MINIMALISM, TECHNOLOGY AND OPPORTUNITY

DEVELOPING A NEW OLYMPIC PROTOTYPE

SIGNATURE PAGE

A Design Thesis Submitted to the
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of North Dakota State University

By

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THESIS ABSTRACT

It is very important as designers to make design decisions that not only effect and create results for the immediate, current situation at hand, but it is also our responsibility to create and design with the intention of fostering an always changing, constantly adapting, sustainable environment that protects, conserves and even harvests our natural environment and preserves it for the betterment of our future generations. With that being said, we designers also have the responsibility of designing a place that has the ability to move its inhabitants emotionally and physically through the space without compromising its functionality. An exorbitant amount of money and resources is invested into designing and constructing stadiums of this day and age. However, most of the time these investments are not fully recovered as the stadiums fail to remain effectively operational regularly throughout the year or even after the major sporting event has concluded. This leads to a massive structural space that is unable to generate enough of its own resources to keep the building up and running. This leads to an abandoned building with a very high embodied energy. To alleviate this situation this thesis will be focused on developing new and innovative methods of designing, constructing and utilizing large scale stadium architecture through the use of robotics and 3d printing while also taking advantage and exercising the tactics and methods of temporary venue architecture.

RESEARCH QUESTION

HOW MIGHT TEMPORARY VENUE ARCHITECTURE BE USED TO POSITIVELY IMPACT THE SOCIO ECONOMIC ISSUES RELATED TO THE CURRENT TREND OF OLYMPIC STADIUM DESIGN

NARRATIVE

THESIS THESIS STATEMENT

Stadiums today cost a large amount of money to build, and even more to maintain. Furthermore, the embodied energy required and the energy footprint that is left behind, is a cause for concern for a sustainable future.

To mitigate the socio-economic impact of stadium architecture on our environment, it is important to turn our attention to self-contained, temporary venue architecture and to rethink the future of stadium design.

Project Focus | Emphasis | Goals

Sustainability Sustainability should be a key focus in any design but for this project, it is espe-cially important because of the scale and size of these massive structures. The amount of resources used to construct such a building should be a major consideration when planning. Renewable energy strategies and renewable resources will be incorporated in construction and post construction deci-sions. The overall goal is to have a self-sustained, efficient building with as little embodied energy.

Cost The high cost associated with this typology is another concern. It is vital to find a balance in aspect of building construction and maintenance. Looking into alternative energy is one significant methods of keeping costs of maintenance down post construction. This should be achieved with cohe-sive collaboration of today s widespread technological advances.

Technology I strongly believe that the key aspect to solving the problematic issues facing the design of this typology is in the incorporation of technology. Finding new methods that make a large venue like this possible will comprise of using strong, lights weight materials that are movable with the help of automation and robotics.

PROJECT TYPOLOGY

Stadium Architecture

Typological research was based on stadium architecture, particularly that which is able to host events for large amounts of people. These structures need to have seating that provides a good view of an arena that is typically at the center of the stadium. Stadium Typology also focuses on effective and safe egress for these large groups of people. Another prominent aspect of stadium architecture includes amenities, which vary from convenient and accessible restrooms to concessions.

Temporary Venue Architecture

Another new research aspect for my thesis is looking into a partly or entirely temporary venue structure. The main reason for this is to minimize the impact on the environment and to reduce the carbon footprint. This would also solve the major issue of abandoned stadiums that are often the case with Olympic stadiums.

User/ Client

Client - Depending on the stadium type the client can vary from a government to a state or city council. At times the client could also be the governing body for the sporting institute i.e. The Olympics Committee, The Football Club etc.
Users - Sports enthusiasts of all ages. This will include little children to the elderly. It is imperative to meet proper ADA standards. Users will also include higher dignitaries and they will typically need viewing space from different stand/ box office. There would also need to be a designated location for media and their equipment. Finally, the stadium will need to have proper facilities for the athletes.

Project Justification

This typology uses a large volume of resources in every stage of its construction and even post construction. The measure of materials and resources that go in to maintaining these buildings need to be reduced substantially or at the very least this issue would be justified if the usage of the facility was such that the amount of resources that it needed was warranted. There should be no doubt that there is a problem in this system. The constantly depleting resources that we invest in these large structures should at least see a payoff that is worthwhile. Our planet cannot afford to keep ingesting their valuable assets into such projects. For these reasons it is important to find a new method for building and maintaining these sports arenas. Sports enthusiast should have the chance to still enjoy these spectacular sporting events without mankind and mother nature having to pay such a high opportunity cost.

DESIGN PROCESS DOCUMENTATION

Context Analysis

Conceptual Analysis

Spatial Analysis

Floor plan Development

ECS Passive Analysis

Section Development

Structural Development

Materials Development

ECS Active Analysis

--Midterm Reviews

Project Documentation

Context Redevelopment

Structural Redevelopment

Project Revisions

Presentation Layout

Plotting and Model Building

Preperation for Presentations

The plan of action for the design process will start much like many of the other studio projects. It is key to have a strong foundation to go off of for a thesis building design. Project design will begin by looking at the site, its elements and the culture and feel sur-rounding it. At this point conceptual design will start taking its course.

Conceptual design will lead into schematic design where soft geometric shapes will transform into defined functional spaces.

From there it will be prudent for the structural development to follow suit. Once the main structural elements are ironed out it will be time to look into materials and building envelop design.

Each of the steps above will need to be in col-laboration with technological and systemic pro-cess of the thesis design. It is crucial that both of these aspects go hand in hand.

Revisions will need in to be made after each review and constantly throughout the project to have a successful end design.

Once these processes are completed to satisfaction I plan to translate them into video renderings and some still renderings for board layout. Model making is likely to begin at the later stage once a con-crete end design has taken shape.

RESEARCH PAPER

Introduction

This year the world held yet another great Olympics. This international sporting event has become a tradition in human culture with more than 200 nations participating. And every four years the host country of the Olympic games will pull out all the stops and deliver an epic show. In the four years of preparation, the host country ingests many millions of dollars into infrastructure and resources and it is not uncommon for countries to hit over 9 figures.

A major part of the costs is in designing and building the arenas or the Olympic stadi-ums itself. Australia spent nearly $700 million on the stadium alone. China - $480 million on the Bird s Nest and London - $537 million. The winter Olympics games in Sochi, Russia a whopping $51 billion. Not to mention the costs to maintain these massive stadium buildings year af-ter year.

The Olympic Stadiums are built to accommodate thousands of people. When it is the largest sporting event that exists, with over 200 nations participating, the numbers for stadium seating will naturally have to be way above the normal stadium seating plan. There is very little chance that those seats will ever again see as many spectators as it did for the Games. So what happens as soon as that torch goes out?

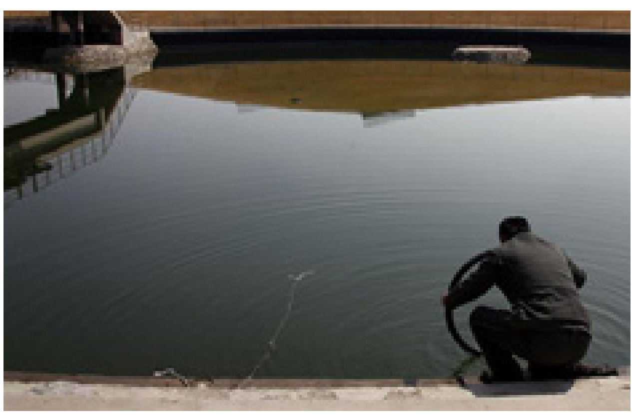
This, in general, is the problem with the Olympics: the Games galvanize their host cities, create a festive atmosphere, spur economic development--and then they are gone. Olympic Villages usually turn into housing, parks and infrastructure remain, and smaller facilities can even be of use, but the major monuments that the Games apparently necessitate rarely serve their cities well. The Bird's Nest by Herzog & de Meuron has sat largely empty since the 2008 Games in Beijing. (Betsky 2013)

Sustainable Stadium design and Construction
Defining the Problem

In Beijing, host to the 2008 Summer Games, the Chinese government struggles to fill its Bird s Nest stadium, which cost $11 million a year to maintain. Now seating 80,000 (after 11,000 temporary seats were removed following the 2008 Games), the site has become a tour-ist attraction, but lacks a regular tenant. (Kim 2014). The Beijing stadium is and has been rec-ognized as spectacular architecture. However, it still lacks the activity needed to keep the sta-dium current as a functioning building. The Bird s Nest is not alone in this, there are many other Olympics stadiums that succumbed to the same fate.

To the left is Athens kayak course then and now. What was once a track filled and exuberant, is now bone dry. (Chester n.d.)

