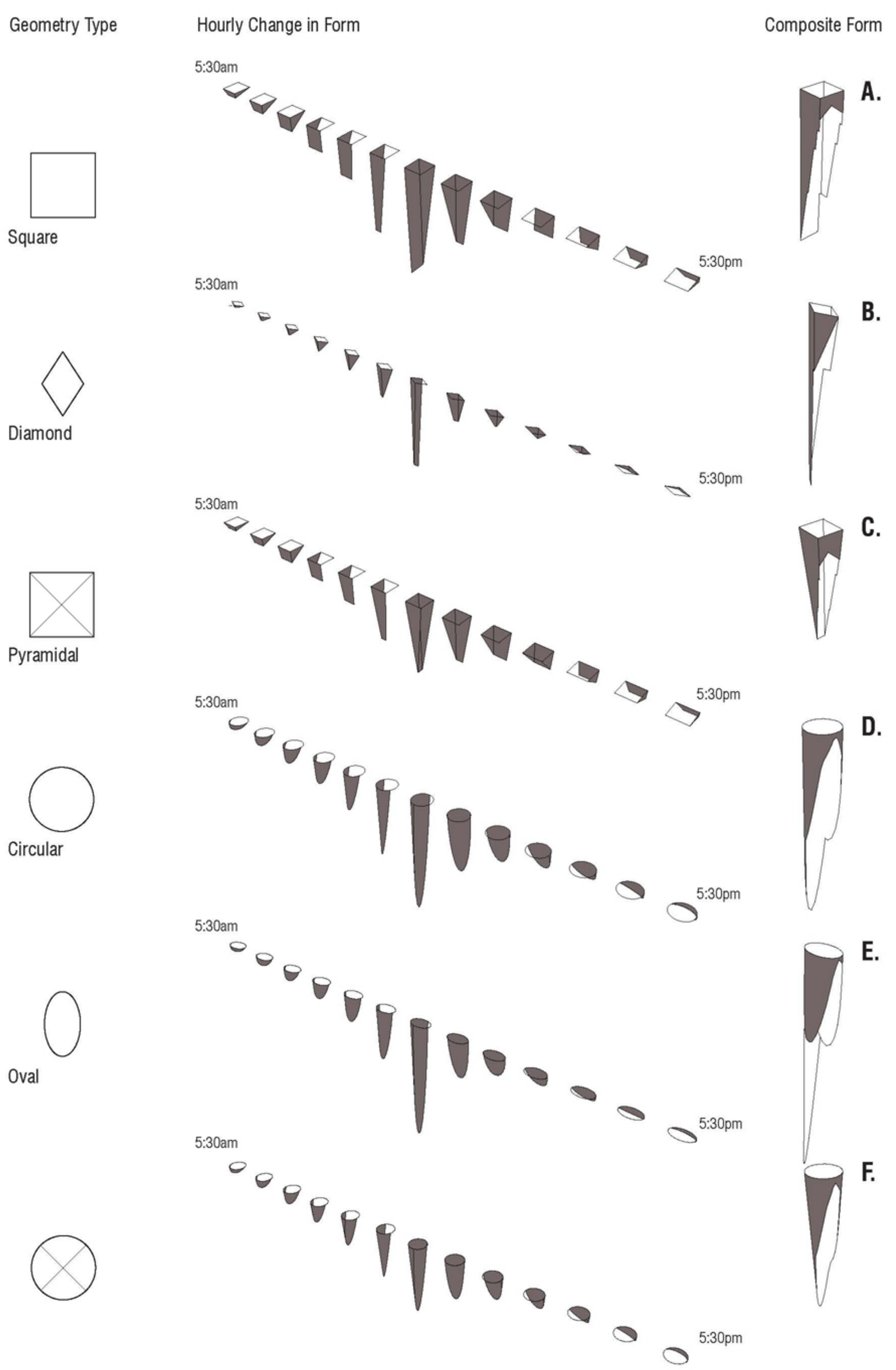
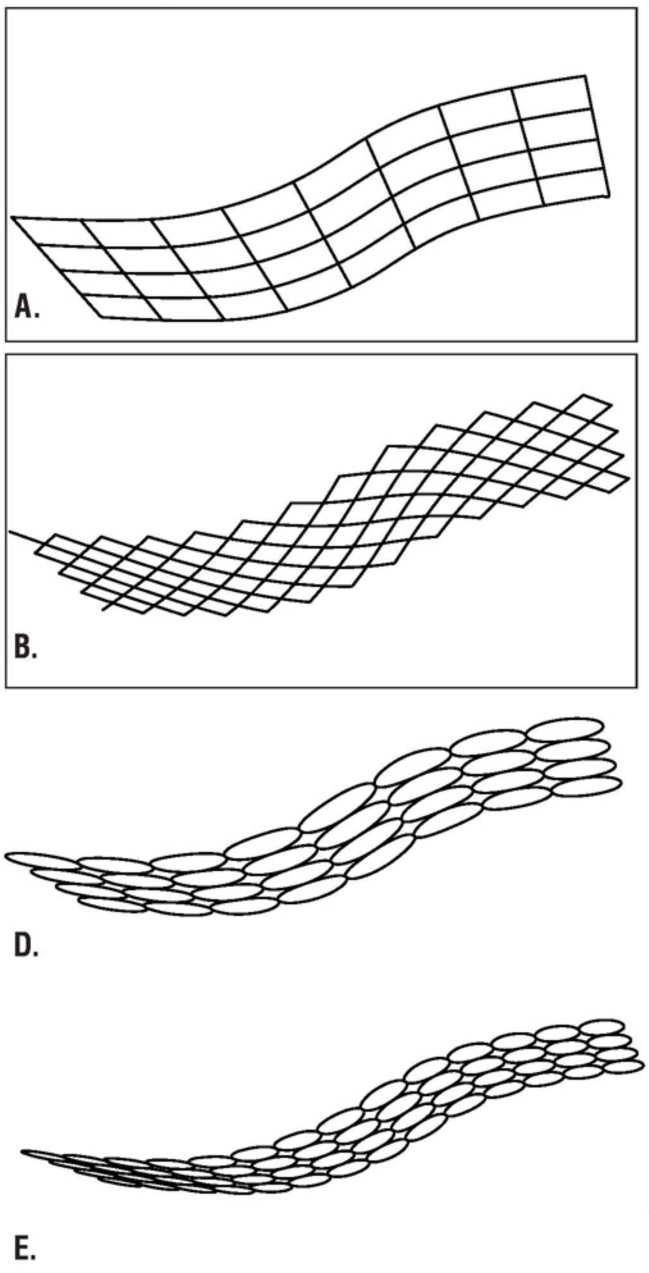
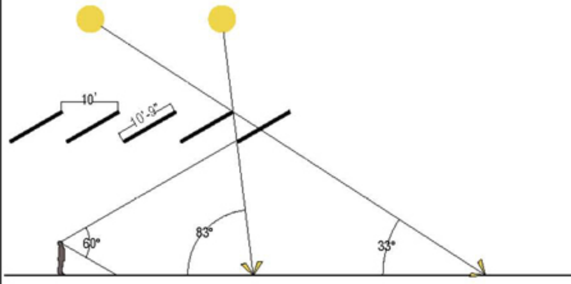


Pattern Geometry On A Curvilinear Surface

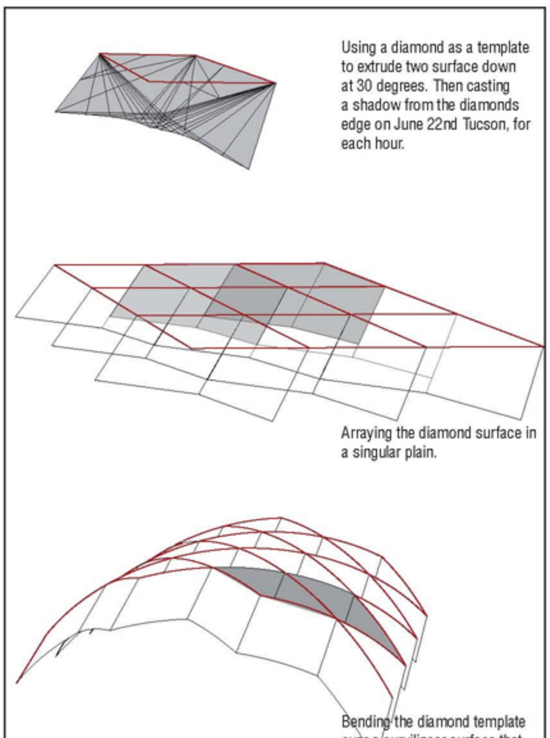


A.

When pattern is extruded vertically to the maximum sun depth, the overall form becomes dense and excessively deep.



Establishing an angular response conditioned by sun and vision to intersect sun to reduce material and depth.



Using a diamond as a template to extrude two surface down at 30 degrees. Then casting a shadow from the diamonds edge on June 22nd Tucson, for each hour.

Arraying the diamond surface in a singular plain.

Bending the diamond template over a curvilinear surface that continues to produce 100 percent shade.

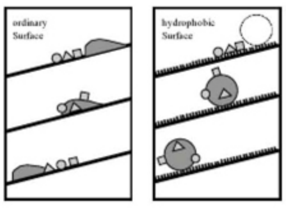
B.

