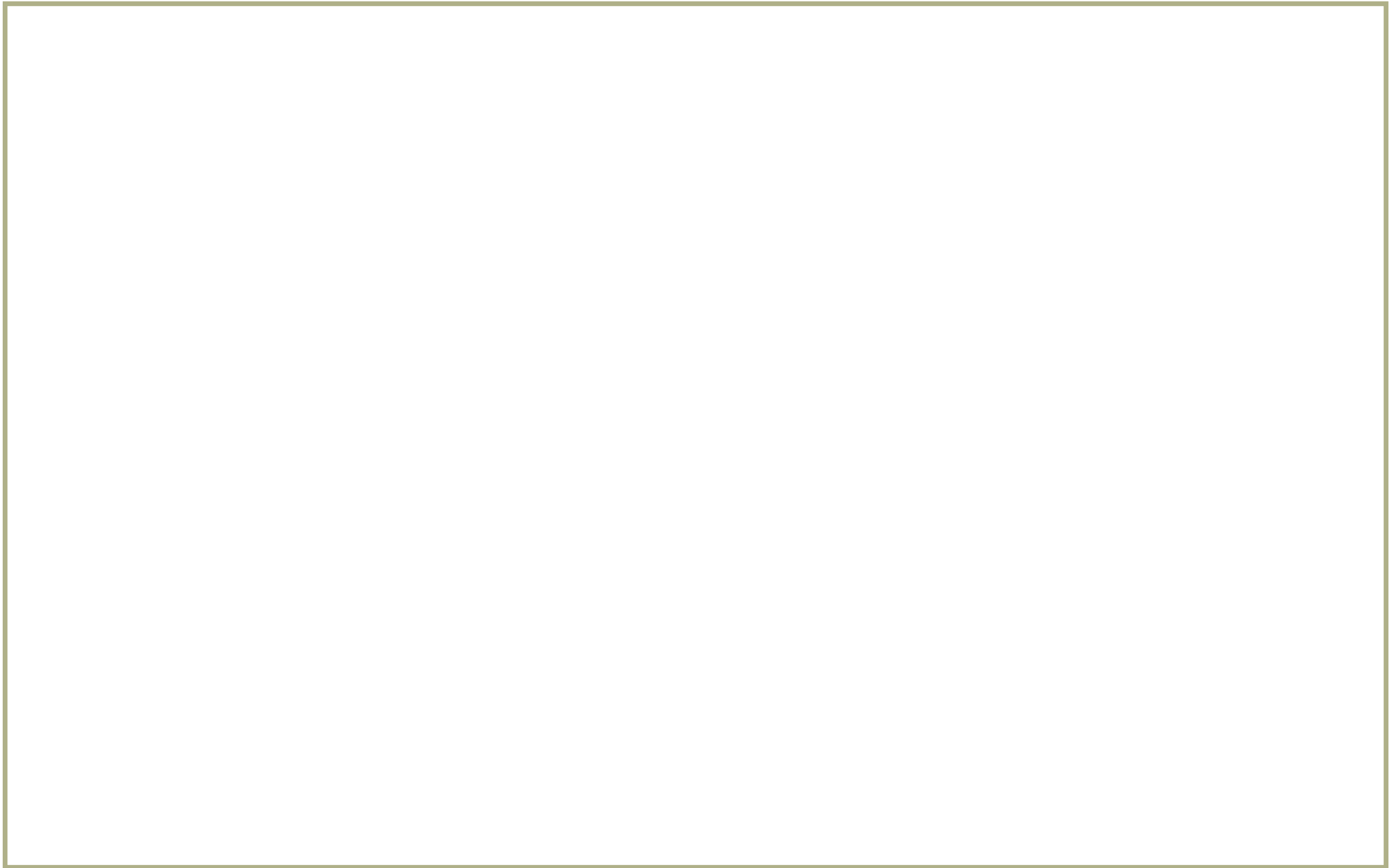




DESIGN OF A SOCCER STADIUM

PROJECT BY DAVID MICHAEL CLAYTON



DESIGN OF A SOCCER STADIUM

PROJECT BY DAVID MICHAEL CLAYTON

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of

MASTER OF ARCHITECTURE

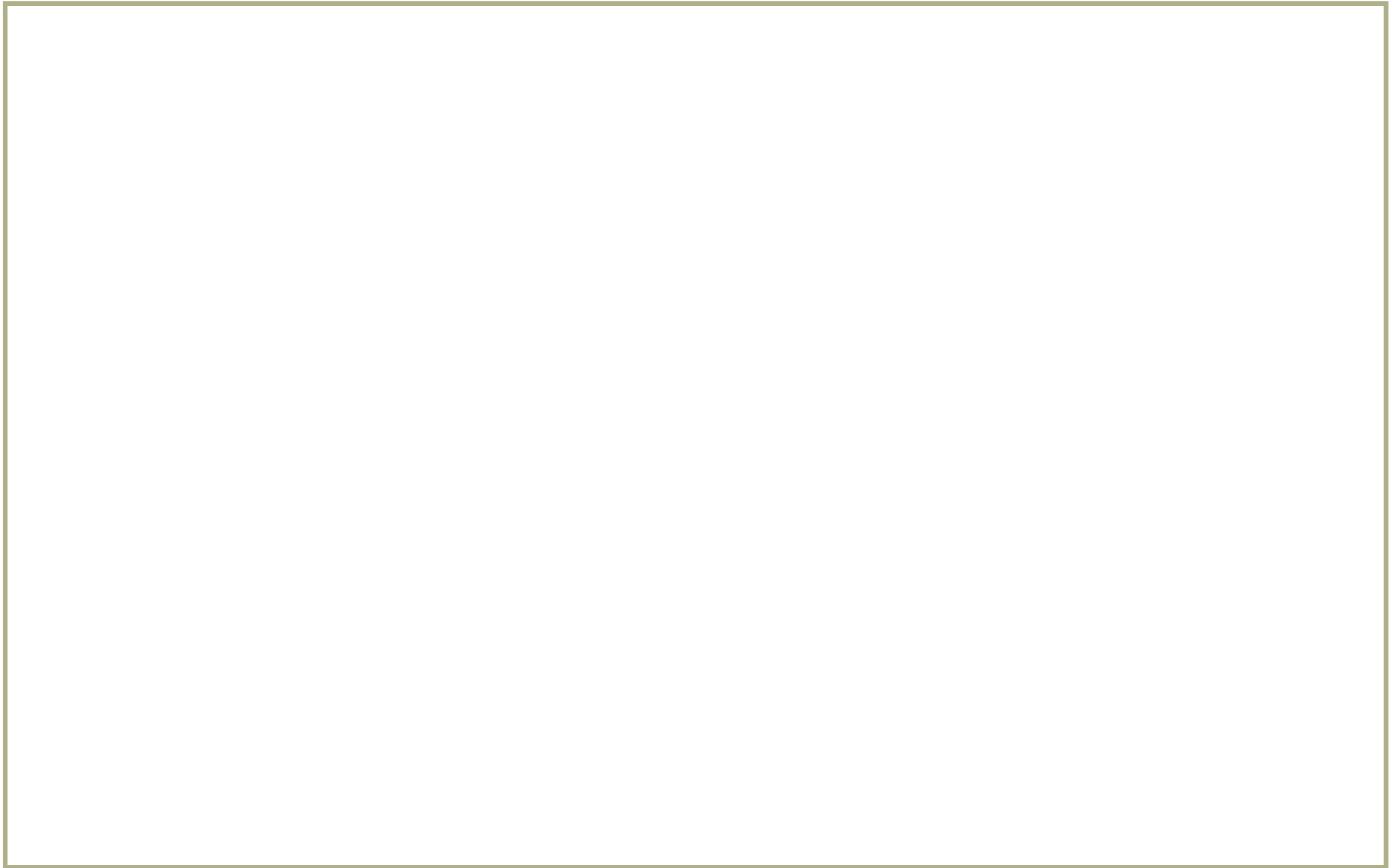
BLACKSBURG, VIRGINIA

DEFENSE DATE: MAY 4, 2007

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DESIGN OF A SOCCER STADIUM

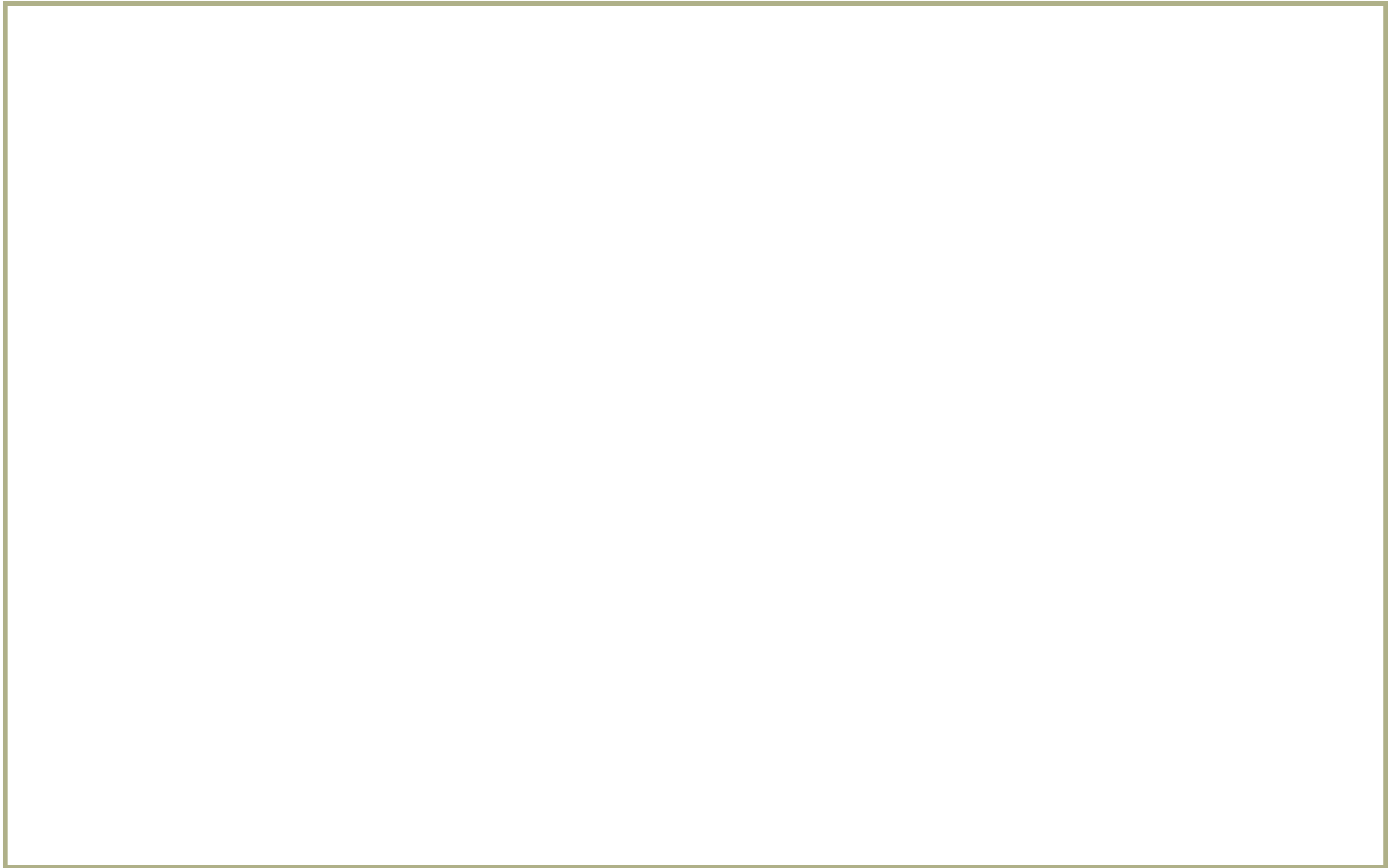
PROJECT BY DAVID MICHAEL CLAYTON

ABSTRACT:

Resisting external forces can be a source of beauty. This work represents an effort to understand how architecture can be derived from the struggle against natural forces to create a built-form. Starting with an idea, that of a tensile roof, the design of a soccer stadium developed into what is presented here.

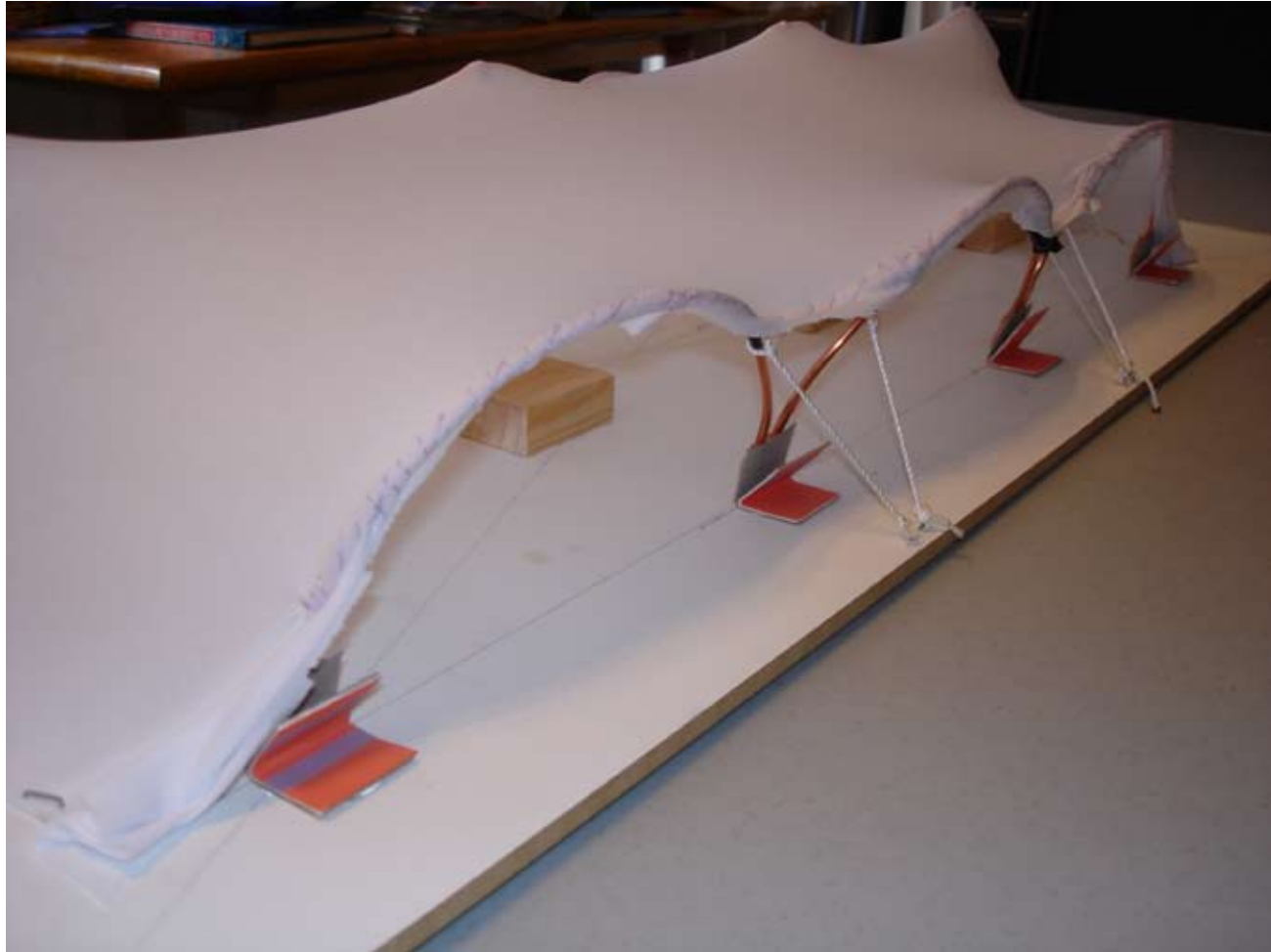
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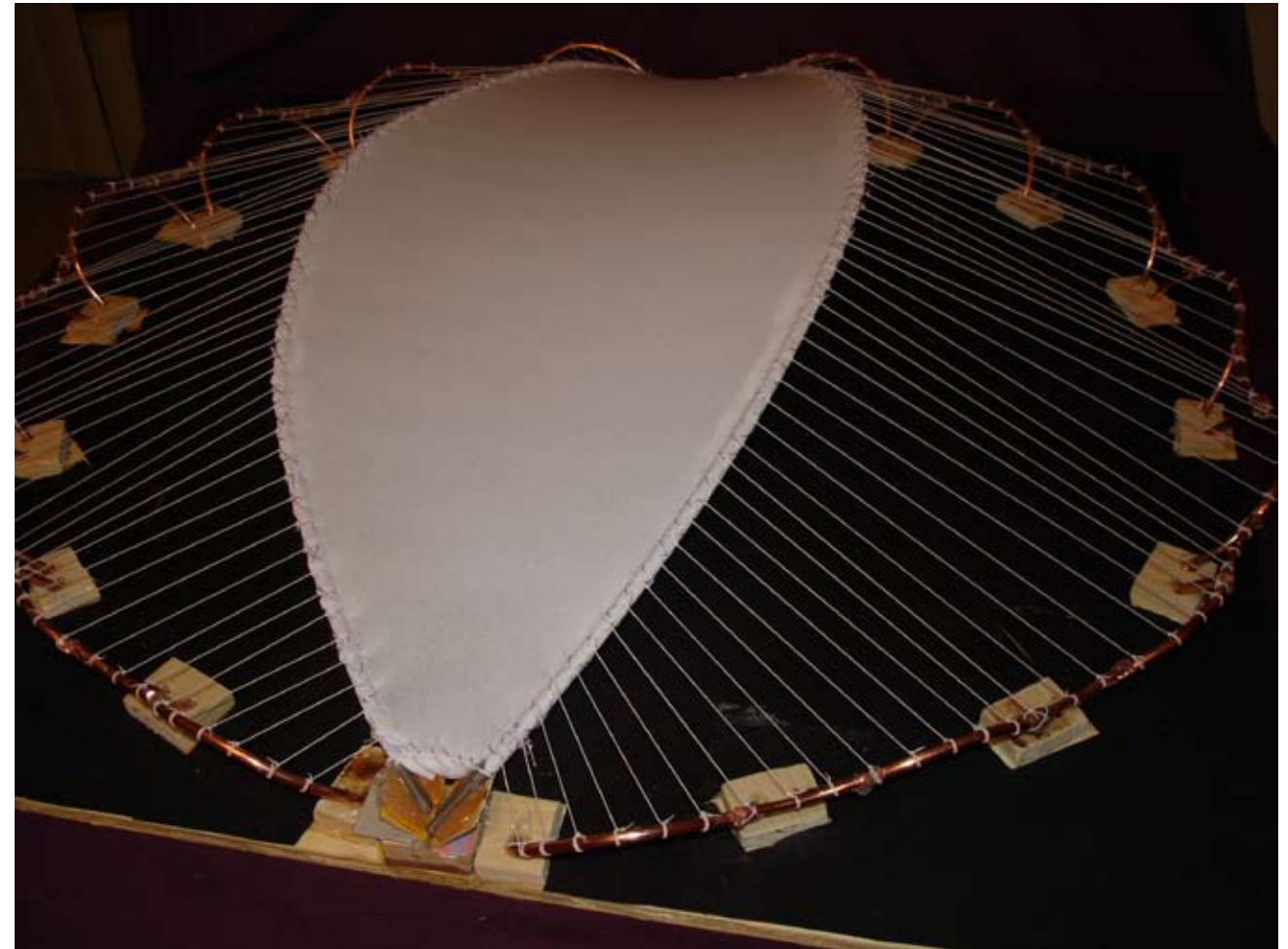


ACKNOWLEDGEMENTS

Most important in this work has been the faithful love and support from my beautiful wife, Ioana. My children have also lifted me up spiritually and emotionally that I may finish this work. To my parents, I thank them for the good upbringing they provided me and the steady support that they give. To all the teachers that have helped me learn throughout the years, I thank also.



