Architectural Precedent #1

Fig1. Helical stair, YYDG Interior Design, 2014

Key Concept:

Natural, organinc, and some-what living. It bears an uncanny resembleance to the stuctures found in plants, shells, or even DNA. A human passage is dimensionally visible in the stairs' strucure brining a sense of proportion and balance to the otherwise sterile and hard roomscape. A very typical element of architecture has been brought to life through natural form and material

Selected design element:

The central supporting member of the stair is of particular interest for its geometric elegance and seemingly impossible structure given it is made from timber.

How is the key concept reflected in the form of the selected design element?

Wood is a natural resource that has been used for thousands of years. Its applications are extensive and we are still discovering the true potential it offers. Being a material that grows from the Earth, wood takes on a shape and form appropriate to the context in which it is grown. In many ways the central helical twist to the stair is a reference to the strength and adaptability of timber in its growing and machined state. We as humans are capable or taking a living material from its natural environment, removing its natural form, machining it to fine tolorances, and then using it to build completley new forms. I feel the concept in its essence behind the design element is taking something that was once alive, processing it, refining it, and turning it into something sculptural, emotive, and reminicet of the form it once held.

Geometrical description of the shape:

The shape takes on an elegant, elongated, organic, and helical shape that is reminicent of such twists, bends, and turns found in nature. It will take this from as a demonstation of the initial concept - the incredible contol we have over such a natural material.

Proposed Scale, material, technique:

~110L x ~110W x 500H The design element taks this scale so it may sit comfortably between my desk and shelfing.

The design element will be contructed out of timber in keeping with the precedent and concept. The type of timber is not yet know.

The following steps will be followed:

1. Research how to use Autodesk Inventor

2. Learn how to create organic forms in Inventor using sweeps, lofts, profiles, and workplanes

3. Spend time sketching concepts to aid in the design process to make it easier to decide upon an order of operations when drawing in 3D

4. Apply restrictions to the form like its overall height must not exceed that of the space between my desk and shelfing, the base must not exceed that of the 3D printer print-bed etc.

5. After creating desired the form I must lasercut multiple layers of MDF to create a jig that will allow me to accurately laminate multiple layers of timber.

6. Lasercut timber laminate layers

7. Glue all layers together and place into the lasercut jig where it will be clamped and pressed until the glue cures.

8. Machine any edges that require tidying up

9. Cut the ends off square if required

10. Sand and finish with an oil

Time commitment

Task	**Forecast hrs**	**Actual hrs**
Research	5	8
Learning new software	8	15
Concept sketching	3	4
Modelling concepts	5	4
Finalising 3D model	3	2
Preparing drawings	2	TBA
3D Printing	-	-
Lasercutting	3	TBA
Laminating timber	8	TBA
Making a Jig	4	TBA
Making a molding frame	-	-
Making silicone mold	-	-
Casting	-	-
Sanding	2	TBA
Finishing	1	TBA
Total	**42**	**33**

Cost/budget

Item/Process	**Expected cost $**	**Actual cost $**
3D Printing	-	-
Lasercutting	-	-
Jig materials (mdf or other)	15	TBA
Glue	5	TBA
Timber Veneer	35	TBA
Molding frame	-	-
Masuring Cups	-	-
Rubber Gloves	-	-
Molding silicone	-	-
Concrete Plaster	-	-
Sanding Paper	7	TBA
Finishing stains and sealers	15	TBA
LED with cord and transforme	-	-
Total	77	0

Architectural Precedent #2

Fig2. Timber stool and Concrete table, Designer Unknown, 2016

Key Concept:

A juxtaposition of opposing materiality united with form and structure.

Selected design element:

I have chosen the sculptural concrete form that takes its shape from the timber structure that embraces it. I chose this element as its theme of material hierarchy giving way to form compliments the other design elements I will be making. I am intersted in exploring this desing element as it allows me to experiment with 3D printing, mold making, and casting concrete. These are all things I am relatively new to and would love to develop and add to my skill set so I can understand manufacturing processes in much greater detail.

How is the key concept reflected in the form of the selected design element?

