on spread courtesy of DFI-Geisler

Realization

BUILDING THE SCALE MODEL

The build phase proved to be a fruitful journey, no matter how daunting it at certain times seemed. With the unremitting guidance and support of the School of Industrial Design's workshop personnel, and Bert Berglund in particular, any and all obstacles were overcome. Many hours were spent welding, grinding, wirebrushing, straightening sheet metal, lathing and fabricating.

Throughout the entirety of the realization of the full scale prototype real world production methods were kept in mind, which helped in the intermediate decision making and evaluative process.

Quite unexpectantly there were not many alterations or departures from the initial ideas and dimensioning during the build process that was thoroughly prepared beforehand. The technical drawings generated from the CAD model proved to be a valuable asset, both as a build guide and as an unambiguous communicative tool in discussions with the workshop personnel.

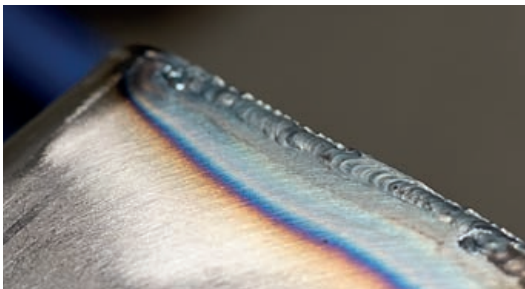
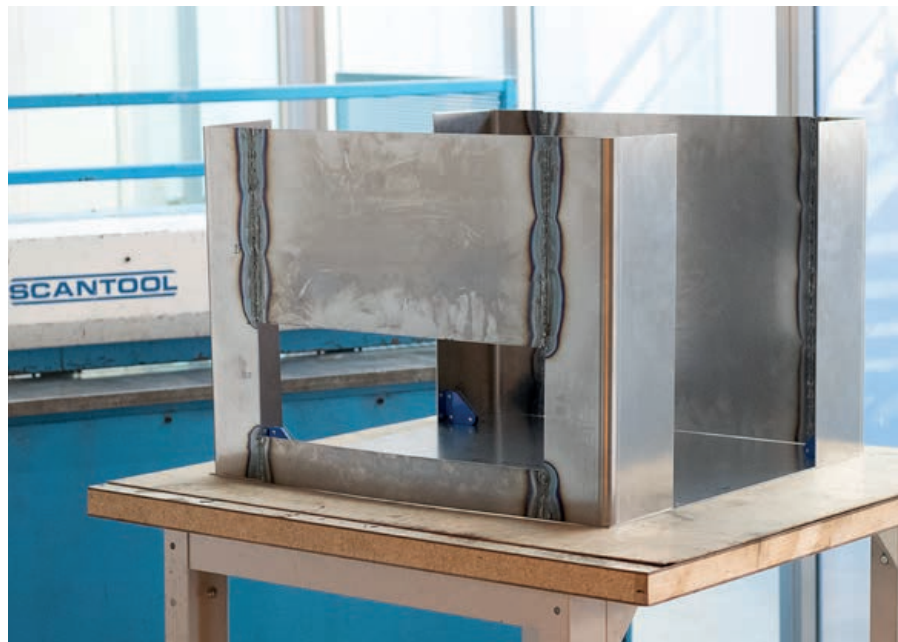
The smoothness of the build is a direct reflection of all the hours spent in meticulously building the virtual model. That is not to say it was a quick thing to build the prototype. Hours were poured into the project, mainly because of my own inexperience and having to conform to workshop opening hours. An experienced crew of fabricators with all materials at hand and all machinery set up and tuned would without a doubt be able to build a small production run in a fraction of the time I have spent building this prototype.

This has proved to be immensely fulfilling since I have learned so much and have had the opportunity of attaining and perfecting my fabrication skills. In the process much of my prior experience in purchasing subcontracted fabrication has also been verified.

