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This design thesis focuses on the social impact of designing interior products for the communal dinning experience. The emotional sustainability of interior products is closely connected to the ability to transition a consumer to an enduring owner. The enduring owner is one who views a product beyond its functional purpose and appreciates the product's social and positional aesthetic characteristics. Residential communal dinning experiences provide opportunities for individuals to create stronger emotional connections with one another beyond other typical social gatherings. Emotionally sustainable products successfully portray the owner's social position and preferences to other individual while fulfilling the owner's personal desire for products that are aesthetically pleasing, easy to use, and reflect their personality. The current material culture of interior products promotes the consumption of products that appeal to the emotional desires of today's consumers. Therefore, emotional sustainability occurs through both the relationships among consumers and the relationship between consumers and their products. This design thesis explores the connections of these relationships through an active design process, which involves a synergy of reflective moments and ideas from the product, designer, and potential end-user.

ENGAGE: DESIGNING INTERIOR PRODUCTS FOR THE COMMUNAL DINING EXPERIENCE

by

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Approved by

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Committee Chair

To Dr. Eugene and Portia Wade, the most supportive parents I could ever wish for. Thank you for the years of dedication and prayers that you have poured into me that have enabled me to accomplish this milestone in my life. To my siblings, extended Battle and Heyward family, and close friends, thank you for your continued support, love, and prayers. You have truly blessed my life. To my New Birth Family, thank you for guiding support and helping me realize the greater purpose of my life. To my Lord, the Master Designer, thank you for designing my life with purpose and guiding me through this journey.

APPROVAL PAGE

This thesis has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I

INTRODUCTION

The creative method of design practices and the acknowledgement of social issues provide a platform from which to create socially relevant interior products. Although most interior products serve a utilitarian function, products can also be social and positional objects, utilized in various social residential settings during the preparation and consumption of food (Walker, 2006). The functional, social, and positional aspects of interior products do not exist without the acknowledgement of the material culture and its impact on the design process. The aesthetics, chosen by a designer, connect the emotional quality to the social status associated with each product. Therefore, the specified use of a product is not limited to its utilitarian function.

The residential environment has primarily been a place for social interactions to occur among immediate family members. However, the home residence is also a place for social interactions to occur between family members and with those inside and outside of the immediate family. The location of the residential kitchen provides a conducive and equalizing environment for individuals to engage in activities and dialog while collectively preparing or consuming meals. The Slow Foods Movement, for example encourages the re-establishment of community and social awareness within the fast paced societies of urban and industrialized cities through the shared necessity of food consumption. Specifically, the open floor plan of current residential environments also implies an increased desire for social interactions and conversations to occur within general living areas of the home such as the kitchen (Pennell, 1998). As such, I designed for the residential kitchen environment and the human interaction that occurs within that setting (Landry & Wood, 2008a; Lowe, 1986).

Consistent with the Bauhaus philosophy, which promotes providing good quality design to the masses, the increased development of mixed income homes has provided quality and affordable homes to urban city residents of various economic backgrounds (Lamb, 2005; Vilet, 1997). Urban developers assumed that new relationships among various households will be a long-term benefit of mixed income housing developments, and yet there is a paucity of significant data to prove that any substantial relationships are forming among residents of various backgrounds and economic statuses within these communities (Lamb, 2005; Vilet, 1997). Since the architecture of mixed income housing alone does not ensure a certain level of social interactions, I considered socially enriched activities such as preparing and cooking meals together as opportunities to encourage the social development of diverse relationships, specifically within the urban residential setting.

I used the design process as a tool for recording and validating each design decision. I utilized design theories, modern social issues, and design principles to create a framework to address social interaction issues through my own creative design process. This design process included precedent analysis, hand sketching, sketch and conceptual modeling, and schematic design practices. The conscious action of reflexivity during these design practices creates a synthesis of ideas (Cowdroy & Williams, 2007;

Goldschmidt, 2003), which results in the simplicity of the aesthetics that I created during this design thesis. I documented this process to highlight it as an essential part of a solution-based approach for design practices while providing design knowledge for further design research (Baxter, Lopez, Serig, & Sullivan, 2008).

In contrast to the paucity of documented creative design methods and design research models, the design profession has received written validation through case studies regarding the behavioral effects that interior and exterior environments have on the end-user. Therefore, urban social movements and their effect on social capital among individuals living in diverse residential communities became a foundational framework for this design thesis. I referred to environmental design's behavioral effect on the individual and society and it's relationship with the social concerns of urbanization to establish the validity of product design within the same context. Although the material culture of products is not a new topic in design research, referencing it in this context allowed me to establish the design parameters and design knowledge best suited for the course of this design investigation.

CHAPTER II

REVIEW OF LITERATURE

Behavior and Design

History of Behavior and Design

The validation of human-centered design is increasingly accepted as designers and architects acknowledge the behavioral impacts of interior environments (Sommer, 1972a). The human-centered design process begins with the end-user in mind and enhances the adaptation of an object or environment to suit the end-user's needs. From a design standpoint, residential dwellers are viewed as designers of their own environment and the identification with place strengthens the emotional connection derived through the experiences within a place (Manzo, 2003).

The effects of Hard Architecture are critical to the quality of design and the end product. Hard Architecture as a reaction to Murphy's Law is the presumption that any destructible material or surface that can be destroyed, will be destroyed (Sommer, 1974). The intentions behind Hard Architecture suggest that certain socio-economic groups fail to understand and appreciate quality architecture. As a result designers and architects created cold environments that fail to support characteristics of humanization and nature within an environment (Sommer, 1974). Therefore, the architecture and interior environment lacked empathy and connection with the end-user. Likewise, it is the designer's responsibility to create products that reconnect empathy to the individual end user.

Opportunities for empathy through social interaction have to be intentionally designed into the architectural environment or product in order for empathy to become a reality. A case study by Sommer showed that a renovated women's hospital ward for mentally challenged patients provided the newest furnishings and material applications, yet lacked the necessary attention to the environment and spatial layouts to facilitate social interactions that assists in the stimulation of the patients' mental development. Despite the aesthetic improvements, "the ladies' mental state was unchanged…with as many as 50 ladies in the large room, there were rarely more than one or two brief conversations" (Sommer, 1972b, p. 78). It is obvious that the end-user was never fully considered in the renovation process for the hospital ward, and therefore the interior environment lacked the ability to evoke participation from the patients. It is as if the decision makers (hospital administration personnel & designers) forfeited the right to fully account for the needs of the end-users during the design process. The designers' failure to grasp the full potential of collaborating with the end-user in the design process is felt most when, "… a chair becomes something to sweep around rather than a necessary tool for social interaction" (Sommer, 1972a, p. 79).

The possible interactions among different socio-economic groups suggest the benefit of increased *social capital* within a community. Historically, members of Victorian society viewed this concept as a means for lower orders to emulate their superior class members through social interactions or *social mixing*. This is defined as the 'nurturing spirit of emulation' meaning that one social class seeks to imitate another class by realm of association (Landry & Wood, 2008b). In addition to the expectation for housing standards to stay desirable, the cultivation of new knowledge and advancement for the under-served was an expected benefit. *Cultural cross – fertilization* was expected to produce a diverse amount of options concerning educational and occupational decisions for under-served populations since *social mixing* creates an avenue for new communication, interactions, and understandings to occur as a form of *social harmony*. The effort to establish diverse residential communities suggested that residential environments should socially mirror the broader characteristics of the global world and that *social capital* accumulates through the synergy of equalizing the shared connections among individuals. However, these methods of building *social capital* did not consistently produce admirable results and there is a paucity of documentation to suggest that interactions actually occurred between residents.

Additionally, this particular effort to achieve *social mixing* often required a greater investment in the uprooting of the under-served population. This uprooting inherently reduced their local connection of already established relationships and support, which disrupted the initial connection to place and the identification with their environment (Landry & Wood, 2008c).

Further explanation is provided in a case study of 180 Parisian residents by the Laboratoire de Psychologie Environmentale, which concluded that individuals who harbored positive feelings towards their place of residence linked these feelings to experiences of meaningful relationships within their neighborhoods. These relationships were categorized as an exchange of services and interactions of kindness and became the social sustainability of a city (Fluery-Bahi, Moser, & Ratiu, 2002).

Discourse on Behavior and Design

Theorist, Hans Gadamer portrays *adult play* as a source of information regarding adults' social behavioral patterns. Furthermore, *adult play* is an artistic expression describing structured adult interaction. Since play is a social form that creates new realities during everyday experiences, the *act of play* engages individuals in the physical and social worlds around them. This results in the creation of staged social scenes for the interactions among people (Gadamer, 1986a).

Human interactions in the urban setting are further understood through men and women's customary roles as they present themselves to others. For example, their encounters in England and Paris during the 18th and 19th century involved extravagant dress as an adult form of playing dress up in public arenas, which revealed the level of importance placed on social status and the desire to own items of high quality. Clothes existed as a definition of character and social positional items (Sennett, 1974), and consumption practices were foundational indicators of urbanism (Lowe, 1986, p. 11). Consumers' habits are tied to both the structural components and human connections represented within the urban environment, and Morrison states that "emotions are stimulated by cultural interpretation, and enjoyed or down played in social interaction" (Hayward, 2004, p. 11). Therefore, those who connect to their own environment and find a sense of identity within a place proactively sustain the visual aesthetics of their environments (Fleury-Bahi, Moser, & Ratiu, 2002). Interior products that co-exist within these environments also aid in the facilitation of place identity and relationships within the urban home.

Summary of Behavior and Design

Although cities can be places of interactions, they are also places where people experience exclusion due to cultural or political differences (Lowe, 1986). Social interactions reveal empathy from one person to another and are often influenced by their perceptions of one another and their environments (Hayward, 2004). Landry and Wood describe the various forms of interactions in the following categories: *grounding, strokes, opportunity, and growth*. *Grounding* is the series of intimate interactions occurring with family and close friends that re-confirm our own sense of identification. S*trokes* also occur in familiar settings, yet these settings affirm our position within a larger social group. *Opportunity* involves the social exchanges that benefit a person's work placement, while *Growth* is the interaction that harvests new cultural understandings and allows for a person to leave a piece of themselves with others. In order to truly benefit from the cohabitation of residential dwellings, individuals should interact within one another in order to foster the type of empathy that satisfies our need for security, companionship, efficiency and communication (Landry & Wood, 2008a).

Social Interactions

<table>
<tr><th colspan="2">Social Interactions</th><th>Grounding</th><th>Strokes</th><th>Opportunity</th><th>Growth</th></tr>
<tr><td colspan="2">Description</td><td>Consolidate identity and values</td><td>Consolidate external Environment</td><td>Broaden external environment</td><td>Broaden identity and values</td></tr>
<tr><td colspan="2">Typical Motivations</td><td>Link to your past or roots
Feeling that other people understand you
Being able to rely on others
Passing on your experience to others</td><td>Being recognized or known in community
Feeling popular
Identification with other people</td><td>Identifying new possibilities
Self –promotion
Professional or amateur networking</td><td>Learning form others
Expanding your perspective
Sharing ambition and common goals
Curiosity</td></tr>
<tr><td colspan="2">Typically with</td><td>People you have history in common with</td><td>People you have community in common with</td><td>People you have benefits in common with</td><td>People you have curiosity in common with</td></tr>
<tr><td colspan="2">Impact on individuals</td><td>Builds self –confidence</td><td>Develops a sense of belonging</td><td>Opens up new opportunities</td><td>Expands perspective</td></tr>
<tr><td rowspan="2">Impact on inter –ethnic interactions</td><td>Positive</td><td>Pride and Identity</td><td>Good community relations</td><td>Mixing</td><td>Understanding and integration</td></tr>
<tr><td>Risk</td><td>May accentuate differences and distinctions between ethnic groups</td><td>May create complacency</td><td>May reinforce inequality if opportunity networks are not fully open</td><td>May alienate or dilute identity
Efforts to engineer growth interaction can seem false</td></tr>
</table>

Table 1: Social Interactions, inserted from The Intercultural City: Planning for Diversity Advantage (Landry & Wood, 2008a, p. 112).

Design and Society

History of Design and Society

From a utopian viewpoint, all members of society qualify to both facilitate and participate in the design process, suggesting that social movements are tied together through reforming social inequality and environmental challenges. Social advocate's concern to unite various demographic groups into a unified force for humanitarian social equality ignited social advocacy (Hawken, 2007; Sommer, 1972a). Sommer documented an example of this through the case study of the Berkley Street residents, who occupied the street adjacent to the University of California. In the late 1960's many modest homes were torn down due to the University of California administration's concern for the diminishing visual character in neighboring communities (Sommer, 1972b). At this time, the community philosophy consisted of participation in activities and collaboration among neighboring individuals. The residents of Berkley Street took an avid approach to claiming and designing their exterior environment by creating environments that represented themselves and spoke to their true characteristic lifestyles. This resulted in the establishment of the Free Store and Switchboard, a donation site for used clothing and a community friendly telecommunication service. Parents, children, and retirees of Berkley Street also began to work with design students, designers, architects, and landscape designers to create what was called the People's Park. Although the park was a combined effort of over a thousand people per day, the efforts of the Berkley Street residents and students finally subsided due to the resistance of government and university officials. The efforts to keep and re-establish the People's Park, however, exhibited the design initiative and opportunities for collaboration between designers and the public.

Design theorists have further stated that designers have many opportunities to play an essential part in creating a more humane society due to their ability to comprehend the various components that contribute to society. Yet, designers have not always provided their input during the process of establishing social policies and are now challenged to properly define their roles within society by establishing artifacts that inform the public of the designer's role in society (Margolin, 2007). The practice and education of interior product design has traditionally been tailored to industrial practices that lack an emergence of social awareness. This creates another opportunity for the development of a combined *social and market production model* for both product design professionals and educators (Margolin, 2002; Swann, 2002). This development of a *social and market production model* should create a response to Papanek's previous discourse from the 1970's and 80's, which suggest that socially responsible products must exist outside of the current market. Furthermore, Jones stated that product design should become less intrigued about the product itself and more intrigued with the potential impact on society as a whole. If manufacturers, distributors, and consumers all benefit from this shift, product design practices can impact society (T. C. Mitchell, 2002). Designers' conscious agenda for social change to occur through design results in design that has become increasingly collaborative, cooperative, and co-existing in order to produce an end-product that is socially responsive (Chapman & Gant, 2007).

In response to new social initiatives, product designers such as Emily Pilloton have founded the non-profit organization Project H. One particular design project consists of revisions to the original design of the Hippo Roller; a product that has enabled South African communities to continue the safe transportation of water; while decreasing the original price margin in shipping and manufacturing cost for South African residents. The Learning Landscapes, another project initiated through Project H, provided a three dimensional stimulation of math comprehension through the unique reuse and placement of automobile tires as a way to mathematically engage children through new outdoor learning activities. The Abject Object project also served as a combined community effort between the Los Angeles Downtown Women's Center and Project H. This project enabled homeless women to develop job skills and business strategies by designing bags that expand into hammocks. The proceeds from the hammock sales were then re-distributed back to the individual women and into the operational cost of the center (Metropolis 2009).

Project H does not create products for the traditional design market, however Side by Side Incorporated has tapped into the traditional design market with their production of interior household products while responding to the need for social design practices. The company's approach to empower individuals has been developed through the production and distribution of well-crafted modern interior products, designed by young industrial designers and a select group of physically handicapped craftsmen in Germany. The standard of aesthetic design and craft allowed Side by Side products to adequately compete in the current design market~~,~~ while providing skilled work for handicapped individuals (Metropolis 2008). These very efforts in social design practices have created new avenues for product design and it's impact on society.

Discourse on Design and Society

The designer's impact on society responds to the culture of the project and the human environment. The establishment of the designer's role in society also requires the consideration of past and present artifacts, adequate vision of what could and should be represented in society and the determination to fulfill human choices that shape the future of society and it's prescription for change (Margolin, 2007).

Further response to Castells's work which defined ideas of social movements for urban society claimed that: "the significance of urban social movements consist of forging alliances between 'the new pretty bourgeoisie' and the 'working class' while viewing 'urban social movements' as the precursor (but no longer the single contributing factor) to the hopeful relations that transform into social victories" (Lowe, 1986, p. 188). Truly sincere social movements simply seek to create social change since metropolitan cities have often contributed to social disintegration through the placement of specialized activities and environments (Lowe, 1986). The increased privatization of previously communal activities means that many individuals rarely engage in activities outside of the home, therefore limiting their opportunities for new social encounters (Fleury-Bahi et al., 2002).

Summary on Design and Society

The practice of architecture is viewed as a contributor to social science, and architecture and its inter-disciplinary practices should remain relevant to society (Sommer, 1972a). Design without some form of social impact is nearly frivolous in its significance; yet design that is properly connected to sources of social advocacy provides a grand gesture for the sake of a community (Avery, 2006).

Sommer has further argued that non-designers are not antagonists to good design. Rather, they are informative participants for the designers to gain insight that establishes a solid foundation for future design practices. The request for designers to not only ask what people need, but to also evaluate past projects improves the design quality in architecture, interiors, and products. Social science includes the involvement of many disciplines and individuals that lend their perception and knowledge to the completion of a particular project (Sommer, 1972a). Therefore, a holistic approach to product design provides design solutions established through the connection of social collaborations and the exposure to multi-disciplinary practices (Margolin, 2002; Swann, 2002).

The Emotional Connection to Objects

History of the Emotional Connection to Objects

The emotional disconnection that results in a broken relationship parallels the frequent disposal of products. The failure of the object to stimulate the consumer due to poor design quality leads consumers to a cycle of consent product-replacement. Walker claimed that the lack of quality in manufactured products since the 20th century has greatly contributed to this decline in the connection between consumers and their products. Our disconnection as consumers also results from our inability to interject our own sense of empathy into the original design of the products that we will purchase and utilize on a daily basis (Walker, 2006). Therefore, we, as consumers tend to undervalue the products that we originally connected with at the time of purchase.

Traditionally, designers have not effectively involved clients in the design process and development of mass manufactured product design. The lack of consideration for the consumer during the conceptual design process results in an ill-designed end product. Since most designers support the notion that the best architectural design solutions involve extensive communication with the client, it is ironic that designers do not view their communication with the client as a sacred practice during product production.

The emotional relationship between consumers and their objects aids in satisfying the basic human physiological needs, and the consumer experience with an object initiates social interactions, explorations, and conversations (Sommer, 1972a). Interior objects used on a daily basis provide a functional platform for social interactions to occur and become the informative tools for evaluating the interactions within a residential setting. The observations that a person makes about another's possessions, especially within their home, provides insight to their taste, values, and even moral standards. These observations create opportunities for inquiry, which may lead to new cultural and social understandings (Maestri & Wakkary, 2008) and provide emotional energy as a result from someone's psychological accounts and actions. Sommer labels this description of emotional energy as Freud's closed model of motivation or the hierarchy of needs and the emotional relationship between consumers and their objects.

Discourse on the Emotional Connection to Objects

In an attempt to further establish the framework of emotional connection, Chapman states that, "objects containing a deep sense of human empathy, continuously entice the consumer further than one initial release of interpretation" (Chapman, 2005, p. 18). The desire for the interpersonal relationship confirms the ability for a *failed relationship* to exist between a person and an object. Objects are a valuable reminder that the conscious design of an object merges the relationship between the consumer and the consumed object through new experiences of unveiled character, emotional energy, and peculiarity (Chapman, 2005). The objects that daily engage us on an emotional level meet a standard of high-qualified design, equipped to intersect our lives and daily routines. This interaction is described by Lipps, as *Einfuhlung* or 'empathy' in the English translation (Chapman, 2005, p. 20). *Einfuhlung* theory reiterates that the survival of an object depends deeply on the user's ability to translate their personal perception of themselves into the object, thus creating a connection to an object. The various appeals of a successful object or product is broken down into three main categories: visceral, behavioral, and reflective. Visceral appeal refers to the appearance of an object and it's perceived ease of use. Behavioral appeal refers the effectiveness and enjoyment that the user experiences when the use an object, and the reflective appeal refers to the user's ability to see themselves in the rationale of the product or object (Norman, 2004). As long as the user can experience a sense of empathy through the object, the object will continue to flourish in the user–object relationship (Walker, 2006).

Norman further suggests that our personal emotions highly contribute to how we successfully resolve problems since we use the cognitive area of the brain to resolve problems. The accessibility to our full spectrum of emotions is vital to our ability to learn, while we produce a creative process of thinking. This ability to orchestrate daily situations in a contributing manner is a by-product from the exposure of attractive things, according to Norman. Isen further supports this theory, as she suggests that those who experience happy emotions possess an increased ability to effectively think in order to resolve difficult situations. Aesthetically pleasing objects make people feel esteemed, which then produces creative and alternative thoughts and leads to the appropriate responses for new solutions and supports the decision to create beautifully sustained interior products (Norman, 2004). In contrast, misdirected intent and a lack of social and positive environmental impact during the design process results in designs that lack attributes of beauty and empathy (Walker, 2006).

Art objects serve as significant artifacts of culture, comprising the past and the future. Designers and artists then constantly look to the past for inspiration and a foundation to establish new ideals in design. However, the value placed on beautifully designed objects is not only important to the artist or designer, but to the public sector as well (Gadamer, 1986b). This value has become a form of status and representation of the object's owner. Walker describes the objects that convey our social status to others as social / positional objects (Walker, 2006). The culture represented in an interior object provides a form of identity and representation that sustains one's personal ideology (Dalby, Doubleday, & Mackenzie, 2004). "[t]he symbolism of an object can change meaning and the existence of an object only occurs through the symbolism that occurs through the activities that they are used for" (Krampen, 1979, p. 10).

Krampen further states the theoretical work of Baudrillard:

> According to Baudrillard this change in the status of the object is brought by the particular nature of life in our 'consumer society'. Consuming - according to Baudrillard –is not a material practice, but the organization of material substance into signifying substance. "To become an object of consumption the object must become a sign." [c]onsumption of objects by society does not simply involve their use or exchange. It involves 'conspicuous consumption' in Veblen's (1963) sense – the continuous 'potlatch' ceremony in which object signs of prestige are exchanged. In the study of the mechanics whereby objects acquire meaning, Baudrillard takes an extreme position: objects have no material existence of their own, but exist only through the symbolic activities of society (Krampen, 1979, p.7).

Summary on the Emotional Connection to Objects

As designers are compelled to personally explore past typical industrial practices, the emotional quality of products and environments continues to infuse the discourse of design even before the 20th century. The emotional state of a product and its ability to provoke empathy relies upon both the sentiment and functional value within an object (Chapman, 2005). Furthermore, it is the handcrafted heirlooms of the past that continue to be transferred from one generation to another. Our connection with products is not based solely on the object itself, but with our connection with the meaning contained within the experience associated with an object (Walker, 2006). The object is then a descriptive representation of past, present, and future attributes of our current lives; it reveals our present status and the status that we hope to acquire (Chapman, 2005). Norman provides personal insight to the emotional connection of objects in the description of his teapot collection. Although his daily activities could easily involve the use of a teapot as he regularly drinks tea every morning, he admits that his admiration of their aesthetic quality does not depend on the amount of their daily use. However, his engagement with these objects has continued because he keeps them out on display for visual enjoyment. He further stated that, "I value my teapots not only for their function for brewing tea, but because they are sculptural artwork" and claimed that each teapot held a significant story that creates a personalization for each (Norman, 2004, pp. 3-4).

The need for emotionally sustainable products is fueled by their symbolic values and is expressed through what we purchase as an extension and representation of ourselves (Landry & Wood, 2008d). Certain utilitarian objects fit multiple object categories such as social/positional and spiritual/inspiration while fulfilling the dominating functional characteristics. A watch, for example, used by the owner to functionally tell time, non-verbally relays the owner's social and positional status to others. Therefore, purchasing products becomes a form of non-verbal communication for the owner and receivers of this non-verbal communication are then privy to assess the age, status, occupation, and economic & cultural standing of the other individual (Arnold & Buley, 1977).

Material Culture

History of Material Culture

The Bauhaus movement is an international movement of reduced ornament and the foundation for modern aesthetic interpretation. Designers of the Bauhaus movement sought to provide socially responsive design solutions to the stressful occurrences and financial angst following the Great Depression of the 1920's. Le Corbusier described modern design as a spirit of beautiful composition that introduced a new era in design. Corbusier further prescribed the manipulation of alluring creations as a benefit to all who encounter it (C. T. Mitchell, 1993). In discourse, Le Corbusier wrote:

> The Architect, by his arrangement of forms, realizes an order which is pure creation of his spirit; by forms and shapes he affects our senses to an acute degree and provokes plastic emotions; by the relationship which he creates he wakes profound echoes in us, he gives us the measure of an order which we feel to be in accordance with that of our world, he determines the various movements of our heart and of our understanding; it is then that we experience the sense of beauty (C. T. Mitchell, 1993, p. 8).

The new era of modernism along with the economical changes of the Depression provided a platform for the mass production of products. Modernists of the time viewed mass production models as a way to share a high quality of design with all who desired it. Although the mass production of products was primarily a response to the industrial age and housing needs, it was also an attempt to collectively stimulate the economical status and comforts of the previously ranked middle class (C. T. Mitchell, 1993; Wilson, 2004). As a result, mass-produced objects appeared through new stylist representation, new methods of advertising occurred, and marketing techniques were developed to promote ideas of social status (Wilson, 2004). Unfortunately, critics of modern design viewed its mass production practices as a void of concern for the opinions of the end user. This view resulted from the misinterpretation that designers considered the end-user opinion as unimportant due to their lack of design knowledge (C. T. Mitchell, 1993).

Some modern designs lacked the benefits of properly re-crafting an object throughout the design process. Furthermore, Norman warns designers that the beauty and simplicity of a form can be lost once an object is designed to serve multiple purposes (Norman, 2002). The striving for simplicity often conflicts with the desire for a well-designed product to visually represent the designer's personality. If the aesthetics of the product dominate the functional attributes, the functional qualities may lose significance over time (Chapman & Gant, 2007).

It is the responsibility of the designer to proactively design against the occurrence of error during the use of everyday objects. Either circumstance or the object, itself are often blamed for the failure that is experienced when using an object. Although, there are many areas of functionality that must be addressed throughout the design process, not *every* aspect of functionality can lend itself to a truly aesthetic form.

Discourse on Material Culture

In support of design simplicity, Norman questioned the reasoning for our constant utilization of everyday objects despite our inability to figure them out in order to utilize every function within any given object. He reiterated this by stating, "Well-designed objects are easy to interpret and understand. They contain visible clues to their operation." (Norman, 2002, pp. 1-2). Although, most consumers accept the misuse of complex objects, common daily objects should be operated with ease. The design of the object should inform the user of the object's functionality. Revising an object's functionality requires a clear reference to the previous design in order for an object to remain user friendly and adaptable. Norman, describes this sense of functionality as *Affordance*, claiming that if images are required to explain simple object, then the design of the object has failed (Norman, 2002).

The aesthetics of our surroundings represent the language that is attached to our social capital and our distinguished privileges within society. Compared to the use of clothing fabric as a form of design in human decoration, adornment represents how an individual is viewed in relation to their position of social class. This portrayal through adornment allows consumers to pre-determine how we are viewed by society during an initial encounter. An individual with the proper adornment can control how they are viewed and what level of vulnerability, if any, is revealed. This is comparable to the value of interior environments and interior products as a representation of social status, especially when someone visits another person's home (Roth, 2006; Sennett, 1974).

Material aesthetics address the boundaries within our environments. Le Corbusier asked, "Is not architecture determined by new materials and new methods" (Klassen, 2006, p. 258). Objects help to determine our view of interior environments and materials determine the readability of an object. Therefore, the exploration of materials and products relate to the spatial qualities of interior environments and introduce *malleable matter*, which informs us of the personalization of interior environments. Klassen suggests that malleable matter created the formation of historical nomadic dwellings and implies that this formation then creates a means to present personal, social and cultural influences (Klassen, 2006).

Summary of Material Culture

Objects are designed based on their functionality in addition to the aesthetic quality. The challenge is that objects often fail to fully address functionality; therefore the notion of emotional design cannot be limited solely to the aesthetic quality of an object (Chapman & Gant, 2007). In contrast, an object should not provide functionality without the emotional benefits of pleasing aesthetics. When a designer establishes a clear aesthetic value for a product, they conceptually insert themselves into the end product as an abstracted form of human empathy for the end user to connect during the consumption of the product. The aesthetics of a product derives from the design intent and deserves its proper acknowledgement for its role in the design process. (Walker 2006). Therefore, as a designer properly develops a product, it should become simplistic and clear in its visual language regardless if it becomes complex during the fabrication process.

Design Knowledge

History of Design Knowledge

Creativity within the design curriculum and diversity of design education has encouraged the flexibility of different learning strategies (Steers 2009). Steers referred to the validation of creativity in most individuals' lifestyles when he stated that, "It is a commonplace human attribute; most people regularly solve problems of all kinds in their daily lives with some degree of creativity" (Steer 2009 p.128). His statement supports the theory that stimulation through objects provides a path to adequately process information and make decisions.

Visualization affects the design process for interior and exterior environments and contributes to the collaborative effort between designers and multi-disciplinary studies. More importantly it is a strong guidance for designers' understanding in social sciences and the behavioral affects of the environments that we envision and create for our clients (Sommer 1978). However, Sommer claimed that designers could not depend solely on digital media sources in order for clients to experience the true visual imagery and perception of a design idea or process. The creation of designs should provide relevant visual imagery for the consumer since the visualization process is most adequate when it is experienced as a constant practice versus through the delivery of ready-made images. While sculpture and other 3-D forms do not require the same level of visualization of 2-D art forms, viewers tend to compensate through the mental provision of movement, human sensory, touch, and audio recognition (Sommer 1978). These forms of recognition provide clues to the causes for the emotional disconnection of frequently consumed products.

The relevance of visual analysis and the exploration of how technology and additional processes alter our visual experiences connect visual interpretation, culture, and capitalization together. Haraway further suggests that what we visually interpret translates into the differentiating factors of social status (Rose 2007).

Discourse on Design Knowledge

Exploration of visual imagery often informs designers of additional opportunities to view various objects as a means to develop inspiration for both current and future projects. If not intentional, designers can take for granted the visual implication of our environments and how these environments readily inform us of acceptable design decisions (Yaneva 2005). Visual simulation further creates a motivation that provides complete views of social environments and the development of emotional connections to others (Sommer 1972).

The ability to stimulate the motor and tactile senses has been critical to the appreciation and acceptance of the fine arts and design disciplines. It is the imagination that provides the platform for stimulation, yet it is not easily transferable from one individual to another. Visual stimulation when linked to imagery operates as a means to facilitate the constant revelation of an object or work of art.

However, constant revelation without new understandings of precedent studies is a questionable practice. The in-depth understanding of new innovations is a foundation for future precedents (Brooker & Northey, 2008; Dahlman, 2007) and creates additional methods for developing interior products that continue to stimulate human empathy during the revealing of emotional layers. Norman and Chapman have agreed that new knowledge begins to develop into an interlocking idea of new design solutions for interior products that exist by fully understanding the previous developments of precedent studies (Chapman, 2005; Norman, 2002). Gaining understanding from new perspectives contributes to the success of user-responsive design when consumers and multi-disciplines are included in the design process. This form of educating consumers and non-design disciplines about design and the intent of the design process is a current design practice (Sommer, 1972a). Mitchell further promotes *user-responsive design* as a means to reduce failure during the design process, as many designs are deemed unsuccessful by the user due to their inability to interject their concerns at the beginning of the design process. Therefore, collaboration between the designer and client satisfies both the client and designer (T. C. Mitchell, 2002). New approaches to design, especially product design, should respond to the life experiences of the end-user (C. T. Mitchell, 1993). Chapman and Gant offered that ‘co-design’ then becomes the evidence of soft methodologies.

Broadbent (2003) defines *co-design* as:

- Being a holistic, intuitive, descriptive, experiential and empirical, pragmatic and wisdom/value- based approach;
- Being an iterative, non-linear, interactive process;
- Being ‘action-based’ research;
- Involving ‘top-down’ and ‘bottom-up’ approaches;
- Simulating the real world;
- Being useful for complex systems or problems;
- Being situation driven, especially by common human situations;
- Satisfying pluralistic outcomes;
- Being internalized by the system

(Chapman & Gant, 2007, pp. 37-38)

Summary on Design Knowledge

The removal of barriers in cultural, social, and design knowledge promotes knowledge as a moveable force that can translate from one individual to another (Bernasconi, MacDonald, & Mendoza, 2007). The connection that occurs through collaboration provides a knowledge for the larger framework of design, since many outside of the design profession have no way to gage the true ramifications of quality design verse superficial design (Sommer, 1972a**).** Therefore, to suggest that boundaries can constantly be redefined once those boundaries are dissected supports the idea that we learn through our social interactions with others since “[i]n each interaction we leave a little of ourselves with the other person and vice versa” (Bernasconi et al., 2007).

Walker further claims that our creative nature and design intelligence lacks proper representation in the realm of mass-produced design because the acceptance of creative thought and imagination seems to occur through a select audience that has already invested in understanding the design community (Walker, 2006). Individuals who aren't naturally wired for the arts and other creative processes are challenged to value the nature of intellect that is represented in good design (Walker, 2006).

Therefore, it is important for designers to fully engage in their own theoretical process in order to produce products that will connect with the end-user and allow them to fully understand the intent of the designer. Once a designer understands his or her own intent, he or she can then properly translate this intent to another individual. The exploration of *mediating artifacts* is an asset to the education of design students for future practice and establishes an *experience economy* for students. The act of play during the design process then contributes to the learning attributes of design students and their future design practices (Milligan & Rogers, 2006).

CHAPTER III

METHODS & METHODOLOGY

I used a synthesis of creative design processes to create interior products for the communal dinning experience. I was inspired to design these interior products based on the lack of social interaction among the diverse residential population found in mixed income housing (Baxter et al., 2008; Cross, 2001; Rhodes, 1998). Addressing the social interactions of *strokes* (opportunities to affirm our position with a larger social group) and *growth* (interactions that harvest new cultural understanding) in mixed income residences provided parameters for the functionality of these interior products.

As the designer of this thesis, I operated as the author of my own creative design process and documented the new knowledge that I gained during this design investigation. The acknowledgement and documentation of my own reflective moments as I assess various design ideas and solutions is referred to as the designer's black box and provides an assessment of design decisions that may seem inherent or non-rational to those not involved in the design process (Cowdroy & Williams, 2007; Cross, 2001; Goldschmidt, 2003). I gained new knowledge through exploring various methods of making in order to achieve the aesthetic and functional qualities that I desired. In addition to the standard design practices of hand sketching, precedent studies, informal critiques, and conceptual models, my knowledge of current social interaction issues in urban residential communities guided my approach to combine functionality, aesthetics, and the method of making into a series of final products. This synthesized creative design process allowed me to explore and re-establish the aesthetic quality of non-traditional serving vessels.

Method: Fall 2009 Studio Formal Critiques

The formal critiques for this studio investigation included an initial theory presentation, midterm critiques, and a final formal critique at the conclusion of the semester. The initial theory presentation focuses on presenting a physiological approach to the studio investigation. It was during this presentation that I presented information pertaining to the emotional connection of objects, the selection of mainstream products available to underserved populations, social design projects, and the growing popularity of mixed income developments. This presentation was well received by the studio professor, however I was challenged to provide a connection between a studio project and the theoretical framework. During the midterm critique, I proposed that communities and social interactions could be strengthen by gathering individuals to a central object; a cooking utensil versus the central location of the built environment. Although, this concept was well received, the models I developed made of Bristol paper and aluminum sheathing were considered crude and unsuccessful. This failed attempt led me to seek alternative modeling techniques with various metals. Final prototypes of sixteen-gauge carbon steel were produced for the final critique. The final prototypes were well received based on their aesthetic value despite some functionality issues. The main challenge with the final critique was my method for presenting the final prototypes. I had to address this challenge repetitively throughout this design investigation because I often find it difficult to adequately provide a visual represent of three-dimensional models in a digital format. The design ideas and modeling techniques that occurred at the interim of these critiques is further described in the following sections, Method: Design Process I Fall 2009 Studio and Prototype Process I Traditional Sheet Metal Forming.

Method: Design Process I Fall 2009 Studio

The *applied action* of the design process refers to utilizing the designer's *reflective evidence* to improve each idea as the designer progresses to a finalized design solution (Swann, 2002). As the author of this design thesis, I was constantly engaged in the application of new ideas and concepts during the design process in order to inform myself of alternative design possibilities.

Challenges

Design is not a linear progression, but a synergy of ideas and informative discoveries. My design ideas and discoveries are infused in the final design solution as I formulated ideas through the process of completing precedent analyses, process sketches, conceptual models, sketch models, and prototypes. These processes created the synthesis of ideas that help me, as the designer assess the previous and forthcoming ideas. The design process is essentially an informative process that occurs in the midst of the active application of my design practices. As a result, my primary challenge during this design thesis was creating my own methodology specific to my design process, versus forcing my design process to fit into a ready-made template of methods. However, creating my own methodology afforded me the opportunity to document a new knowledge base for further research of design methods and practices. This documentation captured the methods of making in addition to pivotal ideas from designer's reflective moments otherwise known as the designer's *black box,* and further solidifies the rational of the designer's ideas.

Design Parameters

The parameters of this thesis guided my design decisions. Since my intent was to design primarily for the human-to-human relationship and the human-to-object relationship, I chose for my design decisions to be influenced by the ideals and characteristics expressed in the work of design theorists, such as Norman, Walker, and Chapman. I concluded that the social interactions within the kitchen provided the greatest opportunities for growth between neighboring residents and the theoretical framework further inspired the development of refined interior objects for these moments of social interactions.

Initially, I considered designing a table that expanded to accommodate different seating configurations as individuals interacted with each other during a meal. After the discourse with fellow design students and studio professors, I considered the action of preparing and consuming meals together as a form of interaction as the focal point for this studio investigation. I then decided to focus on designing non-traditional cookware and serving vessels for the communal dinning experience.

I used parameters such as material selection, formation of objects, the balance between aesthetic quality and function dictated my design decisions. These parameters were established through: precedent studies, a generative design process of sketches, and various modeling techniques, the qualification and refinement of ideas, and final prototype fabrication. These parameters were further tested and justified through various methods of making such as: origami inspired conceptual paper folds, cold forming, metal casting, heat forming, and additional industrial fabrication methods.

Precedent Studies

A precedent study is the comparison of previous design projects with similar challenges or parameters of a current design project. I focused on various precedents of cookware products and other interior products in order to understand previous design choices of the current design market (Brooker & Northey, 2008; Dahlman, 2007). I reviewed products shown in periodicals, showroom displays, and communicated with a commercial chef to access product dimensions, functionality, interior and exterior materials, exterior finishes and treatments, aesthetic and craft quality, social implications of a product, and methods for visually representing design ideas. I recorded this knowledge primarily through hand written documentation and email correspondences.

Fall 2009 Studio Precedents

Williams - Sonoma Cookware
Image Credits: http://www.williams-sonoma.com/

Side by Side Interior Products
Image Credits: http://www.metropolismag.com/story/20081015/helping-hands

Cookware retailed through Hispanic food markets
Image Credit: imusausa.com; janeltorkington.com; hispanic-culture-online.com

Traditional Asian cookware
Image Credit: atlantafixture.com; http://focuscamera.com/product.asp?id=964736477; www.templeofthai.com;

Commercial grade cookware
Image Credit: consiglioskitchenware.com; http://www.thisnext.com/tag/commercial-grade-soup-ladle/; http://www.etundra.com/Pasta_Baskets_And_Pasta_Cookers-C848.html

Dinnerware and Tableware designed by Eva Ziesel
Image Credit: http://s10.thisnext.com/media/largest_dimension/1229AEAC.jpg; http://www.apartmenttherapy.com/la/dining-room/classic-tableware-eva-zeisels-century-collection-069894; www.stroedaily.com

Ikea Cookware and Dinnerware
Image Credits: www.Ikea.com

Main Image Search: http://www.google.com/imghp

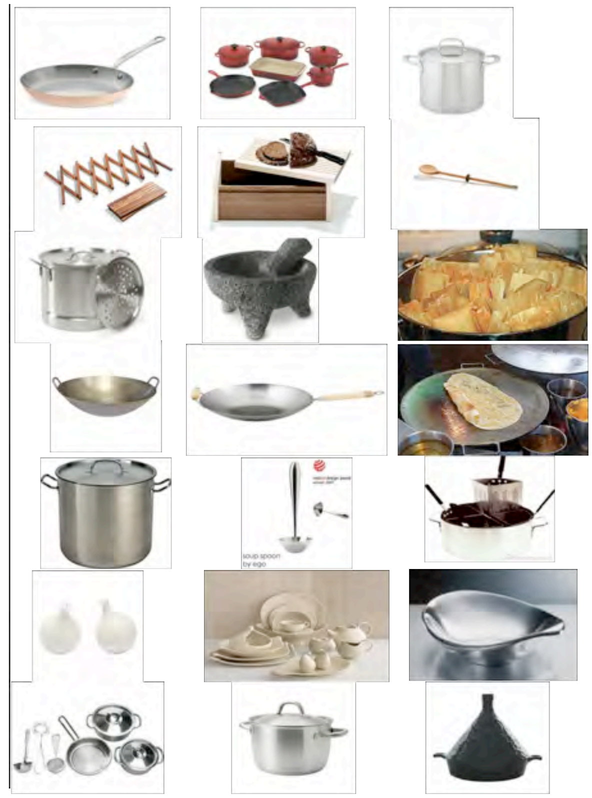

Table 2. Fall 2009 Studio Precedents.

Generative Process

The generative process in the context of this design thesis was used to produce and then re-interpret a continuous flow of ideas. Again, the design process was not a pre-planned event, but a process that informs a designer of multiple ways to re-evaluate ideas and then build upon those ideas through reflexive thought processes (Baxter et al., 2008).

Process Sketches

The act of sketching (a foundational form of visual expression) produced quick non-precise drawings to capture my ideas and design concepts. The ideas and concepts that I sketched as visual information assisted the generative and reflective process of new ideas during my design project and provided an efficient way for me to visually record my design ideas and thoughts. The *back talk* associated with sketching generated new conceptual ideas for non-traditional interior products (Goldschmidt, 2003). I sketched a series of ideas and wrote notes about each idea to record the back talk on trace paper, which allowed me to overlap continuous ideas on paper (See Figures 1 and 2).

