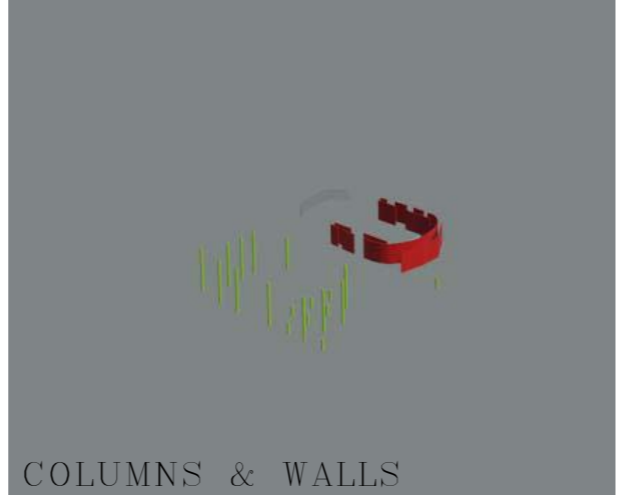
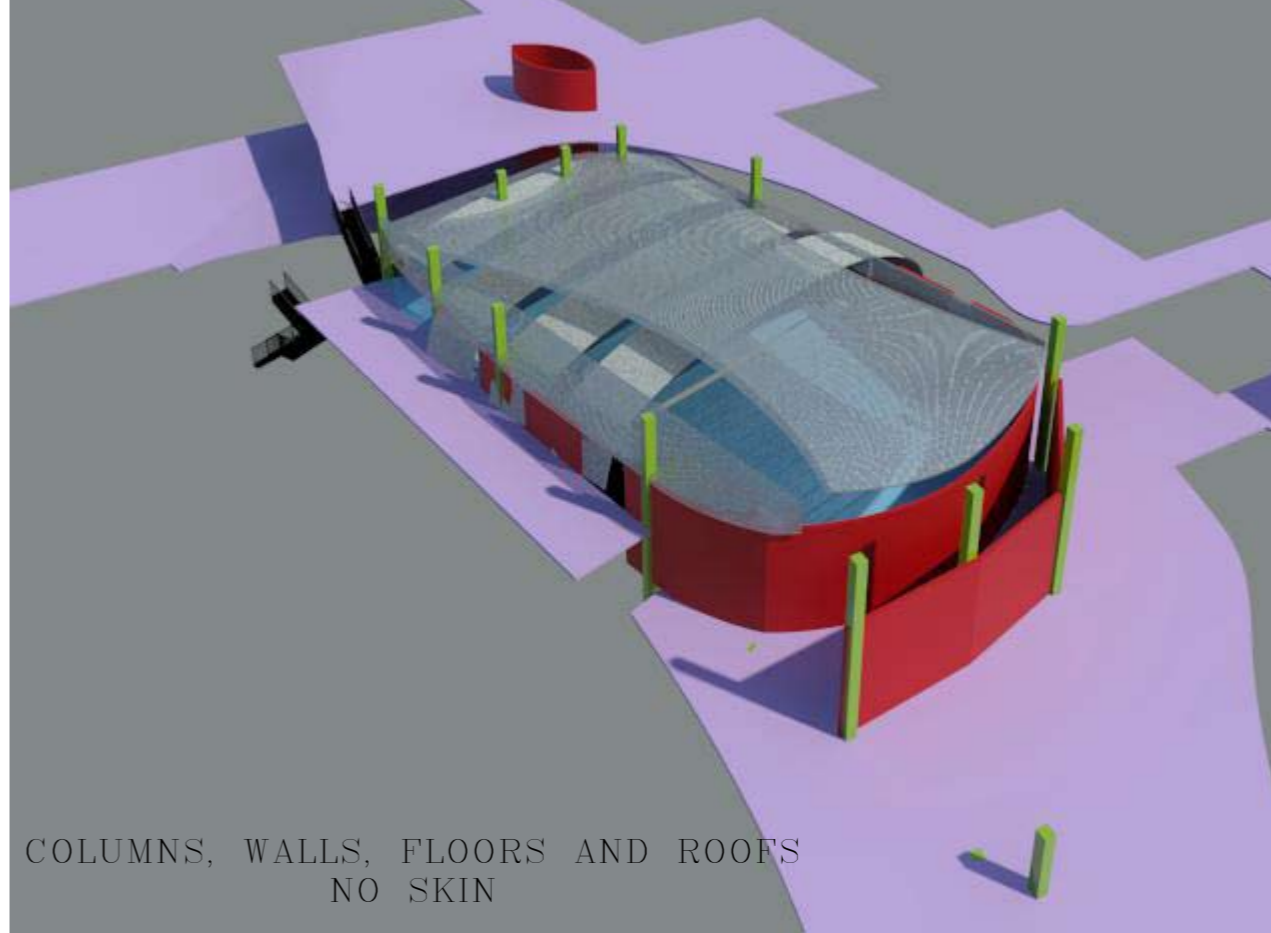


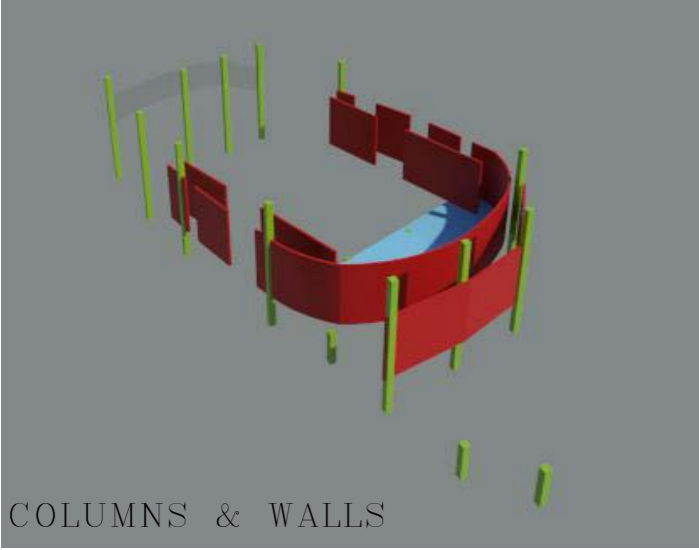
EXPLODED ELEMENTS



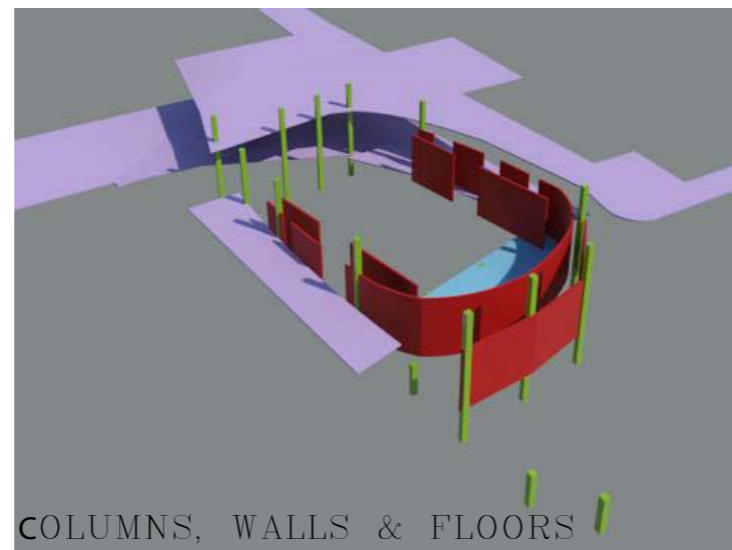
COLUMNS & WALLS



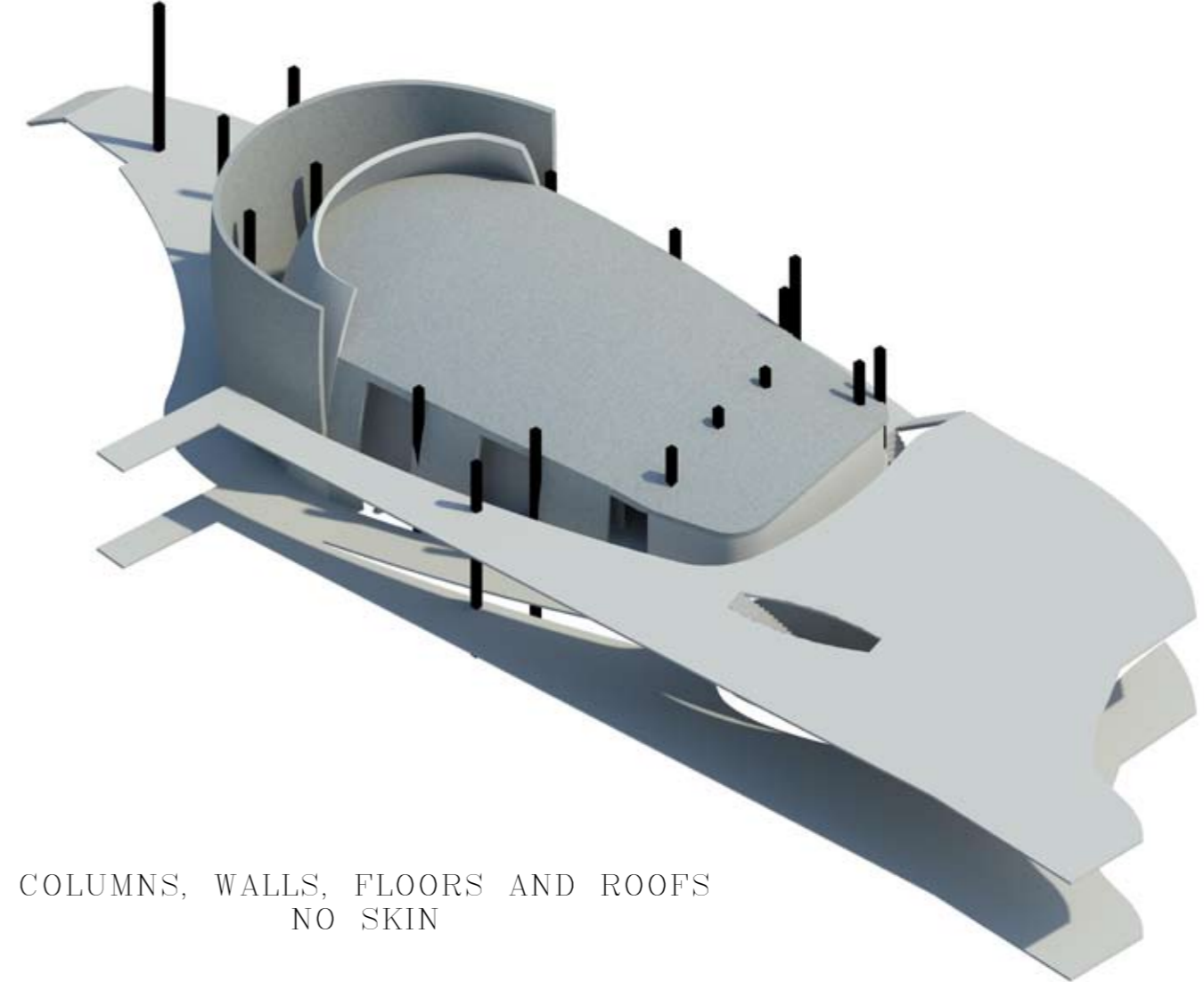
COLUMNS, WALLS, FLOORS AND ROOFS
NO SKIN



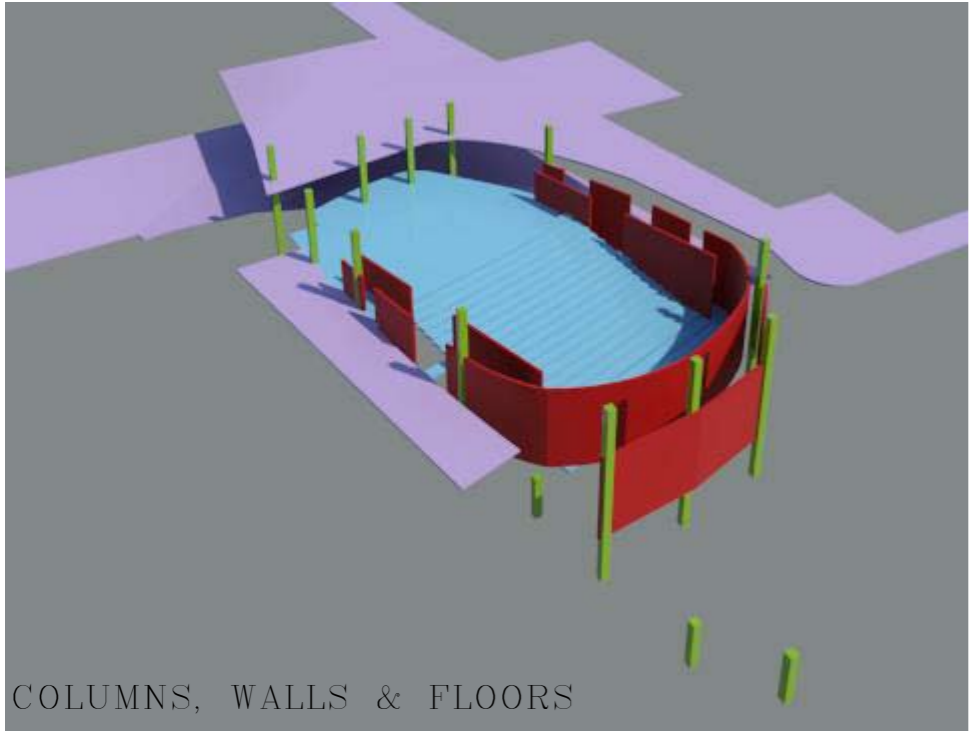
COLUMNS & WALLS



COLUMNS, WALLS & FLOORS



COLUMNS, WALLS, FLOORS AND ROOFS
NO SKIN



COLUMNS, WALLS & FLOORS

Basic parts
The basic elements of the Monster are shown here in a series indicating the assembly of the various parts.

