Data Informed Structures

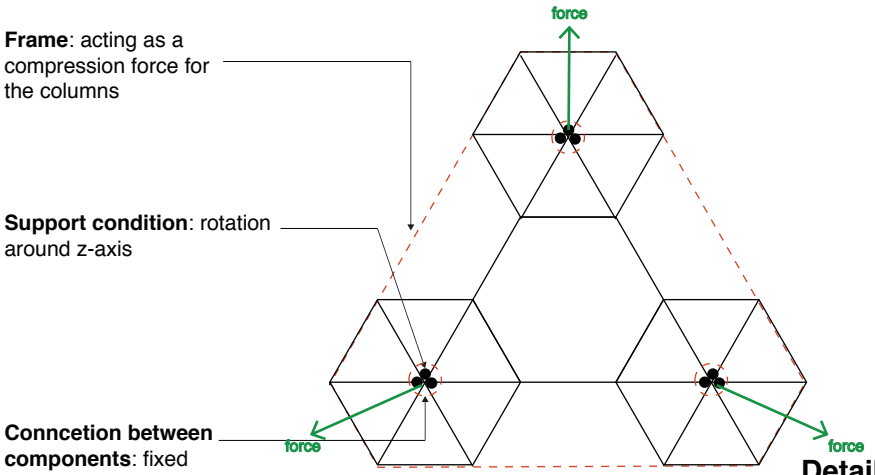
Data in terms of structure

Burham pavilion / Fire place for children

Data Informed Structure
Group 5
Yessica Mendez
Yasmin Hamza

Institute for advanced architecture of Catalonia
2001 2011

Burnham Pavilion

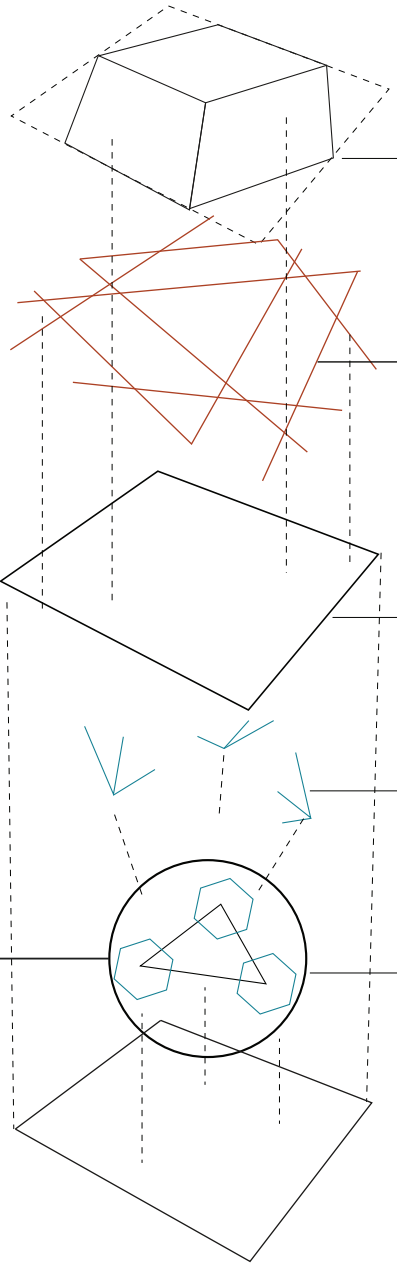


Frame: acting as a compression force for the columns

Support condition: rotation around z-axis

Conncetion between components: fixed equilibrium of forces

Detail of structure



Openings: of the surface from top to bottom.

I-beam :
For structural purposes tension.

Frame : I-beam
For structural purposes compression.

Structure metal tubes for support purposes to link both top and bottom (acting as a shear) part of the anticlastic structure.

Supporting structure:
Is the bottom structure to support the metal tubes.

Exploited view of structural elements

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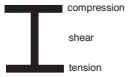
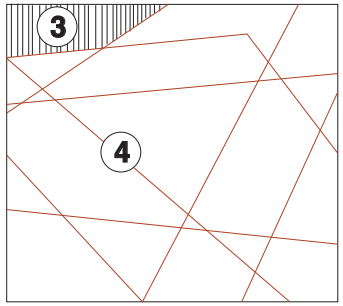
Burnham Pavilion

