PORTLAND

PUB

CALVIN VERONICA TUNMI ELI

“THANK YOU CLARE, ED, AND OUR REVIEWERS FOR ALL THE GUIDANCE WE RECEIVED TO MAKE THIS PROJECT POSSIBLE. THANKS TO THE ARCE DEPARTMENT FOR YOUR DONATION. AND THANKS TO THE CAED SUPPORT SHOP FOR YOUR RESOURCES. WE LOVED HOW OUR SHELL TURNED OUT.”

CALVIN VERONICA TUNMI ELI

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“PPROVIDE AN AESTHETICALLY BEAUTIFUL FUNICULAR STRUCTURE THAT HOUSES A PERFORMANCE PUB IN PORTLAND'S GROWING ART AND CRAFT BEER SCENE”

CRAFT BEER

INDIE MUSIC

ARTS SCENE

"MAX" RAIL LINE

ARTS GALLERY / BREWERY

1. TILIKUM CROSSING

2. ROSS ISLAND BRIDGE

1

2

0 1000' 2000'

5

N

0 200' 400'

LOUIS SIMON / FELIX CANDELA

Royan Market Hall / Textile Factory - Los Manantiales

LOCATION

Royan, France / Mexico City

LIGHTING

Royan Market Hall (left) scatters light into central space throught slits. Textile factory (right) uses many oculi to define sun information

ARCHITECTURAL SIGNIFICANCE

The push for modernism in helped establish new exciting forms such as this one that were considered previously impossible.

CONSTRUCTION MATERIALS

Shell, Reinforced Concrete

ADDITIONAL NOTES

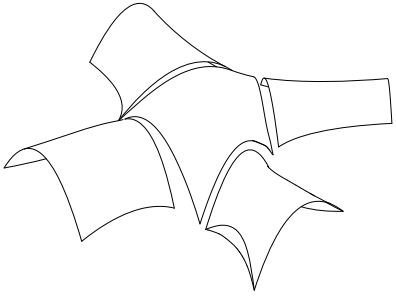
1950s

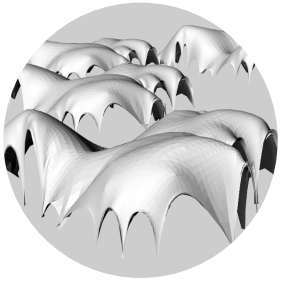
Interior / Exterior showed possible new

2002

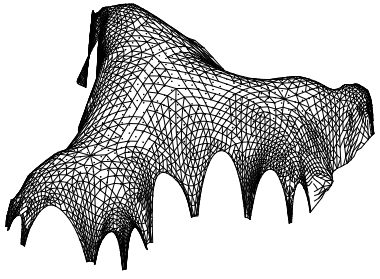
Candela is known for advancements

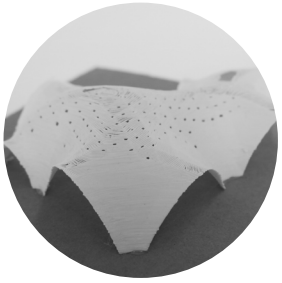
ELEGANCE
STRUCTURAL INTEGRITY ✓
UNIFORMITY
CONSTRUCTABILITY ✓



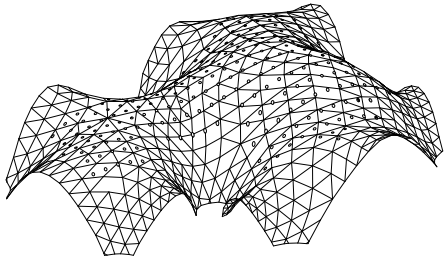


ELEGANCE
STRUCTURAL INTEGRITY
UNIFORMITY ✓
CONSTRUCTABILITY



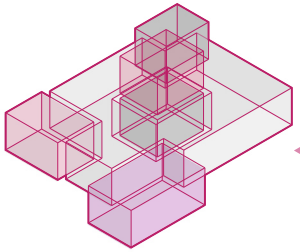


ELEGANCE
STRUCTURAL INTEGRITY ✓
UNIFORMITY ✓
CONSTRUCTABILITY ✓
✓

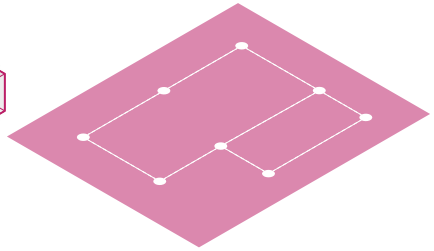


Throughout the quarter, using rhino and grasshopper as form finding tools, we developed several iterations of our shell, ultimatley focusing on four key objectives to drive our shell design, outlined above. We struggled, learned, and worked hard with grasshopper to develop our finalized scheme.