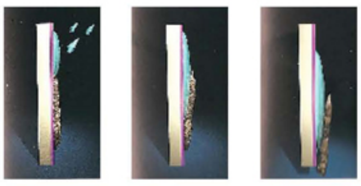
MATERIAL v

Titanium Dioxide

What is it?
The polysiloxane base is porous enough to allow NOx to diffuse though it and adhere to the titanium dioxide particles. The particles absorb ultraviolet radiation in sunlight and use this energy to convert NOx to nitric acid.
The acid is then either washed away in rain, or neutralized by the alkaline calcium carbonate particles, producing harmless quantities of carbon dioxide, water and calcium nitrate, which will also wash away. In a typical 0.3-millimetre layer, there will be enough calcium carbonate to last five years in a heavily polluted city, says Robert McIntyre of the British company Millennium Chemicals, based in Grimsby, Lincolnshire, which developed the paint. When the carbonate has been exhausted, the titanium dioxide will continue to break down NOx, but the acid this produces will discolour the paint.
How does it work?
Photoadhesive Smart Material Their inherent properties allow products based on photoadhesive materials to change reversibly their adhesion in response to light.

Properties
Molecular formula TiO_2
Molar mass 79.87 g/mol
Appearance White solid
Density 4.23 g/cm3
Melting point
1870 °C (3398 °F)
Boiling point
2972 °C (5381.6 °F)
Solubility in other solvents Insoluble





What types of applications?

-Powder (Fine granulated powder of TIO2, used as an additive, clear product but usually mixed with a pure white pigment.)

-Glass (Conventional glass panes with TIO2 surface coating, Available as flat glass in various surface sizes depending on the manufacture, extensive cutting to shape required. They are best suited for use where self cleaning and air quality improvement by breaking down organic pollutants is desirable.)

-Construction membranes (Textile membranes fully coated with plastic e.g. PVC, PTFE with TIO2 surface coating, preferably the anatase modification. Available in rolls in various dimensions depending on the manufacturer, extensive cutting to shape required, can be prefabricated to suit the customer's requirements as conventional construction membranes, best suited for use where self cleaning is desirable. High temperatures may present or deteriorate any air improvement qualities.)

-Ceramic (Ceramic slabs with a surface coating of baked on TIO2, preferably the anatase modification, currently available as facade slabs e.g. with dimensions 592mm x 284mm and as wall and floor tiles, can be handled and used like conventional facade slabs and tiles. They ar e intended for use where their self cleaning properties and their ability to improve the air quality by breaking down organic pollutants are important.)

-Concrete (The reaction with Titanium Dioxide works through adding sunlight. Titanium dioxide has the ability to absorb UV light; this capture of UV radiation then enables a catalytic reaction to take place which destroys common pollutants from vehicle emissions that happen to touch the surface of the titanium dioxide)

-Paints (Add-mixture of powder into paints. Application of raw material.)

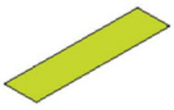
-Paper (Surface treatment of powder baked into paper fibers. Application of raw material.)

Precedence Projects

Garden Chapel (Hyatt Regency Hotel, Osaka Japan)

Monte Verde (High Rise, Vienna Austria)

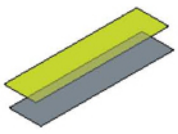
Jubilee Church (Church Rome Italy)



_Canvas Fabric

Test fabric sample.
Coating/Stiffing 0%
Rigid twisting test 0%

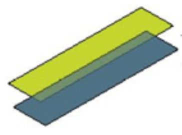
When using a simple canvas matrix piece of fabric, its resistence to bending and twisting is exremly weak.



_Canvas Fabric
_Acrylic w/ TIO2

Acrylic 90% TIO2 10%.
Coating/Stiffing 30%
Rigid twisting test 50%

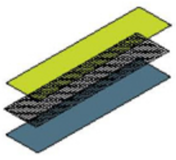
When adding a coating of Acrylic and TIO2 the solvent seeps into the cavities of the fabrics' matrix. This effect crystallizes and adds rigidity to the fabric giving it a fair amount of bending and twisting resistance.



_Canvas Fabric
_Concrete w/ TIO2

Concrete 80% 20%.
Coating/Stiffing 10%
Rigid twisting test 5%

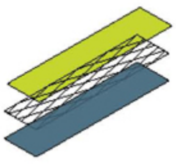
Using a concrete mix with TIO2 actually weakened the bond of the hardneing cement on the fabric matrix. When twisted the result was a crumbeling. Probably a new ration of water to Portland cement is need to completely solidify the coating but due to the thin profile of the fabric suggests that a concrete mix would need a much thinker surface depth for a significant strength increase.



_Canvas Fabric
_Soft nylon mesh
_Concrete w/ TIO2

Concrete 80% TIO2 20%
Soft Mesh
Coating/Stiffing 10%
Rigid twisting test 10%

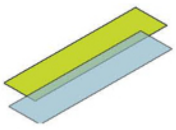
Adding another soft matrix over the canvas fabric ideally should give more random surface overlap of cavities that the concrete solution could fill. Instead a slight depth and increase in surface contact is provided for the concrete but the twisting motion breaks the concrete bond due its weak tensile strength.



_Canvas Fabric
_Hard Steel mesh
_Concrete w/ TIO2

Concrete 80% TIO2 20%
Hard Mesh
Coating/Stiffing 20%
Rigid twisting test 50%

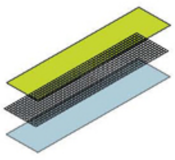
When layering a hard steel mesh over the fabric and then coating it with concrete increased its rigid twisting strength but potentially relied solely on the strength of the steel mesh.



_Canvas Fabric
_Concrete, Acrylic, and TIO2

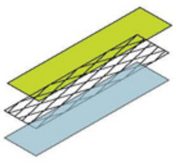
Concrete 50%
Acrylic 40%
TIO2 10%.
Coating/Stiffing 30%
Rigid twisting test 40%

All of these test with the concrete acrylic combo have the same effect as the non acrylic except the flaking is less because the acrylic has better bonding agents.



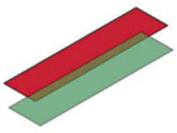
_Canvas Fabric
_Soft nylon mesh
_Concrete, Acyrlic, and TIO2

Concrete 50%
Acrylic 40%
TO2 10%.
Soft Mesh
Coating/Stiffing 30%
Rigid twisting test 50%



_Canvas Fabric
_Hard Steel mesh
_Concrete, Acyrlic, and TIO2

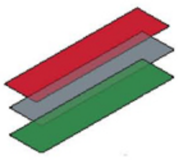
Concrete 50%
Acrylic 40%
TO2 10%.
Soft Mesh
Coating/Stiffing 30%
Rigid twisting test 70%



_Fiberglass Fabric
_Epoxy Resin Mix

100% Epoxy Resin
Coating/Stiffing 70%
Rigid twisting test 70%

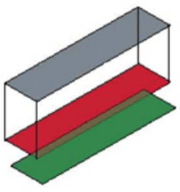
Using waxed glass as a molding surface, the fiberglass and epoxy were painted on in thin layers over 48 hours. When tested the strength is significant relative to scale. The 9 sq foot sheet was very weak. The material also lacks a memory.



_Fiberglass Fabric
_TIO2
_Epoxy Resin Mix

70% Epoxy Resin
30% TIO2
Coating/Stiffing 70%
Rigid twisting test 75%

When TIO2 is mixed into the epoxy the compression strength is increased because the TIO2 acts as micro aggregate filling the epoxy chain with larger and stronger molecules. The overall strength at my testing scale is barely noticeable.



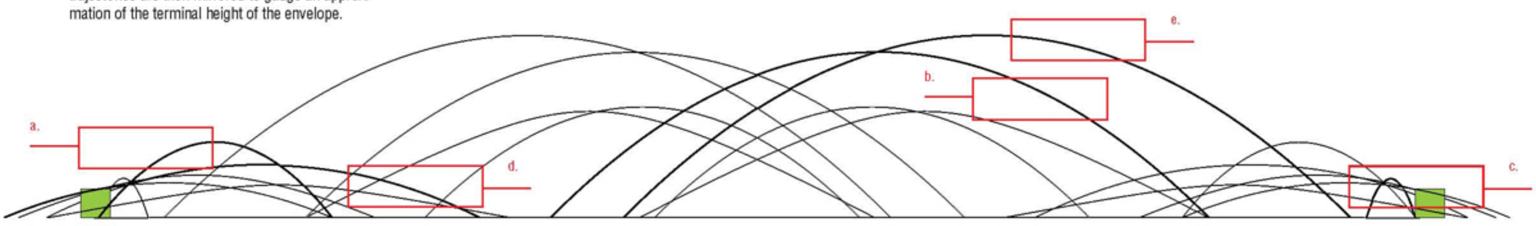
_TIO2 after harden resin
_Fiberglass Fabric
_Epoxy Resin Mix

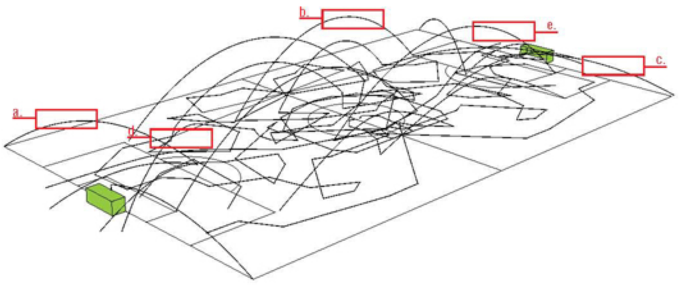
100% Epoxy Resin
TIO2 w/ Acrlic after
Coating/Stiffing 70%
Rigid twisting test 70%

Painting on a layer of TIO2 and Acrylic seems to bond well with the fiberglass epoxy sheet. When twisted the coating of TIO2 does not crack off, but it doesn't seem to add any significant strength as well.

SHAPING LOGICS3

A soccer ball trajectory of FIFA professional soccer game, over the duration of 10 min. The highest trajectories are then mirrored to gauge an approximation of the terminal height of the envelope.