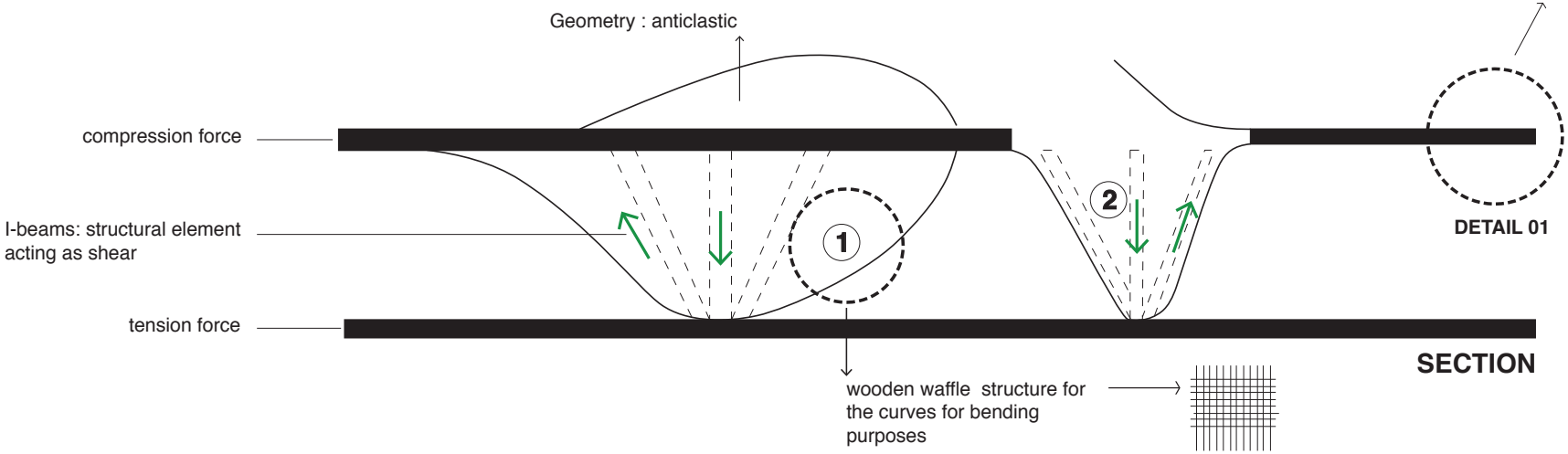
wooden ribs inbetween steel structurethe direction of the wood is in the shortest distance between the different I-beams in the grid



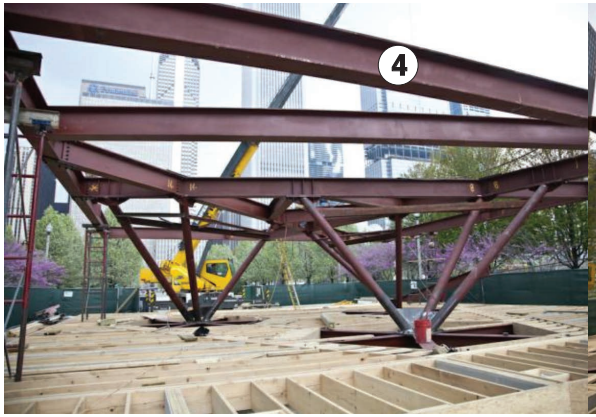
I-beam steel structure grid geometry reinforcing