The drawing to the right illustrates a refined model of the internal pieces assembled.

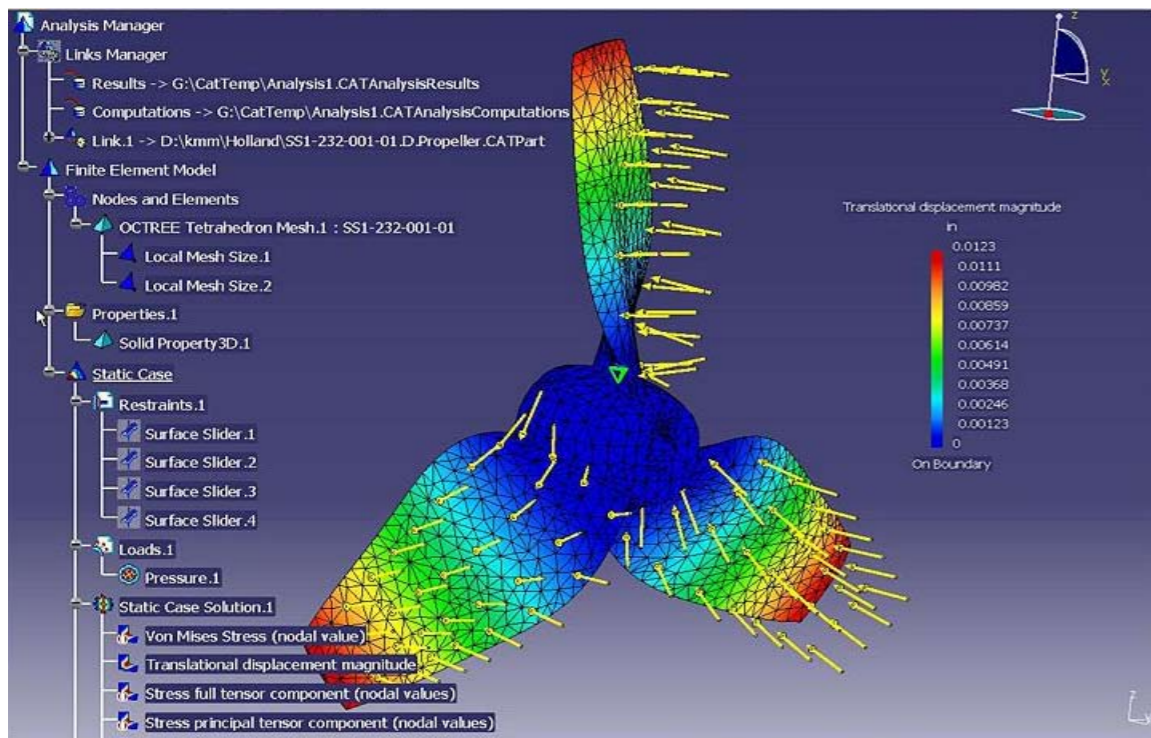
THE MONSTER MODELED IN 3D STUDIO MAX WILL BE FURTHER DEVELOPED IN CATIA



61
 EIFFEL TOWER MODELED ON CATIA

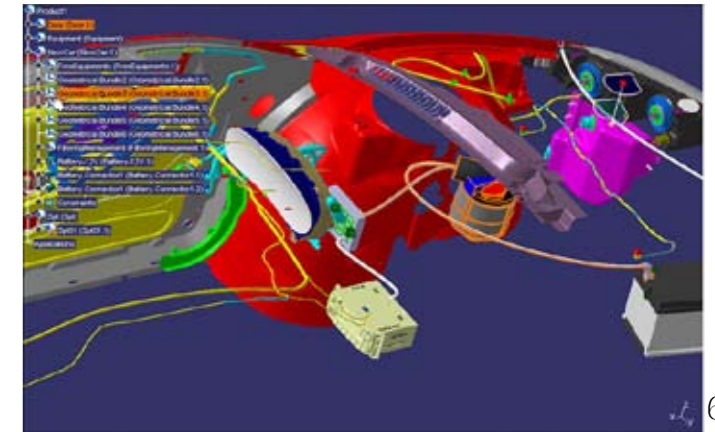
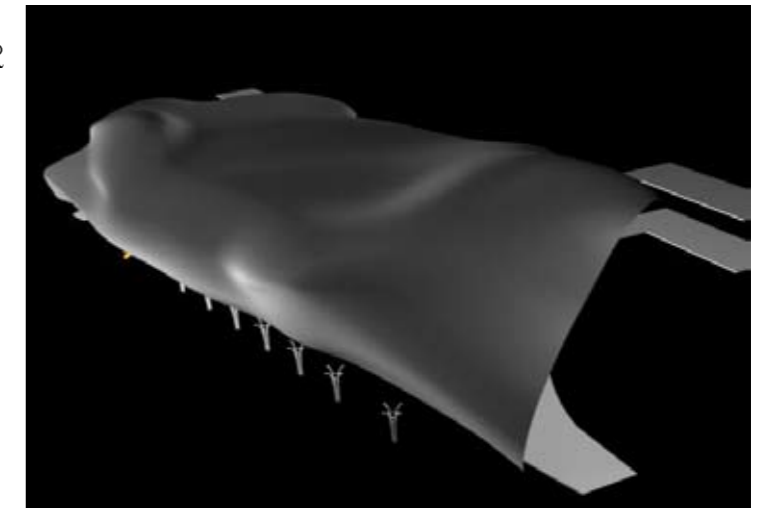
Catia
 The building can be modelled in three dimensions in Catia. A finite element grid can be placed over the structure. The structural engineers use this tool to load stress the structure. The result is a colour coded image to indicate the areas of most load (red) and optimally loaded (green).

[fig. 62]



62

The Monster
 The skin can be created in any modelling program. Thereafter it can be converted to files accepted by Catia. From Catia these files can be loaded into other more specialized programs like Nastran and Pastran.
 These programs are structural engineering programs. The load stressing in terms of individual members are done here. These programs also does the wind loading, earth quake, snow loads and rain loads prediction and stressing. The engineers will suggest the following steps.



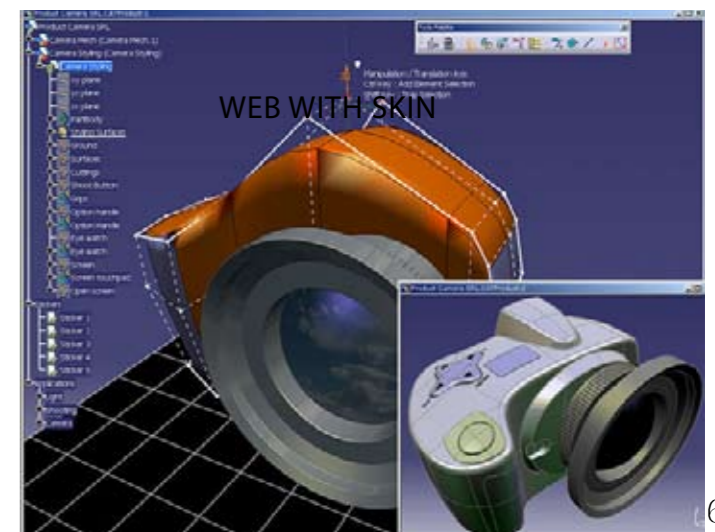
63

Catia
 The entire building can be built as a digital mock-up on a central file, with all the systems, services and structures in place. This is an efficient means of information management. After the entire building has been built on computer, it can be laser-cut in steel to scale.



64

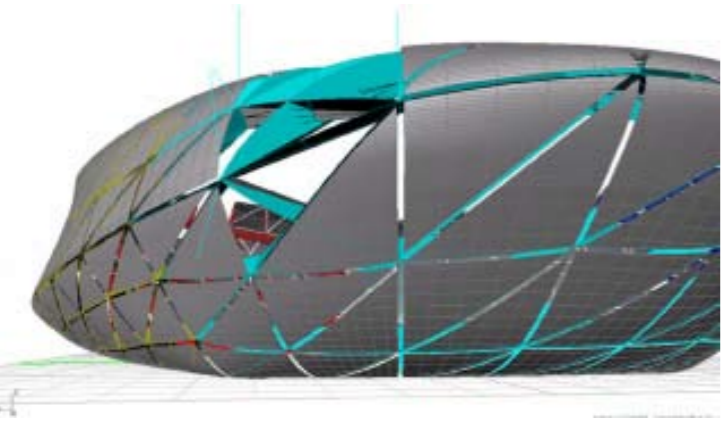
Figures [61-65] illustrate some applications which Catia has been used for.



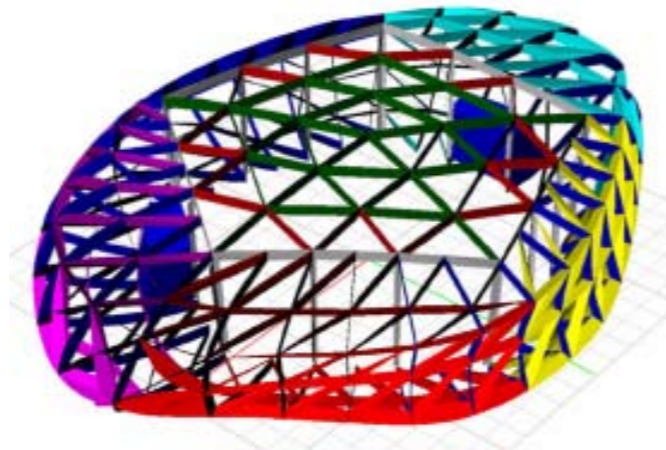
65

Technical Investigation

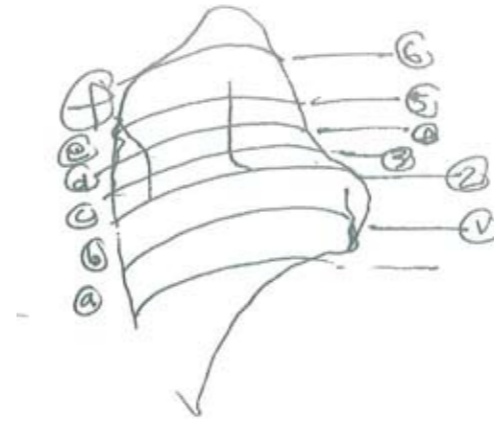
Building process _ Precedents Kas Oosterhuis: Web