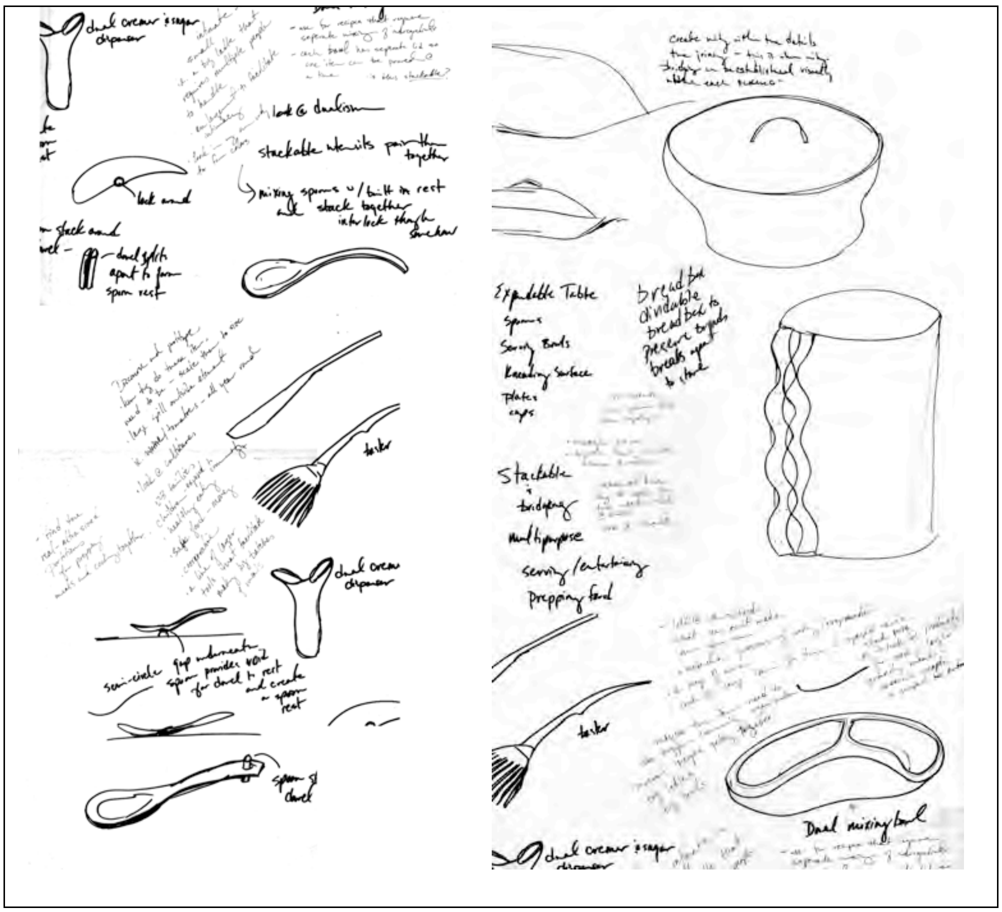

Figure 1: Fall 2009 Studio Sketches, Cookware Product Ideas.

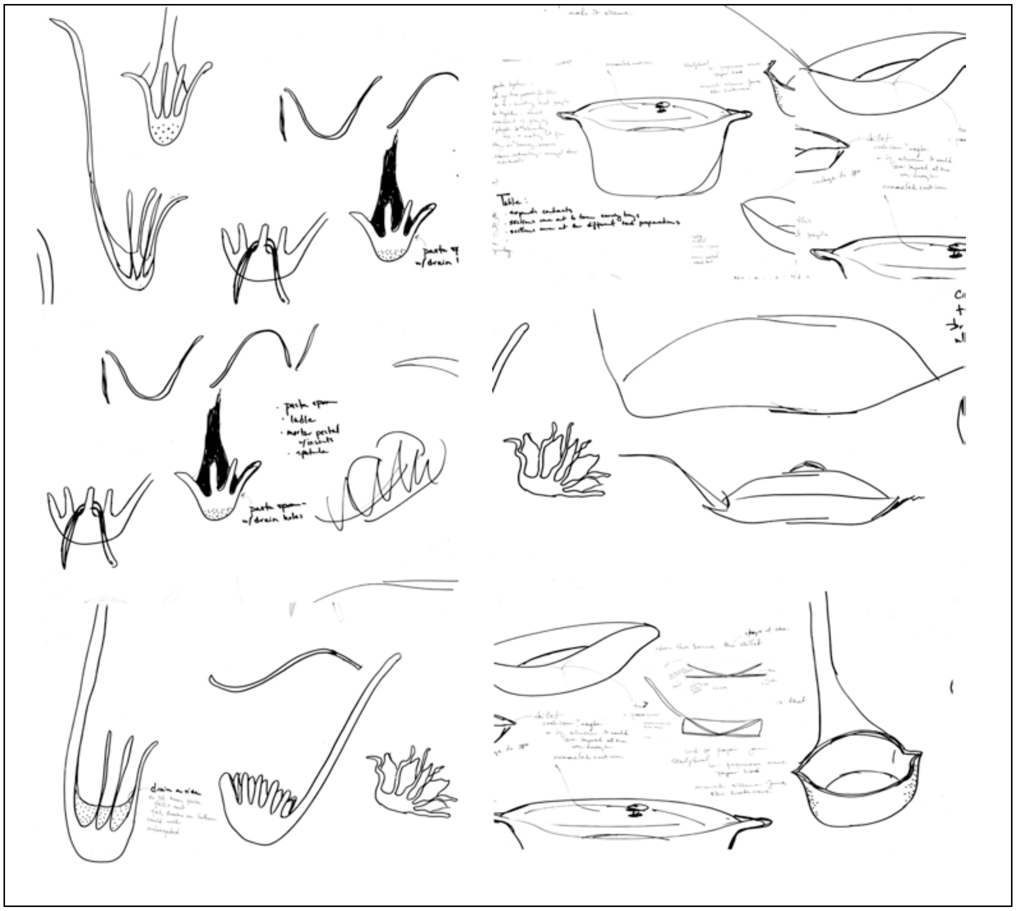

Figure 2: 2009 Fall Studio Sketches, Ladles, Skillets, Stock Pots.

As I re-drew a particular item, a new idea would generate from the previous drawing. However, the sketches did not provide enough adequate information regarding the prototyping and fabrication of each idea.

Sketch Modeling

I created several physical sketch models to express my conceptual exploration in three-dimensional form while addressing the preliminary issues of functionality of each product idea. I initially created three-dimensional models to explore the reality of my design ideas through various mediums consisting of paper, aluminum flashing, and clay. However, the lack of material knowledge hindered my efforts to convey my ideas to other students and professors. At this point in the design process my ideas focused on creating cookware pieces large enough for multiple people to gather around and actively engage in creating meals together. Although, the design idea was not fully conveyed through these particular models (See Figure 3), it did lead me to consider designing these products though the manipulation of folding multiple planes within a single sheet form.

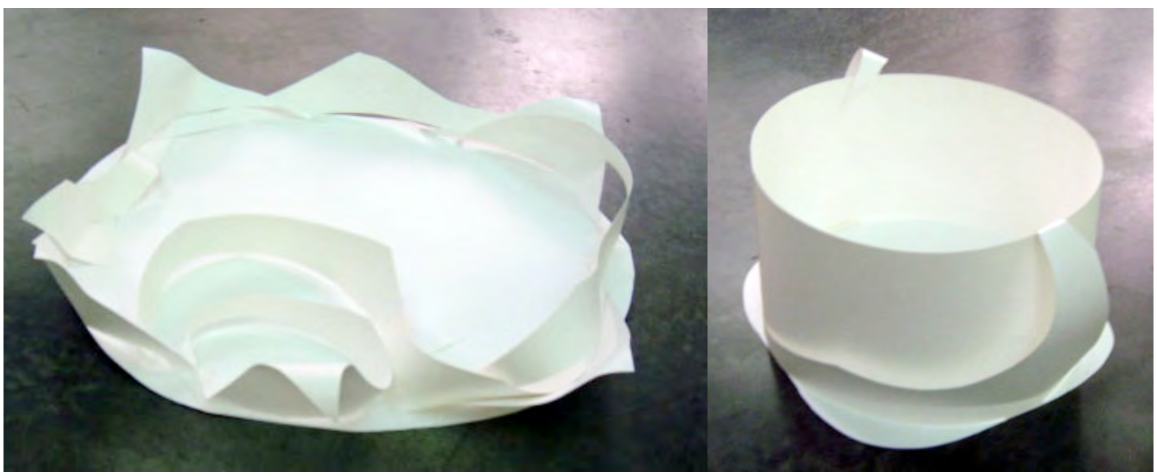

Figure 3: 2009 Fall Studio Conceptual models made of Bristol paper.

Conceptual Modeling

I explored design opportunities through a conceptual modeling technique as I folded small square sheets of paper, as suggested by my studio professor. This approach introduced new ideas and facilitated the aesthetic exploration of potential non-traditional cookware forms. The challenge with this approach is that the ideas may override the function, form, material content, and marketability of the design. Therefore, the actual production or reality of a design can be limited in the conceptual design approach (Marshall, with Micheal Erlhoff, n.d.). However, for the purpose of this design investigation, my primary goal was to develop conceptual forms that I could then further construct into practical scale models.

During this stage of conceptual modeling, I generated 80 different forms from folded 16” x 16” square Bristol paper at a 3” scale (See Figure 4). I chose a 3” scale of 16” x 16” based on the skillet dimensions noted in the William Sonoma cookware specifications. Each folded sheet was generated from the previous one as an informative process. This process inspired me to develop the variations of *Origami*-inspired forms into simplified designs for non-traditional cookware.

Figure 4: 2009 Fall Studio, 16" by 16" Bristol paper folded at 3" scale.

After the completion of eighty forms, I selected three forms to evaluate and develop into full-scale prototypes based on my personal assessment and discourse with other design students and professors. This selection occurred as I began to identify potential cookware pieces or utensils within various forms (See Figure 5).

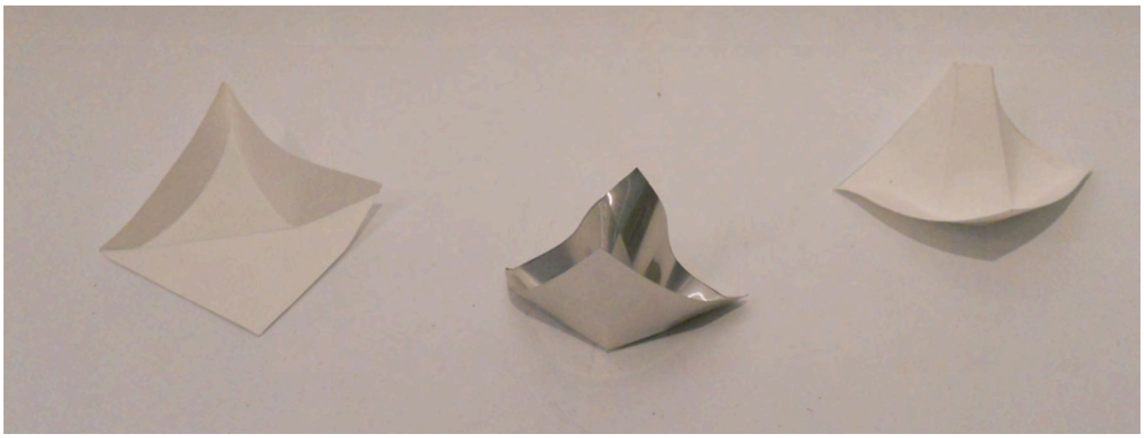

Figure 5: Three Selected Bristol paper and aluminum models**.**

Scale Model

Creating scale models further conveyed my design ideas to other design students and design professors. Additionally, the three-dimensional models aided my visual evaluation of various design options. In preparation of the modeling process, I considered aluminum flashing and copper as design mediums for the final prototype models and initially created a plywood mold to hammer the cooper or aluminum into the replicated shape of a ladle. I did not use this mold for the final prototypes; however, it was used as an informative tool for the assessment of further material manipulation. Additionally, I explored copper by heating it with a torch and bending it in multiple directions in an attempt to replicate the conceptual paper model of a ladle (See Figure 6).

These explorations eventually led to working with 16 gauge sheets of steel, suggested by the Art Department's foundry technician (See Figure 7).

Figure 6: Copper Heated with a torch and bent.

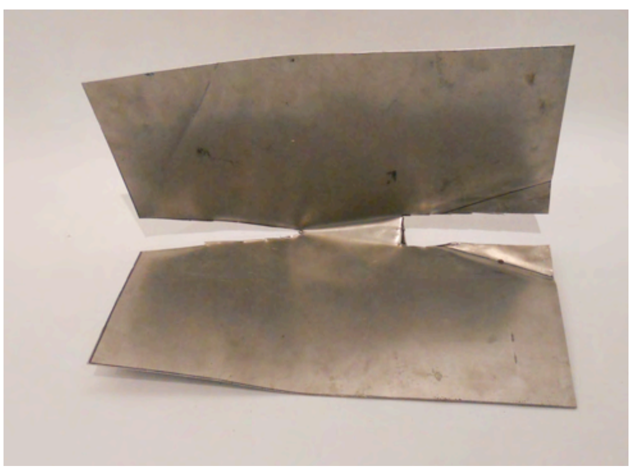

Figure 7: 16-Gauge Carbon Steel Sheet Metal.

Qualification of Product

The qualification of design ideas was subjective. Yet, based on the discourse with other design students and studio professors I narrowed the selected items for scale modeling and prototyping to three specific forms (See Figure 8). I produced the first set of scale models through a pre-determined technique of cutting a single slit on two opposing ends and breaking the sides of a triangle down at a ninety degree angle (breaking in this instance refers to a fold or bend) (See Figure 9).

Figure 8: 2009 Fall Studio, Full-scale model of ladle in bristol paper medium.

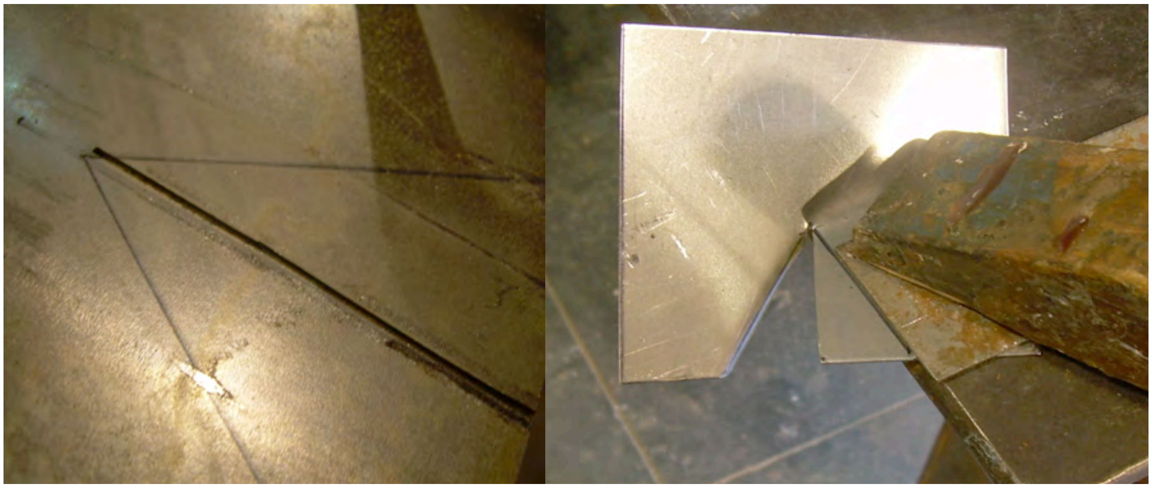

Figure 9: Cutting and breaking sheet metal.

As I bought the sides together at the center of the slit, the sheet metal formed a curvature shape, and the center was welded together to seal the shape (welding describes the ability to heat and fuse to separate pieces of metal into one form) (See Figure 10).

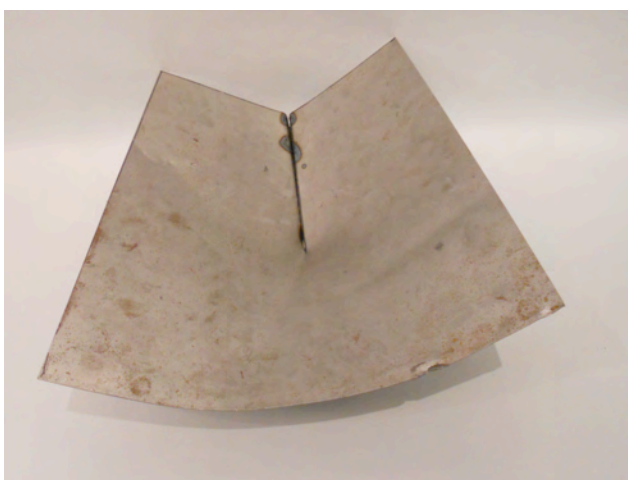

Figure 10: Clamped and welded sheet metal.

After the completion of the first scale model, I repeated the same technique and allowed the functionality of the form to inform me of how each modeled object could be used as a cookware utensil. Once I was able to identify a particular utensil, I then generated new ideas from conversations with design students and professors regarding each object. These conversations occurred in no particular order or formal setting; they occurred in the midst of creating several variations of sketch models (See Figure 11). Documentation of the feedback from students and professors occurred primarily in hand-written or sketched format during this process.

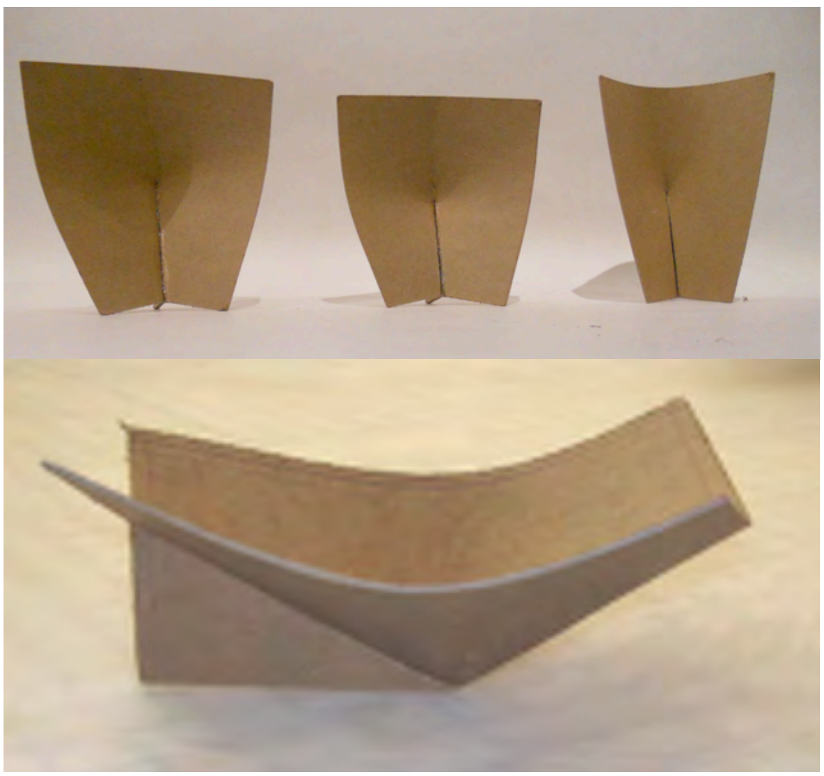

Figure 11: Chipboard Sketch models of scoop form.

Refinement of Product Selection

Once I narrowed the initial design selections for prototyping, I began refining the aesthetic design of each product. At this point I also transitioned back to making half-scale models using both the sheet metal and chipboard interchangeably with the same technique of cutting slits and breaking the sheets of steel or chipboard. I used half-scale models to quickly explore various dimensions and scale options to refine my initial forms and the final curvature of each object (See Figure 12). As I continued to create multiple variations of the selected products at half-scale, I began building wooden handles and stands (See Figures 13 and14).

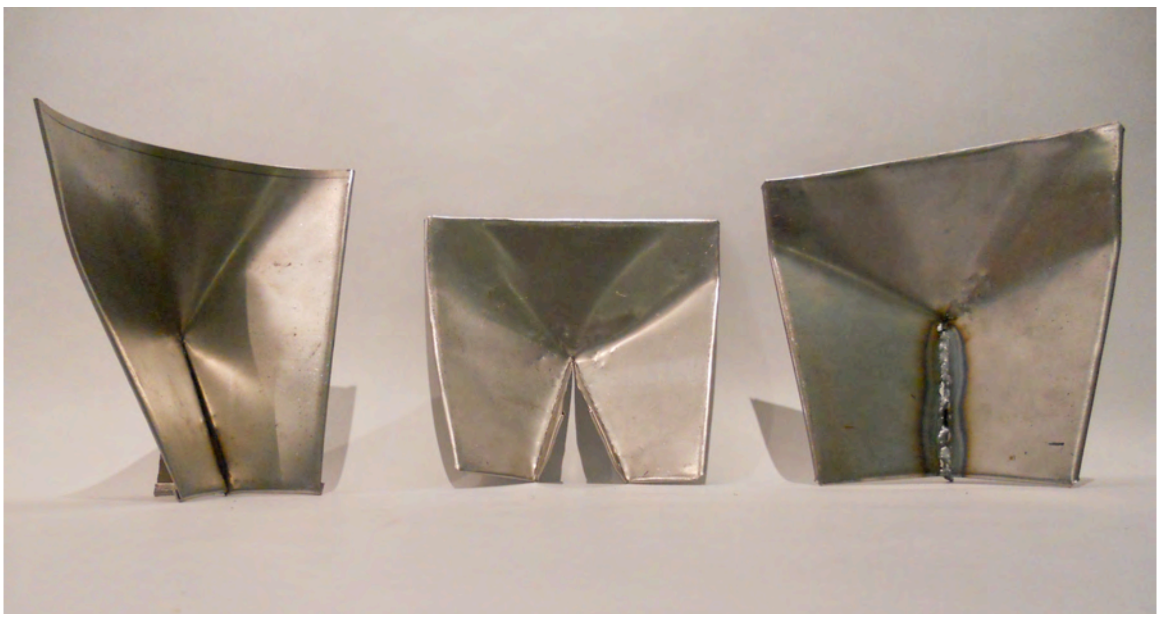

Figure 12: 2009 Fall Studio, half scale steel models of cooking base / scoop form.

Figure 13: Various wooden handles for serving dish.

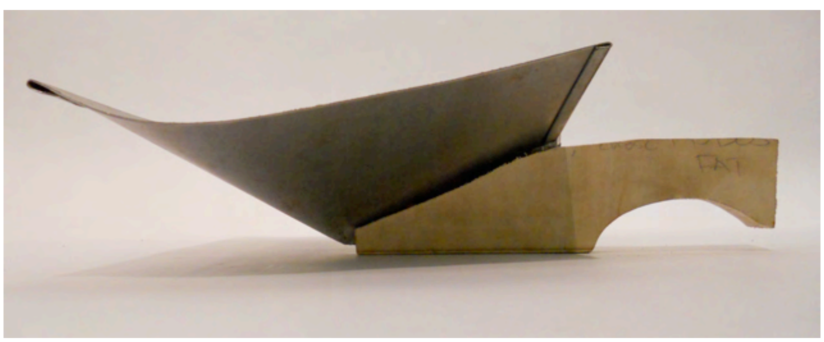

Figure 14: Half-scale cooking base with wooden handle.

During this process I decided that the most suitable handle for the cooking utensil should be made of sheet metal and the stand for the serving dish should be made of Brazilian Walnut. The handle was formed form a rectangular steel sheet that matched the width of the cooking base. The design of the handle also included a single slit and breaking the adjacent angles down at a ninety degree (See Figure 15).

Figure 15: Half scale steel cooking base and handle.

Exploring possible design ideas in half and full-scale chipboard models also allowed me to efficiently test various sheet, slit, and angle dimensions. Since the chipboard was approximately 1/16" in thickness, it possessed similar behavioral characteristics of the twenty-gauge steel and was used to quickly eliminate un-proportioned dimensions. These explorations were completed prior to re-creating additional full scale models in sheet metal.

Final Prototype Construction

To conclude my 2009 Fall Studio, I prototyped my final design selections in full scale twenty gauge steel sheet metal, as a three-dimensional representation of my design ideas (Erlhoff and Marshall 2008). The prototypes included: a cooking utensil, a serving dish, and two food scoops (See Figures 16, 17, and 18). With the exception of the cooking utensil, each of these prototypes were fabricated from one single square sheet of twenty gauge steel.

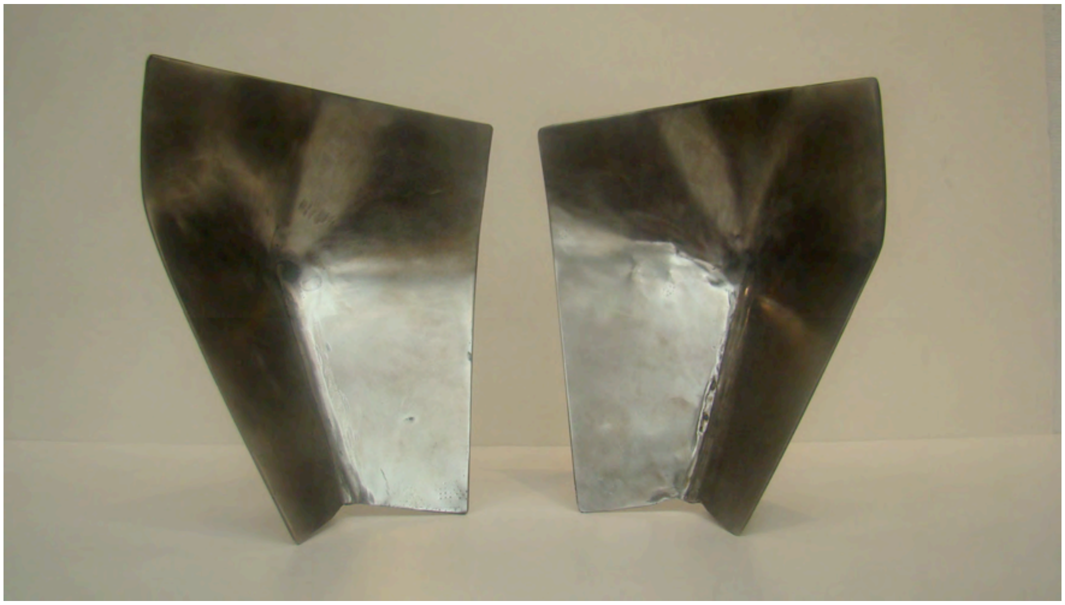

Figure 16: 2009 Fall Prototypes, Food Scoops. (Measures: 7.5 x 7.5 inches
Medium: Steel)

Figure 17: 2009 Fall Studio Prototype, Serving Dish. (Measures: 16 x 16 inches
Mediums: Steel and Brazilian Walnut)

Figure 18: 2009 Fall Studio Prototype of Cooking Utensil.

Fall 2009 Studio - Final Variances

	Food Scoops	Cooking Utensil Base	Cooking Utensil Handle	Serving Dish
Sheet Metal Dimensions	7.5 x 7.5 inches	12 x 12 inches	10 x 18 inches	16 x 16 inches
Length of slits	3.5 inches	5.25 inches	5.25 inches	6 inches on either side
Width from the slit at either side in order to form angled bends	1.75 inches	2.25 inches	1.25 inches	2 inches
Merging the folded angles together to create a bowl shaped form	One side only	One side only	One side only	Two opposite sides
Welding the seam of the folded angles to form a tight bond while the curvature shape is clasped down	Required	Riveted to Cooking Utensil Handle	Riveted to Cooking Utensil Base	Required
Grinding the welded seams to develop a smooth transition between the metal folds.	Required	Riveted to Cooking Utensil Handle	Riveted to Cooking Utensil Base	Required
Filing the square edges of the sheet metal to remove any harsh or harmful edges	Required	Required	Required	Required
Sandblasting each piece	Sandblasted and polished	Sandblasted	Sandblasted	Sandblasted and polished

Table 3. Fall 2009 Studio - Final Variances.

Prototype Process I: Traditional Sheet Metal Forming

The final Fall 2009 Studio prototypes were fabricated using traditional metal forming techniques otherwise known as cold bending techniques. Specifically, these techniques included the use of equipment such as electric cutting shears, a jigsaw, and a standard MIG welder. Industrial mass-production methods may involve the use of similar electrical hand tools, however a larger portion of the work is completed by the use of machine operated equipment. During this process of traditional cold bending, cutting slits and breaking the metal were completed by hand or with the use of hand tools versus the use of a water jet cutter and industrial foundry break.

Challenges

The main challenge in designing these types of utilitarian objects from sheet metal was balancing the functionality and aesthetic design against the material's limitations. Additionally, there was a large learning curve involved in the fabrication of these prototypes. For example welding thin sheets of clamped twenty-gauge steel was problematic due to the high possibly of burning a hole through the sheet metal or warping the sheet metal. Additionally, the selection of carbon steel as a prototyping material required additional finishing techniques in order to simulate the appearance of stainless steel.

Measuring Sheet Metal

During this initial step I transferred the dimensions from the finalized chipboard sketch models onto a thirty-six by forty-two inch sheet of sixteen-gauge carbon steel.

Cutting Sheet Metal

Once the measurements were transferred to the sheet metal, I cut the sheet down into individual sections using an electric shear (See Figure 19). The center slits for each piece were cut using a jigsaw, since these slits were no longer than half the length of the overall dimensions. While using the jigsaw, the sheet metal was clamped on top of a wood board and a metal table. Clamping the sheet metal to the wood helped to absorb the sheet metal's vibration caused using the jigsaw (See Figure 20).

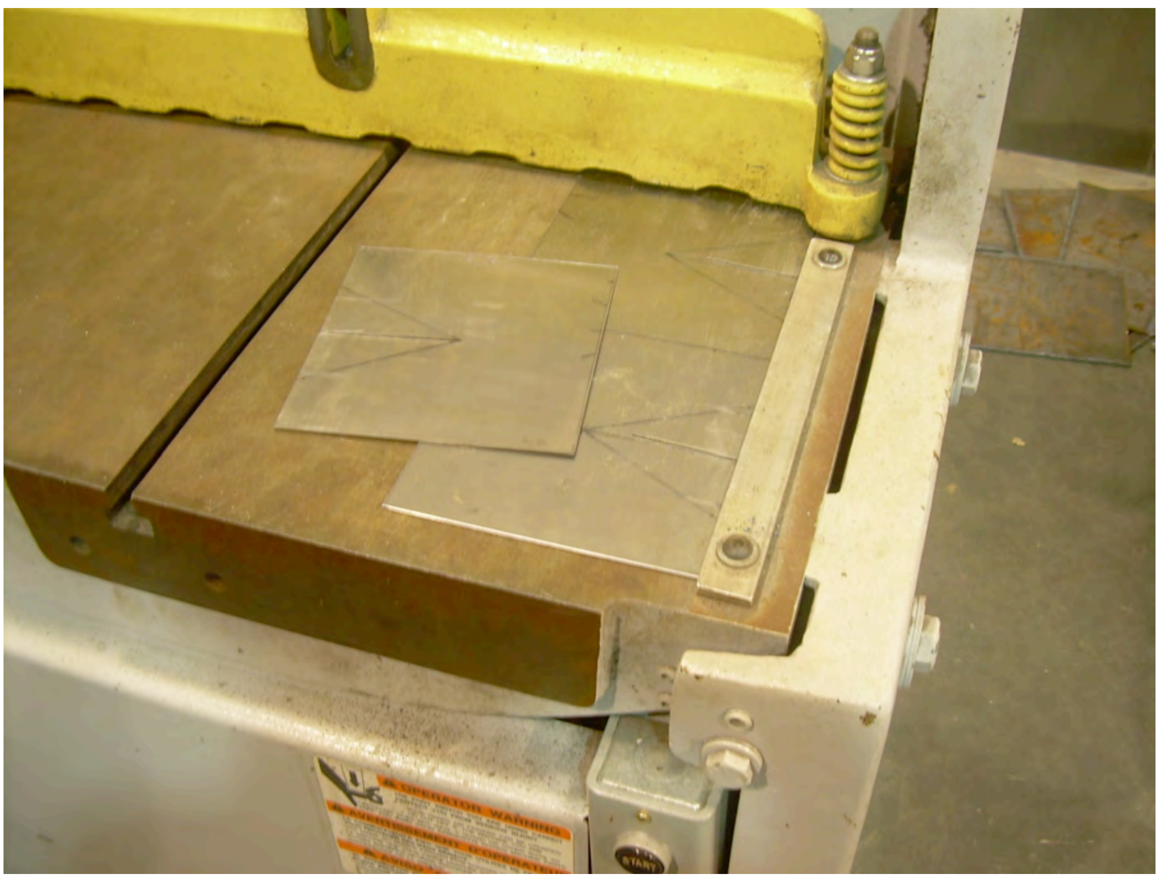

Figure 19: Cutting sheet metal with electric shear.

Figure 20: Cutting sheet metal clamped to wood with a jigsaw.

Bending the Sheet Metal

Once all the necessary slits were cut, I clamped each piece against the straight edge of a wax table along the break line of the piece. To apply the break on either side of the slit, I hammered the straight end of a rectangular piece of cherry wood against the break line of each piece (See figure 21).

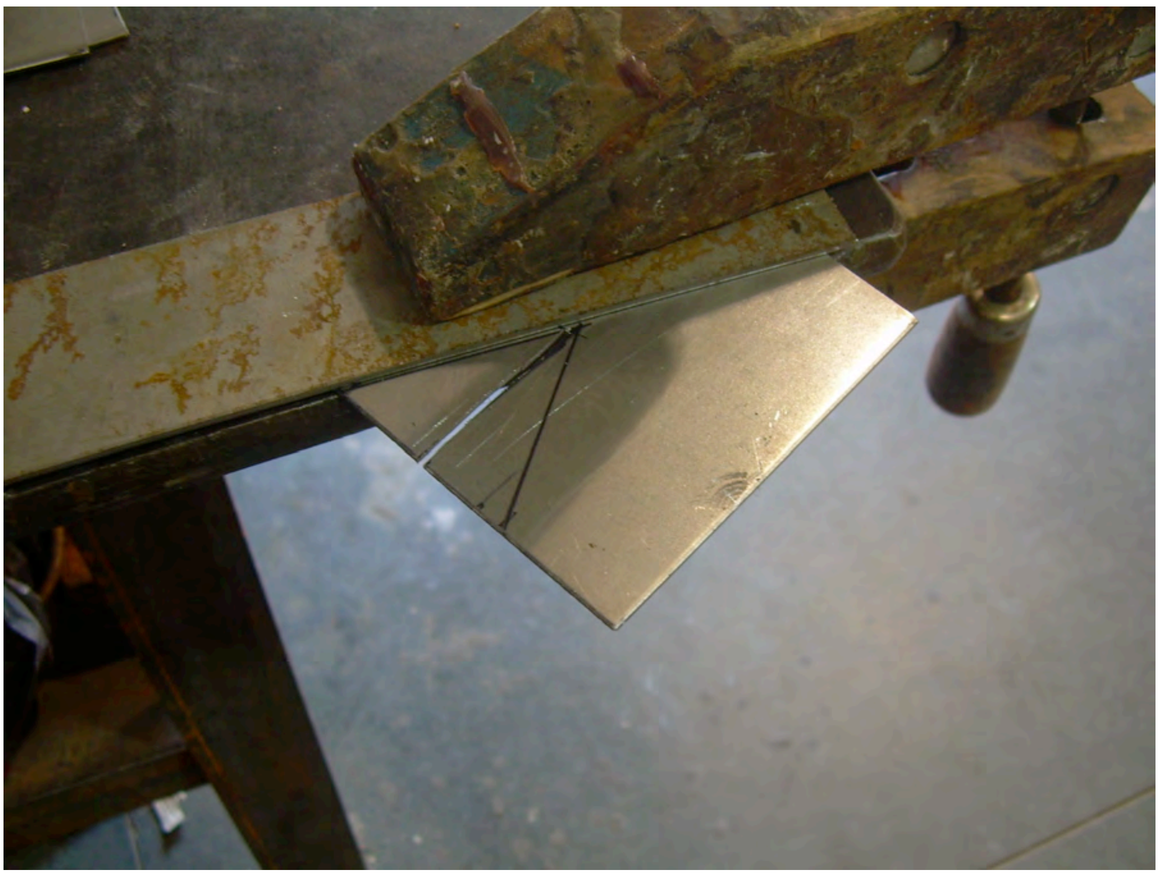

Figure 21:Clamping and bending sheet metal by hand.

Clamping and Welding Sheet Metal

Prior to the final fabrication, I completed various practice welds. However, due to the lack of precision in my welding technique, the foundry technician assisted in welding the final prototypes. Each piece was clamped separately using portable metal vice clamps. The MIG welder was also set to relatively low voltage and speed during the welding process. The voltage of the weld refers to the temperature of the weld while the speed refers to how fast the welding wire is released to bond separate sheets of metal (See Figure 22).

Figure 22: Welding sheet metal.

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Finishing Work

Once each piece was welded, I proceeded to grind down the weld bead with the edge of an angle grinder. Once the weld bead was ground down to a level surface, I sand blasted the entire piece and filed the corners to a slight radius. I then polished the surface of each piece with metal finishing discs to stimulate the appearance of stainless steel (See Figure 23).

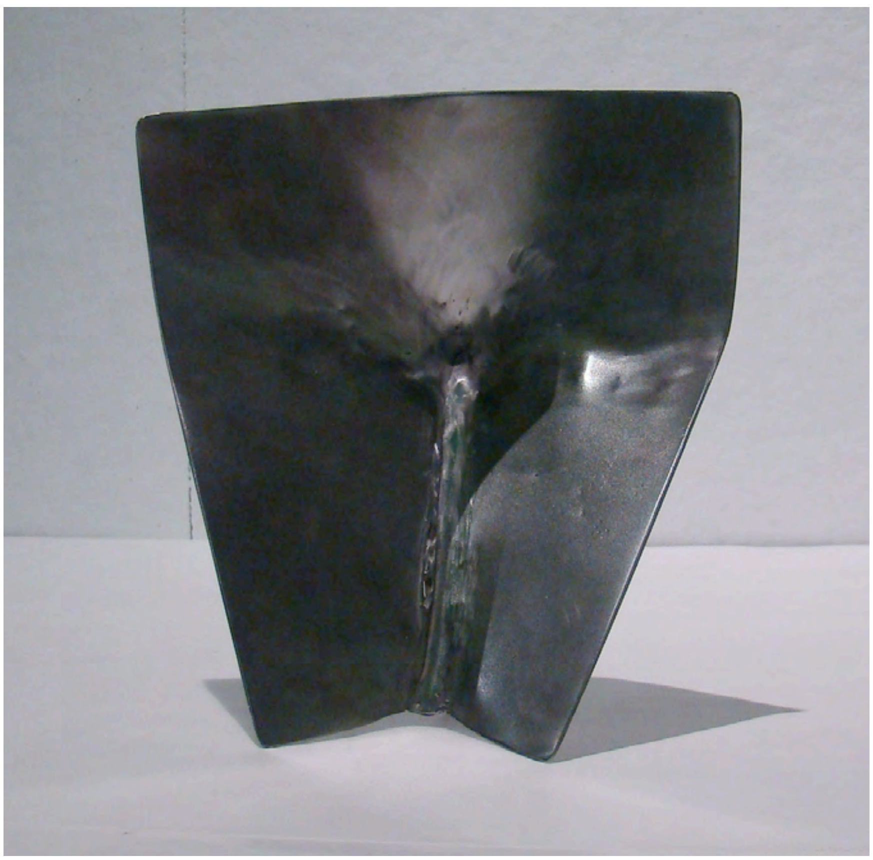


Figure 23: Sandblasted and then polished Scoop.

Prototype Process II: Lost Wax Metal Casting Studio

The traditional technique of lost wax metal casting involves melting aluminum, bronze, iron, or precious metals such a silver or gold into a molten form and pouring it into a hollow mold. These hollow molds are created from a wax model and made of a fire-able material, such as silica sand block molds. The hollow cavity within the mold is created once the wax melts and drains out of the mold during a klin firing process. Molten metal is poured into the cavity through a sprue and vent system and solidifies into the shape of the original mold.

Challenges

My current level of experience in wax working was the primary challenge with using this technique as a craft method for prototyping my design ideas. For example, molding the wax was often difficult for me since it hardens within a few minutes of being poured. However, once I learned the proper tools for sculpting wax and the order in which to use them, the difficulty lessened. This learning process occurred with advice from the foundry technician while I audited a metal casting class during the spring semester. The time invested in the evenings and during the metal casting course provided me with the knowledge of how to work effectively and efficiently with the wax and metal mediums.

Conceptual Models

I produced chipboard replicas of the prototyped food scoops at dimensions of 7.5 x 7.5”, 5 x 5”, 4.75 x 4.75”, and 3 x 3” in order to convey my design ideas to the foundry technician and professor. Once he became familiar with the ideas, he was able to direct me towards the best method of modeling these forms in a wax medium (See Figure 24).

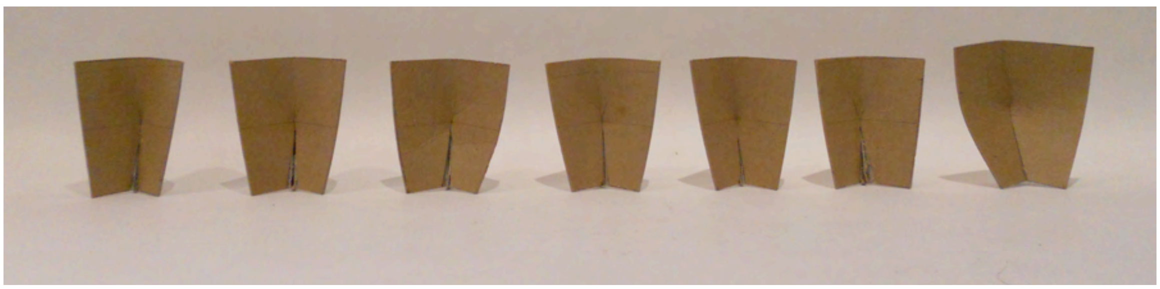


Figure 24: Chipboard models.

Wax Replicas

Under the direction of the foundry technician I poured wax into plaster sheet molds to create a smooth sheet of wax that I then molded into replicas of the various chipboard scoops. I molded the wax versions of the food scoops by using the same technique of cutting one slit halfway down the center of the wax sheet, breaking the angles on either side of the slit at ninety degrees, and then pulling and soldering the center together. I smoothed the texture of the wax models by applying butane and propane torches to the wax surface for a few seconds and briskly rubbing my fingers across the area. Once the unleveled areas were smoothed out, I quickly ran the butane and propane torch across the entire surface to achieve a uniform texture across the entire piece.