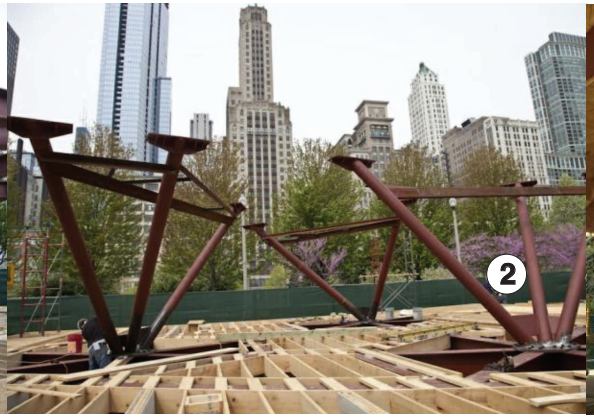


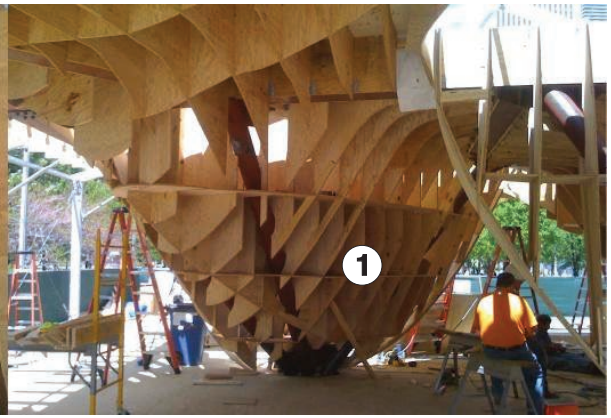
DETAIL 01



wooden waffle structure for the curves for bending purposes







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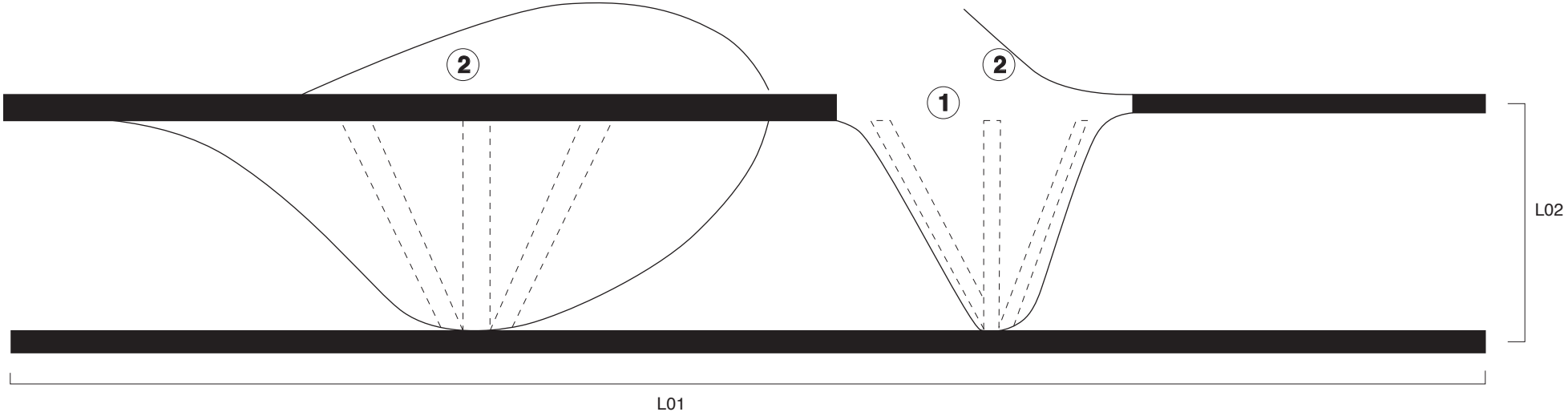
Burnham Pavilion

IF/THEN SECTION

Relation between hight and length :
if the distance between the two planes increases then the structure metal tubes would fail structurally (L02 <L01) (relation L2 : L1 = 1 : 6)

1 **Hole size**
if the holes where bigger the middle of the plane would be more hollow then the structure would tip over due to unbalnced force distribution

2 **Hole location**
if the holes where not in the middle of the plane then the struckture would be in an angle



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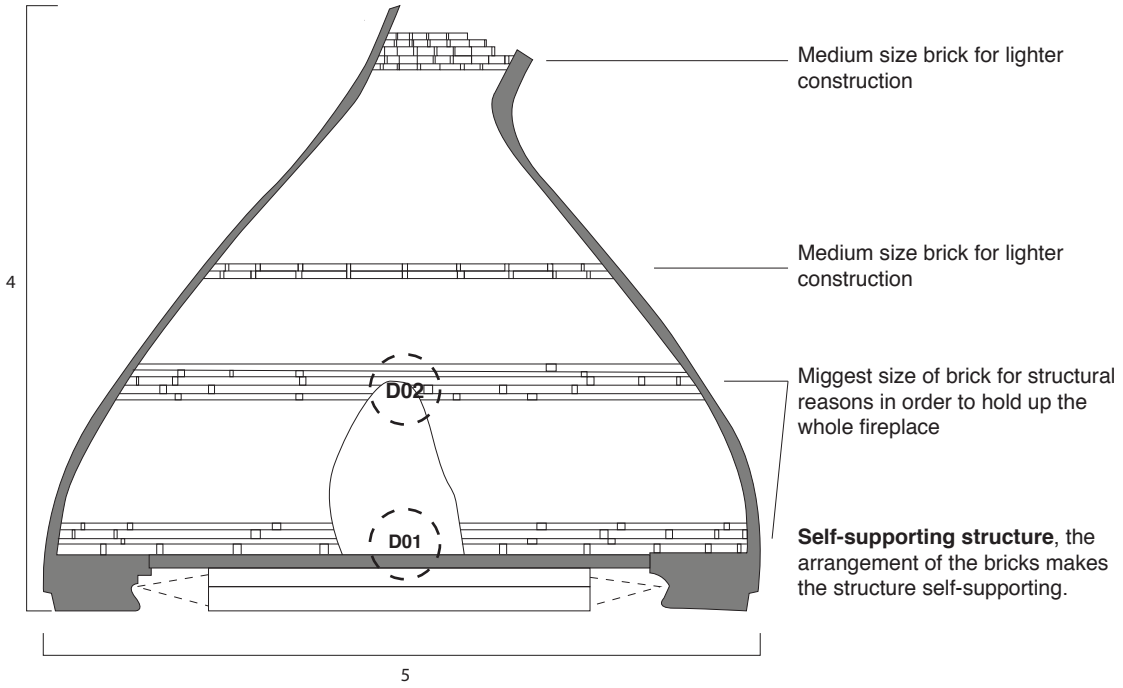
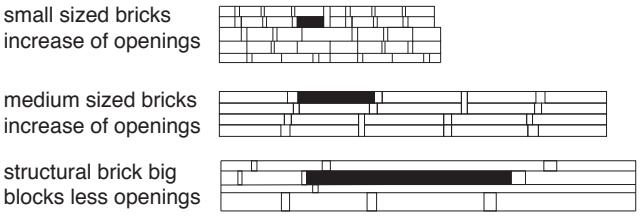
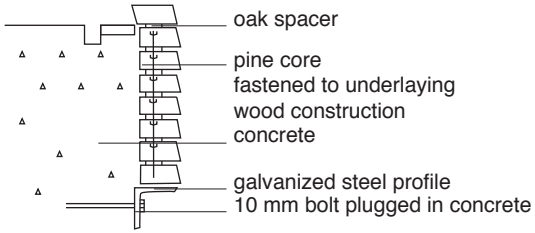
Section