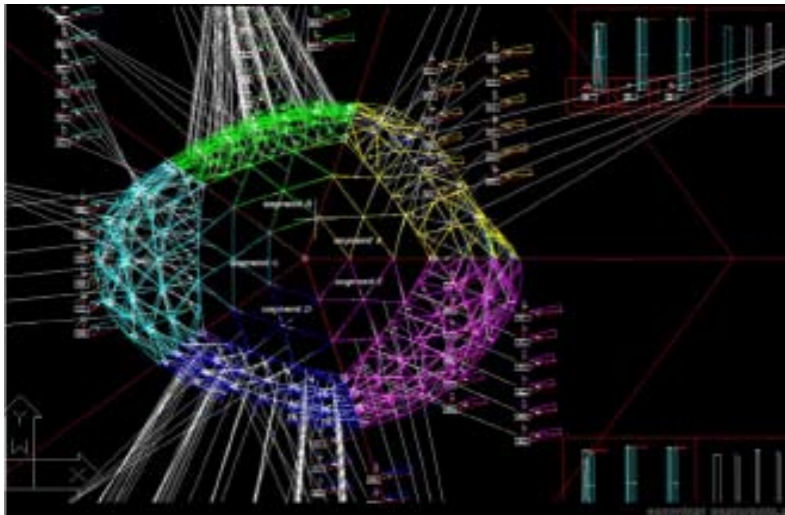
66



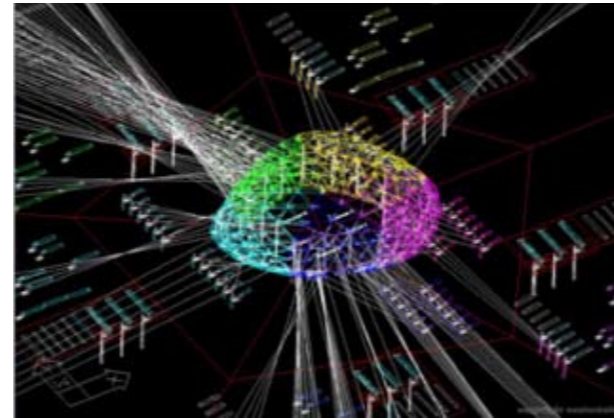
67



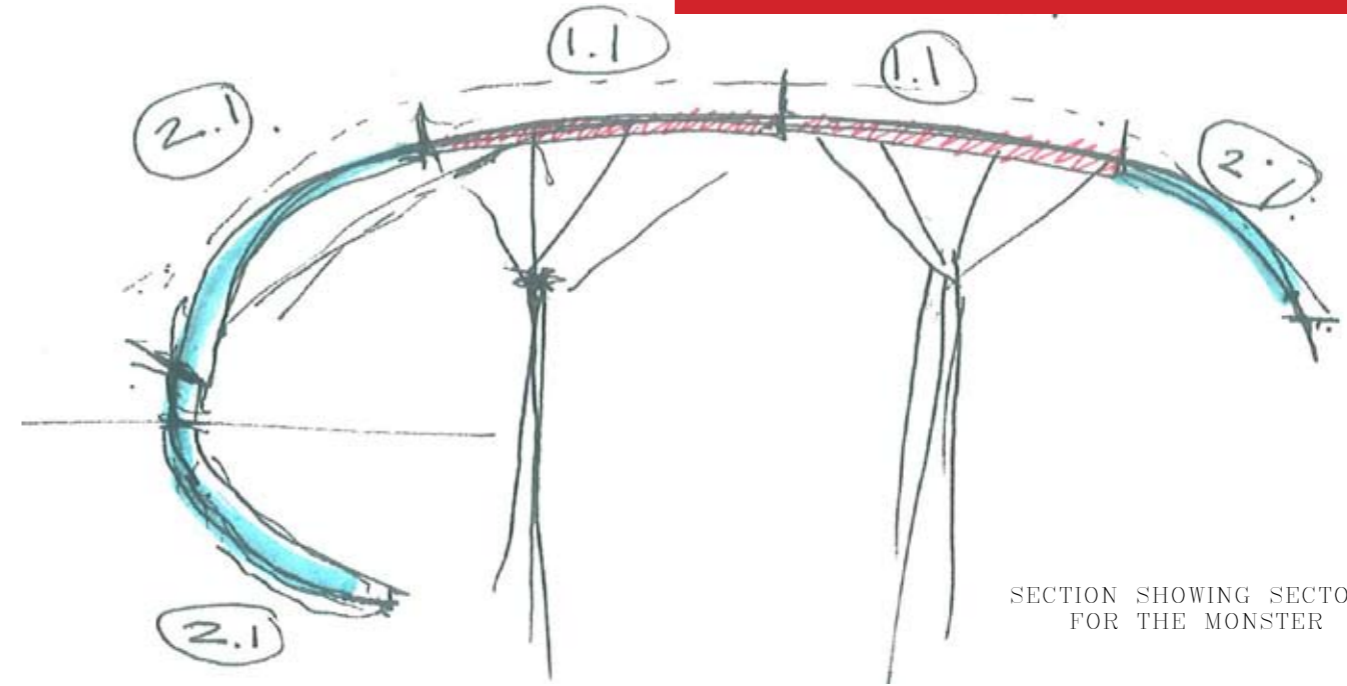
As shown in the precedent and as advised by a structural engineer, a complex curving element like the skin would be divided into sectors[fig.67-69]. Here the drawings show the division into sectors of the Monster's skin. Each sector individually gets load stressed and colour coded. After all the stressing is done, the elements are flattened [fig. 70-72] to create working documents for each element. These flattened drawings are laser cut to steel [fig.73, 75]. The steel elements are assembled in a workshop off site [fig 74, 76]. From the workshop it will be transported to site via truck. On site the contractor can assemble these larger pieces to the plans and sections [fig.77-79].



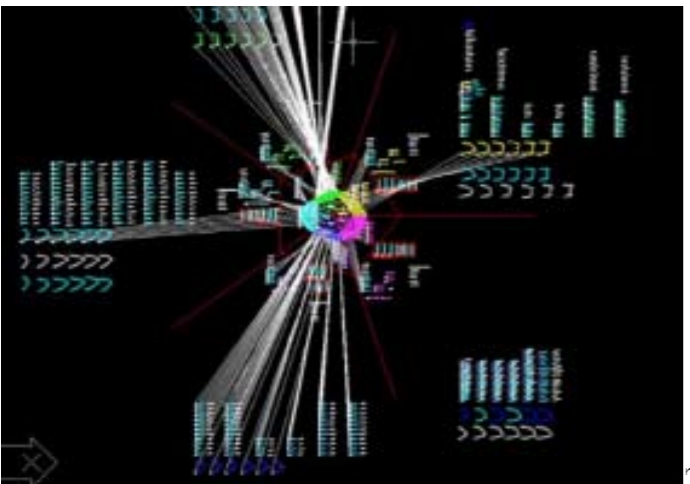
68



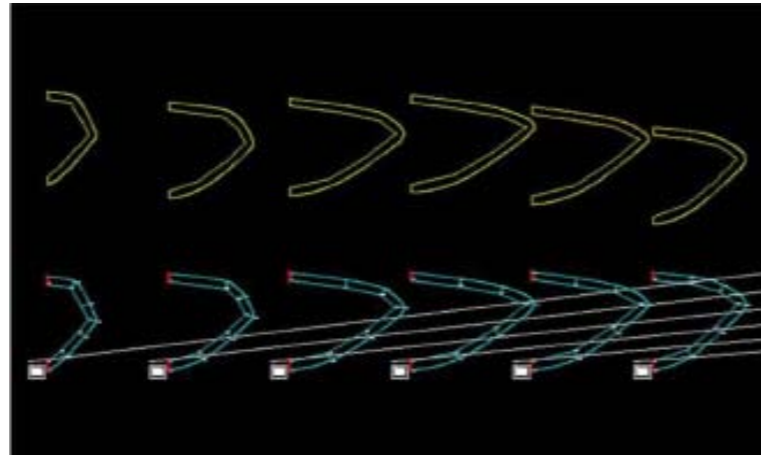
69



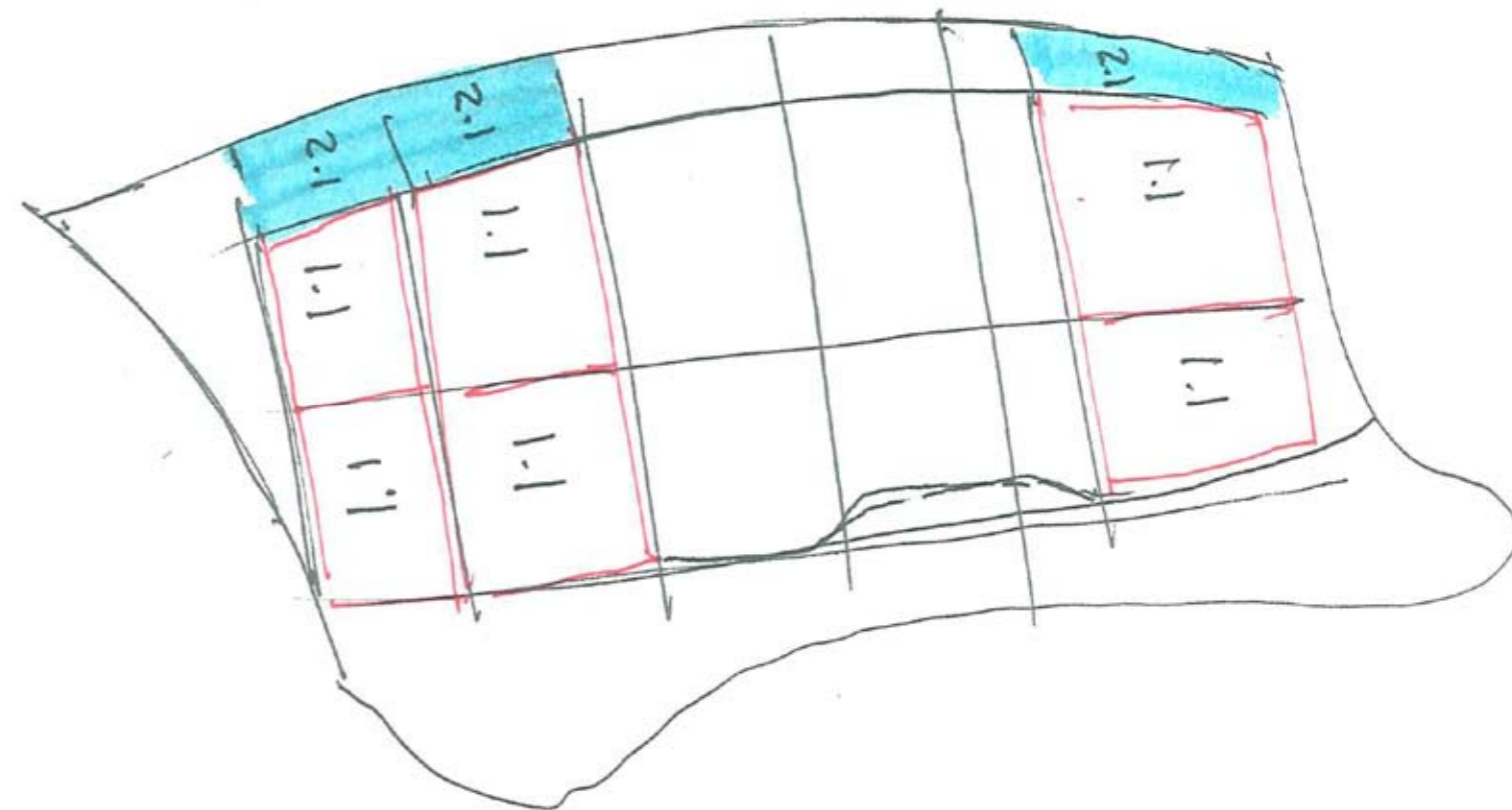
SECTION SHOWING SECTORS FOR THE MONSTER



70

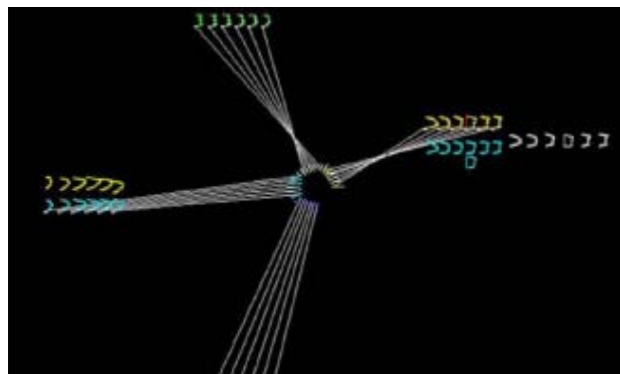


71



PLAN SHOWING SECTORS FOR THE MONSTER

The building process for this dissertation will follow a similar process to this precedent.