Preparation of Wax Molds

Once I achieved the desired surface texture, I applied a red wax rod called sprue wax at two ends of each piece. The larger rod was used as the actual sprue to pour the liquid metal, while the smaller rod was used as a vent for the excess liquid metal to exit from the interior cavity of the mold. (Note: the interior mold was previously filled in wax, which was burned out during a twenty-four hour heating process in a kiln).

Mixing Sand, Packing and Unpacking Molds

The technique of Mixing Sand involved the use of an electric sand mixer, silica sand, resin, and catalyst. This process often involved myself and four or five other individuals. Along with the other art students I poured four bags of silica sand into the sand mixer once we ensured that the sand mixer was clean and attached to the electric power supply (See Figure 25).

Figure 25: Sand Mixer, Resin, and Catalyst Containers.

After the sand was poured into the mixer we made a trench in the middle of the sand and poured liquid catalyst into the trench. We used a handful of sand to loosely cover the catalyst and after lowering the lid to the sand mixer, set the timer to mix the sand for two and a half minutes. Once the timer stopped we checked to ensure that the sand and catalyst had mixed completely and then reset the timer for three and half minutes. During the three and a half minutes, we slowly poured resin into the mixer through the vent in the top of the lid. Once the mixing was complete, we shoveled the sand into buckets and transported it over to the wooden crates surrounding the wax piece and packed the sand around each wax piece. (Each wax piece was previously placed inside a wooden crate-like box so that the sand would keep its form as it set around the wax model. The term *set* in this context refers to the process of loose sand hardening into a carve-able block of sand.) After the sand set over night for approximately seven hours, I unscrewed the wooden crates and used old grinding discs to smooth the edges of the sand blocks. I sanded the sand block edges at the end of the sprue and vents and created a trough around the top of the sprue in order to create a smooth transition for the metal to flow into the mold. The sand block was then loaded into a kiln to bake for twenty-four hours. During the time in the kiln the wax piece melted, creating a voided cavity in the sand block for the metal to be poured into.

Metal Pouring

Once the sand block baked in the kiln it was removed with welding gloves and positioned in a straight line for the metal pouring (See Figure 26). Bronze chunks were heated until they reached a melting point. At the appropriate temperature the metal was poured into the sprue and solidified in the cavity, taking the shape of the previous wax form that melted out during the time in the kiln.

Figure 26: 2010 Spring, Sand Block Molds lined up for Metal Pouring.

Breaking Molds

A hammer and chisel were used to chisel away the remaining sand from the cast bronze piece.

Finishing

General finishing techniques included cutting off the remaining sprues and vents and grinding down jagged edges of the bronze pieces in addition to sanding and polishing. (See Figure 27)

Figure 27: Cast Bronze models of scoop with removed sprues and vents.

Prototype Process III: Two Piece Metal Casting Studio

Two piece sand molds provide additional ways to cast metal objects by pouring liquid metal into two separate mold halves. Utilizing two separate halves allows the designer to capture multiple sides of the casted object during a single metal pour instead of casting several pieces separately and then connecting them together.

Challenges

Similar to casting metal from a wax mold, the primary challenge with this prototyping technique was my current level of experience with two-piece sand block molds. Again, I learned the process for creating two-piece molds while auditing a metal casting class during the 2010 spring semester. The time invested in the evenings and during the metal casting course provided me with the knowledge of how to work effectively and efficiently with various sand molds.

Scale Chipboard Models

I used full-scale chipboard replicas of the final Fall 2009 Studio prototypes in order to convey my design ideas to the foundry technician and professor. The foundry technician then directed me how to create two-piece molds for the 16 x 16 inch serving dish, the 7.5 x 7.5 inch food scoop, and a 4.5 x 9 inch serving dish. (See Figures 28 and 29).

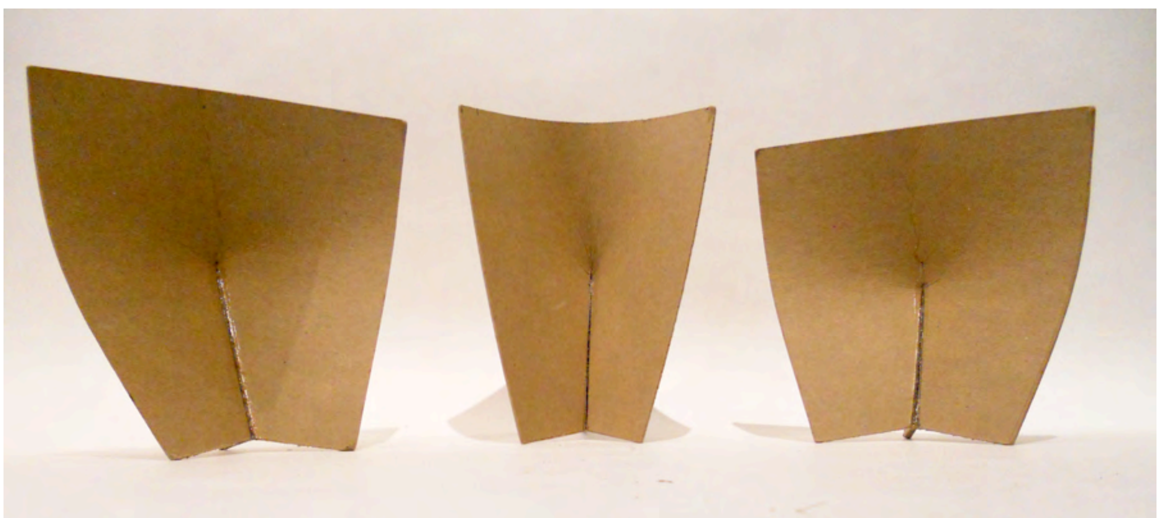


Figure 28: Chipboard model of 7.5 x 7.5 inch food scoop sketch models.

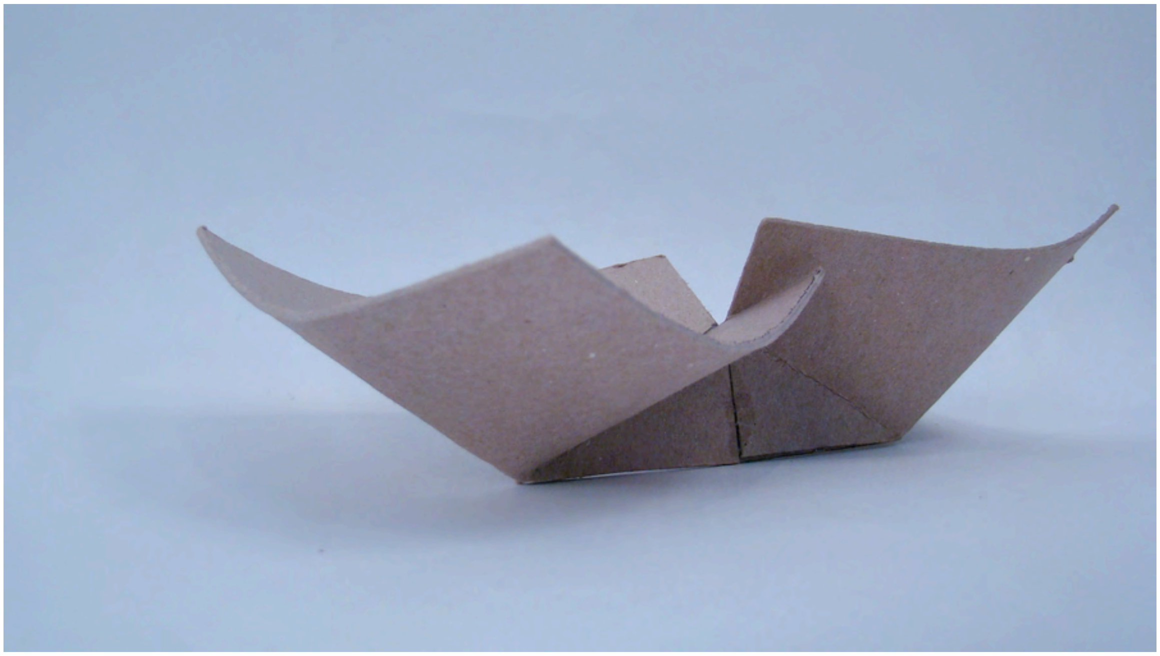


Figure 29: Chipboard sketch model of 4.5 x 9 inch serving tray.

Mixing Sand, Packing, and Unpacking Molds

As described before, sand was mixed and packed around the models to create a sand block. Prior to mixing this batch of sand for the top half of the chipboard model, I placed three inches of old sand onto the floor of the crate and placed the bottom half of the chipboard model into the loose sand. (This loose sand will not set because it was not packed during the initial hours after it was originally mixed. *Packing* in this context refers to pressing freshly mixed sand into a form so that it can set into a particular shape and the term *set* in this context refers to the process of loose silica sand hardening to form a carve-able sand block). I then packed the freshly mixed sand onto the exposed top half of the chipboard model. After the mixed silica sand set over night I unscrewed the boxes around the sand mold, flipped the mold onto its' flat side, and repeated the process to pack mixed sand onto the other half of the chipboard model.

Prior to pouring the new batch of sand I smoothed out the edges of the existing sand block where they meet the edges of the chipboard model and placed baby powder as a release agent along the exposed edges of the sand block. This was completed prior to mixing the next batch of sand because once the sand is mixed it begins to set and must immediately be packed around the object or model in order for it to set properly. I then repeated the sand mixing process and once the second half of the sand mold set over night, I removed the crates from the sand block mold and ground down the exposed edges with a grinding disc until I could see the white line of baby powder. Again, I used the baby powder as a release agent and to identify one half of the mold from the other so that I could pull the two-piece sand block mold apart without breaking it and retrieve the chipboard model (See Figures 30, 31, and 32).

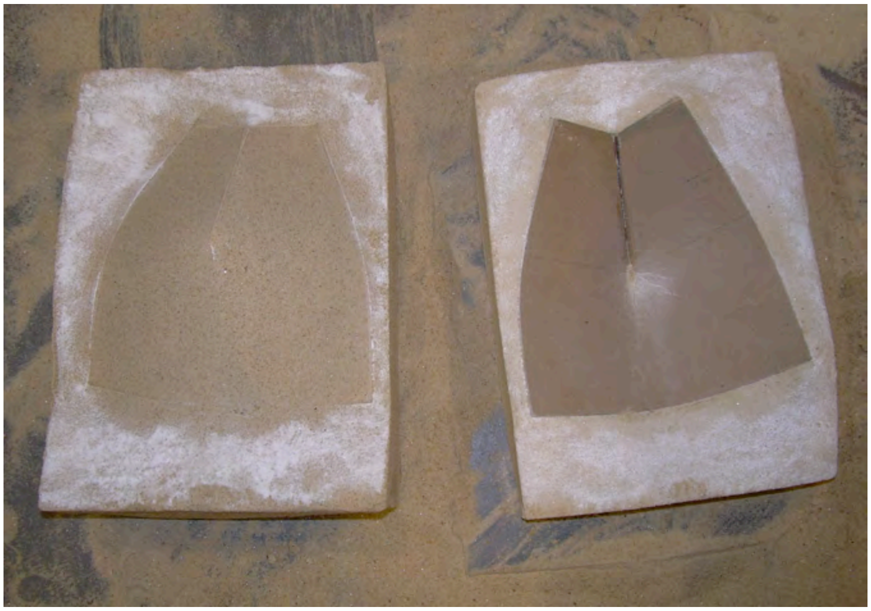


Figure 30: Chipboard model of food scoop in bottom half of the sand block.

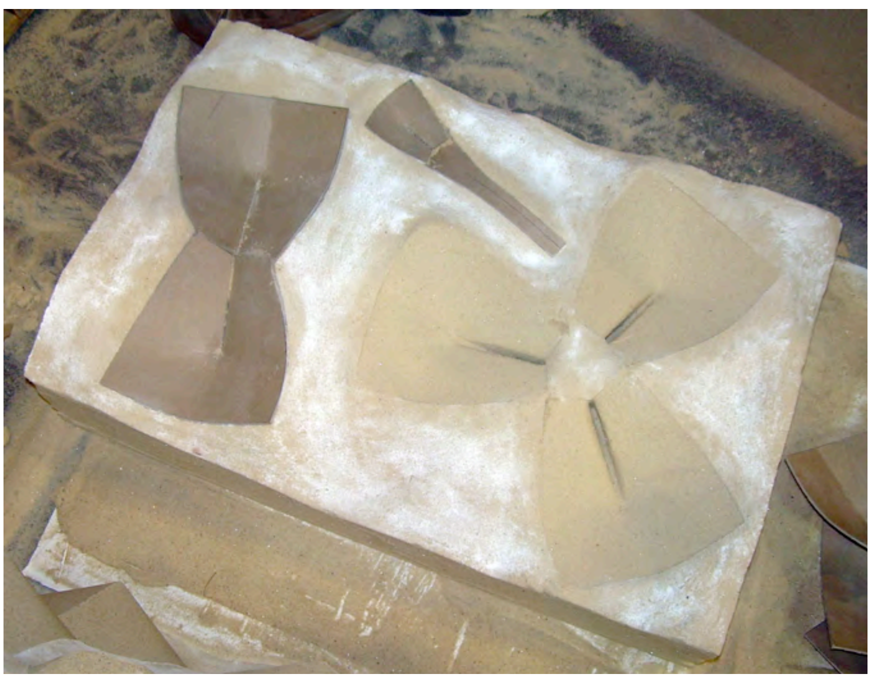


Figure 31: Chipboard models of serving tray and spoon.
(Nested in the bottom half of the sand block).

Figure 32: Chipboard models removed from bottom half of two-piece mold.

Once I released the chipboard model from the mold, I then smoothed out any visible imperfections and dents in the mold in order to achieve a smooth form for the melted aluminum and iron to be poured into (See Figure 33).

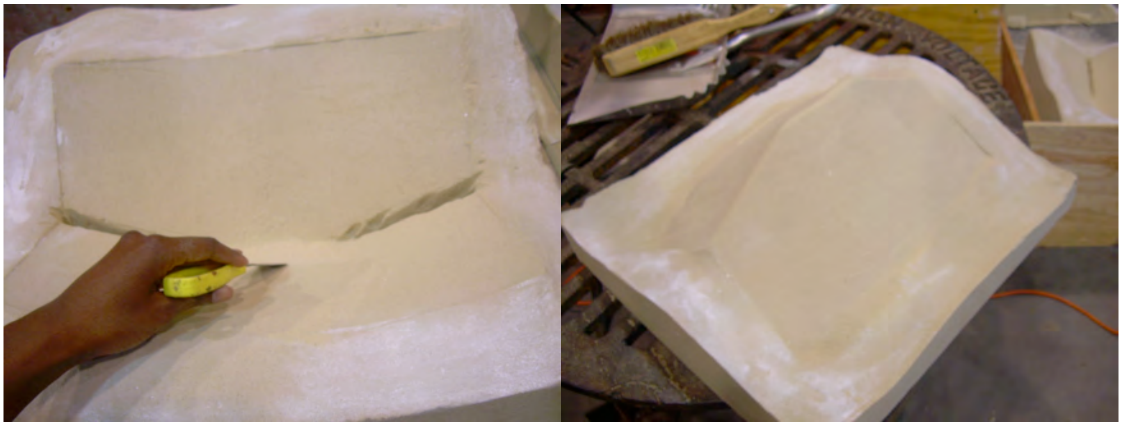


Figure 33: Jagged edges smoothed with a putty knife. This was done after the chipboard models were removed.

I then used a hammer drill to make holes in the center and other various high points in the top half of the sand mold. (See Figure 34)

Figure 34: Drilling holes into the top half of the sand block using a hammer drill.

Once this was completed I glued the top and bottom half of the sand block mold together and also attached sand cups at the top to create a sprue for the metal to be poured into. (See Figure 35)

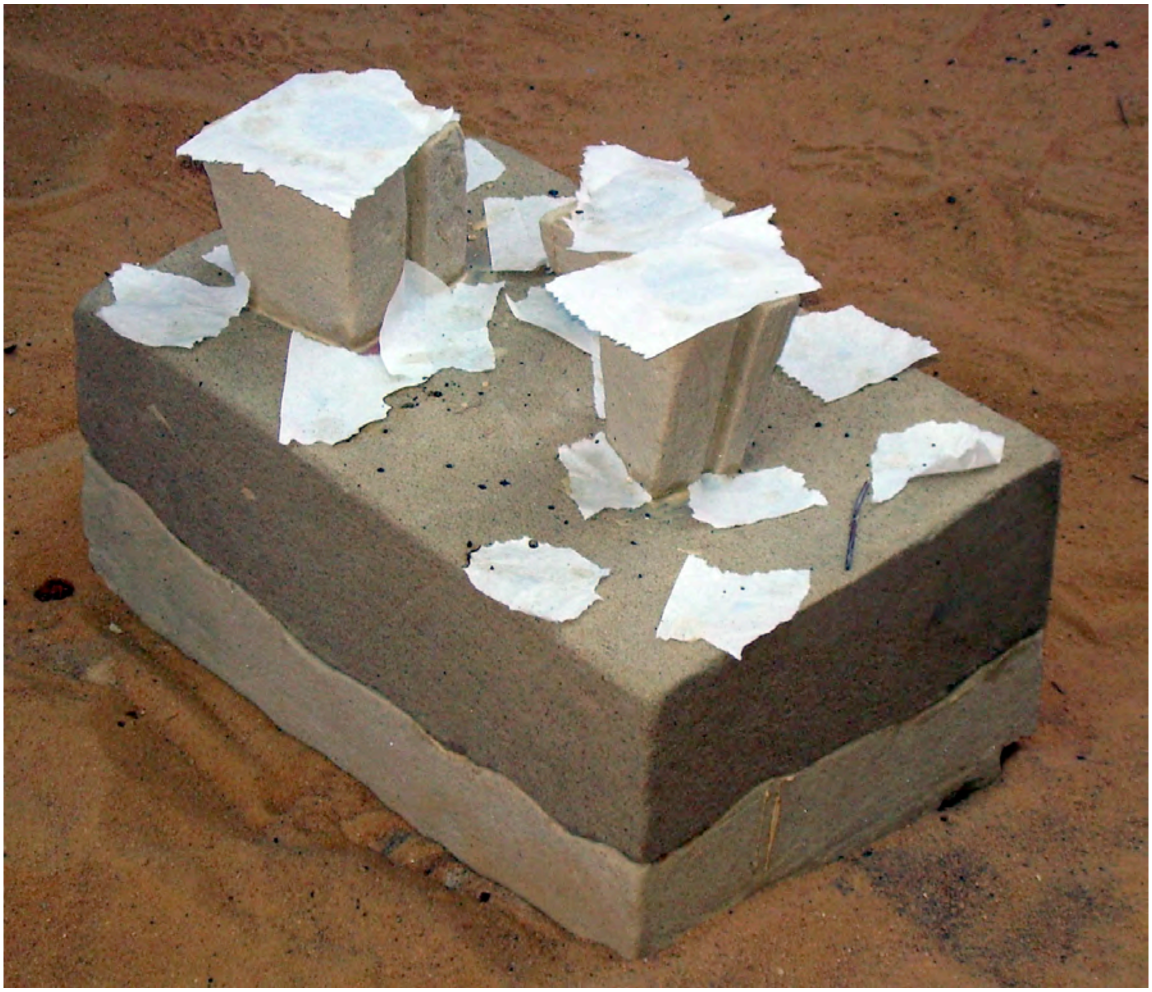


Figure 35: Two piece sand block mold glued together with sand cups. (Note: paper towels are placed on top of the cups to keep debris from entering inside the mold.

Metal Pouring

Aluminum and iron were heated to the melting point and poured into two piece sand molds. As the metal cooled inside the mold, it solidified and took the shape of the voided cavity within the sand block mold. (See Figures 36 and 37) (Note: The voided cavity was formed from the removal of the chipboard models once the mixed sand had set and hardened around the model for a period of at least 7 hours.)

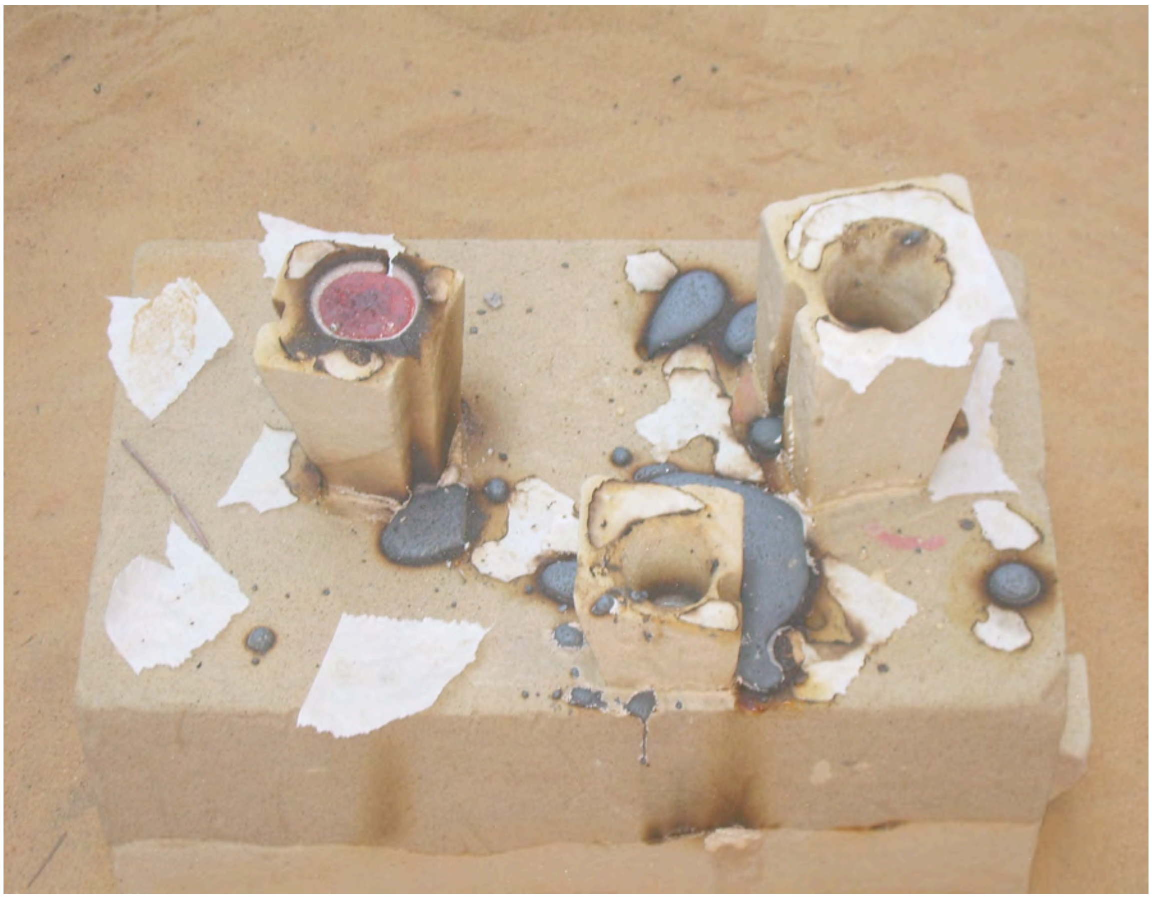


Figure 36: Excess of poured iron in the two-piece mold.

Figure 37: Solidified cast iron food scoop, serving tray and spoon. (Note: These cast pieces are attached to the top half of the two-piece mold due to the metal sprues and vents that formed during the metal pouring).

Breaking Molds

A hammer and chisel were used to remove the sand around the aluminum and iron cast pieces. The sand block was chiseled away in small sections in order to avoid breaking the metal sprues and vents of the aluminum and iron pieces. (See Figure 38)

Figure 38: Sections of sand block chiseled away from serving tray vents.

Finishing

Finishing techniques included cutting off sprues and vents and grinding down the jagged edges of the cast aluminum and iron. Most of the metal sprues and vents were removed with a grinding wheel. Sanding and polishing wheels were used to buff and smooth out the surface. (See Figures 39, 40 and 41)

Figure 39: Cast iron serving trays and spoon with metal sprues and vents attached.

Figure 40: Cast iron serving tray and spoon with sprues and vents removed.

Figure 41: Finished Cast Iron serving tray and spoon.

Prototype Process IV: Polystyrene Forming

Polystyrene is a ubiquitous thermoplastic material commonly used for a variety of objects from casted models to disposable flatware. This material is rigid at room temperature and comes in various colors and opacities, but it becomes extremely flexible when it is heated to a moldable state. During the prototyping process, sheets of polystyrene were heat formed with a Bosch heat gun and modeled into a 9 x 5 inch serving tray prototype and serving spoon.

Challenges

The major challenge with this prototyping technique occurred when I drew Google Sketch Up and Autodesk Auto CAD shop drawings. These shop drawings were meant to provide a template for making a jig from MDF board. However, figuring out a method to subtract the voided area from a solid block of MDF proved to be problematic. After completing the Sketch Up and Auto CAD drawings, I reviewed the shop drawings with a professor in contrast to the process of cold bending sheet metal by hand into the same form. We concluded that the best fabrication method was to heat-bend the polystyrene with my hands, and use the MDF board as a straight edge when needed. This decision allowed me to shape the polystyrene while it was in a flexible state and maintain greater control of the form.

Scale Chipboard Models

I again utilized full-scale chipboard models of the proposed design to convey my ideas to others. The chipboard models were also used as visual three-dimensional references during the fabrication process. (See Figure 42)

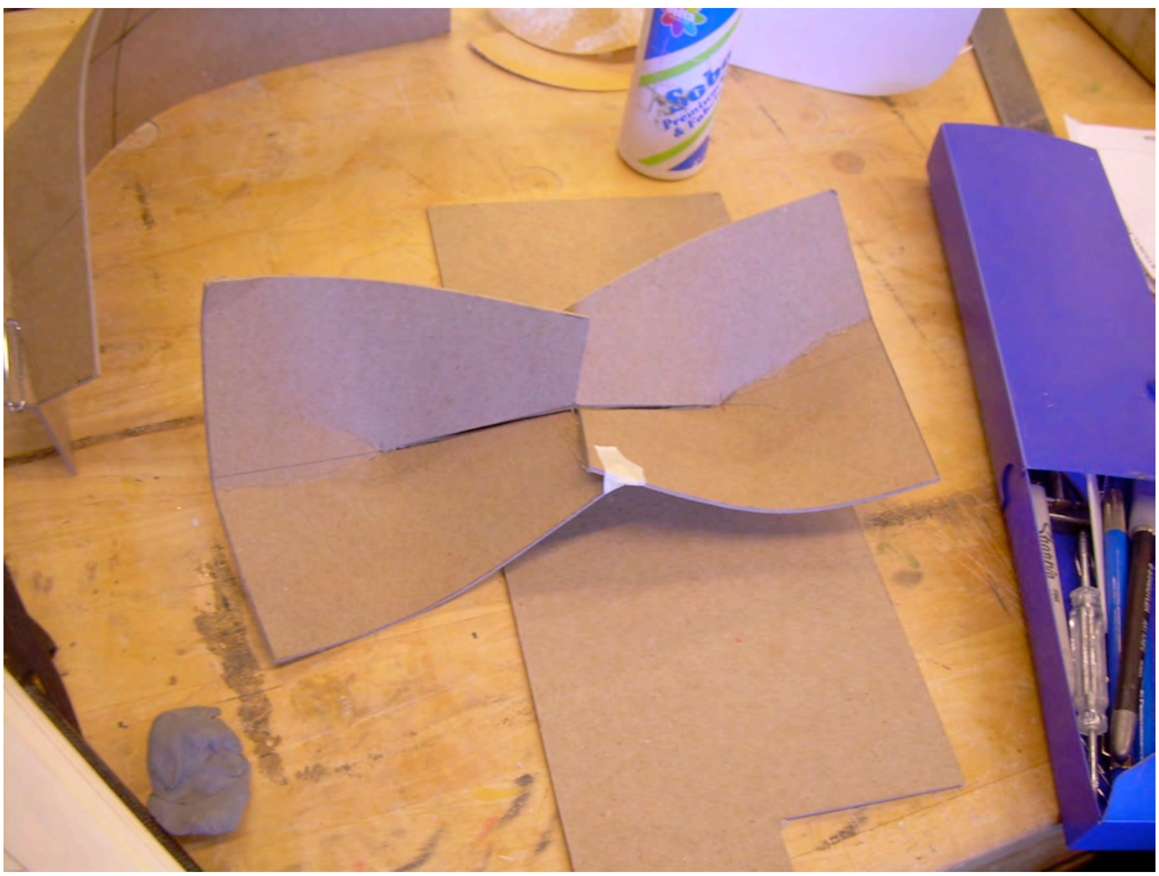


Figure 42: Chipboard model reference of 4.5 inch x 9 inch serving tray.

Sketch Up and Autodesk Shop Drawings

As I referred to the three dimensional chipboard sketch models, I utilized the Sandbox from Contours Tool in Google Sketch Up to create a digital replica of the 5 x 9 inch serving tray. Once the digital model was complete the file was exported in a DWG format into Autodesk Auto CAD. The plan and section views of the serving tray were created in Auto CAD and dimensioned. These shop drawings were intended as a reference for creating a MDF board jig.

Cutting Polystyrene Sheets

I initially cut the one-sixteenth inch thick polystyrene into two separate 5 x 5 inch squares. The additional 2.5 inch center slits in each 5 x 5 square were cut with a band saw. (See Figures 43 and 44)

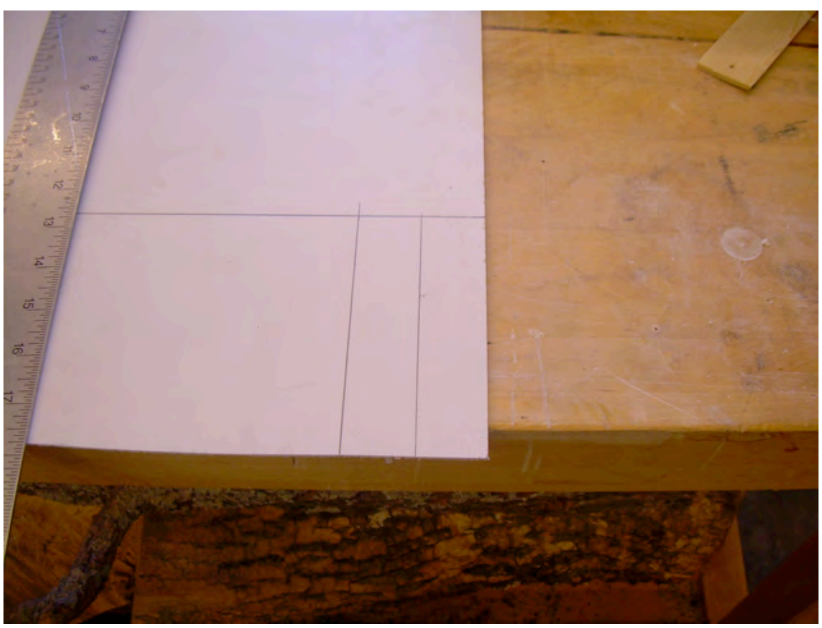


Figure 43: Measured sheet of polystyrene.

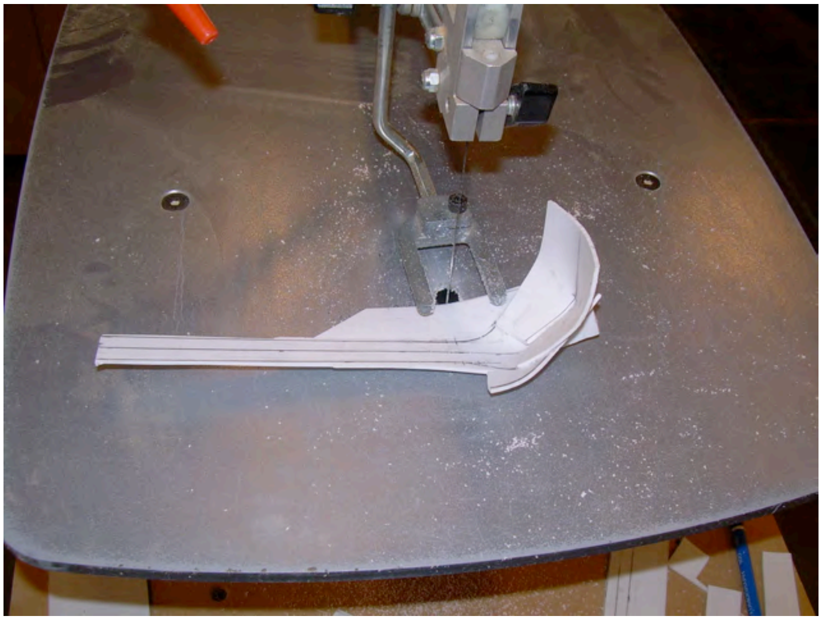


Figure 44: Cut polystyrene sheets.

Cutting MDF jigs

After cutting four 2 x 3 inch rectangles out of a ½ inch thick sheet of MDF board, I screwed two of the rectangles together. A forty-five degree angle was cut with the band saw along the top half of each rectangle and then sanded against the belt sander. The MDF was clamped against a worktable to provide a rigid form to support the polystyrene while it was heated and bent into the desired shape with a heat gun. More importantly the MDF was also used to create a stable crease line for forming and braking the polystyrene into the desired form. (See Figure 45)

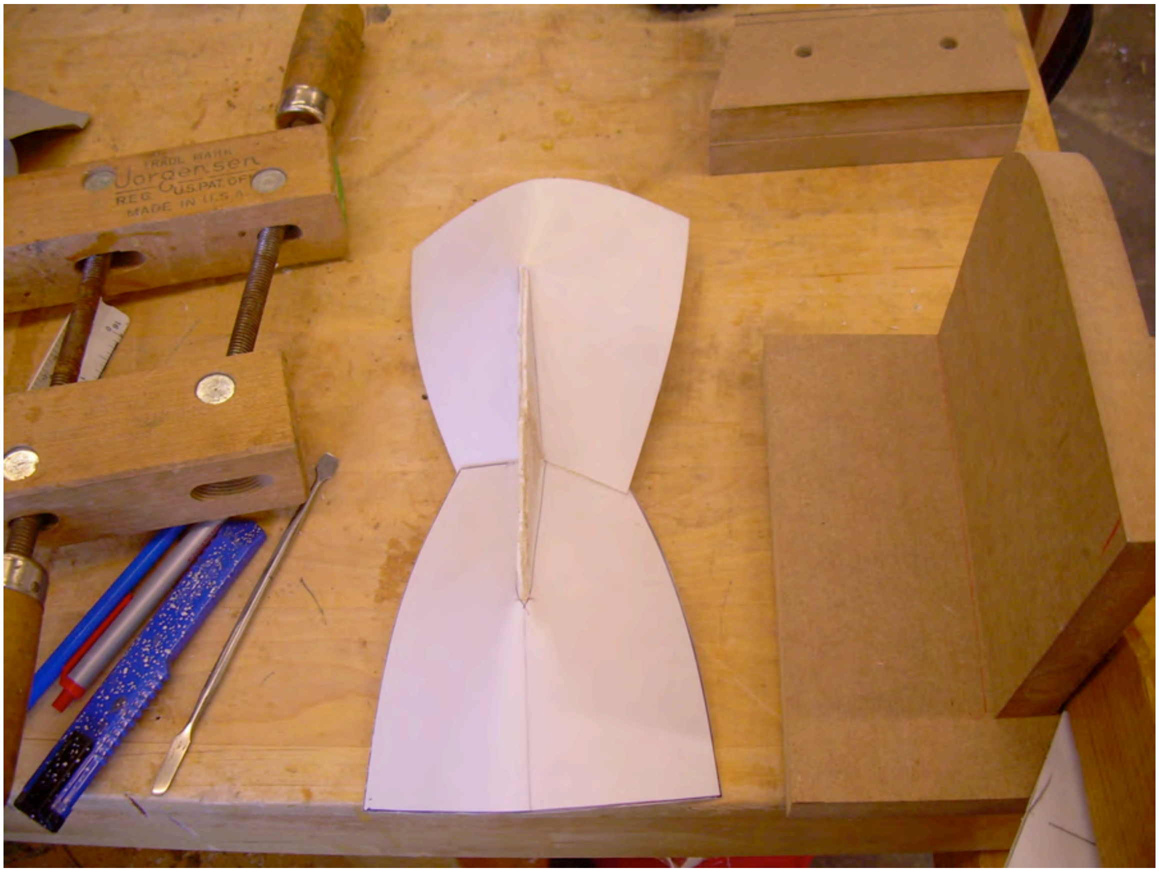


Figure 45: Cut and angled MDF board used during heat forming. (In the upper right corner)

Heat Forming and Adhering Polystyrene Sheets

A Bosch heat gun was set to three hundred and fifty degrees and waved evenly across the polystyrene. After the sheet became flexible from the heat it was placed against the MDF board and bent at a ninety-degree angle at the brake lines for each piece. The brake lines were one hundred and twenty degree angles on either side of the center slit, so the brake lines formed the center crease once the sides were pulled together. Once I achieved the desired shape I glued and clamped the edges together. Clamps were used to hold the form overnight as the liquid cement glue dried. (See Figures 46, 47,and 48)

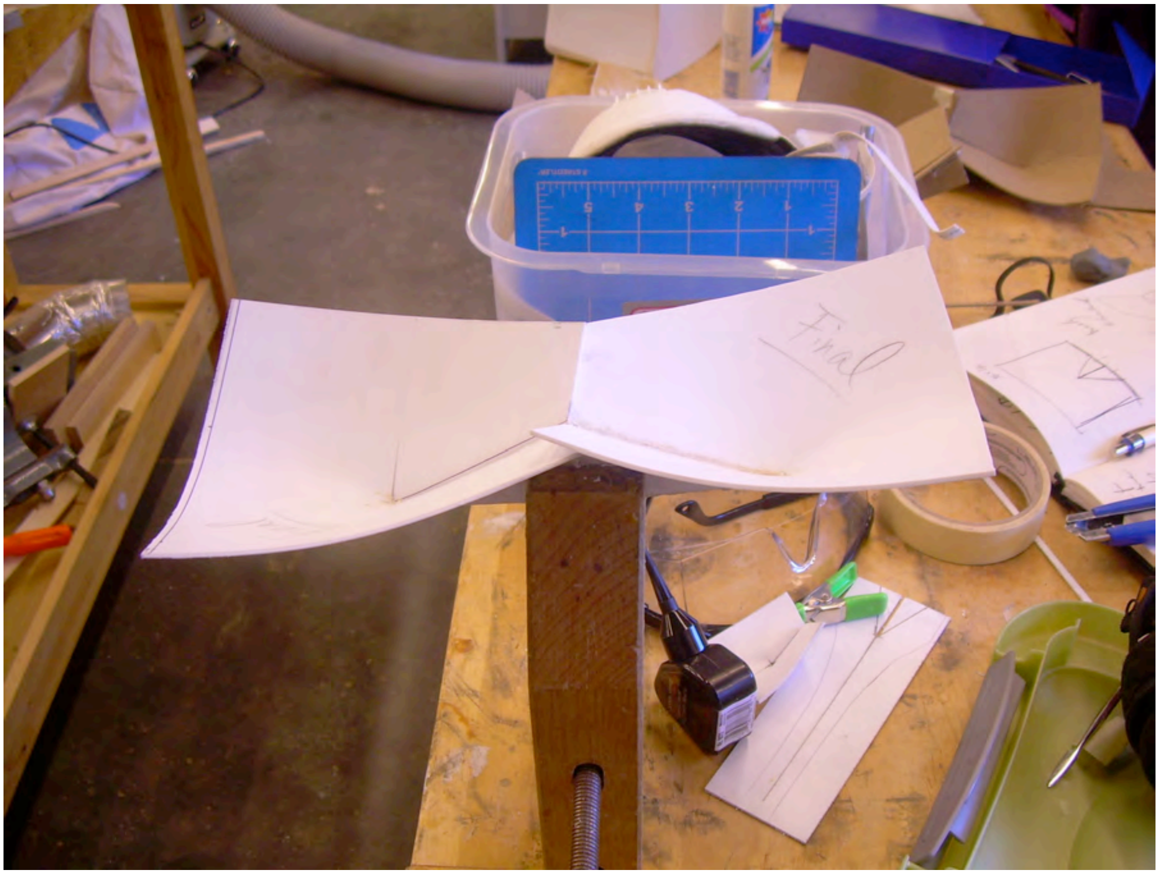


Figure 46: Polystyrene serving tray glued and clamped.

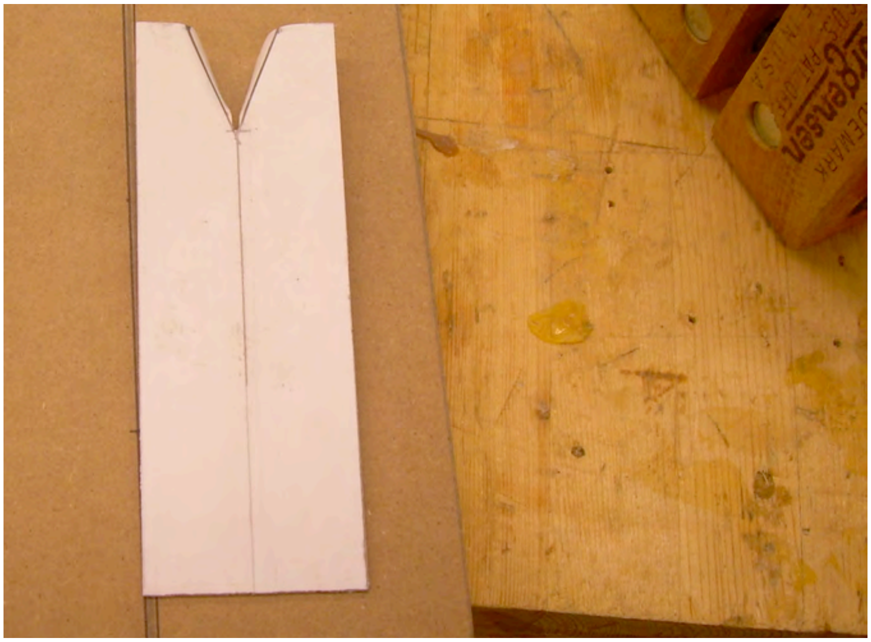


Figure 47: Spoon handle with slit and 90 degree breaks on either side.