Beijing s beach Volley ball stadium remains unused for the last eight years. Right next to that is the dessertted and unmaintained kayaking centre for the beijing 2008 olympics. (Chester n.d.)



It s a sad story, author and historian David C. Antonucci told TODAY.com. Either many venues just are no longer economically sustainable, or they are overtaken by technology or size. (Kim 2014).

It takes many different entities and eliments to ensure that these infrafrusture projects are not abndoned or forgotten after the games are done. The way the Arcitects and designers approach the subject can have a vast impact on this dire situation.This thesis topic is driven by what can be done by us as designers to make these venues more sustainable.

Designers can look into different methods of repurposing. Making stadiums adaptable to more than one sport? Making structural components easy to disassemble and components easy to reuse and recycle.

Some arenas are just unusable because of technology or policy changes. Bigger crowds and better athletes also rendered Squaw Valley s facilities obsolete (Kim 2014). Adaptability should be a main focus when designing and constructing. We may not be able to see the exact changes that are going to take place in future sporting events, however, it is important to pre-dict and build in a way that if needed, such measures can be taken to change certain parame-ters without having to claim the structure redundant from that point on.

Blyth Arena only sat 8,500, which is way too small to host a hockey game now, Anto-nucci said. Also, ski jumpers just became more adept at what they were doing and jumped longer distances, so the ski jump was no longer suitable or safe. (Kim 2014). There are many variables to consider, technology is changing so rapidly that it is becoming more and more dif-ficult to predict what would happen in the span of five years. Therefore, we as designers need to be even more conscious of the buildings we erect. "That still leaves the question of why we insanely invest so many resources into struc-tures of such little use. Somebody should devise a competition that would do for sports what Burning Man did for festivals: build it for the event, and then take it down, leaving no trace. Or we should figure out how to reuse and reconfigure existing structures in such a way that such renovations are in turn reversible and adaptable. (Betsky 2013).

Possible Solutions

More Sustainable Stadium designs

Sustainable design or integrated design is definitely one solution. What I mean by this is using innovative tactics to firstly, cut down building costs but more importantly to reduce post event maintenance and operational costs which is mainly what leads to the down fall of such a building after the games are over. The Velodrome, London 2012's flagship green building, is an outstanding example of integrated design. The most innovative aspect of the Velodrome is its tensile cable-net roof structure, which was made possible by early contractor engagement at Stage C. Initial costing had indicated that a conventional steel structure was more economical, but more detailed analysis revealed that the cable-net option enabled a cost saving of £1.5 million and shortened the programme by 20 weeks. It also significantly reduced the embodied carbon in the building. Hopkins Architects' carefully considered rooflights and natural ventilation also reduce operational energy loads. A targeted approach to services employs underfloor heating to keep cyclists on the track warm, while modular air-handling units under the seating tiers keep spectators comfortable. (AJ 22.09.11) (Hartman 2012). The Velodrome is considered one of the more recent, successful designs when it comes to the Olympics. This is the sort of planning that is done to ensure that the arena remains usable and effective long after the games.

The Japanese are considering a different approach for the 2020 games and incorporating the design in to the daily lives of the community. One of our main ideas is Sora no Mori, meaning "forest in the sky." It is an 850-meter running track ringing the top of the building and can be used by runners as well as pedestrians. It will be open to the public every day, even if there are events in the arena. The idea of Sora no Mori is that it can draw people to the building and create a new relationship between the stadium and its neighbors. (Pollock 2016).

A Stadium that is slightly smaller

Most stadiums seem to be designed with temporary settings such as seating that can be taken down post event. However, most of the time these temporary stands consist of 30,000 seats and the stadium is still left with about 80,000 seats. No matter how sustainable a design, if the stadium size is just too big for an event, it is more than likely that that venue will not be selected to host that particular event. There can be pre-tests and studies that can be done prior to construction to minimize this effect but doing studies on already existing stadiums is a good indicator and a place to start. One such stadium building is the one that hosted the Sydney Olympic Games.

It takes years to come up with reasonable post games studies and after having 16 years to back up their research, the Australian government has come to this conclusion. The capacity of the stadium for the Games was 110,000, reverting to 80,000 post-Games.

It soon emerged that there were not enough major sporting or musical events outside the Olympics to generate large attendances beyond the capacity of existing stadiums. The state government s

Sydney Cricket Ground and Sydney Football Stadium both had capacities of around 40,000, and there were few sporting and other events that could produce attendances beyond that level (Searle, 2002). A notable exception was the Rugby World Cup final in 2003, for which Stadium Australia s 80,000 capacity enabled Sydney to win hosting rights. Such events were too infrequent, however, and the consortium suffered large losses from the start: $24 million in 199899, $11 million in 19992000, and nearly as much in 200001 (Australian Financial Review, 7 September 2001). (Searle 2012).

The stadium in Sydney is an instance where the temporary seating cut down the size considerably yet, it still wasn t enough.

It is a difficult task to keep any sort of large scale stadium functioning and productively efficient let alone one with a capacity of holding 80,000 people. Buildings of this size and nature whether used or not face very large operational costs, and with no events to cover these costs, will eventually start running at a loss. Which is what the studies for the Sydney stadium indicate.

This was less than total debts ($198 million in 2004 (Masters, 2005)) and was only a fraction of final construction and post-Games reconfiguration costs of over $690 million. In 2007 the stadium was sold to the main creditor, the ANZ bank, for $10 million (Askew, 2006). The stadium pays South Sydney NRL club to play its home matches there to generate a greater number of events. But ordinary round rugby league matches have low attendances, with vast areas of empty seating, and are seen as lacking in spectator atmosphere, contrasting with occasional full crowds for international rugby union and interstate and grand final rugby league matches (Searle 2012).

In this case, not only did the stadium operate at a loss but ended up having to pay sporting teams to play at the venue.

Repurposing of the Stadium

A tried and tested and somewhat successful alternative of repurposing is to turn the stadium into an arena that can host large musical performances the SuperDome, now Acer Arena, has hosted a number of major popular music events since 2000 that might otherwise have been forced to be played outdoors or to reduced audiences at the Entertainment Centre.
It is now claimed to be one of the most successful indoor entertainment complexes in the world (Meacham, 2010) (Searle 2012).
This is not an indefinite answer that addresses the serious issues that were just discussed but is undeniably a practical and logical avenue for creating more use for an otherwise abandoned building. Other than the fact that it generates activity within the stadium the fact still remains that it is not a solution that is brought about by thoughtful and innovative design tactics.

major lesson arising from Sydney s hosting of the year 2000 Games for the planning of future global special events such as the Olympics is that post-event legacy planning should be carried out at the same time as planning for the event itself, not several years into the process. This can reduce the likelihood of surplus venue capacity and increase the prospects of aligning future strategic development to Olympic infrastructure. It would also allow greater opportunities for the local community to be engaged in the planning of post-event outcomes (Searle 2012). This lesson should be learnt by not only Sydney s hosting but by the many other Games priors to it.

After reading many case studies it is my understanding that extensive research and planning need to go in to designing and constructing such a stadium. Planning in areas such as, physical and environmental, socio-economic, sociopolitical, urban displacement, and socio-cultural and socio-psychological impacts should be a fundamental step and responsibility of a host city.

Although I too like many others wait in great anticipation and excitement for the games, it still seems like a great waste of many different resources for something that takes place for such a short interval of time. Thus, it is my conclusion that in a world where resources are of a rapidly depleting nature, it is imperative that we design taking into serious consideration that these games only come to fruition in such a large scale once in a few decades and therefore the stadiums in particular should be constructed as temporary large scale structure which is designed in a way that can be taken almost entirely apart once the event has concluded. Where most, if not all the resources can be reassigned and reassembled in a different environment for a different purpose. In an age where prefabricated buildings and 3D printing is becoming the future, it is certainly an avenue to consider as a part of the solution.

Great architecture should not just be a beautiful gesture, but a sensible response to a need--something that celebrates the occasion without binding a place to that event for all time. (Betsky 2013)

Work Cited

Betsky, Aaron
2013 Design of Olympic Proportions: Japanese Architects Are Outraged by the Size of the New Stadium Planned by Zaha Hadid for Tokyo s 2020 Olympic Games, Its Design Notwithstanding. Everyone Should Be Concerned. Architect (Washington, D.C.) 102(11): 48 48.

This article conveyed the importance of considering a small scale stadium as a appose to a large austentacious structure. It draws attention to the fact that the Olympics is an event that draws huge audiences but only once in a few decades. Which supports my argument for a temporary structure.