INTRODUCTION

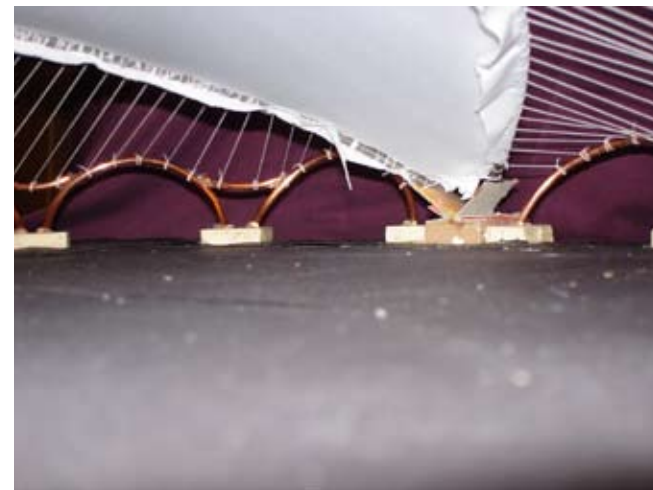
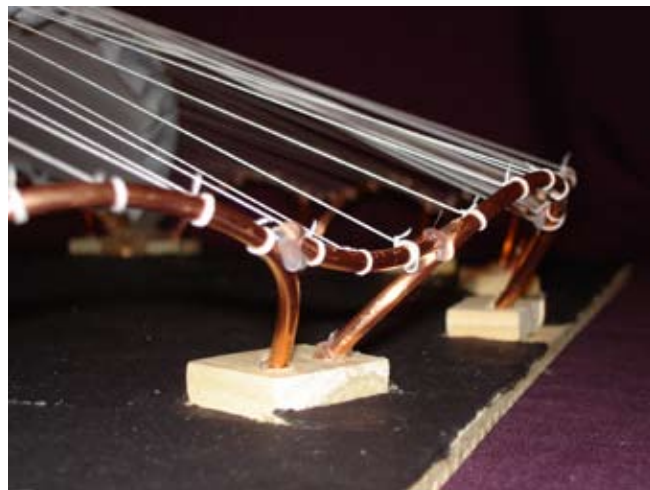


In the beginning, there was a question: do I start with a program and find a structure to support it or do I start with a structure and find a program? In the end, I had tried both. The result was a new found understanding that it is easier to find a program to fit into a structure than to find a structure to fit into a program.

What is presented in this book is the latter. After finding a structure to work with, my mind envisioned a stadium. It seemed the best program to fit the structure I had created.

The structure is fairly simple. It is the cause and the result of my new found respect for the laws that govern natural forces and their ability to inform in the shaping of structures. We learn from virtually all religions that there is opposition in all things: light and dark, up and down, etc. Architecture is not immune. If architecture is what is sought, and beauty is a desired result, then remembering the balance of things is important. Black does not seem as dark until it is set next to white. This balance is what makes the structure possible.

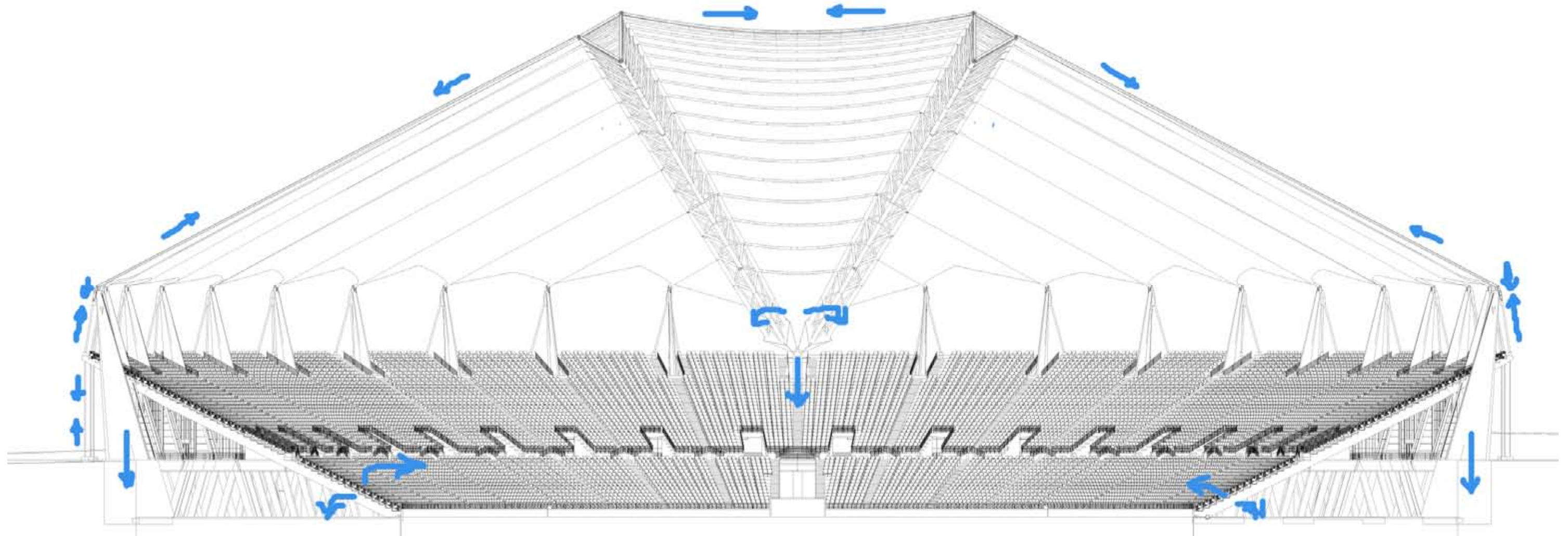
I will say little else, for I hope the project will speak for itself. I do not declare this to be perfect or great. That is for others to decide for themselves. It is sufficient for me to say that this project has taught me a great deal about architecture, as will all my projects throughout my career.



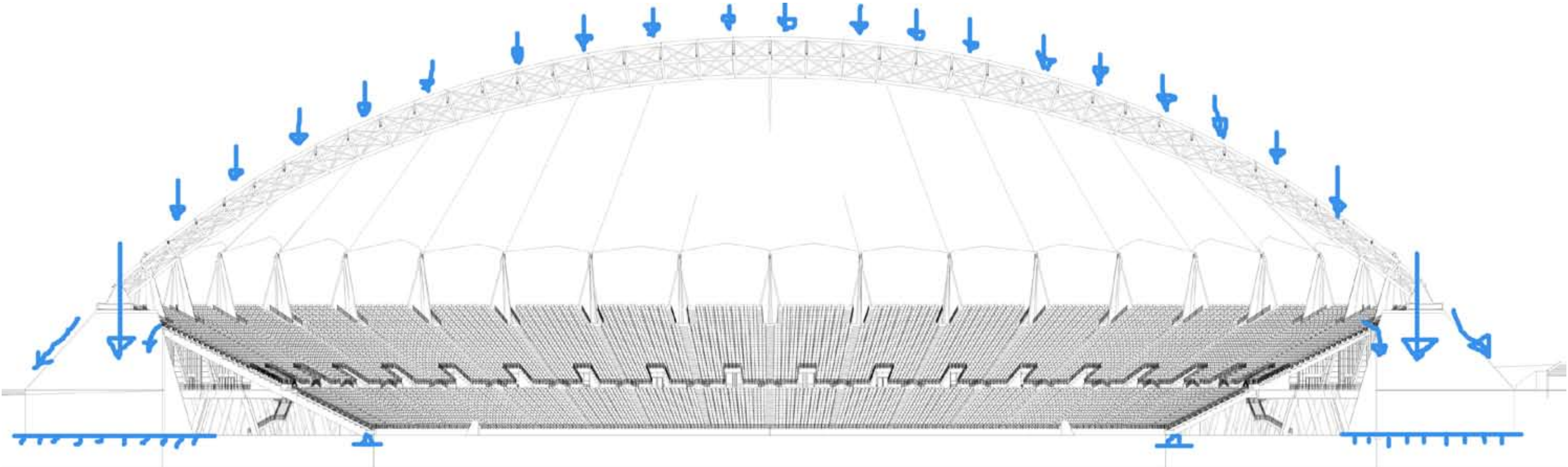
STRUCTURAL DIAGRAM

To illustrate the forces at play here, the main cross section with diagrammatic arrows are shown. As can be seen in the long section, the major arch trusses put their massive load and outward thrust down onto solid concrete bearings. Hinges provide lateral flexibility essential to this structure. The weight of these arches causes outward moments that are resisted at top by a series of tensile cables. Another series of cables provide the lateral stability between the perimeter masts and the major arches. Fiberglass fabric roofing is pulled taut between these cables for shade. The cables past the masts split into two and connect to the ends of the grand stand seating spine. To finish off the balancing act, cables then connect these spines to anchors in the ground. The masts mentioned are also bearing points and carry their gravitational load down to concrete piers.

Structural Diagram Cross Section



Structural Diagram Longitudinal Section





N. Temple St.

300 West

200 West

Existing Site

Light Rail Transit lines

S. Temple St.

Basketball Arena

© 2007 Europa Technologies
Image © 2007 DigitalGlobe

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EXISTING SITE

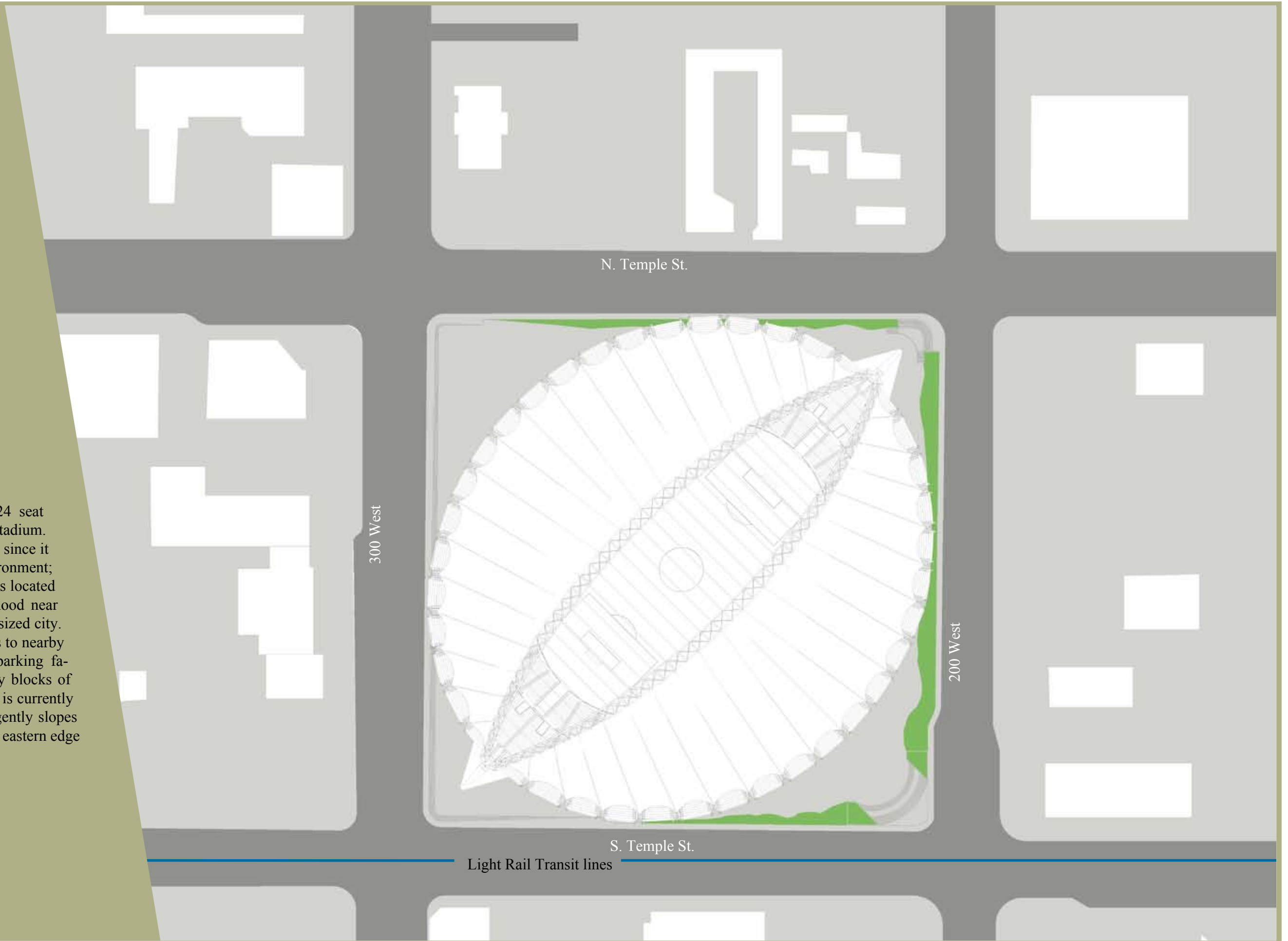
Aerial photograph of site.

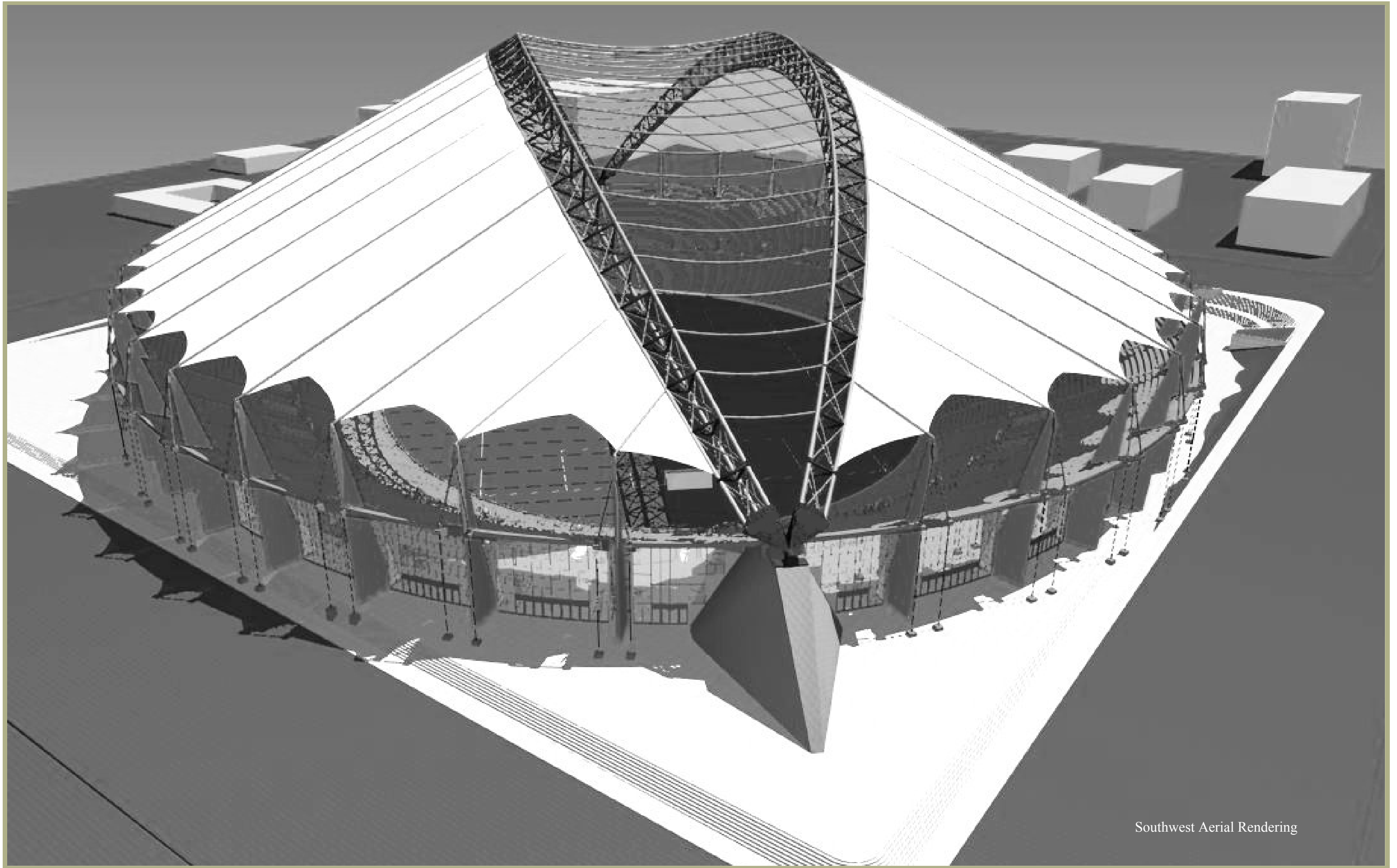
Source: Google Earth ©2007



SITE PLAN

The program is of a 25,924 seat open air, but roofed soccer stadium. The roof is largely for shade since it is intended for a desert environment; rain is less of a concern. It is located in a dense urban neighborhood near the downtown of a medium sized city. The site has excellent access to nearby public transportation, and parking facilities are located in nearby blocks of the city. The property itself is currently an asphalt parking lot that gently slopes from the western edge to the eastern edge twenty vertical feet.