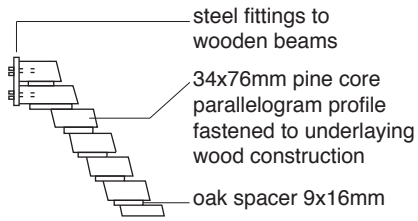
Wood spacing detail

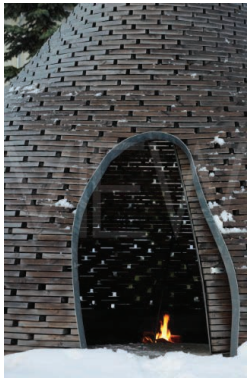


D02



D01





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Fire place for children

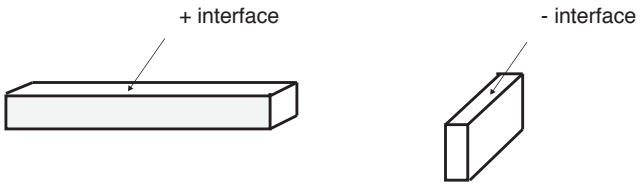
IF/THEN SECTION

Brick positioning :
If the bircks where used vertically then less interface would be available and the structure would fail

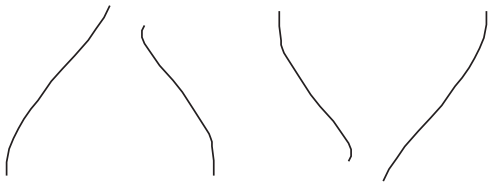
Base Circle size
If the given structure was inverted and the smaller circle was the base of the structure then it would fail structurally given the support geometry would be to small to hold up the building

Hole location
1-If the holes where alligned through out the structure then a line of threshold would created making the structure more vulnrable to fail
2- If there were more holes in the base of the structure then the foundation of the fireplace would not be strong enough to hold up the rest of the construction

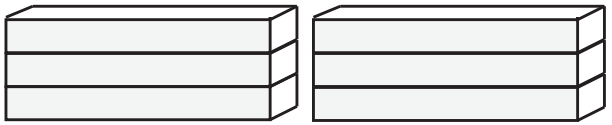
Brick positioning



Base Circle size



Hole location



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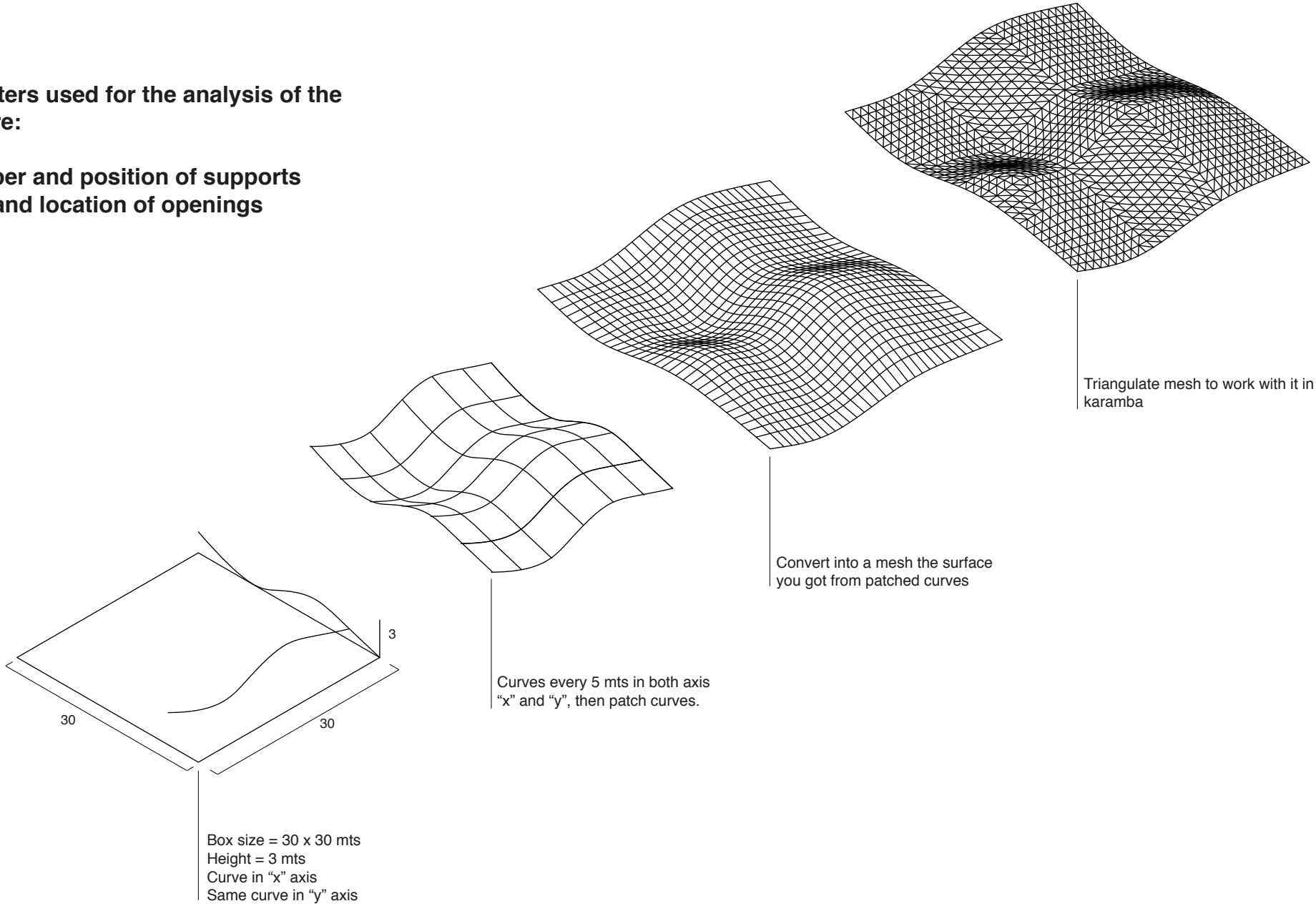
Triangulated mesh