Chester, Tim
N.d. After the Games Go: 17 Haunting Abandoned Olympic Venues. Mashable. http://mashable.com/2016/08/10/abandoned-olympic-venues/, accessed October 11, 2016.

This article provided many different photographs and was able to give a visual representation of the issue at hand. I feel that in this topic it is important to see the post games situations to further strengthen the importance of the issue. It will appeal to the auditory and the visual learners like myself to have images to follow the facts.

Hartman, Hattie
2012 Marathon Not a Sprint [Olympics 2012]. Architects Journal 235(10): 48.

This article represented a structure that is considered successful. I believe it is important to give examples of projects that have gone well to know what the line is that we must measure up to. In this quote it is also mentioned that the better standard that they achieved was due to extensive research and innovations. Not to mention investing in sustainable design methods. Which is a key element to the solution

Kim, Scott Stump and Eun Kyung
2014 What Happens to Olympic Venues after the Torch Goes out. TODAY.com. http://www.today.com/news/what-happens-olympic-venues-after-torch-goes-out-2D12152101, accessed October 11, 2016.

This article speaks of the failures of post games stadiums in a broader aspect. The quotes that were taken from this article points to the small changes that happen year by year but have sig-nificant impact on the utility of them. By quoting this article the reader is able to understand that there are technological changes, changes in sporting rules and also the capacity changes that need to be thought of when the designing and planning is in progress.

Pollock, Naomi R.
2016 Kengo Kuma. Architectural Record 204(2): 32 32.

Like the article about the Velodrome this was another to give examples of environmentally sus-tainable, positive thing that can be done to ensure that the stadiums remain populated once the games are done. I chose this article in particular also because it is the where the next Olympic games will be held and where hopefully the most recent innovative solutions will be put to the test. The Japanese are also generally an environmentally conscious nation, hence, why I thought their ideas may have some success. However, we will not know for certain if this will hold true for at least another decade.

Searle, Glen
2012 The Long-Term Urban Impacts of the Sydney Olympic Games. Australian Planner 49(3): 195 202.
This is by far the most important article and one that had the most amount of post games re-search. The quotes I extracted were mostly factual and gave the reader evidence in the form of numbers. Having had nearly two decades of research done after the games, this article was able to give accurate predictions on what normally happens to the investments made for the games. It also provided numerical figures for the losses that can be obtained from a stadium that is not utilized but still needed continuous maintenance.

PRECEDENT ANALYSIS AND THEIR NARRATIVES

HOK Sport and Sir
Peter Cook

London, UK

2011

Capacity - 80,000

LONDON OLYMPIC STADIUM

Achieved a balance between the immediate needs of the Large Games stadium against a long term small scale venue

Seating capacity started at 80,000 with temporary structures for the opening and closing ceremonies and was shrunk down to 25,000

Transformation still cost close to $400 million

MUNICH OLYMPIC STADIUM

Frei Otto, Gunther Behnisch, Hermann Peltz, Carlo Weber

Munich, Germany

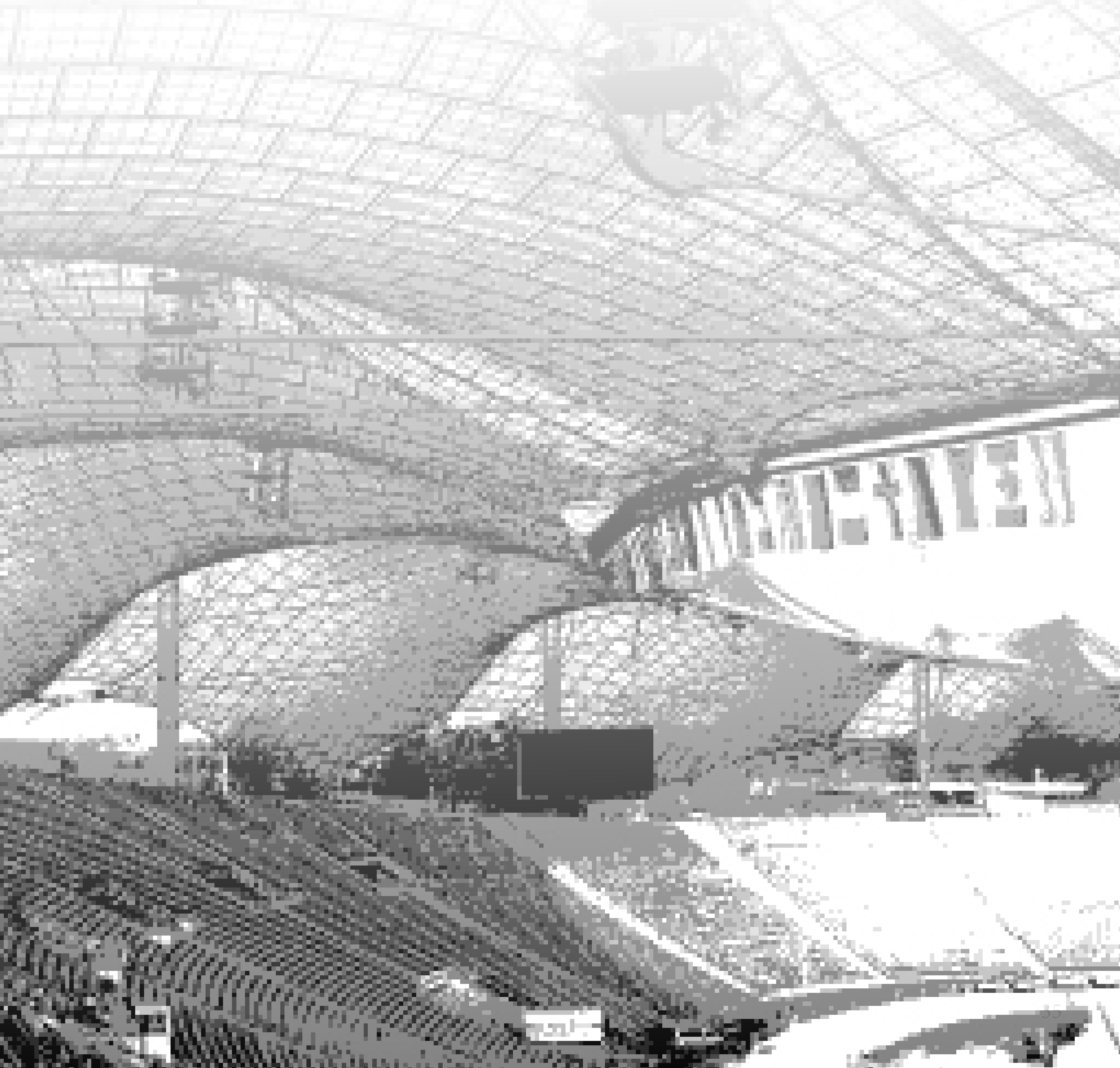
1972

Capacity - 80,000

Otto's inspiration for this design was to imitate the alps. Wanted to show Germany in a new light after War.

The roof is a covering of transparent acrylic panels that are supported by a web of steel cables.

The canopy covers not only the stadium but also other smaller spaces to the side.



CIRQUE DU SOLEIL

circuses like Circe de solei puts on an elabo-rate show with an even more elaborate structure in a specific city during a specific time. However once it s done, they take down the structure, pack it up to move to a different place and do it all over again. This Unique feature has become a main component in this prototype

Although the scale is much larger for an olympic stadium,
with adequate planning it is possible to apply this same principal
for this typology to design an olympic stadium that can
have its resources used multiple times through-out its life
cycle