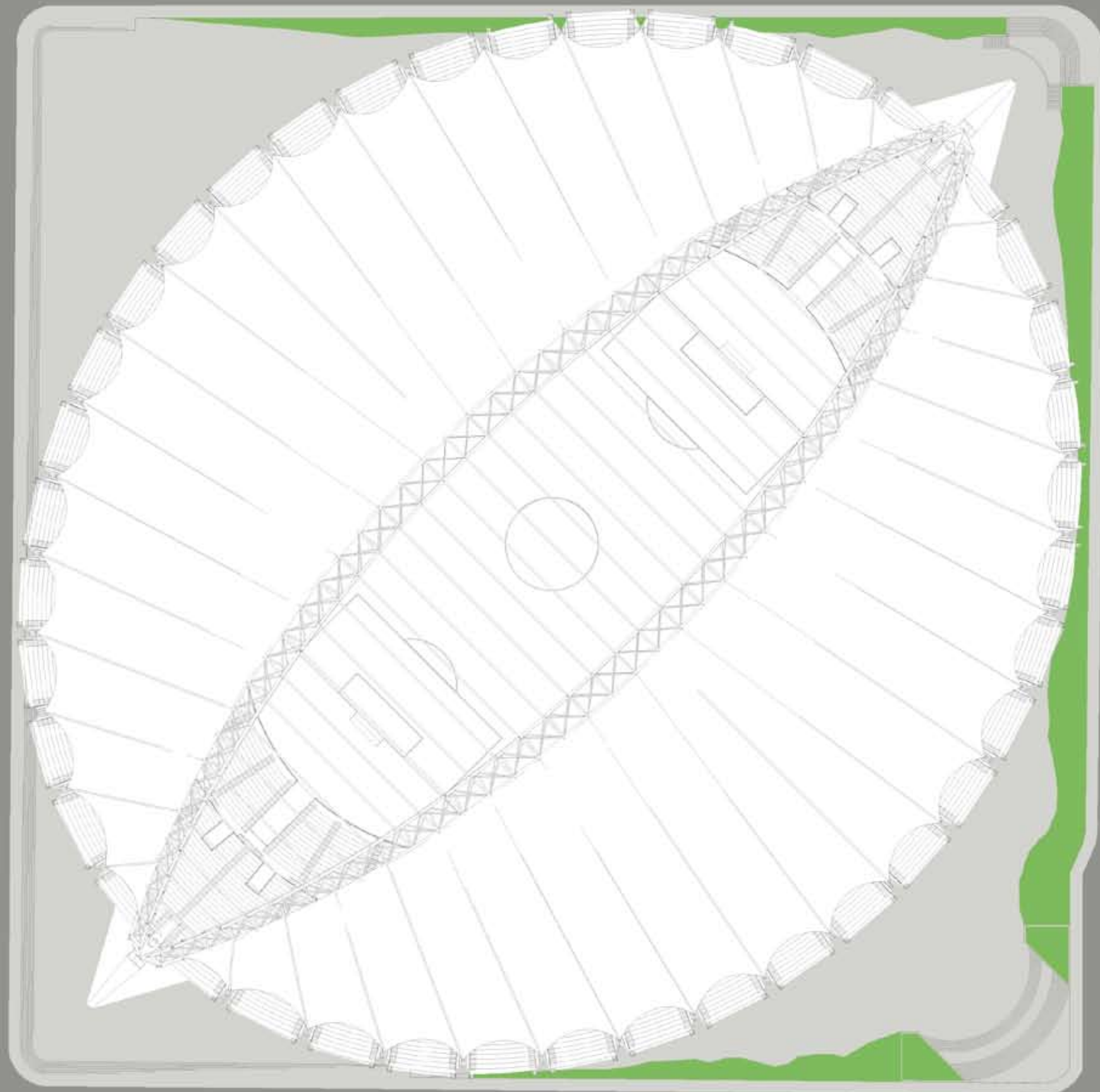
Southwest Aerial Rendering

N. Temple St.



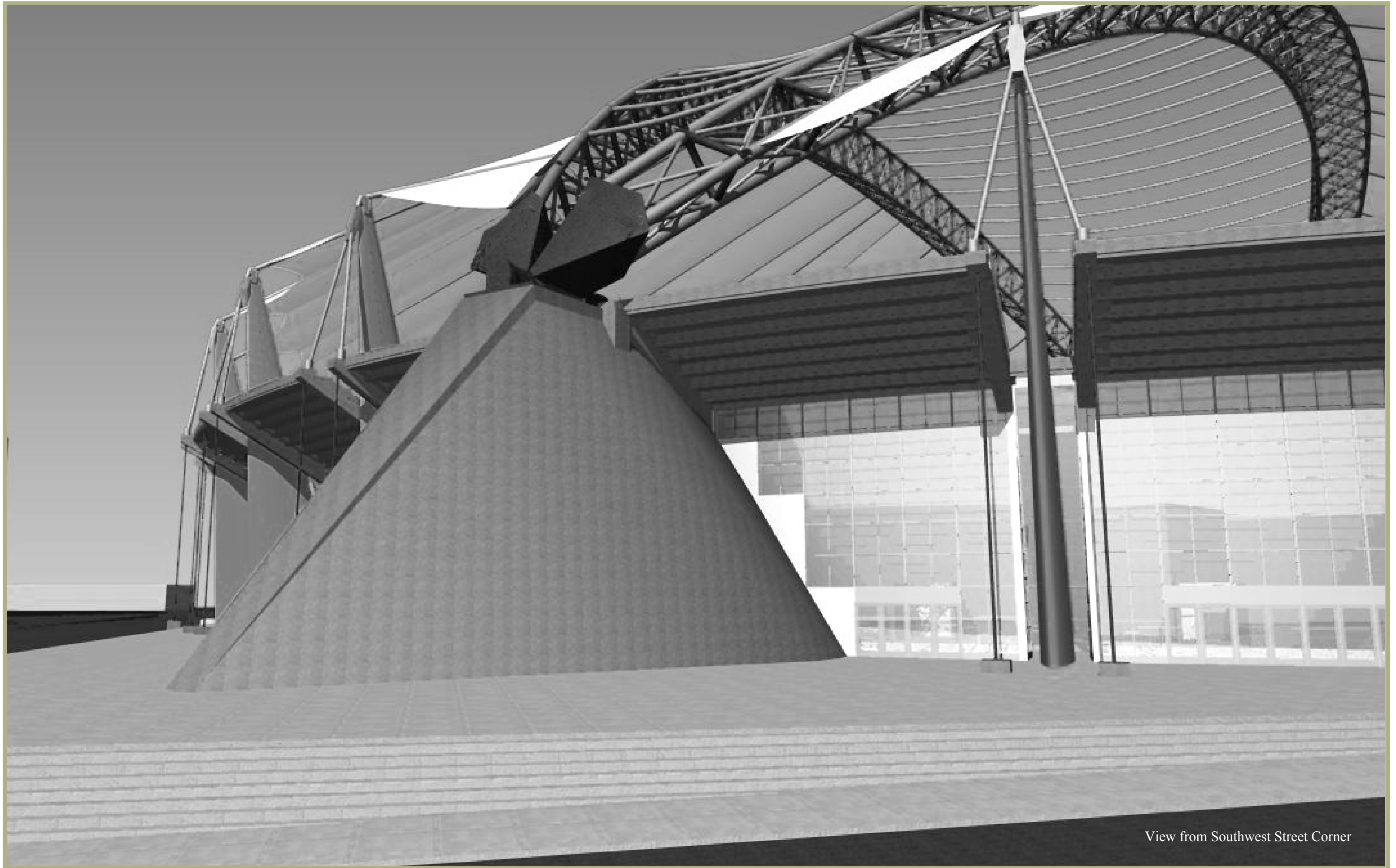
300 West

200 West

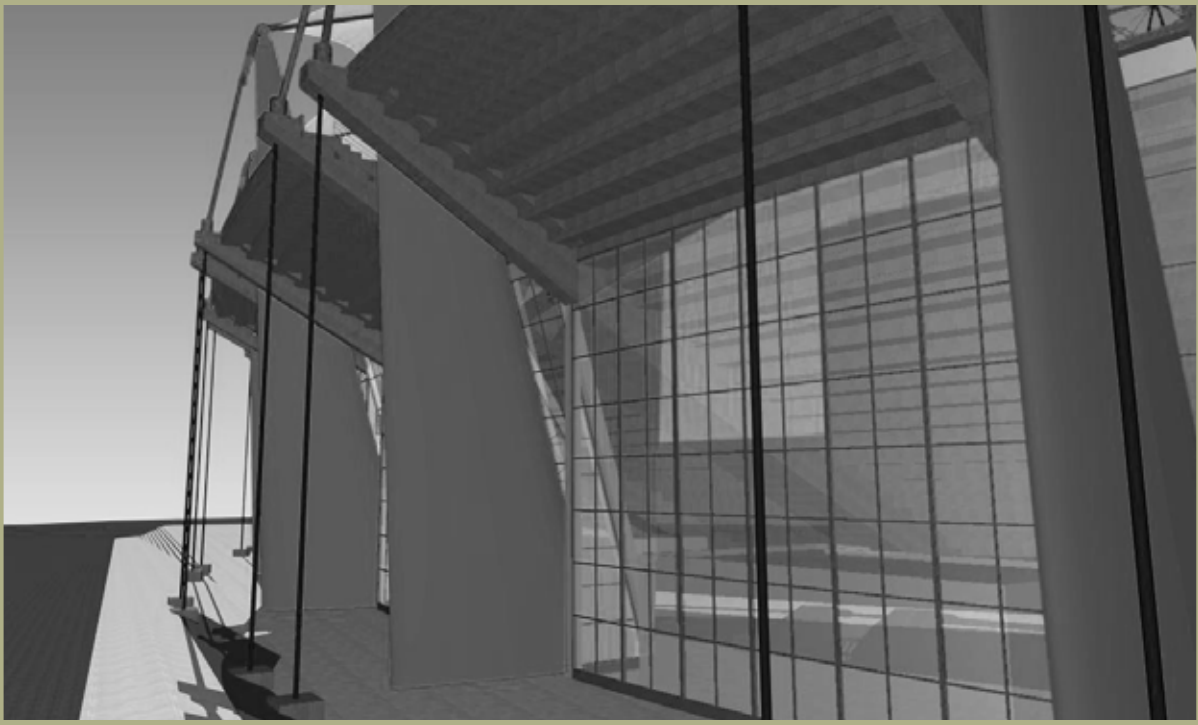


S. Temple St.

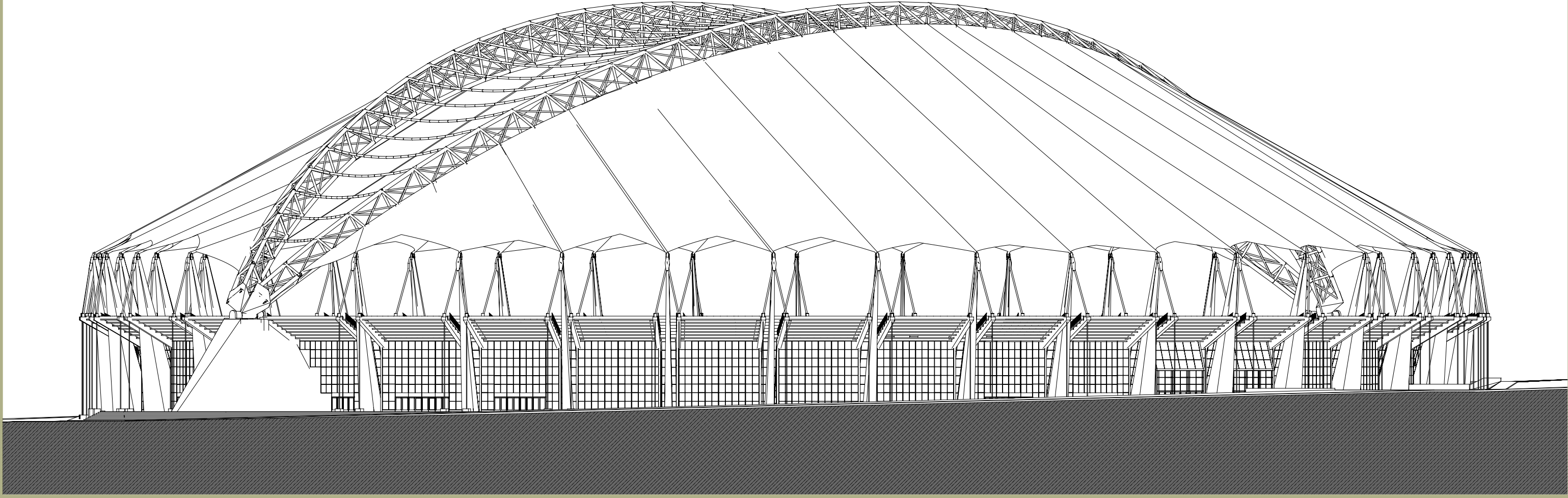
Roof Plan

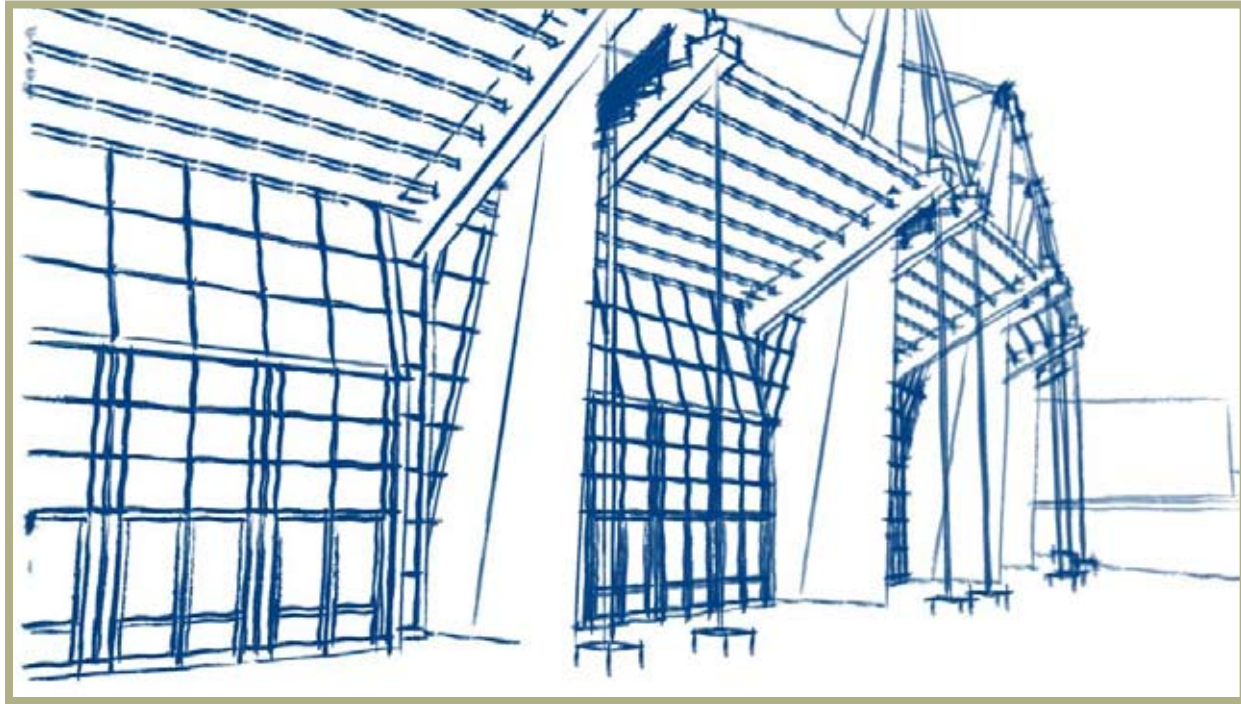


View from Southwest Street Corner

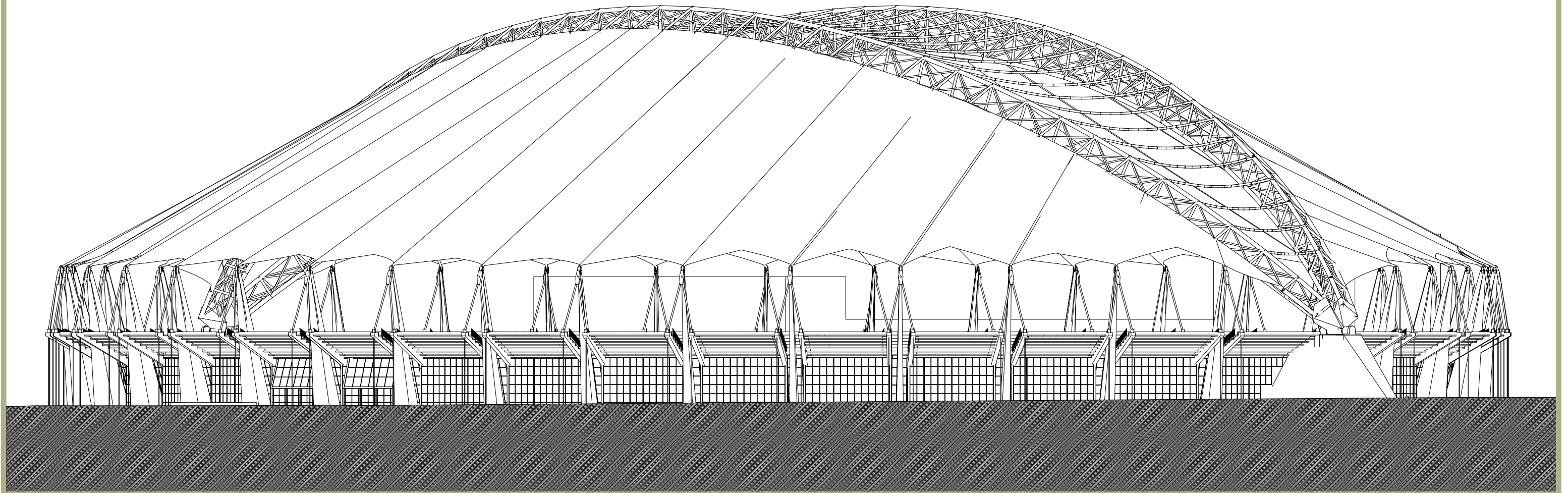


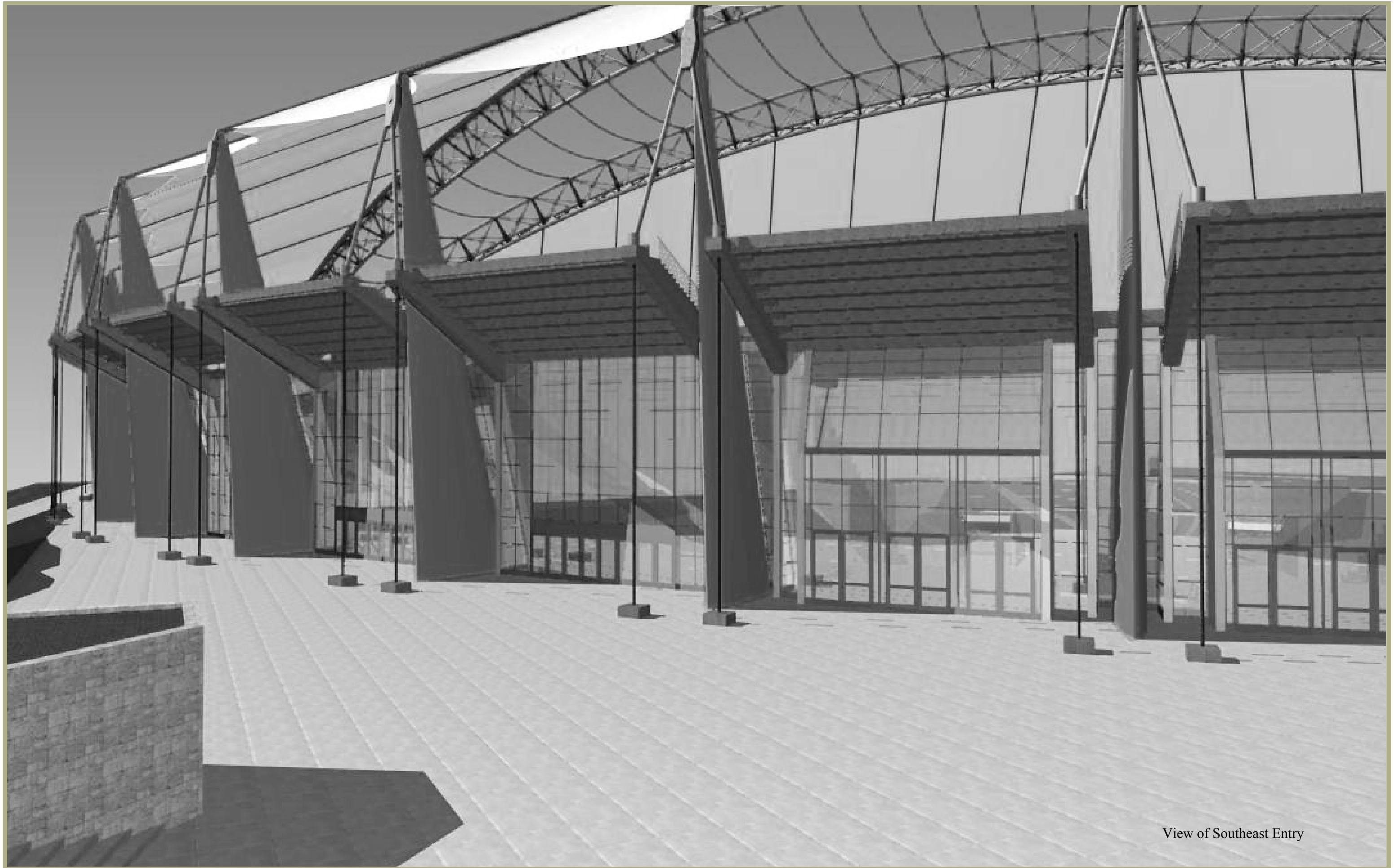
SOUTH ELEVATION
or view from South Temple