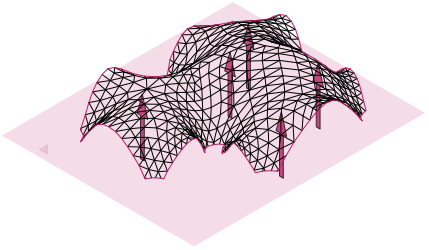
AMENITIES
OUTDOOR SEATING
UPPER LEVEL SEATING
STAGE
STANDING / DANCING AREA



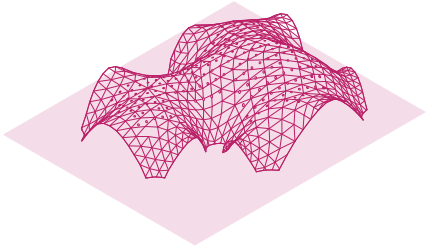
PROGRAM



ANCHOR POINTS



CATENARY SURFACE

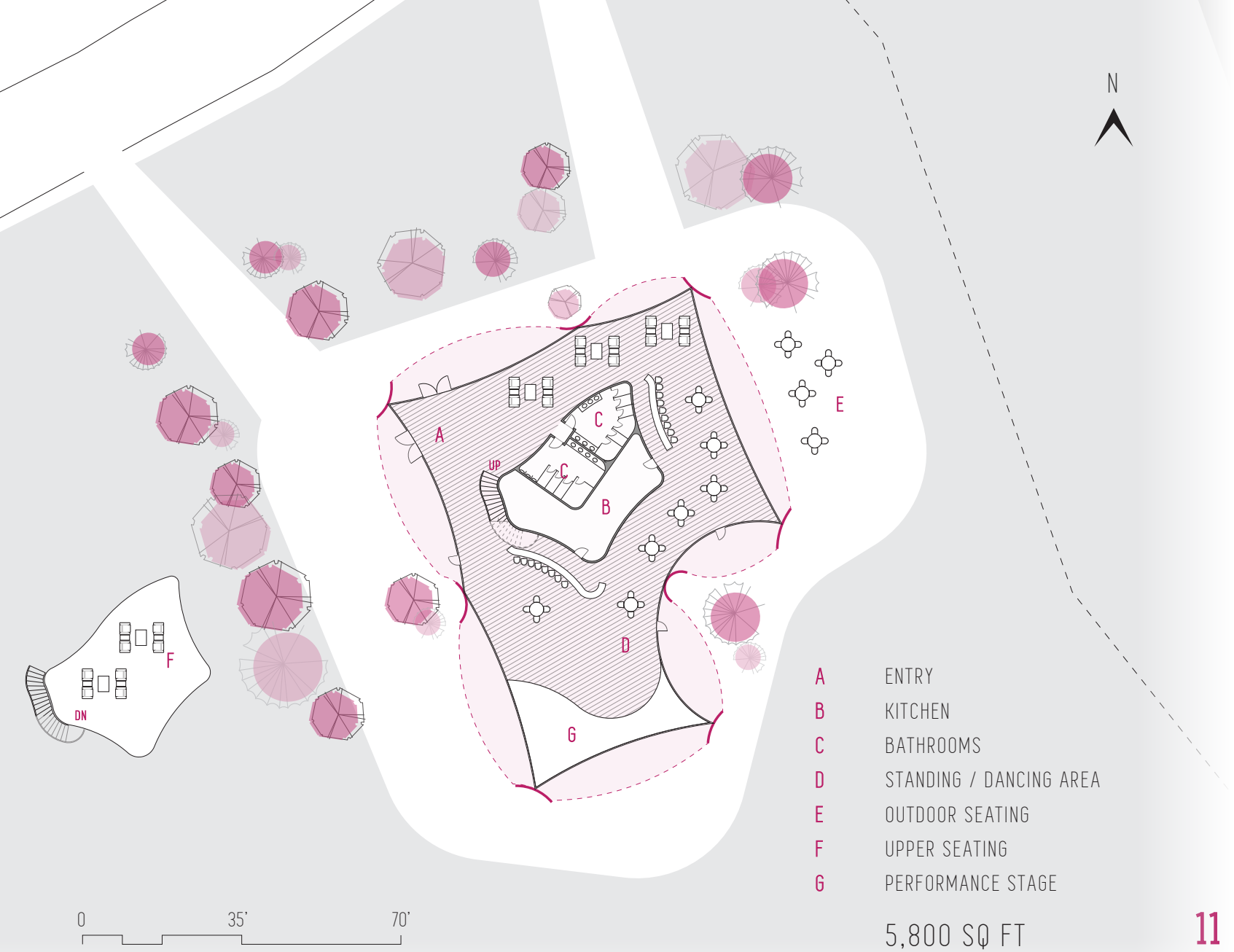


OCULI

Programmatically, we designed a seamless floor plan to ensure free-flowing circulation, while maintaining a separation between the amenities and entertainment spaces. From our programmatic studies we designed a rectangular floor plan with a square cut out to create outdoor seating with a view of the river. The subtracted rectangle lended anchor points for the shell which we input into grasshopper. A catenary surface was inflated, baked and punctured with 6" inch oculi to mimic a starry sky.