LONDON AQUATIC CENTRE

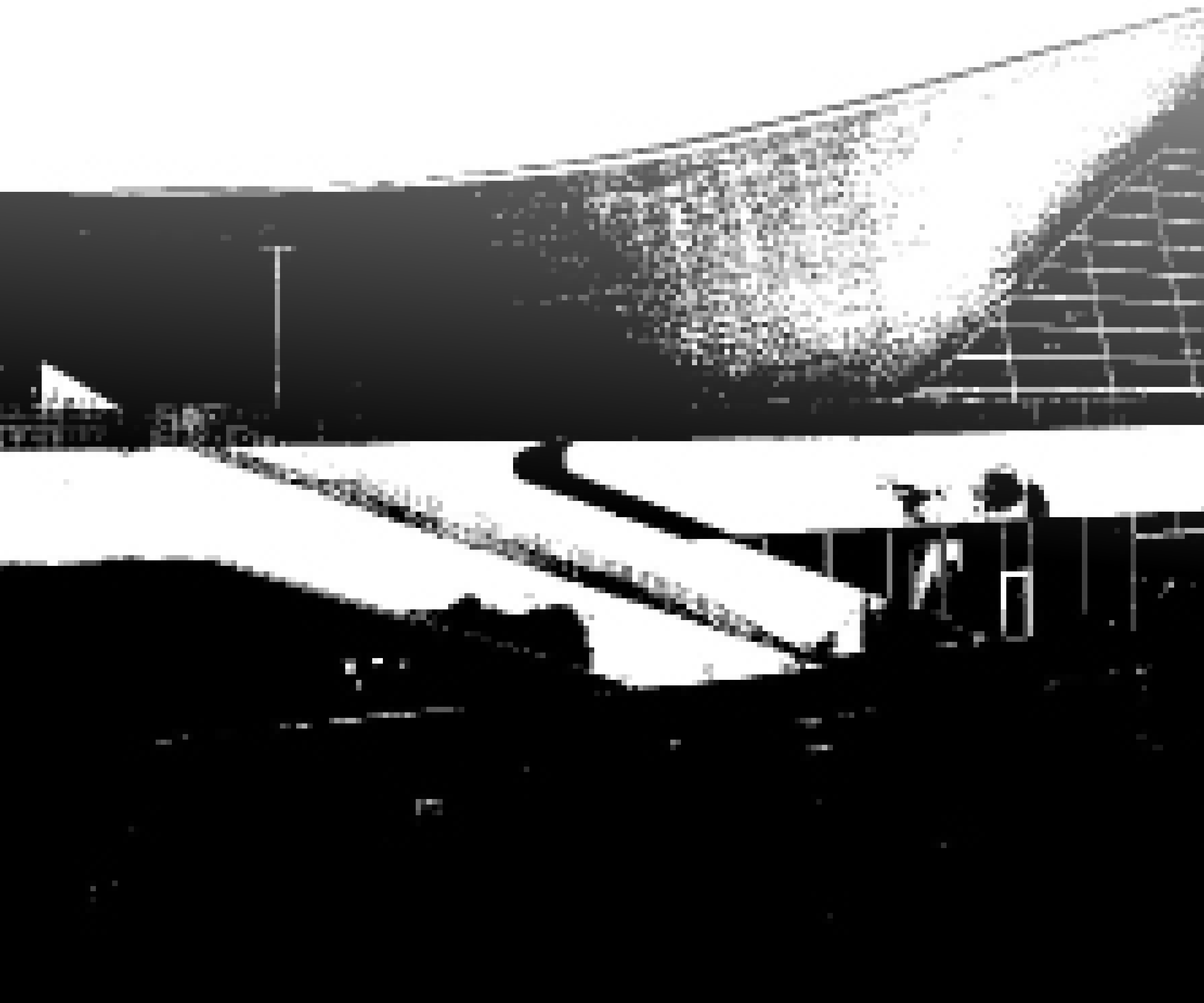
Zaha Hadid Architects

London, United kingdom

2005 - 2011

Olympic Footprint Area: 21,897sqm

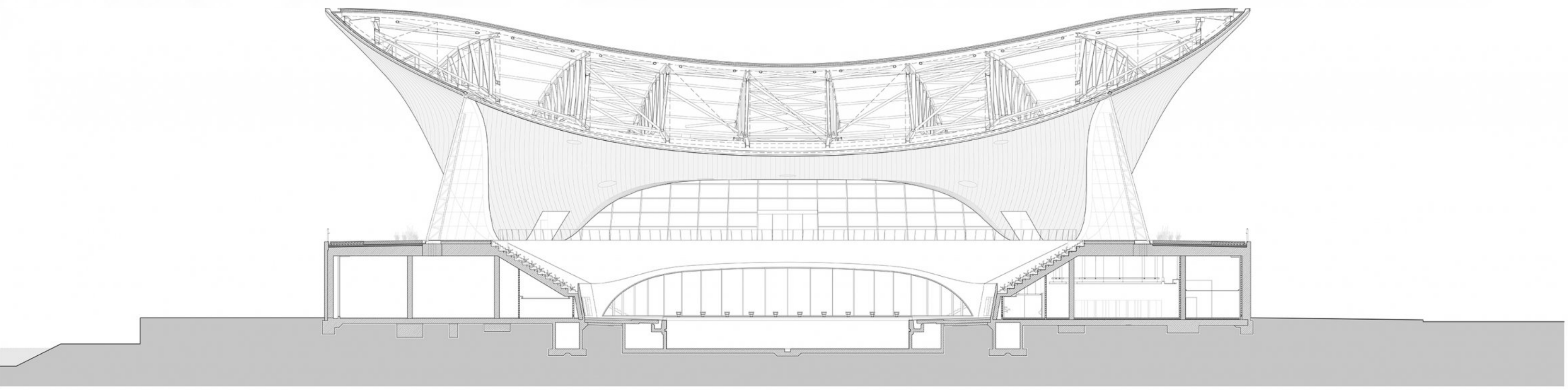
Legacy Footprint Area: 15,950sqm

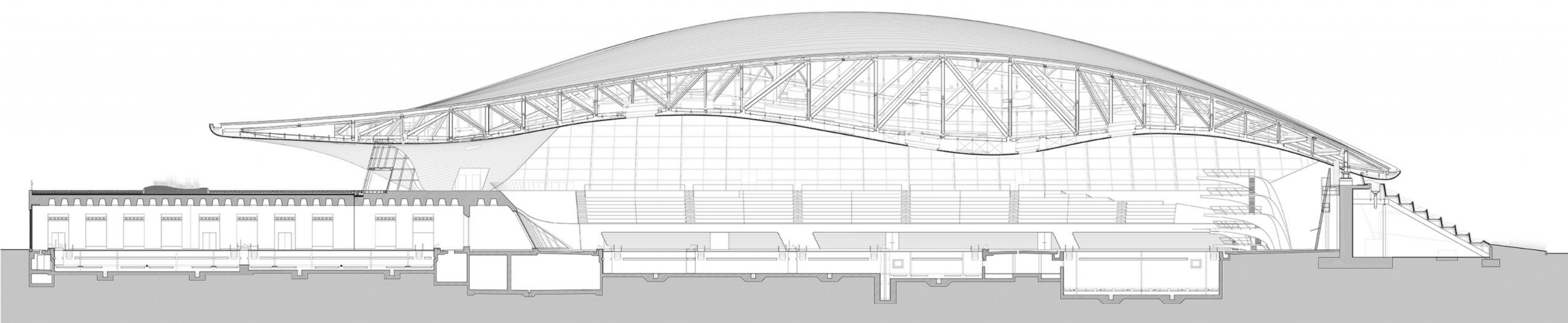


Zaha Hadid's London Aquatic Center is considered a successful example of what Architecture catered to the Olympic should embody and what typologies like stadium Architecture should characterize.

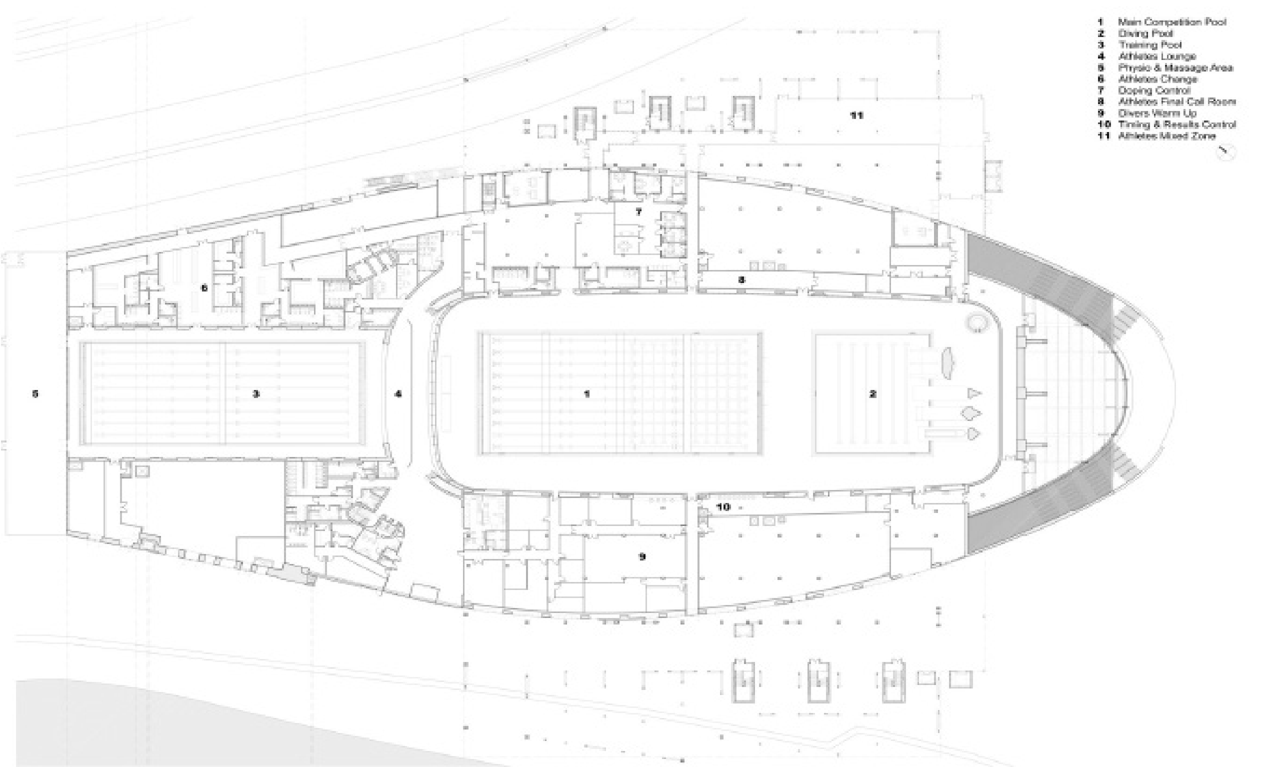
It captures the style, grace and novelty of what I feel a building such as this needs.