72



73



74



75



76



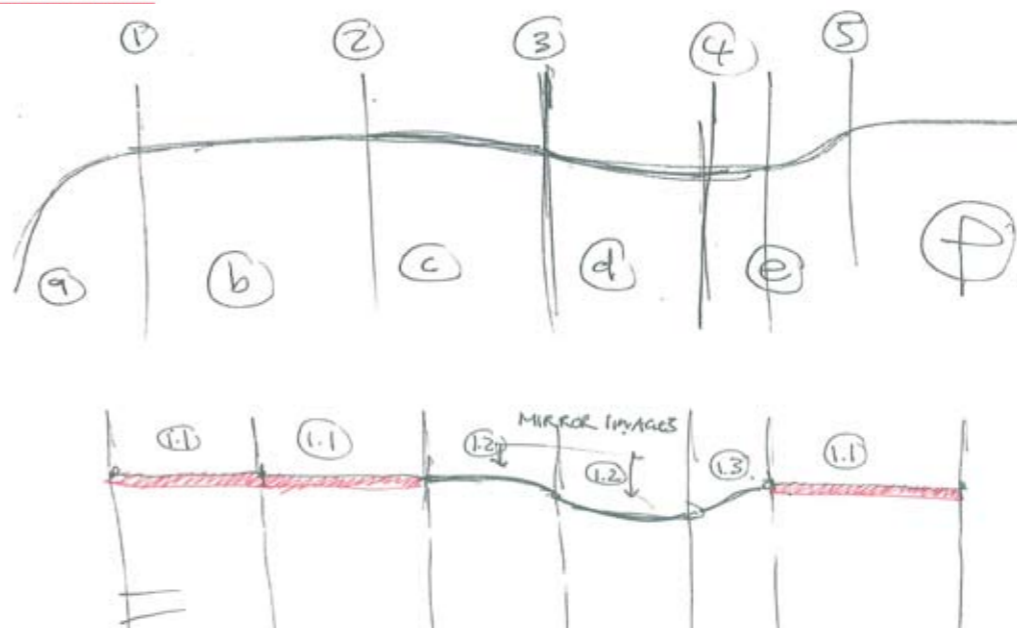
77



78



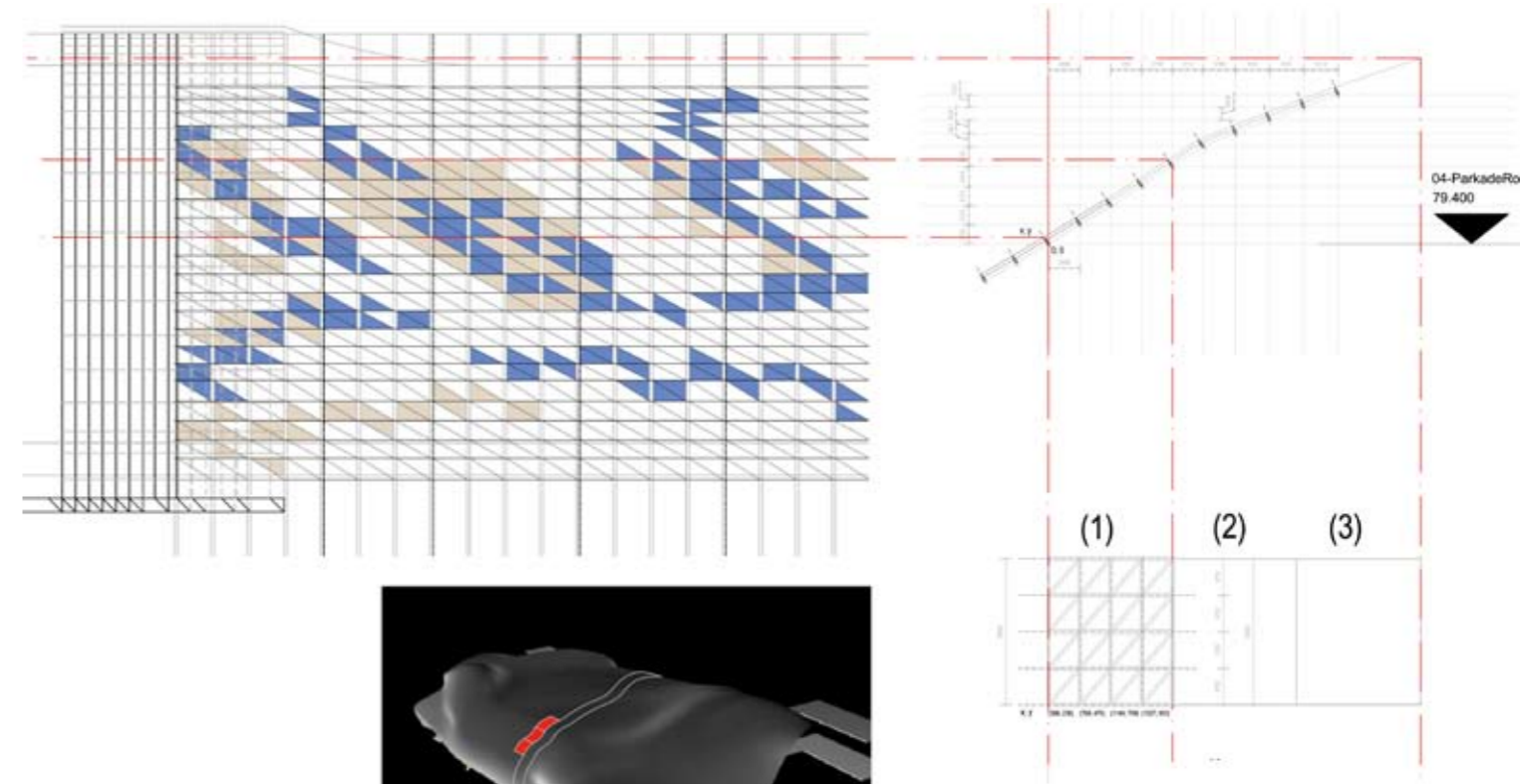
79



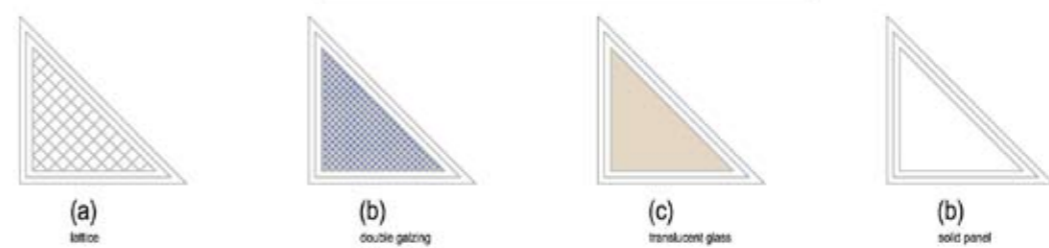
Basic sections divide the skin of the Monster into sectors as the example shows. These sectors are similar in dimension. This is in order for construction and structural analysis.

The sectors of the skin will be expressed using coordinates. The nodes where the six RHS come together will be assigned these coordinates. The entire skin will be communicated as X, Y and Z points.

SECTIONS SHOWING SECTORS FOR THE MONSTER

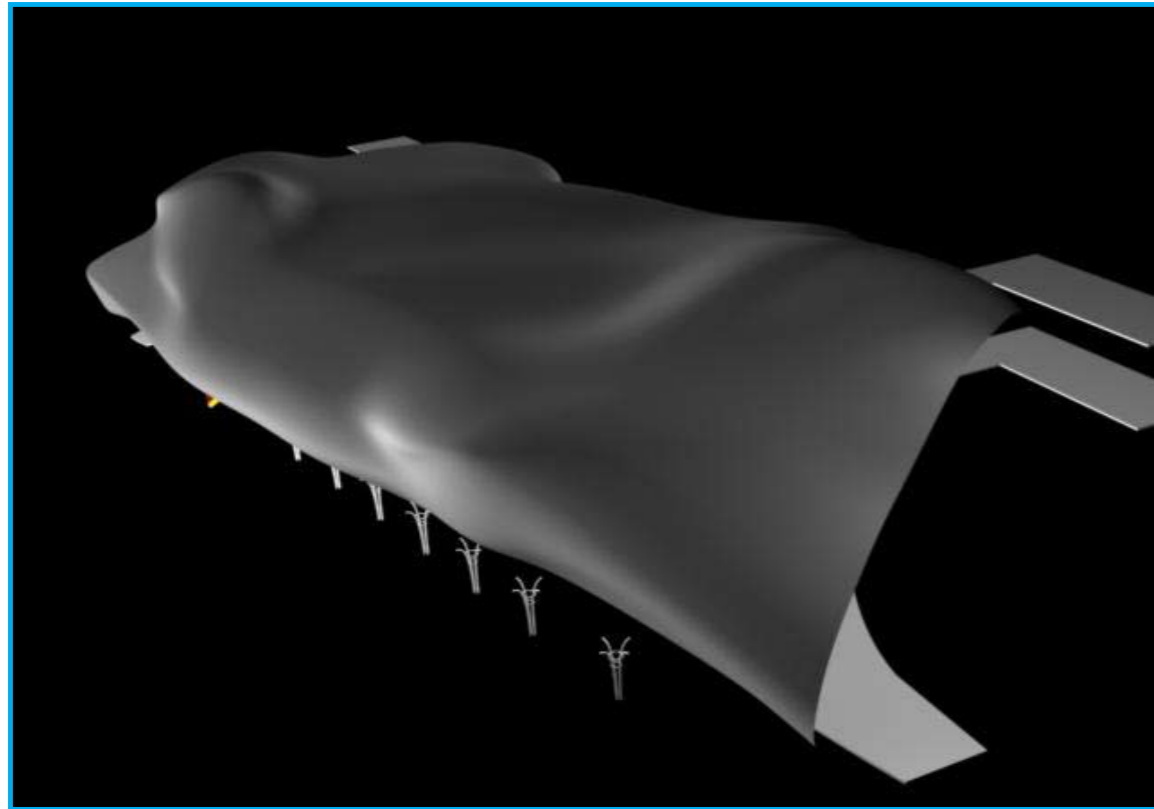


SKIN, MAP WITH COORDINATES FOR ASSEMBLY

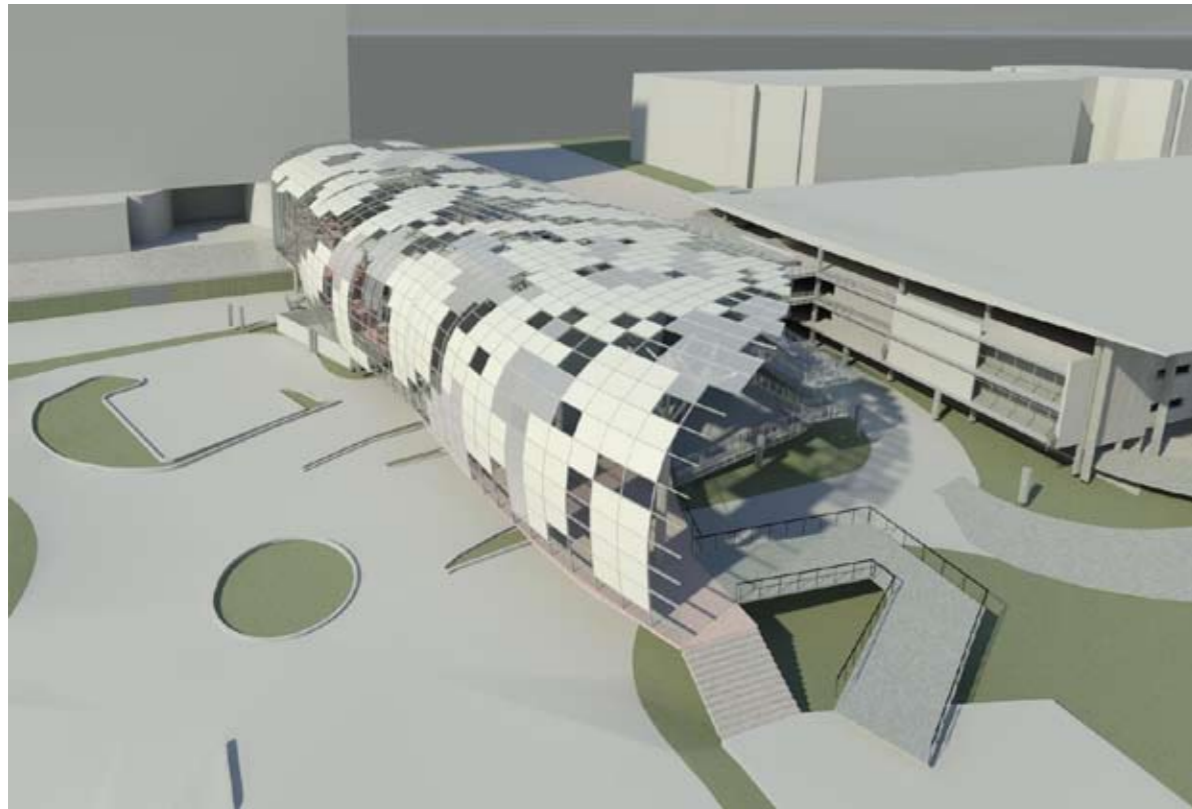


4 INFILL PANELS FOR THE SKIN OF THE MONSTER

Sectors assembled in a workshop (fig. 74, 76).
These sectors can be transported to site and assembled by the contractor on site. (fig. 77)
Adding of in-fill panels. (fig. 78)
Completed project. (fig. 79)

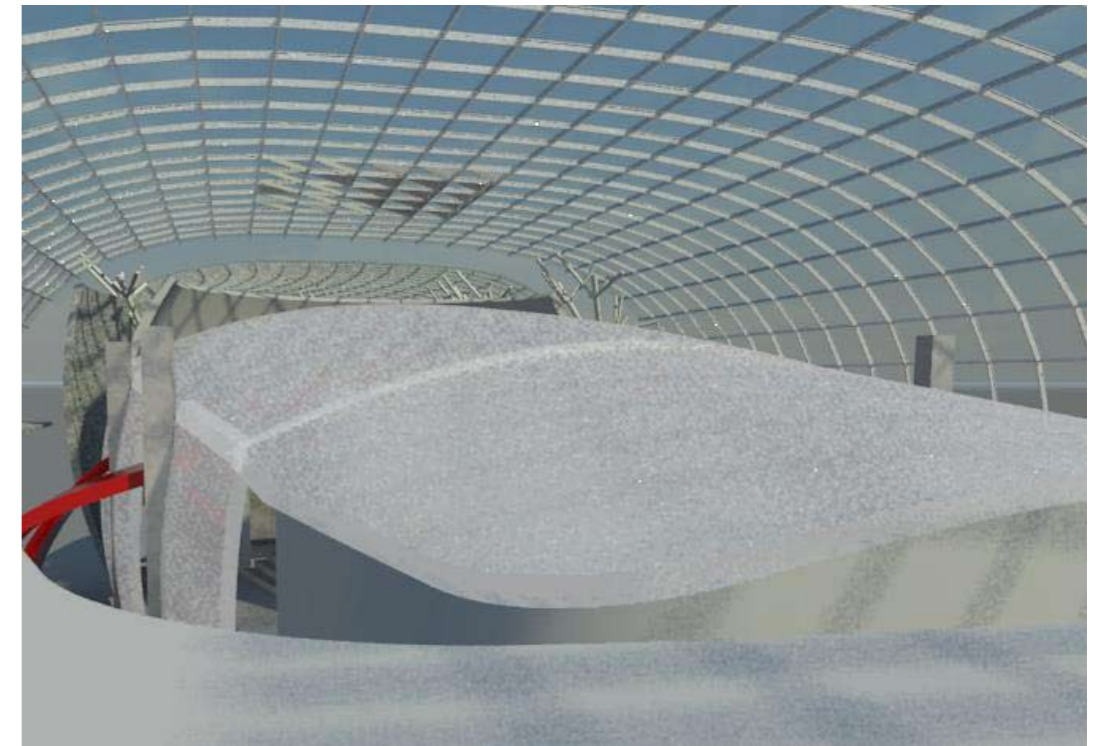


MONSTER WITH SKIN



MONSTER WITH SKIN

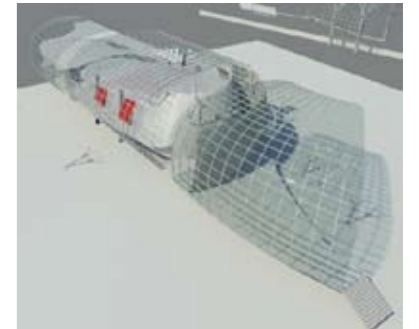
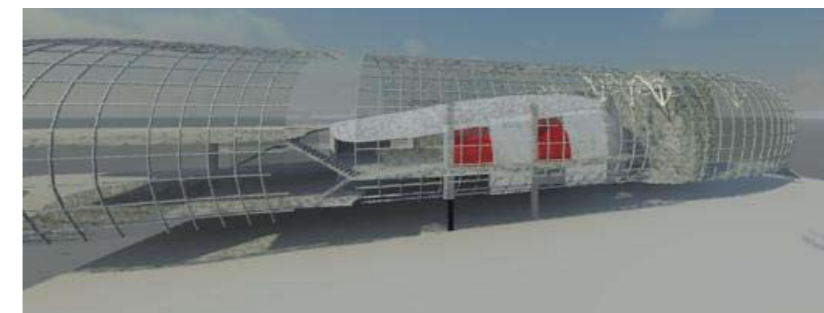
Developmental renderings of 3d model of the Monster