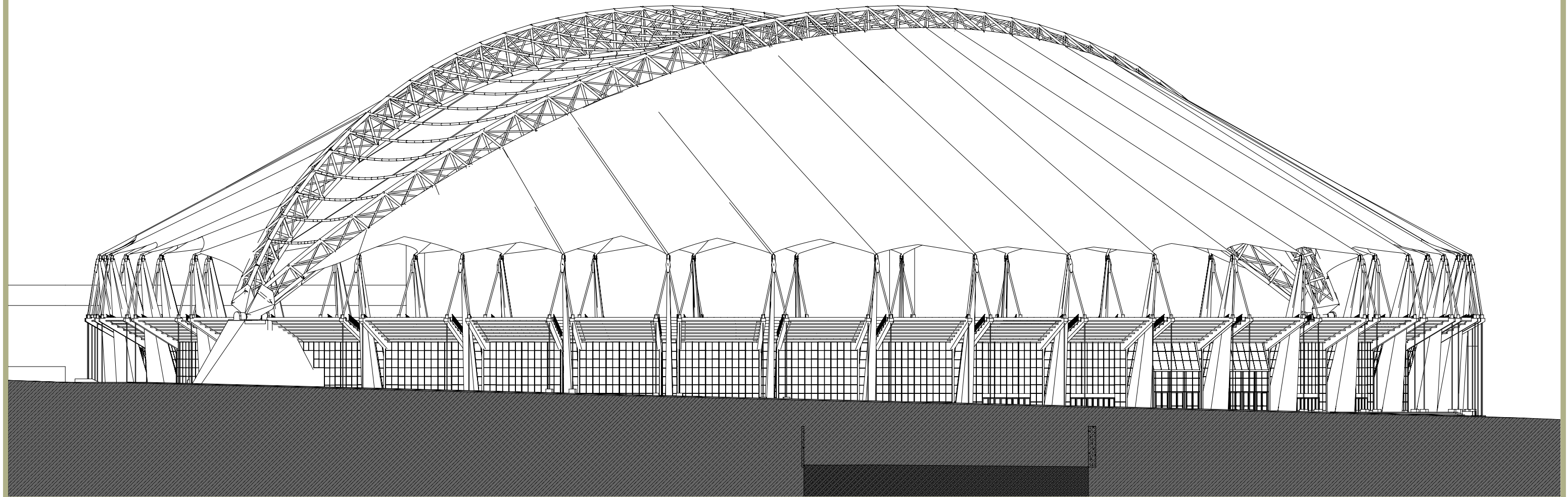
EAST ELEVATION
or view from 200 West



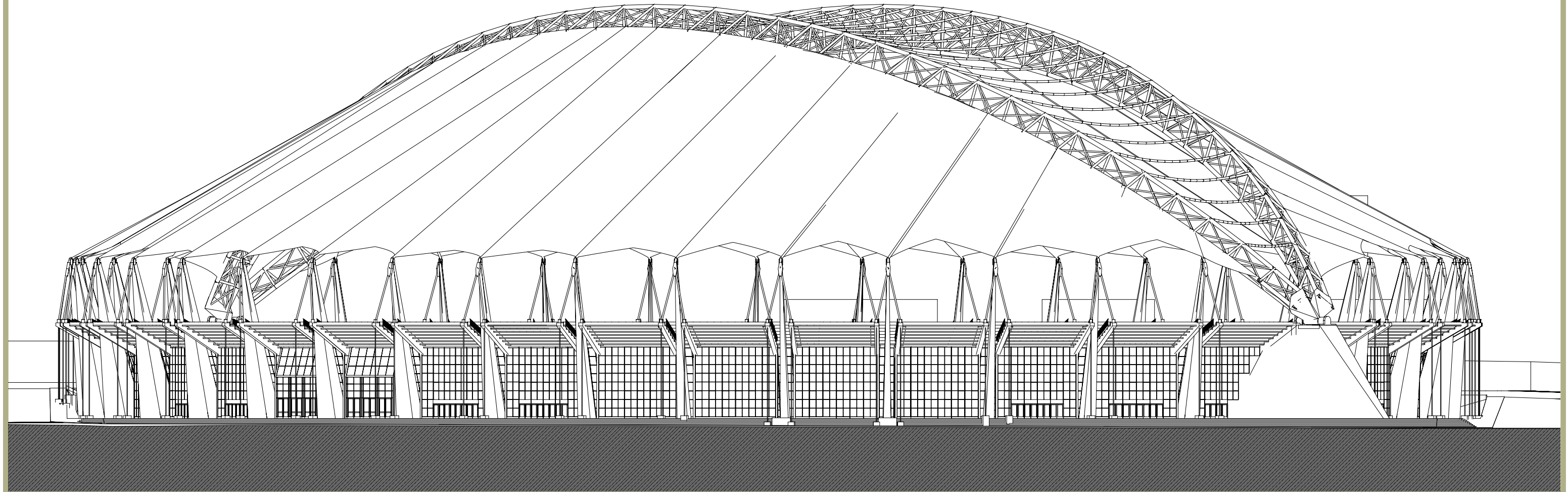


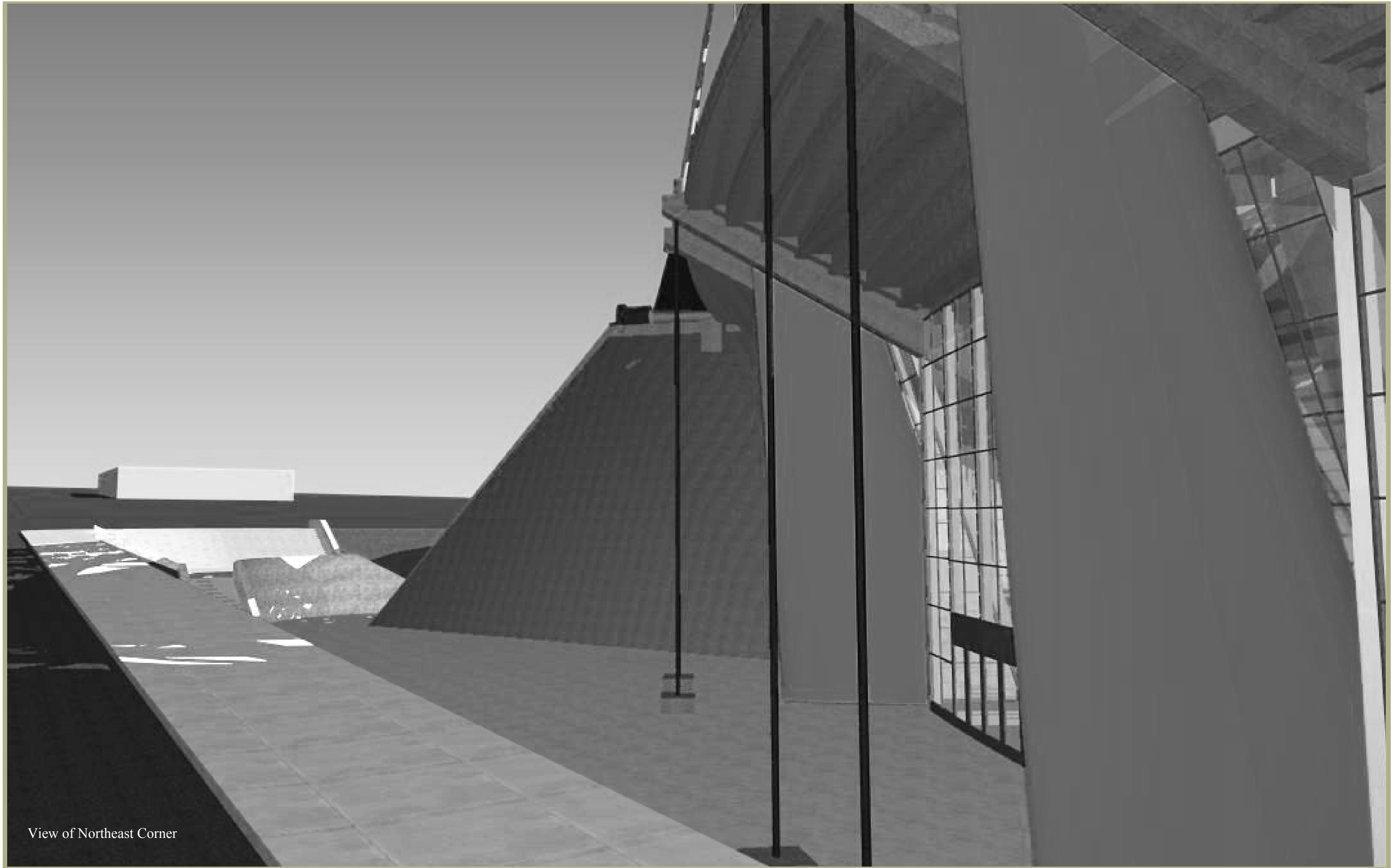
View of Southeast Entry

NORTH ELEVATION
or view from North Temple



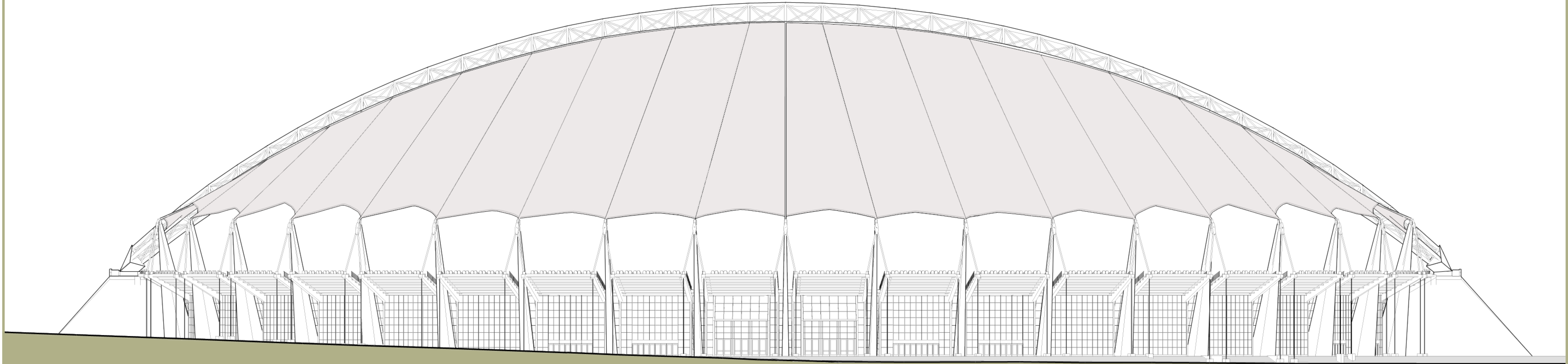
WEST ELEVATION
or view from 300 W



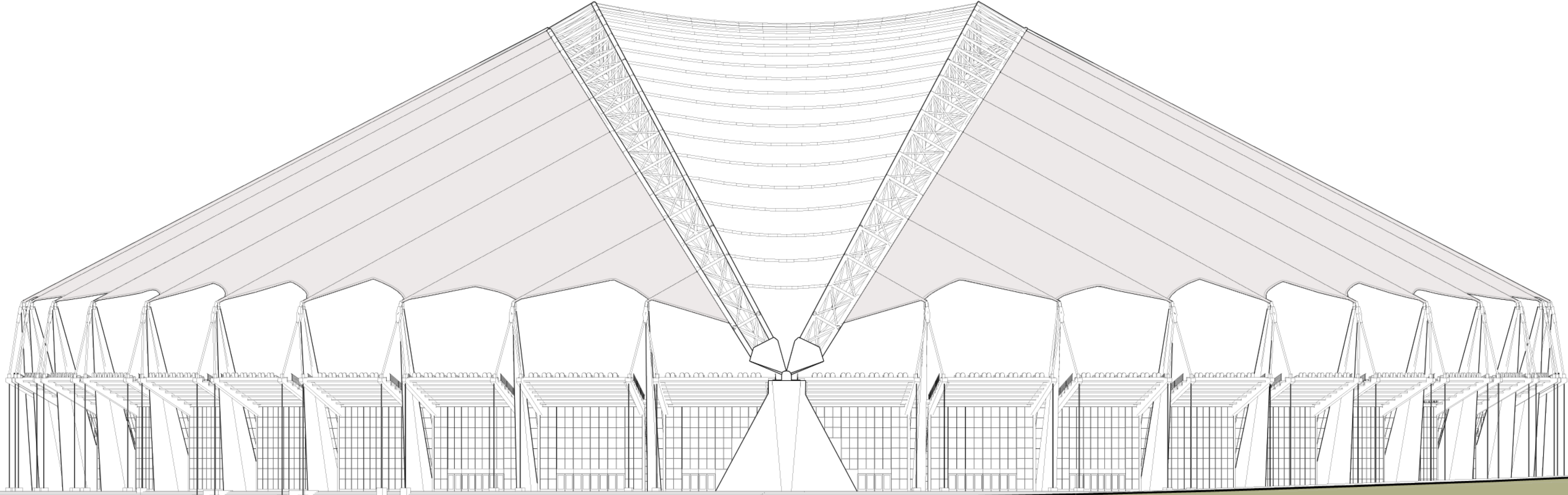


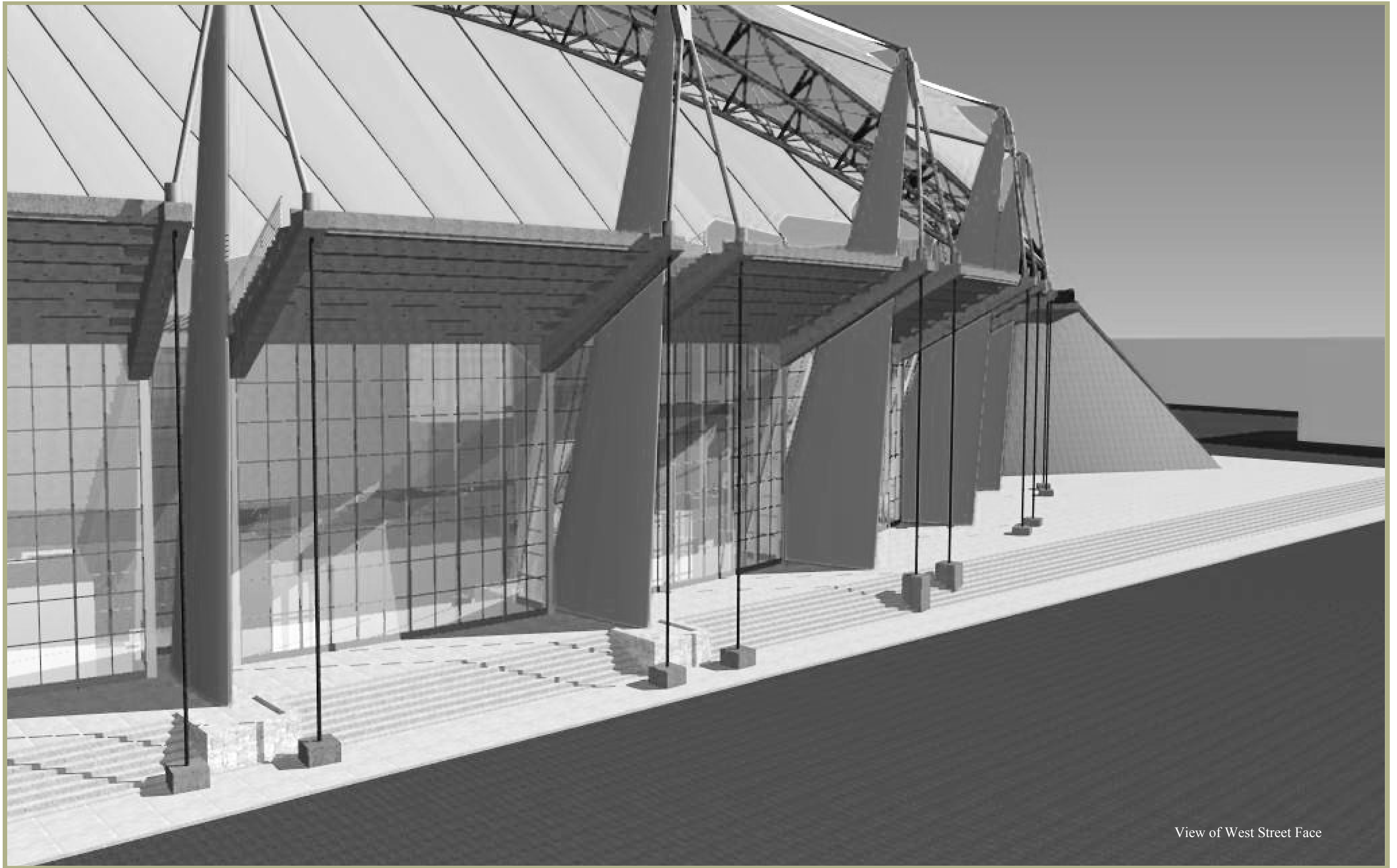
View of Northeast Corner

SOUTHEAST ELEVATION



SOUTHWEST ELEVATION



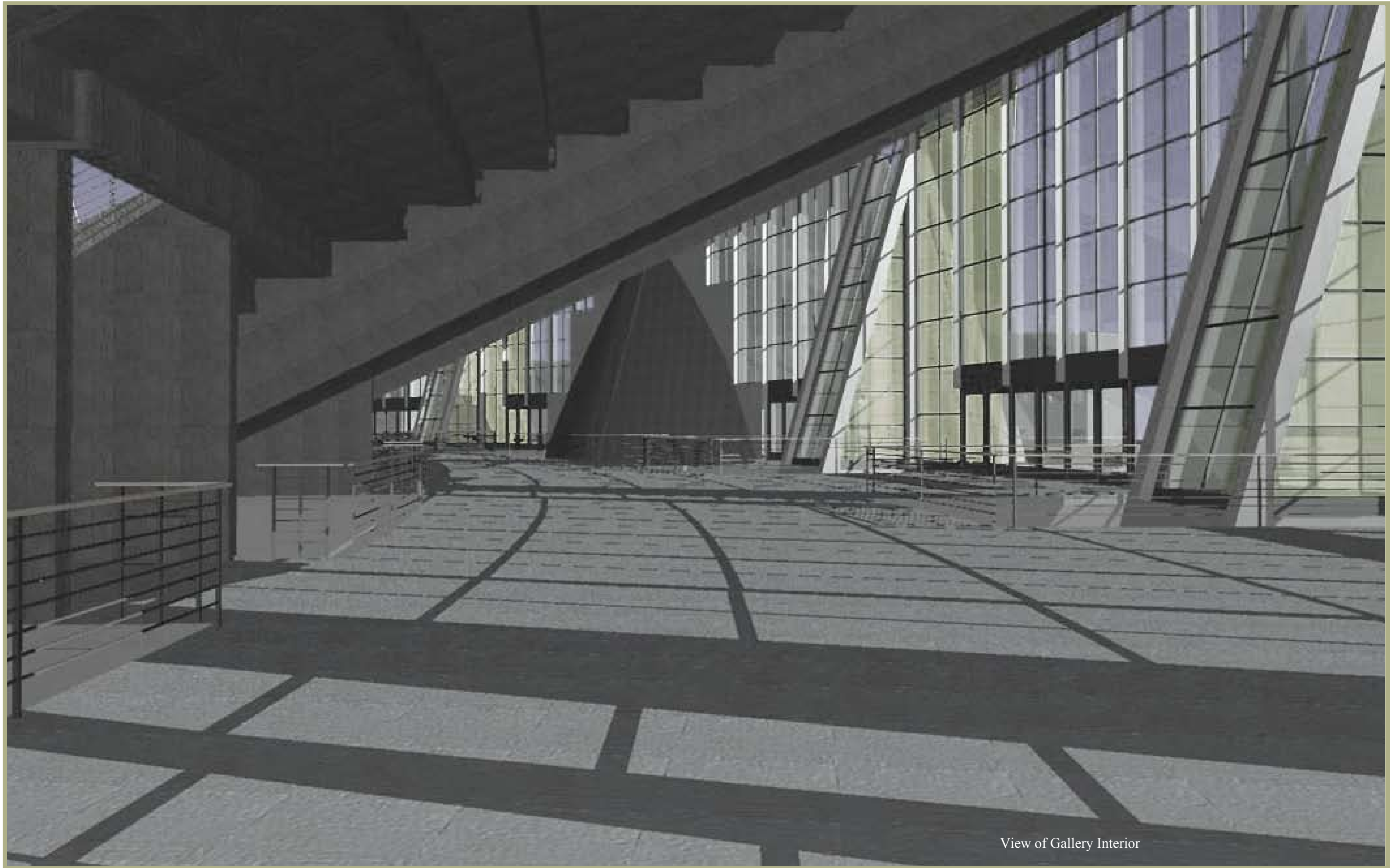


View of West Street Face

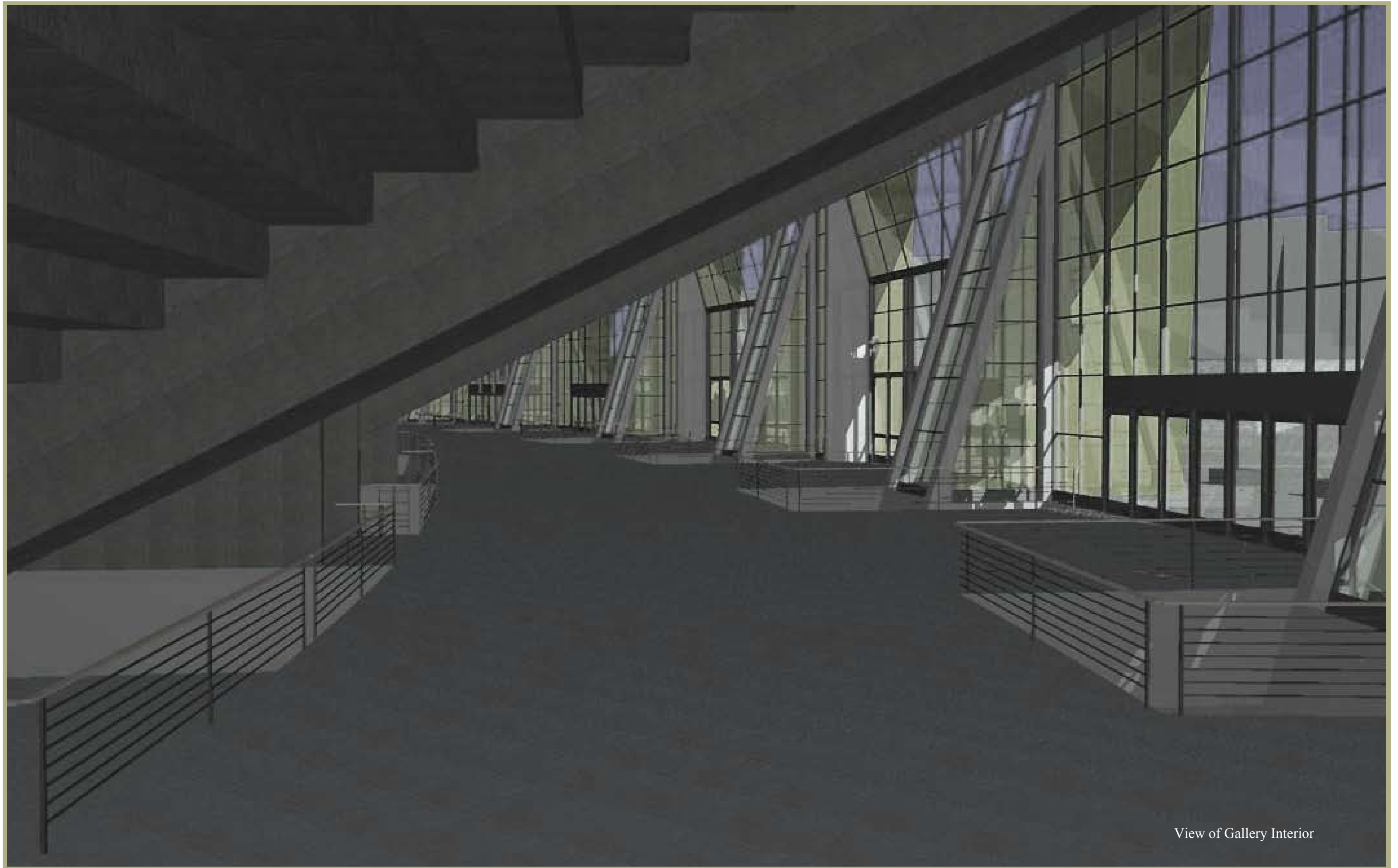


GROUND FLOOR PLAN

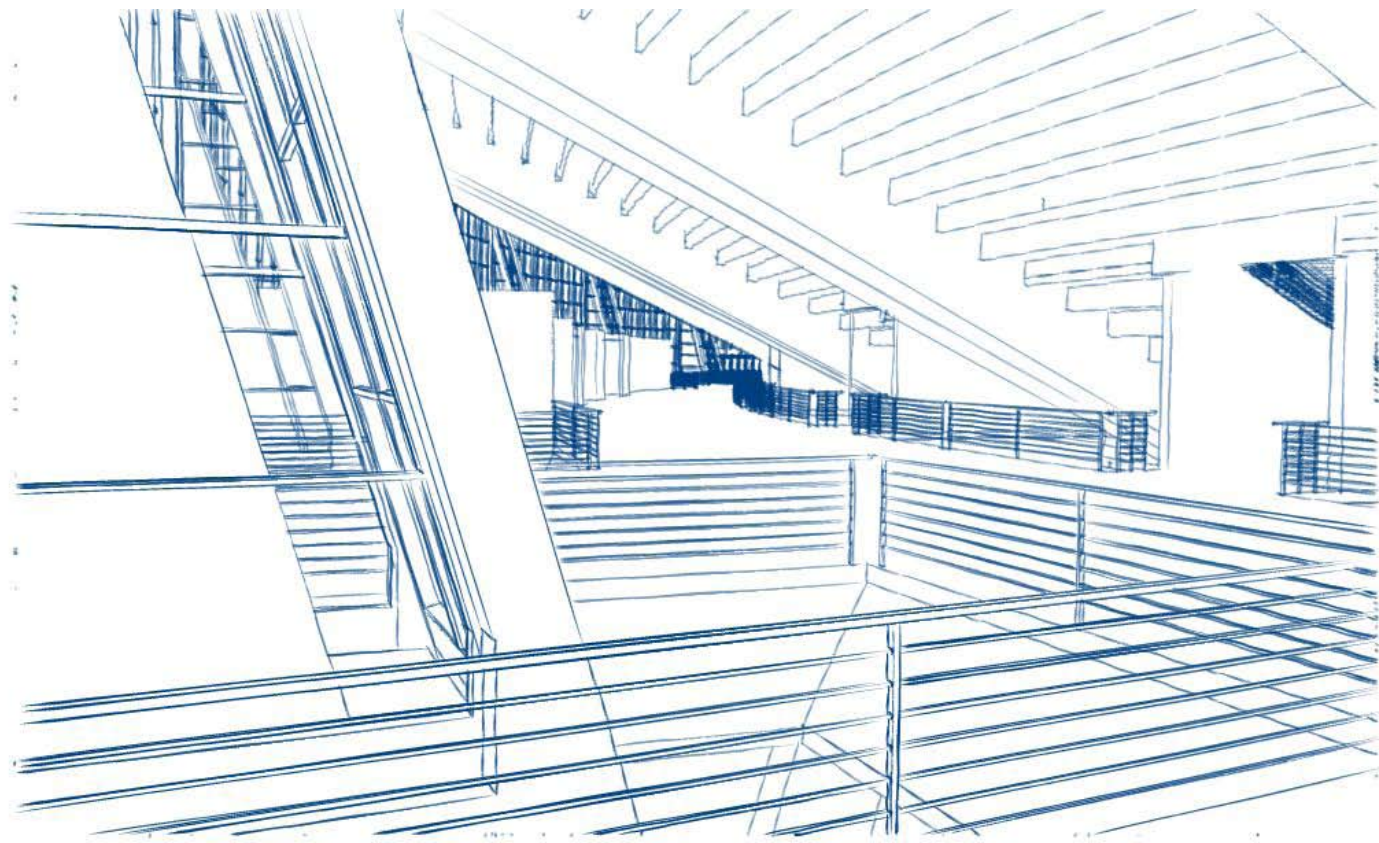
In yellow is shown where the ground floor gallery bridge is including portals to the grand stands and the restrooms and concessions. The entries are on the southeast and northeast sides of the building anticipating where parking decks and transit stops will be located. All other doors are exit only with alarms. Security details can be installed in the entry bridge linking to the gallery bridge as shown by the red line on the plan. It should be noted that the spacing of the masts around the elliptical plan of the stadium are made equidistant because of construction purposes. This also helps to make for a better seating layout.



View of Gallery Interior