The stadium is a good indicator of how Olympic venues can still be successful post games due to transformations undertaken to adjust seating capacity.

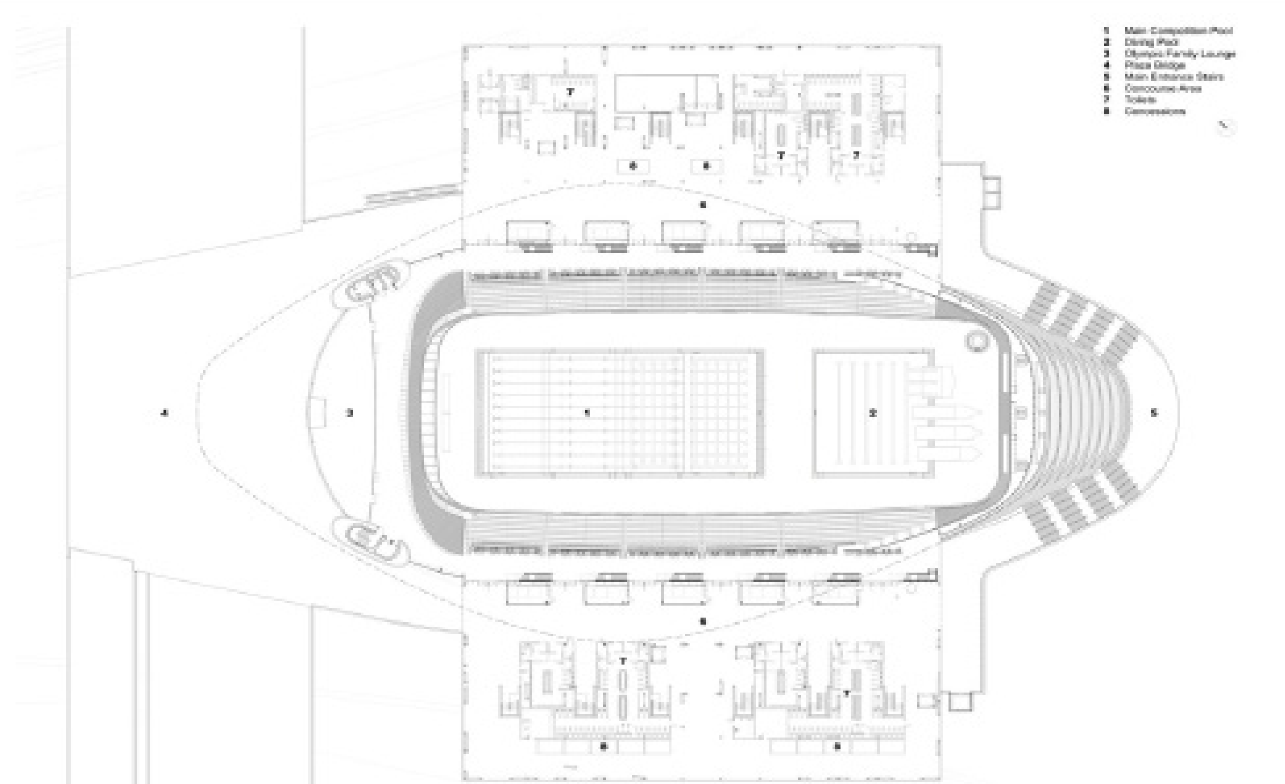




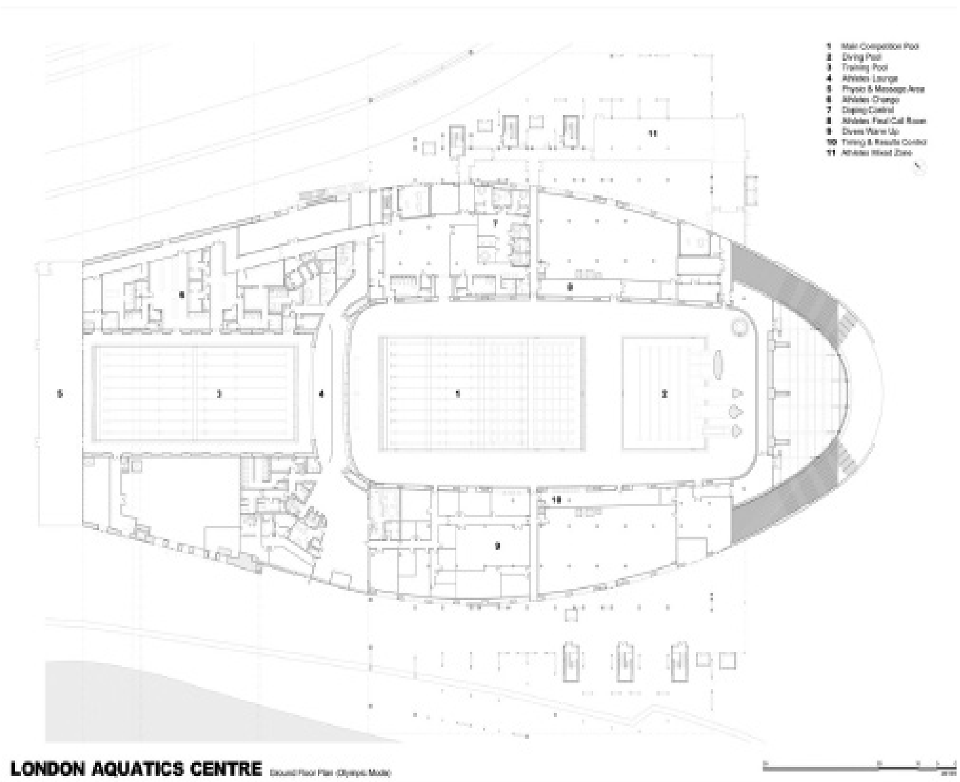
The design is positioned on the south edge of Olympic park and therefore the pedestrians gain access to the Olympic park through the Stafford city bridge. The integration of the building and its surrounding is key here.By connecting the stadium to the park it en- sures convenience and easy accessibility for visitors and athletes alike. Thus is an important aspect to consider for this thesis.



LONDON AQUATICS CENTRE Ground Floor Plan (Olympic Mode)