N

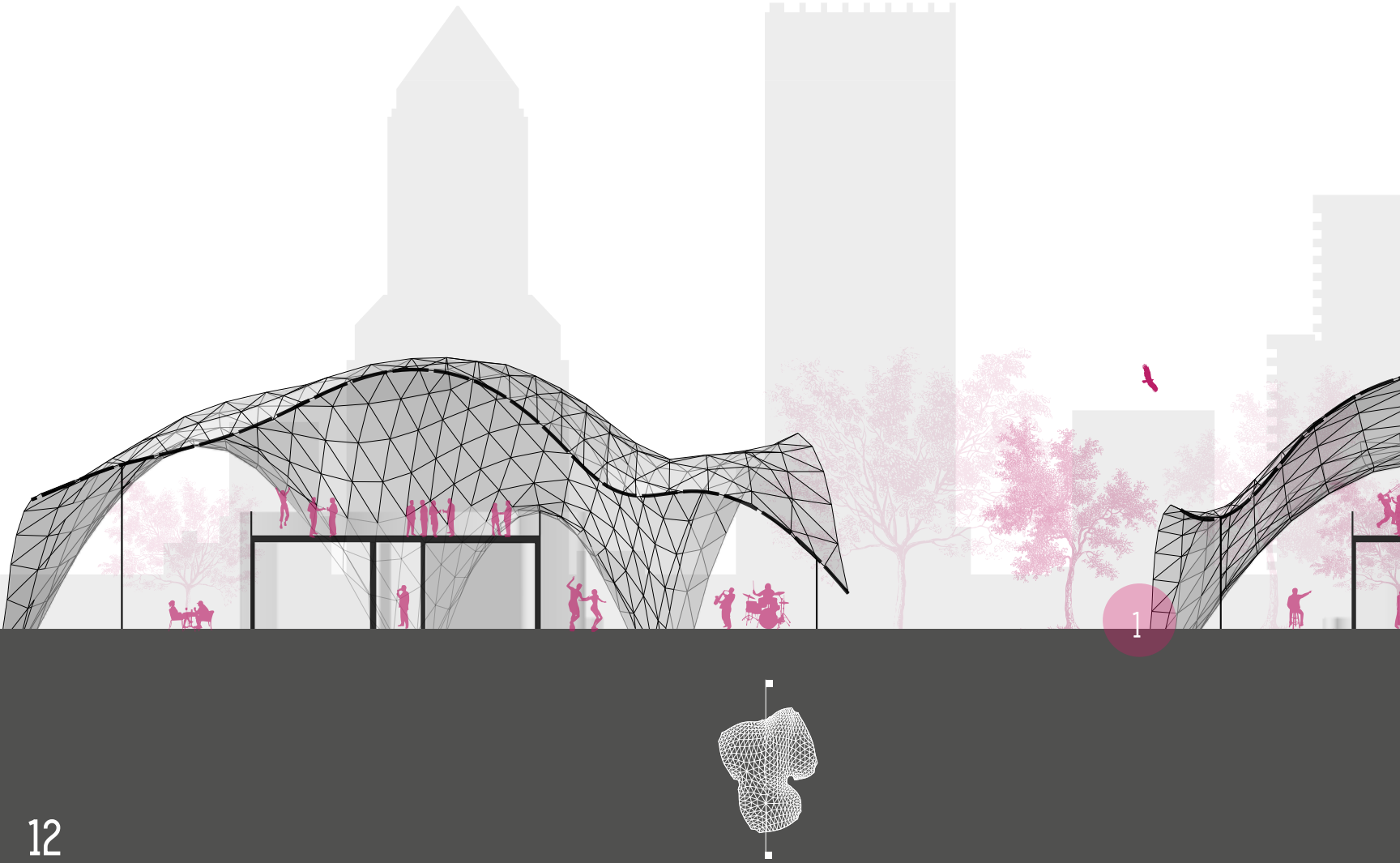
0 200' 400'