Figure 48: Polystyrene spoon handle heated with a heat gun.

Finishing Work

Finishing work for this polystyrene model included cutting off excess edges, applying contour putty to uneven sides, sanding and spray-painting the surface. (See Figures 49 and 50)

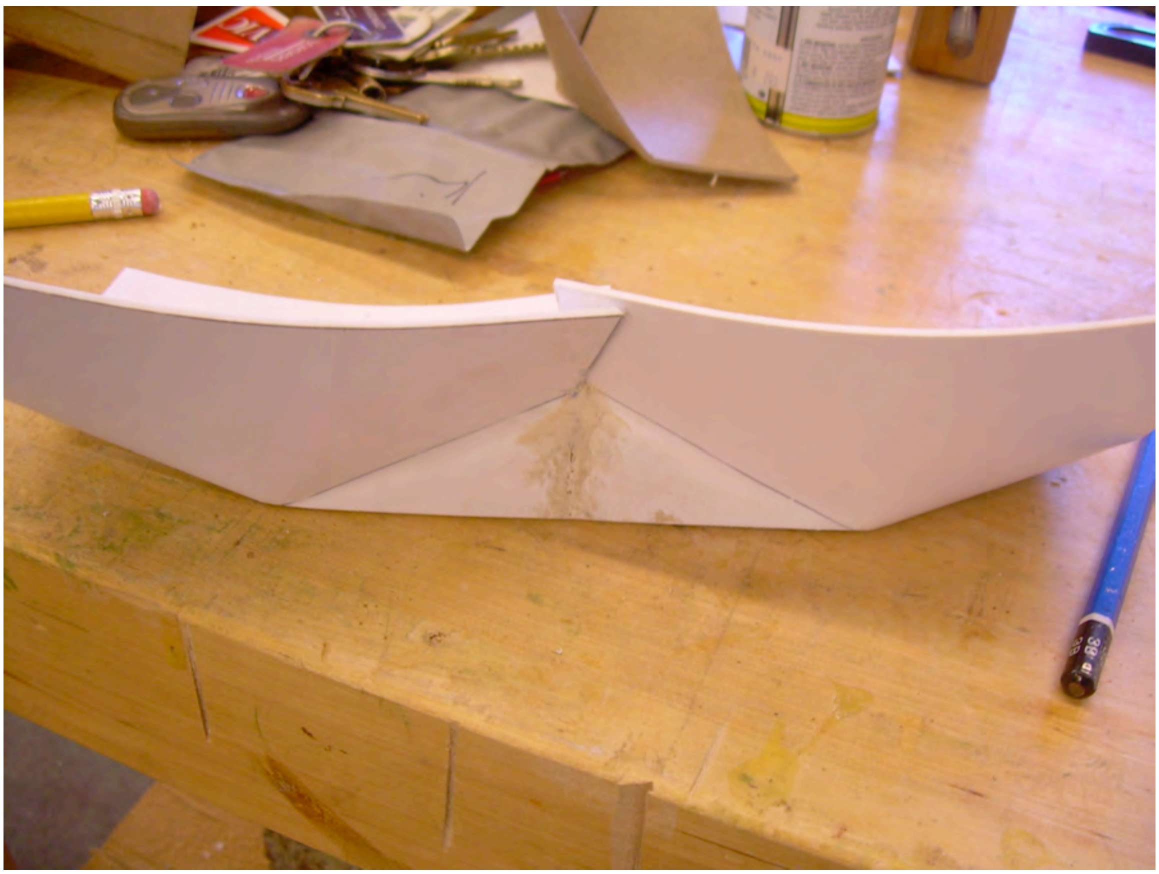


Figure 49: Sculpting putty applied to polystyrene model.

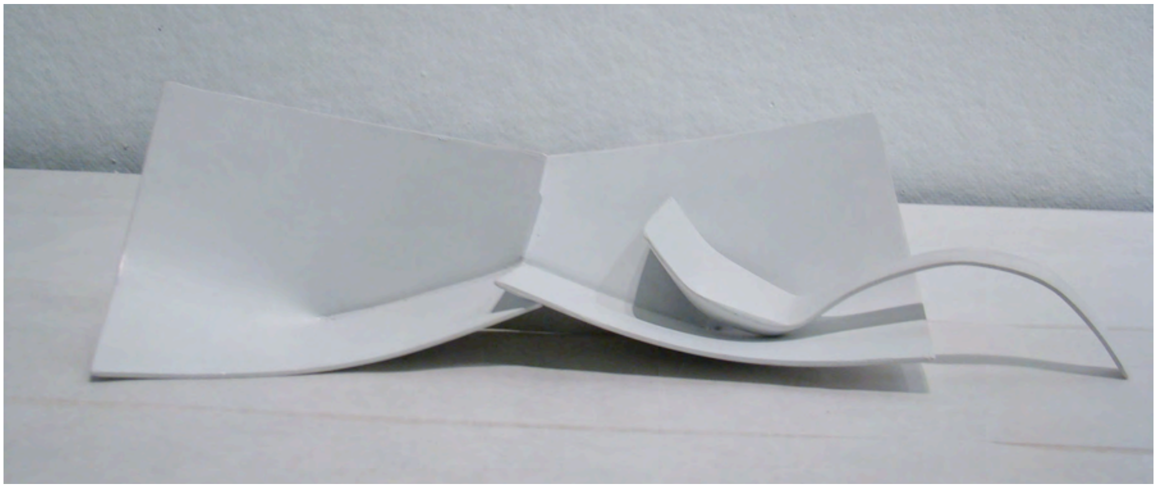


Figure 50: Finished Prototype of serving tray sanded and painted.

Method: Fall 2010 Studio Formal Critiques

During the Fall 2010 Studio investigation formal critiques included a theory presentation, a midterm critique, and a final critique. During the initial theory presentation I presented the theoretical approach to the studio investigation, which focused on the object-to-human and human-to-human relationship. This theoretical framework was well received by the studio professor and I then developed a design project that I could use to explore the theoretical framework through the development of an interior product. I chose to develop a design project that focused on creating serving-ware vessels. At the midterm critique, I presented various sketch models and discussed which ideas should progress through the design process. My design ideas were again well received, however I was challenged with my choice of digital display in my attempt to showcase the products within a dining environment. Final prototypes of sixteen-gauge stainless steel were produced for the final critique. The final prototypes were well received based on their aesthetic value and their functional use as serving vessels, which provoked a substantial discourse regarding further design implications. The presentation of the final prototypes was successful due to my incorporation of both physical and digital display. The design ideas and modeling techniques that occurred at the interim of these critiques is further described in the following section, Method: Design Process II Fall 2010 Studio, Prototype Process V –Industrial Water Jet & Cold Bending, Prototype Process VI – Turning Wooden Bowls, and Prototype Process VII – Slumping Glass Molds.

Method: Design Process II Fall 2010 Studio

During the Fall 2010 Studio I explored the aesthetic design of the previous prototypes and developed select designs into new objects. The design of the 7.5 x 7.5" food scoop was used as a foundational design to create new product ideas. Proposed design ideas for this studio investigation were filtered by their intended use as serving vessels and serving trays for appetizers, side dishes, and desserts. Again, this process involved refining the use of various materials and confirming the function of earlier prototypes.

Challenges

Similar to previous studio investigations, I choose to utilize materials based on their appropriateness for a specific product's aesthetic and function value. Therefore, completing the final prototypes required me to subcontract professional assistance and acquire new modeling techniques. For example, for the final nesting bowl prototype set I specified glass insert bowls, which required subcontracting a professional glass worker. Additionally, I explored new modeling techniques, such as creating plaster molds, sculpting clay forms, and turning wood bowls during the course of this studio investigation.

Design Parameters

The parameters of this studio investigation were used as specific boundaries that guided my decisions during the design process. The parameters were influenced by the work of design theorists such as Donald Norman, Stuart Walker, and Jonathan Chapman. Their theoretical framework addressed designing for the human –object relationship and inspired the interior products that I designed for the communal designing experience. Additionally I narrowed the functionality of these products as dinnerware and tableware objects for dinner party activities.

These initial parameters were further influenced by material selection, a balance of aesthetic quality between various materials, and the functionality of each object based on its' fabrication. The majority of these parameters were explored through precedent studies, sketches, full scale and half scale sketch models, and available fabrication methods.

Precedents

Since I had previously focused on precedent studies related to cookware items, I studied precedents for serving trays, nesting bowls, and serving dishes with multiple compartments during this particular studio. As I reviewed these precedents, I focused on the utilitarian function of the object, the aesthetic quality, choice of materials, benefits to the end-user, and the typical activities surrounding the usage of each product.

Generative Process

The generative process in the context of this 2010 Fall Studio still described my ability to re-produce ideas by reflectively thinking through previous design processes and applying the gained knowledge to a current set of proposed design solutions. This studio investigation gave me the opportunity to re-evaluate ideas through a cumulative design process between two separate studio investigations (Luz, Narvaez, & Guillermina, 2000).

Sketch Modeling

During the earliest stages of this design studio I use chipboard sketch models to quickly generate my initial ideas. These sketch models represented the conceptual ideas that drove my creative design process and were used throughout the design investigation to explore the initial ideas and adjustments to scale. (See Figures 51, 52, 53, 54, and 55*)*

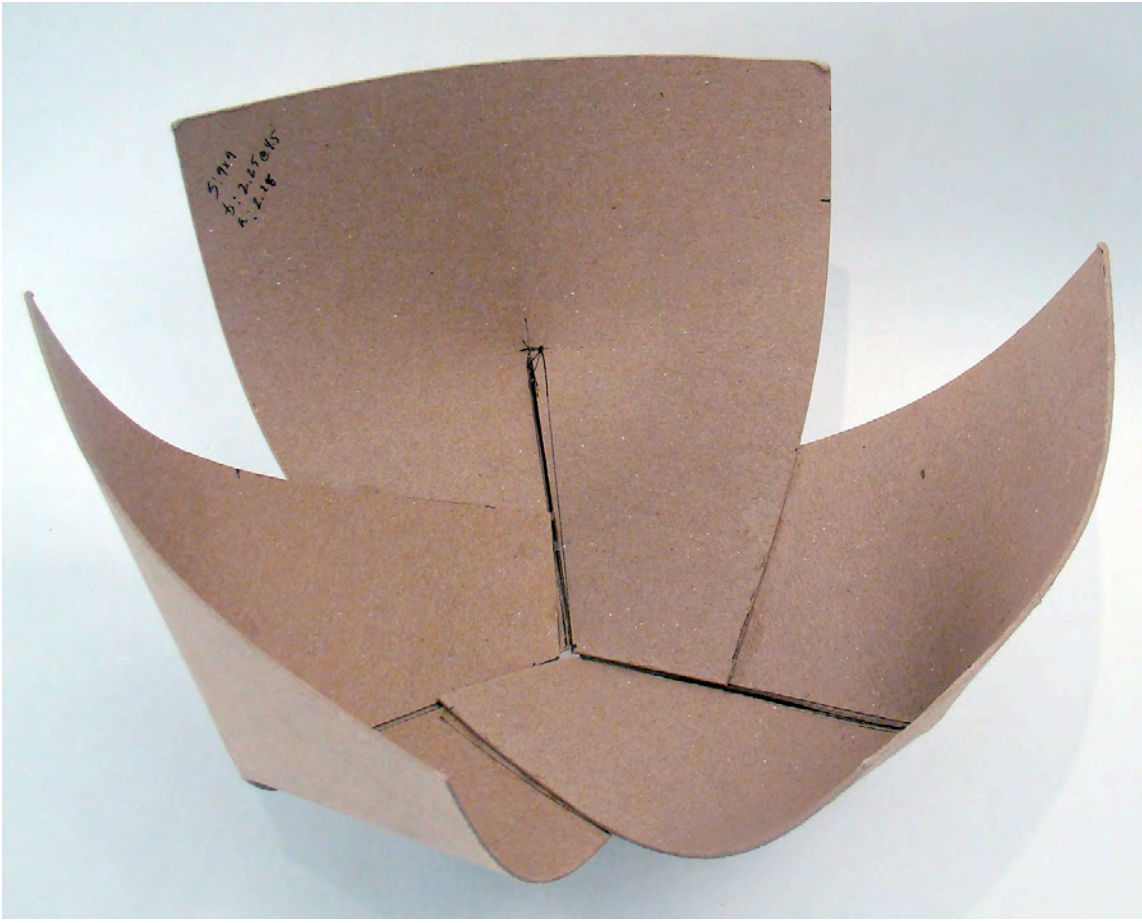


Figure 51: Preliminary chipboard model of 9 x 9 x 9 inch nesting bowl.

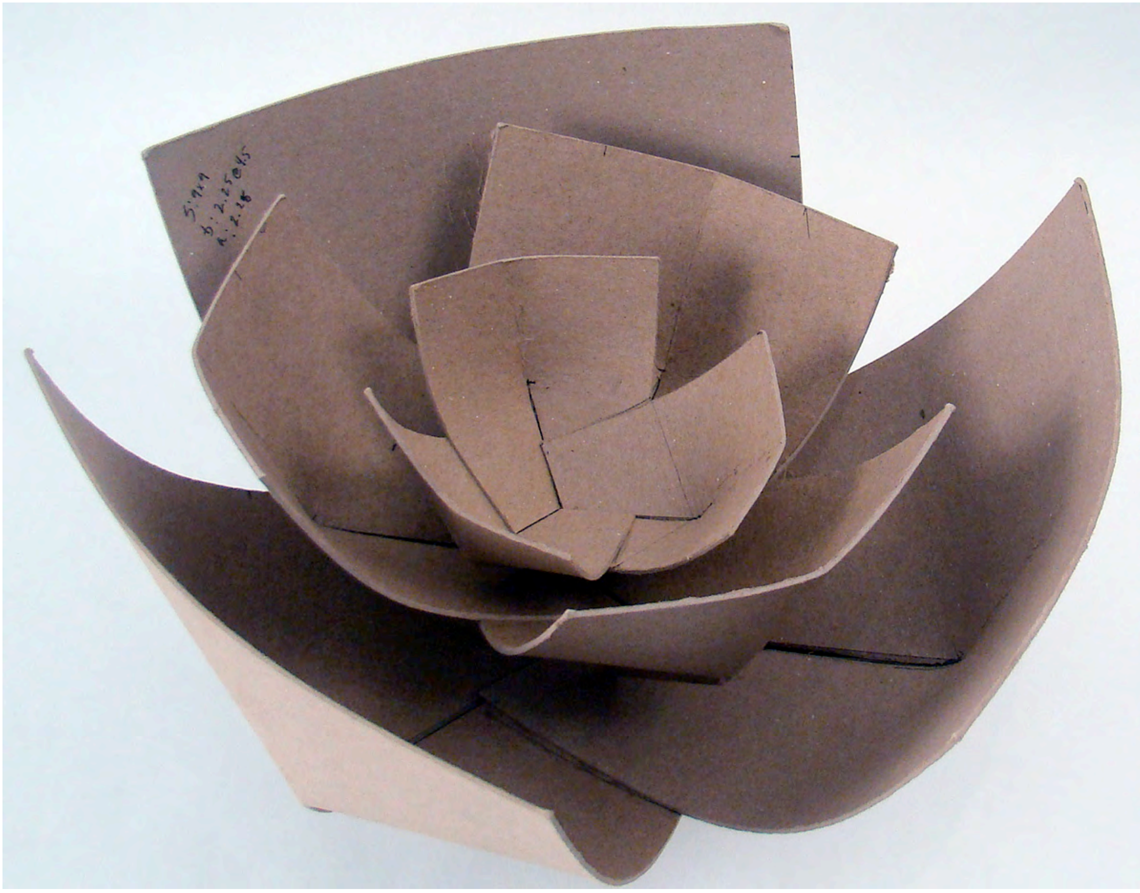


Figure 52: Preliminary model of nesting bowl set.

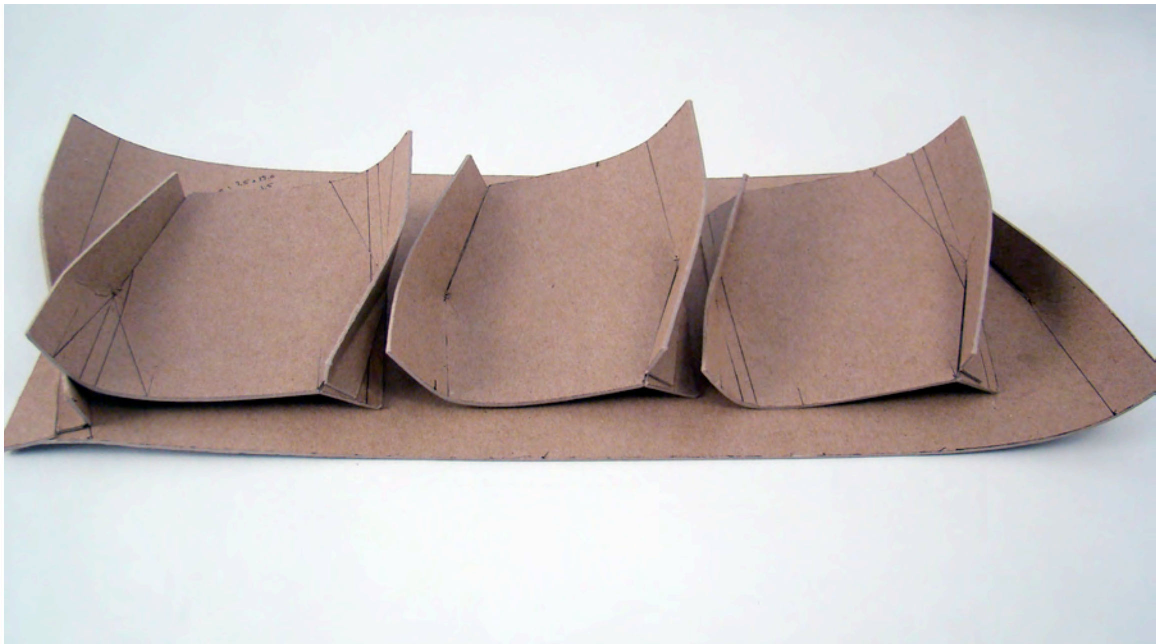


Figure 53**:** Preliminary model of serving tray and serving dishes

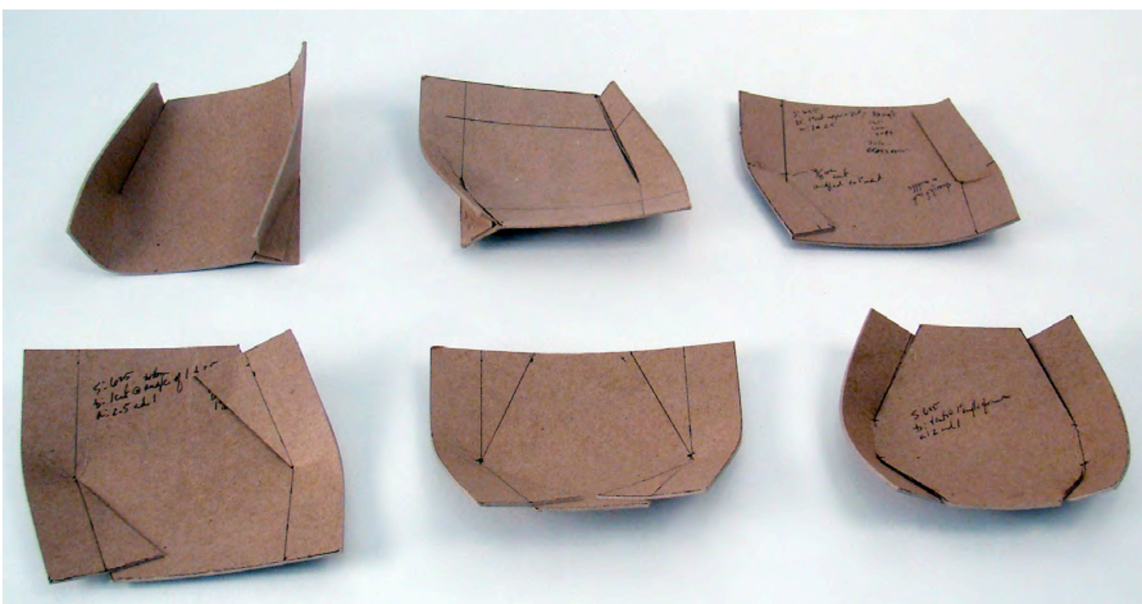


Figure 54: Preliminary model of individual serving dishes

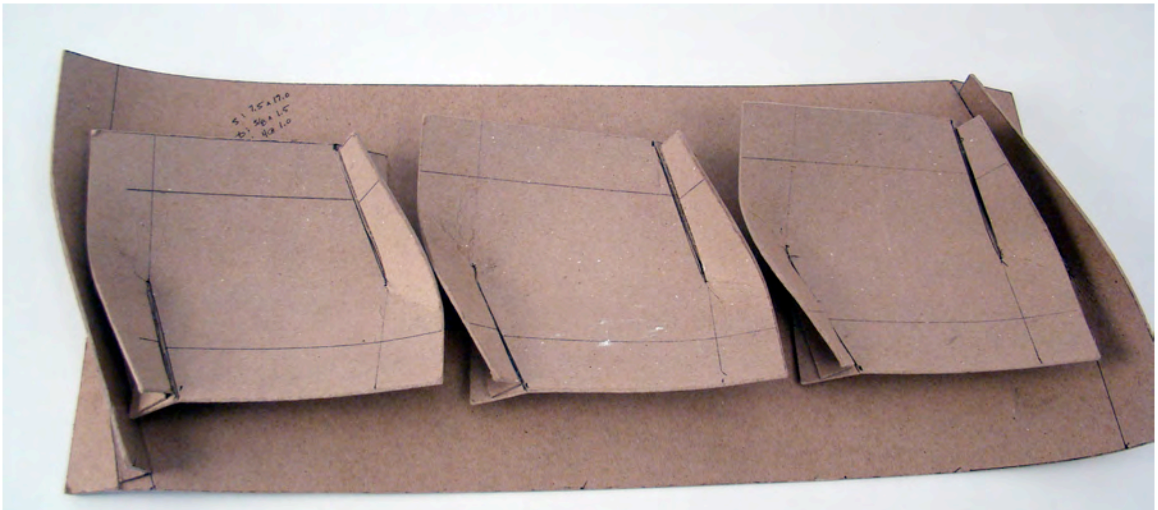


Figure 55: Preliminary model of serving tray and serving dishes.

Process Sketches

In similarity to the previous studio investigations, I still used sketches to visually record the designer's back talk associated with the generative design process (Marshall, with Micheal Erlhoff, n.d.). Unlike my previous investigations however, process sketches were used primarily as a reflective tool of design decisions once I completed a sketch model. (See Figure 56).

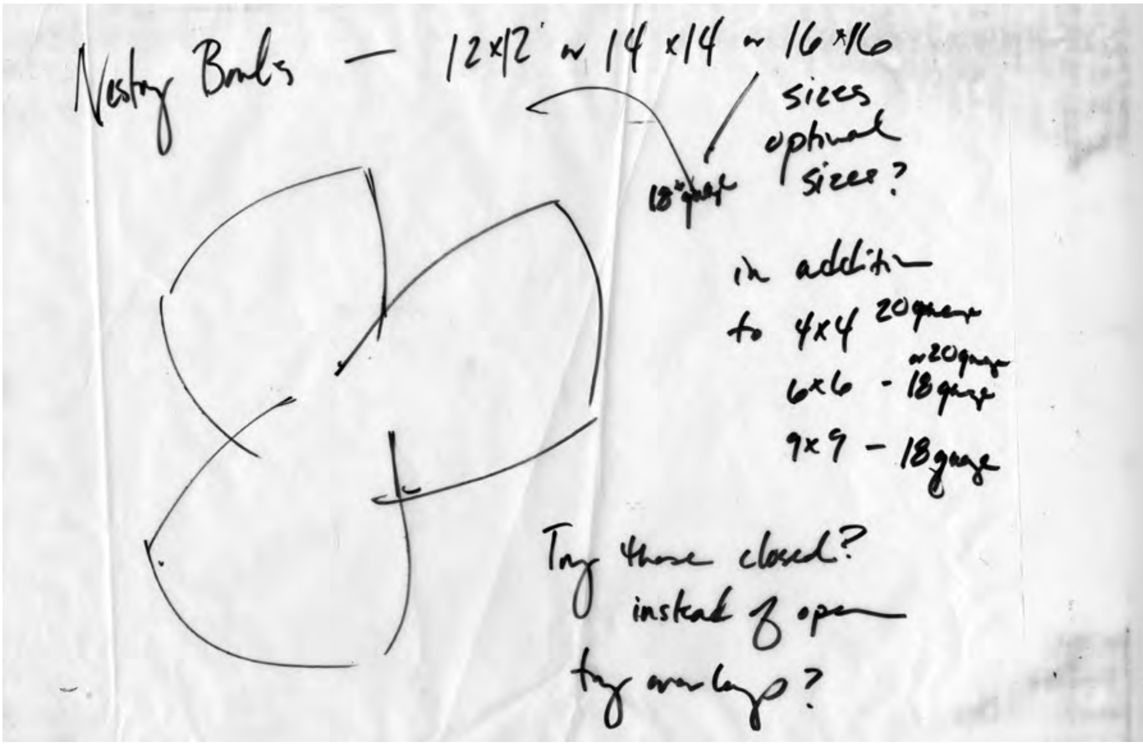


Figure 56: Sketches of nesting bowls. These sketches capture the reflective moments of the design process.

Scale Model Making

After, I generated the sketch models I fabricated full-scale models in sixteen gauge carbon steel to convey my design ideas to other design students and design professors. The full-scale models also aided my visual evaluation of the designs. During this time, I considered various mediums for the final prototype models. (See Figure 57)

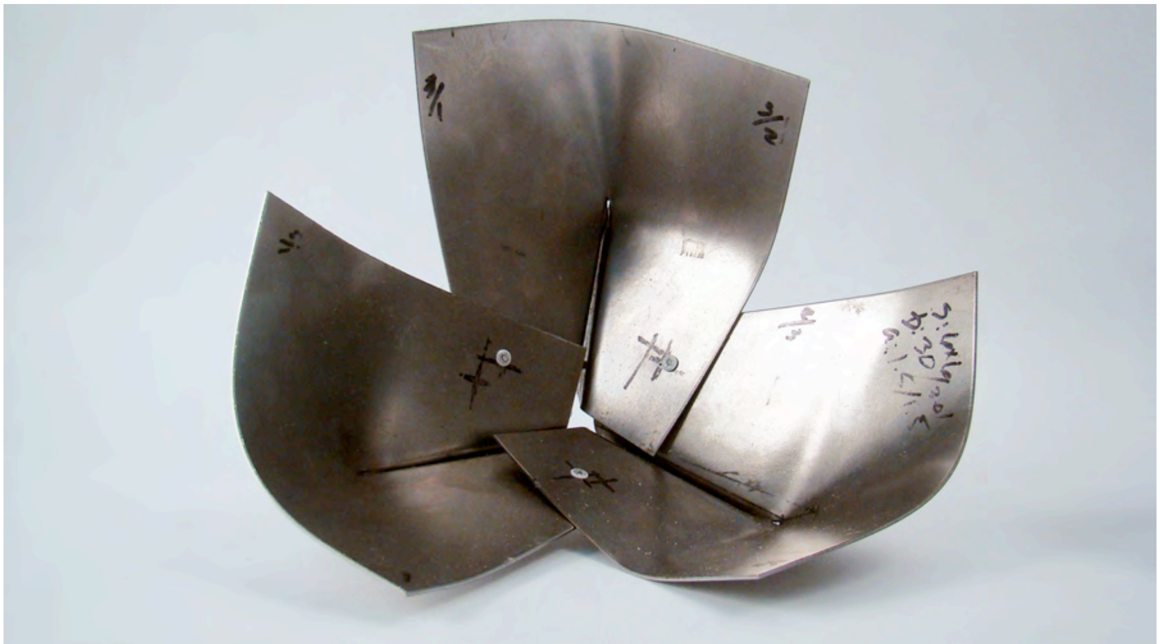


Figure 57: Initial sketch model of 6 x 6 x 6 inch nesting bowl in carbon steel.

Qualification of Product

The qualification of ideas during this design process was constantly in a subjective state; however, based on multiple conversations with other design students and studio professors, I narrowed my selection of design ideas for the final prototypes based on aesthetic quality and function. (See Figures 58 and 59).

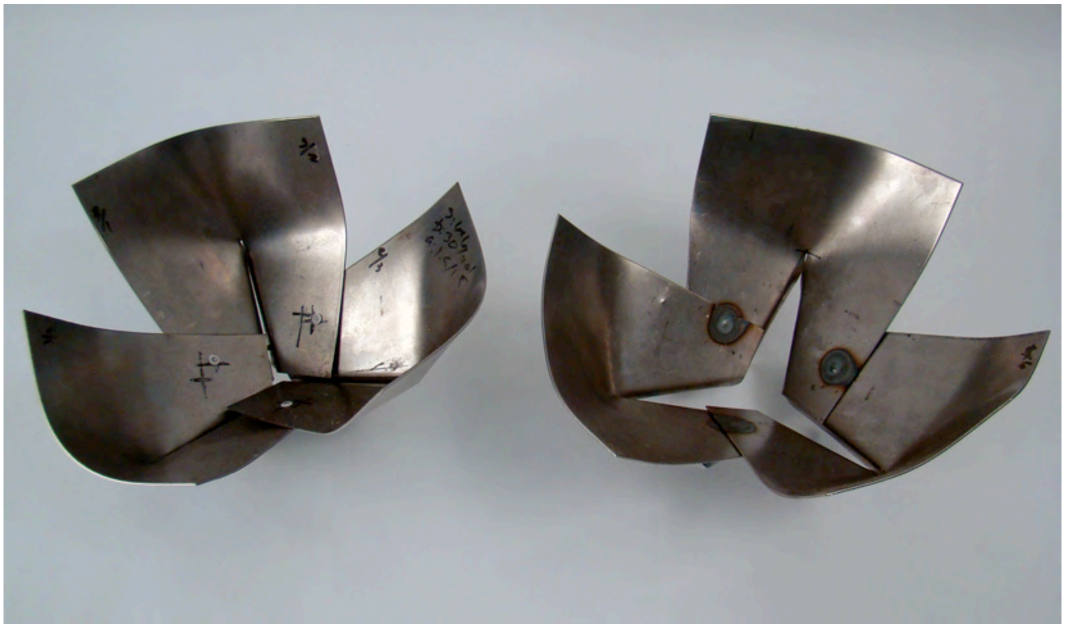


Figure 58: Sketch models of closed and open nesting bowl.

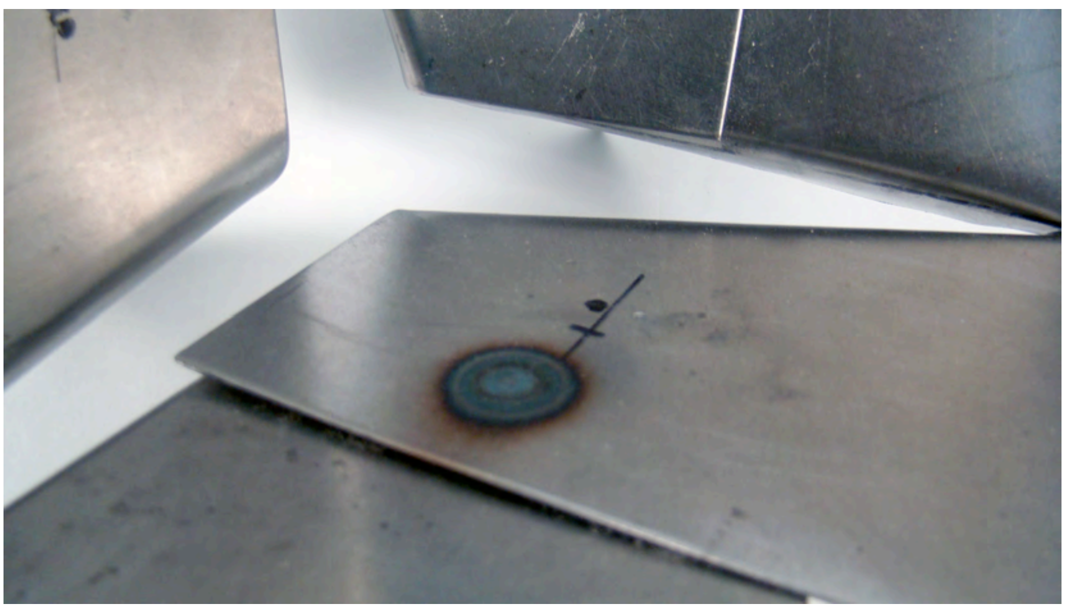


Figure 59: Nesting Bowls: Detail of spot weld and overlap of sections.

Refinement of Product Selection

By the midterm of this design studio, I had narrowed down the initial design selections for prototyping, and I began refining the aesthetic design of each item. At this point I, contacted several professional craftsmen who could assist and guide me in the fabrication of these objects. I also finalized my decisions regarding the dimensions, scale, fabrication methods, and materials during this process as I discussed my work with various craftsmen. (See Figure 60, 61, 62, and 63).

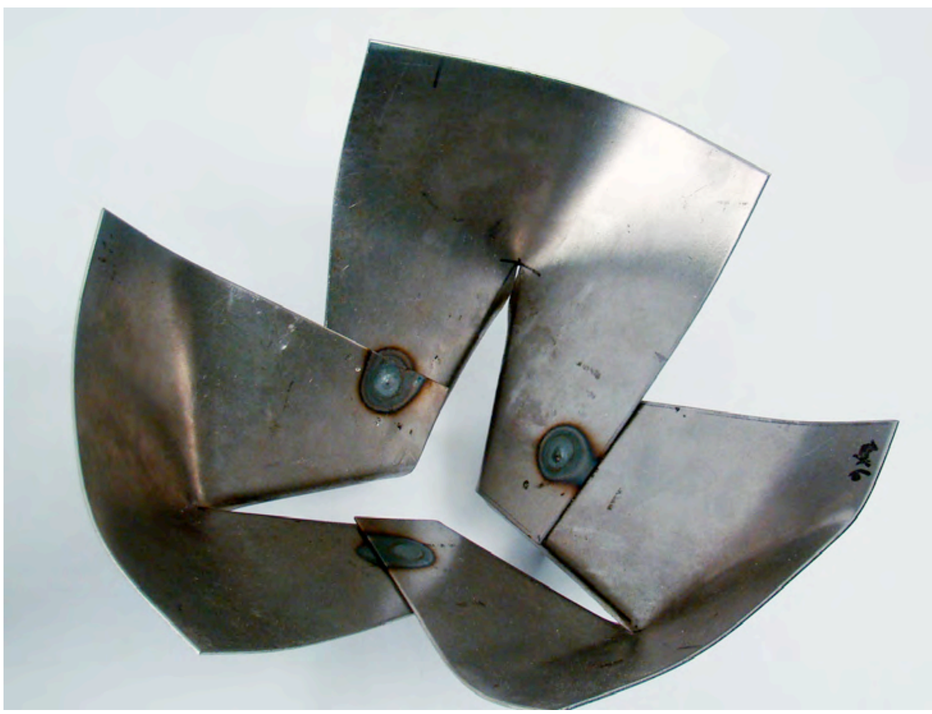


Figure 60: Final scale model of 6 x 6 x 6 inch steel nesting bowl.
(This scale model was selected for prototyping).

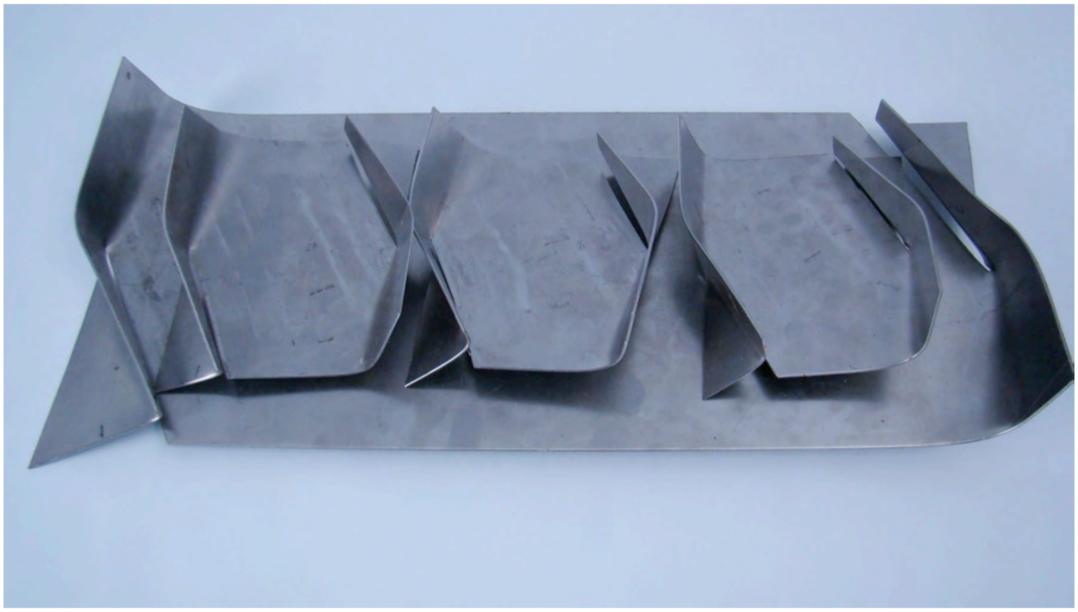


Figure 61: Final scale model of serving tray and serving dishes. (Some design decisions were altered during the final fabrication process to achieve the desired aesthetics and functional qualities.)

Final Prototype Fabrication

To conclude my 2010 Fall Studio, I prototyped the final design using sixteen gauge stainless steel, poplar wood, and tempered glass sheets. The remaining prototyping processes describe the fabrication process of each prototype.

Figure 62: Final Model of nesting bowl set.

Figure 63: Final Models of serving tray and individual serving dishes.

Prototype Process V: Industrial Water Jet & Cold Bending

Utilizing industrial fabrication methods such as a water jet cutter and industrial brake eliminates opportunities for unnecessary human error. During this final prototyping process, the use of the water jet replaced the use of a hand-held jigsaw to cut the slits. An industrial brake was used to create brakes in the stainless steel instead of braking the steel (bending) with traditional hand techniques. (Note: An industrial water jet machine projects a highly concentrated beam of water through a nozzle and makes precise cuts through steel and other mediums.) (See Figures 64 and 65)

Figure 64: Left side: cutting sheet metal with an industrial water jet cutter. Right side: cutting the sheet metal with a jigsaw.

Figure 65: Left side: breaking the sheet metal with an industrial brake. Right side: cold bending by hand**.**

Challenges

Since I chose to work with sheet metal as primary prototyping material, I was required to push the limitations of the material to adapt to the functional and aesthetic design of the products. The availability and non-availability of some fabrication methods also influenced my final design decisions.

Drafting in Rhino

After I selected the final designs for prototyping, I translated the layout of each piece into a digital format using Rhinoceros. (Note: Rhinoceros is a three dimensional NURBS modeling software for designers.) These files were saved as cutting templates for an industrial water jet cutter with a DWG filename.

Water Jet Cutting Stainless Steel

The DWG files for the nesting bowls, serving tray, and serving tray dishes were exported into Auto CAD at a local foundry. The foundry owner made necessary adjustments before loading them into an additional software program that controls the direction of the water jet cutter. After we loaded the file and checked for any additional errors, we placed a sheet of sixteen-gauge stainless steel on the cutting bed of the water jet cutter. During the cutting process a concentrated beam of water was released through a nozzle. The release through the nozzle produced a laser like cutting beam that followed the digital file layout. (See Figure 66.)

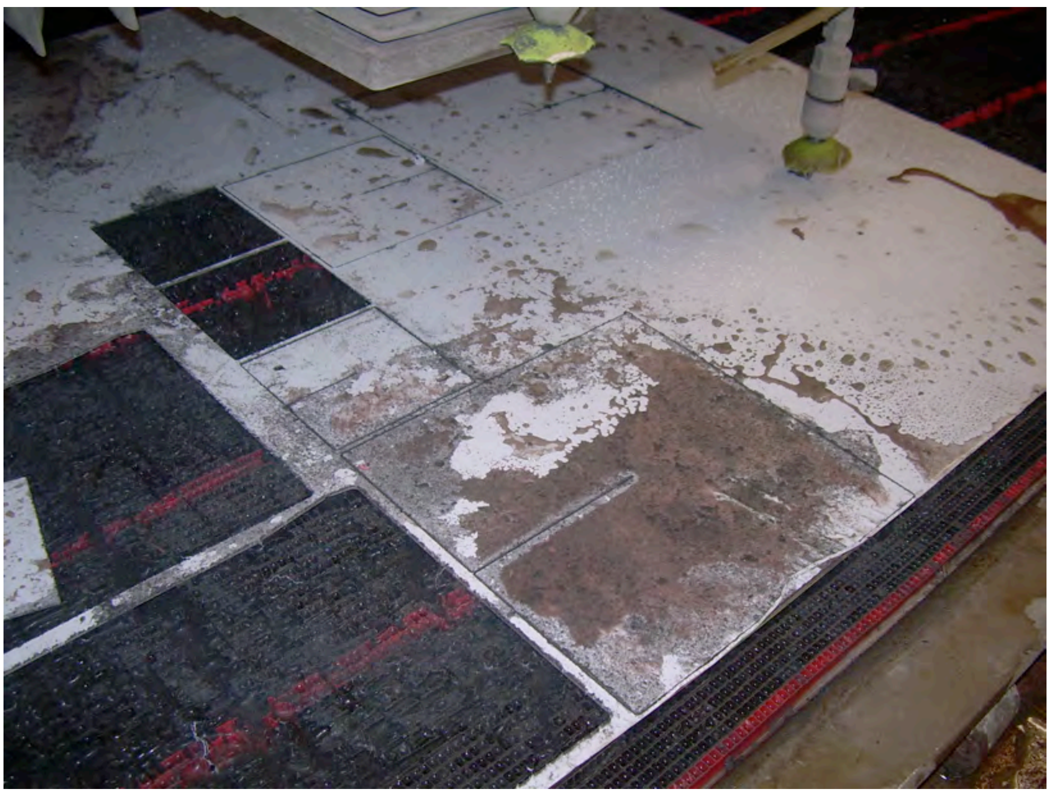


Figure 66: Water jet cutting sheet metal. (9 x 9 x 9, 6 x 6 x 6, and 4 x 4 x 4 inch layouts)

Shearing the Edges of Stainless Steel

After each piece was cut, a foundry technician sanded the edges with an angle grinder to remove any jagged edges. (See Figure 67)

Figure 67: Sharp edges of sheet metal filed with an angle grinder.