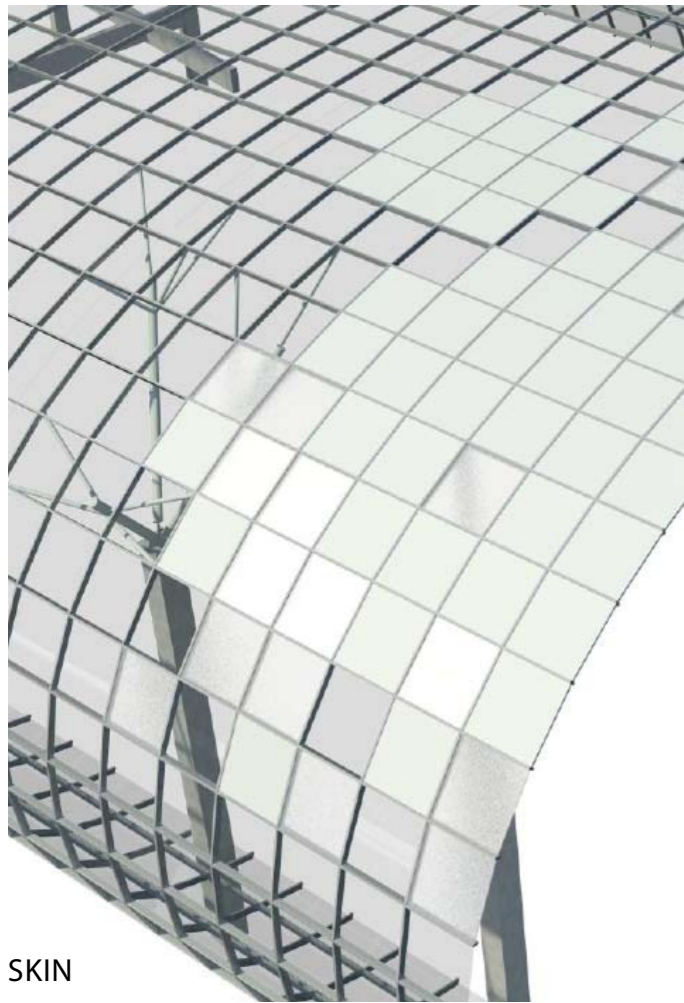
INTERNAL VIEW FROM CAFE OVER AUDITORIUM



INTERNAL VIEW FROM SMOKING AREA



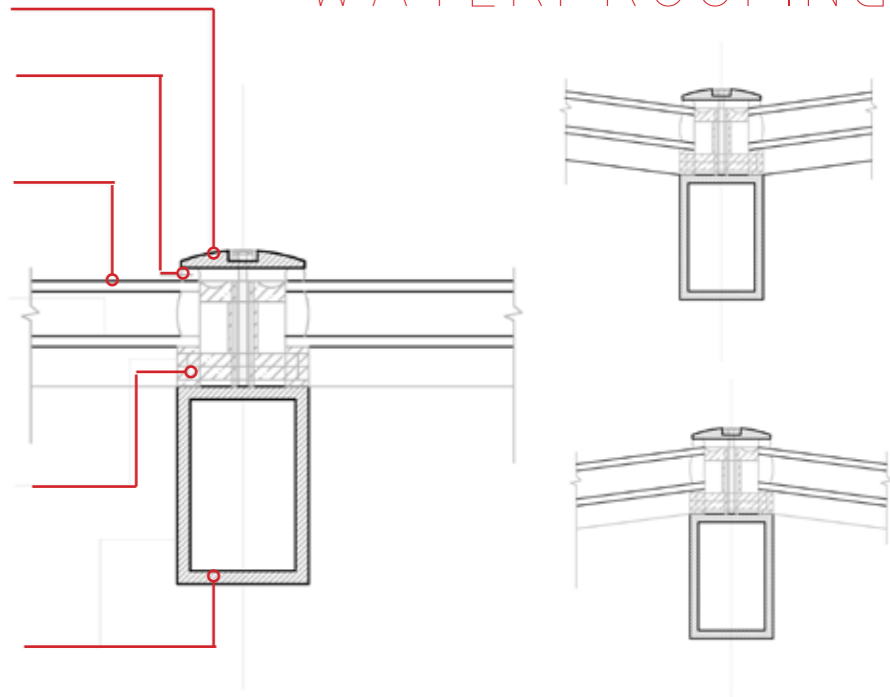
MONSTER WITH SKIN



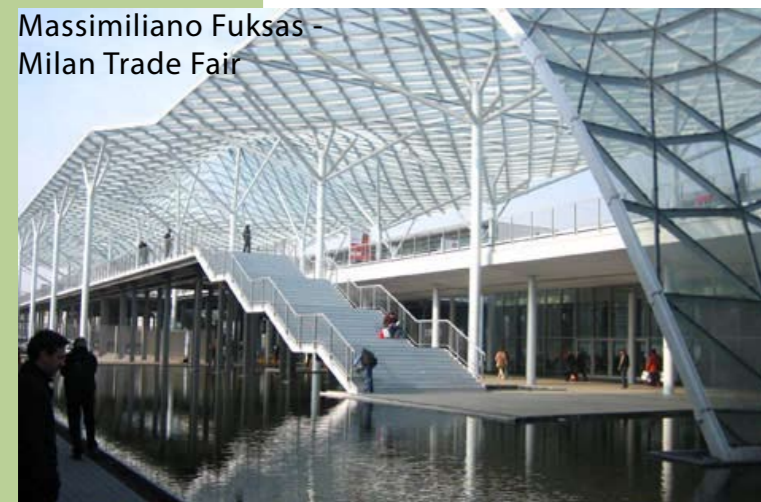
Thermal movement
The skin could have movement joints, but like Zlote Tarasy no movement joints were chosen. The reason was to create a flush waterproof finish (fig. 82). Therefore thermal movement would have to be considered especially because there are "steel members directly below glazing". (Arup Journal. 2008: 43) The entire skin is not glazed (as seen left) therefore the temperature difference between members would be significant due to the "angle of incidence to the sun." (Arup Journal. 2008: 43) The thermal load cases investigated for Zlote Tarasy determined that the members running East-West would have higher temperatures compared to North-South members.

SKIN

- 100mm Ø steel glazing button
- glazing sealant
- 8mm toughend low-e glass
- 8mm toughend screen printed glass
- 4 part rubber gasket system to engineer
- 150mm x 100mm RHS thickness of members between 5mm to 15mm according to the loads by engineer



(DETAIL 1) WATERPROOFING DETAIL GLAZING SYSTEM WITH GLAZING BUTTONS



Massimiliano Fuksas - Milan Trade Fair

80

This precedent [fig. 80] shows how it is possible to make a skin which is free-form. It is faceted to render it able buildable. The facets consists of a square grid. This grid is given depth through stressing programs.



82



83 INSTALLATION OF GASKET SYSTEM



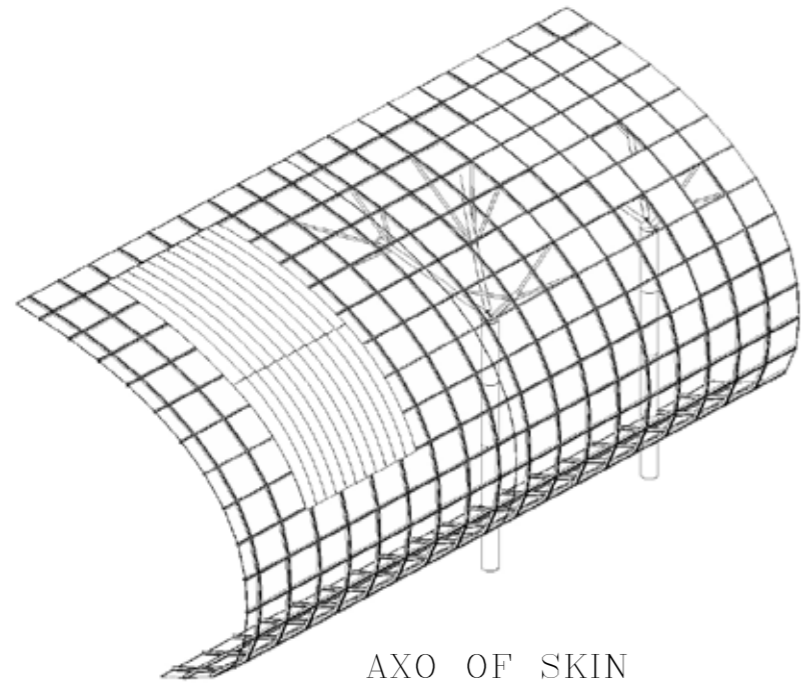
81

Toyo Ito - Pavilion in Brugge [fig. 81] Steel Lattice construction creates a transparent structure (left), which is one of the qualities derived from my theory and relevant for my design. (a) Lattice in-fill panels

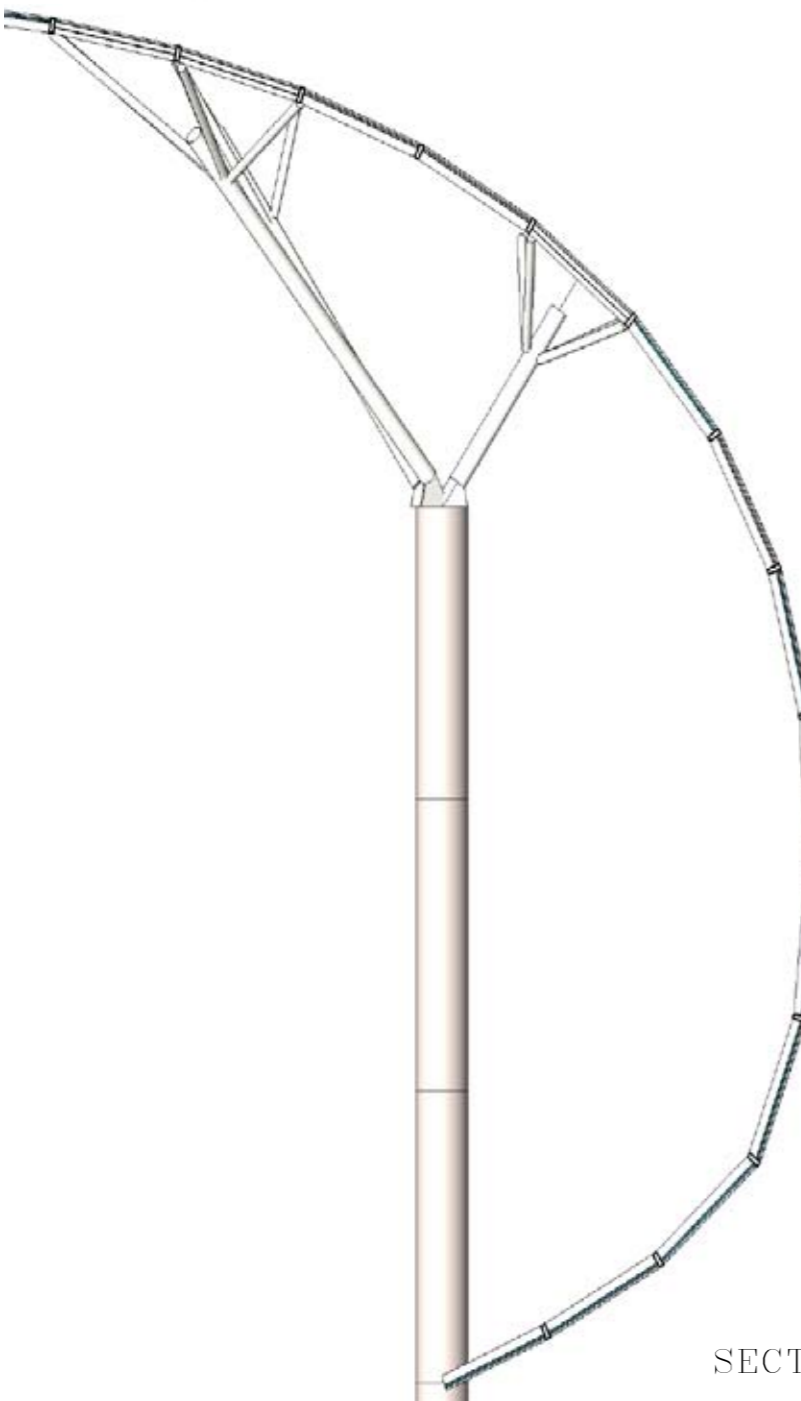
Waterproofing
The structural engineers for Zlote Tarasy also developed a unique four-part silicone gasket system, which will be duplicated for this design (detail 1). This supports the glass planes and accommodates the wide variety of glass angles, "while also providing a second line of drainage [fig. 83]." (Arup Journal. 2008: 45) To create a flush finish [fig.82] at each node the underside of "the glazing panels coincided at a single point." (Arup Journal, 2008: 45)



84 INSTALLATION OF GLAZING SEALANT



AXO OF SKIN



SECTION THROUGH SKIN

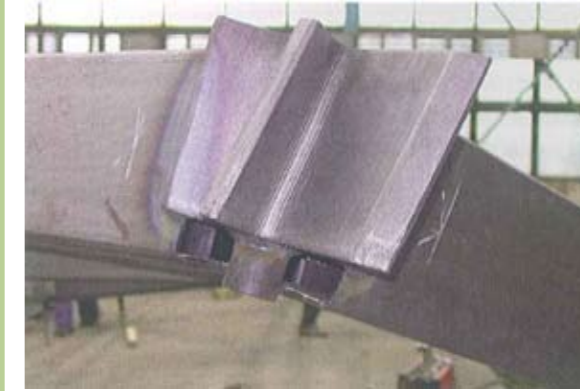
The supports
The skin would need to span 30m wide by 85m long, therefore internal columns would be needed. The main considerations for the support can be taken from the Zlote Tarasy project by Arup:

- provide stability for the roof mesh
- avoid excessive deflections
- minimize local stress concentrations to achieve the required uniform mesh
- allow thermal expansion of the mesh without building up excessive stresses
- be structurally efficient
- be elegant and visually interesting
- minimize obstructions at the floor, allowing clear walkways
- allow ease of cleaning and maintenance of the glazing underside.” (ARUP journal, 2008: 40)

These structural trees (left) are divided into 3 parts. A circular reinforced column, which would “transfer some large out-of-balance bending moments” (ARUP journal, 2008: 41) “Splayed out from the top of each trunk at different angles are three tubular steel branches, each of which in turn splits into a “quad” of four tubular members [right] that connect to the roof mesh [far right].” (Arup Journal, 2008: 41)

The end result is a continuous triangulated grid of steel rectangular hollow section, (RHS) of constant size, 150 mm deep by 100 mm wide, with wall thicknesses probably in the range of 5mm-15mm depending on the forces in the members. This will be stressed with a finite element grid analyses.