Parameters used for the analysis of the structure:

1. Number and position of supports
2. Size and location of openings



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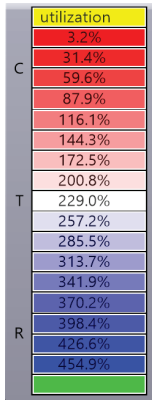
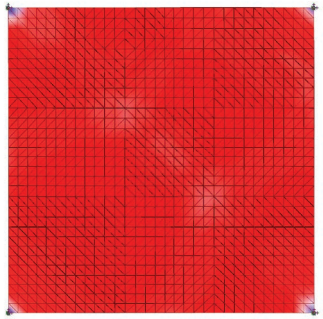
Parameter: supports

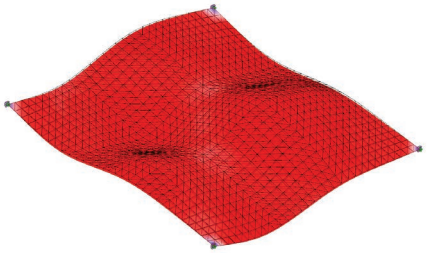
4 Supports at the corners

Utilization



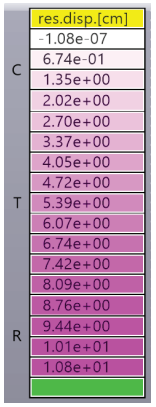


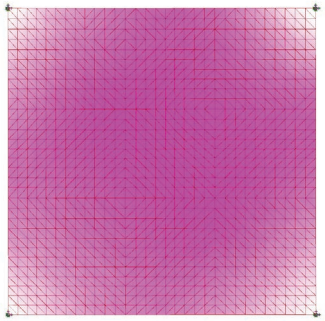
Top view



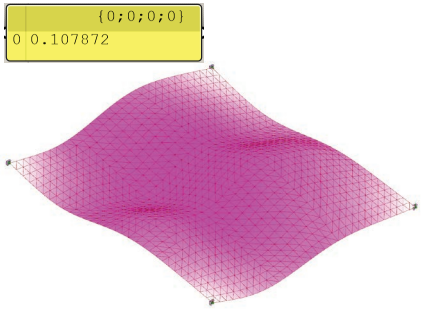
North West isometry

Displacement



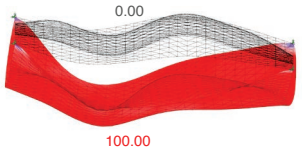


Top view



North West isometry

Deformation



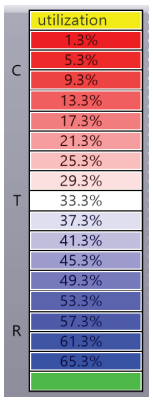
Data

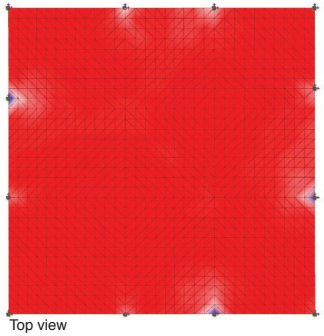
Span (meters): 30 by 30.
Type of load: local to mesh
Loading: 0/0/-20 kn/m²
Material used: Concrete
Section used: 63 cms
Supports conditions: 4 supports on the corners
Total mass of the structure: 2,5071e+6

Conclusion: supporting it from 4 points at the corners is not sufficent given the heavy structure in the middle.