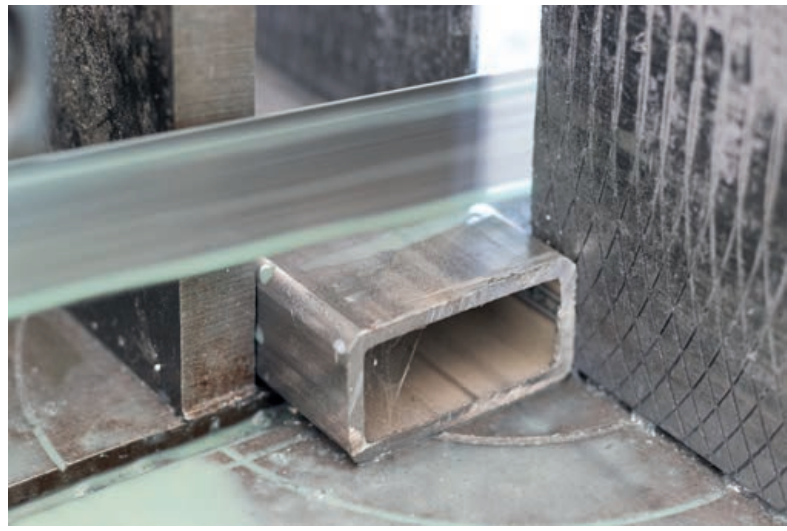
All in all I have attained a deeper understanding of opportunities and difficulties and how to overcome them, in which I see great benefits in having when conducting dialog with fabricators, suppliers and manufacturers in my future profession.



SPREAD When making the enclosure sheet metal strips were cut and a 15mm vertical radius was applied using a hydraulic press brake. Additional panels of sheet metal were cut to size in a hydraulic shear, and tacked together and subsequently TIG welded together for a strong elastic joint. All welds were ground flat and wire brushed and the edge running around the bottom was hand ground to a radius corresponding to the radii of the rectangular tubes of the frame.



REALIZATION



ABOVE RIGHT All the horizontal stretchers and crossmembers all had their sawn off edges deburred and chamfered and were mated flush on the inner side of the frame with regular butt joints and tacked in place prior to welding.

FAR RIGHT The outside joints were TIG welded in a weaved pattern to create a fillet for an aesthetically appealing transition.

IMMEDIATE RIGHT In the hands of an experienced professional welder the outside fillet joints should look something like this. Beautiful welds like this eliminates the need for further finishing.