“The most complex part of the roof mesh design was the node connections [fig. 86]”. “Six RHS members intersect at every node, a star with six arms, each arm intersecting the angle between two adjacent members.” (ARUP Journal, 2008: 40)



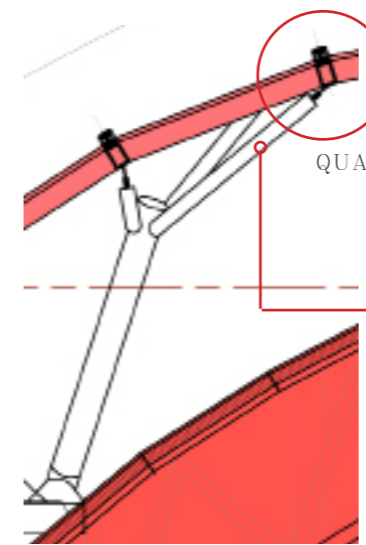
NODE STRESS TEST

85

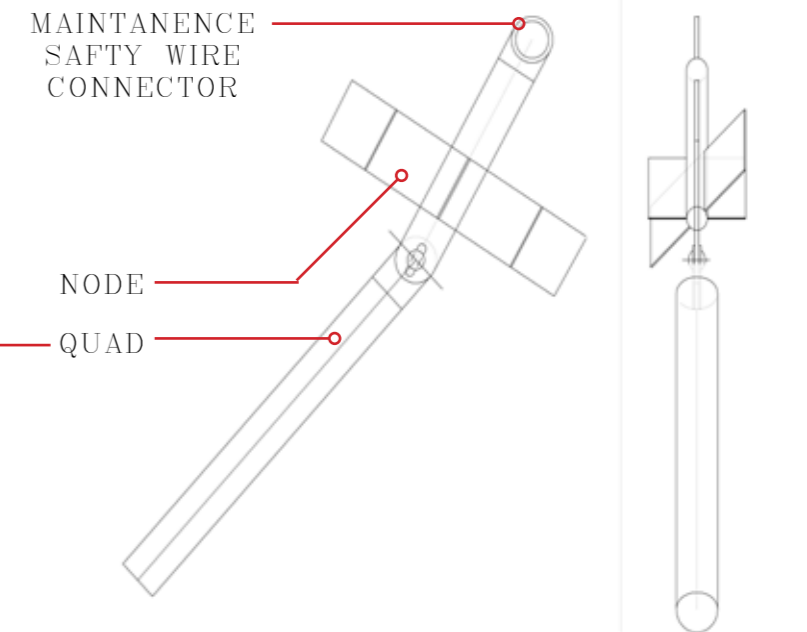


PRECEDENT NODE

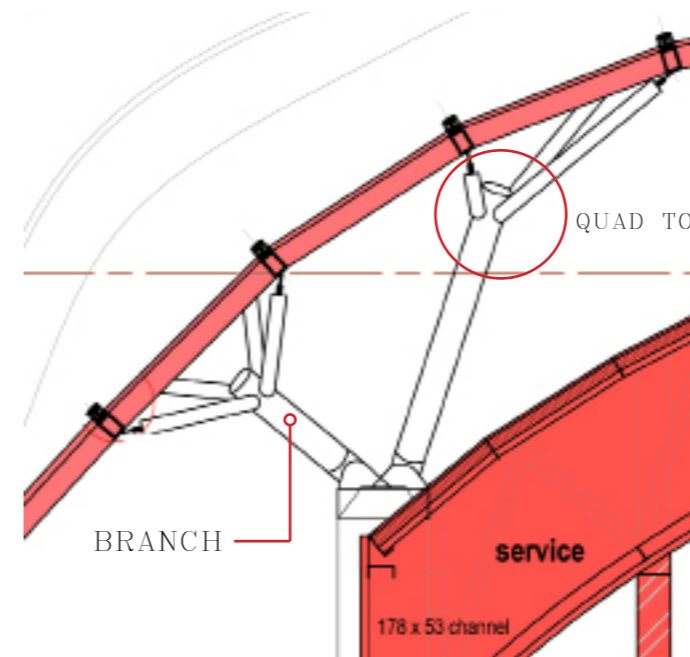
86



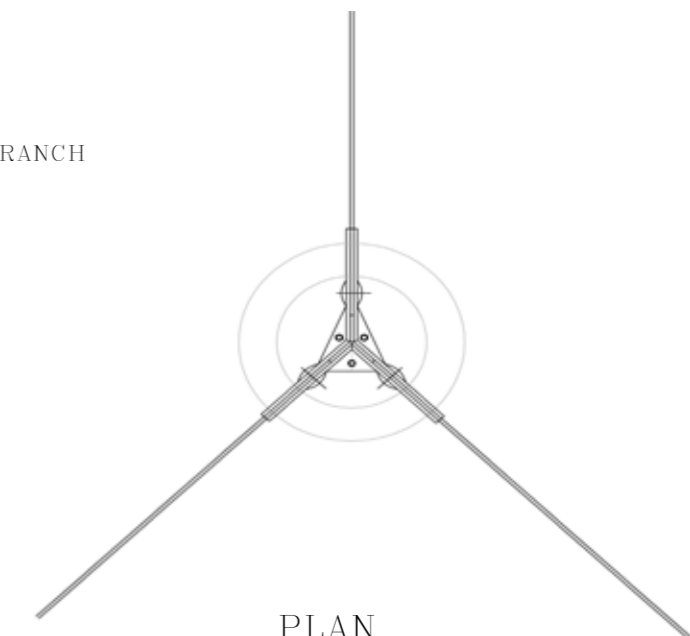
QUAD TO BRANCH



QUAD TO NODE

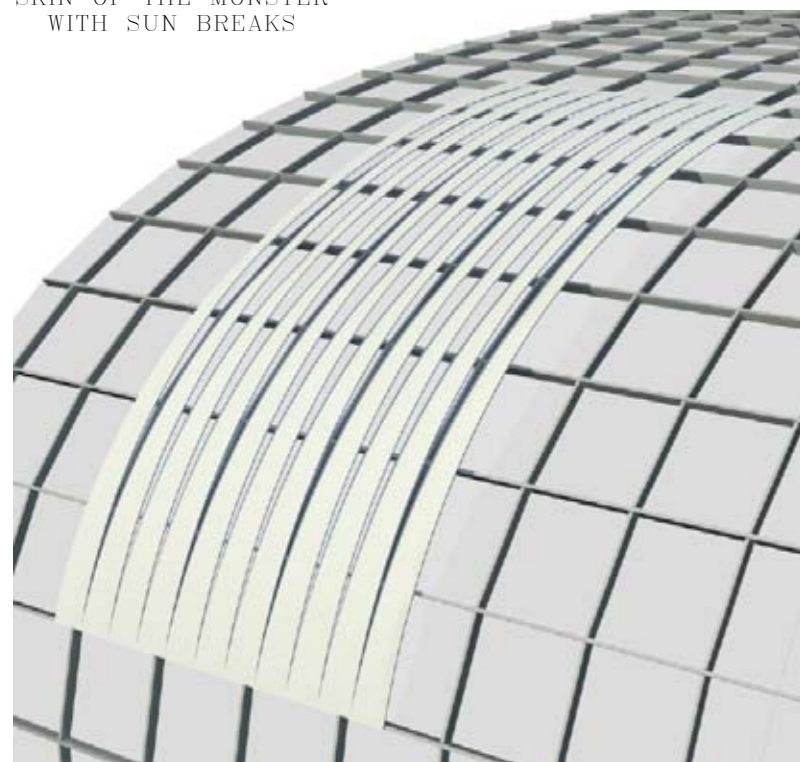


COLUMN TO BRANCHES



PLAN

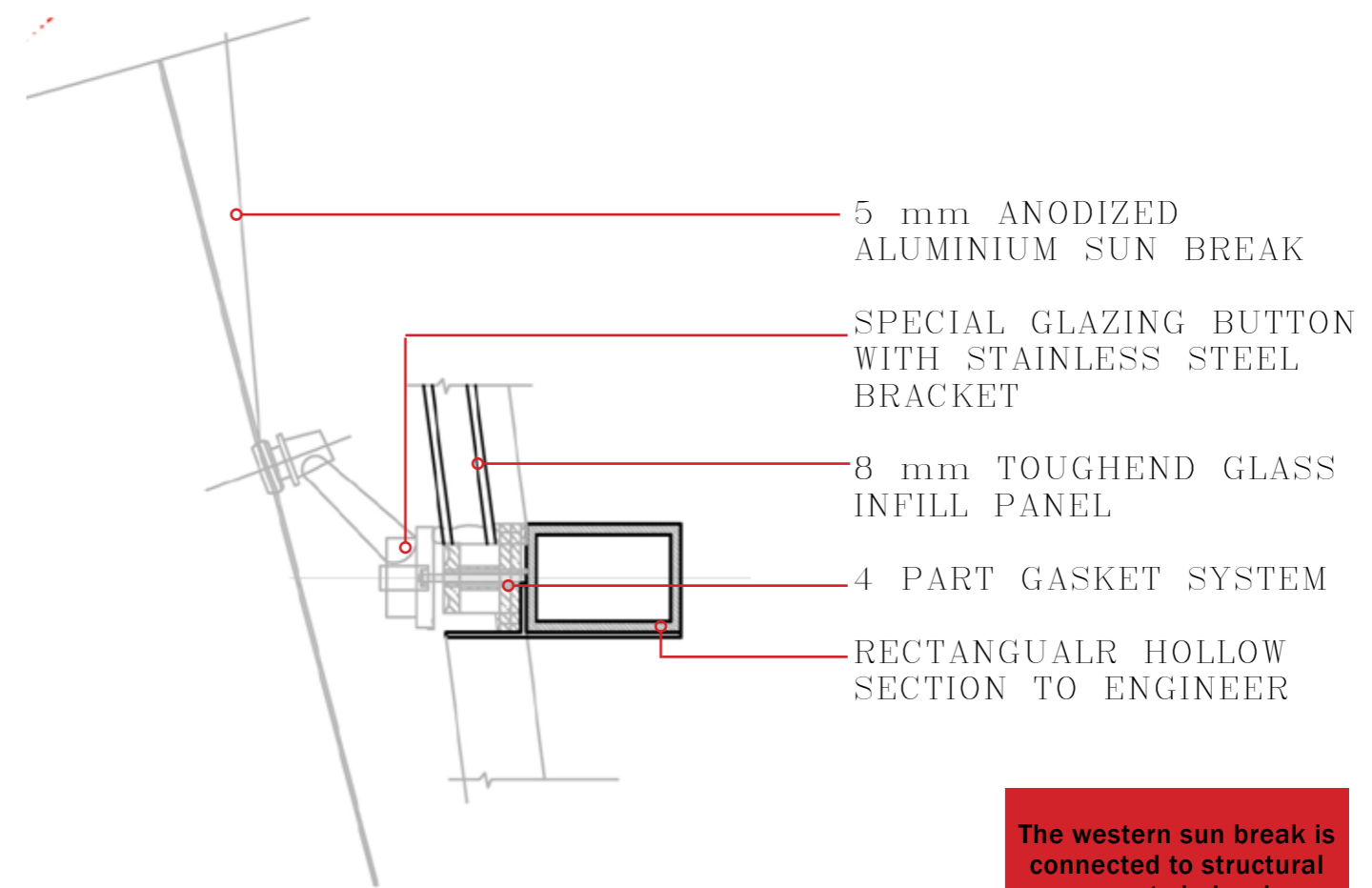
SKIN OF THE MONSTER
WITH SUN BREAKS



EXTERNAL VIEW

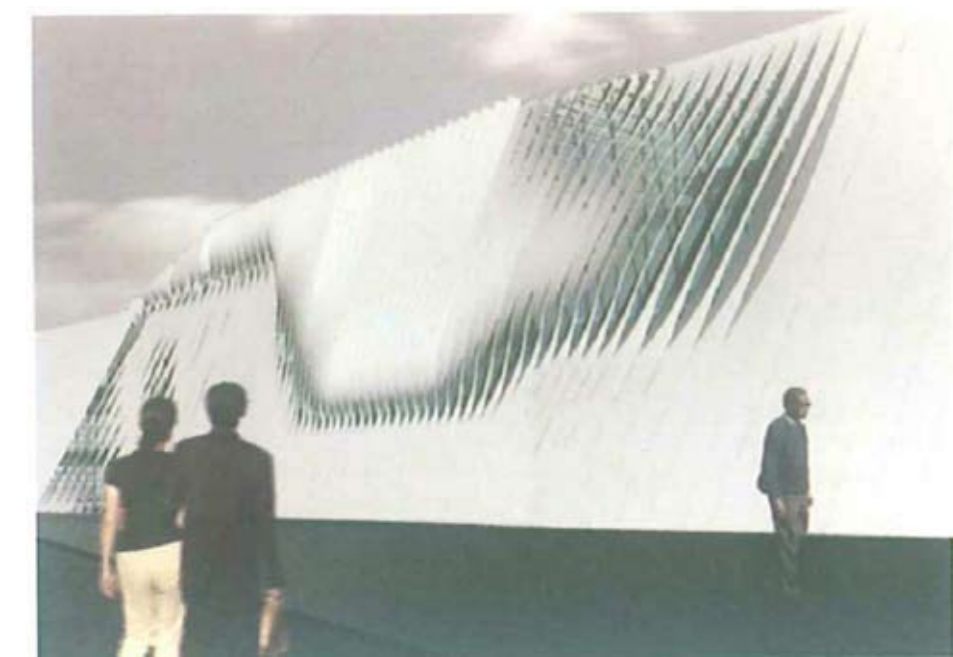


INTERNAL VIEW



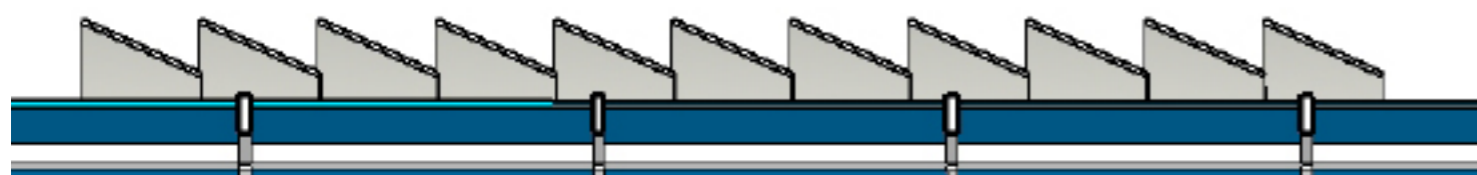
DETAIL 6
CONNECTION OF SUN
BREAKS TO SKIN

The western sun break is connected to structural supports below by replacing the normal glazing button with a stainless steel bracket influenced by Grimshaw's work.