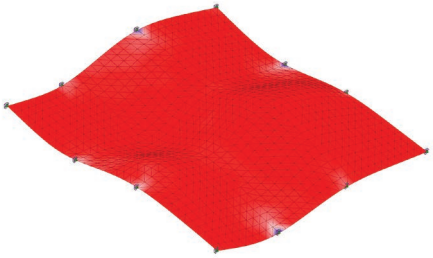
4 Supports at the corners + 8 at of the vertices

Utilization



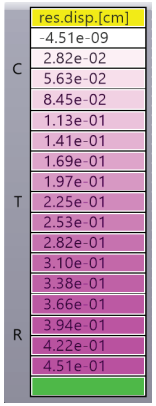


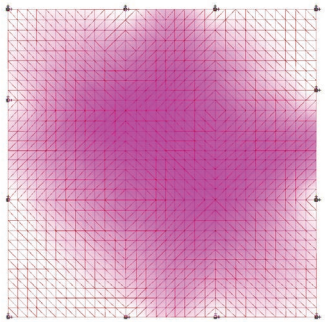
Top view



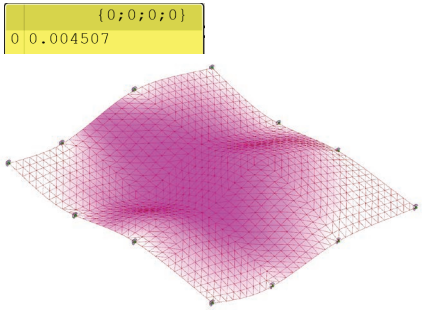
North West isometry

Displacement





Top view



North West isometry

Deformation

*** No deformation**

Data

Span (meters): 30 by 30.
Type of load: local to mesh
Loading: 0/0/-20 kn/m²
Material used: Concrete
Section used: 63 cms
Supports conditions: 12 supports
Total mass of the structure: 2,5071e+6

Conclusion: supporting it from 12 specific points on the perimeter helps to reduce the deformation.

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Yasmin Hamza

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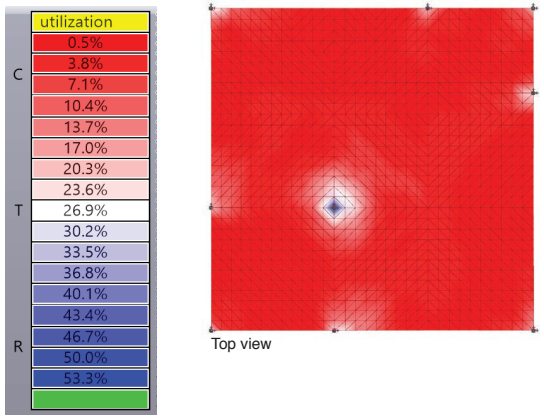
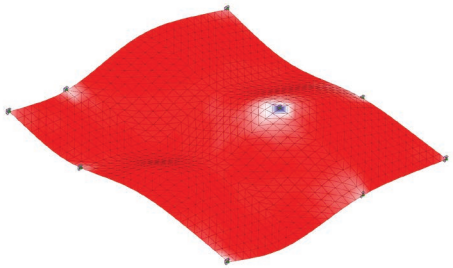
Parameter: supports

9 Supports in specific location

Utilization

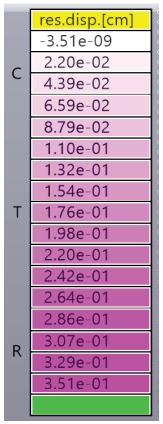


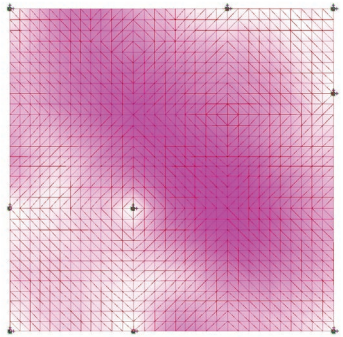
Top view



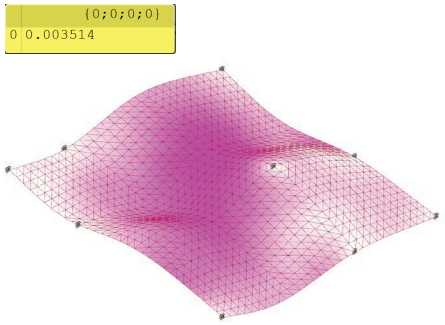
North West isometry

Displacement





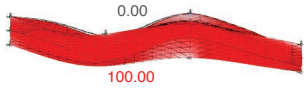
Top view



North West isometry

Deformation

*** No deformation**



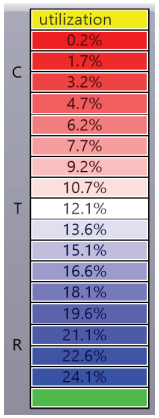
Data

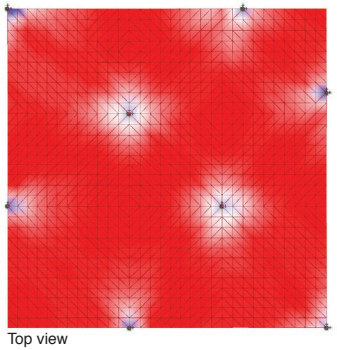
Span (meters): 30 by 30.
Type of load: local to mesh
Loading: 0/0/-20 kn/m²
Material used: Concrete
Section used: 63 cms
Supports conditions: 9 supports on specific points
Total mass of the structure: 2,5071e+6

Conclusion: adding another support in the middle, we can reduce the number of support without deformation.