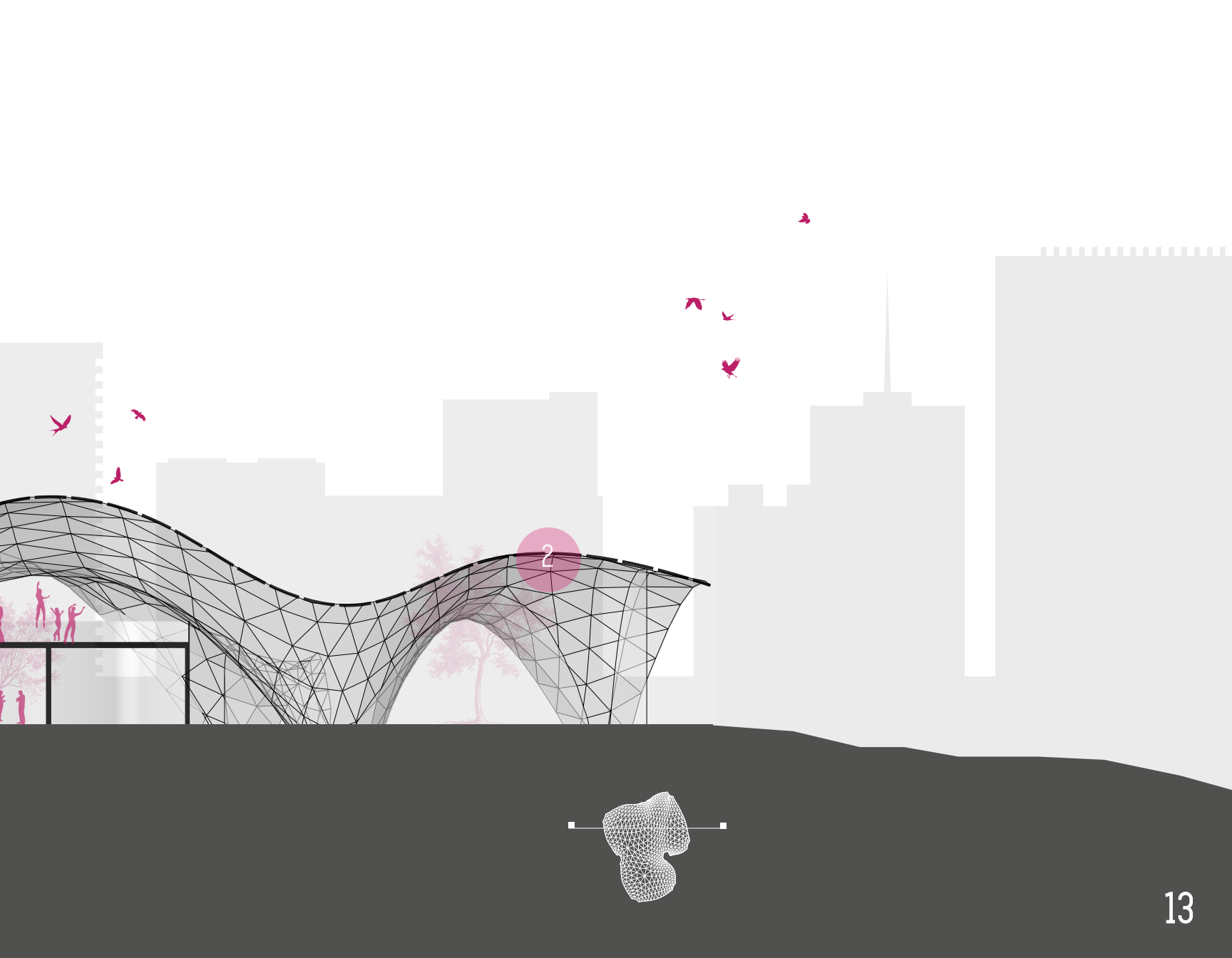


A ENTRY
B KITCHEN
C BATHROOMS
D STANDING / DANCING AREA
E OUTDOOR SEATING
F UPPER SEATING
G PERFORMANCE STAGE

5,800 SQ FT

In the design development stage, in was essential for the shell to accommodate the two-story amenities island. To achieve this, we played with various forces in grasshopper to provide a seamless undulating curve in section. As you can see, the view from the upper level to the dancing/stage area is clear and unobstructed.

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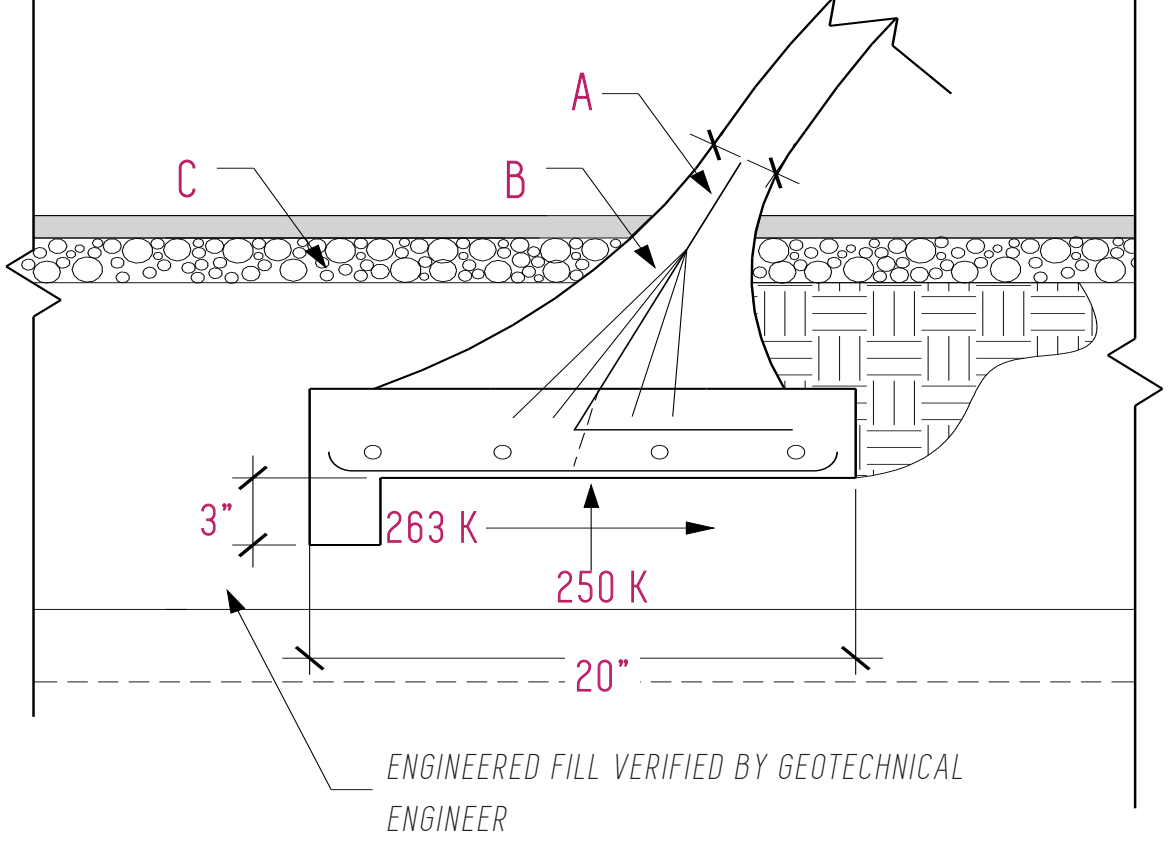


The 3" concrete shell meets the foundation at finished grade where it is attached by a reinforcing steel that is connected to a reinforcing mesh to distribute the loads to the footing. The footing has a key to prevent the structure from sliding due to the thrusting force.