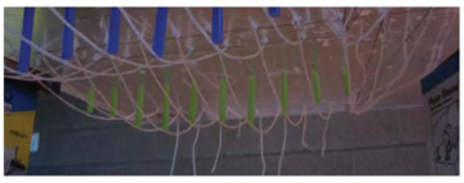




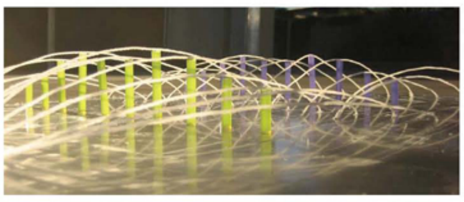
Important trajectory shots
a_ Corner kick setup for a head bunt goal shot.
b_ Goalie clearing down field from corner of box.
c_ Corner kick directly set up on opposite corner of goal.
d_ Attempted goal shot from mid field.
e_ Goalie clearing shot from goal.

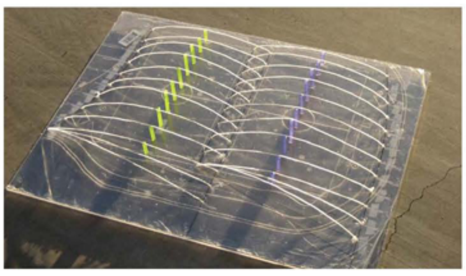
1.

Markers designate minimum height, then strings dipped in wax are hung upside down making catenary curves aligned from fields edges.

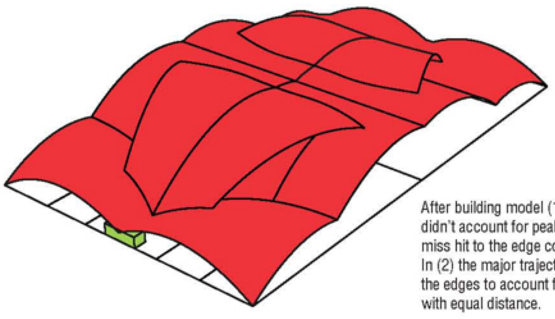


Using the trajectories in one plain to gauge the surface distance an arch spanning from sideline to sideline.





1a.

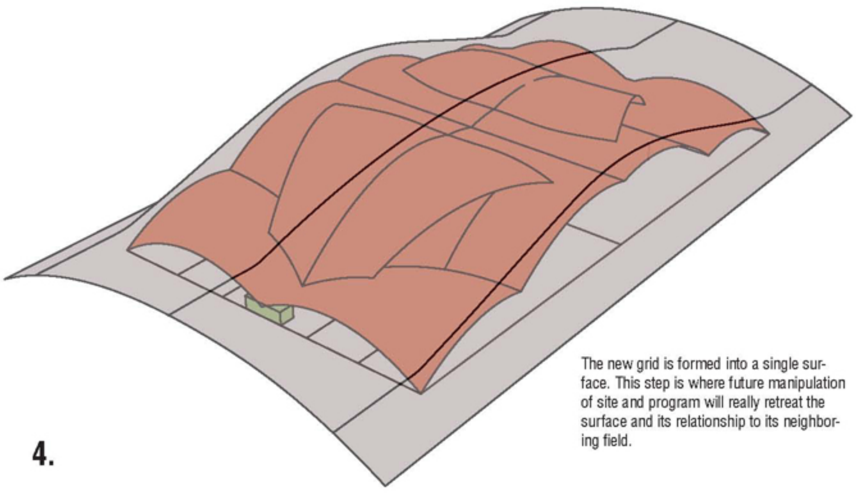


After building model (1a) the major flaw didn't account for peak trajectories being miss hit to the edge conditions of the field. In (2) the major trajectories are revolved to the edges to account for poorly placed hits with equal distance.

2.

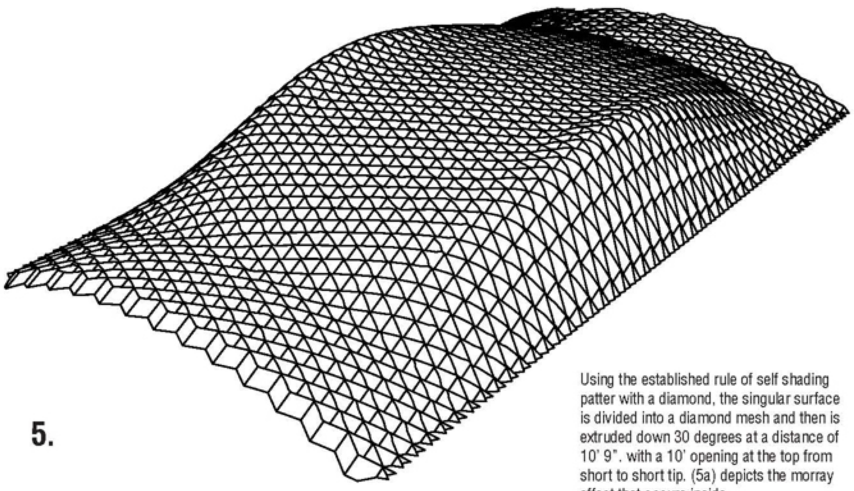
Using the maximum heights from the revolved trajectories, a new grid is established linking them all. The new grid is also raised 10 feet as a buffer zone. The North and South edge conditions are elongated to canopy over future spectators. These edge are the generic formation, site and program will reorder there positions.

3.



The new grid is formed into a single surface. This step is where future manipulation of site and program will really retreat the surface and its relationship to its neighboring field.

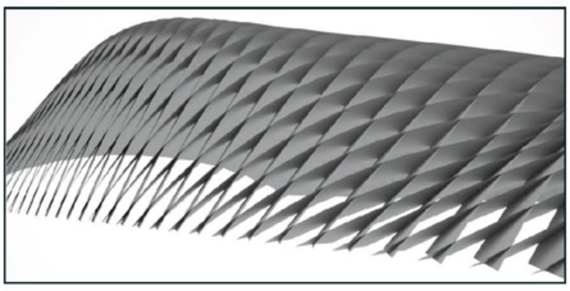
4.

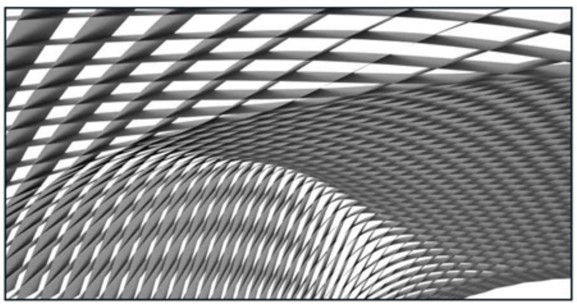


Using the established rule of self shading patter with a diamond, the singular surface is divided into a diamond mesh and then is extruded down 30 degrees at a distance of 10' 9". with a 10' opening at the top from short to short tip. (5a) depicts the morray effect that occurs inside.

5.

Generic Form

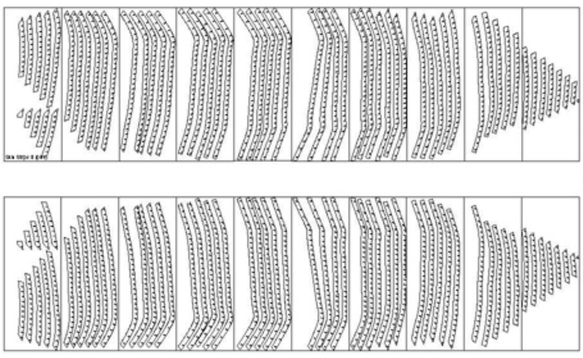




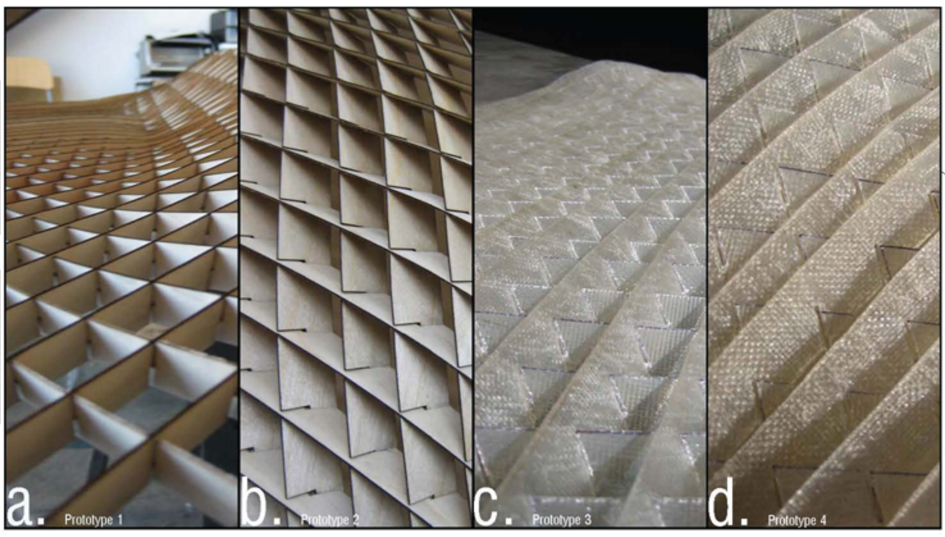
5a.

PROTOTYPE4

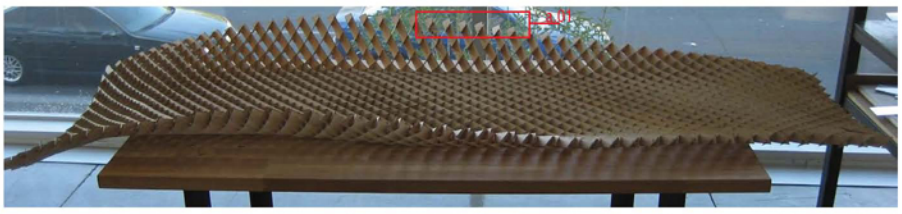
Cut Sheet



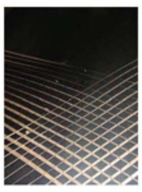
In Rhino modeling I drew indicators lines to designrating where each strip intersected another, then they were flettened out digitally and grouped into sets. The two halves of the structre are symetrical so only one half was arranged and then mirrored.