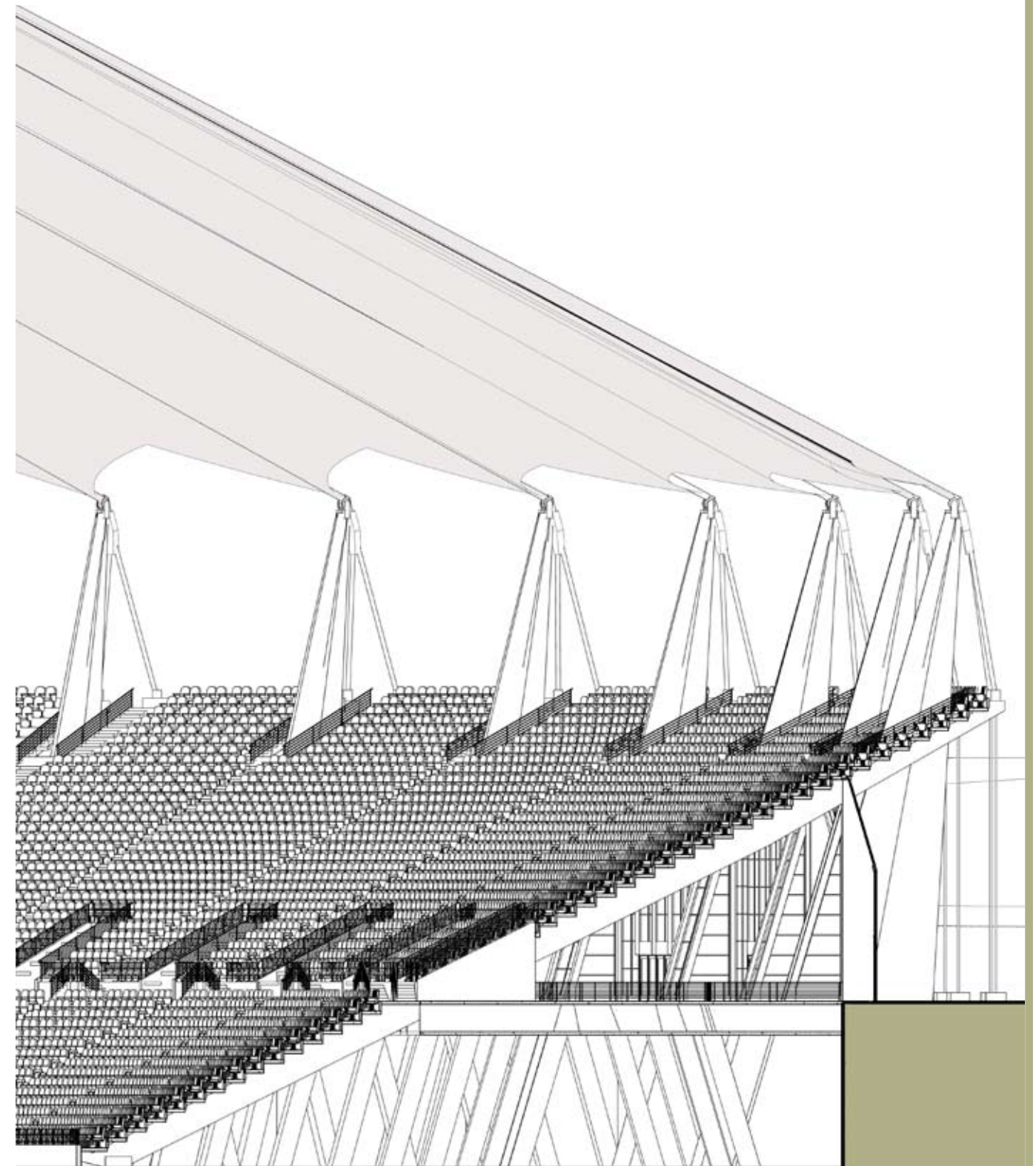


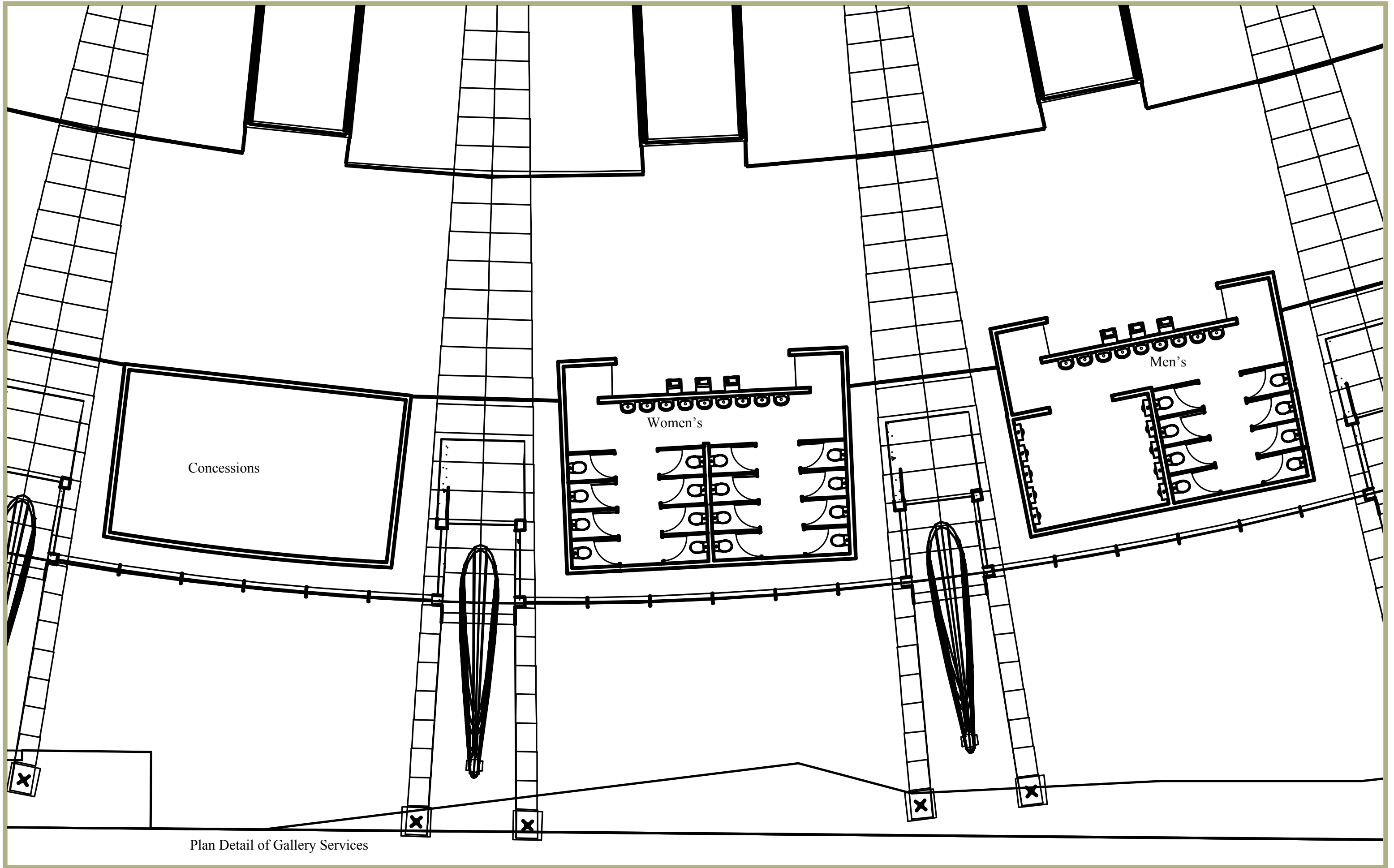
View of Gallery Interior



Ground Floor

At street level, the doors of the facility open to a gallery underneath the grand stands. This gallery is created using a bridge supported simply by canted columns below. As can be seen in the pictures, the piers of the roof and grand stand structure remain outside and the enclosure wall to the gallery wraps around. This way, the enclosure wall can meet the spine of the grand stands and let the piers stand proud. This level also provides rentable space to concession vendors and restrooms for spectators. All spectator portals exit on this level both for traffic flow of the fans, but also for fire escape reasons. This area would be conditioned with ducts running in the cavity of the bridge. Air curtain blowers would be mounted above the portals to the grand stands to maintain thermal comfort within the gallery since the stands are open air. At right, a section is cut through one of the four main entries. Most of the doors on the perimeter are exit only and will sound alarms if opened, whereas the entry doors are twelve foot tall and are subtly pushed outward a few feet to indicate clearly from the street where spectators are to enter and then pass through security.