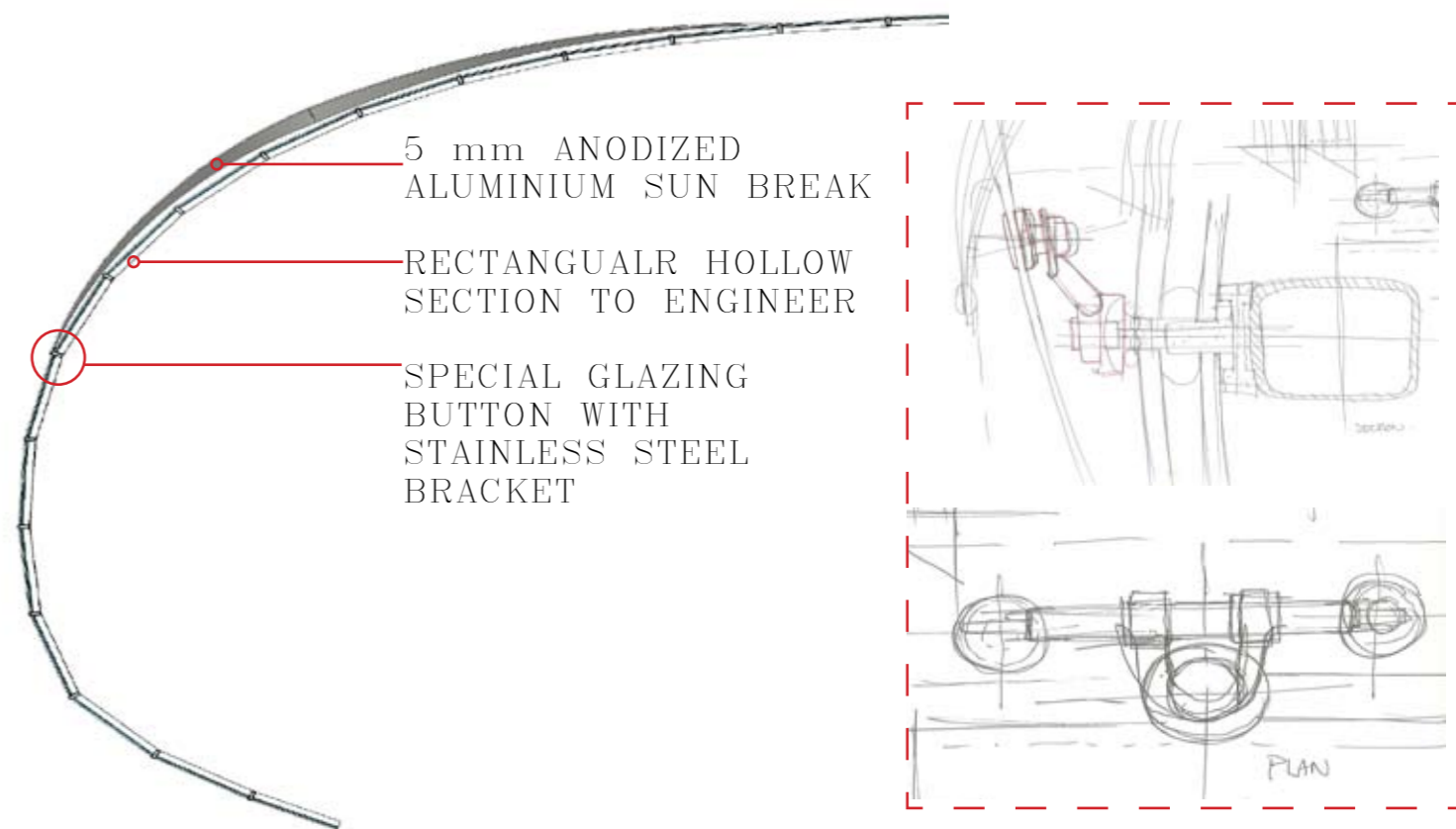


87

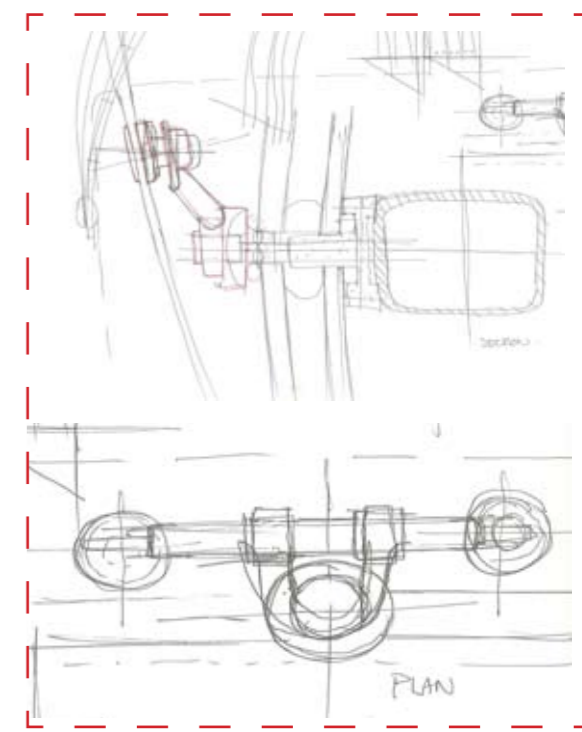
The western sun breaks consist of vertical twisted steel. The vertical panels are the most effective to the west. Further they are twisted upwards to the South. These control the sun to the west of the cafe to enhance the internal climatic performance. The western sun breaks were inspired by the skin for a department store by Chad Burke [fig. 87].

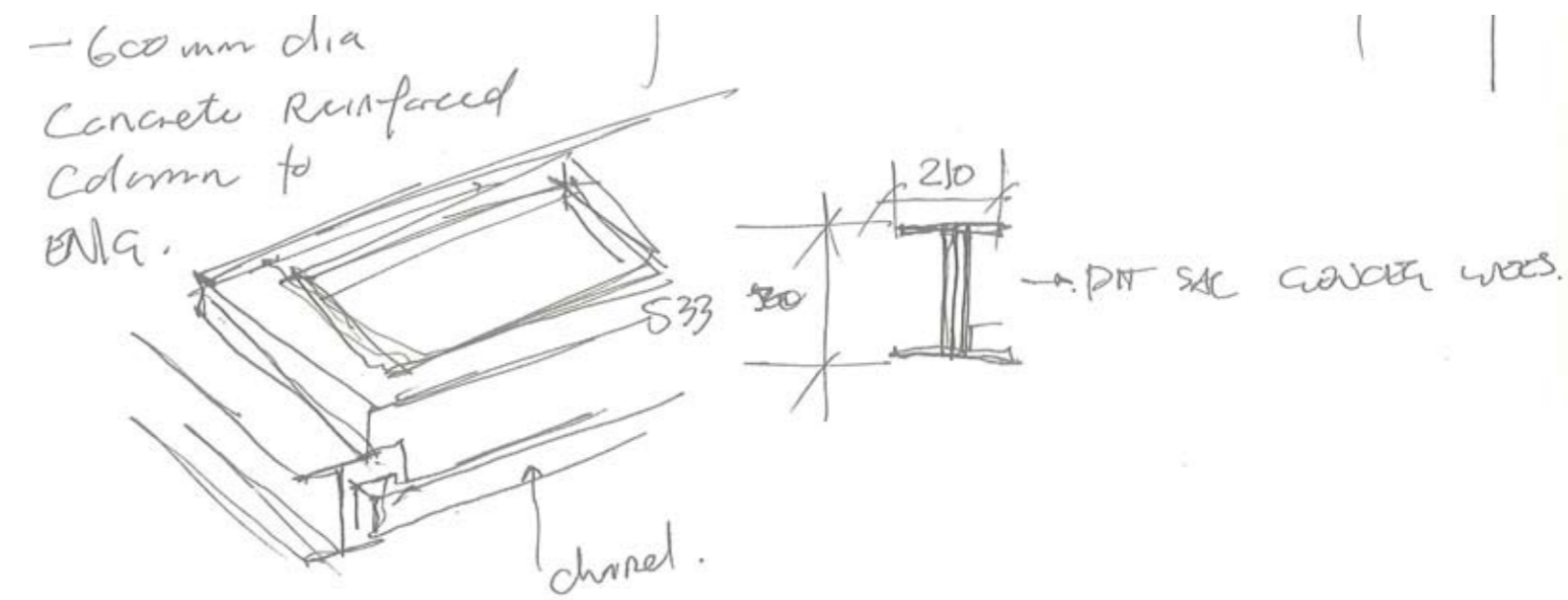
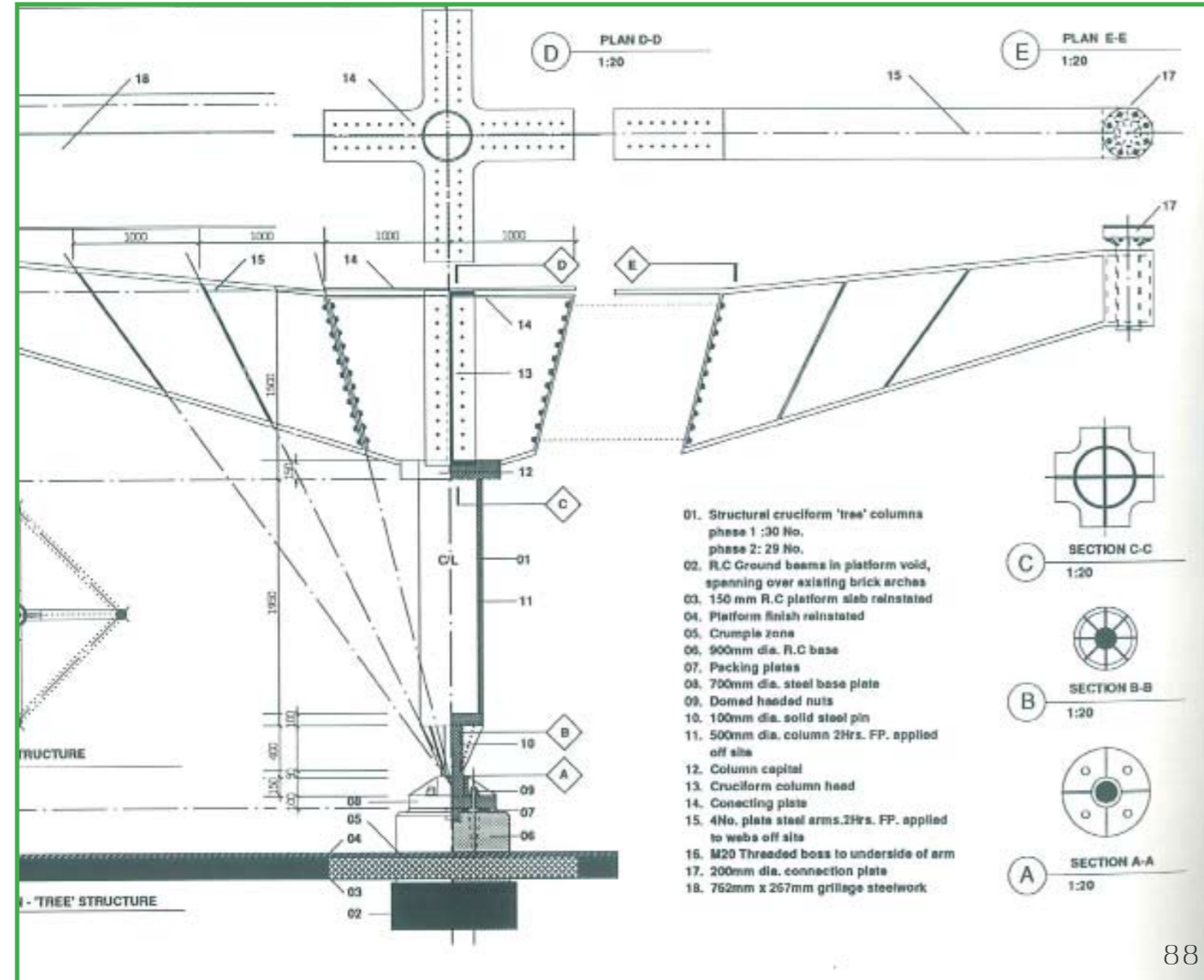
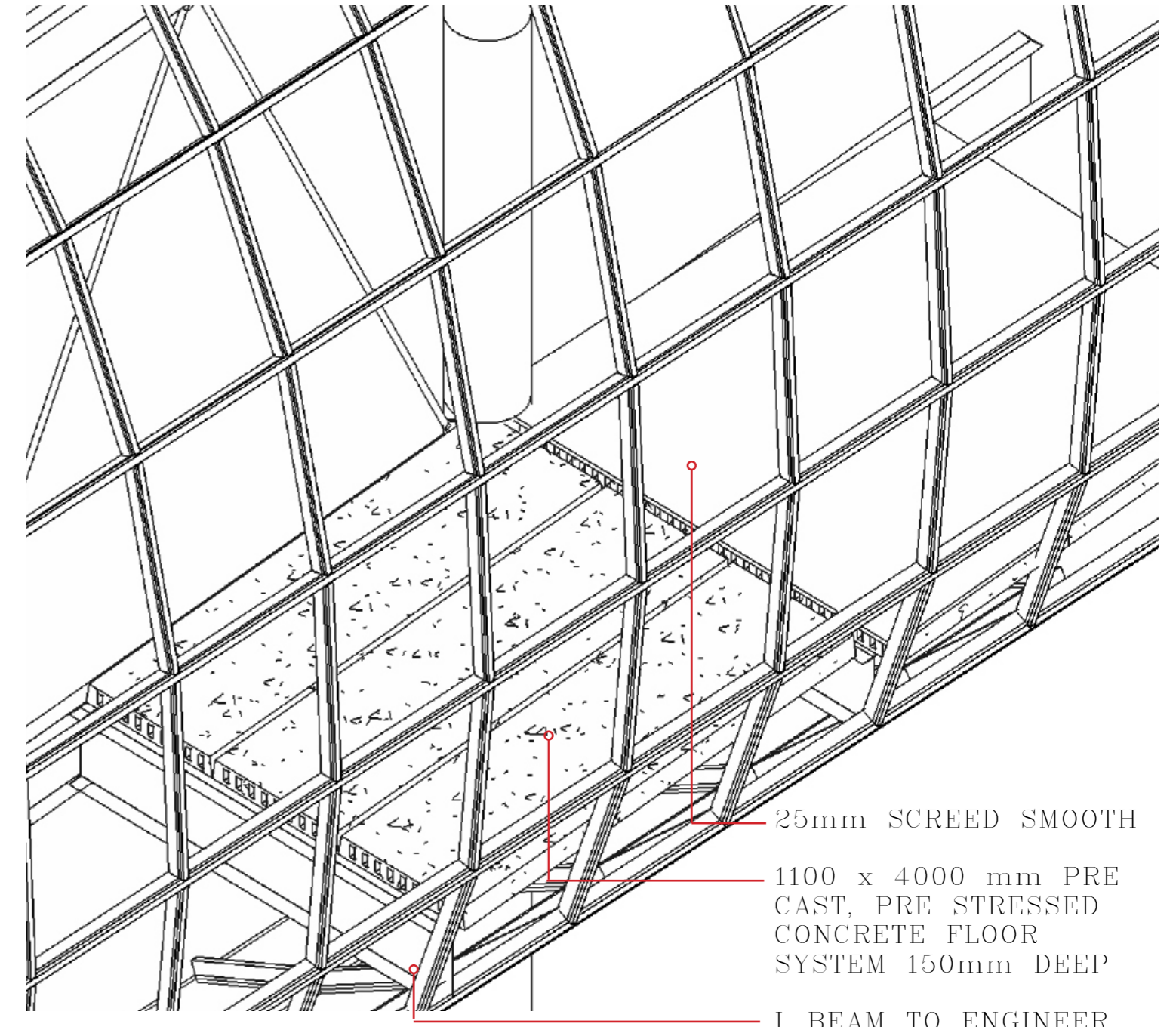
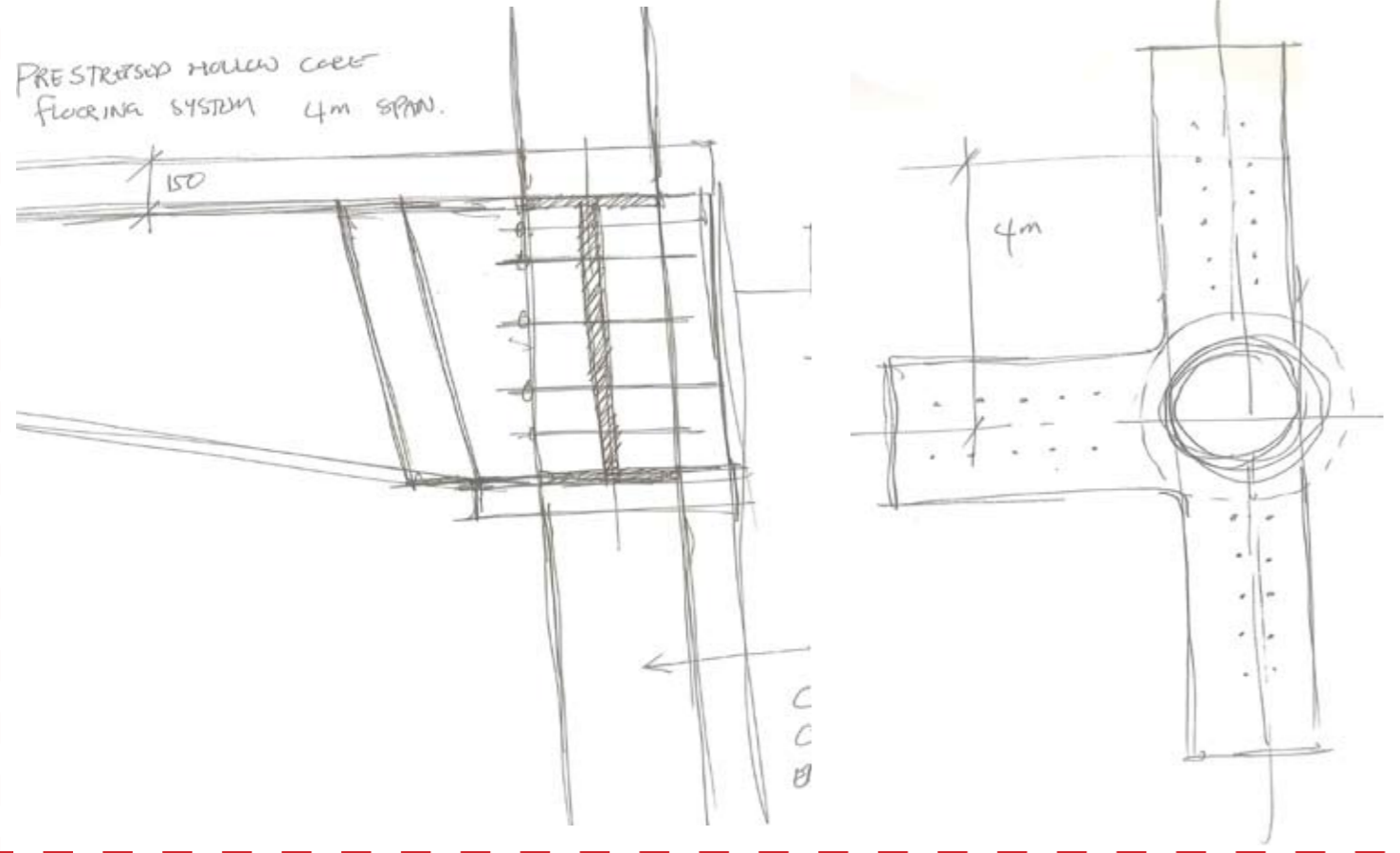