FIG 1 THRUST CONTAINMENT

REINFORCING STEEL	A
REINFORCING MESH	B
2" GRAVEL	C

An array of 6” diameter occuli are spread out on top of the shell to portray a stary-night experience within the shell. The occuli are casted in place when pouring the concrete, and then formed with an acrylic glass to protect the interior of the shell from rain. The occuli are flush with the shell to allow the rainfall to flow directly off the shell and into the ground

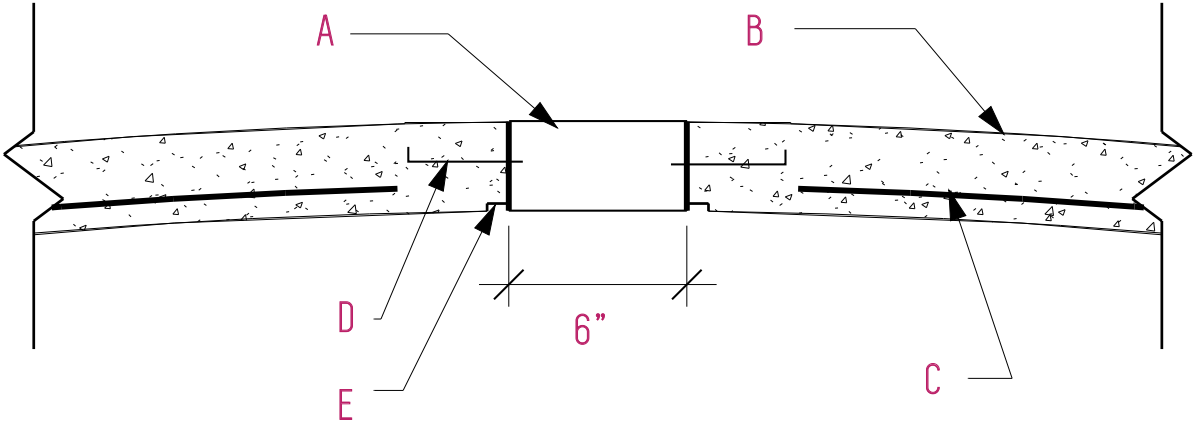


FIG 2 OCULI

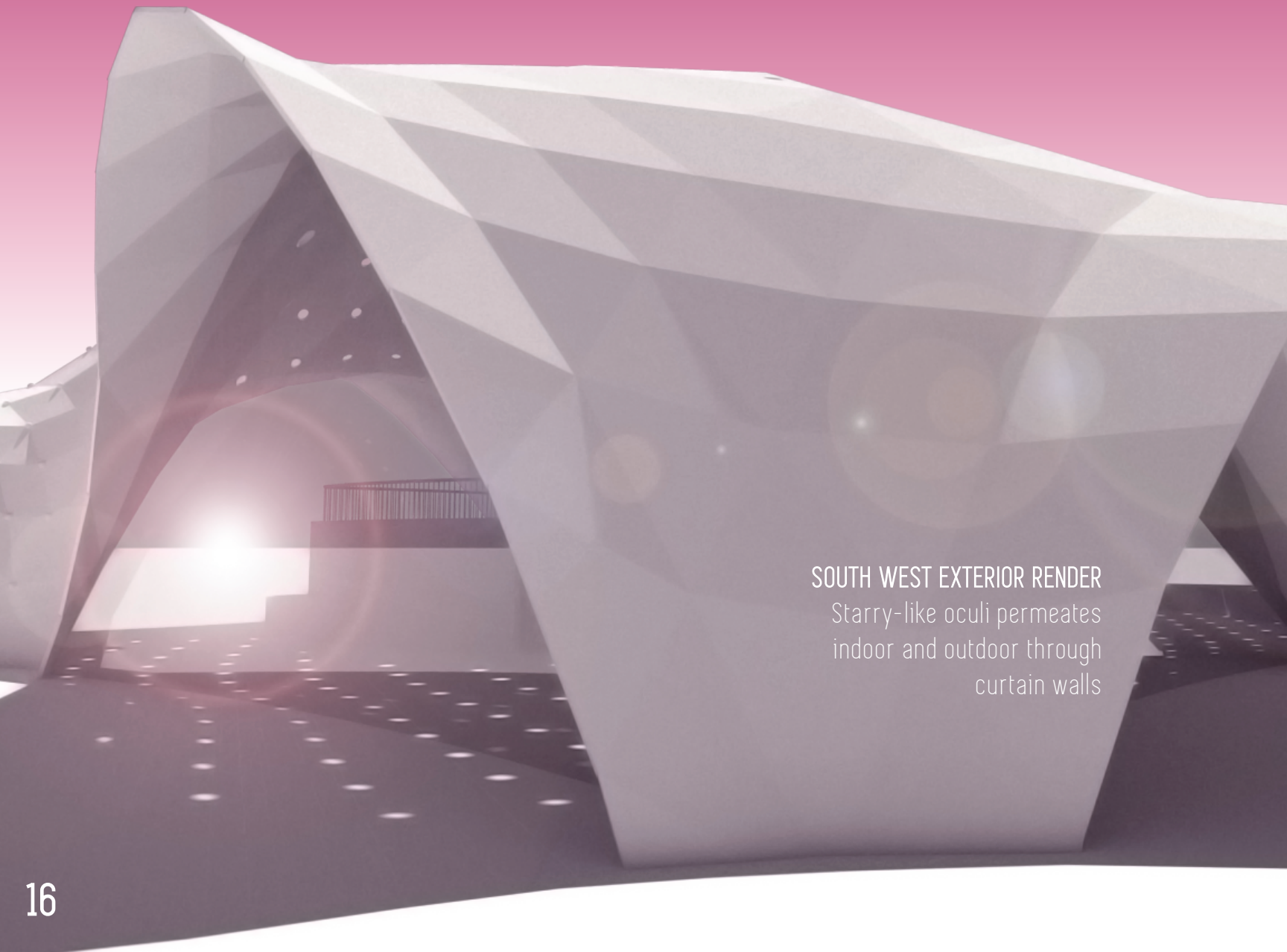
A ACRYLIC GLASS

B 3” CONCRETE SHELL

C WIRE MESH

D STEEL SHEET

E LED PLACEMENT



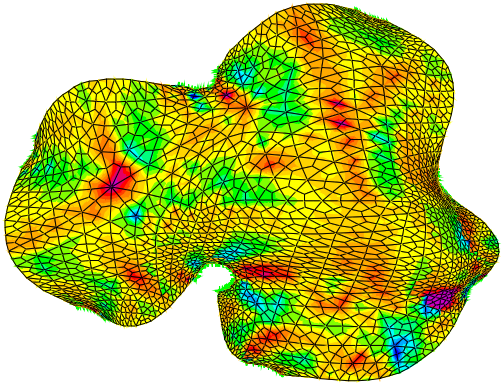
SOUTH WEST EXTERIOR RENDER

Starry-like oculi permeates indoor and outdoor through curtain walls

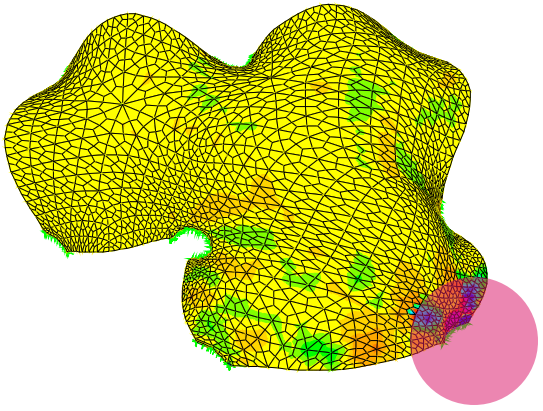
INTERIOR RENDER