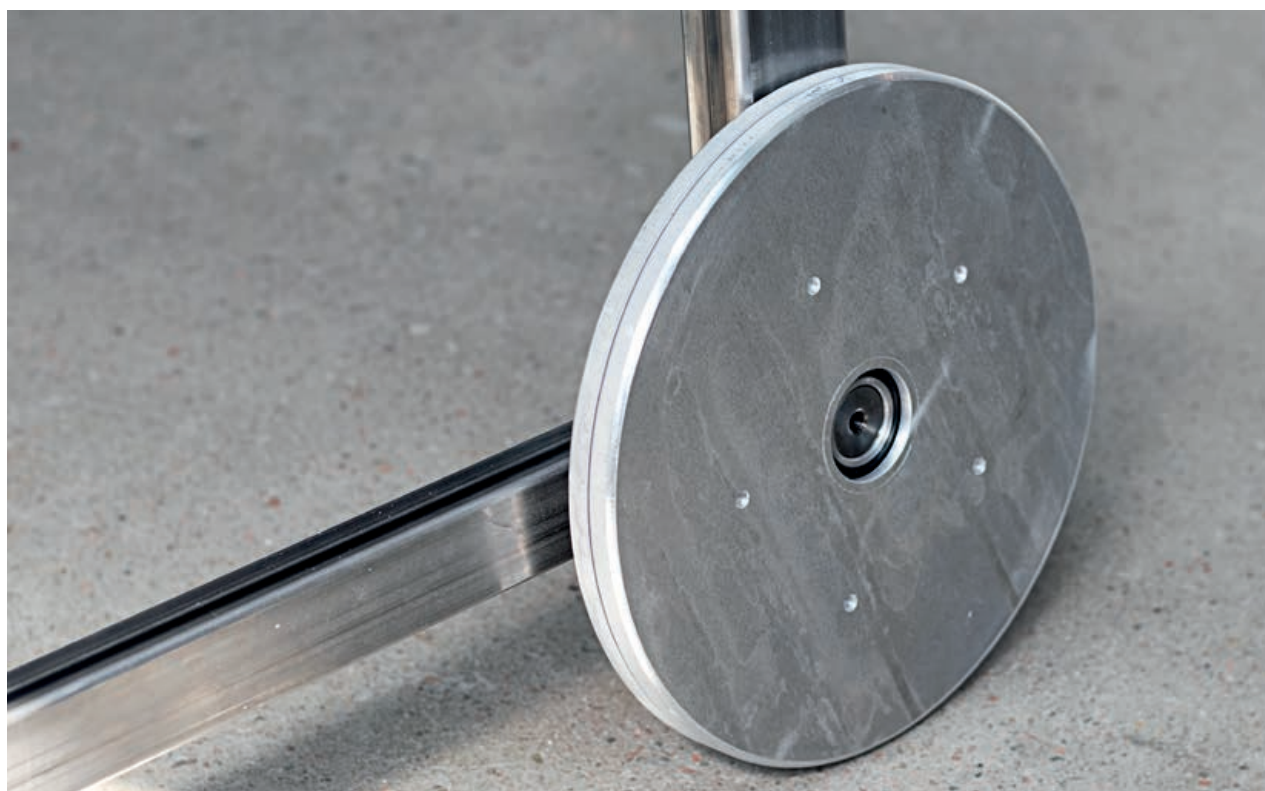


Josh Welton



REALIZATION





Results

THE UPPÅKRA WOOD FIRED OVEN

Finding its inspiration in the ancient connection to analog wood-fired cooking, and the local genuine craft dating back to the time before electricity, The Uppåkra Wood Fired Oven is not something to behold and admire from a distance. On the contrary, it invites participation in the whole process from the choice of wood and stoking the fire to the culinary experience of the end result through wholehearted immersion in the craft of analog cooking.

Dynamic, culinary, initiated, wholehearted, inclusive. Not for the faint of heart.

The simplified geometry and balanced proportions provides a modern sleekness further enhanced by the elegance in the hyperbolic curvature of the landing of the oven entrance.

It provides a generous space on the countertop for your *Mise en Place*, and the heat resistant ceramic will withstand sizzling hot skillets being placed on it when the meal is ready

to be served. The griddle directly above the oven is heated by the scorching fire below and will produce a restaurant level sear on that sous vide steak in mere seconds.

The complementary surface below provides equally generous space for storing firewood, accessories and produce.

The oven caters to the active, affluent, consumption inclined, quality-minded, initiated and well-informed homeowners in their late thirties to early forties. They are both skilled and interested in cooking and want to take their culinary experiences to a new level.

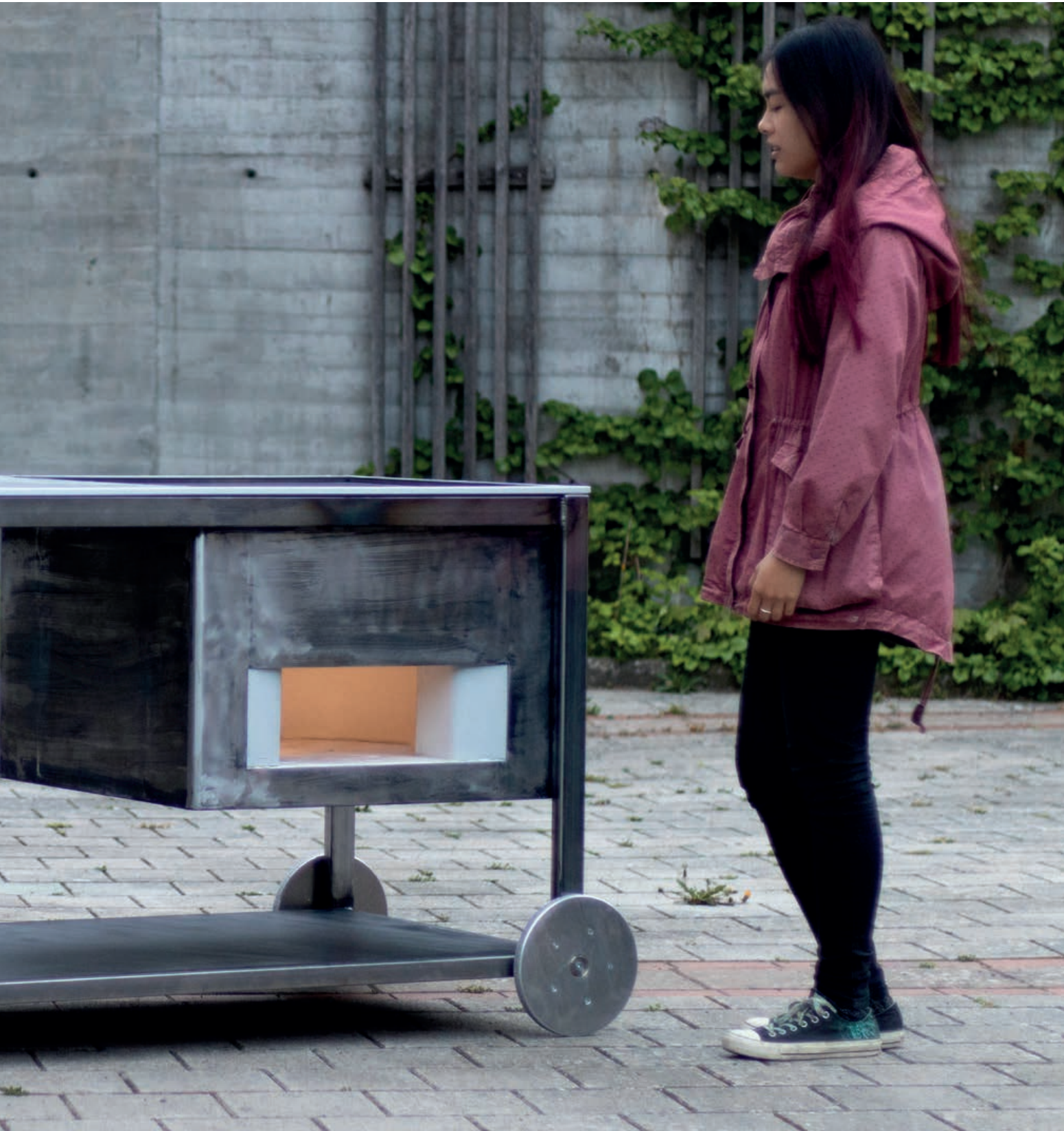
The Uppåkra Wood Fired Oven will provide the functionality that allows high level baking and cooking so that we can once again gather around the fire with friends to enjoy a delightful meal.