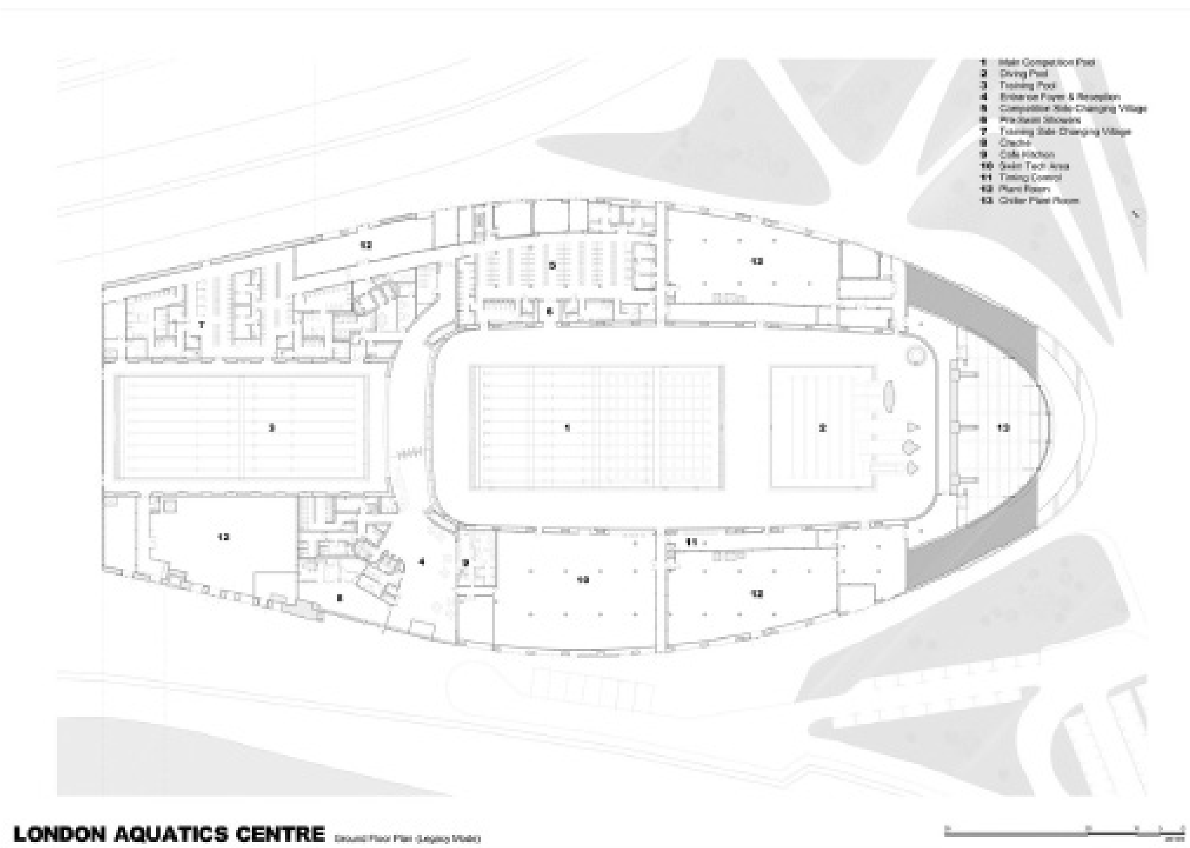


LONDON AQUATICS CENTRE First Floor Plan (Olympic Mode)



Perhaps the most important element of this design is the fact that the Aquatics Centre is designed with an inherent flexibility to accommodate 17,500 spectators for the London 2012 Games in Olympic mode while also providing the optimum spectator capacity of 2000 for use in Legacy mode after the Games.

The photos illustarte the transfomation



PERIS+TOTAL ARCHITECTS TEMPORARY PAVILION

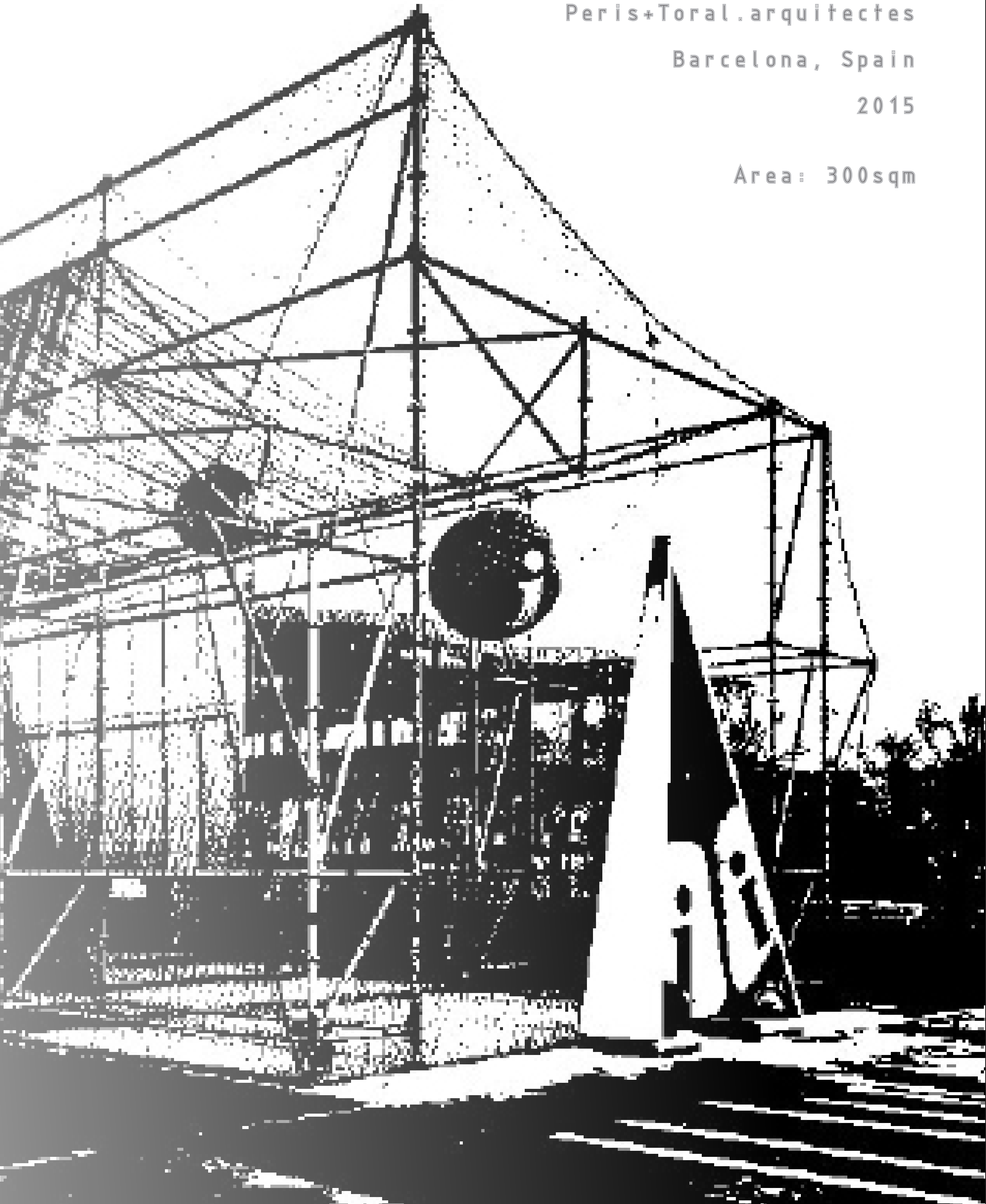
This design represents the use of inexpensive materials to create a functional yet elegant design. Although the scale of the project does not quite compare to a stadium, the project embodies the idea of using strong, light weight material to build a functional facility. It also gives example to the efficiency of temporary venue architecture