Bar adjacent to seating area

AERIAL VIEW
upper standing area with view
of stage and dance floor

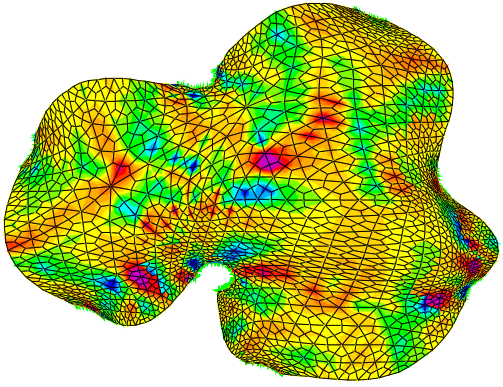
AERIAL VIEW 2
upper standing area with view
of stage and dance floor



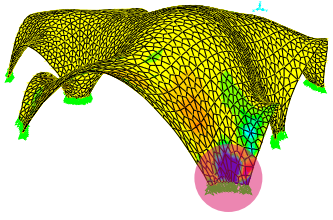
GRAVITY STRESS



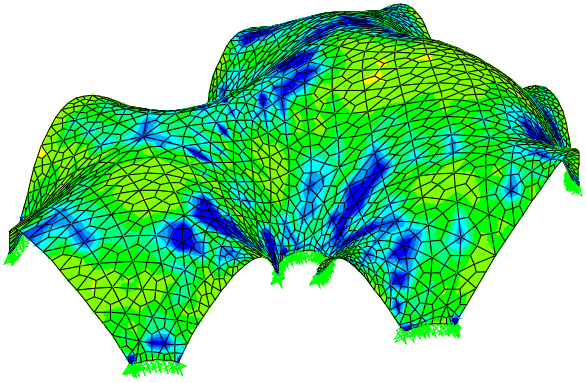
BUCKLING ANALYSIS



LATERAL STRESS



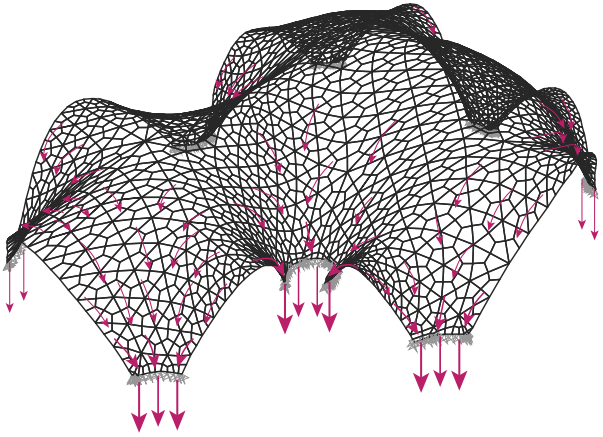
Due to the complexity of our structure our structural analysis was computed through the program SAP. Our buckling analysis showed that our shell would want to fail in the area highlighted if it experienced a force that was **30.6** times our building weight which is **644 kips**. In our gravity analysis our shell showed a maximum deflection of **0.28"**, and our gravity plus lateral analysis gave us a thrusting force of **193.3 kips**.