The timber stool echoes the form of the solid and heavy concrete table... or is it the other way around. Although the material quality of both elements is drastically different the form is consistent. The core concept is one of material hierarchy, the timber stool is seen to carve its way through the stone-like table asserting strength and dominance. The concrete form is one of juxtaposition. The most permanent, rigid, and heavy material moves at the will of the lighter, more impermanent, and delicate timber structure surrounding it.

Geometrical description of the shape:

Just as the precedent does, my design element will take on the form of the timber structure embracing it. The design element from precedent 1 will inform the geometry of the concrete design element. The concrete will fall into the same material hierarchy as the precedent seeing all other materials take assert their form first.

Proposed Scale, material, technique:

~95L x ~95W x 135H The design element will be this scale and size as it is intended to fit with the design of element 1.

Throughout the process of construction the design element will take form in two different materials (3d printed PLA and silicone) before finally becoming concrete. The design element will be concrete as it is in keeping with the concept while being a nice contrast to the other design elements and a sturdy base for the other 2 design elements.

The following steps will be followed:

1. Research how to use Autodesk Inventor

2. Learn how to create organic forms in Inventor using sweeps, lofts, profiles, and workplanes

3. Spend time sketching concepts to aid in the design process to make it easier to decide upon an order of operations when drawing in 3D

4. Apply restrictions to the form like it must be proportional to design element 1 and leave space for design element 3. In keeping with the concept it must fit in-between the structure of design element 1.

5. Once decided on a form export results and test 3D print in miniature to study the form and its presence.

6. After deciding on a form or choosing to alter the form the final model will be generated

7. Export the model with high fidelity so there is minimal triangulation visible when it prints

8. Set up the 3D printer by leveling the build plate, and making sure it is extruding correctly and pass the STL model file through the 3D printer software to generate layers, supports, and rafts

9. Once happy with the setup I will print the model

10. After the model has been printed I will sand it smooth and spray with a primer to get it even smoother in preparation for the mold

11. I will build a mold forming box out of melamine and screw it together so it may be pulled apart easily when required

12. Place the finished 3D print in upside down into the mold and support the base with a sick. i will also make sure to spray the 3D print with mold release

13. Mix up 1:1 potions of the polyurethane molding silicone and delicately pour into and around the 3D print. I will make sure to pour continuously so to prevent air bubbles forming

14. Before the silicone hardens I will vibrate the assembly with an orbital sander so all remaining air bubbles rise tot he surface

15. After the silicone has cured I will de-frame the mold, remove the 3D print and clean up in preparation for the concrete

16. I will mix up varying portions of concrete and plaster to achieve a smooth and consistent mix that will flow into all of the small parts of the mold

17. Let the concrete cure for 24 hours and then de-mould

18. Clean up any rough edges with sand paper and seal with acrylic bases sealer to prevent dusting

Time commitment

Task	Forecast hrs	Actual hrs
Research	5	8
Learning new software	8	15
Concept sketching	3	4
Modelling concepts	5	4
Finalising 3D model	2	1
Preparing drawings	1	0.5
3D Printing	4	8
Lasercutting	-	-
Laminating timber	-	-
Making a Jig	-	-
Making a molding frame	2	3
Making silicone mold	3	TBA
Casting	1	TBA
Sanding	2	TBA
Finishing	1	TBA
Total	**35**	**43.5**

Cost/budget

Item/Process	Expected cost $	Actual cost $
3D Printing	30	22
Lasercutting	-	TBA
Jig materials (mdf or other)	-	TBA
Glue	-	TBA
Timber Veneer	-	TBA
Molding frame	5	6
Masuring Cups	5	8.36
Rubber Gloves	5	2.24
Molding silicone	45	73.15
Concrete Plaster	15	TBA
Sanding Paper	-	-
Finishing stains and sealers	5	TBA
LED with cord and transforme	-	-
Total	**110**	**111.75**

Architectural Precedent #3

Fig3. Lamp with a twist, Franco & Taiwanese Collaboration, 2016

Key Concept:

Contrasting the authenticity of hand made with the extremes of machine craft. Extruding impossible form as opposed to carving.