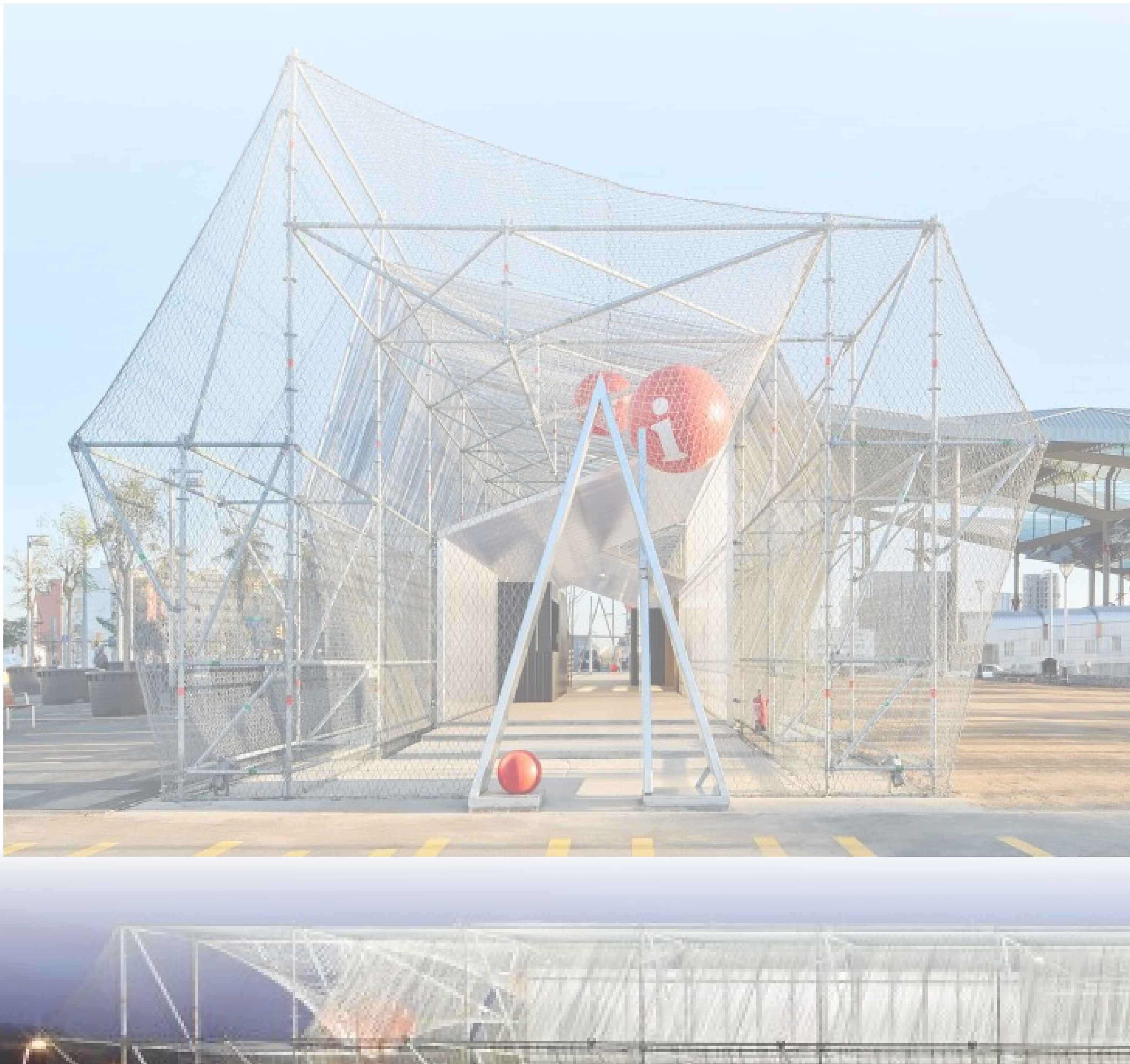
Peris+Toral.arquitectes

Barcelona, Spain

2015

Area: 300sqm

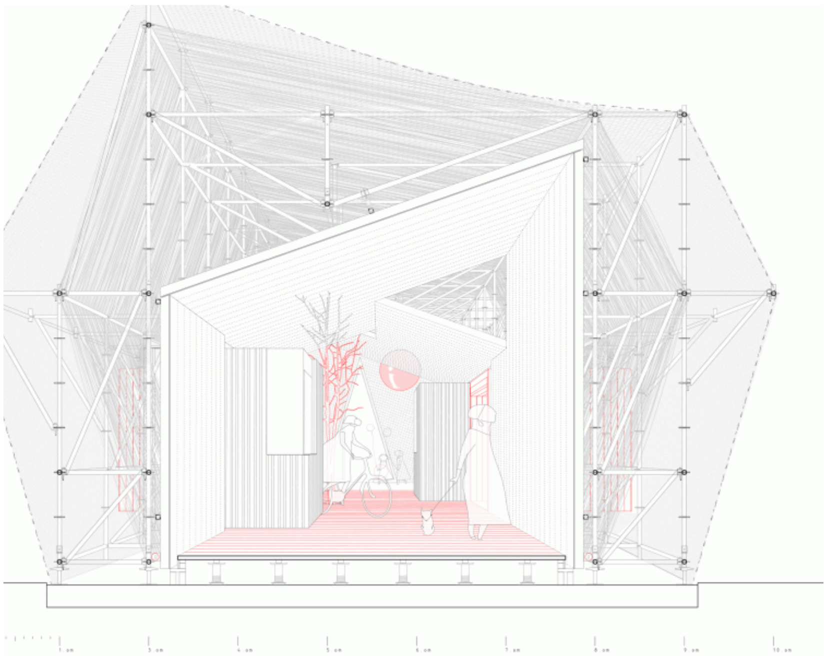


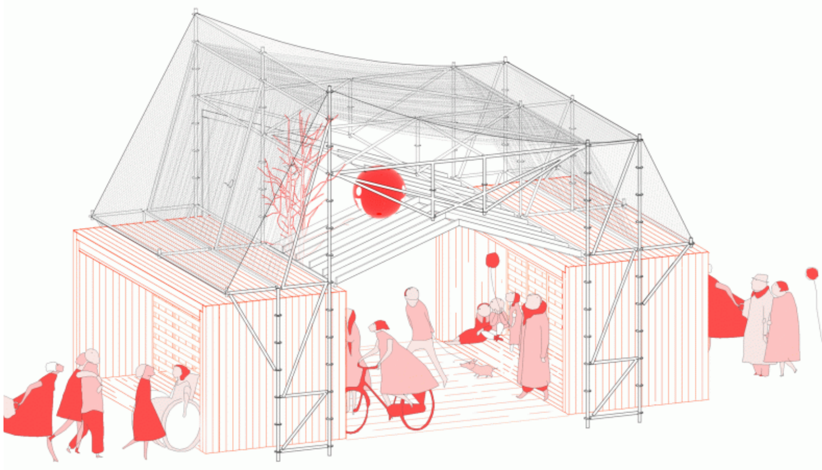


In this design polycarbonate panels are fitted to the scaffolding to create a tubular space within, while the exterior of the pavilion is wrapped in a layer of metal mesh and another of netting.

These facilities are constructed with scaffolding as their main structural element.thus this means it can be disassembled once the event is done.The scaffolding gives the building the sense of permeability and invites the visitor to walk through the entire structure.At the same time it acts as a support structure to the building envelop that is necessary to give the building the sense of haitability.

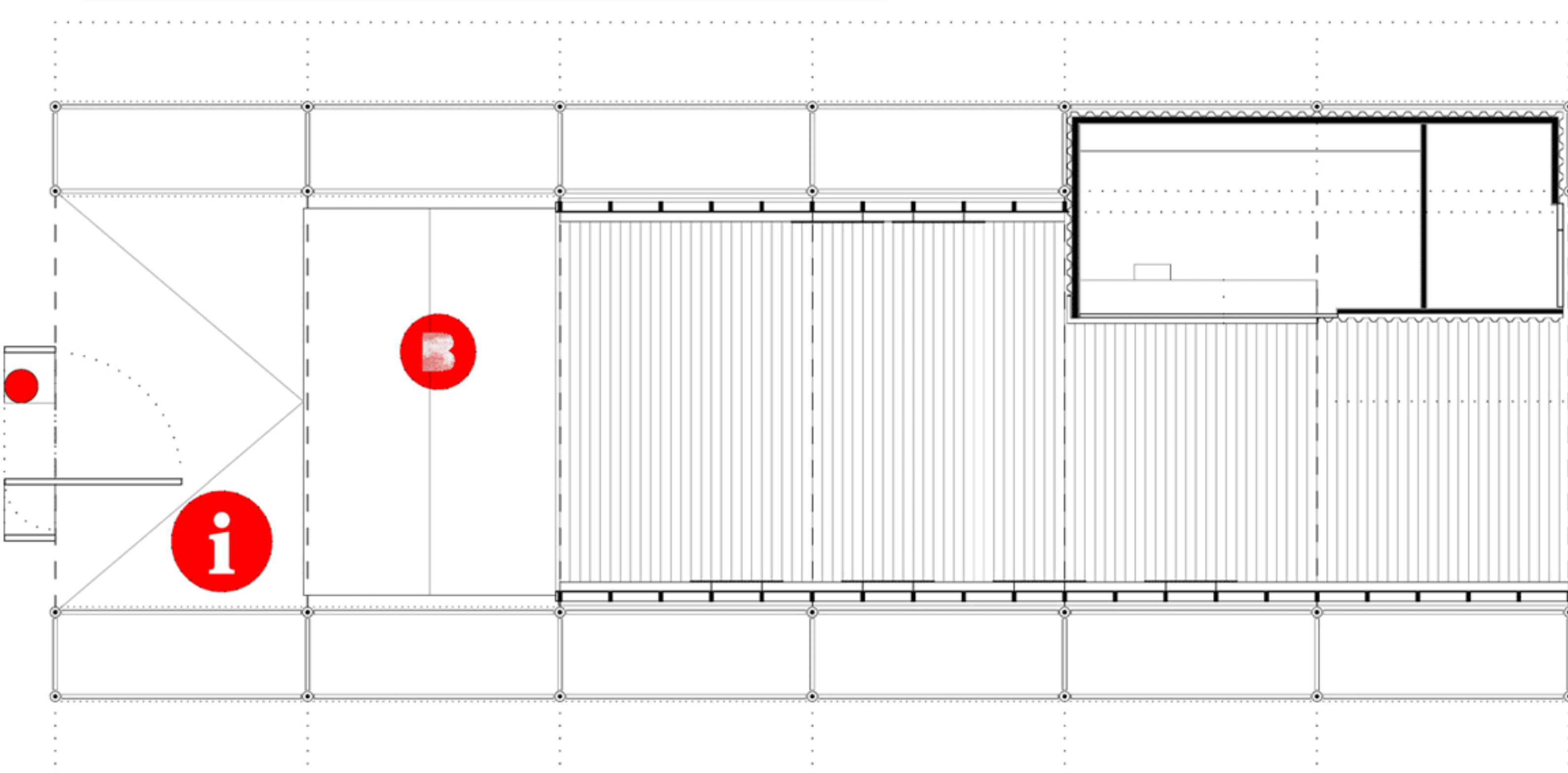
The structure of the roof changes with the functions that go on within