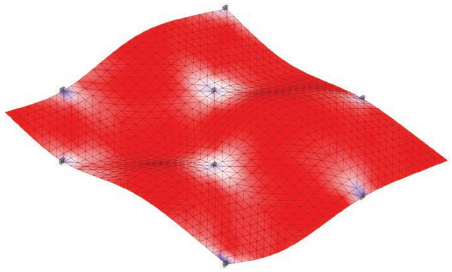
6 Supports on specific points to increase the efficiency

Utilization



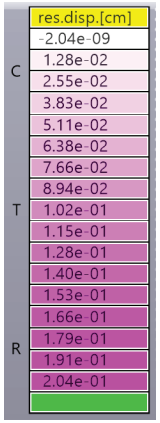


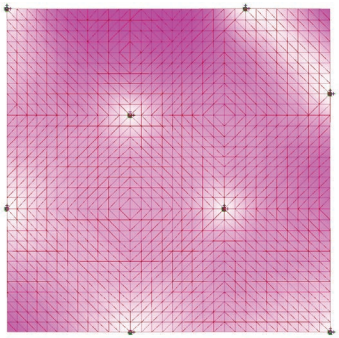
Top view



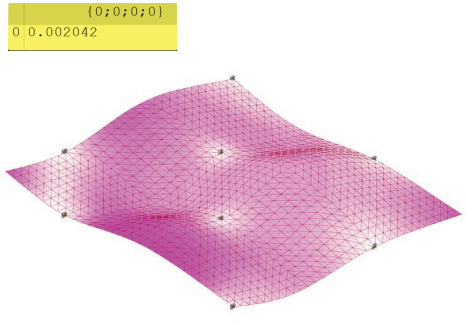
North West isometry

Displacement





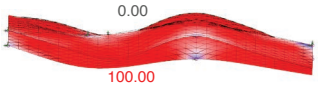
Top view



North West isometry

Deformation

*** No deformation**



Data

Span (meters): 30 by 30.
Type of load: local to mesh
Loading: 0/0/-20 kn/m²
Material used: Concrete
Section used: 63 cms
Supports conditions: 6 supports
Total mass of the structure: 2,5071e+6

Conclusion: the most efficent number and position of the supports.

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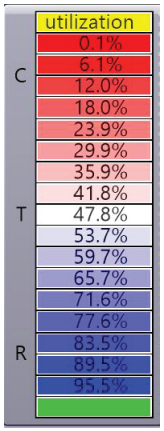
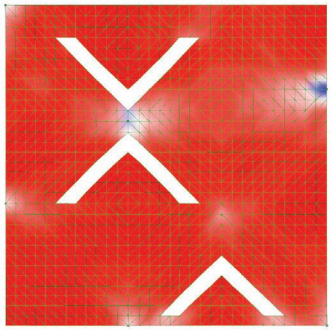
Parameter: Openings

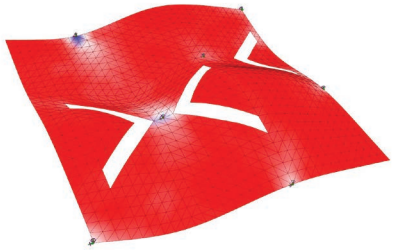
3 Openings close to the supports

Utilization



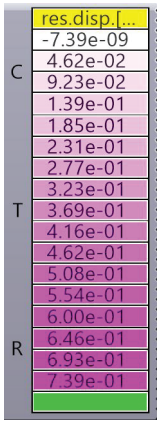


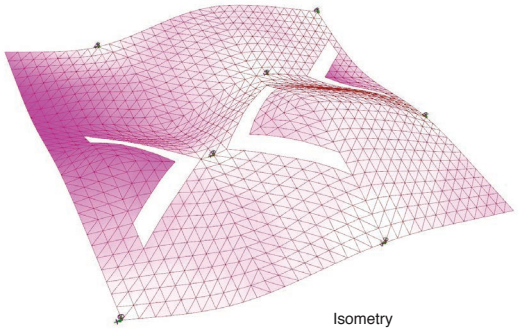
Top view

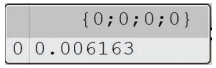


Isometry

Displacement







Isometry

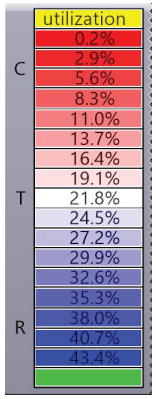
Data

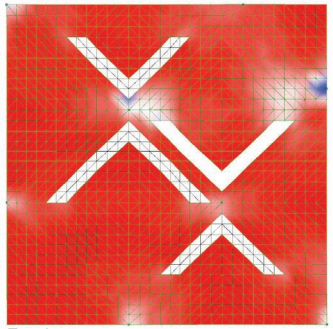
Span (meters): 30 by 30.
Type of load: local to mesh
Loading: 0/0/-20 kn/m²
Material used: Concrete
Section used: 63 cms
Supports conditions: 6 supports on the corners
Total mass of the structure: 2,5071e+6

Conclusion: we try differents position for the openings and the ones closest to the supports make the structure work metter, did 3 diferent and linear openings around supports and the deformation was 0.