6.7 EARTHQUAKE TIME HISTORY ANALYSIS

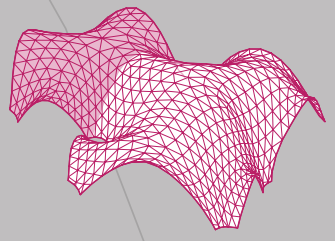
DEFLECTION < 1“

MAX STRESS 300 PSI

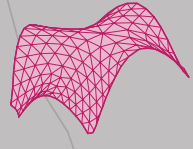


LOAD FLOW

We also ran a time history analysis with the magnitude of the famous Northridge earthquake 6.7 showing that our shell would have survived the earthquake with little to no damage.



CAL POLY SECTION



FUNICULAR FORM

LANDS ON 4 POINTS

REASONABLY DIFFICULT TO BUILD

SPATIALLY INTERESTING

N

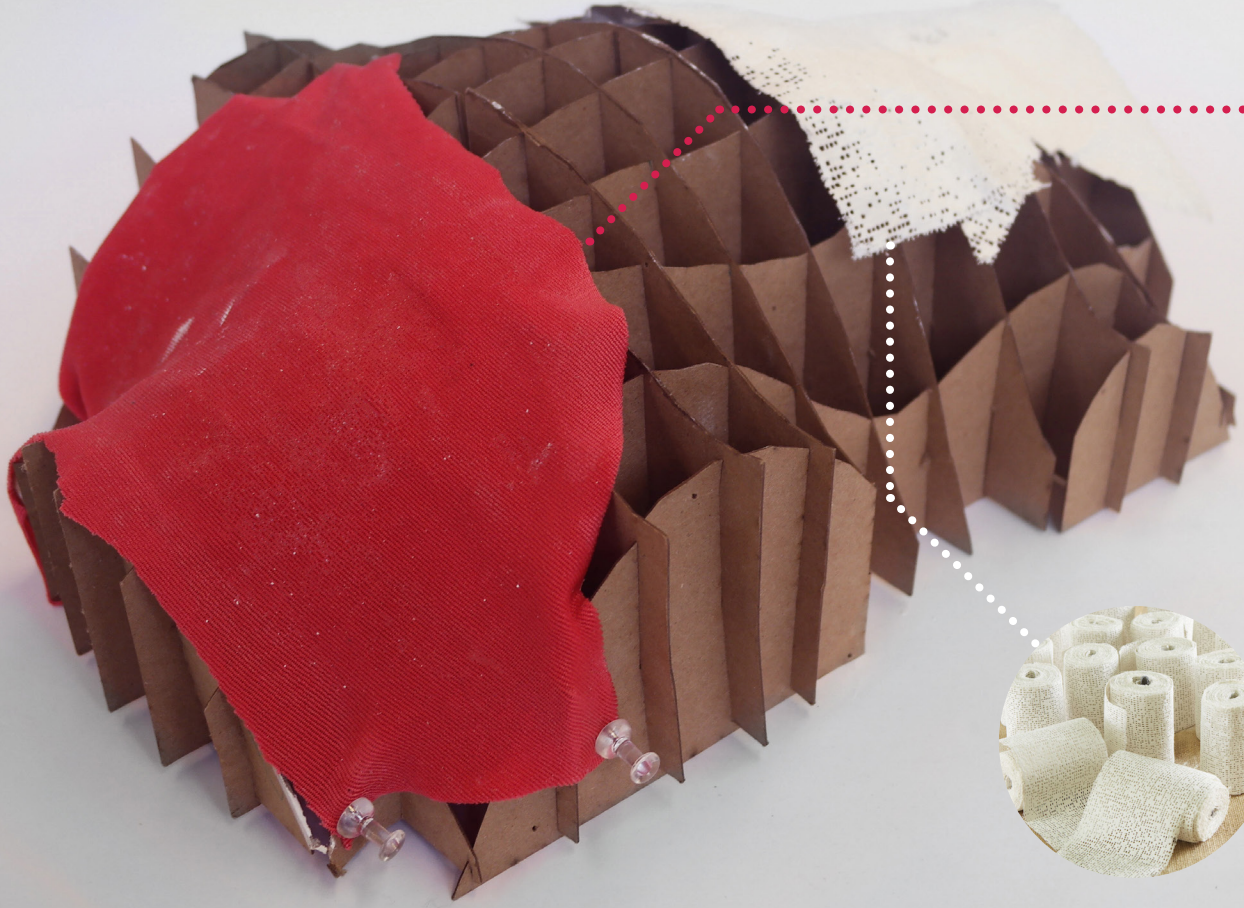
0 200' 400'