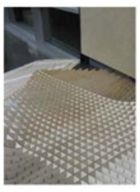
a.



The initial conception of assemblage, was that after slot fitting all the members that the model would spring into the designed form. Instead a new equal equilibrium was achieved where gravity and slot stress found a path of less resistance. This new form elongated in one direction extending the model an additional two feet.



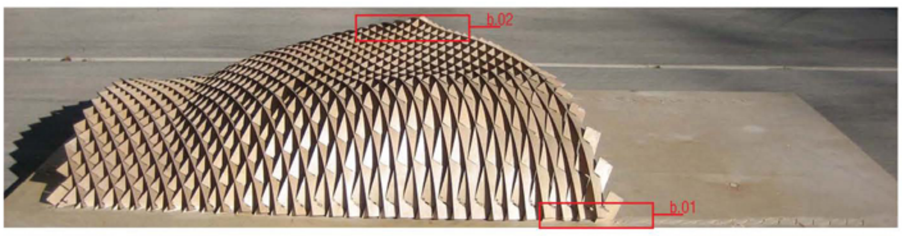
During initial assemblage I started interlocking the pieces starting from the corner, about midway through the structure sprung out of place dislodging all the pieces.



Second time rebuilding the structure I started from the center working out towards the edges, This allowed for the internal torsion to equalize itself out.

a.01 Once the torsion works on the structure it begins to lift itself along the permitter. The corners receive the most deflection.

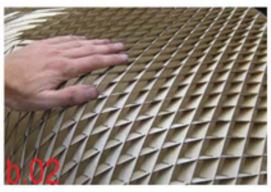
b.



The emphases on rebuild number two, is that by fixing the edge condtion where the strips meet the ground is the proper way to construct. Instead of springing into form the members are pulled taut to there limit to make the designated form. This makes the structure rigid but brittle.

Started weaving from the corner despite my initial discovery that you reduce less stress if start from the center. While construction the structure must be able to cantilever its own weight .

b.01 The elasticity of the wood is to brittle and cause fractures while trying to make such tight interlocking bends.

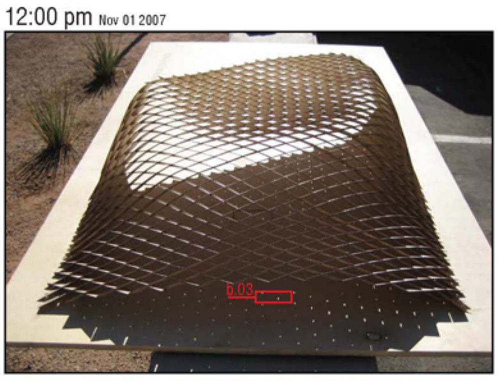


b.02 The double curvature and redundant members are what give the form strength.

Tested Daily Shading

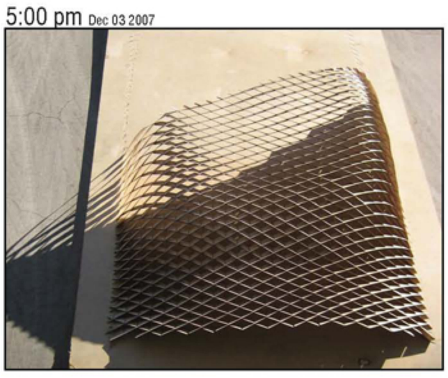
8:30 am Dec 05 2007

12:00 pm Nov 01 2007



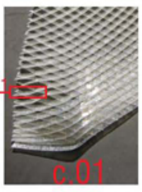
b.03. Construction tolerence at slip joint is not meet and the after effect is spekled lighting on the field.

5:00 pm Dec 03 2007



c.

All the members are fiberglass cast in three layers of epoxy resin. To maintain the profile thickness of 1/32 the epoxy resin strength is inefficient to achieve the proper rigidity. Technically a layer of acrylic and TIO2 would be adhered to the structure at this stage and would add strength and opacity for shading capacity, but the semi clear epoxy strips produce shade without the coating.

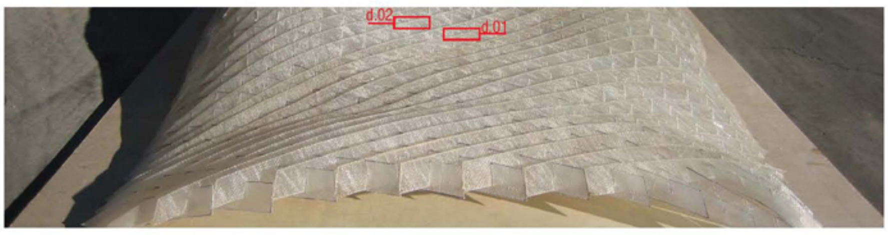


c.01 Unable to determine why this bunching is occurring. This could be a mistake in construction or a structural effect that is occurring the actual structure to dislodge itself. This could be a severe threat to the structure.

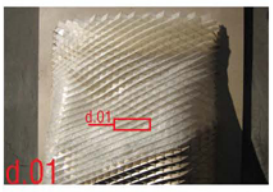
The extreme elasticity causes sever sage. This is because the fiberglass strips retain no memory in the fabric. Gravity becomes the leading force.

The double curvature hump geometry still achieves enough strength to form the mailable strips.

d.



This construction was done with fiberglass strips with out adequate stiffness. The foundation and fixed intersecting nodes are what give the form shape. This would suggest that material strength is only dependent on carrying its own weight through the network. This is essentially a textile construction. Also the density of the fiberglass mesh is dense enough to shade, but still has some transparency.



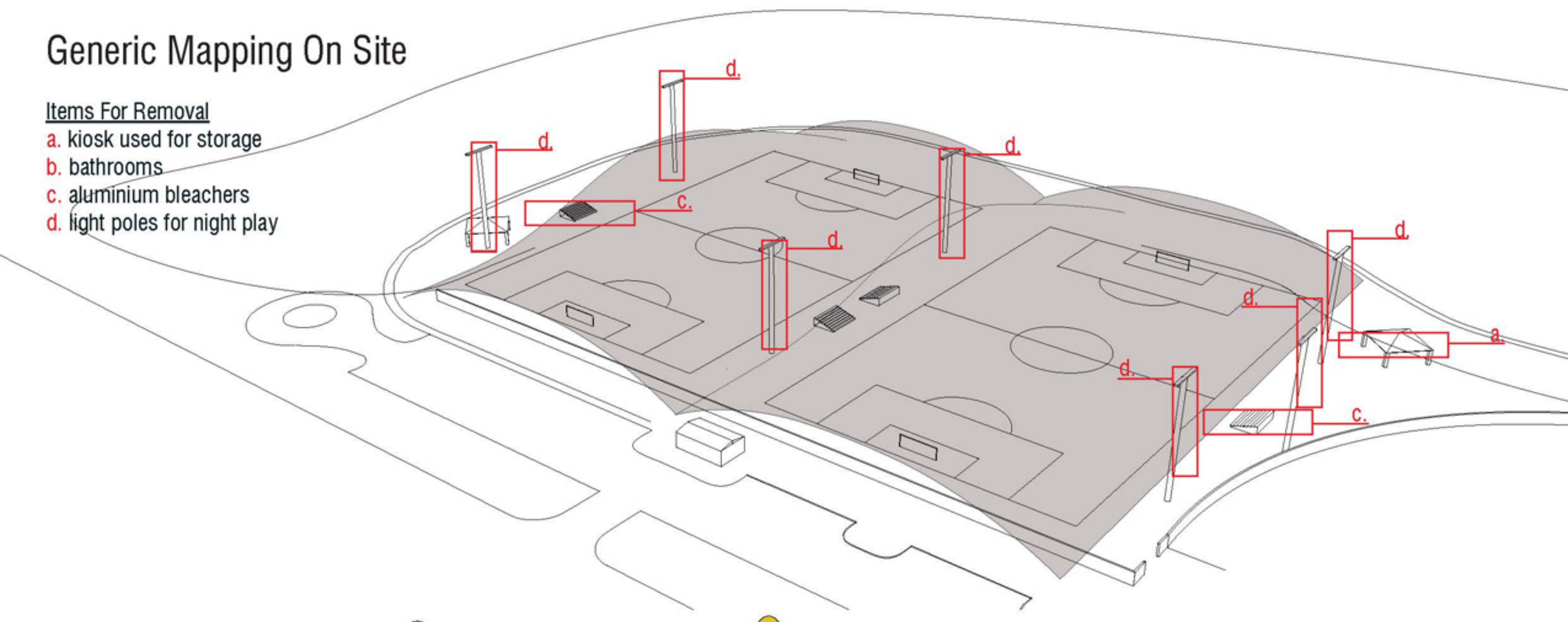
The overall fiberglass construction is using the wood as scaffolding. There is a portion at the apex of the hump where the overall form is collapsing which is the catalyst for d.02 collapsing.

Because of the flexibility of the strips the layers begin to collapse on each other, causing the designated aperture to be sealed.