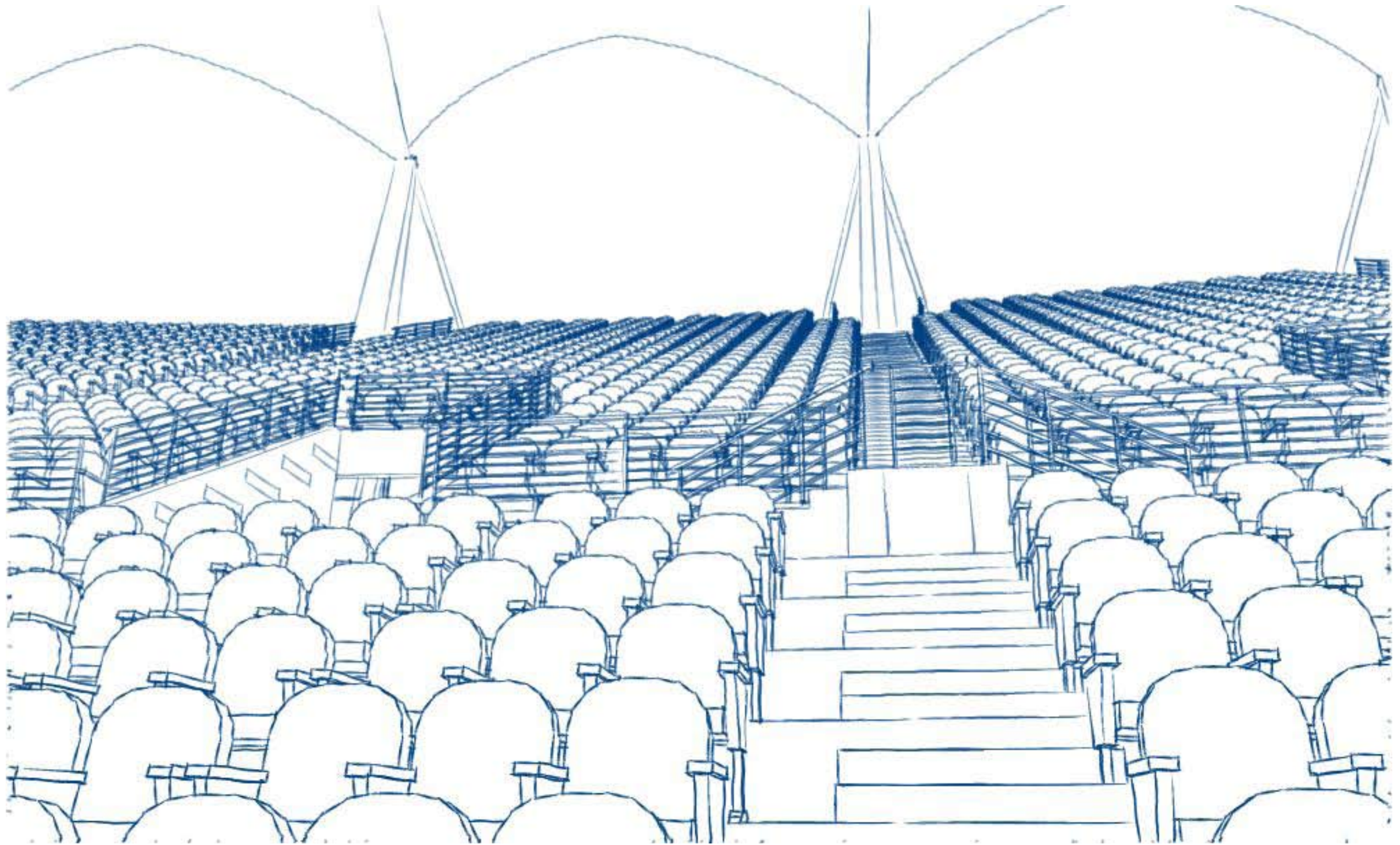




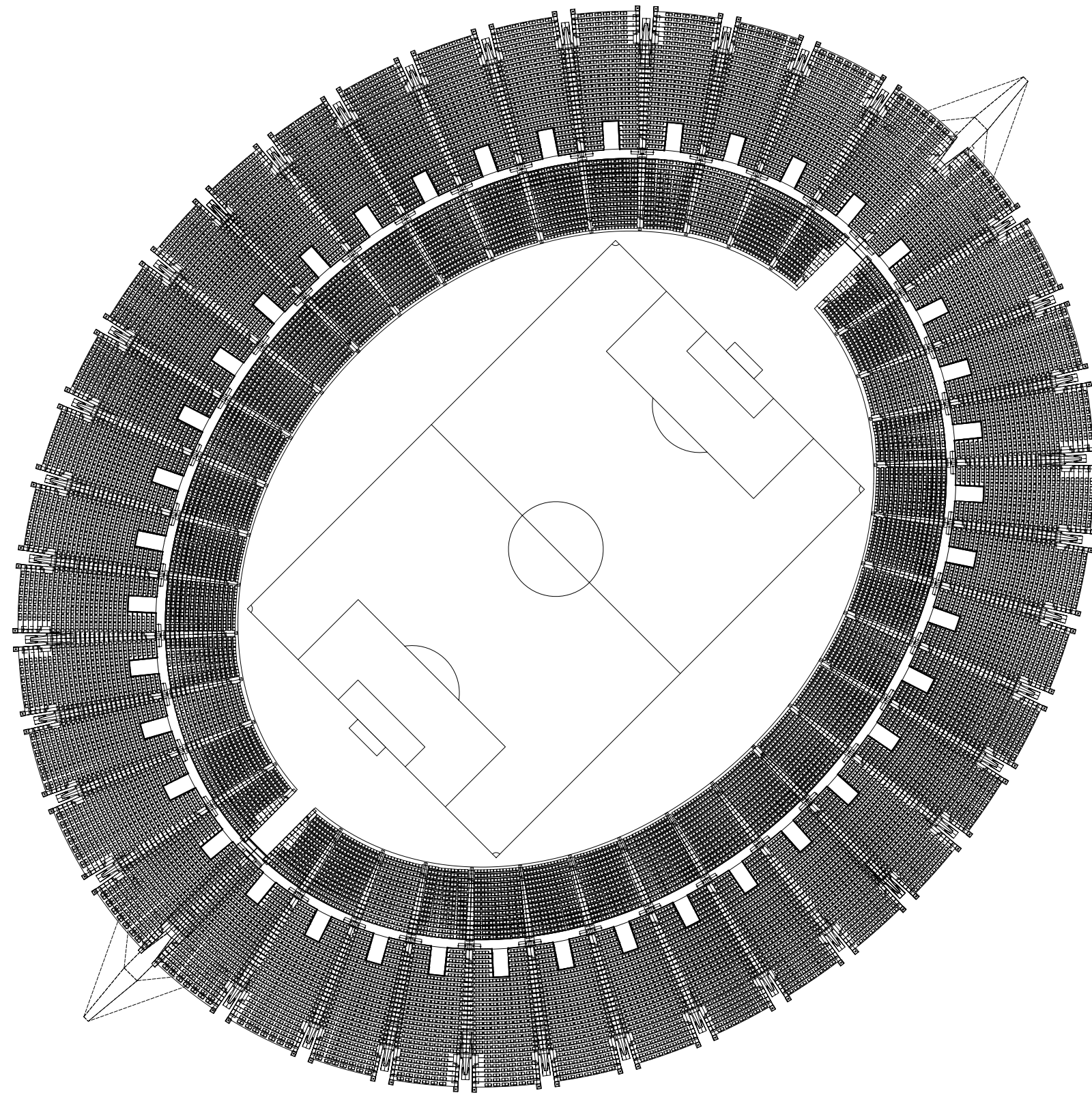
Plan Detail of Gallery Services



View of Gallery Services

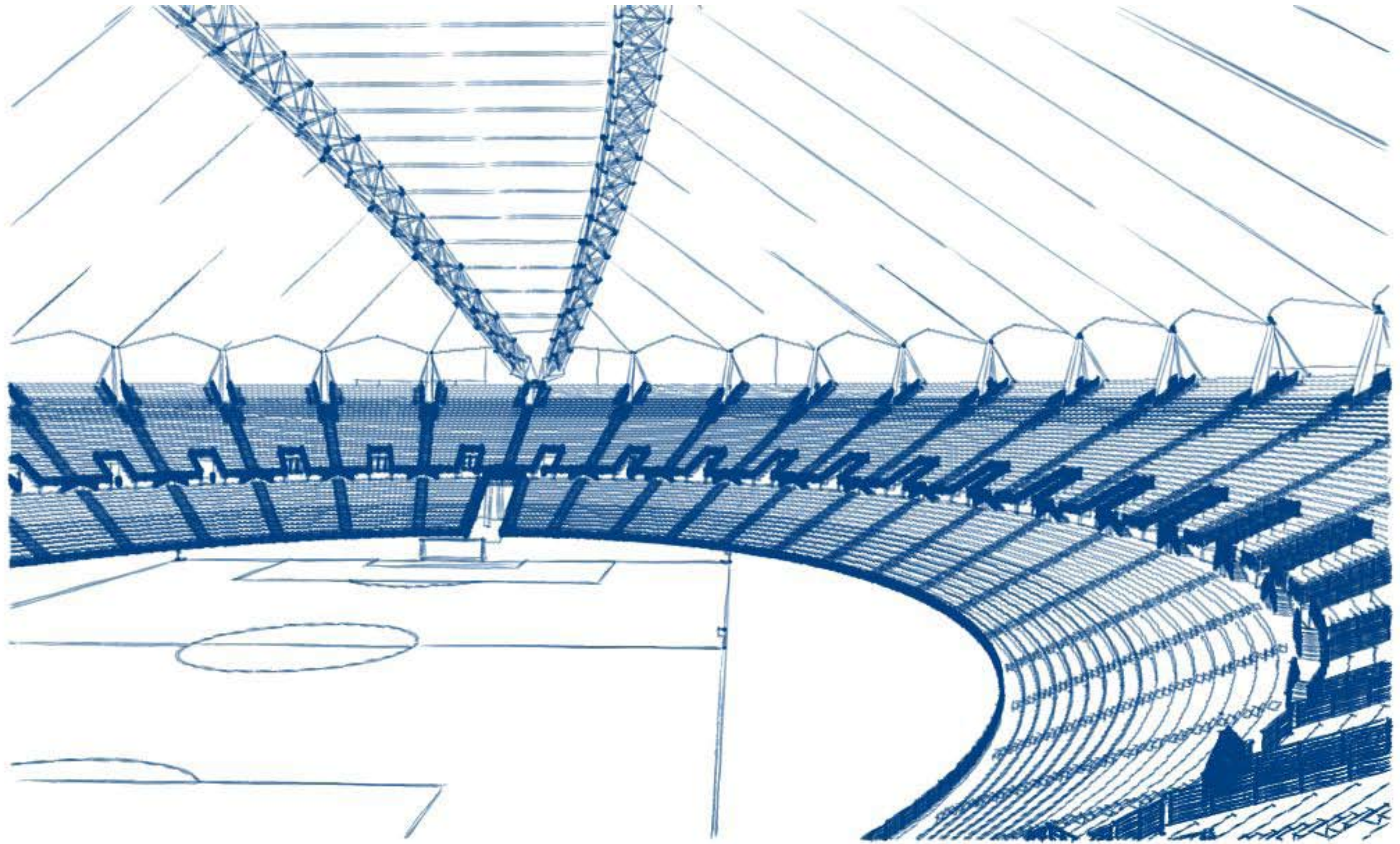


View of Stadium Seating

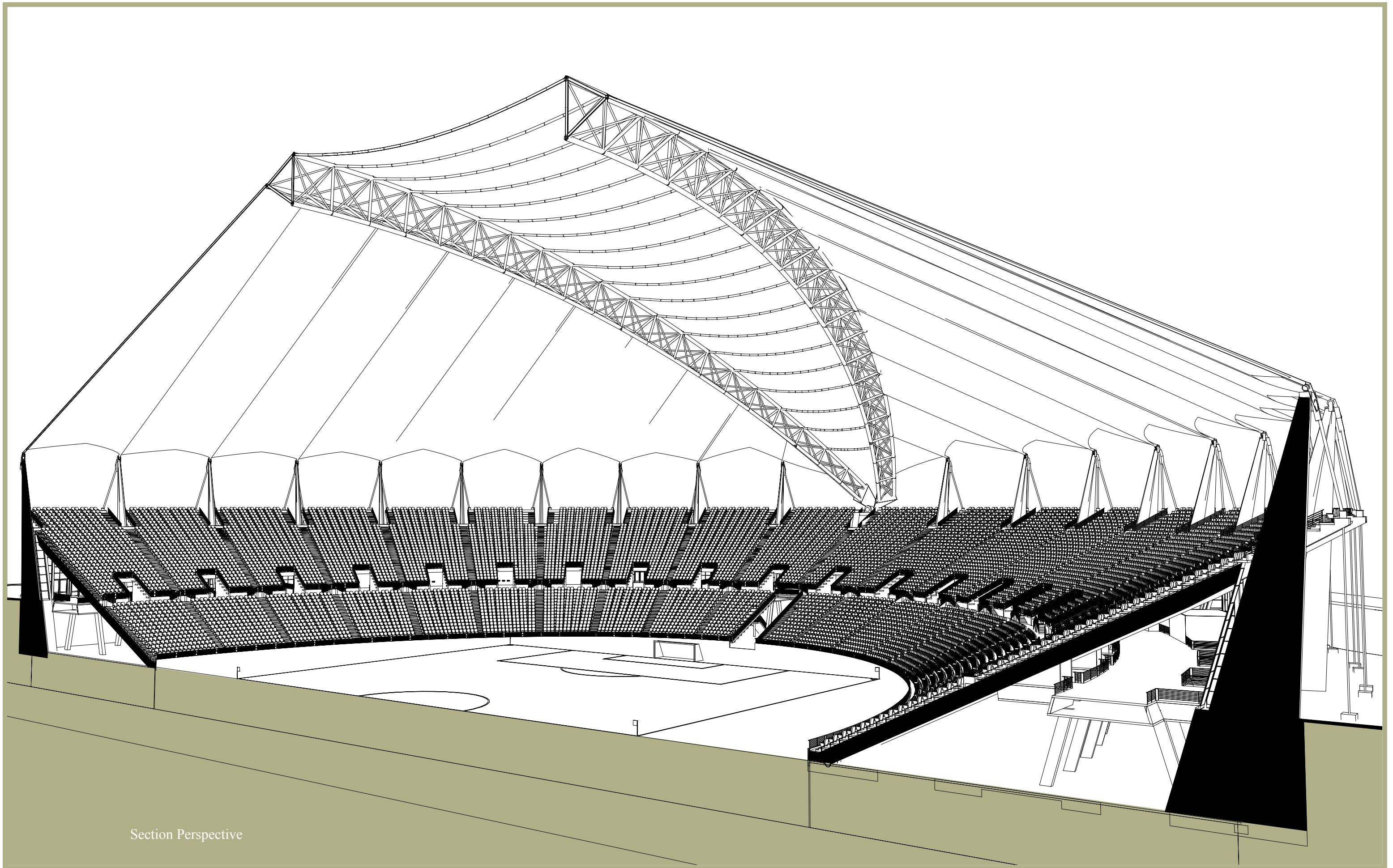


SEATING PLAN

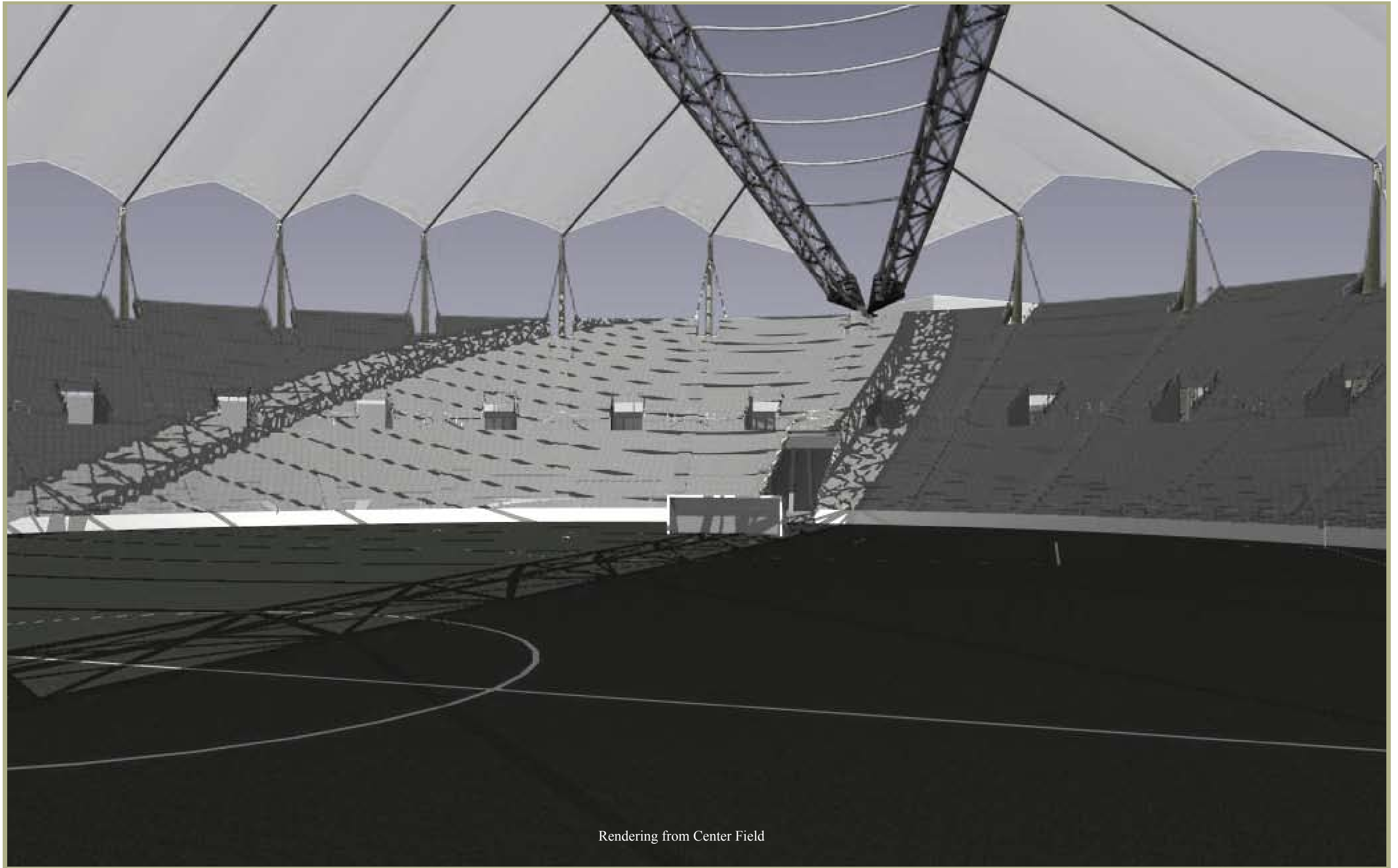
Seating Plan showing all
25,924 seats.