Curving Stainless Steel Sheet Metal

The pieces of sheet metal used to create the nesting bowls were curved with the edges facing upward using an electric roller. Each nesting bowl was fabricated using three identical pieces. Therefore, placing an identical curve in each piece retained the uniform shape of the bowl (See Figure 68). (Note: Fabricating the serving tray and dishes did not require the use of the electric roller.).

Figure 68: Curving the sheet metal with an electric roller.

Breaking Stainless Steel

The stainless steel sheets for the nesting bowls, serving trays, and serving dishes were each placed inside an industrial brake at various angles. Each of the angles started at the tip of the center or side slit and ended at the bottom left or right edge. The stainless steel sheets for the serving tray, serving dishes, and nesting bowls were each placed inside the brake and lined up to their specified angle. (Note: *Braking* in this context refers to the industrial term used for bending a certain area of the materials such as sheet metal.) (See Figures 69)

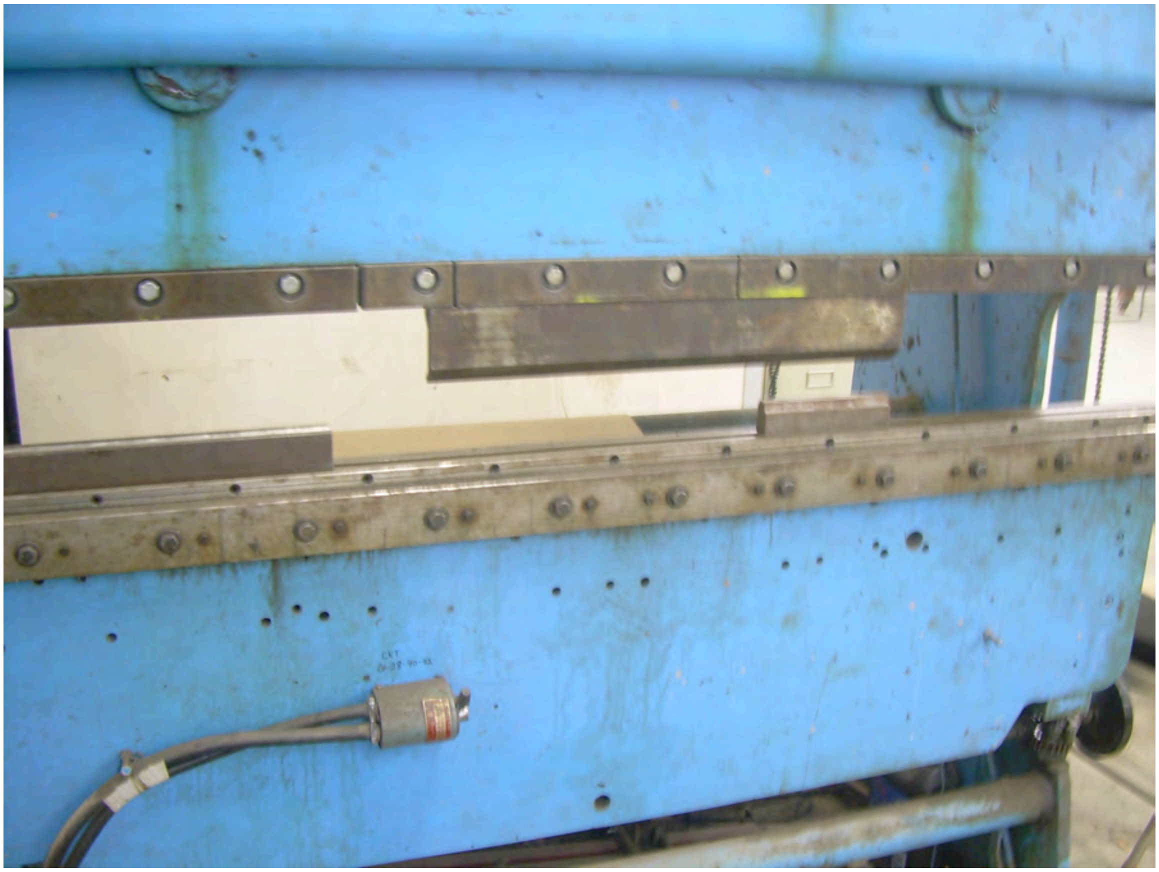


Figure 69: Breaking the sheet metal with an industrial brake.

Clamping and Welding Stainless Steel

The welder spot-welded the three sections of each nesting bowl together. These spot welds were placed at the bottom left of each section in a pre-drilled hole. The welder placed additional welds at the tension areas between each section. The slits in the serving tray and serving dishes were also welded together using a TIG welder. The edges of the serving tray and serving dishes were clamped against a piece of aluminum in order to reduce the possibility of warping the sixteen-gauge metal. (Note: each nesting bowl was fabricated using three identical forms that were connected to create a single form.) (See Figure 70)

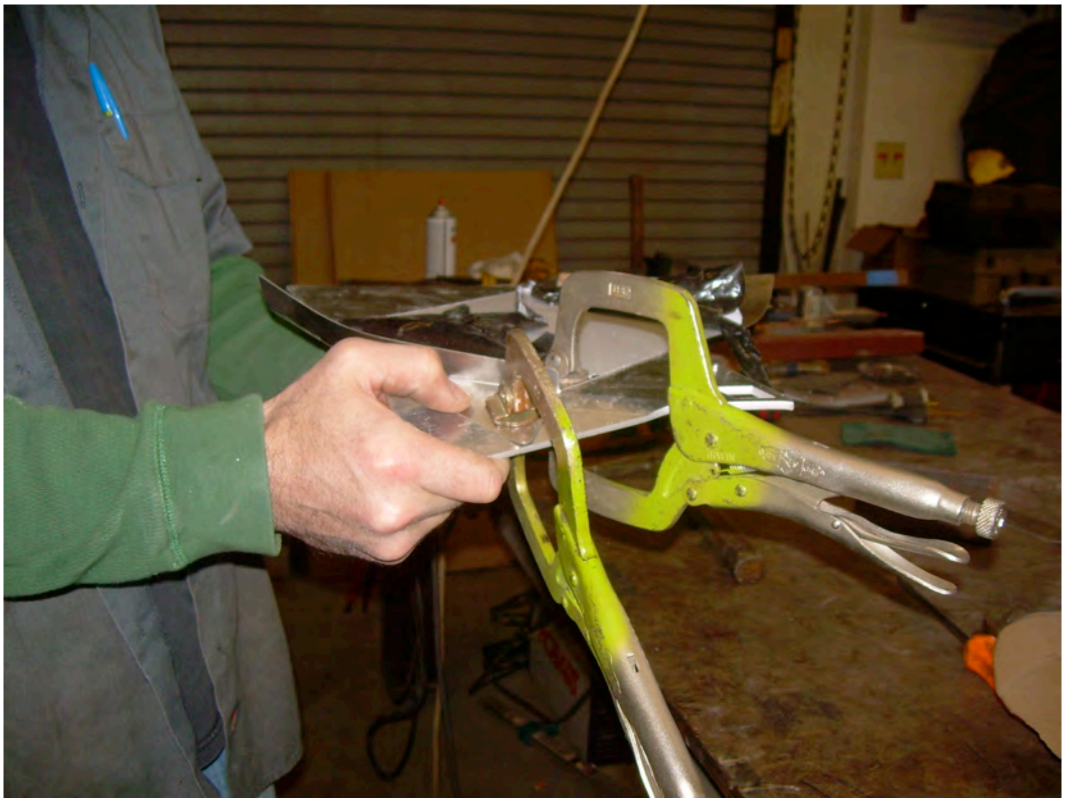


Figure 70: Welded sheet metal clamped to aluminum.

Finishing Work

The finishing work for these stainless steel pieces included grinding down the surface welds with a Dremel tool attachment, filing down sharp edges and corners, and sanding the surface with both steel wool and two hundred and twenty grit sand paper. (See Figure 71)

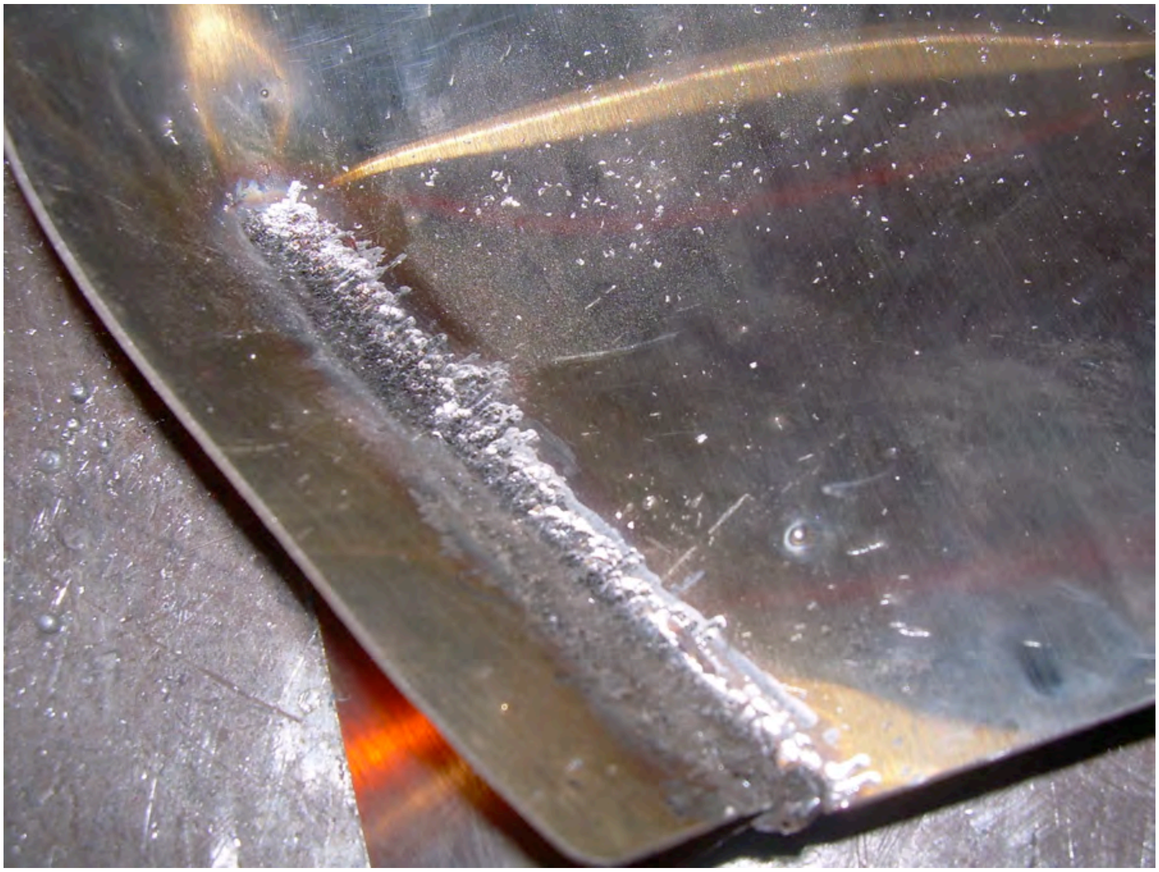


Figure 71: Ginding welds, filing edges, sanding final prototypes.

Prototype Process VI: Turning Wood Bowls

Turning wood is a process of carving an exterior shaped from a block of wood as it turns on a lathe. This process may also include carving out an interior cavity from the block of wood. These pieces of wood are usually used as utilitarian objects or decorative items. For the purpose of this studio investigation, a block of wood was carved and shaped into a bowl on a lathe to create a wooden insert bowl for the stainless steel nesting bowls.

Challenges

The main challenges with this process came from the learning curve associated with turning a wood bowl the first time (See Figure 72). Along with the learning the techniques to turning a wood bowl, I had to adjust to the frequent possibility of chucking as I carved out the interior section. The other challenge was determining the correct shape for the exterior so that it would appear as a custom-made fit for the stainless steel bowl. Watching guided demonstrations by the Interior Architecture's woodshop personnel along with using certain tools, alleviated the majority of these challenges.

Figure 72: Turning wood on a lathe.

Selecting Wood

I made my initial wood selection based on discussions with fellow design students and professors, including wood shop personnel. I selected poplar wood as an appropriate testing material for turning the initial insert bowl for the 6 x 6 inch stainless steel nesting bowl. (See Figure 73)

Figure 73: Block of poplar wood.

Determining Size and Outlining Shape

In order to determine the initial size of the exterior I drew a nine-inch diameter from the center of the wood block with a compass. After I screwed a metal attachment into the center of the block, I cut around the outline of the diameter using the band saw. (See Figure 74)

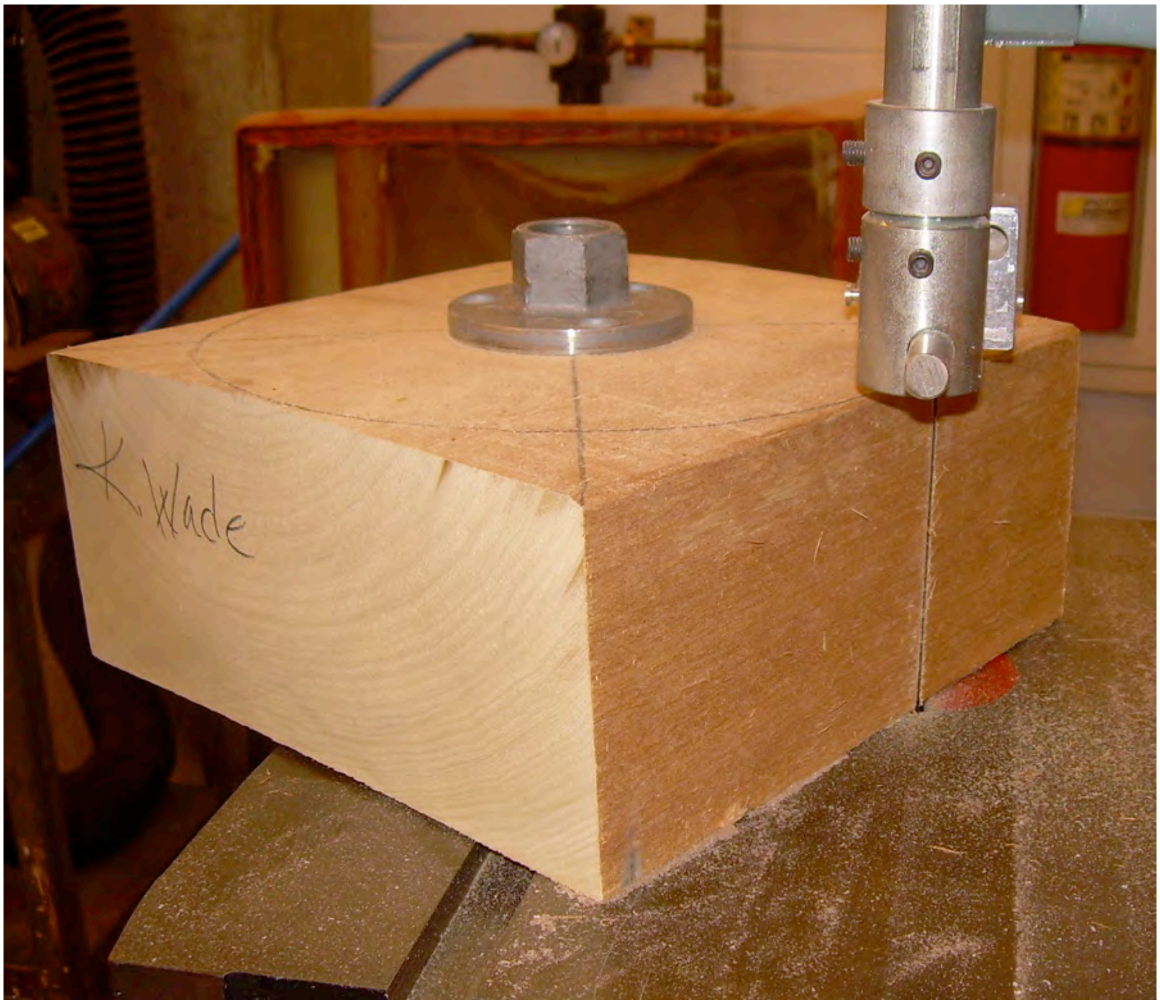


Figure 74: Cutting out traced diameter of poplar wood with the band saw.

Attaching Wood to Lathe

In order to begin shaping the bowl's exterior facade, I attached the center base plate to the lathe. The tool rest was then adjusted and braced into the front center of the wood block. (See Figure 75)

Figure 75: Poplar wood block attached to lathe.

Shaping Exterior and Interior of the Wooden Bowl

I initially leveled the bowl's exterior surface with a chisel. Once the exterior surface was level, I began to taper the exterior to mimic the interior shape of the stainless steel vessels. At this point, I discussed multiple options with other design and art students and faculty to figure out the appropriate dimensions of the exterior shell. I first attempted to figure out the appropriate shape by spraying insulating foam into a saran wrapped stainless steel nesting bowl. In my second attempt, which proved to be successful, I used red clay and pressed it against the interior shell of the stainless steel nesting bowl. Once the clay dried, I used it as a visual guide for carving the rest of the bowl's exterior. After I completed the main shape of the exterior I began to carve out the interior. I estimated the depth of the interior at one inch from the exterior. The additional carving to the exterior was done with an air-sanding disc in order to create triangular notches into the exterior. (See Figures 76, 77, 78, 79, 80)

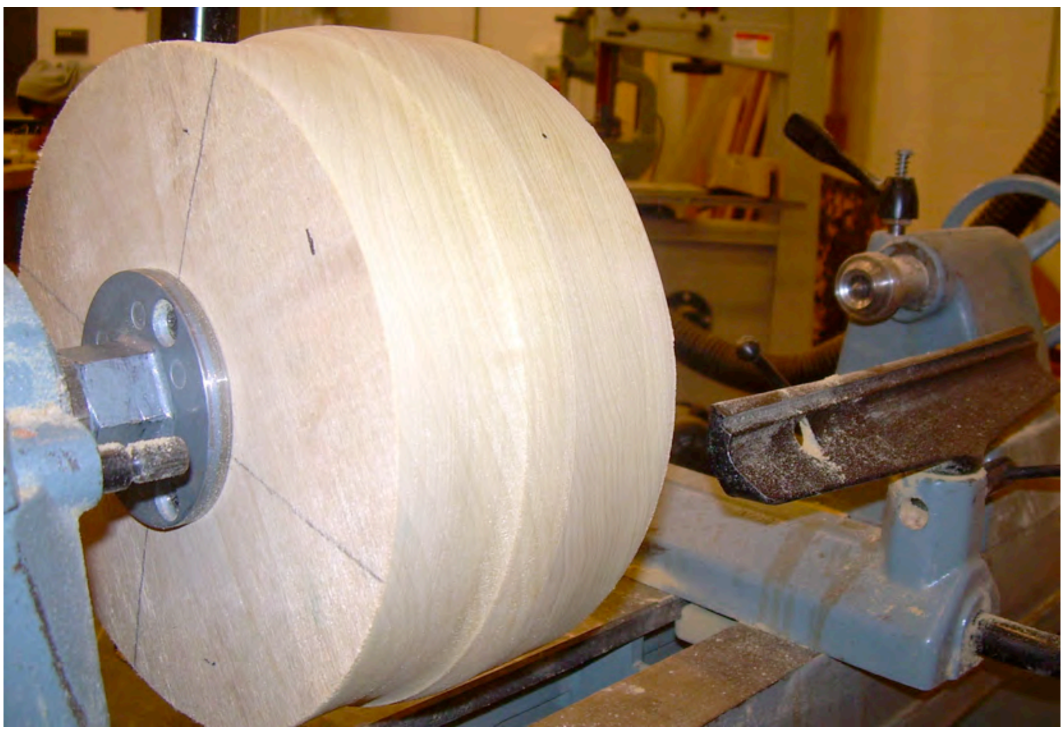


Figure 76: Leveling wood surface of exterior wood block on the lathe.

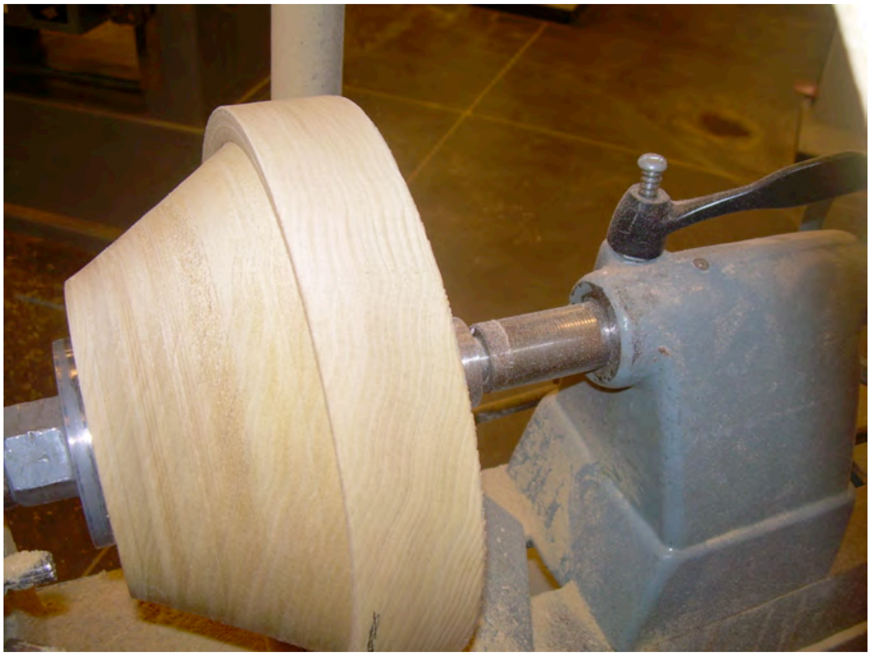


Figure 77: Tapered exterior of wooden bowl.

Figure 78: Insulated foam sprayed into a stainless steel nesting bowl. Note: The stainless steel bowl was covered in aluminum and saran wrap in attempt to preserve the stainless steel finish.

Figure 79: Clay negative of interior of stainless steel nesting bowl.

Figure 80: Measuring exterior of the bowl with the nesting bowl.

Finishing Work

To finish smoothing the surfaces of the wood bowl, I sanded both the interior and the exterior with sand paper while the bowl turned on the lathe. During the final steps, I used a technique called wet sanding to raise and then remove any excess wood grains to smooth the surface. After the sanding process was complete, I used walnut oil to seal the bowl's surface and preserve its' finish. (See Figures 81 and 82)

Figure 81: Wet sanding poplar bowl on the lathe.

Figure 82: Oiled poplar bowl with stainless steel bowl.

Prototype Process VII: Slumping Glass Bowls

Slumping glass is the process of firing a sheet of glass at a particular temperature and allowing the sheet of glass to flex or slump into the shape of a particular mold. Molds are typically made from a combination of materials such as plaster, silica sand, and fiberglass; however this may vary based on the amount of times the mold will be used.

Challenges

The main challenge with slumping glass into a mold is that it is difficult to predict how each glass sheet will react once it is fired in the kiln. There is no guarantee that the glass will accurately take the shape of the mold. Additionally, there are various methods for creating a mold and various directions for the glass to be slumped. This posed the challenge of finding the most effective method for slumping the glass.

Making Clay Negatives

The first step in creating a plaster mold required packing the interior of the stainless steel nesting bowl with clay. (This process was similar to the process used to determine the details of the exterior of the wood bowl.) The major difference in this initial step, however, was that the entire interior of the serving vessel was packed with clay and pressed against the stainless steel to remove any existing air bubbles within the clay. Once the interior of the serving vessel was packed with clay and any existing air bubbles were removed, I flipped the nesting bowl upside down and removed it from the clay form. The clay form replicated the stainless steel bowl's interior and I continued to shape the clay to match the desired contours for the glass bowls with my hands and the clay modeling tools (See Figures 83 ad 84). (Note: Water was frequently added to my hands and the clay tools to keep the clay malleable.)

Figure 83: Clay pressed into the 9 x 9 x 9 stainless steel nesting bowl.

Figure 84: Top view of stainless steel nesting bowl filled with clay.
Note: This was prior to turning it over onto he wooden board.

Making Plaster Molds

Once I finished shaping the clay form, I placed it on a clay modeling board and applied a solution called clay slip as a border around the edge. I then applied a clay wall, one and a half inch tall and one inch thick along the edge of the clay slip. (See Figures 85 and 86).

Figure 85: Clay negative of 9 x 9 x 9 inch nesting bowl interior. (Released from stainless steel nesting bowl and turned upside down)

Figure 86: Clay slip and clay wall applied to the border of the clay negative.

Once this was completed, I mixed a dry solution of one half plaster, one quarter silica sand, and one quarter hydrocal into a gallon sized bucket. I sifted this mixture into a half gallon of water at room temperature, which created small mountain-like piles in the water. As the piles settled and the mixture thickened this indicated that the solution was ready to be applied to the clay. To start the first coat, I flicked the plaster solution onto the clay. As the plaster solution thickened, I began applying it to the clay form by grabbing a handful of plaster and gently smearing it onto the clay form. In between coats, I applied three-inch strips of shredded fiberglass. Once I finished applying the last coat, I smoothed the plaster into a tapered form and allowed the plaster mold to solidify. After forty-five minutes I was able to turn the plaster mold over and scoop the clay out of the mold. The mold was then placed on a shelf to continue drying and hardening before placing it inside the kiln. The drying and hardening process lasted two to three days. (Note: This process was completed for each of the stainless steel nesting bowls.) (See Figures 87, 88, 89, and 90)

Figure 87: Dry mix prepared for mixing plaster.

Figure 88: Plaster mold applied to clay negative.

Figure 89: Plaster mold removed from base and turned over with clay.

Figure 90: Clay removed from plaster mold.

Selecting and Cutting Glass

Once I completed the plaster molds, I selected three different sheets of colored glass for the glass bowls. The selected colors: included: amber, royal blue, olive green, and orange. Each glass sheet was trimmed to a diameter slightly larger than the diameter of the nesting bowl that it was selected for by the glass fabricator. The olive green and orange glass sheets were selected for the four by four inch nesting bowl.   The royal blue sheet of glass was selected for the medium six by six inch nesting bowl and the amber colored glass sheet was selected for the large nine by nine inch nesting bowl. (See Figures 91and 92).

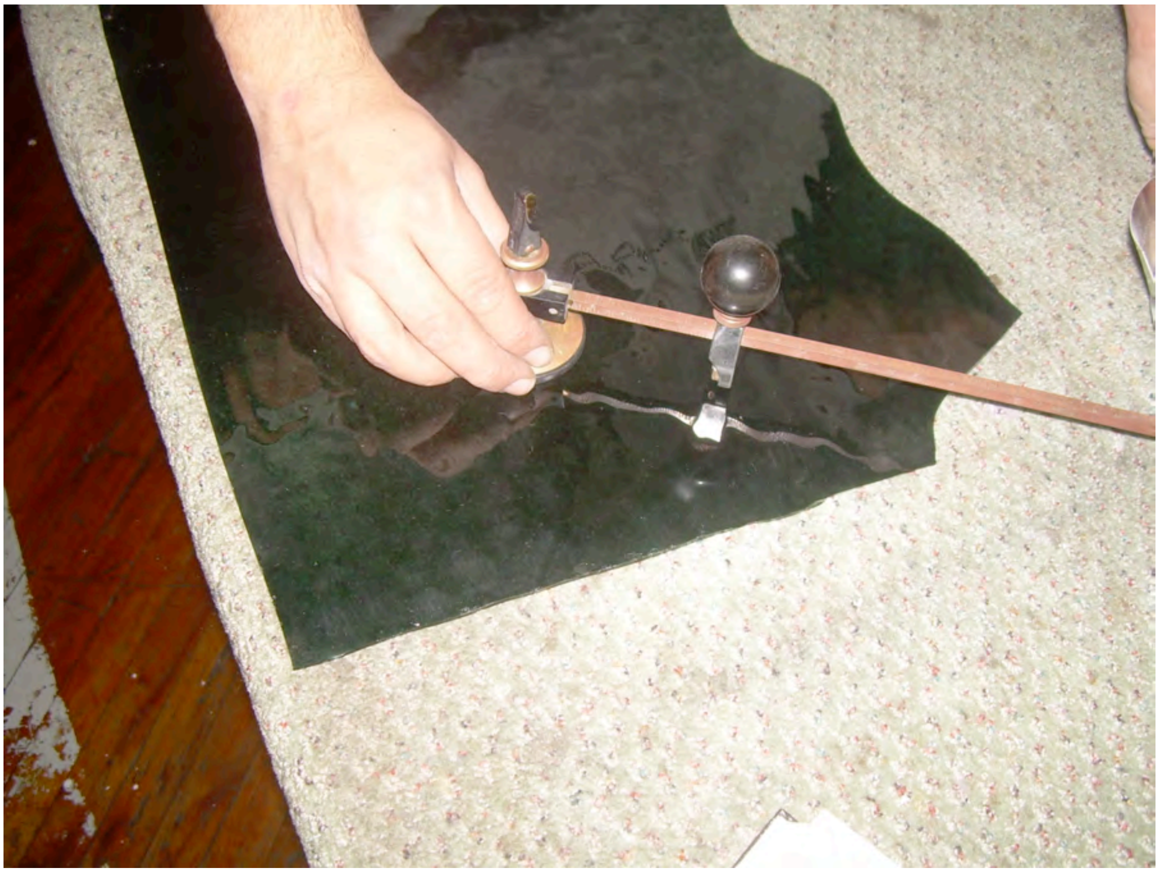


Figure 91: Cutting selected glass sheets to the appropriate diameter.

Figure 92: Cut glass sheets in the appropriate diameter.

Firing Plaster Molds and Slumping Glass

After the glass was trimmed, the glass fabricator coated the interior of each mold with a purple paint and drilled a three-sixteenth inch hole into the bottom center of each mold. Each plaster mold was placed into the appropriate sized kiln and the corresponding glass sheet was placed on top of the mold. As the kiln began to reach the appropriate temperature, the glass heated and began to sink down into the mold (Note: This describes the actual process of the glass slumping down into the mold). After the glass slumped into the mold, the kiln was turned off to allow the glass and the plaster mold to reach room temperature before the glass was removed from the mold. (See Figure 93 and 94)

Figure 93: Interior of plaster mold coated with a primer. Primer was used to prevent the mold from cracking during the firing process.

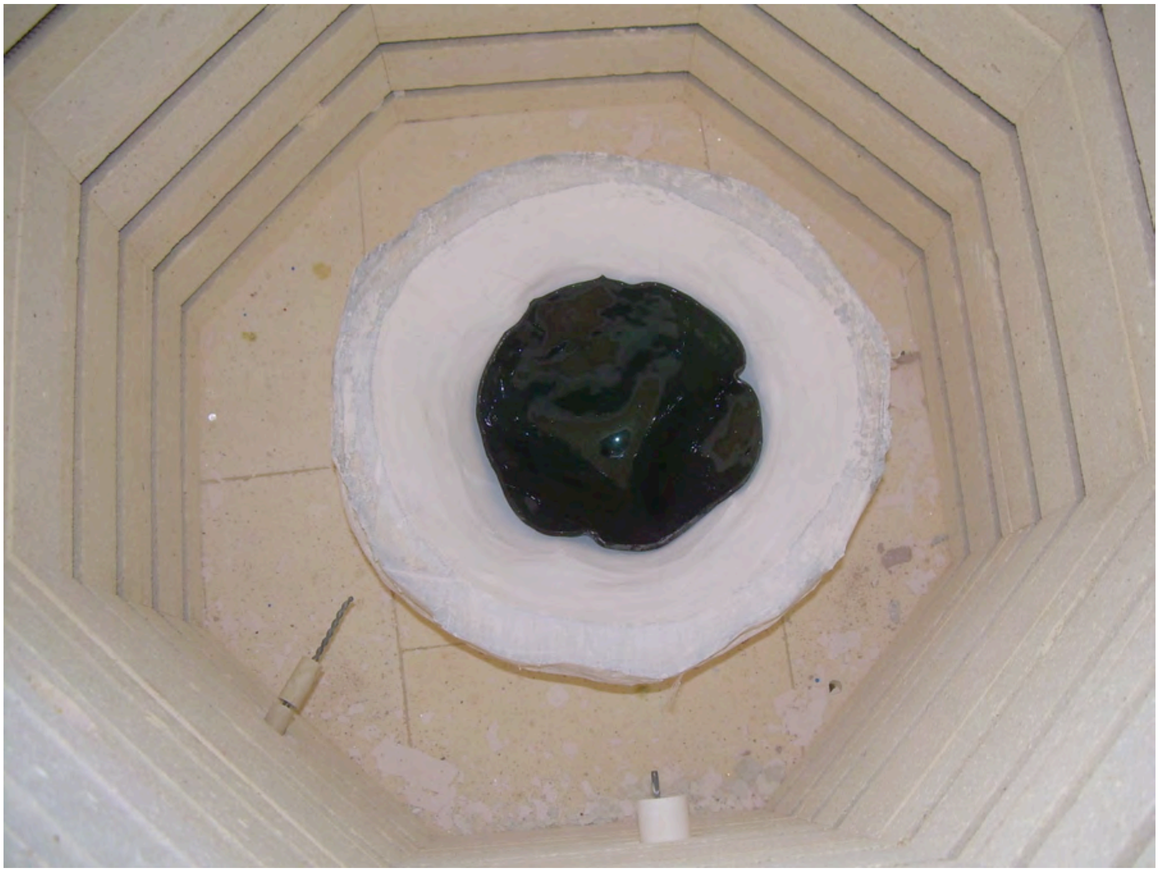


Figure 94: Glass slumped inside of plaster mold after it's fired inside the klin.

Finishing Work – Fusing Glass

The optional finishing work included fusing the glass bowls in order to remove any gaps in the glass. However this would require an additional firing in the kiln. At this time, I decided not to pursue fusing the glass due to time constraints. (See Figure 95)

Figure 95: Slumped olive green glass bowl for 4 x 4 x 4 inch stainless steel bowl

CHAPTER IV

ANALYSIS

Formal Critiques. Exhibits. Desk Critiques. Meetings with Committee Members

Analysis of the final design decisions occurred through formal critiques, design exhibits, informal desk critiques with fellow design students, comparative precedent research, and regular meetings with committee members. Formal critiques were used during each studio investigation as a method to assess final prototypes. A local design exhibit, where I showcased previous and future design ideas to the general public also provided a verbal analysis of previous and future designs from an objective viewpoint. Additionally, I was able to adjust my design decisions based on the frequent discourse with fellow design students and meetings with my thesis committee members. Informal desk critiques with fellow students often occurred when another student would stop by my desk and start *playing* with the various chipboard sketch models that I had created. Unlike the meetings with my committee members, these informal desk critiques were rarely scheduled. Additionally, meetings with my committee members were also used to plan for final critiques and the upcoming studio investigations.

The synthesis of design ideas requires the production of a prototype and its assessment based on critique and comparison with the stated goals. This process continues until the prototypical artifact possesses the desired qualities and satisfies the functional, ergonomic, aesthetic and emotional aspects of the parameters. This process and the synergy of ideas that results from the designer's reflective moments describes the *designer's back talk*. The exploration of design requires the designer to acknowledge and assess the ideas that emerge through sketching and conceptual models. The use of these ideas to inform design decisions is labeled as *back talk* or *situational feedback*. This feedback from a two-dimensional sketch or a three dimensional object results from the conscious act of evaluating new ideas and either developing them into a finalized design solution or eliminating them as possible solutions to a design problem. Therefore, the synergy of design ideas as a response to the design parameters dictates how the designer brings resolution to a design problem.

Design Parameters

At the beginning of this design thesis I designed interior products for a particular user group and social activity. I determined that the act of cooking and preparing meals together strengthen social connections between individuals. Due to the lack of evidence that suggested new relationships are currently forming among residents of urban mixed-income developments, I focused on creating interior products for social dining experiences within these residential developments. I utilized design parameters to determine the aesthetic and functional aspects of each product idea generated during the design process. These design parameters consisted of the following categories:

Lasting Aesthetic Value

Aesthetics of design relates to taste, elegance, and beauty. Artistic qualities such as the visual harmony between materials, sculptural geometric form, permanence of materials, delicate proportions, scale, and the ability to refuse excess external ornamentation create aesthetically pleasing artifacts that express values, uplift the spirit, engage emotions, and confirm individual taste. Ultimately, the selected materials and the product's form should convey artistic qualities that continuously capture the end-user's visual appeal.

Sculptural Qualities & Simple Form

Capturing artistic characteristics through chosen geometry, proportion, and scale results in a product's sculptural form. Using these sculptural qualities can also produce simple forms while either concealing or celebrating the structural fabrication of a product. The simplicity of a product though, causes the user to visually focus on the purity of its form.

Material Culture, Visual Harmony and Balance, Permanence of Materials & Selection of Food Safe Materials

Material culture connects the emotional relationship of mainstream artifacts to a particular era and society. The decision to specify more than one material for a product requires the designer to consider if one material will visually overpower another. If the specified materials counterbalance each other, they create visual harmony for the product, and the permanence of materials suggests that a material surface can endure the daily use of its owner and not lose its aesthetic appeal over time. The selection of materials for residential dinnerware and tableware requires the designer to consider materials that will not add harmful additives to the food that it is in contact with, or allow acidic foods to degrade the surface.

Material Typology: Shiny, Modern, New

This typology describes consumers' desire for products that visually stimulate their emotions. The aesthetic appeal of these products results from sleek, clean lines, and the sheen of surfaces. Twenty-first century plastic products typically have this aesthetic quality; yet, this material typology is also found in wood, metal, and glass products (Chapman, 2006).

Ergonomics

The consideration of how each product would accommodate the human form and movements aided in qualifying the design decisions and ideas.

Size / Volume of Serving Vessel

The functionality of each product relied on the ability for the final prototype to hold various types of food. Identifying the usage of products by predetermining which foods the products would hold guided the decisions regarding scale, dimensions and the exterior size.

Functionality & Social / Positional Characteristics

Since these products were designed for use during communal dining experiences, they function as utilitarian objects during dinner gatherings. However, the visual display quality of each product symbolizes the owner's social and positional status.

Fabrication & Design Alterations Required for Industrial Fabrication & Mass Production

Various methods of making during this design investigation included cold and heat bending, metal casting, turning wood bowls, and slumping glass. The majority of the prototypes were fabricated using traditional hand methods; however, some decisions were also based on the possibility of future mass production. In the interim, the aesthetic design and the order of fabrication was altered to accommodate industrial fabrication methods when applicable.

Visceral, Behavioral, & Reflective Appeal

The aesthetic design of a product can affect the ease of use for the end-user. Design theorists suggest that if products are designed well and have a non-cluttered design then it is easier for the end-user to operate them. Pleasure & effectiveness during the use of a product contributes to the memorable experiences associated with product usage. The memories and experiences associated with the use of a product also tell the story of each end-user and the appeal of a product's reflective characteristics relates to the end-users' ability to 'see themselves in the product'. Products that have this reflective quality for end-user's are considered positive representations of the owner.

Decision Making Regarding The Parameters. Each studio investigation had similar, yet slightly different foci. The initial focus of the 2009 Fall studio was to design cookware products for the residential environment. At the conclusion of the first studio investigation, the functional qualities of the cookware prototypes were questionable; yet, their aesthetic value led me to more promising designs for future serving vessels. Therefore, during the 2010 Fall studio I specifically focused on designing two sets of nesting serving vessels that could be used during dinner parties. The functionality was predicated on creating serving vessels that could be used individually or collectively to hold appetizers, fruits, side dishes, and small deserts.

Regardless of the functional intent of each product, the aesthetic design was dictated by the process of cutting and folding the horizontal plane of a material into a curvaceous form. During the second studio investigation these curved forms were pieced together to create bowls, dishes, and trays. The commonalities among the most successful prototypes were the introduction of various materials and the retaining of the visual integrity of the folds and creases within each piece. In contrast to the metal casted pieces, the prototypes made from either sheet metal or polystyrene were more successful at maintaining the visual and aesthetic integrity of the conceptual design. These conceptual designs were fully explored in chipboard medium prior to making half and full-scale models. Furthermore, the addition of a secondary material in certain prototypes added visual warmth to the overall design while increasing the functionality of the piece. These additions are seen specifically in the carbon steel serving tray and the set of three nesting stainless steel bowls. The need for a stand to hold the serving tray upright provided an opportunity to utilize American walnut as a supporting material, which added increased warmth to the carbon steel. The visual appeal of the wood led to the visual play between the fluid form of the steel serving dish and rigidity of the wooden support stand. The option of glass or wooden insert bowls was added in an attempt to increase the functionality of the stainless steel serving bowls. The use of glass or wood insert bowls alleviated the need for the stainless steel nesting bowls to hold side dishes other than whole fruits. Therefore, the fabrication process was simplified to connecting the sections of each bowl by spot welding the corners together instead of welding each sectional piece individually down the center and then connecting the three sections with spot welds. By limiting the functional requirements of the stainless steel bowls, the aesthetic value stayed consistent with the conceptual models. Furthermore, specifying the bowls for various fruits removed the concern of small food particles getting caught in the overlapped creases that resulted from connecting the sections together with simple spot-welds.

The additional final prototypes from the 2009 and 2010 Fall studio investigations did not include the introduction of a secondary material. These prototypes included two food scoops, a cooking utensil, and a serving tray and dish set. (See Figure 96,97, and 98)

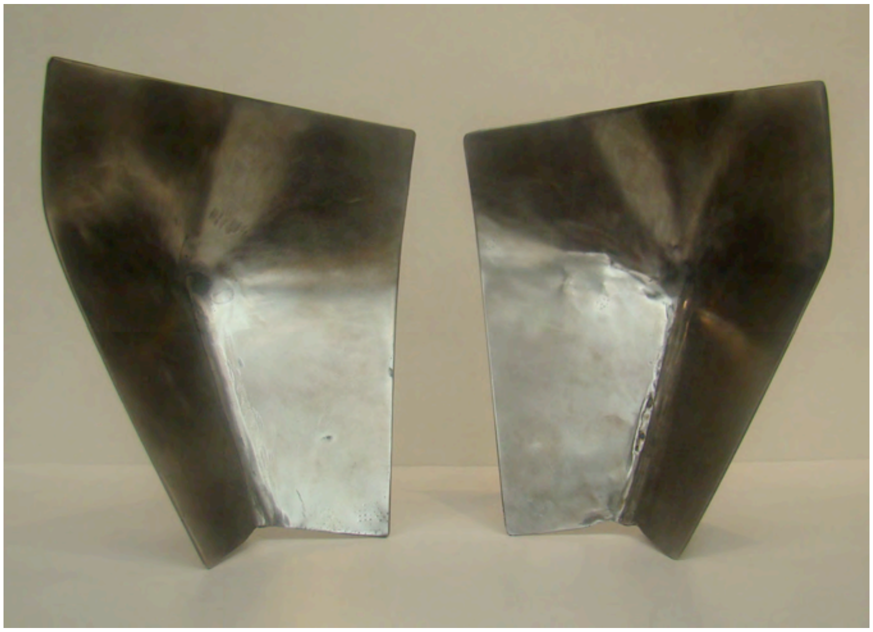


Figure 96: 7.5 x 7.5 inch 16 gauge carbon steel food scoops. (Note: Food scoops were sand blasted and polished to simulate stainless steel.)