SITE RESPONCE5

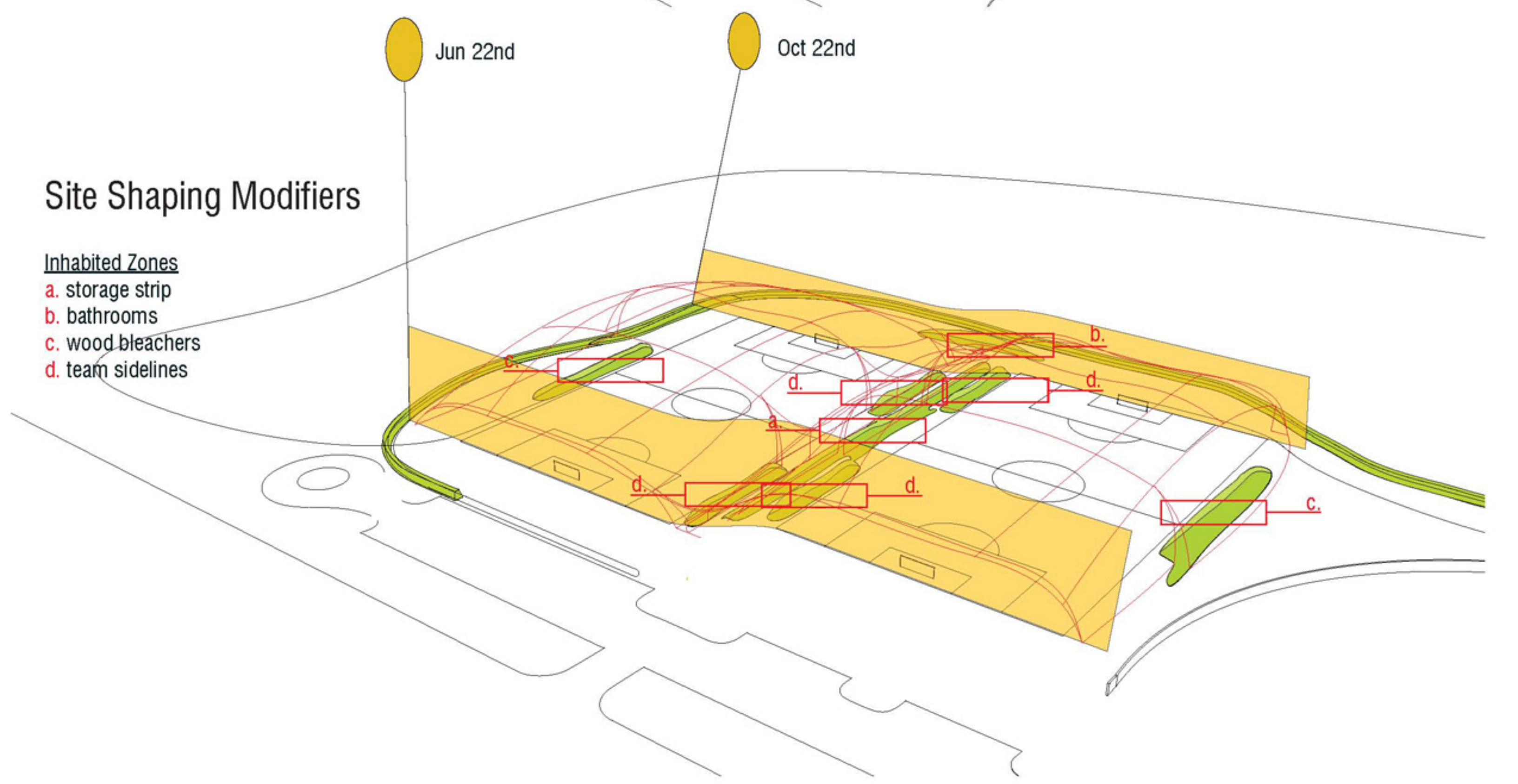
Generic Mapping On Site

Items For Removal
a. kiosk used for storage
b. bathrooms
c. aluminium bleachers
d. light poles for night play

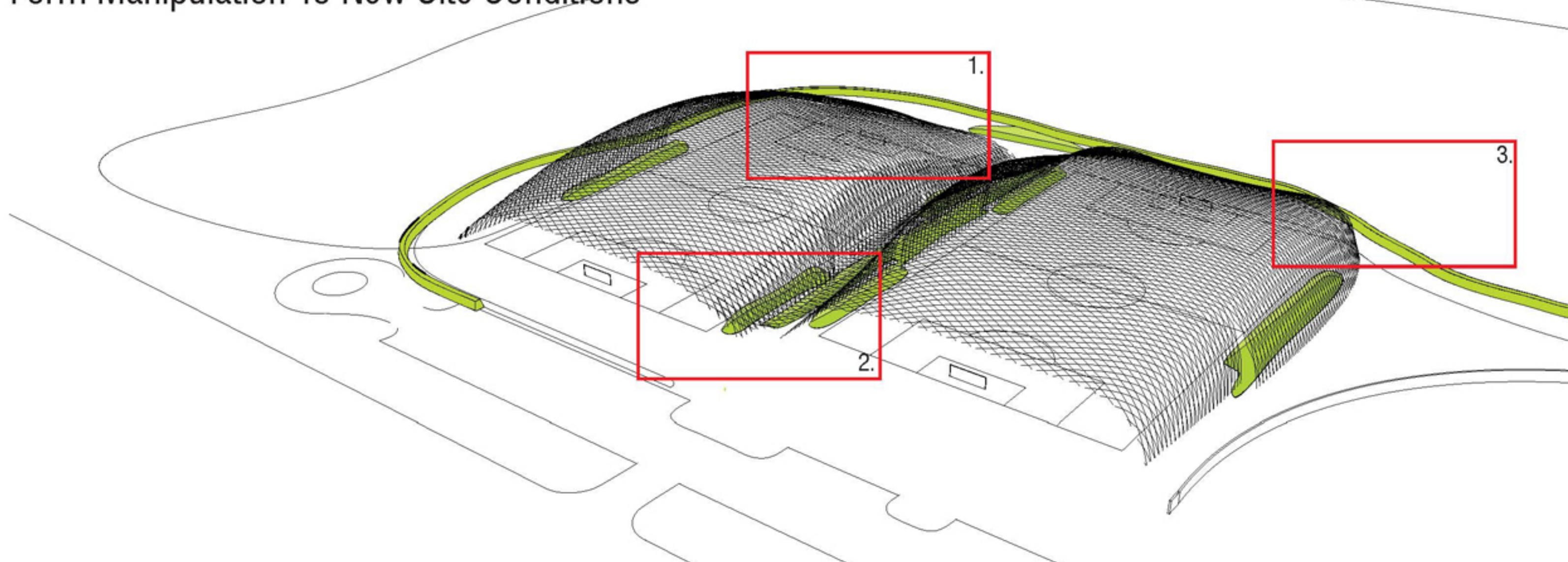


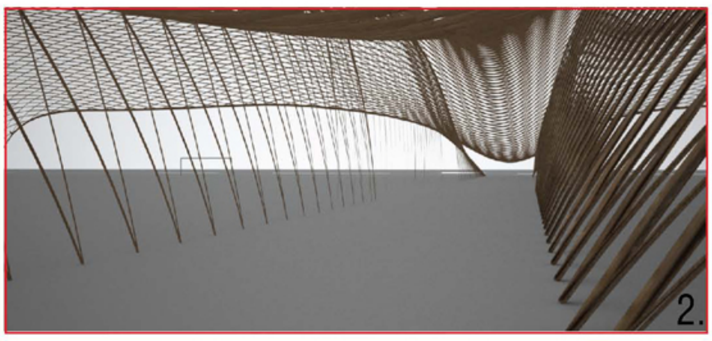
Site Shaping Modifiers

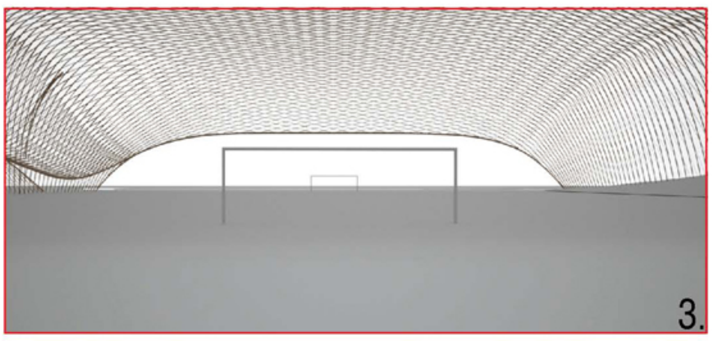
Inhabited Zones
a. storage strip
b. bathrooms
c. wood bleachers
d. team sidelines