PLAN OF THE SKIN WITH THE SUN BREAKS



SECTION OF THE SKIN WITH THE SUN BREAKS





Climatic Performance

The climatic performance of the building is a result of the skin, therefore strategies involving sun breaks, passive ventilation and air conditioning systems are employed. The 4 panel system which is suggested for the skin allows parts of the space inside to be heated or cooled. Heating of the space will occur through the glass panels allowing sunlight through. Through reradiating sunlight and convection passive ventilation will occur. Solid panels will be inserted into the skin where less sunlight and heat is wanted. The auditorium needs air conditioning, with air being introduced through the ceiling, circulating through the entire space and being returned from the back of the auditorium. The plant room is situated below the auditorium, and has a chimney that sucks in clean air from above the Monster.

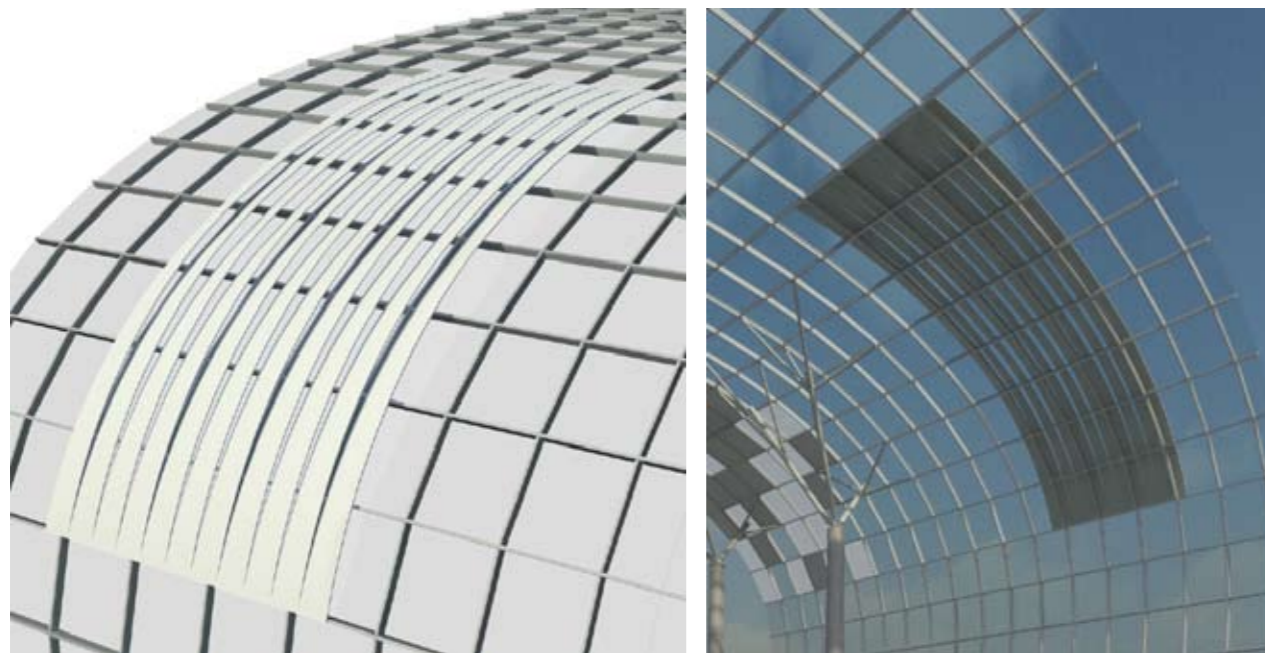
Texture

The textures of the materials like the handrail are deliberate so as to physically manifest the theory. The in-fill panels of the handrail follow a gradual transition from obscure glass to clear glass. Textures of the floor finish materials also contribute to the progression of the spaces. From a smooth Epoxy monotonous floor finish, to grainier ceramic tiles and finally brick paver units laid out in circular patterns. Various textures are employed from smooth to rough, these textures follow and express the different parts of the building. This is also done to further define the male and female parts of the space. As the skin portrays these qualities to the outside the textures will to the inside.

The resultant light qualities from the textures and material choices materialize the theory visibly. Light would reflect from the different materials and textures in unique ways. Thus subtly further enhancing the definition of those spaces. The handrail panels are a transitory progression from obscure to transparent glass. The handrail has a fluorescent light concealed in the power skin. The obscure glass would absorb and emit this light at night. The light being emitted would clearly communicate the progression from ethereality to clarity. Where the Monster and the new parking garage touch a wall cladding is suggested which will reflect natural light into the walkways, which is predicted to be the darkest areas of the building. During the day natural light will filter through the skin lighting up the spaces behind. This is done to minimize the use of artificial lighting during the day.

Acoustics and noise

The planning of the building was modified in such a manner as to dampen and lessen the effect of the noise produced by Lynwood Road. The acoustic absorbing materials were placed to enhance their effectiveness. Acoustic absorbing and isolating bands were employed to mainly to the South where all the traffic noise occurs. The acoustic qualities of the auditorium can be dealt with by a specialist.



What I have done.

I explored ways to transform liminality into a building. Various devices were investigated to facilitate the transition from abstract concept into architectural possibility. The final product is a fusion of theoretical notions and technology expressed as a hybridized typology, all these qualities are arranged in ways not experienced every day, resulting in the Monster.

What are its limitations?

The Monster is functionally specific and does not allow for further flexibility.

What is its Future?

The Monster as is will be built as is. Further extensions of the building are possible. Currently no further additions are envisaged due to the functional limitation.

What will its impact on the University be?

The Monster acts as the threshold to the University grounds. All the students and visitors who pass through it would see the University in a different light. The University can gain financially as well from the Monster through its rentable conference centre.

What is its iconic significance to context of Tshwane?

The faceted skin fuses the new with the reflections of the existing. The skin is imbued with a unique sense of iconic imagery through the technique of integration. By reinvigorating these icons of the past legacy with contemporary conditions a symbolic unity is created.

How will it transform the self-perception of the students and staff?

As the awareness of the intent of the University by the students and staff becomes greater, the possibilities open up to pushing the boundaries of the system. The students and staff will perceive themselves within this system. The students will become aware of their liminal state as students. The transformation into this self-perception would result in greater understanding of circumstances and opportunities.



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http://limen.mi2.hr/limen1-2001/catherine_smith.html
 Cited 2 March 2008.

IMAGE LIST

1. Aerial photo of University of Pretoria Hatfield Campus. (sourced from: Departement Geografie. UP)
2. Edited Aerial photo zoom in on main entrance. (sourced from: Departement Geografie. UP)
3. Lynch diagram: Path (Lynch, K (1960) The Image of the City. Cambridge, Mass: MIT Press)
4. Lynch diagram: Gateway (Lynch, K (1960) The Image of the City. Cambridge, Mass: MIT Press)
5. Lynch diagram: Node (Lynch, K (1960) The Image of the City. Cambridge, Mass: MIT Press)
6. Lynch diagram: Edge (Lynch, K (1960) The Image of the City. Cambridge, Mass: MIT Press)
7. Lynch diagram: Precinct (Lynch, K (1960) The Image of the City. Cambridge, Mass: MIT Press)
8. Crossroads (www.madamtalbot.com) Cited 2 March 2008
9. ADA space (www.Oosterhuis.nl)
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Note: All drawings not listed by I. Coetzee 2008.