LYCRA CLOTH

EMBEDDED IN FORMWORK ✗

RELATIVELY INEXPENSIVE ✗

FORM ADAPTABLE ✗



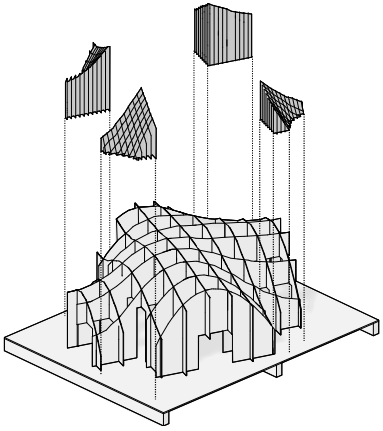
PLASTER FABRIC

EMBEDDED IN FORMWORK ✓

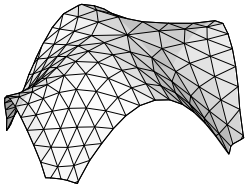
RELATIVELY INEXPENSIVE ✓

FORM ADAPTABLE ✓

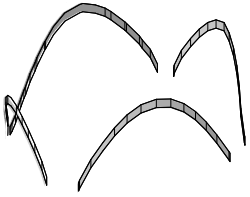
For our construction methods we wanted to achieve a pillowed effect on the inside of our shell with a glossy finish. We tried lycra cloth, plastic sheets, and wire mesh as a layer of our formwork, with the plaster fabric imitating the concrete. From these trials we found that the plastic layer gave us the best control on the pillowed texture, and also gave us the glossy finish we wanted



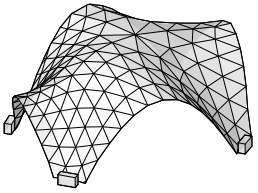
WAFFLE FORMWORK



POLYETHYLENE PLASTIC IS USED AS WATER BARRIER



SPILL EDGES ARE DEFINED USING POLYEURTHANE TUBING AND PVC PIPES



CONCRETE POURED WITH THRUST CONTAINMENT

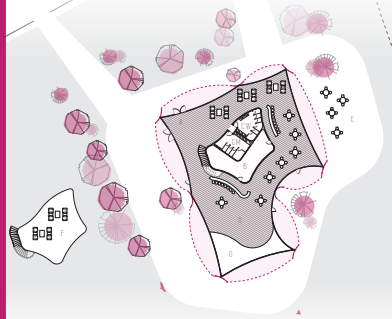
MATERIAL PORTLAND / CAL POLY	COST PORTLAND / CAL POLY	AMOUNT PORTLAND / CAL POLY	TOTAL PORTLAND / CAL POLY
POLYETHYLENE PLASTIC	$0.04 per SQ FT	17,284 SQ FT / 100 SQ FT	$700 / $5
3" THICK CONCRETE	$3.30 per CUBIC FT	4321 CUBIC FT / 25 CUBIC FT	$14,400 / FREE
WIRE MESH	$0.15 per SQ FT	17,284 SQ FT / 100 SQ FT	$2600 / $20
WAFFLE FORMWORK (PLYWOOD/MDF)	$2.00 / $0.08 per SQ FT	26,500 SQ FT / 200 SQ FT	$50,000 / $16
SHORING (2X'S/CMU BLOCKS)	$2.00 per 8 FT / FREE	1000 FT / ABOUT 8 BLOCKS	$2,000 / FREE
LED BULBS/LIGHTS	$50.00 PER BULB / $0.03 PER LIGHT	80 BULBS / 33 LIGHTS	$4000 / $12.00

$53.00	CAL POLY SUBTOTAL
$50	+ SHOP SUPPLIES
$119	CAL POLY TOTAL

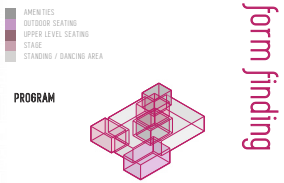
“THIS INTERDISCIPLINARY PROJECT TAUGHT US HOW TO COMMUNICATE AND COLLABORATE. THROUGH THE SMALL SCALE CONSTRUCTION OF A FURNICULAR STRUCTURE, OUR GROUP LEARNED THE COMPLEXITIES OF CONCRETE FORMS INCLUDING WATER BARRIERS, FOUNDATION SUPPORTS, AND FINISHING TECHNIQUES.”

CALVIN VERONICA TUNMI ELI

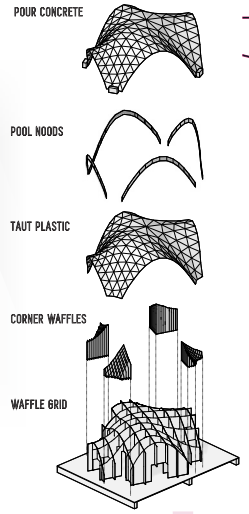
portland pub.

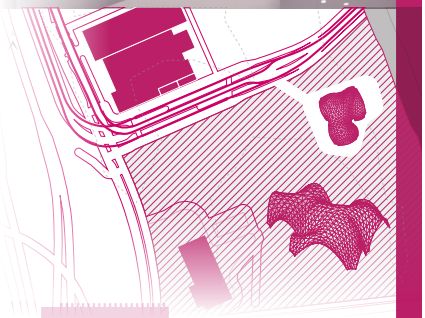


form finding



poly construction





AN EXPLORATION OF FUNICULAR GEOMETRY TO PRODUCE A VISUALLY AND ARCHITECTURALLY STRIKING PERFORMANCE CENTER IN PORTLAND. A PLAY OF SCATTERED LIGHT THROUGH OCULI. A LIGHT AIRY INTREPATION OF A PERFORMANCE PUB. A HIPSTER PLACE FOR GATHERING!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