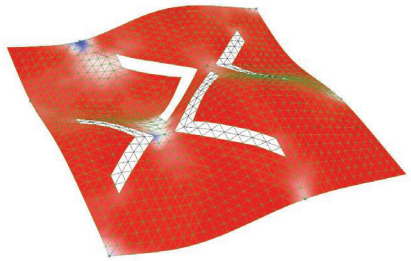
4 Openings close to the supports

Utilization



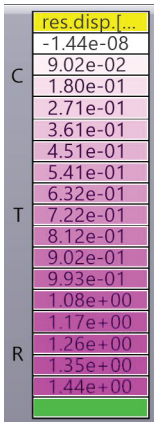


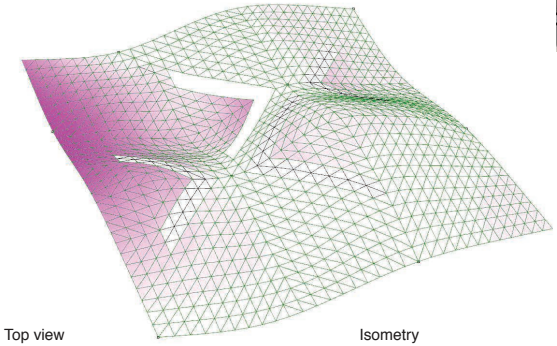
Top view



Isometry

Displacement





Top view

Isometry

Data

Span (meters): 30 by 30.
Type of load: local to mesh
Loading: 0/0/-20 kn/m²
Material used: Concrete
Section used: 69.8 cms
Supports conditions: 6 supports
Total mass of the structure: 2,5071e+6

Conclusion: we added 1 more opening in order to see if that would affetc the deformation, but the deformation was 0

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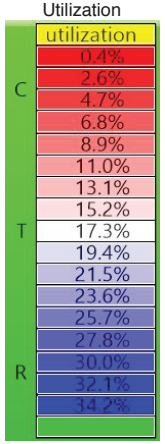
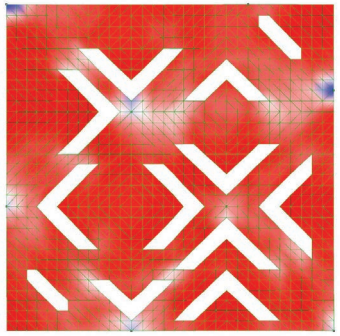
Yasmin Hamza

Parameter: openings

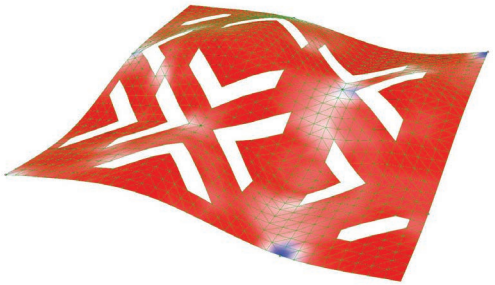
Multiple openings close to the supports

Utilization



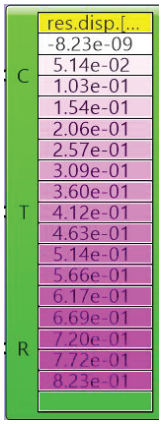


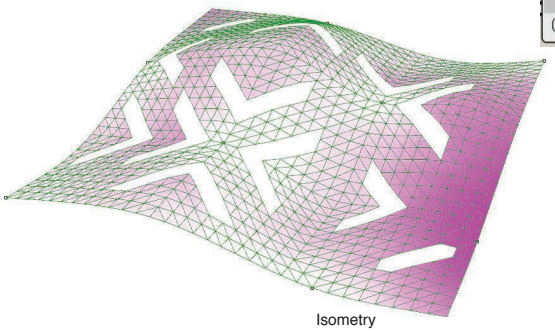
Top view



Isometry

Displacement





Isometry

Data

Span (meters): 30 by 30.
Type of load: local to mesh
Loading: 0/0/-20 kn/m²
Material used: Concrete
Section used: 71.20 cms
Supports conditions: 6 supports on the corners
Total mass of the structure: 2,5071e+6

Conclusion: the multiple openings are the maximum number of openings we could fit for the deformation no to happen for the structureto be standing with this amount of support, this is the maximum openings.

Data Informed Structure
Group 5
Yessica Mendez
Yasmin Hamza