When the guests have left after the fire has waned and the last few embers have gone out, as you roll the centerpiece of the evening across the yard, the calm of satisfaction sets in.

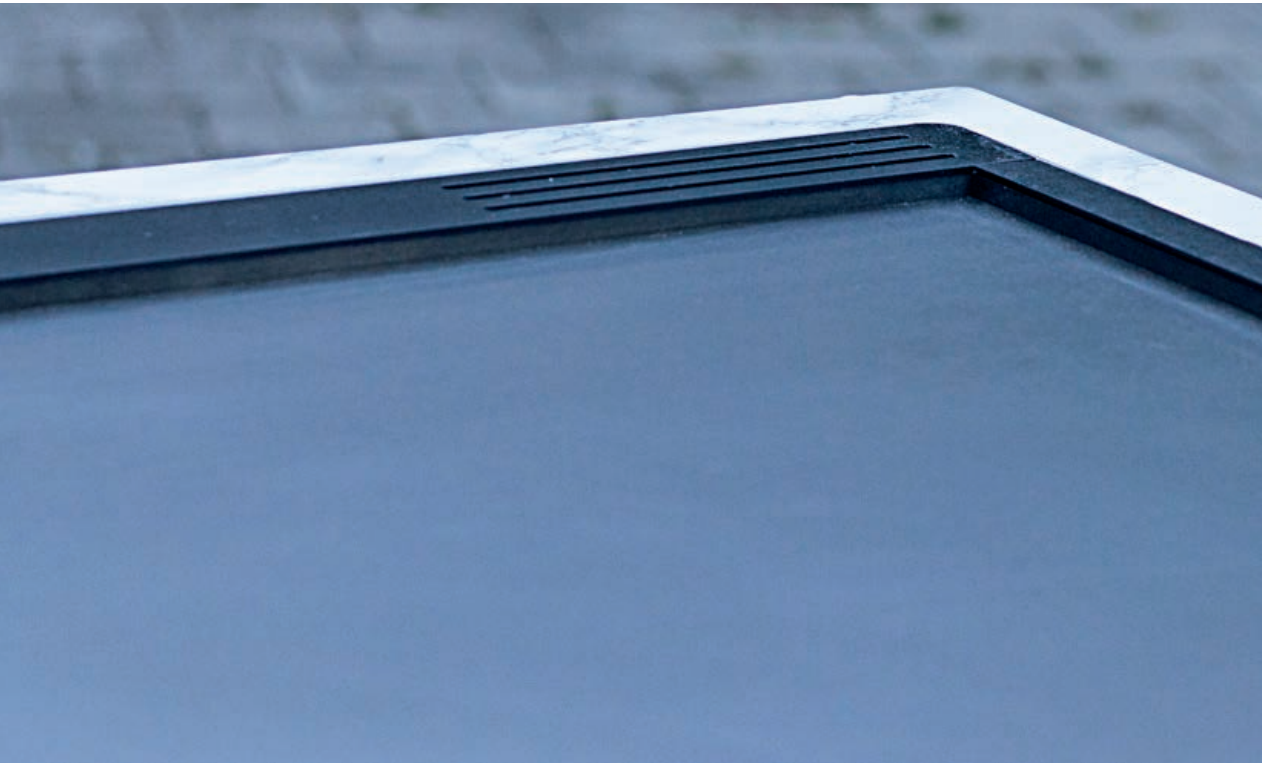


RESULTS





RESULTS





Further Developments

PRACTICALITIES

First of all the future developments of the project is to finish all parts of the prototype to transform it from a scale model to a fully functional and finished prototype.