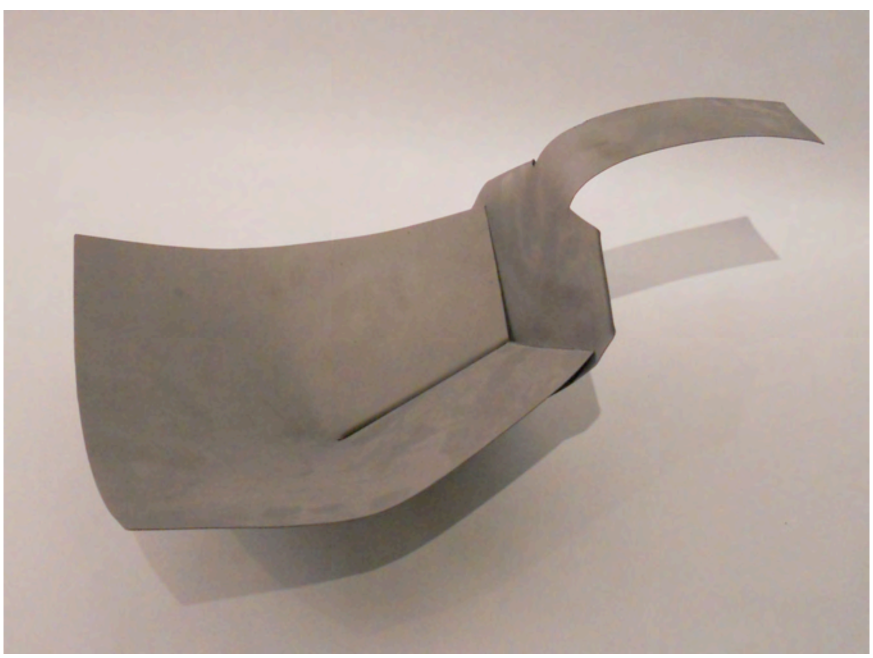


Figure 97: 12 x 12 inch 16 gauge carbon steel cooking utensil. (Note: Cooking utensil was sand blasted and polished to simulate stainless steel.)

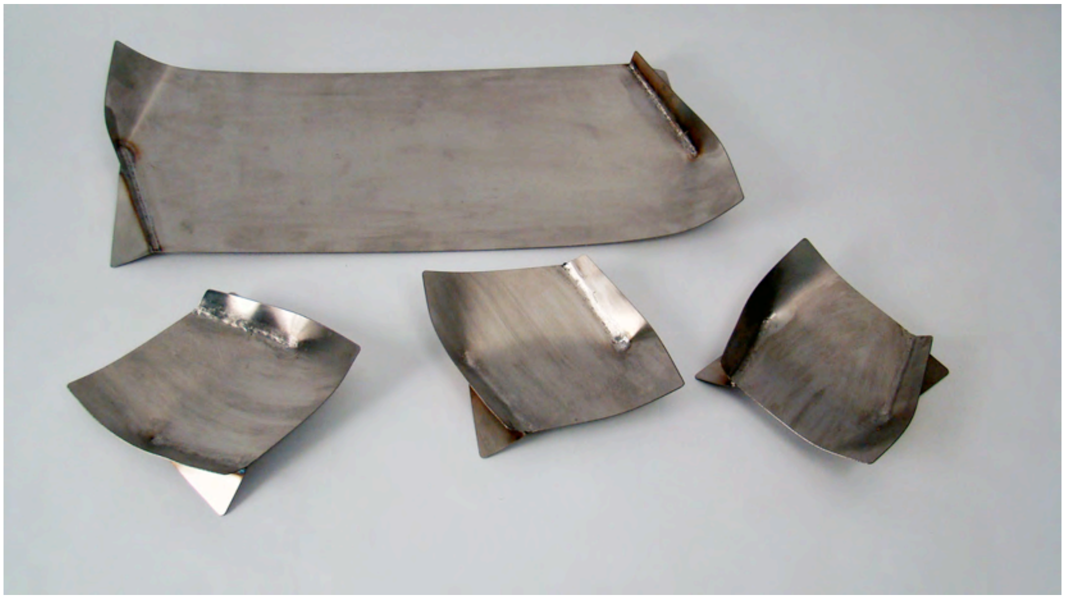


Figure 98: 16 gauge stainless steel serving tray and individual serving dishes. (Measures:19 x 7.5 inch and 5 x 6 inch).

These prototypes vary in functional and aesthetic value. The food scoops were the most simplistic in form and aesthetically achieved a greater visceral quality compared to the cooking utensil and serving tray and dish set. However, the functionality of the food scoops was limited by their size and the inability to stabilize them as bowls that could stand on their own. The major advantage that came from the simplistic form of the food scoops was that they became the base for other product ideas including the cooking utensil, the poly-styrene serving tray, and the stainless steel nesting bowls.

The cooking utensil was based on the food scoop but did not succeed in the areas of visceral aesthetic value and stability. The conceptual chipboard model conveyed a visual simplicity and a fluid form that appeared seamless. (See Figure 99)

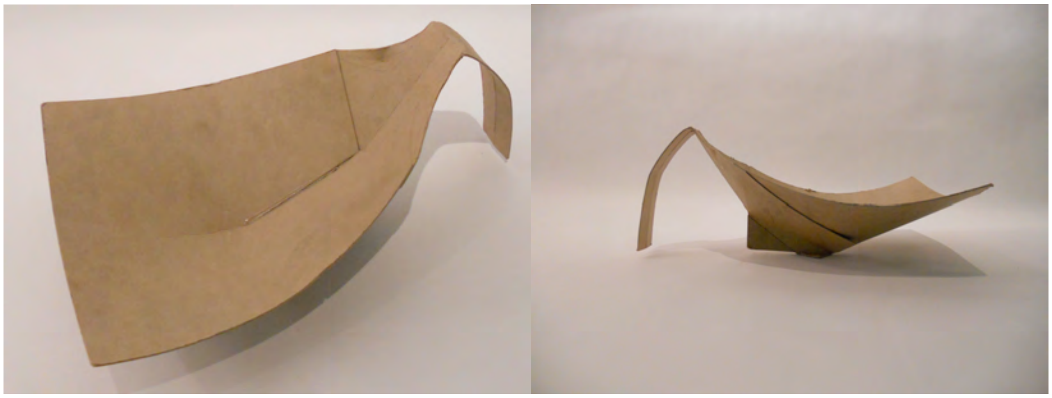


Figure 99: Chipboard model of cooking utensil.

The steel version however did not appear seamless, and in contrast, appeared as though there was additional material that did not serve a purpose functionally or aesthetically. (See Figure 100.)

Figure 100: Sand blasted carbon steel model of cooking utensil.

The serving tray and dish set also did not convey the visceral characteristics from the chipboard model to the stainless steel prototype. (See Figures 101, 102, 103, and 104)

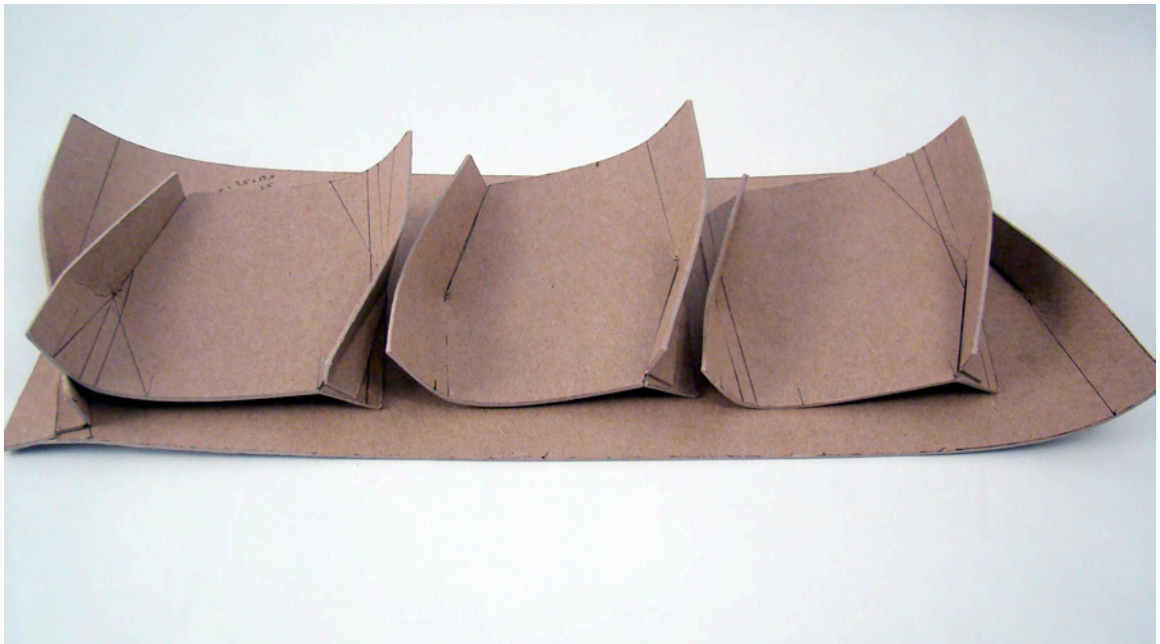


Figure 101: First chipboard model of serving tray and dishes

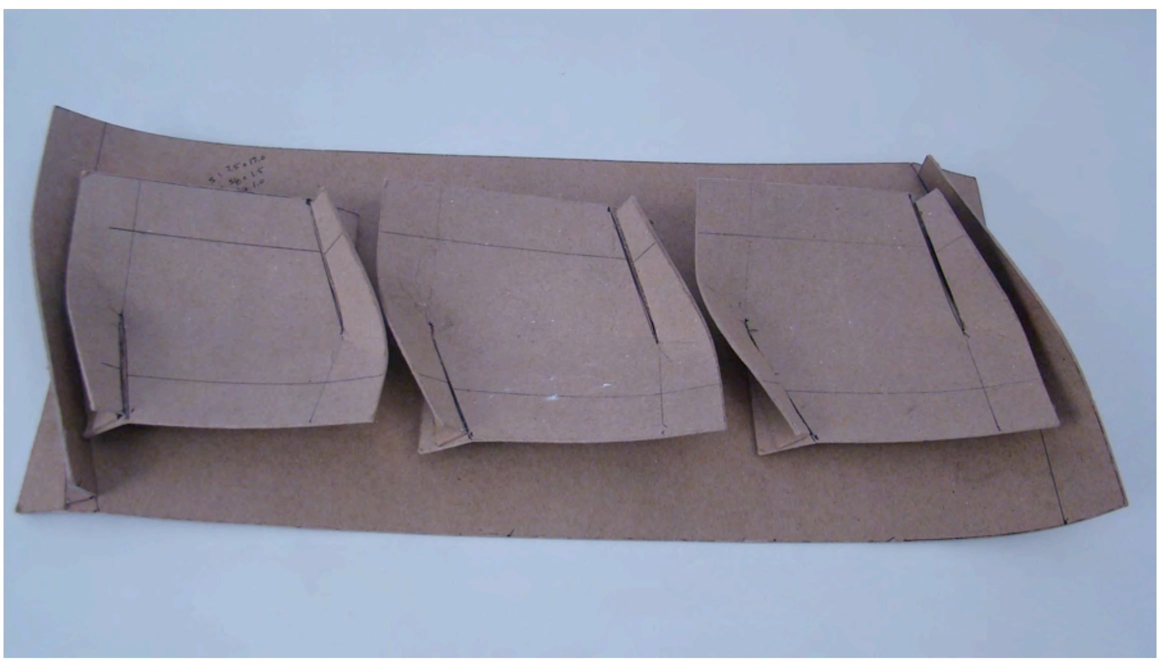


Figure 102: Chipboard model of serving tray and dishes.

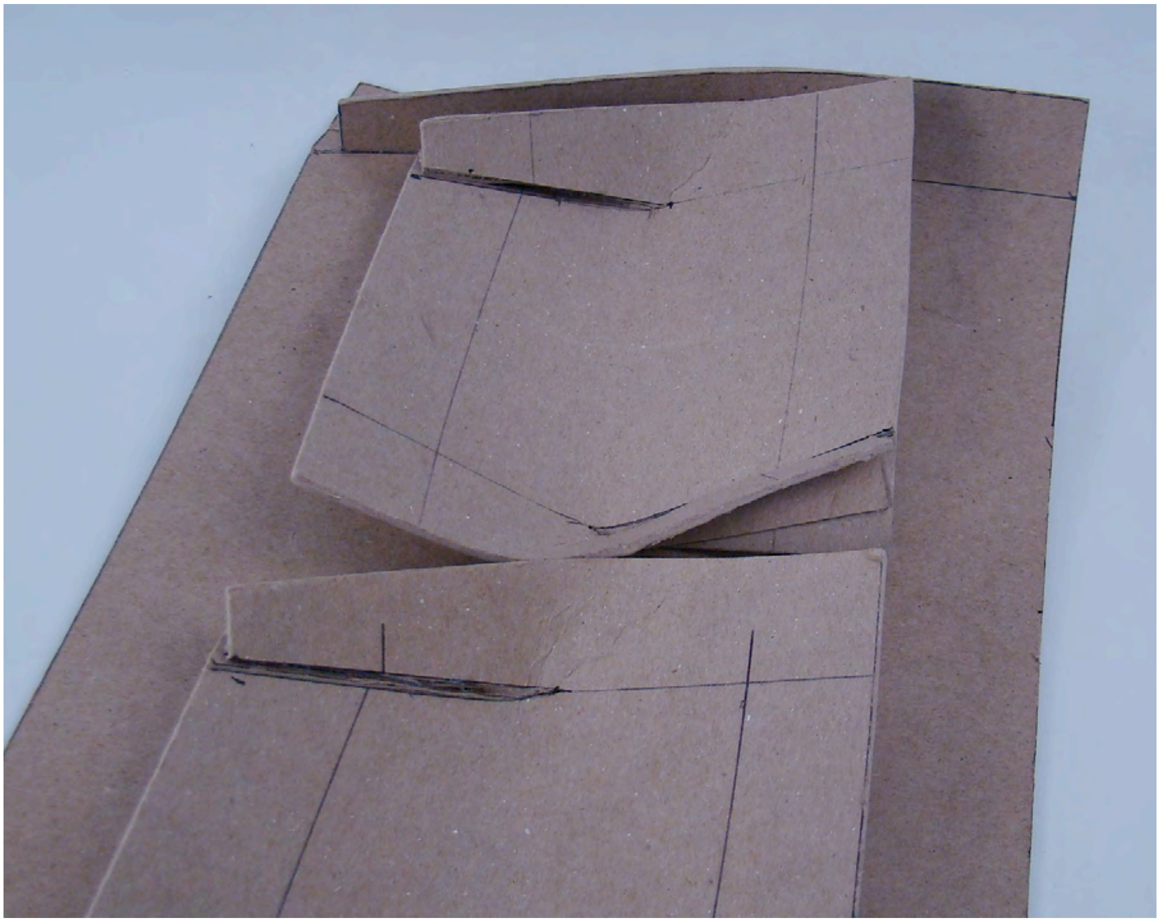


Figure 103: Chipboard model of serving tray and dishes.

Figure 104: Stainless steel model of serving tray and dishes.

Additionally, the three individual dishes produced a clanging sound as they often rocked back and forth, which diminished some aspects of the visceral appeal in spite of their simplicity of form. In terms of ergonomics, however, most individuals were able to hold the dishes in the palm of their hand and hold the tray in various positions depending on their own preferences. It is noteworthy that alternations to the fabrication process also affected the aesthetics and ergonomics of the dishes and tray. These alterations in the fabrication process included applying a single brake to the opposing sides of the serving tray and serving dishes instead of double brake on both sides of the slit. (Note: a slit was placed on two adjacent sides of each dish or tray.)

Carbon and stainless steel have been specified as the primary materials because metal's surface characteristics produce products that maintain the visual appeal of the shiny, new, and modern typology. The sleek and reflective nature of metal products along with the ability to re-polish metal to its original surface quality makes it an ideal material choice for products belonging to this typology. The secondary materials were also chosen based on their permanence and their ability to enhance the end-users experience with the product. For example, the option of wooden insert bowls added instant warmth to the stainless steel nesting bowls through the visual contrast of the stainless steel nesting bowls and the rich yellow and red tones in the wood. The colored glass insert bowls also added warmth and increased pleasure during the use of the stainless steel nesting bowls. The color and transparency of the glass, along with the reflectivity of the stainless steel contributed to the end-user's sense of warmth and pleasure. These visual experiences occurred in addition to the social experiences and memories associated with the products as they are used in the midst of social dinning. Over time the reflective and behavioral qualities of each product increase as it is used during moments of social interaction and dinning experiences.

Materials where chosen based on their food safety and longevity and the consideration of food safety was also applied to the selection of potential finishes and general fabrication decisions. These considerations led me to specify stainless steel as opposed to aluminum, cooper, or plastics as a final material for the products. (Note: Although, polystyrene was used to develop a final prototype it was chosen solely as a modeling material and not as a final material for actual fabrication.) While the aesthetic value continued as a dominant factor in, the design of each prototype, the aesthetic quality had to be measured against the products' potential to properly function as a serving or cooking vessel that would not contaminate food.

The ability for each product to achieve visceral, behavioral, reflective and sculptural qualities weighed heavily on the appearance of a simplistic artful object that functioned as a utilitarian product for serving food during a social dinner.

Implications of Manufacturing and Production

While various methods of making were employed, the method of traditional cold bending and industrial small-scale mass production proved to be the most successful techniques for forming sheet metal. Unlike the various metal casting techniques explored, the cold bending process retained the visibility of the original creases while cutting and breaking the sheet metal's planar form into a curvilinear object. I produced solid replicas of the 2009 Fall final prototypes and the polystyrene prototype by using the metal casting technique. This removed the concern that food particles might get caught into creases or overlapped areas of the product, however the aesthetic appeal of the curvilinear plans, creased material, and overlapped joints was lost in the metal cast prototypes. (See Figure 105 and 106)

Figure 105: Cast Iron Prototype of 4.5 x 9 inch Dual Serving Tray and Spoon

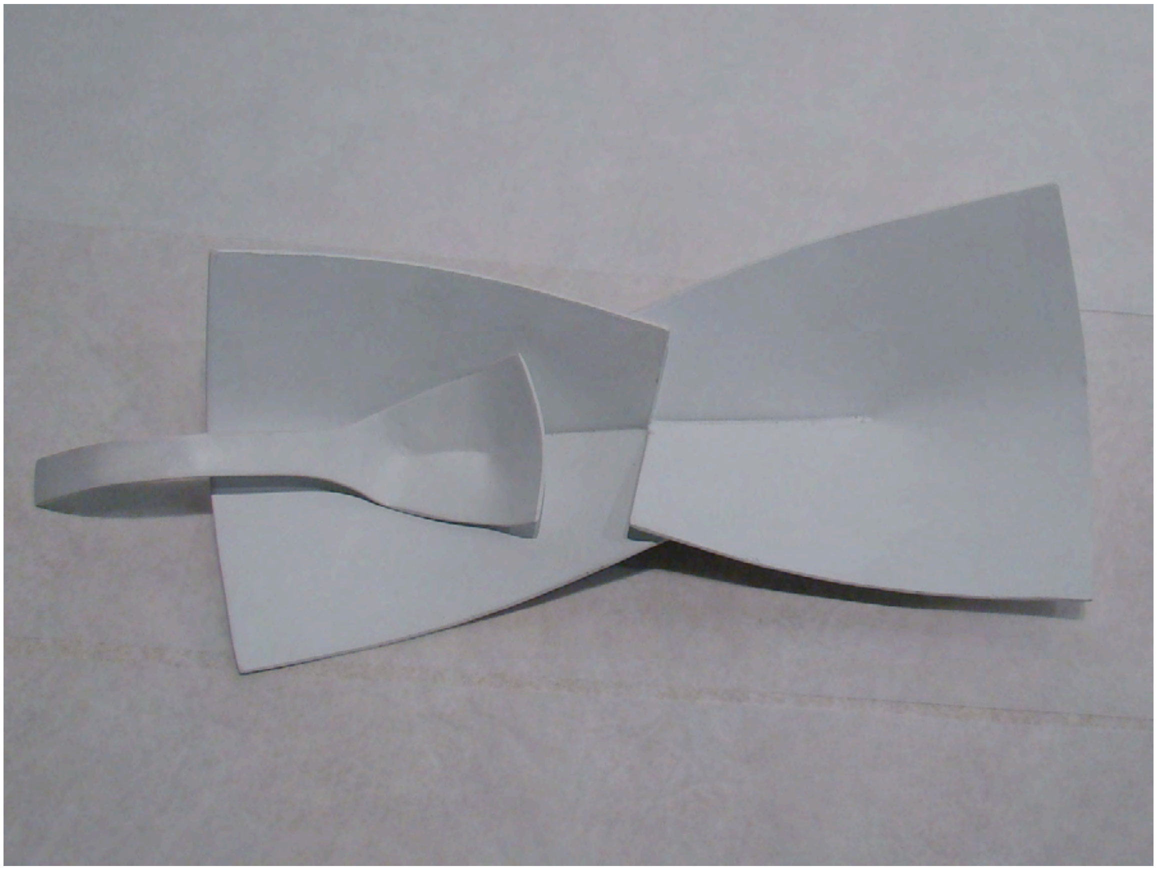


Figure 106: Polystyrene model of 4.5 x 9 inch Dual Serving Tray and Spoon

The process of industrially fabricating the cold-bent sheet metal prototypes produced more precise prototypes than traditional cold bending by hand. The precision was seen in the straight edges of the slits, clean break lines, and tighter welds that could be ground down to be barely visible. This level of precision resulted from using an industrial water jet cutter, an industrial foundry brake and TIG welder versus a jigsaw, braking the metal by hand and using a MIG welder. (See Figures 107 through 112)

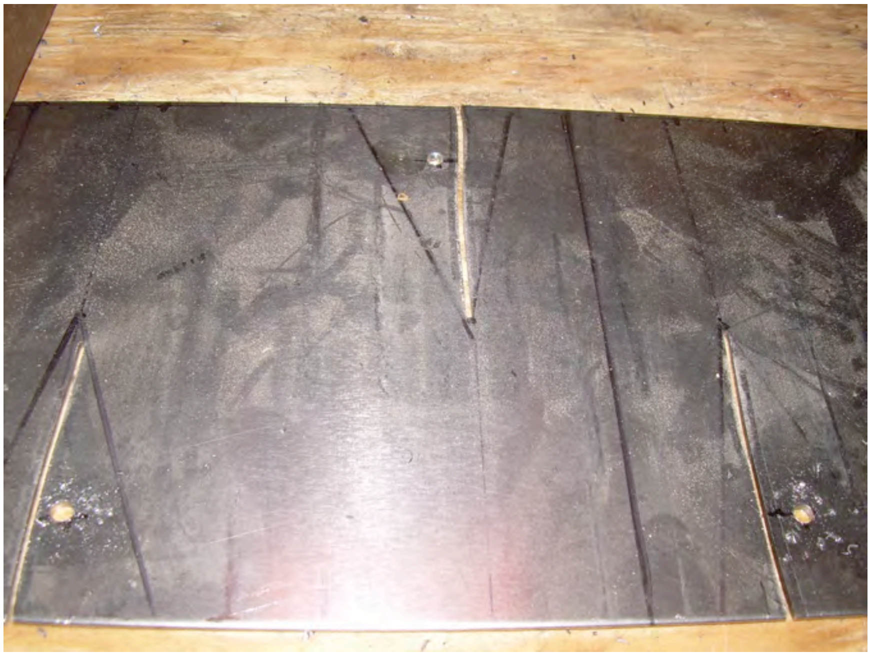


Figure 107: Slits of individual serving dishes cut with jigsaw.

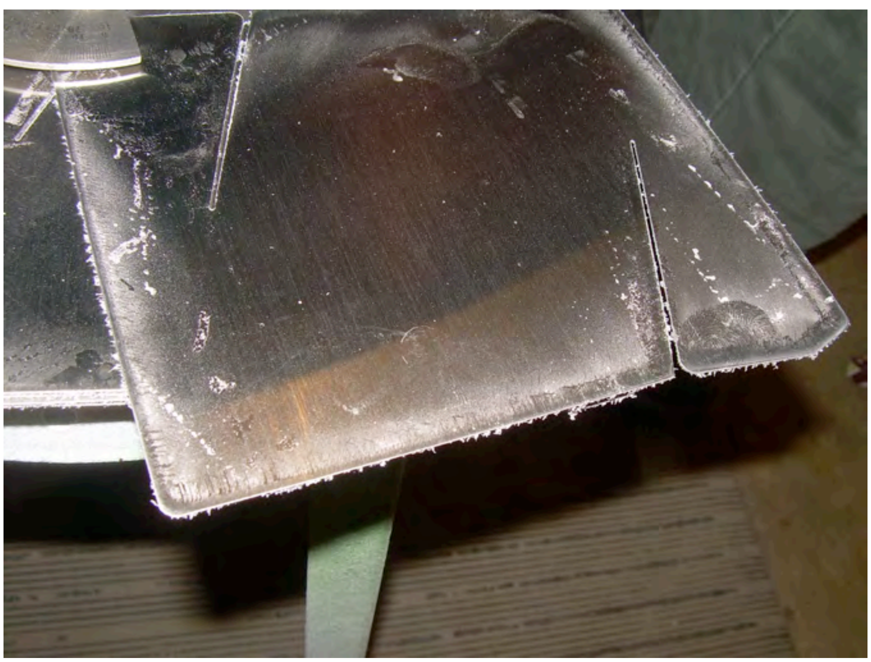


Figure 108: Slits of individual serving dishes cut with water jet.

Figure 109: Cold bending by hand.

Figure 110: Cold bending with industrial brake.

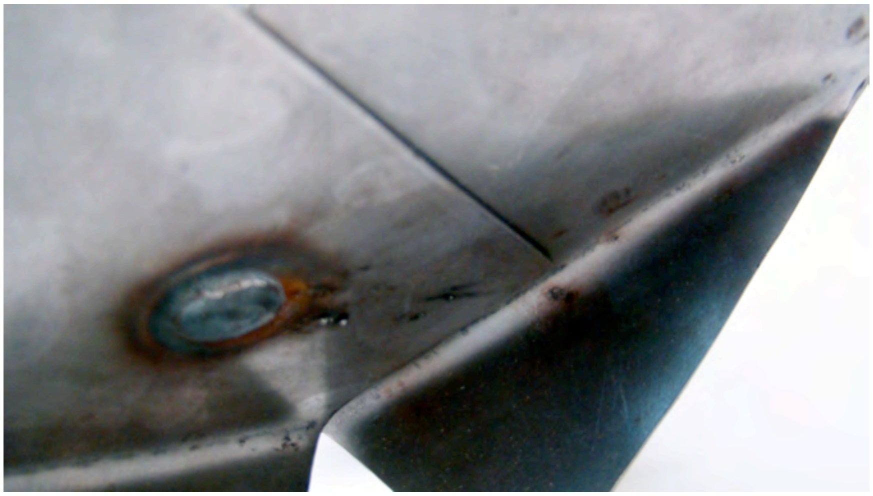


Figure 111: Spot Welding with a MIG welder.

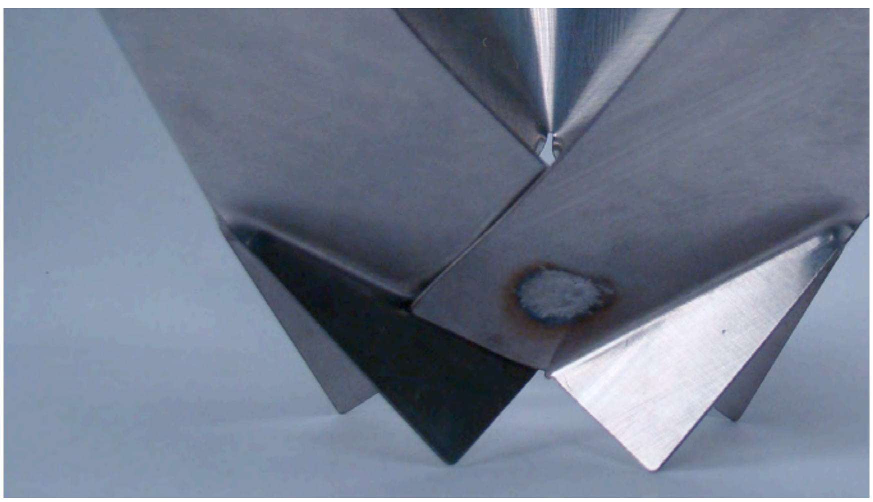


Figure 112: Spot Welding with a TIG welder.

The additional benefit of the industrial fabrication process was the considerable reduction in production time and the increased knowledge of future mass production processes. Some prototype designs were altered based on the order of making these prototypes from sheet metal versus the chipboard medium. These alterations included reducing the amount of brakes in the adjacent sides of the serving dishes and serving tray, utilizing spot welds for the stainless steel nesting bowls, curving the individual sections of each nesting bowl prior to braking them, curving the individual dishes, pre-drilling the holes for the spot welds, and choosing not to weld the slits of the nesting bowls. (See Figure 113, 114, 115 , and 116)

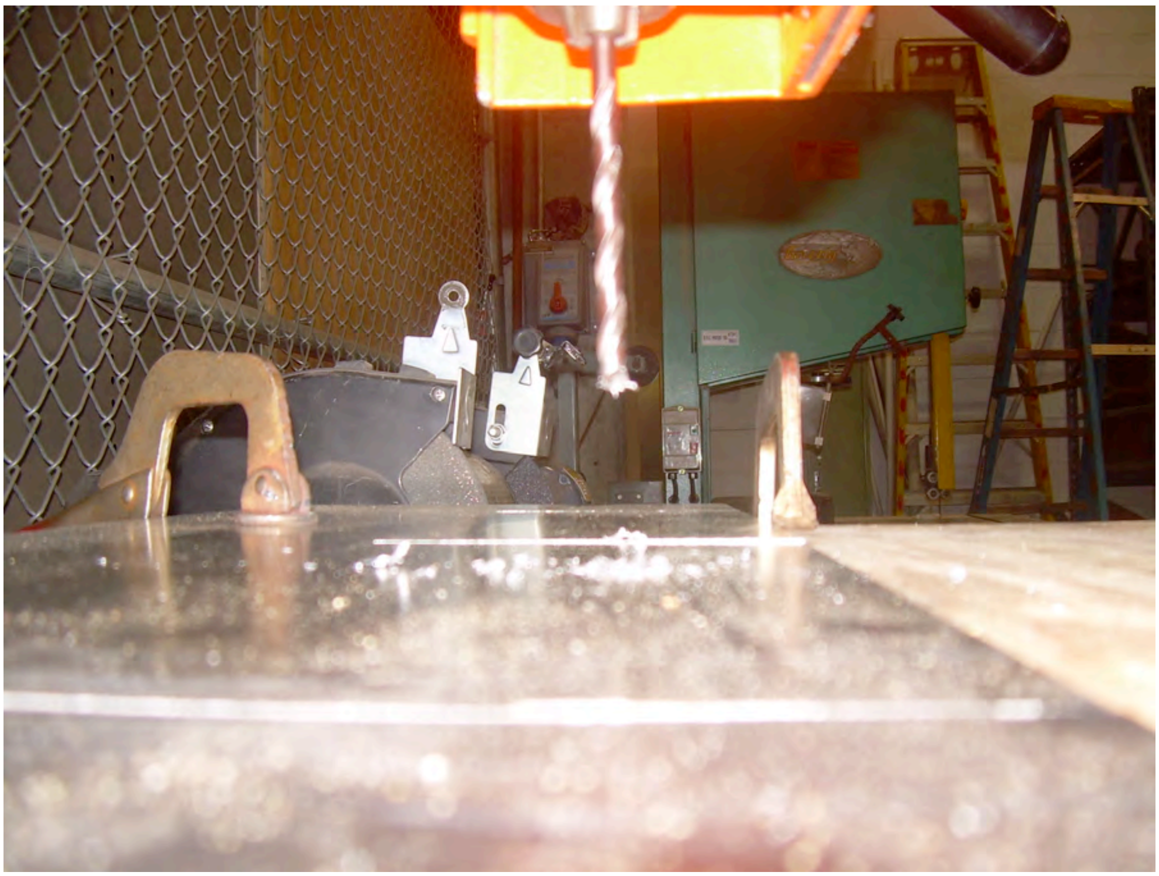


Figure 113: Preparing holes for spot welds with a drill press.

Figure 114: Water-jet cutting holes for spot welds.

Figure115: Welded slits versus open slits of the scoop form.

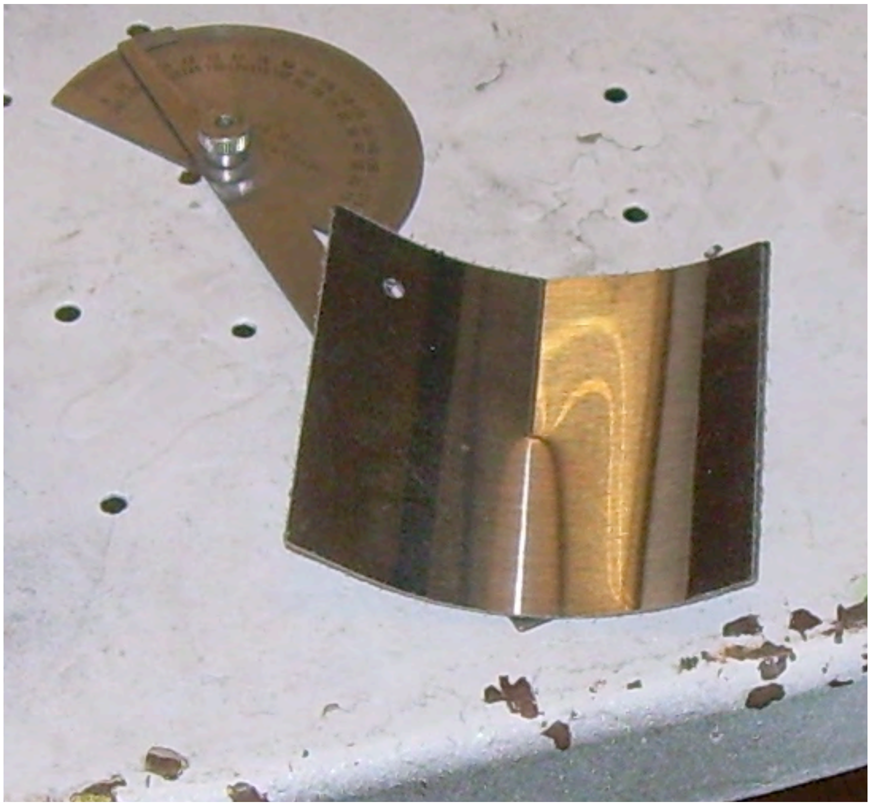


Figure 116: Section of nesting bowl pre-curved through an electric roller.

Design Improvements

Food Scoops

The pair of food scoops was originally designed as bowls. However, the inability to balance them in the traditional bowl form caused individuals to pick them up and hold them between their fingers in order to use them. In spite of the functional challenges, I decided to fabricate these final prototypes, recognizing potential end-users' response to the form and their pleasure associated with using the objects. During the discourse of informal critiques and design symposiums, design students and professors suggested that I continue to piece the scoops together and explore various scales after they saw other chipboard models of this form. Additionally, design students noted the ease in handling the food scoops and using them to gather ingredients for large meals (See Figures 117, 118, 119, and 120).

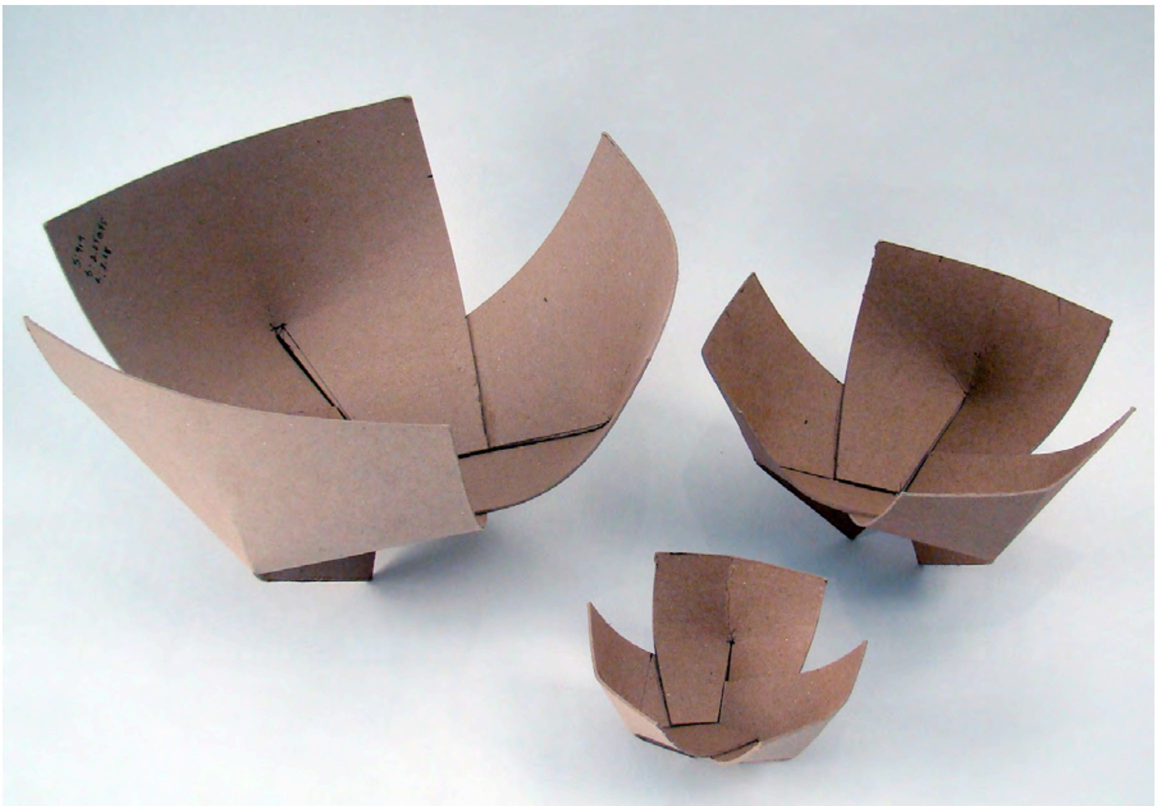


Figure 117: Chipboard models of nesting bowl set.

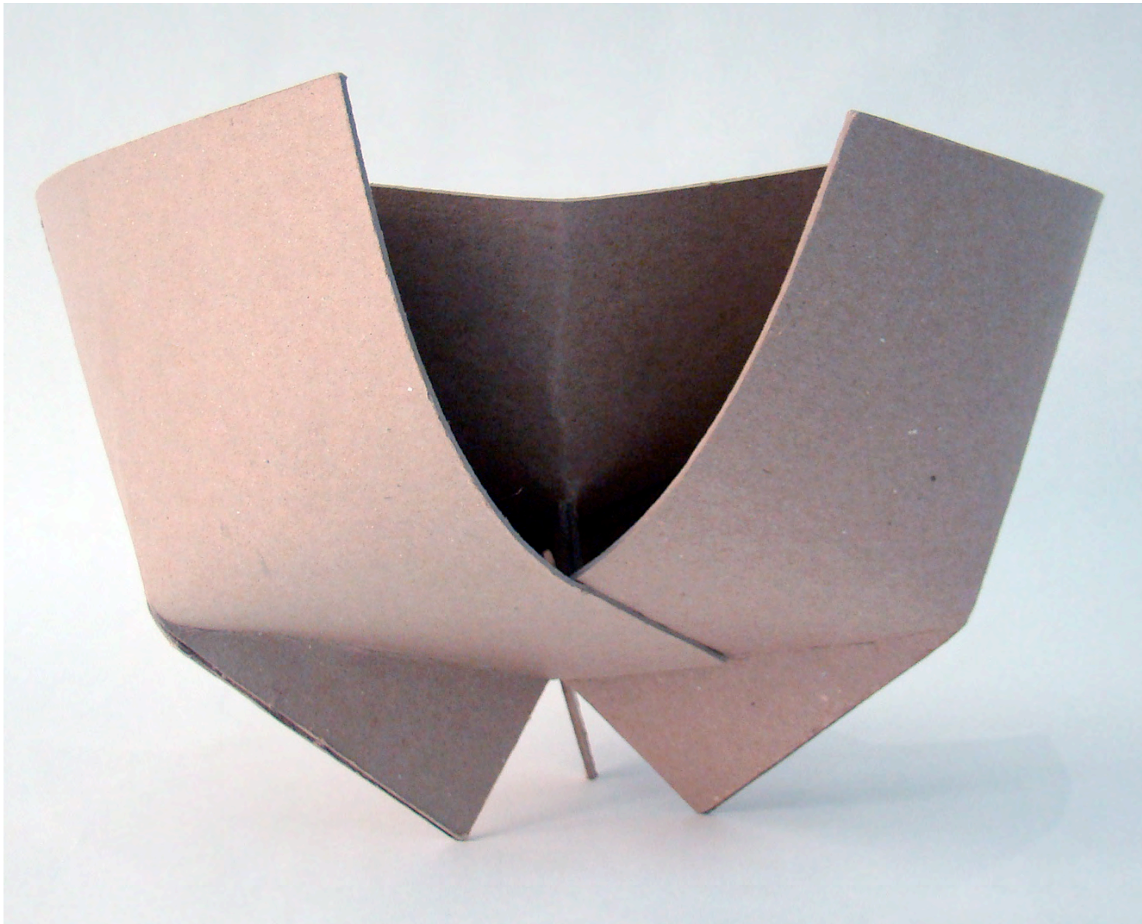


Figure 118: Chipboard model (side view) of 9 x 9 x 9 nesting bowl.