View of Field and Grand Stands

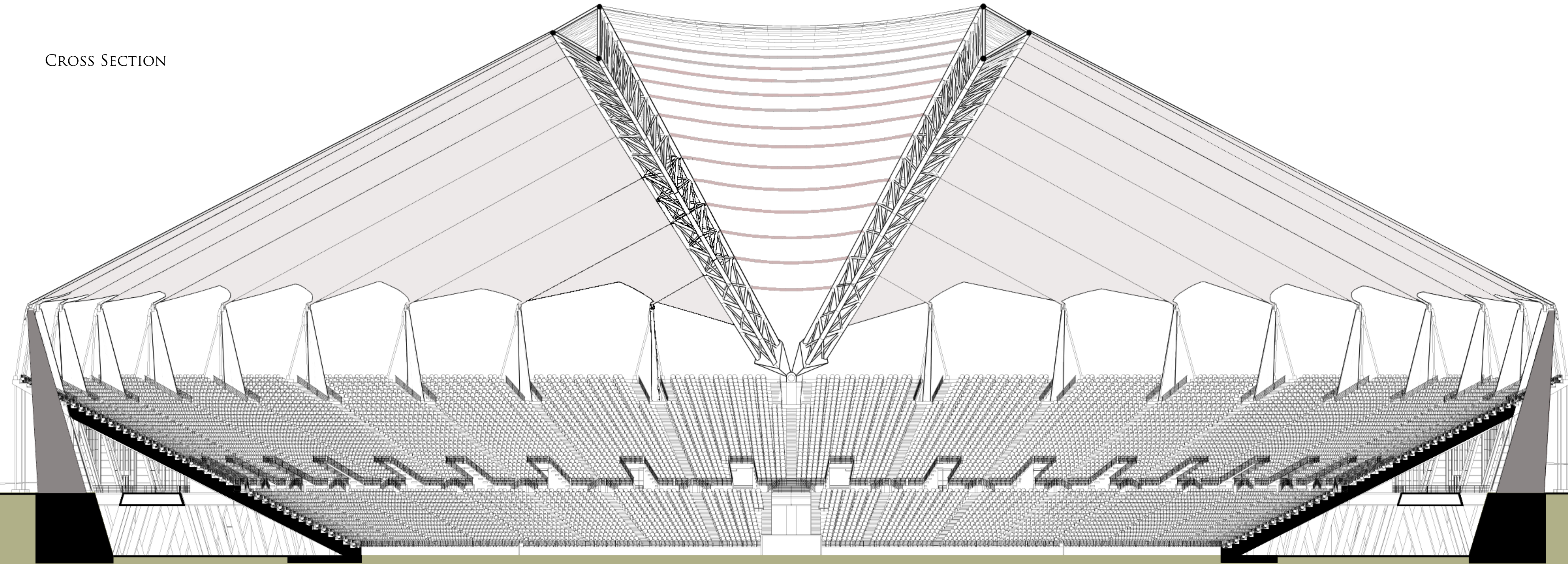


Section Perspective

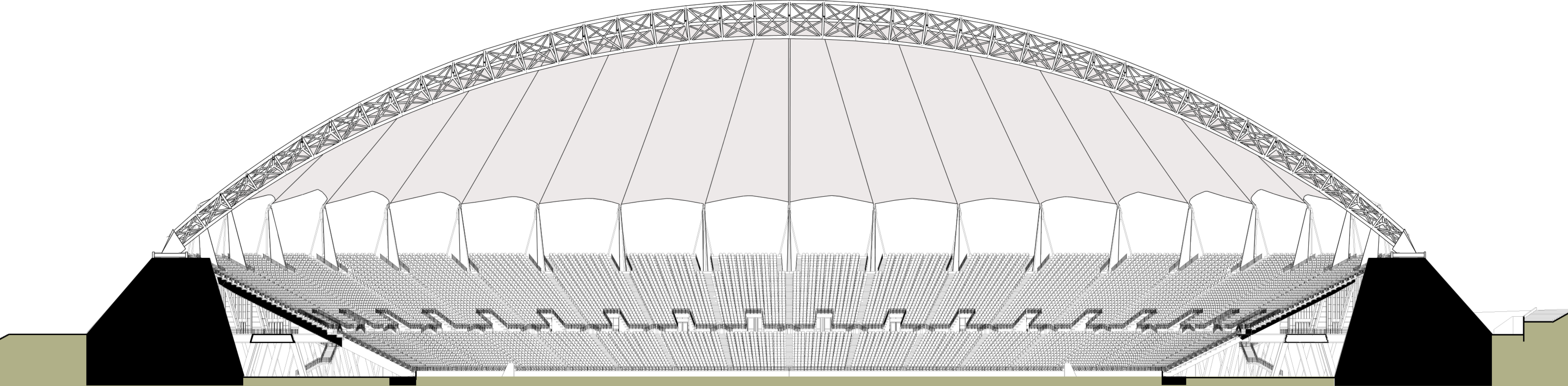


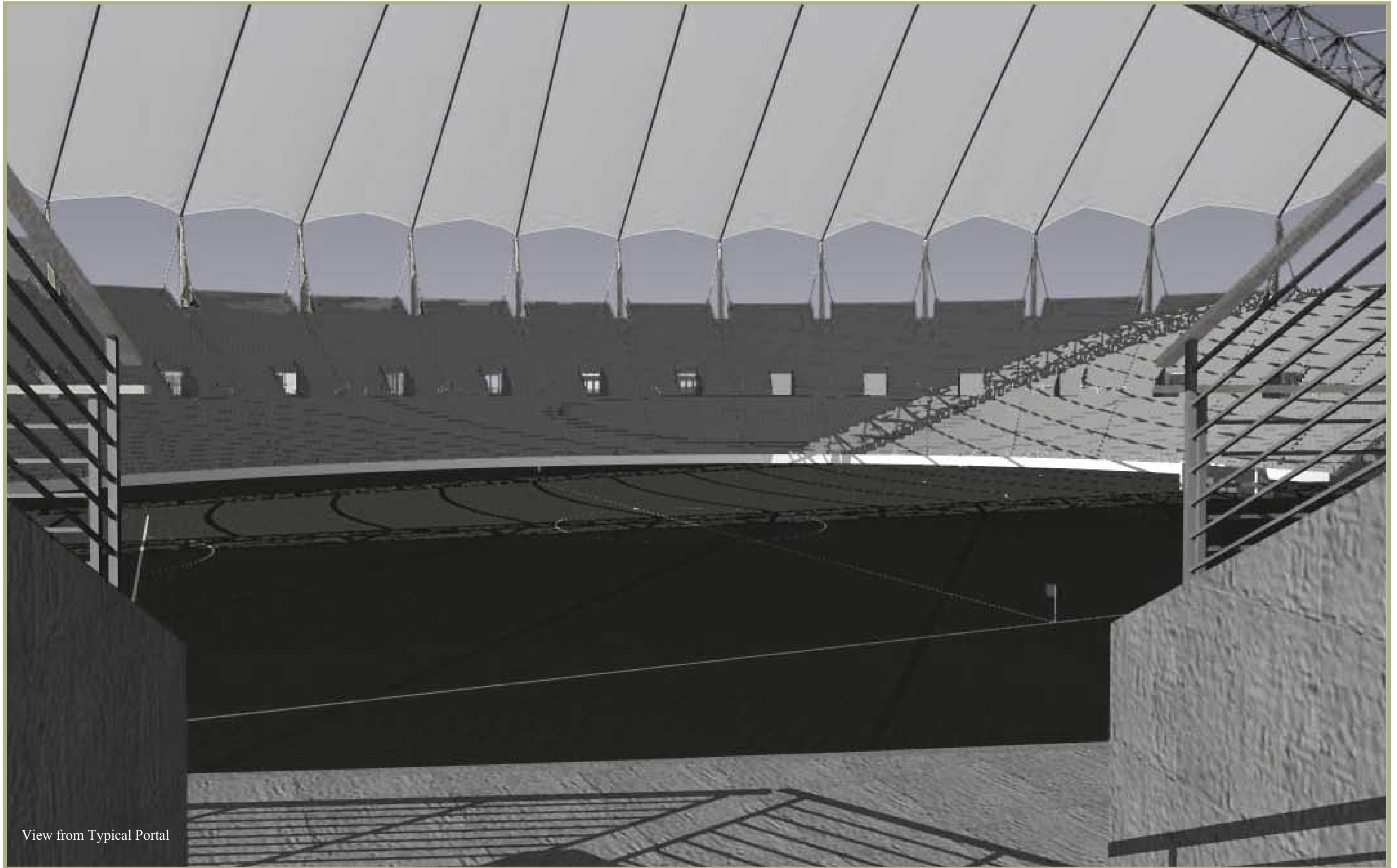
Rendering from Center Field

CROSS SECTION

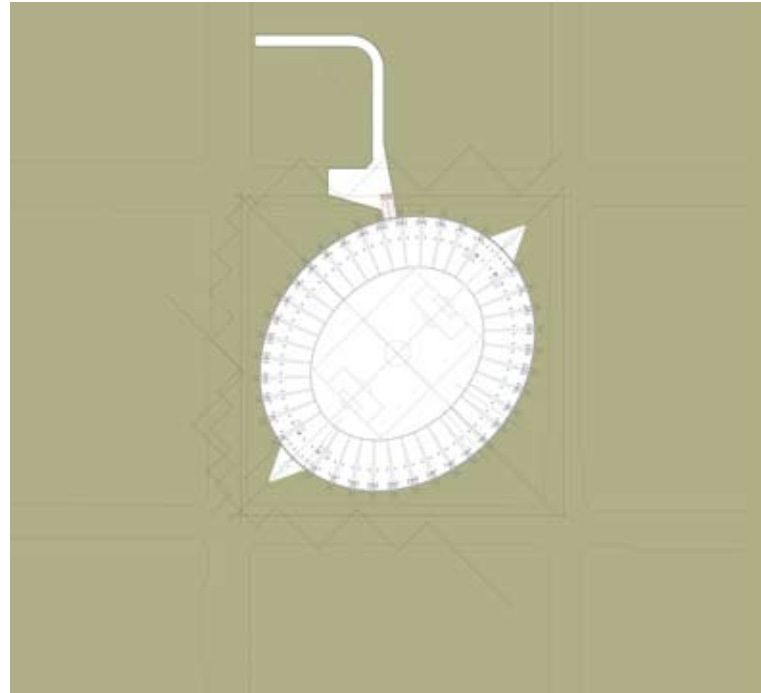


LONGITUDINAL SECTION



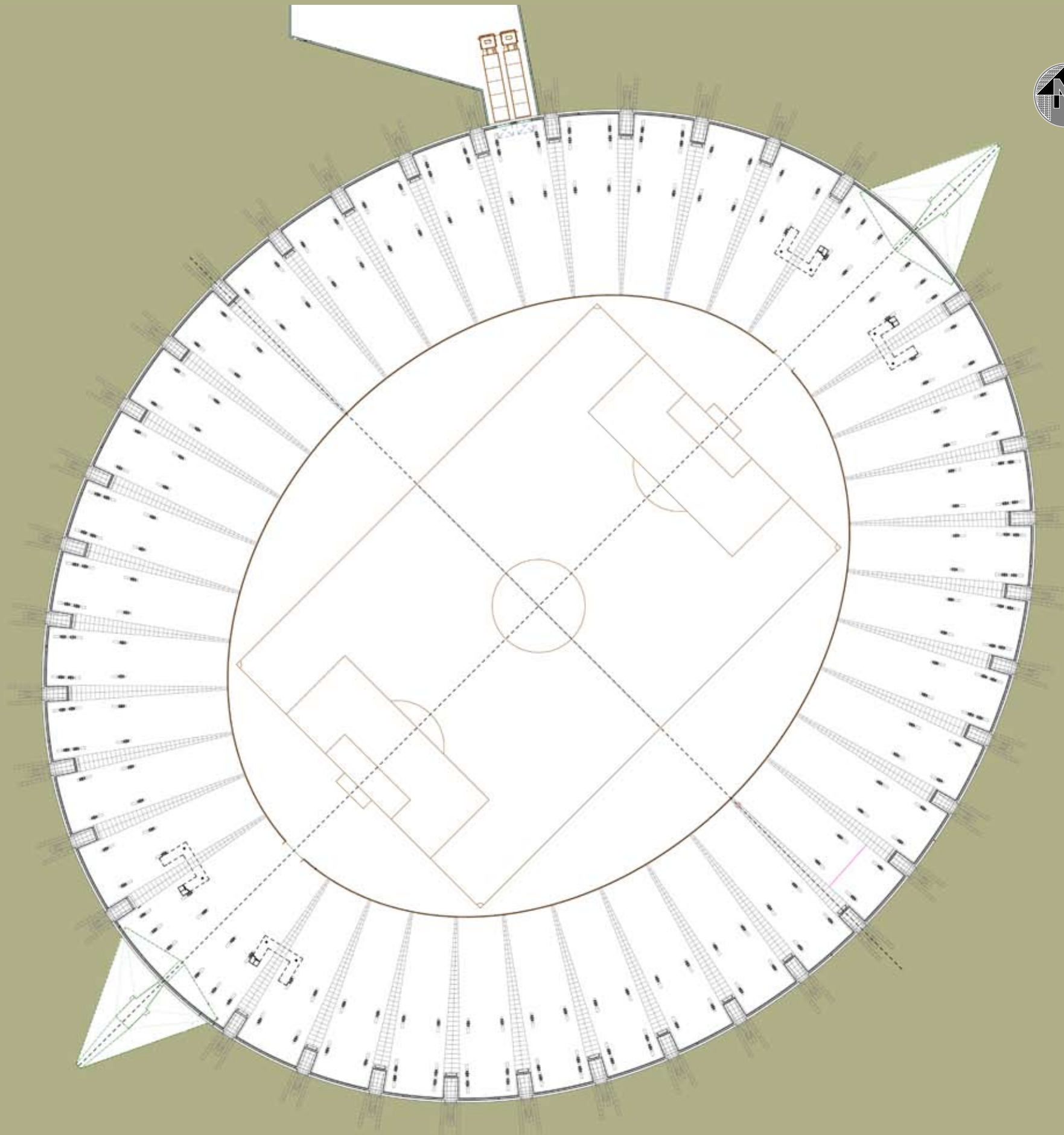


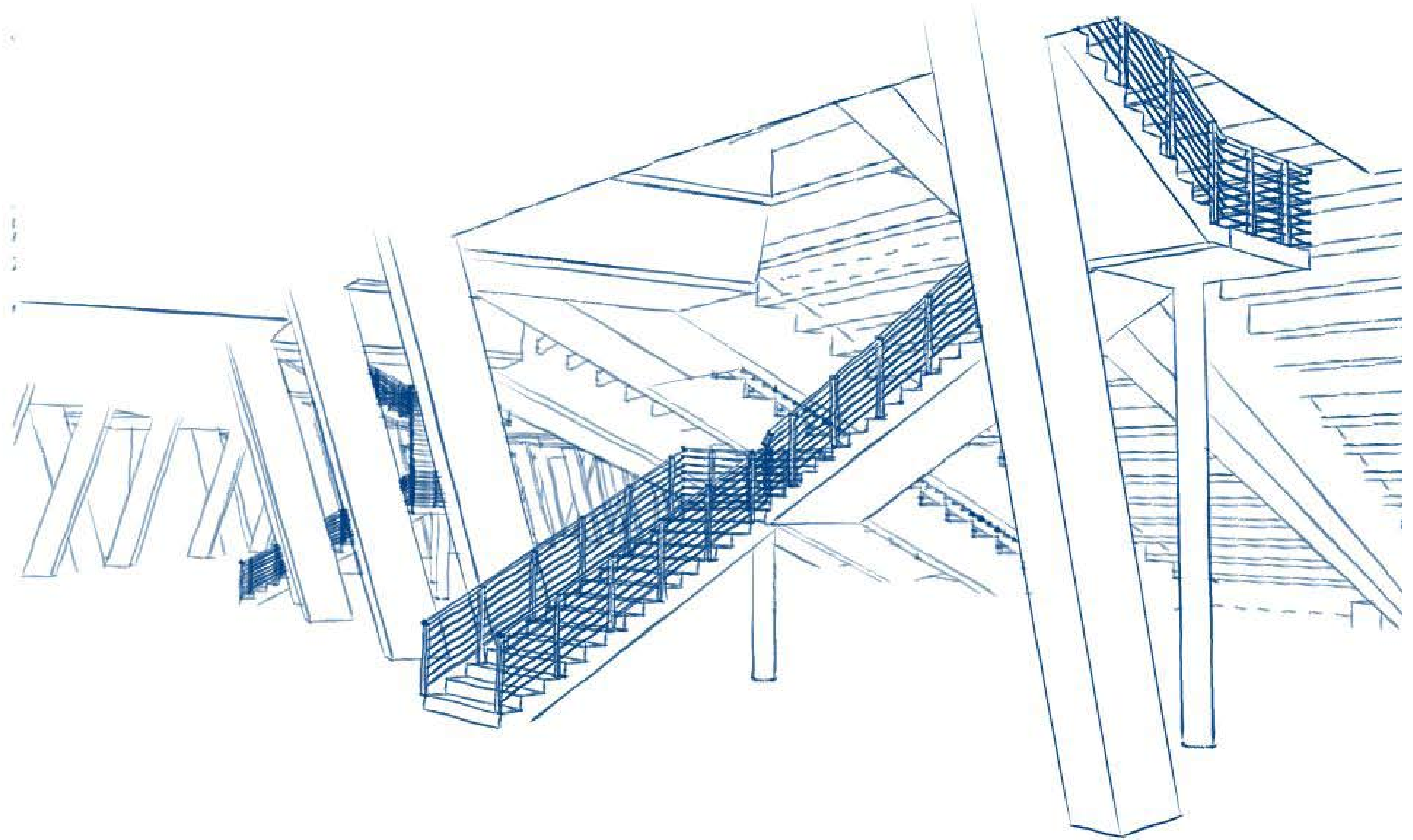
View from Typical Portal



FIELD LEVEL PLAN

Shown to the right is the plan of the field level. This is not a public access area of the stadium, although from the ground floor bridge, visitors will be able to view some of what occurs here. On the northern side of the stadium, an underground truck access provides turn around and parking for team buses, tractor trailers, and other vehicles. The ramp for this underground access is in the block north of the facility. The primary access to the field is through the goal end portals. Locker rooms, custodial closets, and other service zones are purposefully not shown to emphasize that this floor level is flexible and can be changed as necessary. There is also ample room vertically to provide a second floor of services depending on how the facility may be configured.





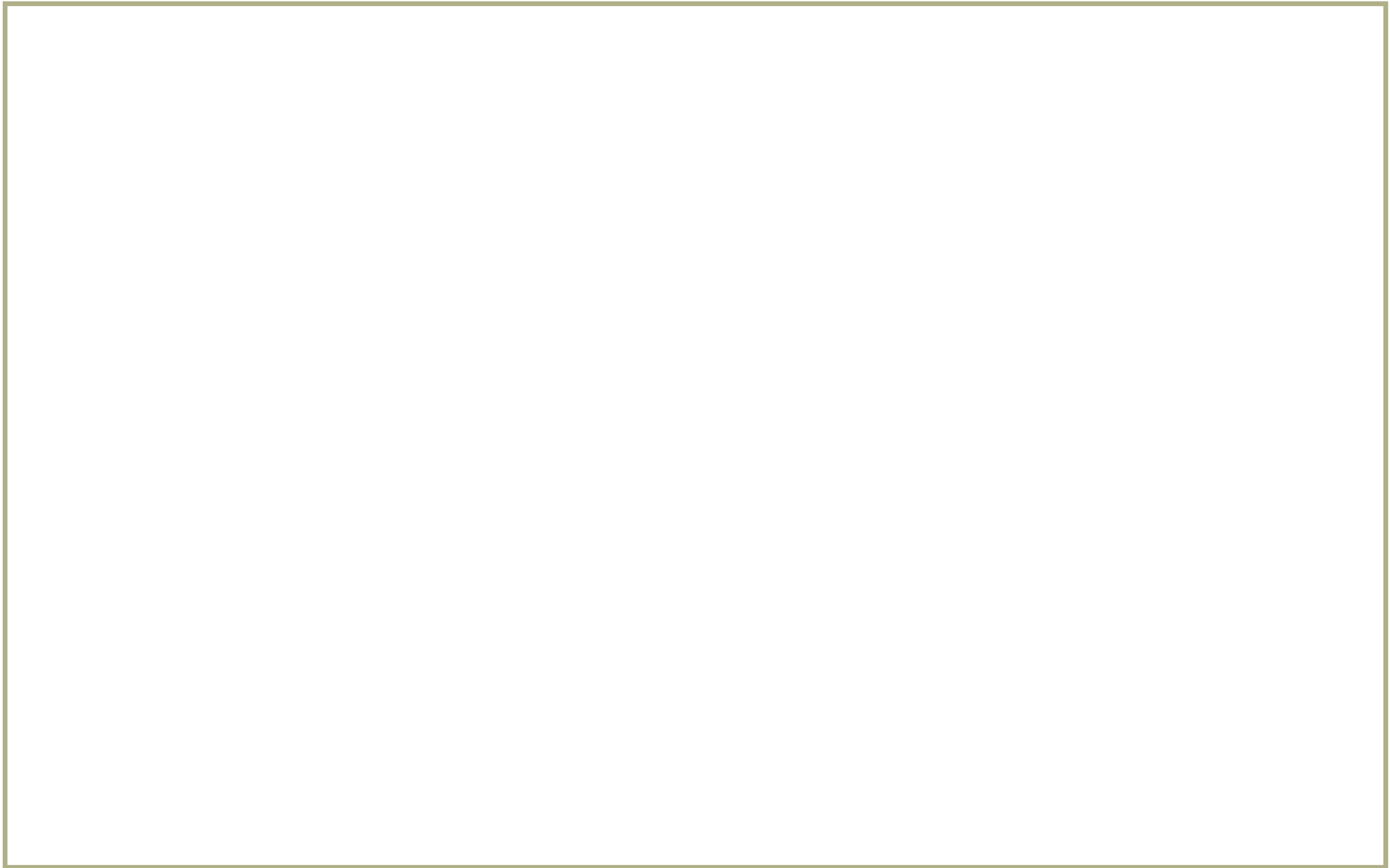
View from Field Level Gallery



Exterior Rendering



Aerial Rendering

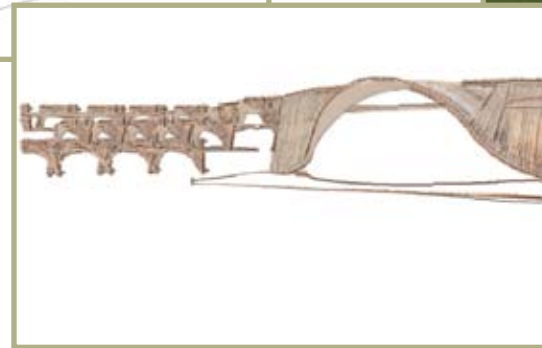
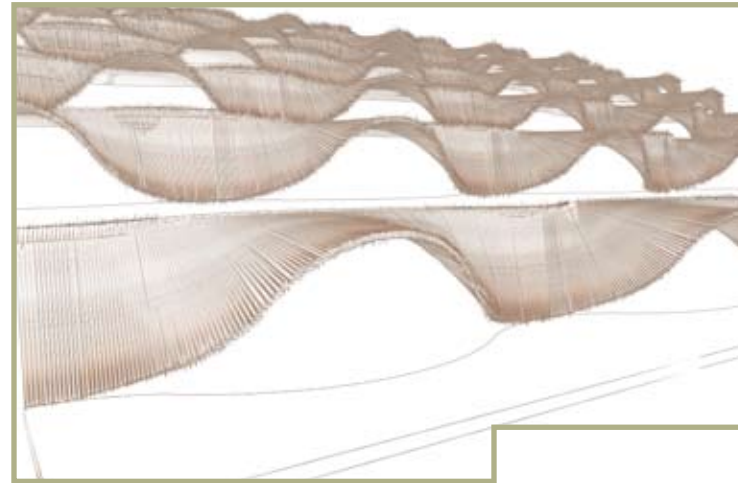


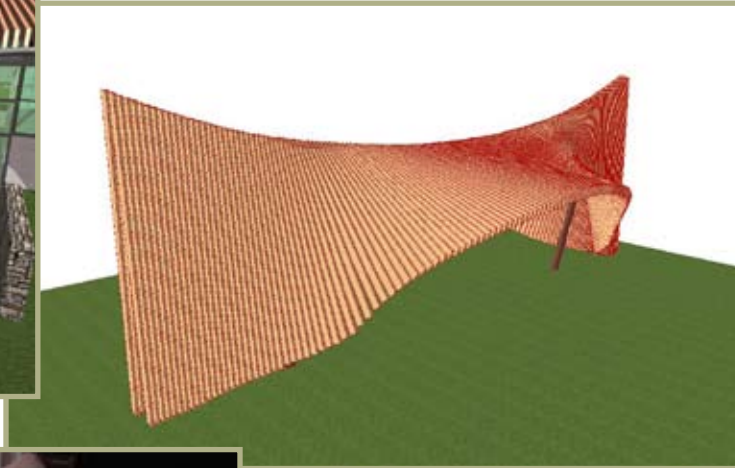
EPILOGUE

Challenges present themselves in many ways. Many people face challenges that are set upon them by external forces and those forces overwhelm them. Some get the opportunity through the beneficence of their family and friends to rise above basic survival and face challenges that are not innate to the human struggle, but are those challenges centered upon higher aspirations. I have been so blessed in my life to have never struggled for basic survival. Never has the want of food, clothing, or shelter been a cause for me to fail. Inasmuch as I have been blessed, humility enters my heart as I consider how so much of what I have accomplished in my life has been because of those who have lifted me up throughout my life.

The word 'thesis' is a difficult one. When I set out to earn my degree in architecture, I knew that there would be a thesis project in the final year. Having a limited understanding of what a thesis project in architecture school is about, I began the process thinking that it is a thesis in the true sense of graduate studies, that is, a research on a question that culminates in a new addition to the body of knowledge within a discipline of learning. I also wrongly imagined that it would be like the scientific method learned in 6th grade science class. Struggling with that preconceived notion, and tirelessly striving to execute an impossible scheme by which I had found myself chasing due to a fanciful notion of how the end product might look without exploring carefully the structural means by which that form might be obtained, I failed mightily in the first several months of my thesis year to produce anything worthy of inclusion. Some of those ideas are pictured at right. I began thinking I understood architecture. I began thinking that I could force success by my will and effort.