Form Manipulation To New Site Conditions

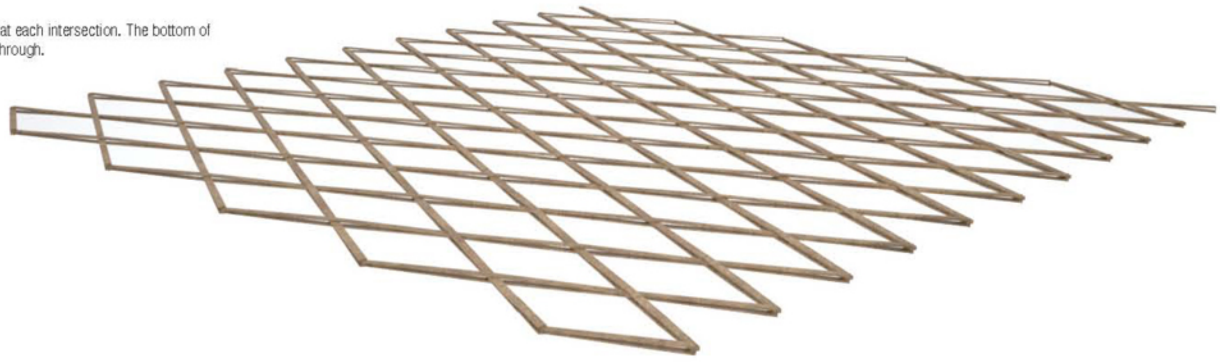


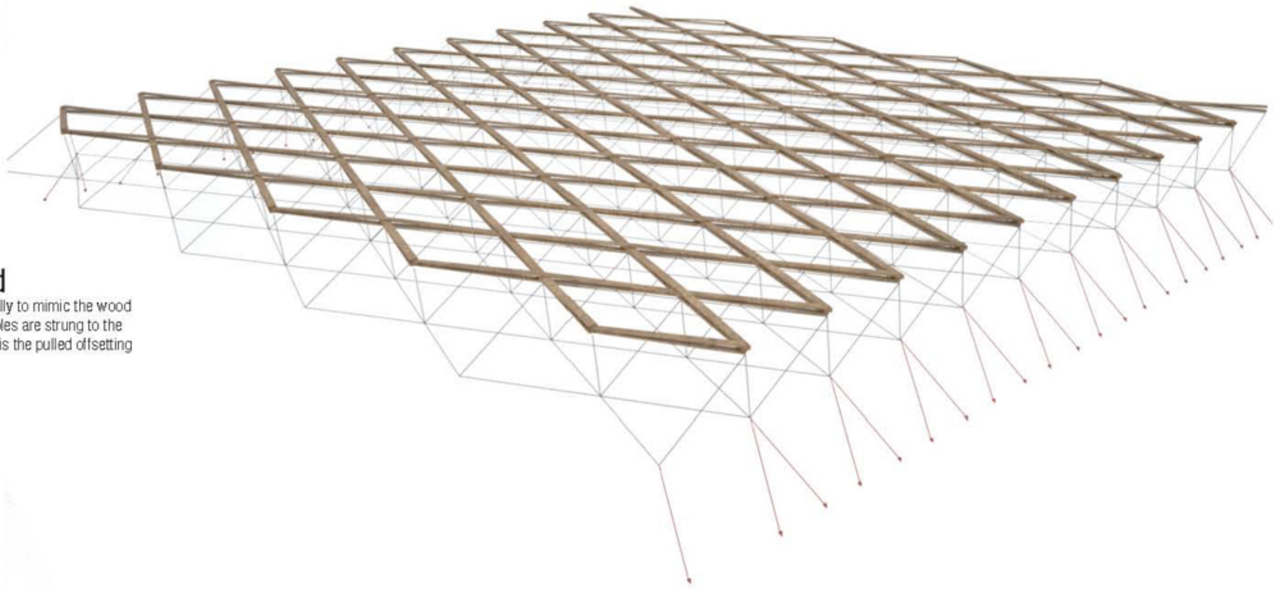




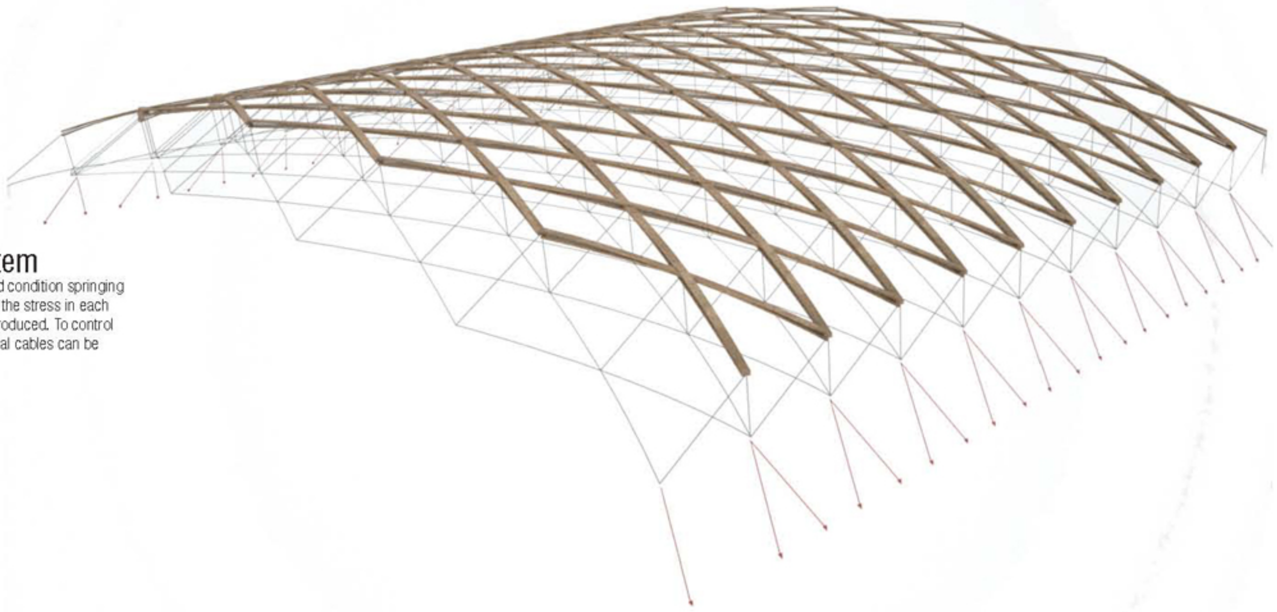
Structural Strategy6

Woven Wood Grid
Wood grid is laid out flat with dowels pined at each intersection. The bottom of the pins have a loop for cable to be strung through.

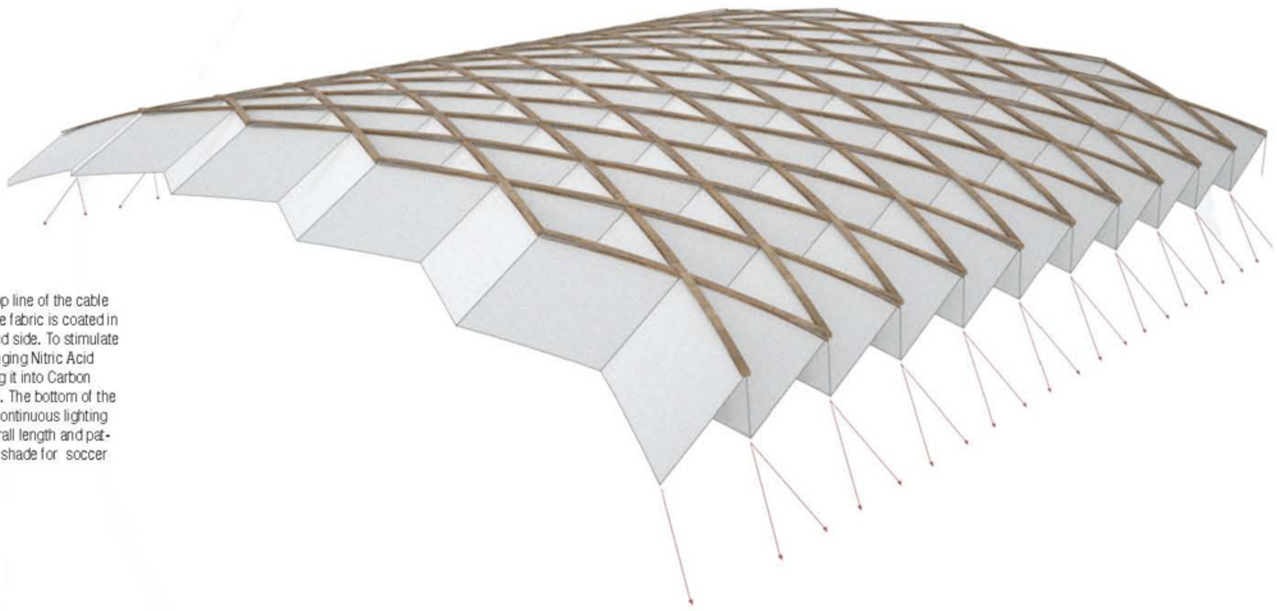




Draped Cable Grid
Continuous cable is strung diagonally to mimic the wood grid. Then in the other direction cables are strung to the previous southern intersection and is the pulled offsetting the main cable matrix 30 degrees.

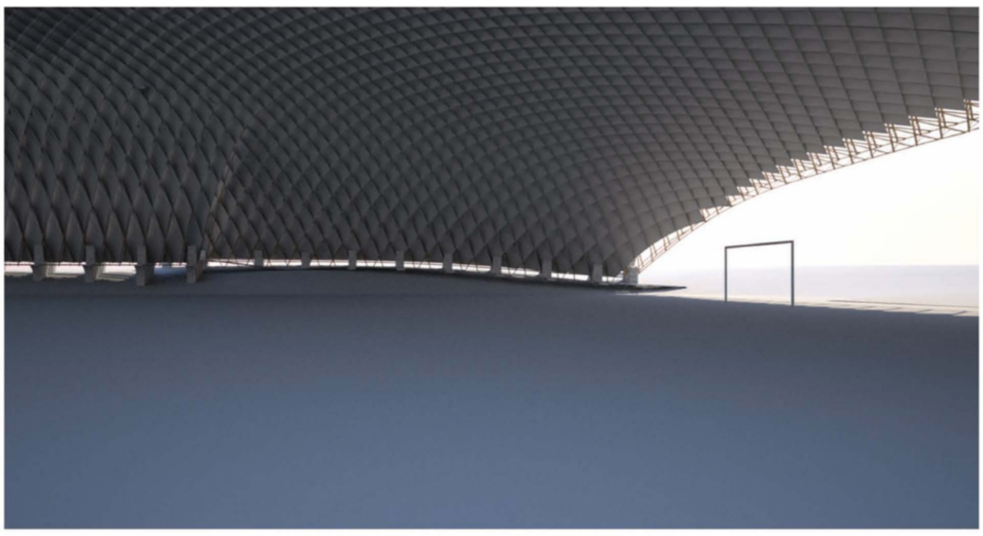


Post Tension System
The cable matrix is pulled at the end condition springing the wood grid upwards. By varying the stress in each cable, general deflections can be produced. To control specific nodal deflections the vertical cables can be shortened.