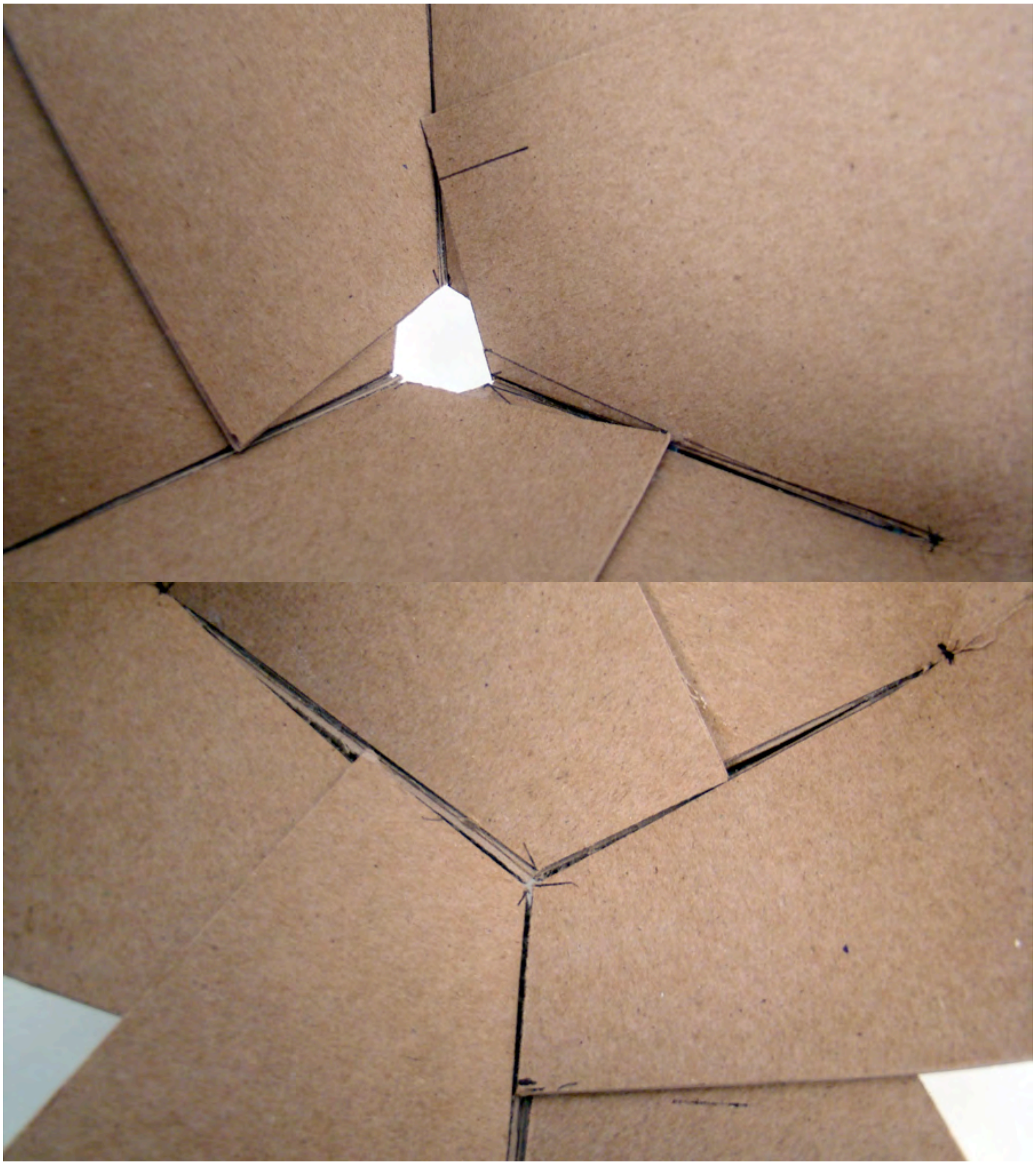


Figure 119: Detail of nesting bowl center.

Figure 120: Various arrangements of carbon steel models.

Cooking Utensil

The cooking utensil was based on an enlarged version of the food scoops with the intent that the addition of a suitable handle would create a stable bottom and increase it's functional qualities. As I explored various wood handles and chipboard models, I concluded that using the same approach of cold bending metal to form a handle for the cooking utensil would provide a seamless, elegant, and cohesive cooking utensil. This particular prototype however, appeared to have too many parts despite its' two piece construction. The suggested improvements included creating a base and handle from one single piece of sheet metal versus a two-part construction method. If this cooking utensil could support itself without an additional handle or base, the design would become uncluttered and hopefully retain its' original sculptural qualities. (See Figures 121, 122, 123, 124)

Figure 121: Half-scale carbon steel model with wooden handle.

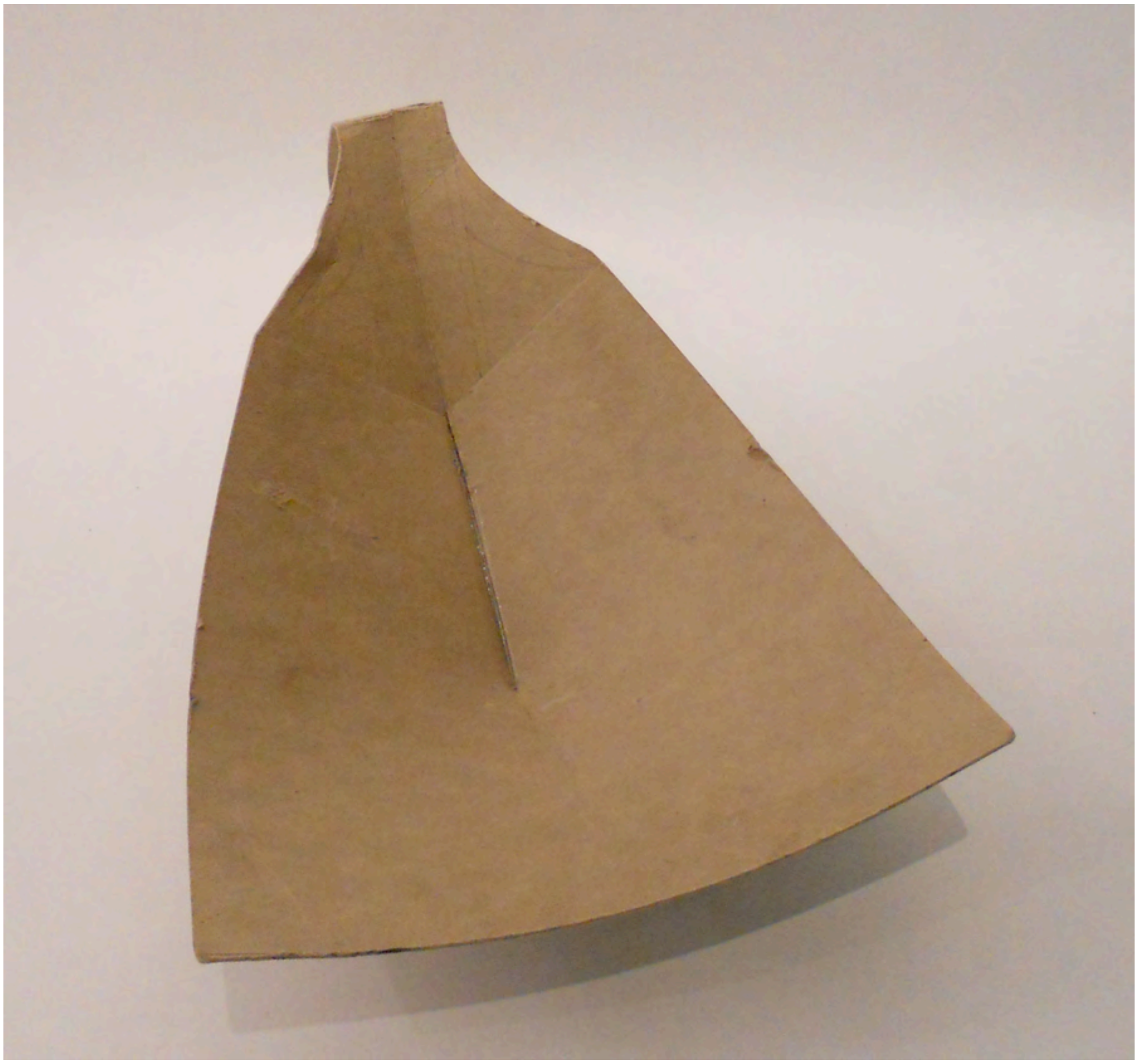


Figure 122: Final chipboard model of cooking utensil.

Figure 123: Final carbon steel model of cooking utensil.

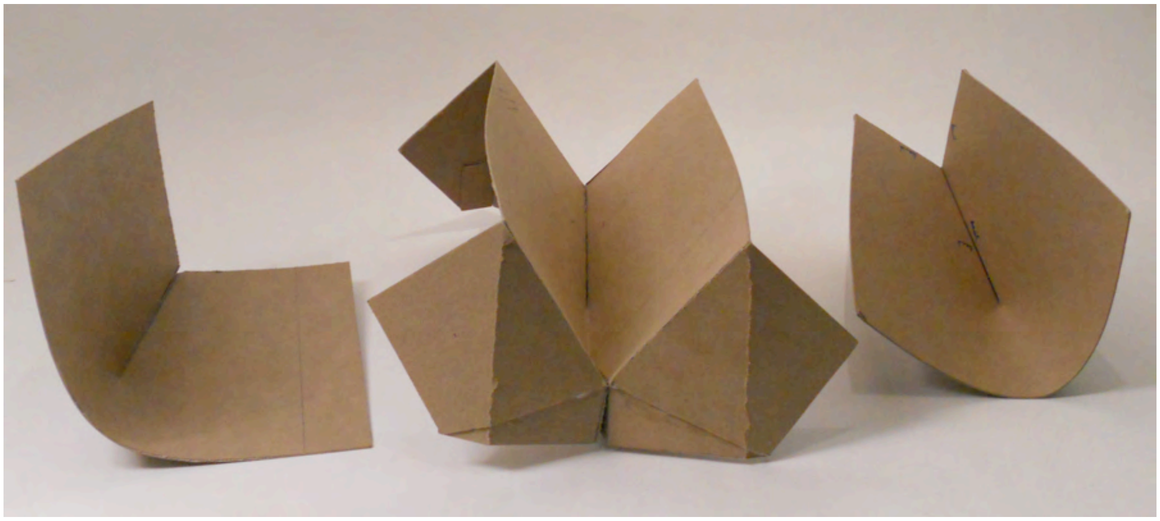


Figure 124: Testing chipboard models of revised cooking utensil and serving dish.

Serving Dish

The serving dish was fabricated from carbon sheet metal, polished to appear like stainless steel. The depth of the slits was determined based on the proportions and scale that would create a deep enough curve to hold breads or fruits. The welded seams helped to retain the form as a narrow bowl or dish. Walnut was used to create a durable stand for the serving dish while providing a visual contrast between the cool and rustic surface of the carbon steel and the warm red undertones of the wooden handles. The durability of the walnut suggests that, as it ages the characteristics of its surface will remain appealing to the end-user. Additionally, a variety of potential shapes were explored for the wooden stand (See Figures 125, 126, and 127.)

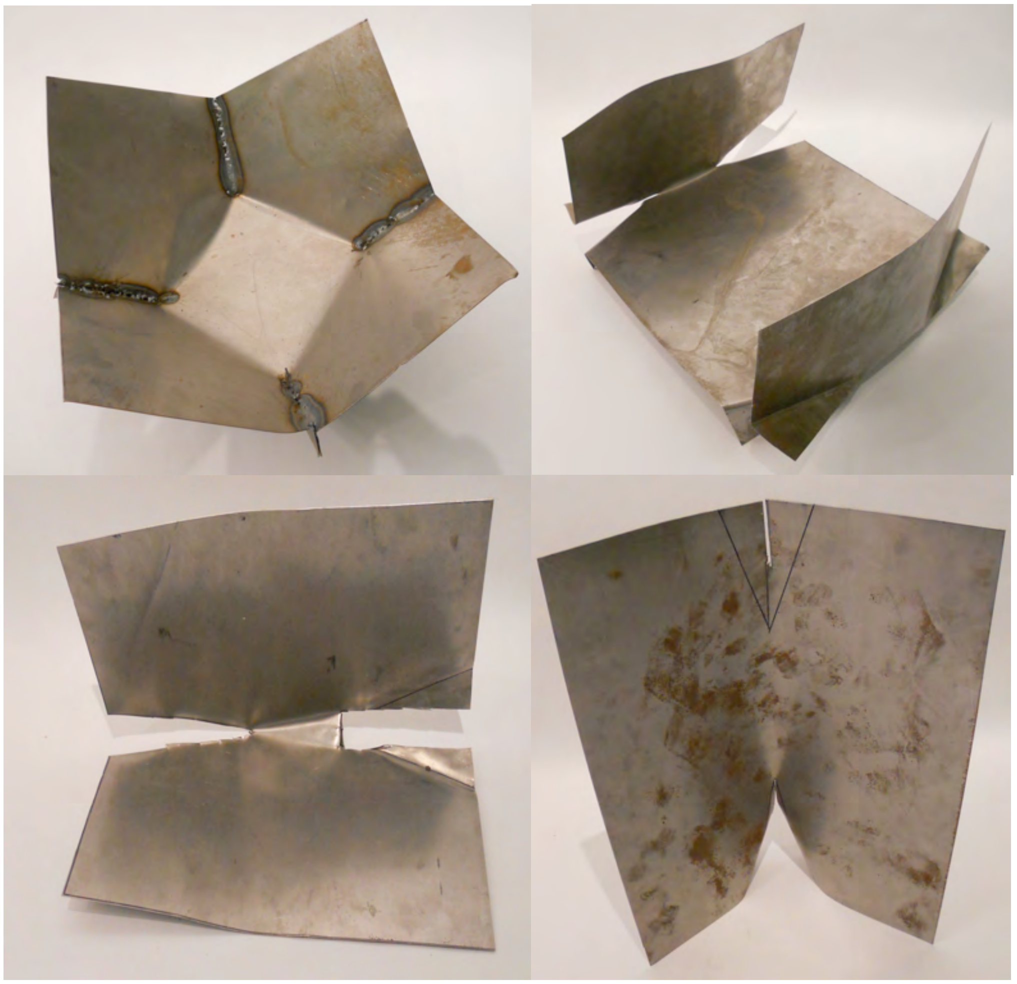


Figure 125: Various serving trays in carbon steel.

Figure 126: Various wooden stands for serving dish.

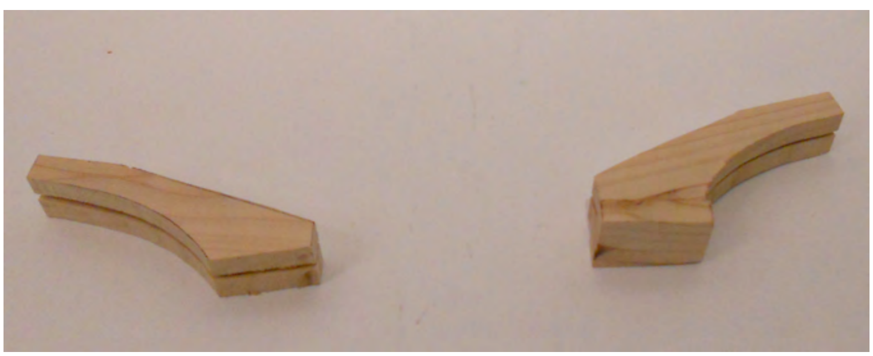


Figure 127: Final plywood stand for serving dish.

I chose the final shape for the wooden stands based on its ability to support the steel serving dish without visually overpowering it or diminishing its' slender and floating appearance. The main improvement for this product is the stability of the stands when they are not in use. A 1/8" inch diameter steel rod was placed in a bottom notch of each wooden stand to resolve this issue and add balance to each stand. This solution should prove more successful if the stands were slightly wider and if the steel rods were fixed into the lower half of each stand. The marks that appear over time could remind the owner of a particular event or memory they experienced with another end-user as they used the product together. This potential for reflection creates stronger opportunities for both the behavioral and reflective appeal of the product. (See Figure 128)

Figure 128: Final prototype of Serving Tray with stand.

Dual Serving Tray and Spoon

The serving tray was developed after exploring the food scoops at various scales. These scales were accepted or declined based on the ability to recreate a curvaceous form deep enough to hold particular foods or condiments. (See Figure 129)

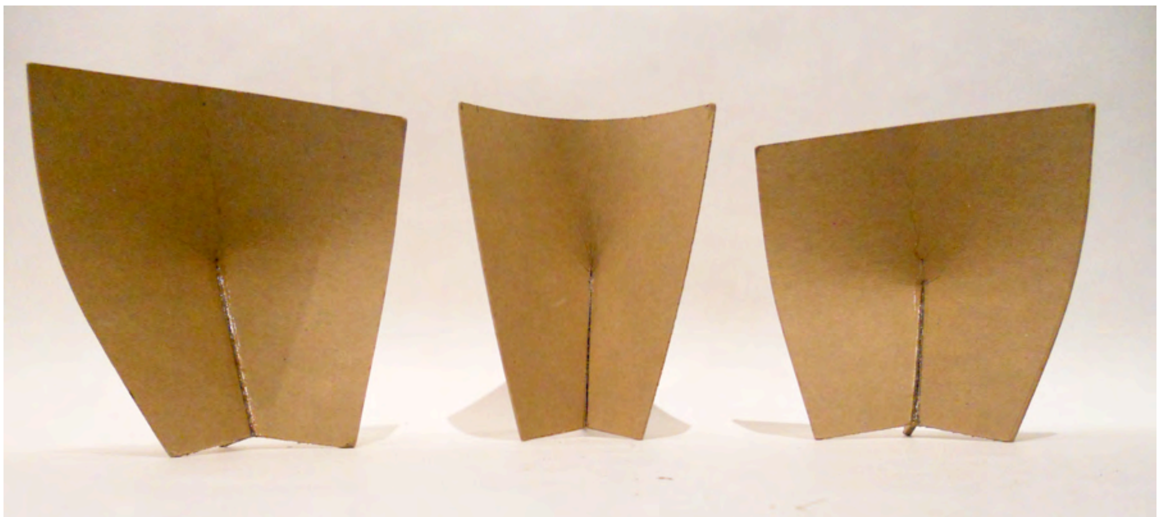


Figure 129: Chipboard models for various food scoops.

Scale and handling comfort were also considered during the final selection of design ideas. The design for the dual serving tray was conceived from connecting multiples of the food scoop form to form a new object. This process was repeated again to create the set of nesting stainless steel bowls and other product designs. Connecting two forms together in a particular manner created an additional visual play between the structured and organic form. The aesthetic appearance of the dual serving tray achieved the appearance of a simple, sculptural, and elegant form. Additionally, the serving spoon that accompanied the dual serving tray was modeled directly from the cooking utensil base and handle; however, the serving spoon achieved a more sculptural form and aesthetic appeal. The dominant critique of this prototype during formal critiques and informal meetings with thesis committee members was its' inability to stand on its' own. Although some professors and design students suggested that I design stands or a base out of another material, other professors or thesis committee members suggested that I redesign the product to balance and stand without an additional material or structure. A similar suggestion was also made regarding the cast iron version of the dual serving tray and serving spoon, so the bottom of the iron dual serving tray was ground down until it would balance on it's own without any additional materials or supports. However, the main critique of the cast iron prototype from design students was the visual loss of the breaking a planar sheet into a unique curved form. (See Figure 130 through 133)

Figure 130: Chipboard model of Dual Serving Tray.

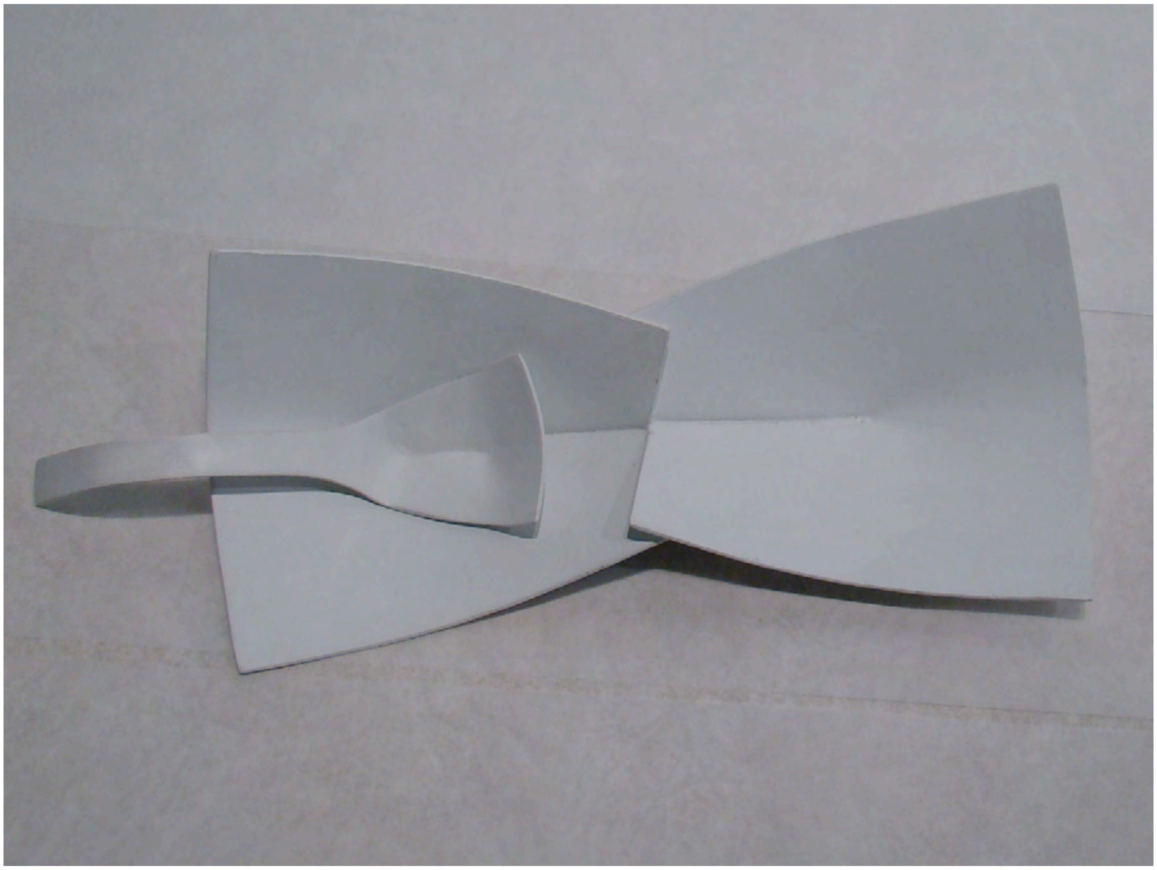


Figure131: Polystrene model of Dual Serving Tray and Spoon.

Figure 132: Cast Iron model of Dual Serving Tray and Spoon.

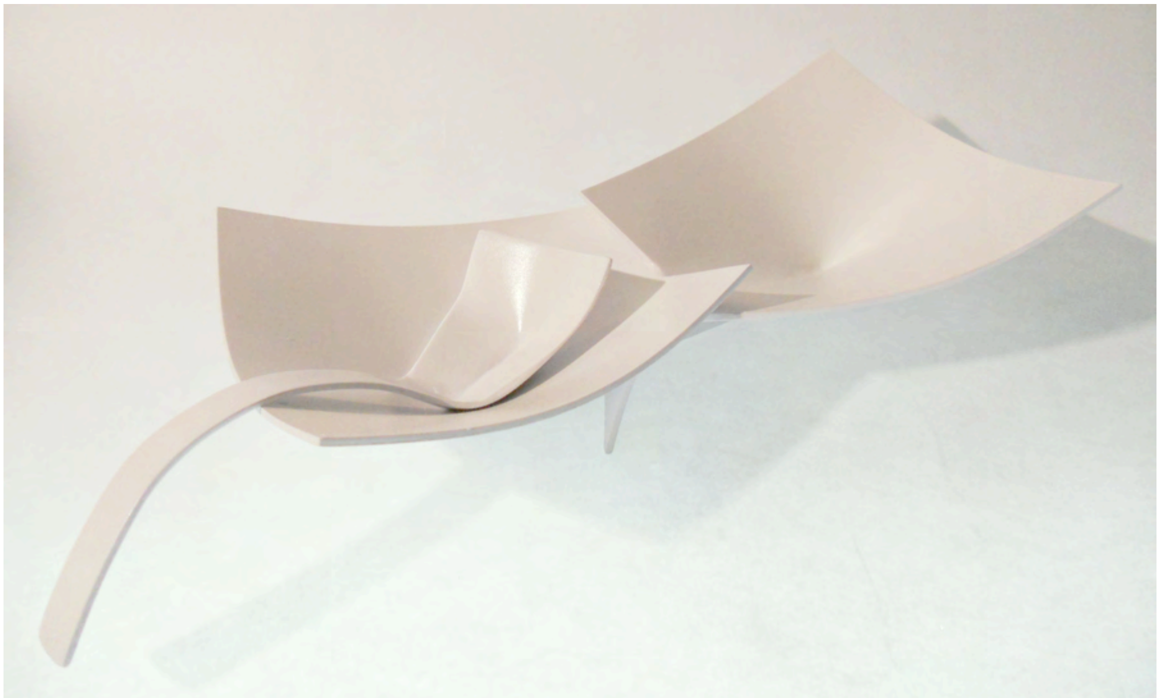


Figure 133: Polystyrene Dual Serving Tray and Spoon with built-in stand.

Stainless Steel Nesting Bowls with Glass or Wood Insert Bowls

Similar to the dual serving dish, the stainless steel nesting bowls were developed through the process of cutting and breaking a planar sheet into three food scoop forms and then connecting them to create a single nesting bowl. These bowls were specified at the following scales: 9 x 9 x 9 inch, 6 x 6 x 6 inch, and 4 x 4 x 4 inch. The variance in scale provided accommodations for different foods and the option to stack the bowls for storage. The diameter of the 4 x 4 x 4 inch bowl measured approximately 6 inches and held small fruits such as grapes and strawberries without the need for a an insert bowl. The 6 x 6 x 6 inch bowl had a 9 ½ inch diameter, suitable for holding bread rolls and the 9 x 9 x 9 inch bowl with a fourteen inch diameter was suitable for holding larger fruits such as apples, oranges, and bananas. Insert bowls were added to the overall design to enhance the nesting bowls' functionality. Utilizing additional insert bowls enabled the end-user to use the nesting bowl for other foods such as soups, rice, and salads, while maintaining the nesting bowl's unique form and open center. (See Figure 134 and 135)

Figure134: Glass and wood insert bowls for stainless steel nesting bowls.

Figure 135: Open seams of nesting bowls.

Moreover, if I had decided to weld the center slits and overlapping edges of each section of the nesting bowls, a proportion of the aesthetic integrity from the conceptual models would have been lost. Again, the main reason for closing the center of each nesting bowl would have been to increase its functional capacity at the risk of decreasing its aesthetic integrity. (See figures 136, 137,and 138)

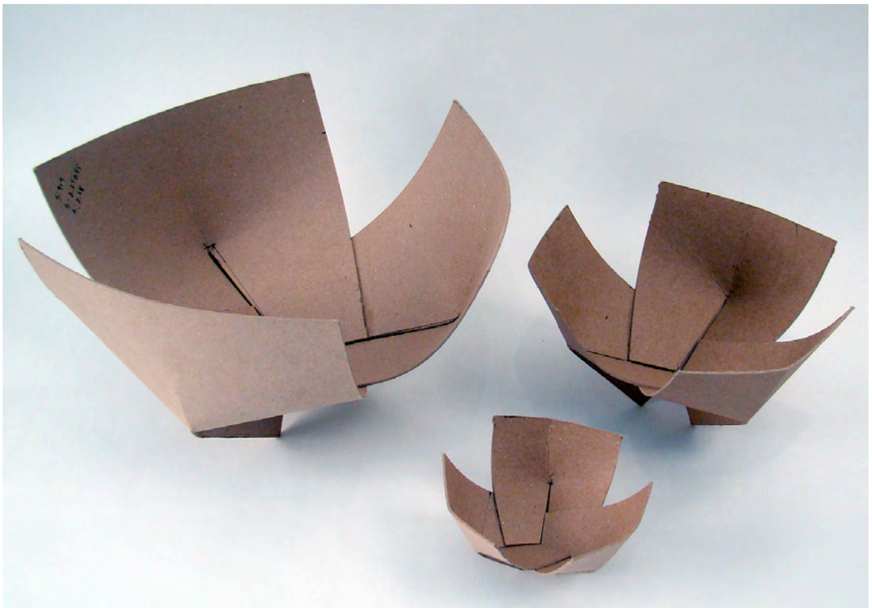


Figure 136: Chipboard models of Nesting Bowls

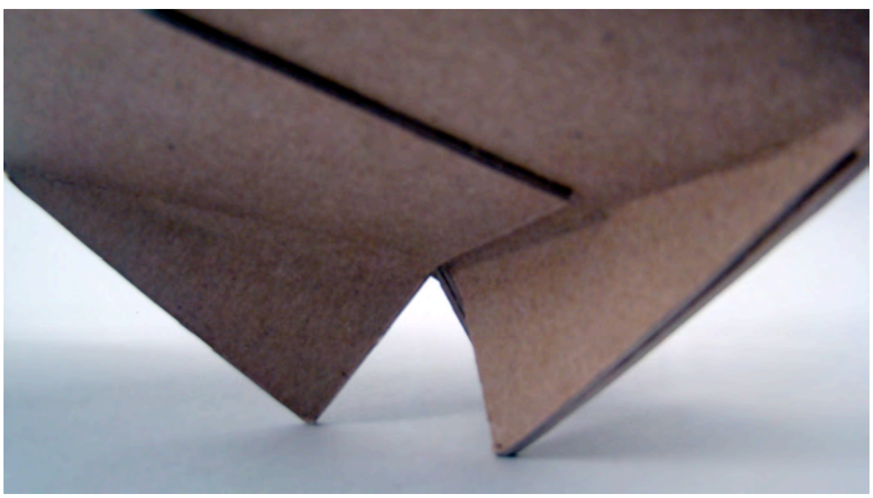


Figure 137: Detail of nesting bowl chipboard model showing overlap connection.

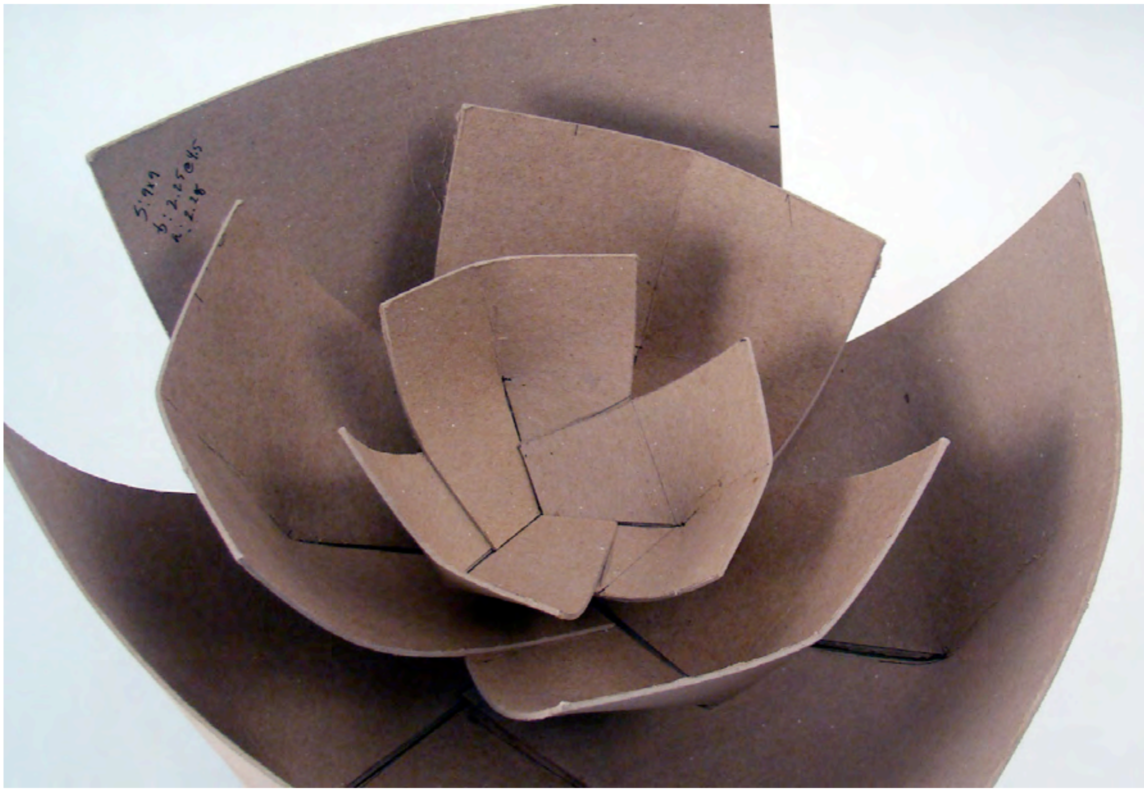


Figure 138: Chipboard models of nesting bowls stacked together.

Utilizing different materials for the nesting bowls and insert bowls provided an aesthetic balance between various materials. Glass and wood were my initial choice materials for the insert bowls. An advantage of using glass insert bowls was achieving a strong visual connection between two materials, since the color of the glass reflected against the stainless steel surface. The transparency of the glass also allowed the end user to visually connect the lines of the stainless steel nesting bowls with the contours of the glass bowl. The ability to create visual fluidity with the glass also allowed me to contour the shape of the glass bowls specifically to the stainless steel form. (See Figure 139)

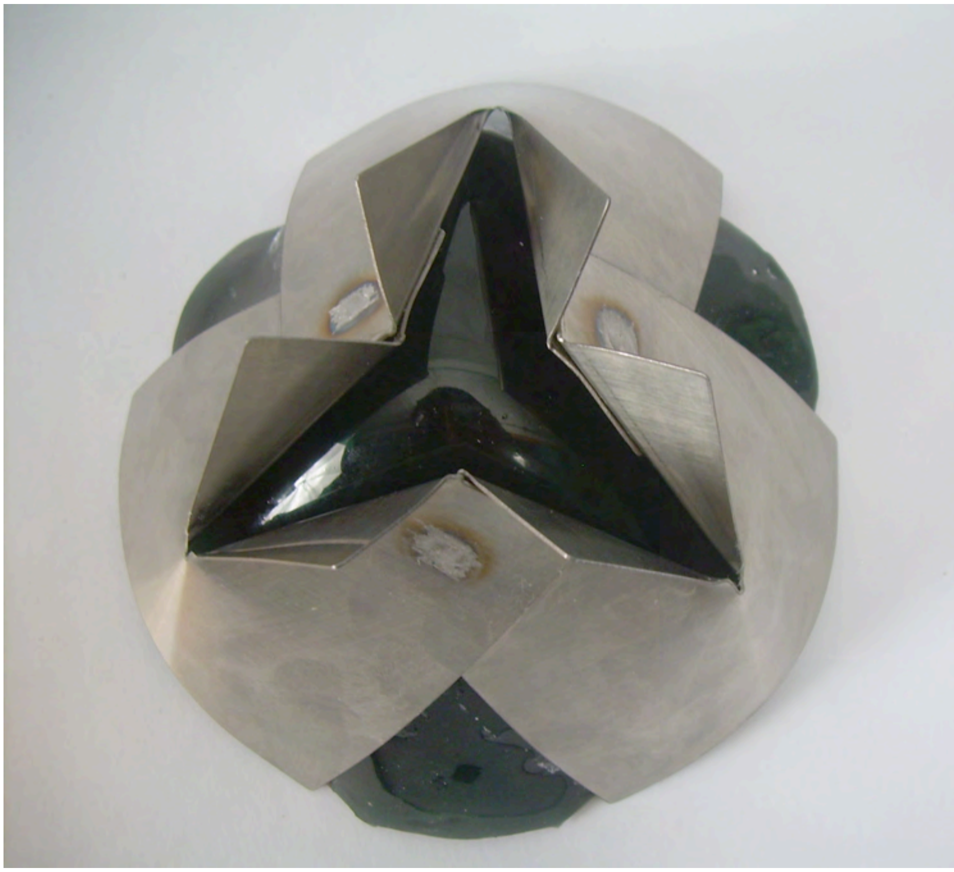


Figure 139: Bottom of slumped glass bowl. (Contoured to fit stainless steel serving vessel)

This connection appealed specifically to the visceral and reflective qualities of the product more than wood insert bowls. However, utilizing wood for the insert bowls provided a greater visual contrast between the warmth of the wood and the cold and hard characteristics often associated with stainless steel. The bottom contour of the wood bowl also provided greater stability, allowing it to function as a utilitarian object, apart from the stainless steel nesting bowls. (See Figure 140)

Figure 140: Wood and glass insert bowls.

Due to the unpredictable outcome of the glass slumping process, the bottom contour of the glass bowls was not stable enough to function separately from the stainless steel. The main disadvantage of the wood insert bowls was the need for the end-user to hand-wash the wooden bowls versus washing them in a dishwasher. The glass bowls, however, could be washed in a dishwasher. The overall aesthetic and functional value of the nesting bowls met the desired parameters of the Fall 2010 studio investigation with a positive response from potential end-users. The main adjustments would be specifying twenty gauge stainless steel for the 9 x 9 x 9 bowl to increase its stability, adding a clear rubber cap to the bottom of each foot, and placing the spot welds closer to the top edge of each section. Additional adjustments would include finding new fabrication methods to slump the glass upside down to ensure that it forms exactly to the mold and to contour the wood bowls' exterior precisely to the nesting bowls. (See Figures 141, 142, 143, and 144)

Figure 141: Final Prototype of 4 x 4 x 4 inch Stainless Steel Nesting Bowl. (Glass Insert Bowl: Olive Green)

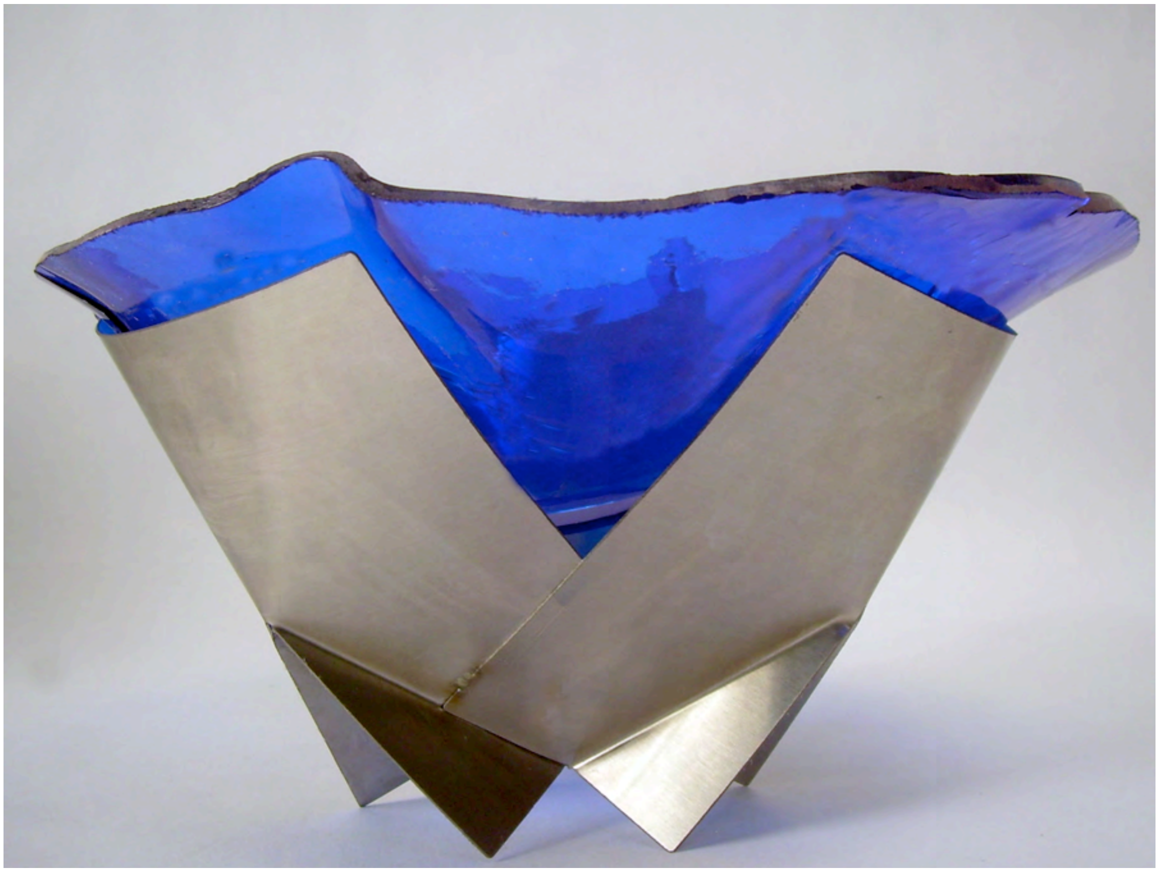


Figure 142: Final Prototype of 6 x 6 x 6 inch Stainless Steel Nesting Bowl. (Glass Insert Bowl: Royal Blue)

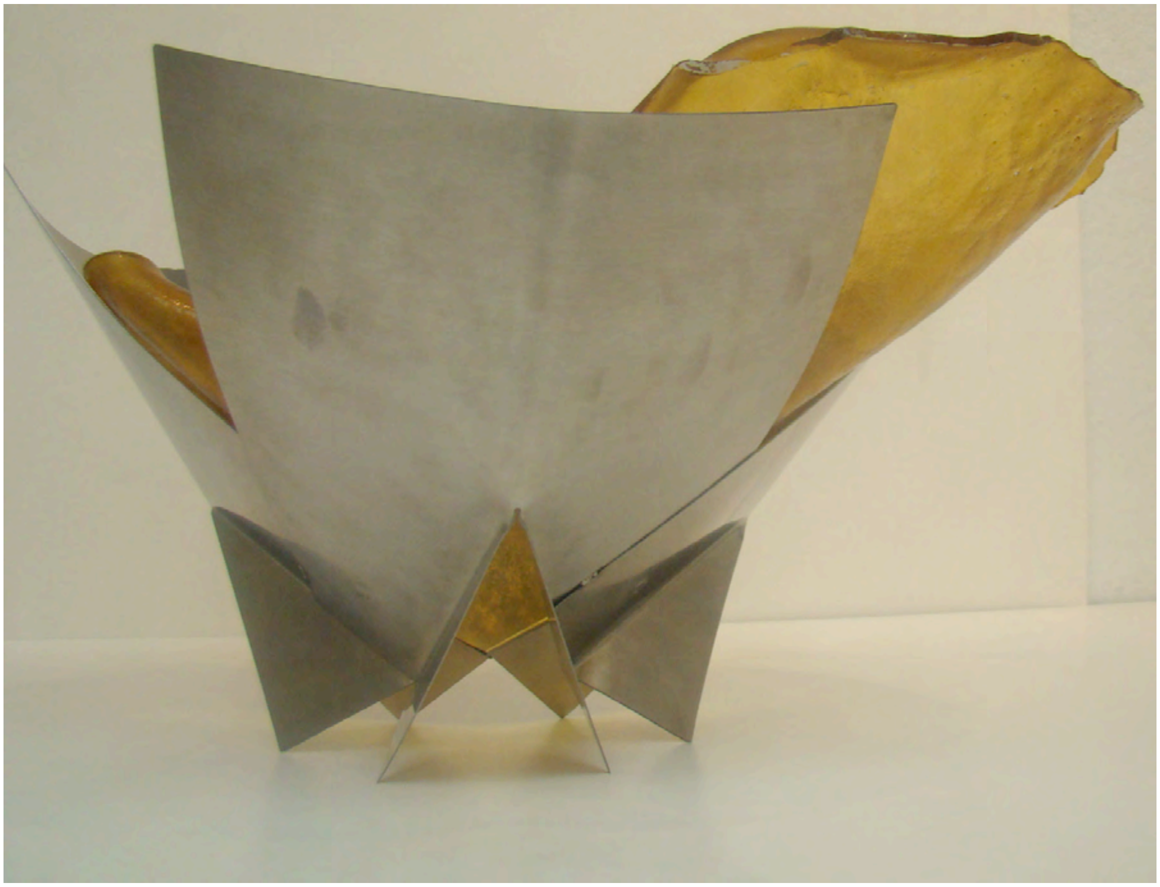


Figure 143: Final Prototype of 9 x 9 x 9 inch Stainless Steel Nesting Bowl. (Glass Insert Bowl: Amber)

Figure 144: Final Prototypes: Stainless Steel Nesting Bowls. (Various Wood Insert Bowls)

Stainless Steel Serving Tray and Serving Dishes

The stainless steel serving tray and dish set is a result from my attempt to design a table setting or plate and bowl set using the same cutting and braking technique. The major contrast from the original chipboard models is the amount of specified adjacent slits and breaks in order to achieve the desired and most ergonomic proportions. The sketch models originally had two brakes on either side of the two adjacent slits. (See Figures 145, 146, and 147.)