This includes CNC-milling the plug for creating the dome using the modelling build-up technique of Sven Backstein.

The flue and the griddle with its surrounding fram with integrated ventilation slots will have to be produced, however it is only a matter of welding the finished pieces together.

DFI-Geisler has kindly agreed to supply me with a ceramic countertop of my choice.

The prototype will be sent for powder coating, and I am negotiating that with several suppliers to find the powder with the most suitable properties, texture and finish.

After transitioning to a fully functional prototype, it will of course have to be testfired and evaluated. This may or may not lead to minor changes, but the aim is to be able to produce and market the oven.

VISIONARY DEVELOPMENTS

During the work with ideating, iterating and developing the concepts for the UPPAKRA Wood Fired Oven, several valid additional variations emerged that would make for a whole family of outdoor cooking products.

These additional concepts all deserve to be further developed, which would provide the opportunity to offer a complete line of outdoor kitchen solutions that follow the same governing attributes and aesthetics as the oven already developed, for the initiated consumer.

There is a line of accessories already lined up that would be both inspiring and desirable to complete the product range with.

Since the development and production of even small runs of this kind of product entails a high initial investment, my ambition is to try to find funding for the continued work that is required. In relation to that, suppliers, manufacturers and fabricators need to be visited and enlisted. Hopefully I will be able to put this product to market in the near future.

TECHNICAL DRAWINGS

A key factor that played a major part in successfully being able to undertake a project of this magnitude was my ability to produce CAD visualizations and highly detailed technical drawings. These drawings laid the foundation for weight and material consumption calculations, dimensioning of components, fabrication and also proved to be an excellent means of communication with the IKDC workshop staff.

For the previous stated reasons I have omitted any technical drawings in this report since I am, during the time of writing this report, in the process of investigating possibilities of taking the oven to market. I do not wish to disclose any detailed specifications and drawings in order to safeguard the future viability of producing the oven commercially.

I will, however, be able to provide these technical drawings at a later stage confidentially at the recipients discretion, should the need arise.

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Aknowledgements

First and foremost I want to extend my deepest love and gratitude towards my wife *Reka* for all her support and patience during these three years of studies at the School of Industrial Design. It has truly been an invaluable contributing factor to the successful completion of my studies.

My children *Rebecka* and *Astrid* have done their very best to keep me grounded and able to maintain a work life balance that would otherwise been difficult, and at times near impossible to achieve. No matter what, you always put a smile on my face.

During these past three years I have come to respect and appreciate the sometimes tangled but always eloquently expressed wisdoms of *Professor Jasjit Singh*. The deeper understanding of form studies, edge and surface refinements, importance of intelligently conducted flow lines, the orientation, balance and direction of design is something I will carry with me for the rest of my life.

I want to thank my supervisor *Charlotte Sjödell* for refining my sketching abilities and giving me the confidence and free reigns to pursue this vision of mine.

Bert Berglund, in particular, deserves a special acknowledgement for his unremitting guidance, support and willingness to go above and beyond.

My sister *Åsa* for always believing in me and I owe to her my inclination towards the philosophical and multifaceted perspectives I find myself entertaining.

My parents *Ann-Marie* and *Per-Åke* deserve a very special acknowledgement and my deepest affection for their relentless patience, love and support. They have always believed in me and my abilities and supported all my dreams and endeavours, no matter how large, how small or how impossible they might have seemed, as when I decided to put my career on hold to pursue this lifelong dream of mine.

Johan Skoogh for kindly supplying me with literature and participating in a deeper conversation about analog cooking.

Tom Lunde for our peer review sessions that proved as fruitful for giving feedback me as it did for him receiving it.

Fredrik Baigi for always being available for our long talks no matter the situation or how busy you were.

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Christina Zhou for kindly volunteering as a model for the initial photo documentation.

Tobias Almén, Vonna Heidenblad, Tom Lunde, Fabian Malmhagen and *Christina Zhou* for their unparalleled bravery by risking life and limb in the validation of the concept by riding the test cart.

Last but by no means least I want to extend my gratitude towards *Martin Fruth, Sales Manager of DFI-Geisler* for their positive reception of my project and for kindly supplying me with a ceramic countertop of my choice.