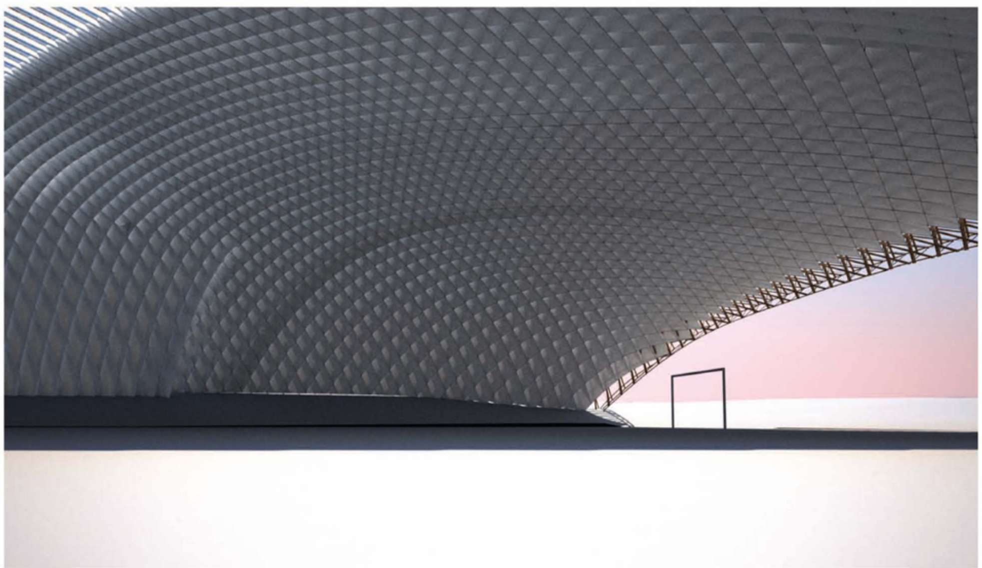


Shading Baffles
Fabric in fill is stayed through the top line of the cable matrix to the lower cable matrix. The fabric is coated in Titanium Dioxide on the sun exposed side. To stimulate its photo adhesive qualities. Exchanging Nitric Acid pollutant from the air and converting it into Carbon Dioxide, a less dangerous chemical. The bottom of the fabric shall be detailed to house a continuous lighting system for night play. While its overall length and pattern produces a continuous field of shade for soccer players below.

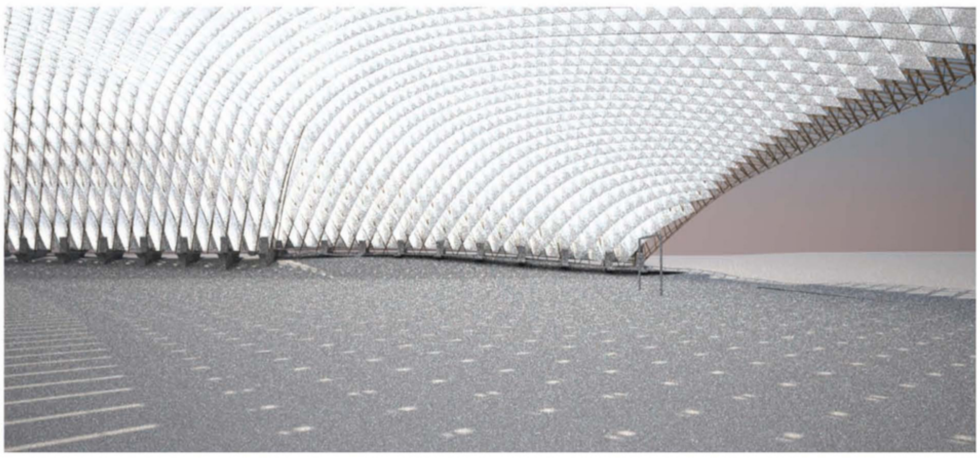
TIO2 Light Studies9



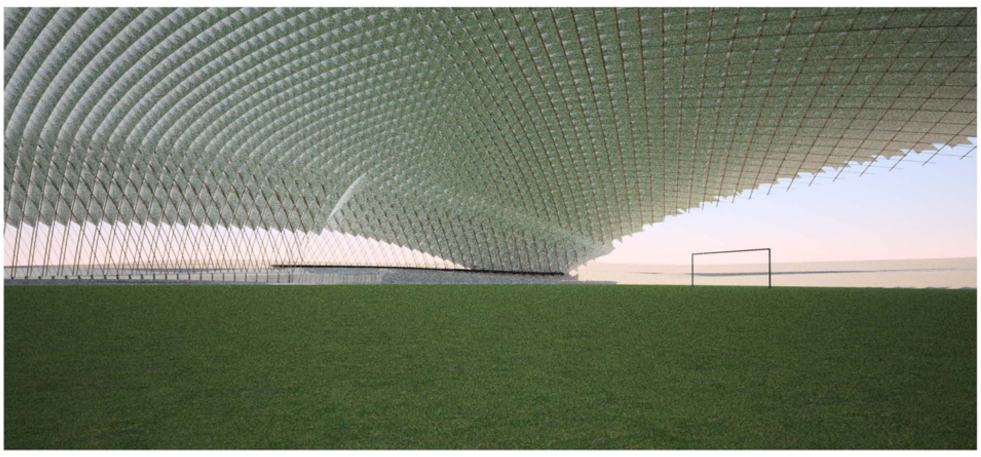
Simulated lighting condition using a flat matte finish canvas.
Reflectance(0) =153,153,153
Reflectance(90) =255,255,255
ND Scale =3.00
Roughness =L(Lambert) & 95.00



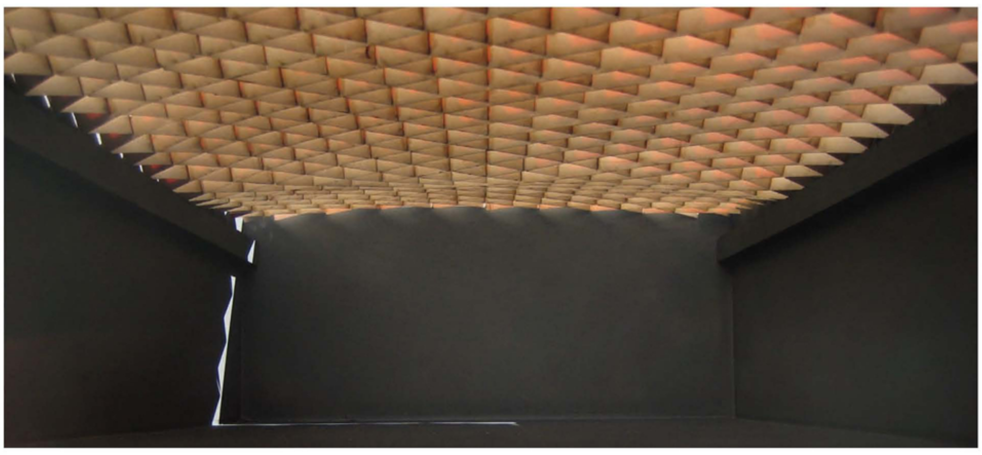
Simulated lighting condition using a milk.
Reflectance(0) =229,229,299
Reflectance(90) =219,2519,215
ND Scale =1.30
Roughness =L(Lambert) & 0



Simulated lighting condition using a high reflective ceramic.
Reflectance(0) =243,243,243
Reflectance(90) =163,163,163
ND Scale =1
Roughness =95,55,0