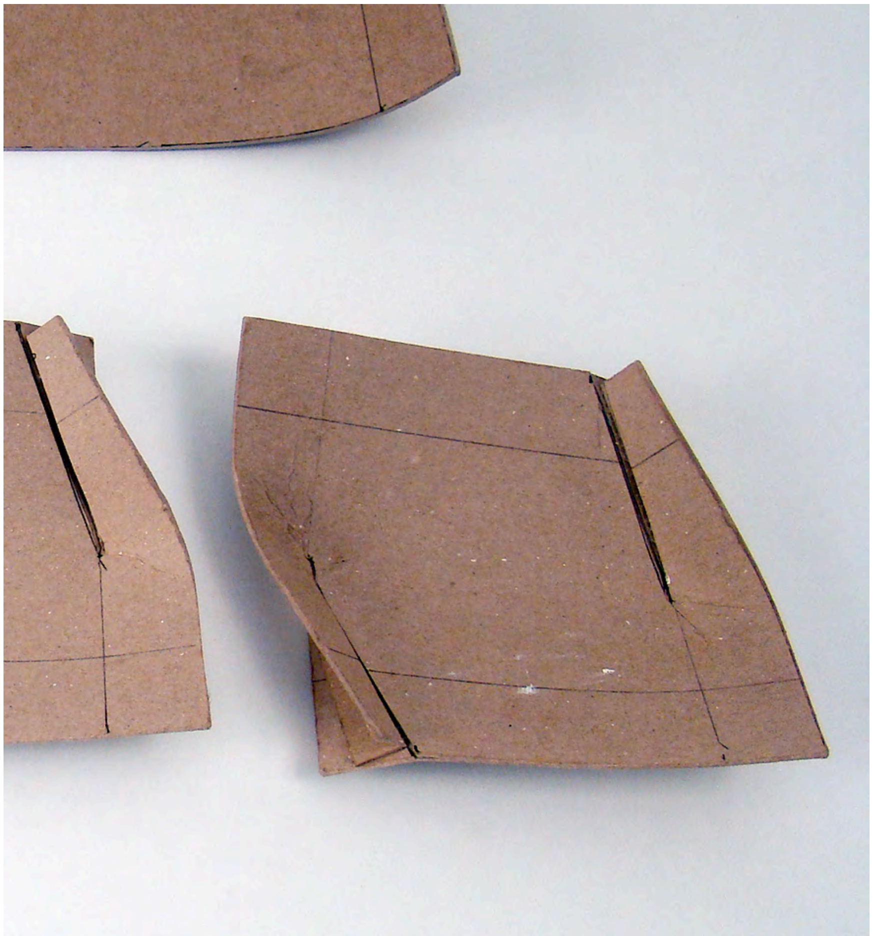


Figure 145: Chipboard models with two slit construction.

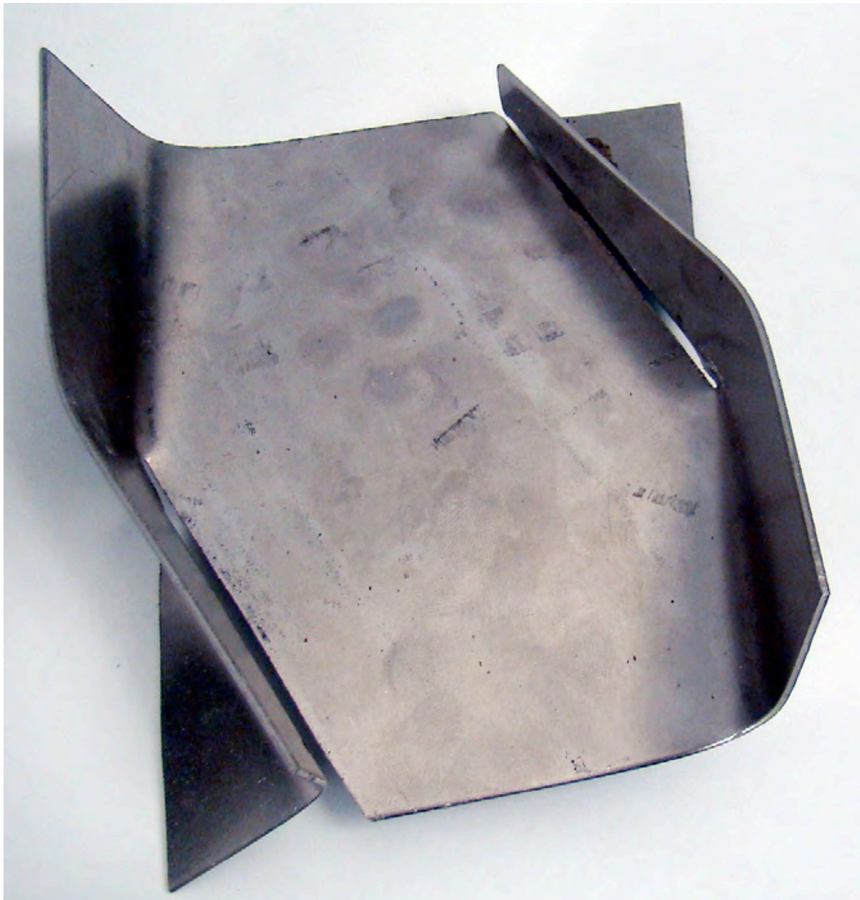
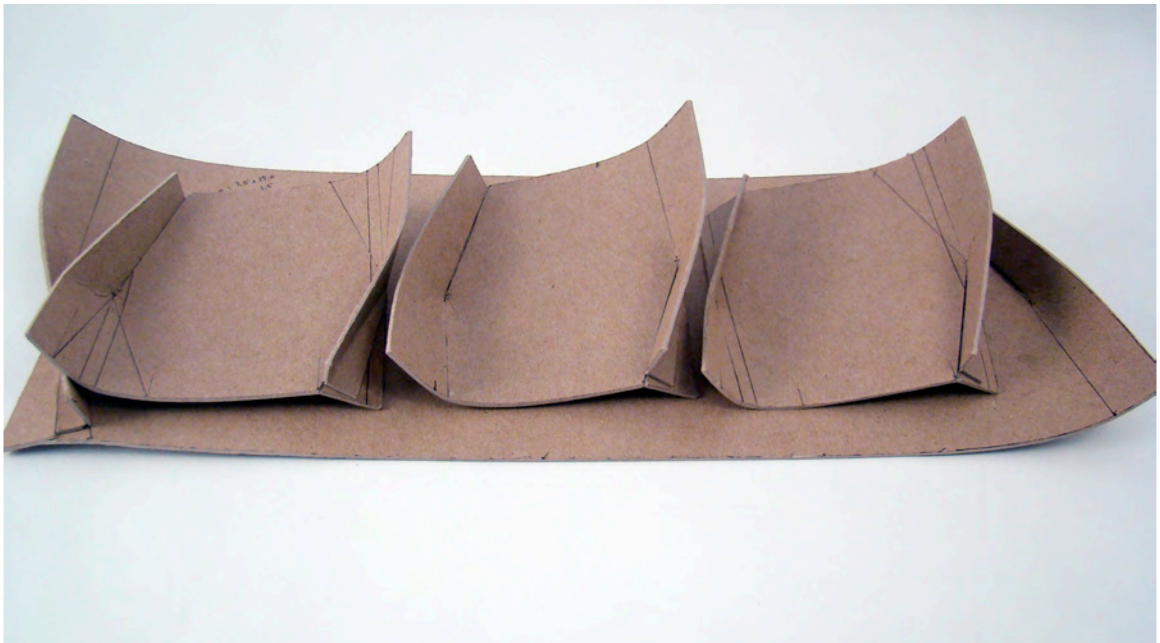
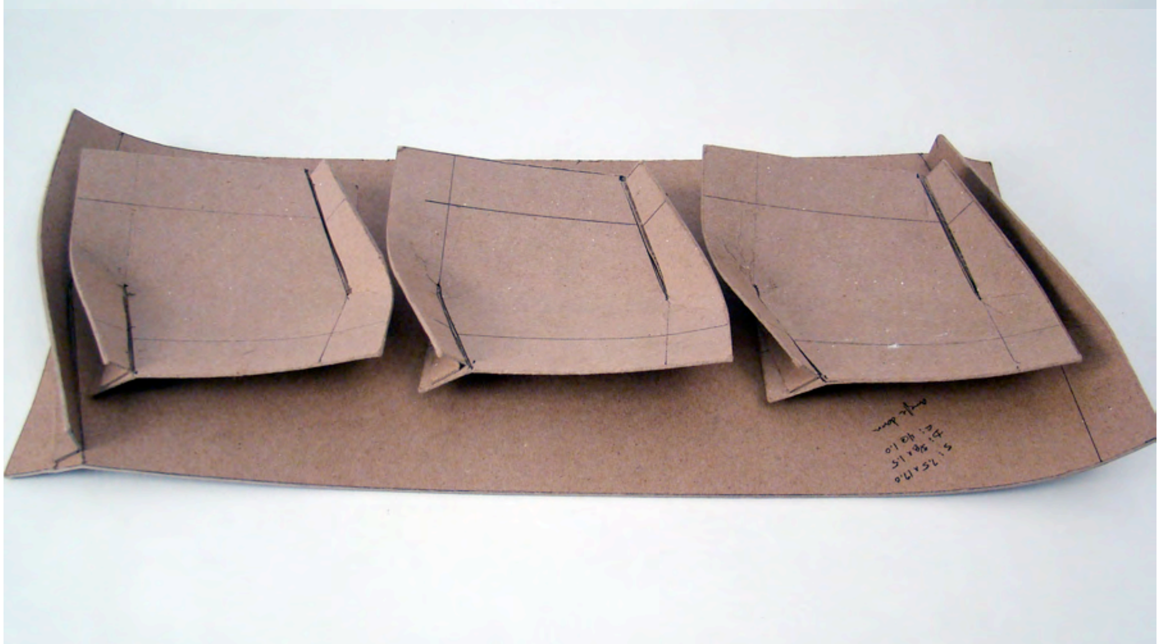
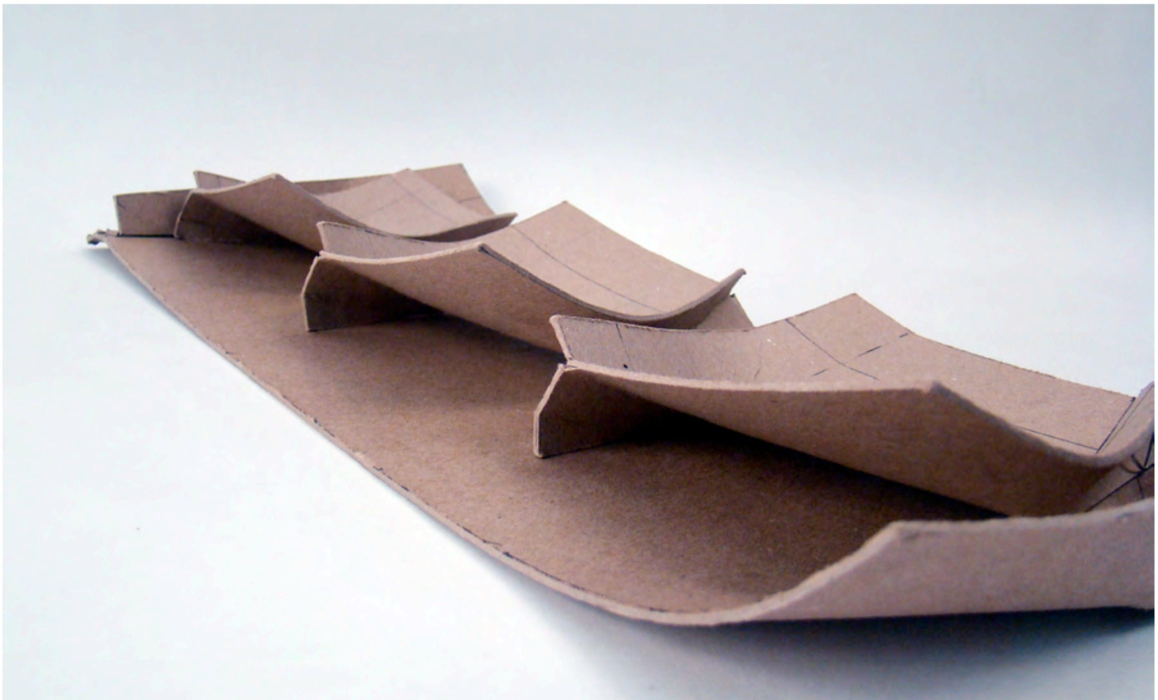
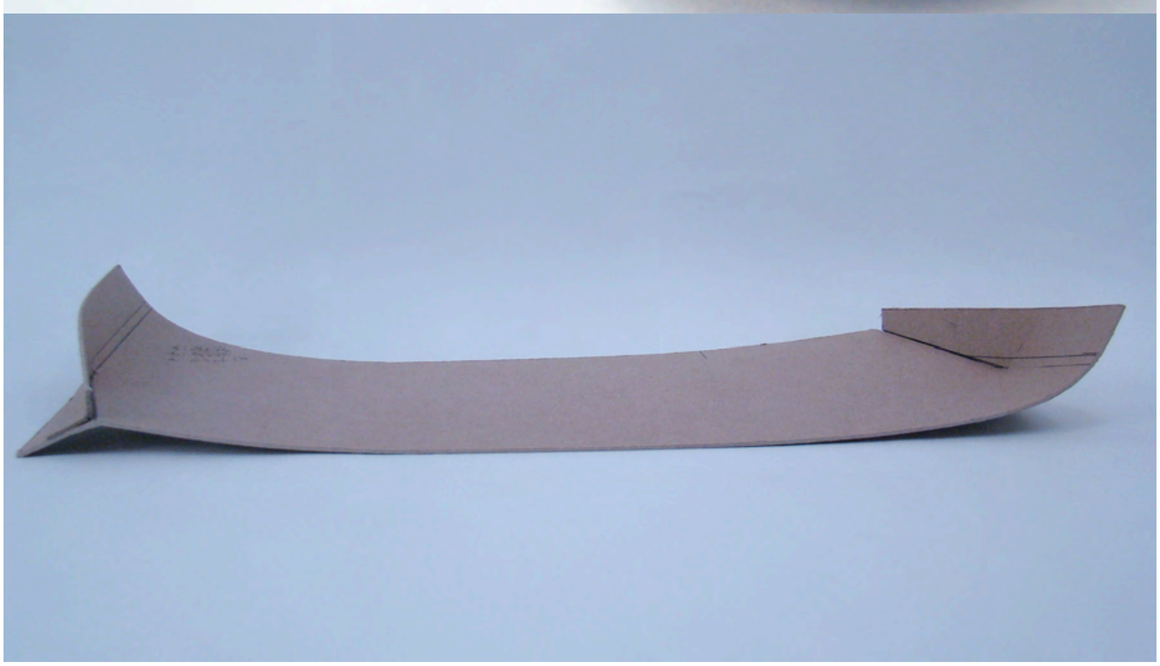


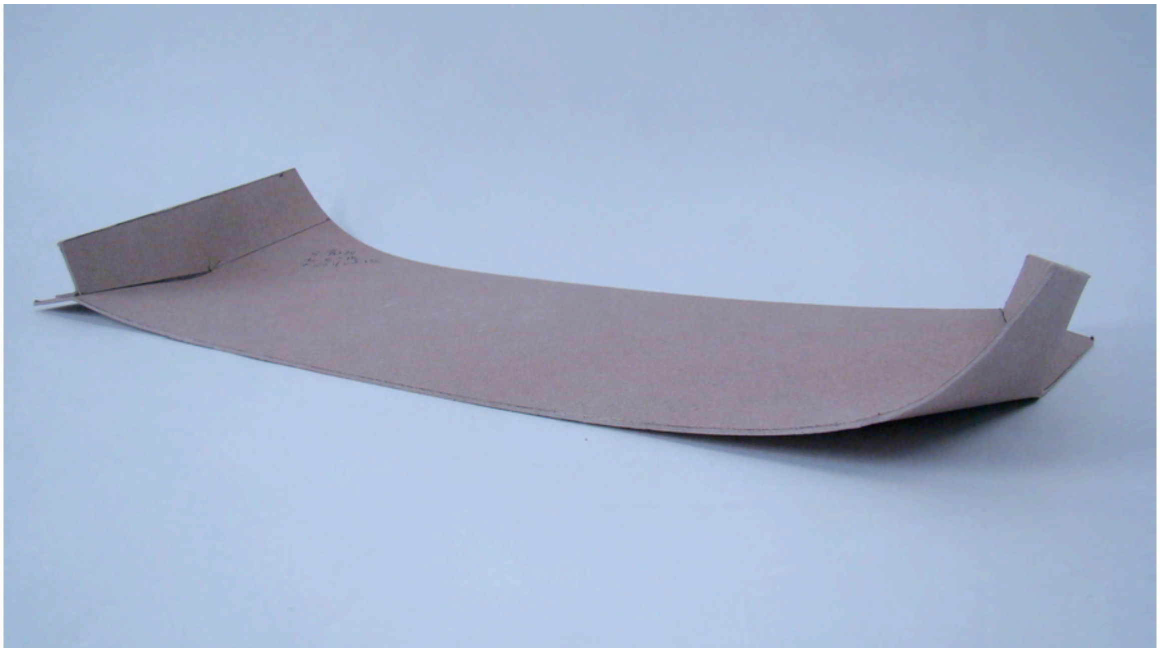
Figure 146: Carbon Steel model with single slit construction.

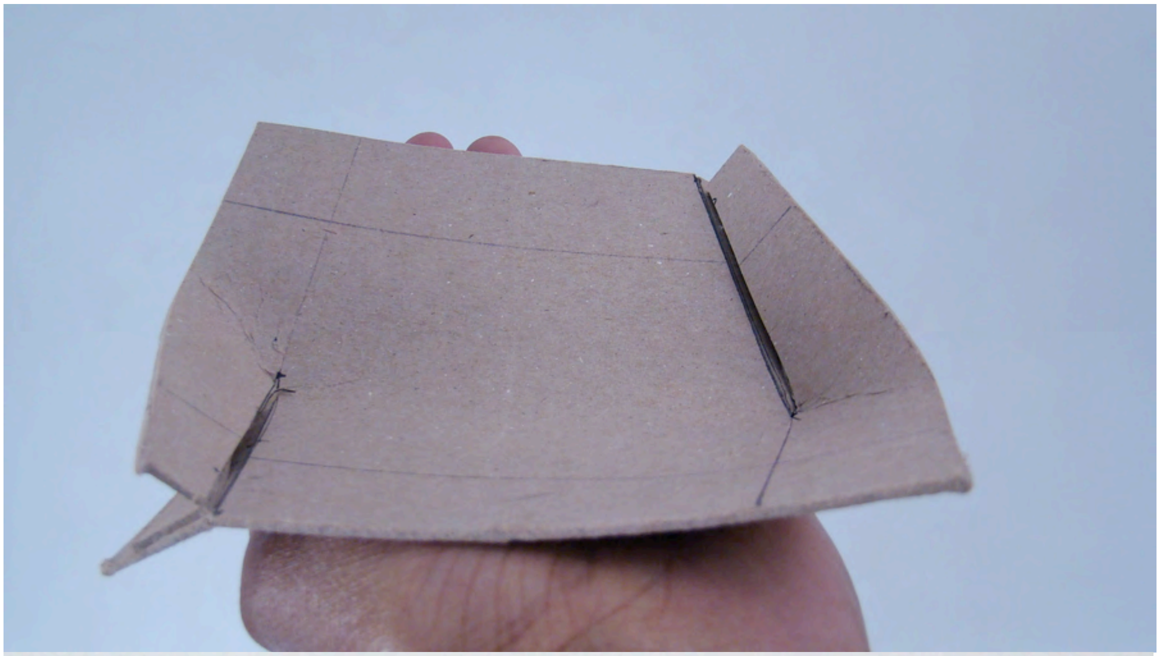


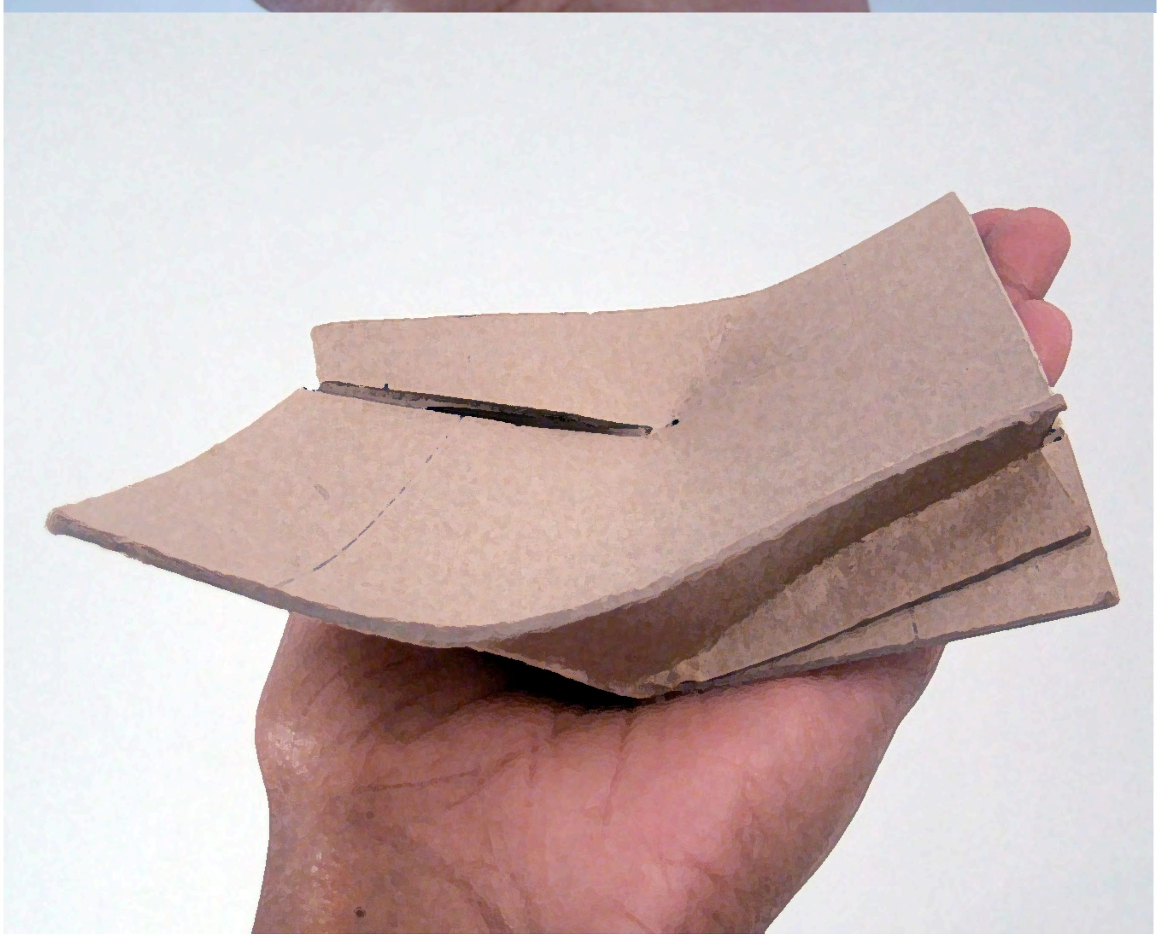












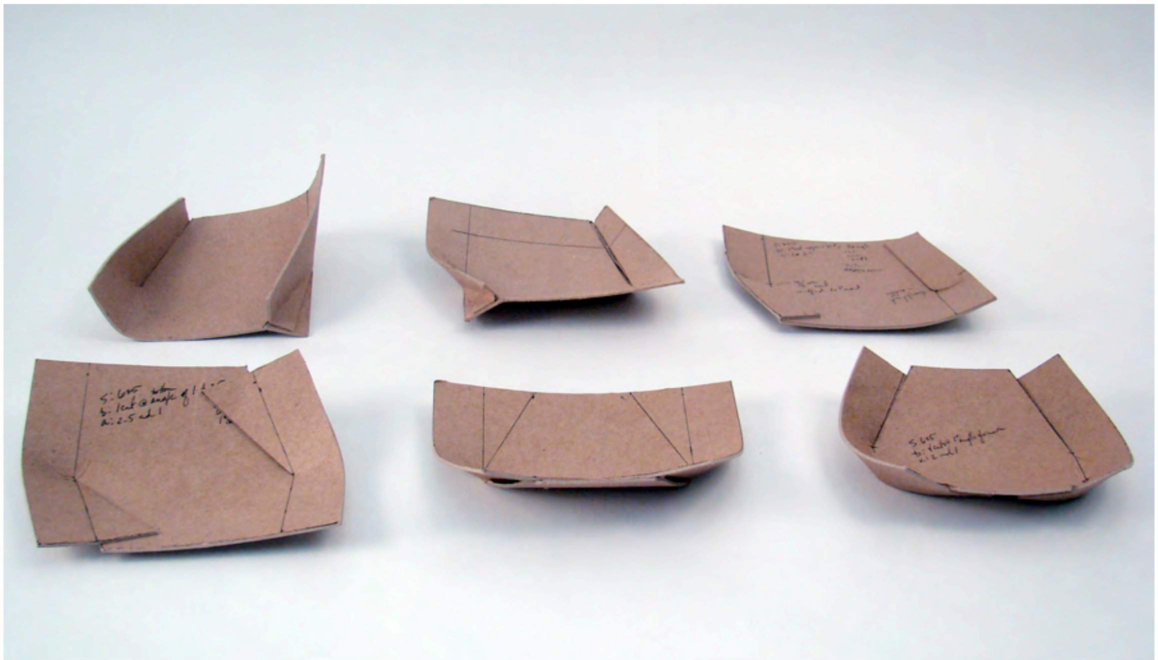


Figure 147: Chipboard models of serving trays and serving dishes. (Various sizes)

During a consultation with a foundry owner concerning the fabrication process, it was confirmed that the two brakes on the adjacent sides would have to be reduced to one brake on the left side of each adjacent slit. This allowed me to continue fabricating the prototype; however, the outcome of the aesthetic value was challenged in the final prototype. (See Figure 148)

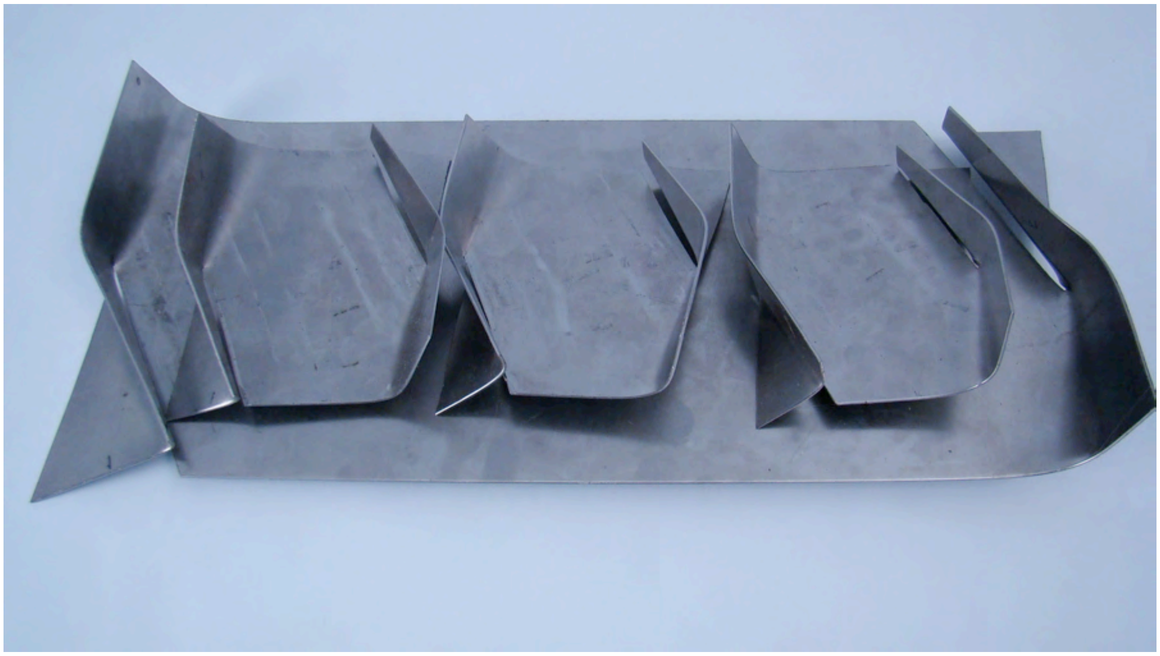


Figure 148: Final sketch model in carbon steel. (Serving tray and serving dishes)

As I critiqued the initial prototypes during an informal meeting with a thesis committee member, we agreed that the subtle curve of the original sketch models was lost during the fabrication of the final pieces. After I attempted to recreate these prototypes at the university's foundry, I realized that I needed to create the individual dishes' curve using a roller prior to breaking the sheet metal at the adjacent edges. Interjecting this step into the fabrication process ensured that I successfully translated the aesthetic value of the sketch models to the final prototypes. (See Figure 149)

Figure 149: Extra water-jet sheets rolled through foundry roller. (Welded for individual serving dishes)

Additionally, sixteen-gauge stainless steel was specified for both the serving tray and serving dishes, however the combination of sixteen-gauge stainless steel and the length of a nineteen-inch serving tray caused the serving tray to flex and buckle in the middle. (See Figure 150)

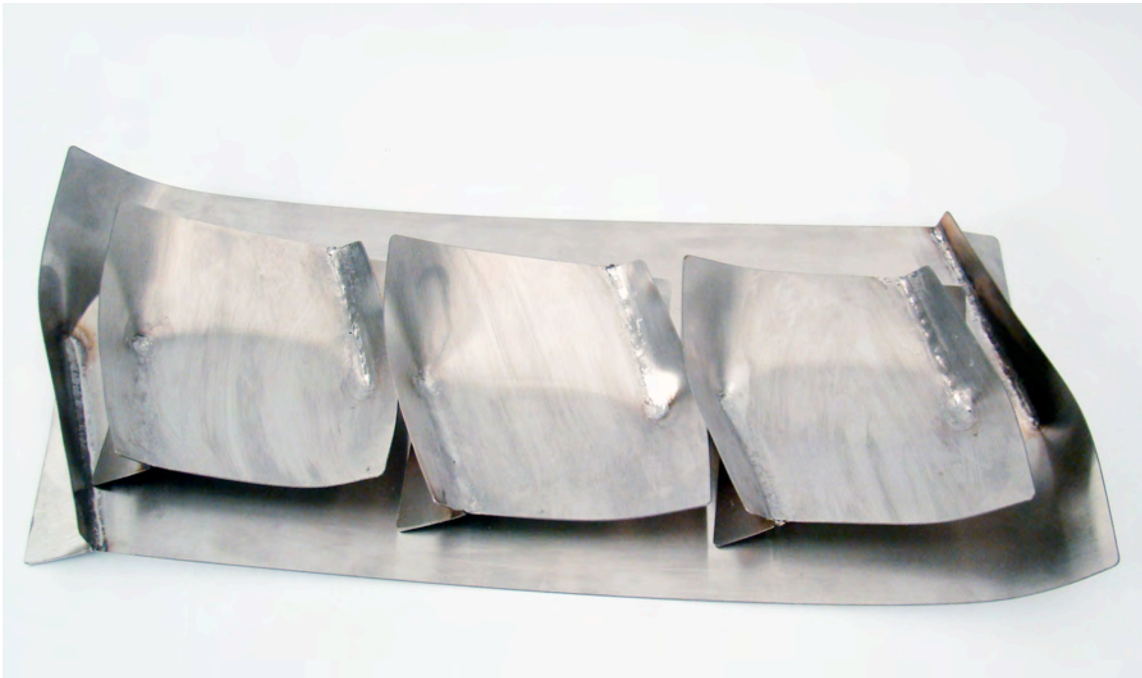


Figure 150: Final prototype of Stainless Steel Serving Tray and Dishes. (16 gauge)

To rectify this challenge with the buckling, a foundry owner suggested that I specify twenty-gauge stainless steel for the final production models. The additional challenge with the serving tray was the physical connection between the serving tray and the serving dishes. When the serving dishes were placed on the tray and passed along to potential end-users, the dishes and tray produced a clanking sound. The clanking sound implies that the use of stainless steel for both the tray and dishes creates an unstable balance when the objects are handled, which results from the connection of two sleek surfaces. To remedy this issue, I have considered specifying a different material for either the individual serving dishes or the serving tray. Fabricating either the serving tray or serving dishes in wood would provide a physical contrast between soft, hard, and sleek surfaces, resulting in greater stability while reducing the clanking like sound.

Analytical Summary

My design process for designing serving vessels for the communal dinning experience has become a cycle of re-interpreting my own reflective thoughts and the reflective thoughts of potential end-users as they engage with the conceptual models and final prototypes. The variety of discourse through informal desk critiques with fellow design students, meeting with thesis committee members, comparative precedent research, formal critiques, and design exhibits guided my decisions to either develop or eliminate certain product ideas. The inspiration to create products for an activity that encourages social mixing among individuals of a mixed income development constantly defined the possible function of each conceptual model. Upon the completion of this design thesis my ultimate decision as a designer is to reassess the various methods of making and determine which is most viable for the further development of these products in addition to determining which products are most viable for the current and future markets

CHAPTER V

CONCLUSION

The task to transform a consumer into an enduring owner requires the designer to consciously create utilitarian products that visually entice the end-user after the initial purchase. These products satisfy the consumer's desire for functional, visceral, and behavioral products that uplift the consumer's portrayal of their own self-image.

As consumers engage one another in their daily tasks and activities, their objects become part of that engagement. These are the objects that we remember when we visit someone's home. They are objects that tell us a story about the other individual's preferences and dislikes. Specifically, these objects tell us about the other person's design preferences and lead to further non-verbal assessments. We assume that the individual who owns an original Barcelona chair appreciates high-class design and would appreciate other classic and timeless interior products. We could assume that they gravitate towards elegant and harmonious proportions. This is an individual who obviously dislikes clutter and desires a sculptural form that can provide all necessary ornament. These conclusions that consumers make about one another are not limited to objects such as the Barcelona chair. We, as consumers make these observations about one another based on the clothes and the jewelry we wear, the cars we drive, the personal items we carry, and the serving-ware we set out for our dinner guest.

When these objects become the topic or introduction to our conversations, they act as a catalyst for our moments of social interactions. Socially connecting with other individuals and families within our communities increases our opportunities to learn about cultural, social, and economic differences. Communal dining is a social activity that promotes an inviting atmosphere for individuals to share their experiences, while removing false preconceived notations.

Designing interior products for social dining experiences creates an opportunity to foster the emotional connection through the human-to-human relationship and the human-to-object relationship. These experiences may occur throughout the design process, before an end product is fully developed. During the course of this design thesis, I exhibited my thesis work at the annual Design, Arts, and Technology Symposium. This exhibit gave potential end-users the opportunity to connect with various product ideas, initial prototypes, as well as myself. I was able to gauge their response to the products and adjust certain design ideas as needed. This experience provided a more objective point of view regarding the design process since the majority of attendees were not designers or design students. Most attendees gravitated towards the sixteen by sixteen inch serving tray and the chipboard sketch models of the nesting bowls. I noticed this as attendees often reached for these items and especially began to play with the chipboard models.

The aesthetic appeal of these products results from the uncluttered appearance and the elegant proportions while the products function as both utilitarian and artful objects. The simple process of cutting and breaking a planar medium into curvilinear forms made these products interchangeable in various mediums. The ability to re-create these products in various materials increases the feasibility of mass production. Since each product idea was developed through various sketch models and the final prototypes were made primarily by hand, this body of work does not appear machine made. This product line instead conveys the warmth of hand fabrication or the designer's touch embedded in the aesthetic value of each product.

During this design thesis, I realized that I could best retain the visual warmth of hand fabrication by exploring the design process through physical three-dimensional sketch models and the appropriate selection of materials. By exploring the portions, scale, and form with my own hands, I did not have to guess whether the final prototype would appeal to the potential end-user. Additionally, the sketch models of these objects were available throughout the design process for individuals to handle each one and engage with them on an individual and group level. The material choice for each prototype also influenced its perceived value. For example the polystyrene prototypes were perceived as a model that showcased the form of a particular product versus the prototypes fabricated with steel, wood, and glass were perceived by some individuals as final and sellable products. Specifying stainless steel as the primary material for this series of serving vessels was a logical and functional choice because it's considered a food safe material. However, the permanence of the metal surface and its association with industrial fabrication coupled with delicate and sculptural forms added to the artistic value of its aesthetic. Using a traditional cold and industrial material as a delicate and sculptural utilitarian object forces the end-user to assess it in a similar manner as an artistic object. In other words, the end-user had to assess their own interpretation of the object and determine what they perceive it to be before they handle the object. This moment of reflective interpretation essentially creates the end-user's moment for the *act of play* with an object.

While I was successful at creating a series of elegant serving vessels for the communal dining experience, I admit that my specification of materials such as the stainless steel, glass, and wood will hinder the ability for individuals of all economic classes to personally obtain these products. The ability to make these serving vessels available outside of the high-end design market would require that I specify materials that have a lesser value of material permanence. This is a feasible design alternation, considering that the sculptural form of these products is easily transferable to various materials. However, in the interest of designing these serving vessels for a diverse social-economic group of households I would propose implementing creative strategies to alleviate the cost barrier for some individuals and households.

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APPENDIX A

GLOSSARY OF TERMS

Bauhaus: International design movement and design school founded by Walter Groupis. This movement in design introduced form and function as desired design principles in response to traditional and heavy applied ornament.

Hard Architecture: Impersonal architectural environments that are built to contain the user.

Murphy's Law: A law that defines and ranks the basis human needs above superficial desires.

Social Capital: The ability to strengthen a community through the developed relationships of individuals within a community.

Social Mixing: The ability to create new experiences and understandings through social interactions.

Cultural Cross – Fertilization: The acceptance and socialization among various social classes.

Social Harmony: The general acceptance of each other and ability to co-habitat and / or work together within a diverse group of individuals.

Adult Play: The structured social encounters and behaviors of adulthood.

Act of Play: The engagement of artful objects and other individuals as a form of adult socialization or play.

Grounding: Intimate social interactions with a family that affirm an individual's identity.

Strokes: The affirmation of an individual's position in society outside of family and close friends.

Opportunity: Social interactions that advance an individuals work environments.

Growth: The cultural understanding and acceptance of others through social encounters.

Social and Market Production Model: The practice of designing socially relevant products for mass production.

Einfuhlung: A German description for empathy found in objects.

Malleable Matter: Objects or surfaces that change in form with applied pressure.

User-Responsive Design: Designing for the end –user and adapting design solutions to meet their needs.

Co–Design: A holistic design approach that incorporates the end user in the design process.

Mediating Artifacts: Objects that inform the user of their surrounding.

Experience Economy: The understanding gained based on actual experiences and the ability to apply that to new problems and solutions.

Applied Action: The act of applying principles or ideals to inform the design process.

Reflective Evidence: The understandings and knowledge that a designer gains through the process of sketch models and sketch drawings.

Designer's Back Talk: Describes the knowledge that a designer gains during the process of making. This describes the intuitive nature of the design process for designers.

Origami: The Asian art of folding paper into new forms.

Packing: Pushing sand into a crate to form a box that hardens overnight.

Set: The hardening process of packed sand, which allows it to be carved into a form.

Situational Feedback: The ability to gain new knowledge through design processes and other solution-based processes.