Selected design element:

I have chosen the organic 3D printed light feature form as my design element. I have always been interested in pushing the boundaries of technology, it allows us to create forms and geometries that are exceeding complex and difficult to manufacture by hand. This design element allows me to explore the capabilities of 3D printing and its application at any scale.

How is the key concept reflected in the form of the selected design element?

3D printing is an extremely unique process. In this case the selected design element is printed from PLA which is an all natural non toxic polymer derived from corn. 3D printing has taken an all natural material, proceed it into a polymer, and used this polymer to then extrude a form that in no way resembles its initial natural form, shape, colour, or texture. Not only does the finished form lack resemblance to its original state - it takes on structural properties that were never evident in the source material. The timber is still reminiscent of its original natural state as a living tree - the lamp form is not. We often start with a material and slowly remove parts of it to reveal the form inside just as Michael Angelo spoke of revealing the sculpture in every piece of marble. The design element goes against thousands of years of convention and creates form without a mold, carving, cutting, gluing, welding, etc. The core concept is that something natural, elegant, and beautiful may be created using a process that removes almost all ties to the existing material it was made from and the fabrication techniques that have built our civilisation.

Geometrical description of the shape:

The form just like the precedent will be organic, thin, and delicate in form. The intent is to contrast the other two design elements that are extremely natural and heavy while raising questions as to how such a from may come into existence.

Proposed Scale, material, technique:

~35L x ~35W x 145H The design element will be this size and scale so it will comfortably fit inside the timber form and connect into the concrete base. It is also the maximum hight dimensions of the 3D printer.

The from will be printed from white PLA which is an all natural material made from corn. The white PLA was chosen as it will have the best diffusing and color properties when it is lit from the inside.

The following steps will be followed:

1. Research how to use Autodesk Inventor

2. Learn how to create organic forms in Inventor using sweeps, lofts, profiles, and workplanes

3. Spend time sketching concepts to aid in the design process to make it easier to decide upon an order of operations when drawing in 3D

4. Apply restrictions to the form like it must fit within design element 1 and easily connect into design element 2. It must also fit within the dimensions of the 3D printer build platform.

5. Once decided on a form export results and test 3D print in miniature to study the form and its presence.

6. After deciding on a form or choosing to alter the form the final model will be generated

7. Export the model with high fidelity so there is minimal triangulation visible when it prints

8. Set up the 3D printer by leveling the build plate, and making sure it is extruding correctly and pass the STL model file through the 3D printer software to generate layers, supports, and rafts

9. Once happy with the setup I will print the model

10. If dimensioned correctly the print should slot into the base without requiring any glue

Time commitment

Task	**Forecast hrs**	**Actual hrs**
Research	5	8
Learning new software	8	15
Concept sketching	3	TBA
Modelling concepts	5	TBA
Finalising 3D model	6	TBA
Preparing drawings	2	TBA
3D Printing	8	TBA
Lasercutting	-	-
Laminating timber	-	-
Making a Jig	-	-
Making a molding frame	-	-
Making silicone mold	-	-
Casting	-	-
Sanding	-	-
Finishing	-	-
Total	**37**	**23**

Cost/budget

Item/Process	**Expected cost $**	**Actual cost $**
3D Printing	30	TBA
Lasercutting	-	-
Jig materials (mdf or other)	-	-
Glue	-	-
Timber Veneer	-	-
Molding frame	-	-
Masuring Cups	-	-
Rubber Gloves	-	-
Molding silicone	-	-
Concrete Plaster	-	-
Sanding Paper	-	-
Finishing stains and sealers	-	-
LED with cord and transforme	25	TBA
Total	55	0

References

Fig1. Helical stair, YYDG Interior Design, viewed 14 August 2016, <http://www.yydg.tw/>.

Fig2. Timber stool and Concrete table, Designer Unknown, viewed 14 August 2016, <https://au.pinterest.com/pin/434738170263530215/>.

Fig3. Lamp with a twist, Franco & Taiwanese Collaboration, viewed 14 August 2016, <https://au.pinterest.com/pin/434738170263530215/>.