Never be afraid of failure, though. By traveling through the depths of despair, not knowing if I could salvage my thesis project, I discovered the truth. I knew it before, but had forgotten. All architecture is structure first. No lesson in my time studying architecture has been as important as understanding that truly beautiful form comes not from artistic fancy, but from understanding that there is opposition in all things and then responding to those forces. Like my self-imposed struggle to gain an architectural education, the construction of a building is voluntary. Life is voluntary. We choose to fight another day and in so doing, we struggle against opposition. Yet as the bonsai tree is made beautiful through careful pruning and its difficult but successful challenge against external forces, architecture is also made beautiful by careful crafting of elements designed to respond to the physical world of gravity and wind.

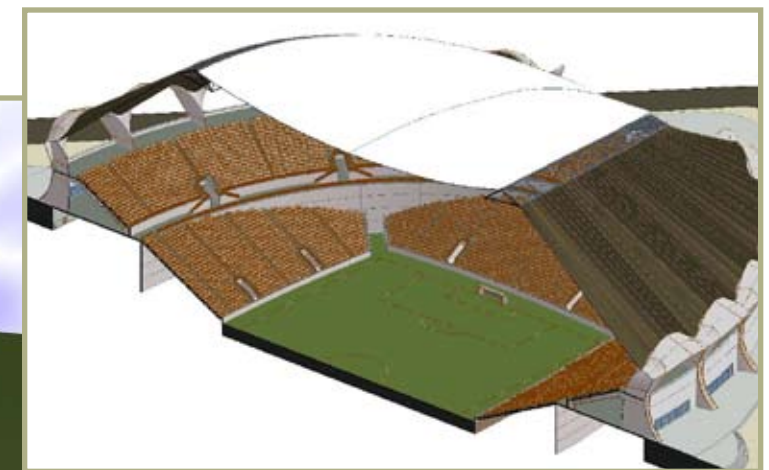
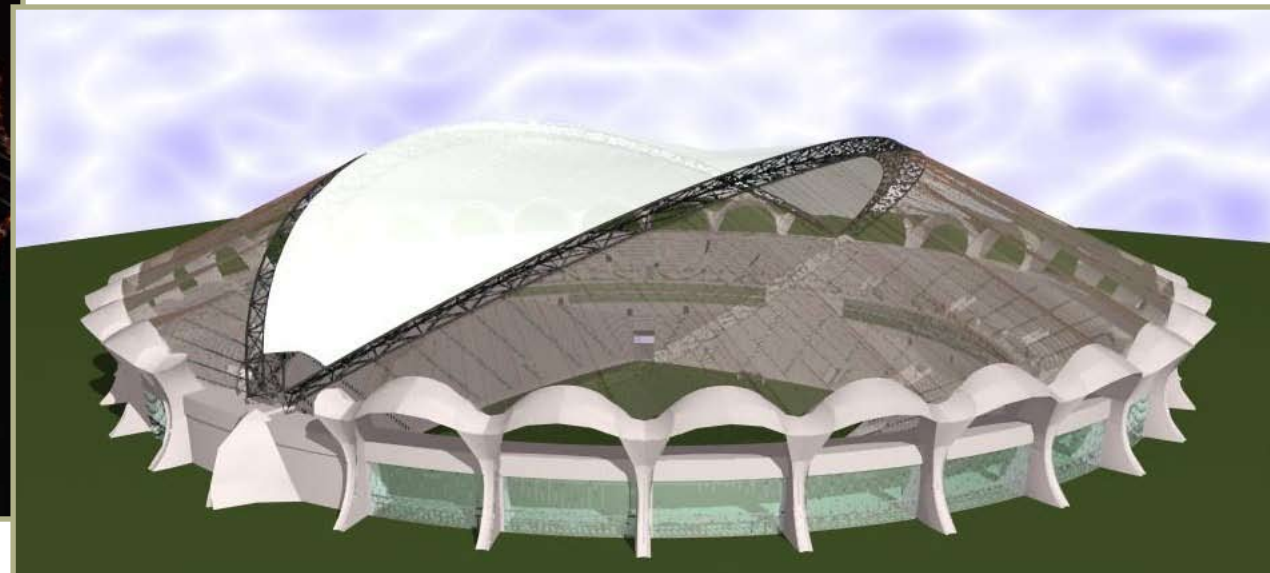
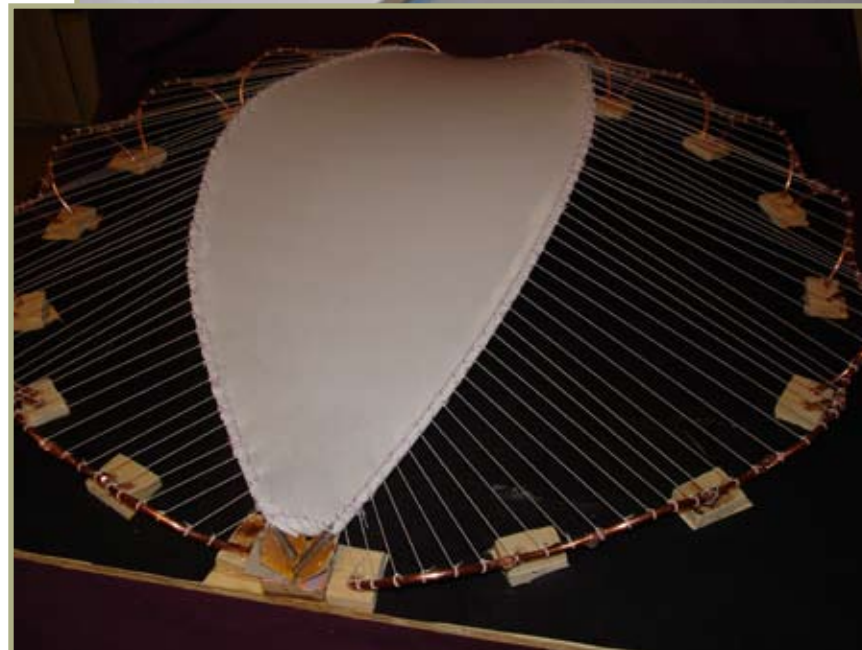
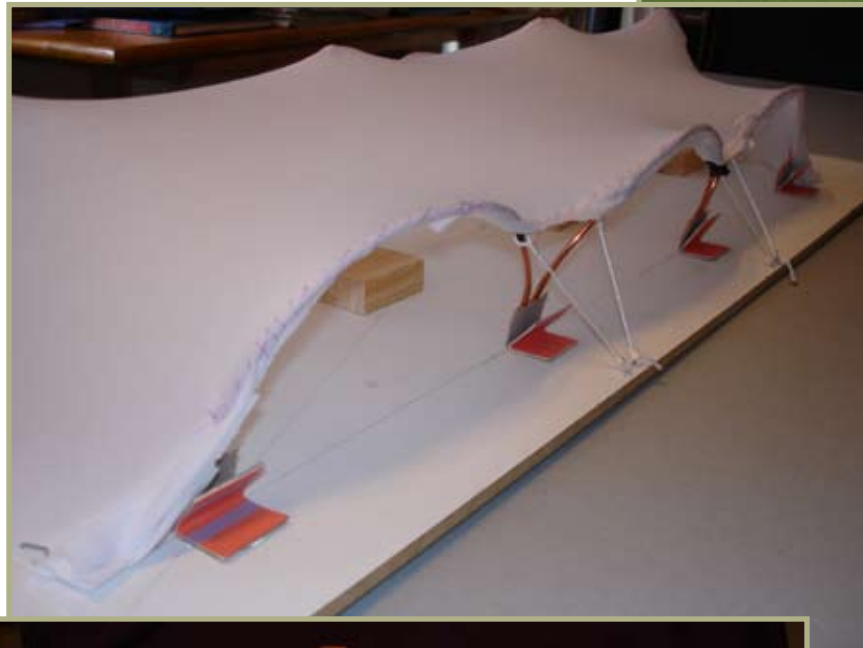




The beautiful life is one lived not in simple survival—for if that is all the effort made, then nothing is left for posterity. If we in the 21st century have been beneficiaries of such great knowledge, learning, technology, art, and philosophy, do we ever ask how these things came into being? The simple hunter and gatherer of the Stone Age knew how to survive and did so. Yet, at some point, a spark of humanity entered his soul and he thought to make his condition better through art and science. As each subsequent generation thought to make their condition better, concern for their children often provided the impetus.

Too often, uninformed people hold the belief that the world was more beautiful before mankind entered the picture—yet in those serene places of natural beauty they cite in their empirical observations, they forget that often, those environments were too shaped by humans desiring to create better spaces. To see the desert bloom as a result of human intervention is truly a beautiful sight. With no struggle, there is no beauty.

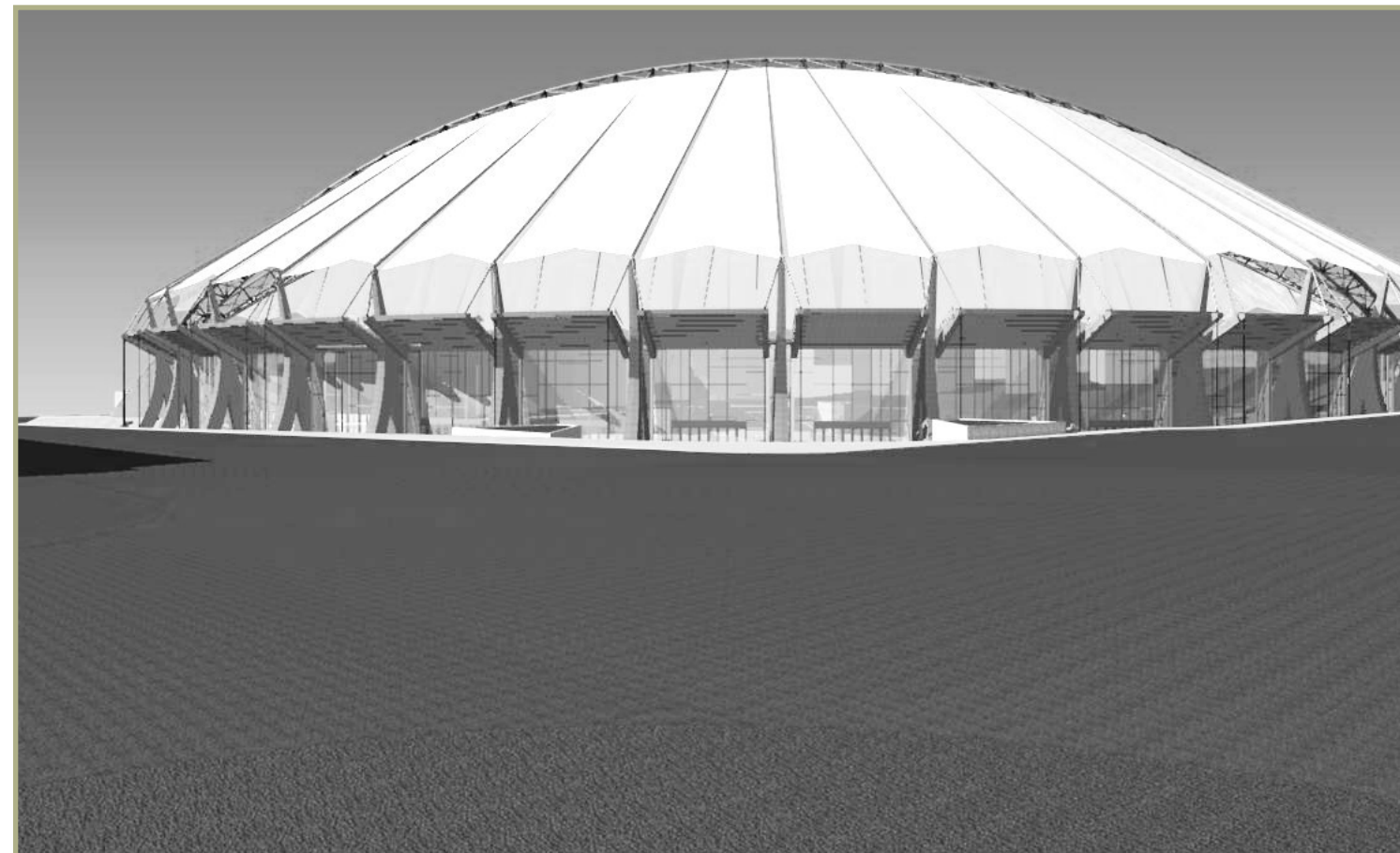
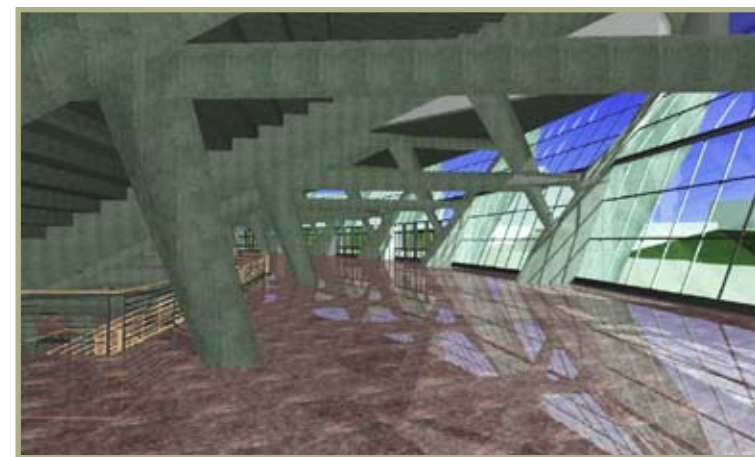
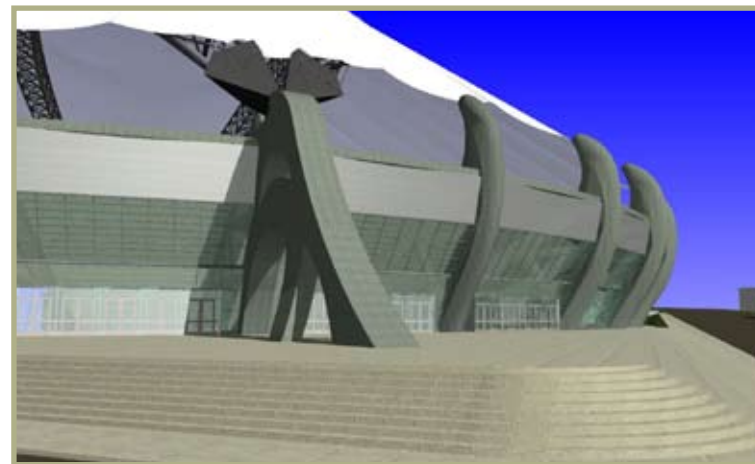
Coincidentally, the purpose of the facility I have designed and shown in previous pages is one by which there is no necessary struggle either. It is all voluntary. Yet the drama that unfolds there in each ninety minute game is one of beauty brought about by the culmination of struggles of twenty-two men. The most memorable scenes the spectators will carry home with them in their minds will undoubtedly be those moments when an individual manages to successfully oppose natural forces and human forces to set a ball in motion in a beautiful path into the goal. This voluntary struggle has nothing to do with survival, but neither does architecture. Shelter, the generally accepted third member of the triad of needs for survival, can be found without human built form. Yet it is the voluntary struggle to create spaces that provide the inhabitants with a beautiful life that produces architecture.

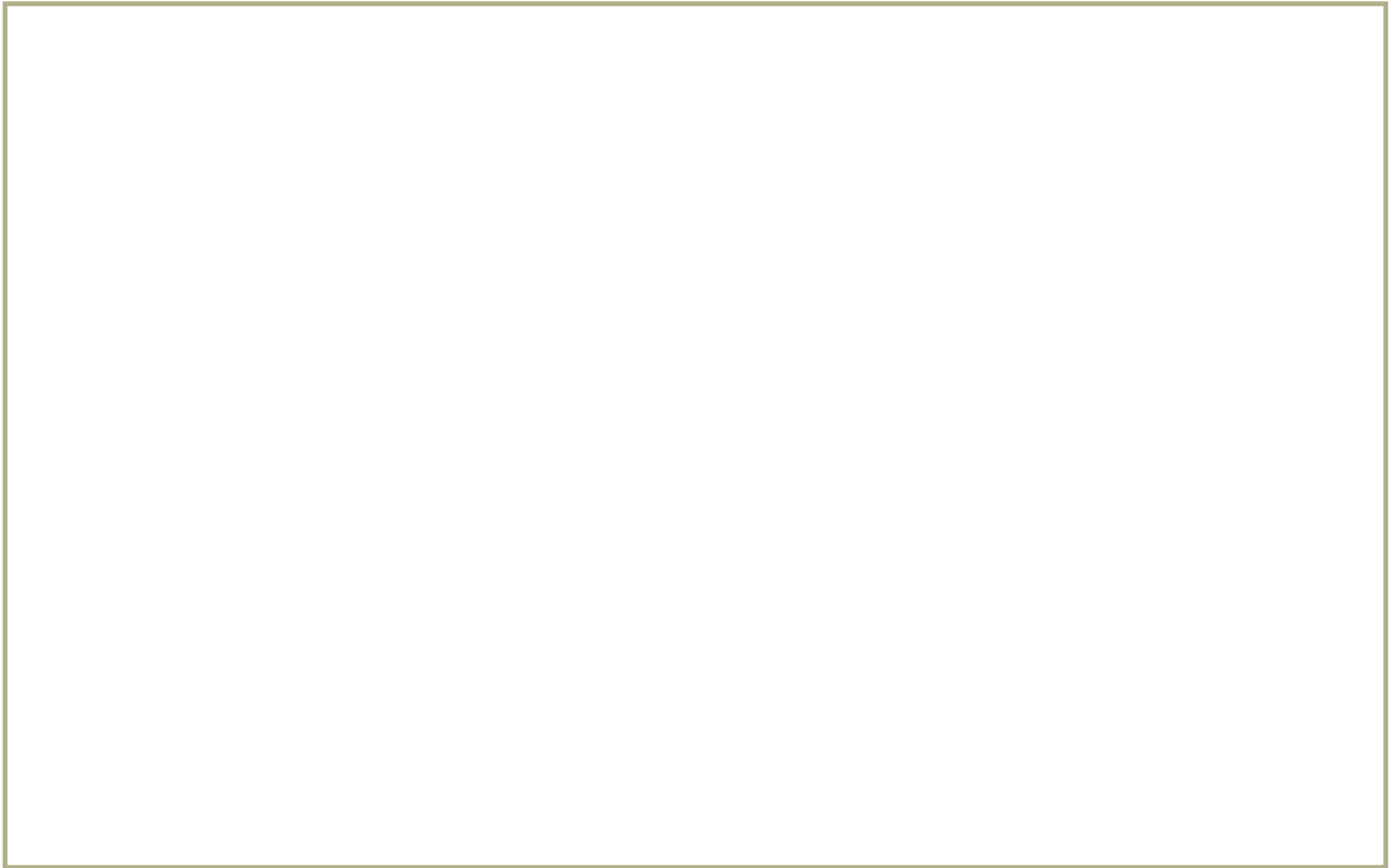




At one point, I had begun to believe that architecture was nothing more than the work of a master builder, or in other words, a direct translation of the original Greek root words. I was feeling jaded. What did it matter if we call all buildings architecture? Yet deep down, I knew that was not true. Though technically accurate to say all people are human, I cannot call the actions of all people human for if I did, I would have to accept rape, torture, and murder as acceptable human behavior. The same is true in architecture: just because an architect builds it does not make it architecture. Why this dichotomy? Why does it matter? It matters the same reason why we strive for excellence in our personal lives: we desire a better condition and such improved lot in life can only be obtained by striving for excellence. While I readily admit what I have presented in this book is not excellent, note I said “strive for excellence.” We seek after happiness in life, too, but it is a struggle to attain it.

So what is architecture, then? Can we even define it? At this point in my life as an architect, I suggest that architecture is like a Platonic form, meaning it is an ideal that in its physical reality can never be obtained. For a building to be called architecture, it must not necessarily reach that ideal, but be in the pursuit of excellence to a degree that exceeds the average. It is an incremental lifting of the standards. Thus, it should be better than what has gone before.





REFERENCES

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