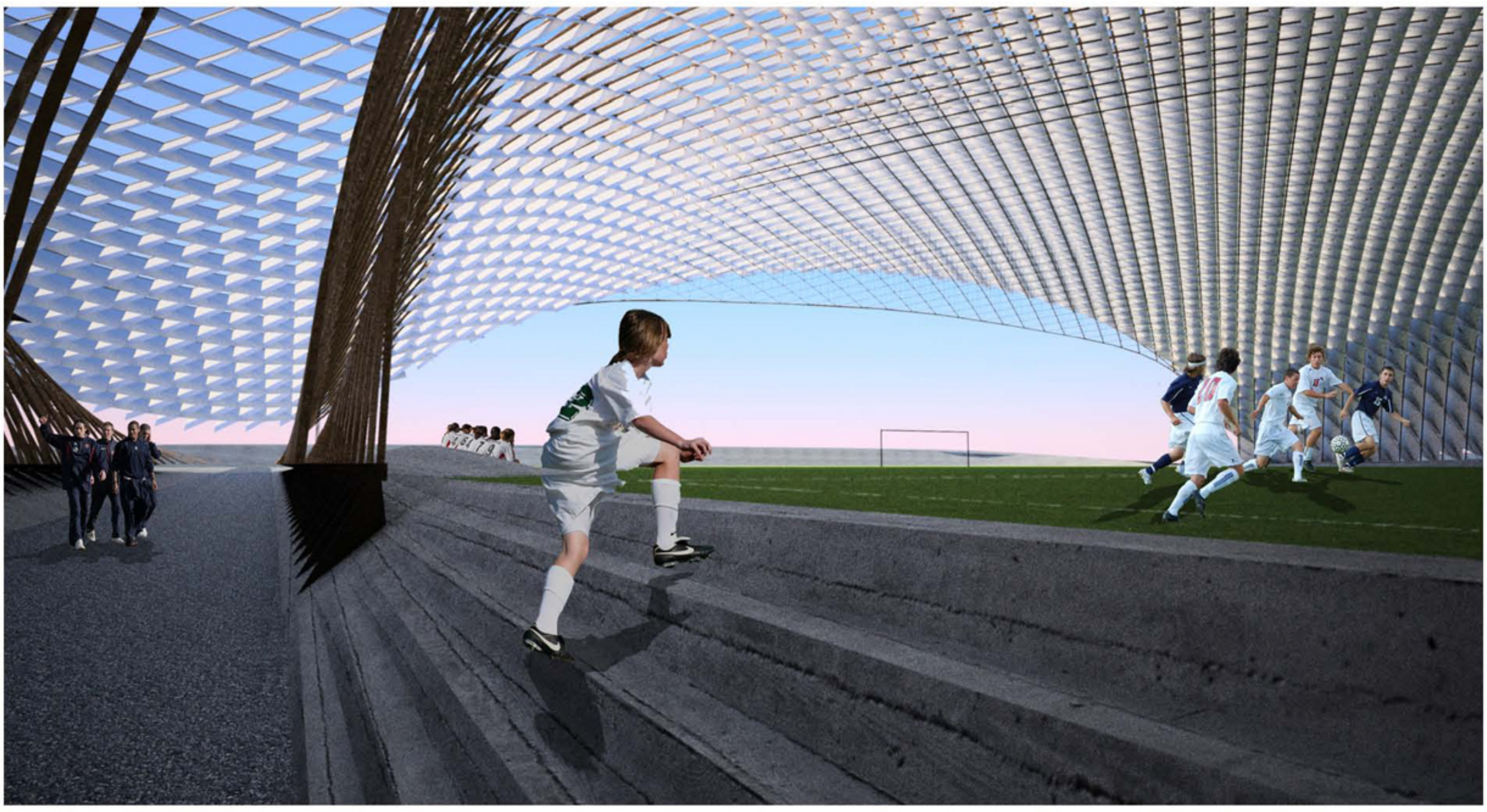


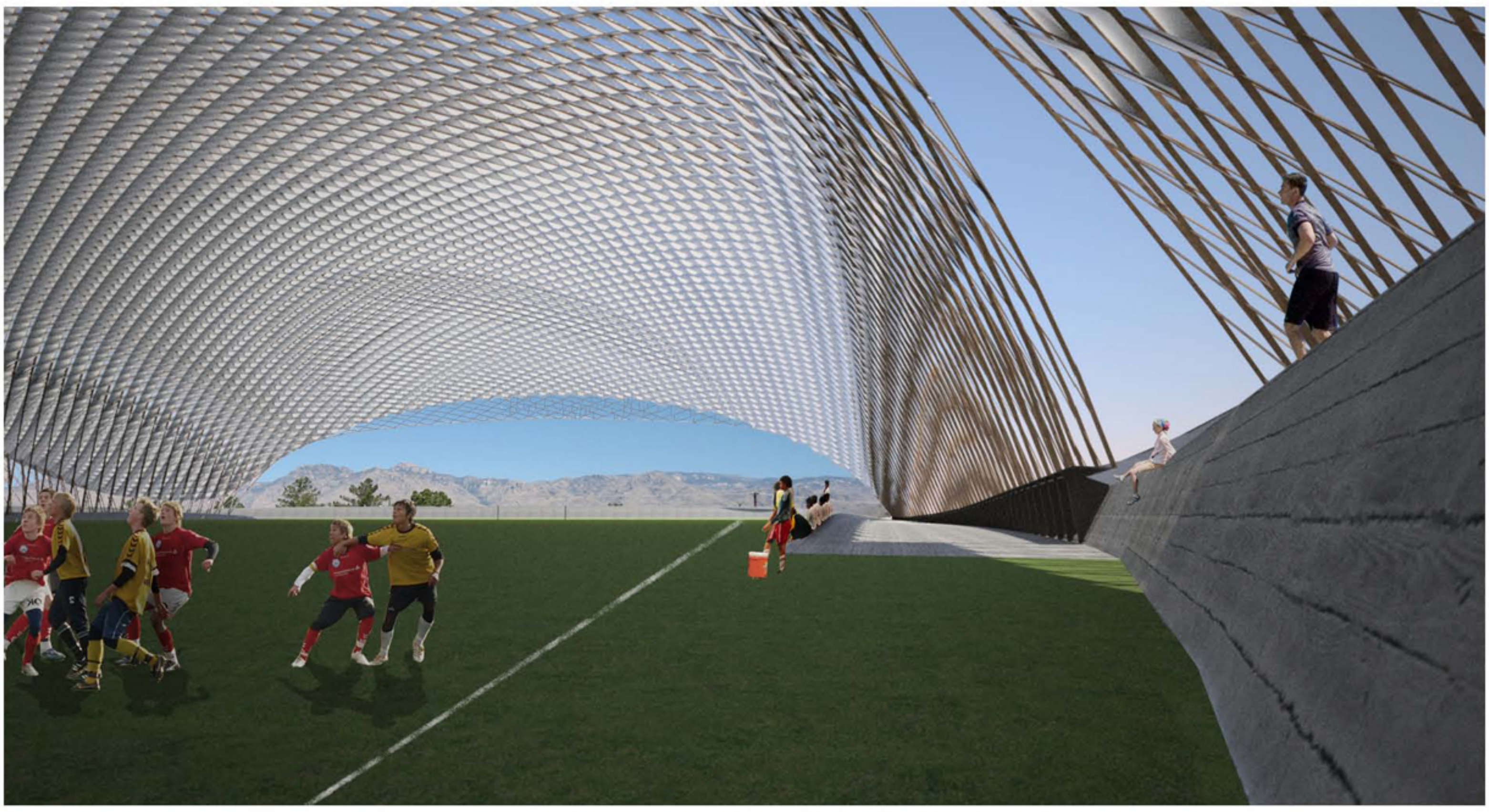
Simulated lighting condition using a rough paint finish
Reflectance(0) =240,240,240
Reflectance(90) =254,254,254
ND Scale =3.00
Roughness =50



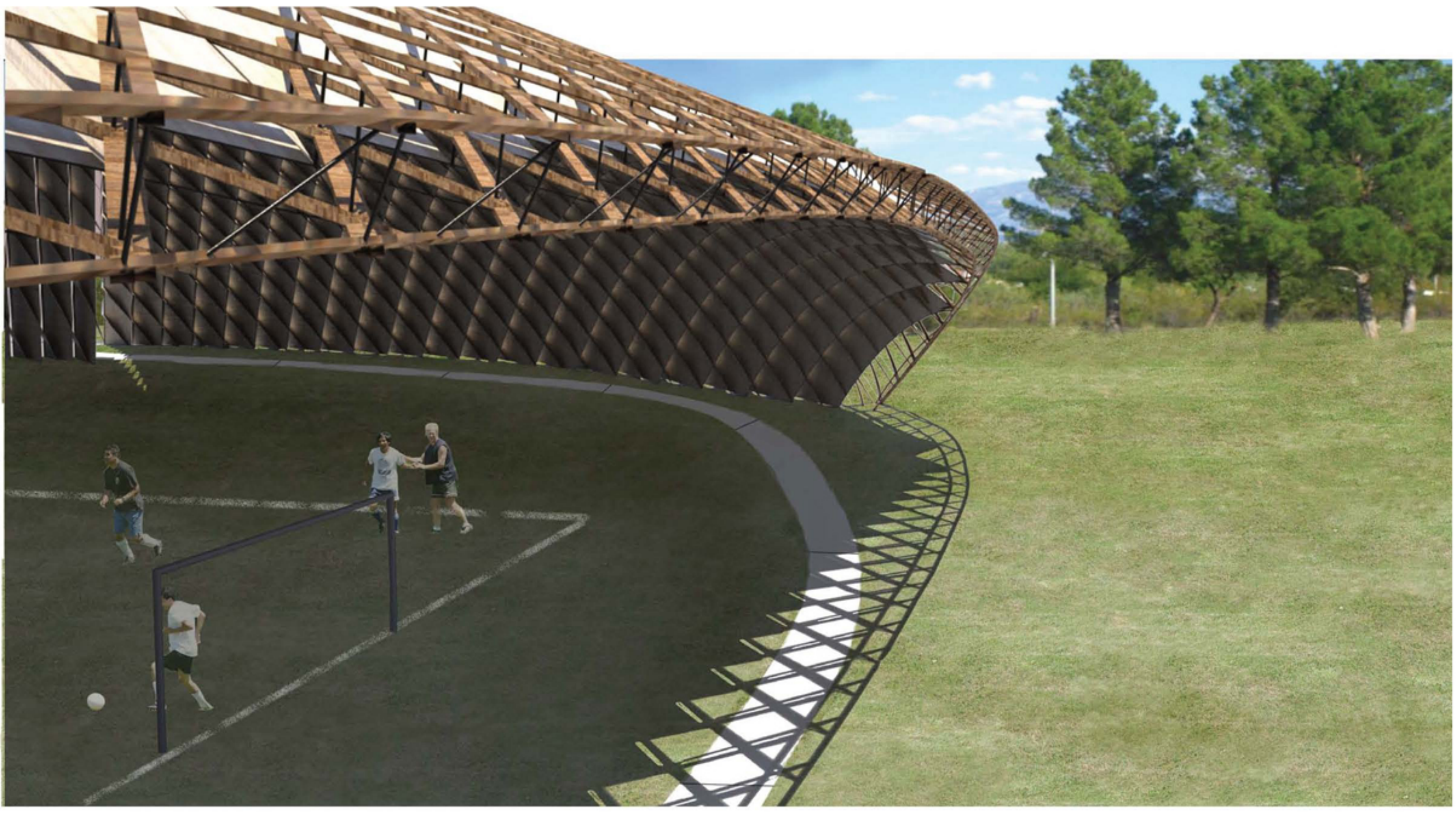
3:00PM

5:00PM






OZBUS



Ground Manipulation 11