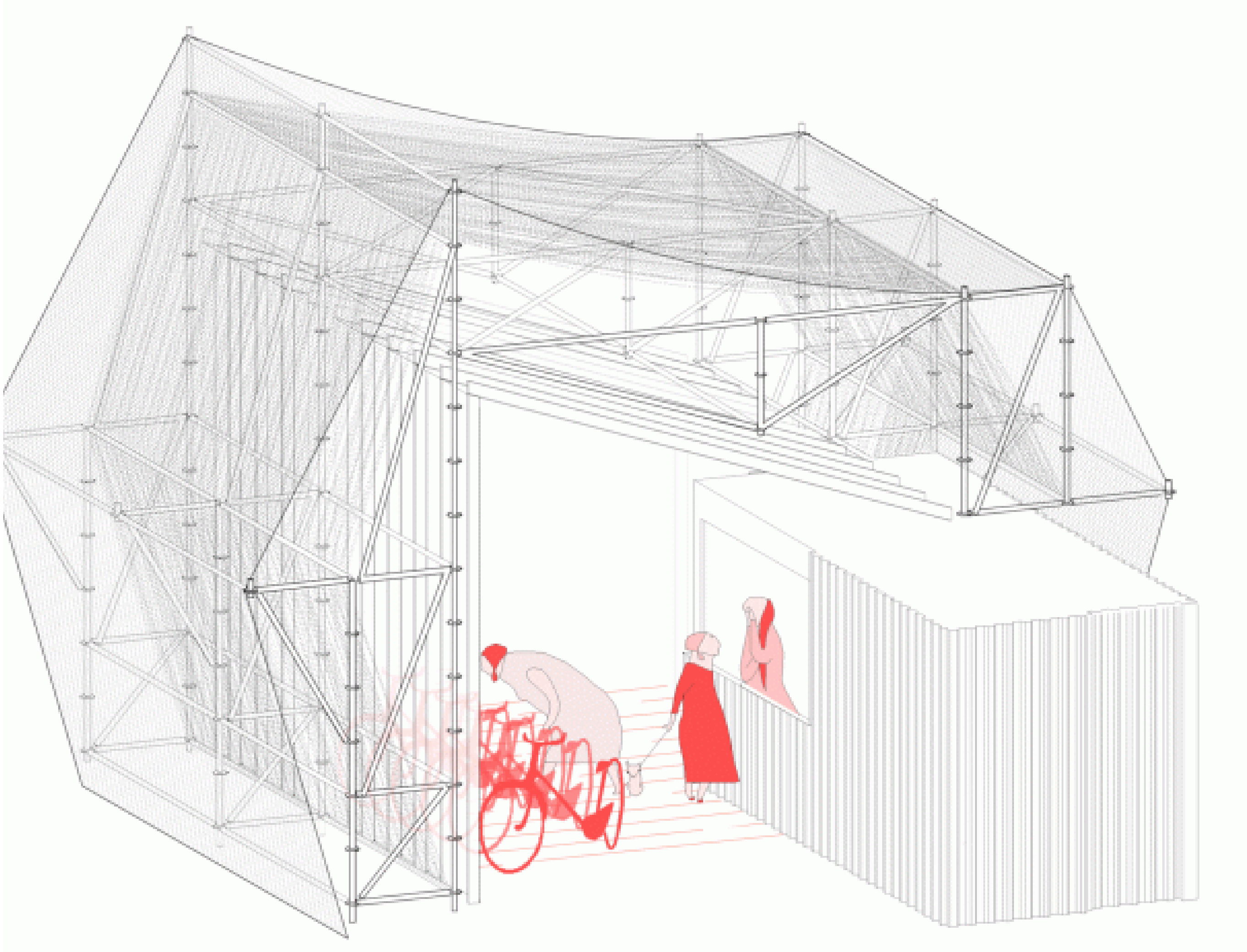


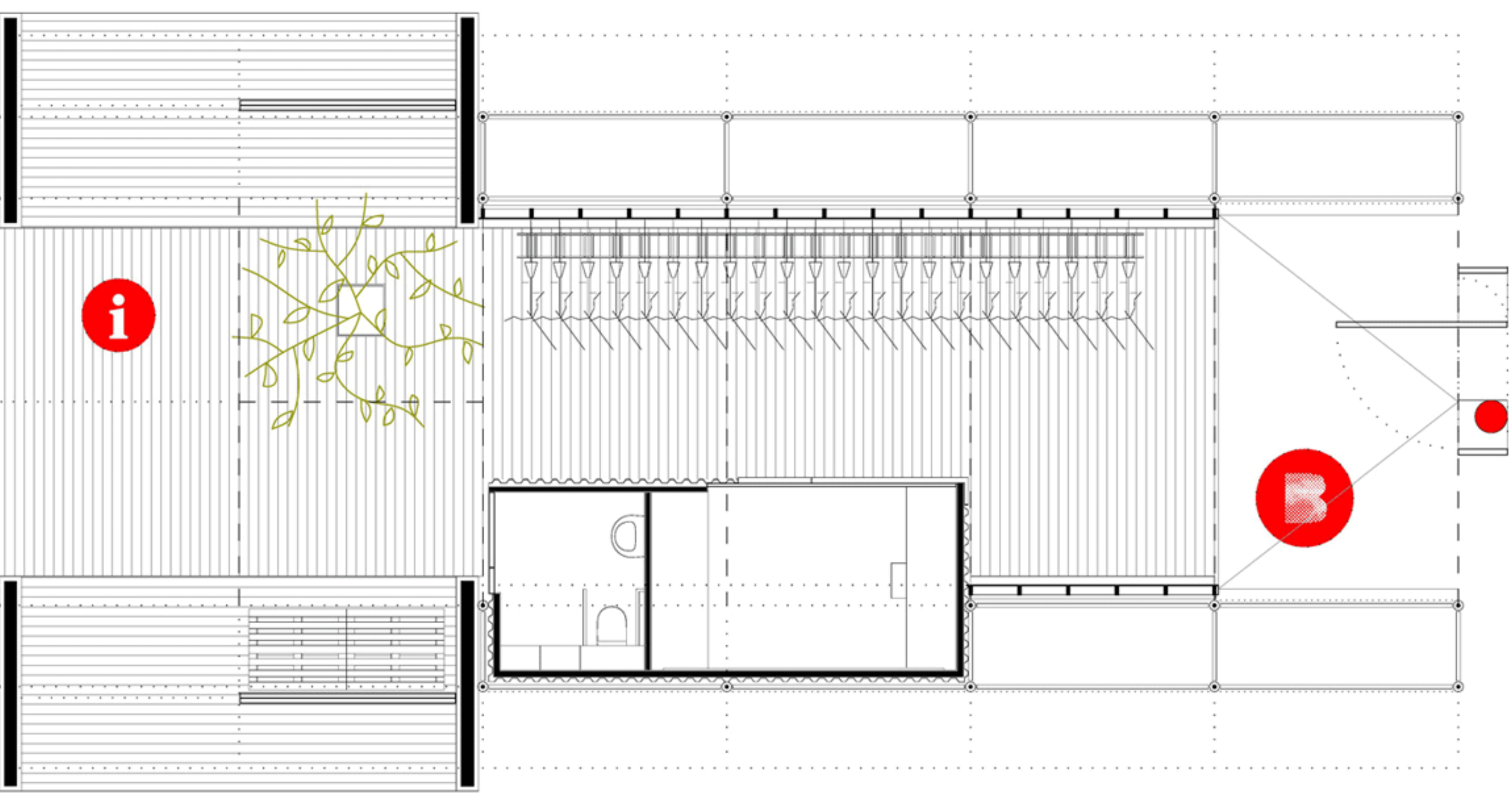


With the research of this project I was able to find out that scaffolding has become and increas-ing popular with architects to design temporary venue architecture especially ones that relate to public spaces. Its flexibility allows for quick and easy assembly and dismantle post event.

While it may not be possible to use scaffolding as a primamry structural component for this thesis project, it is a good material to consider for many of the other temporary facilities.



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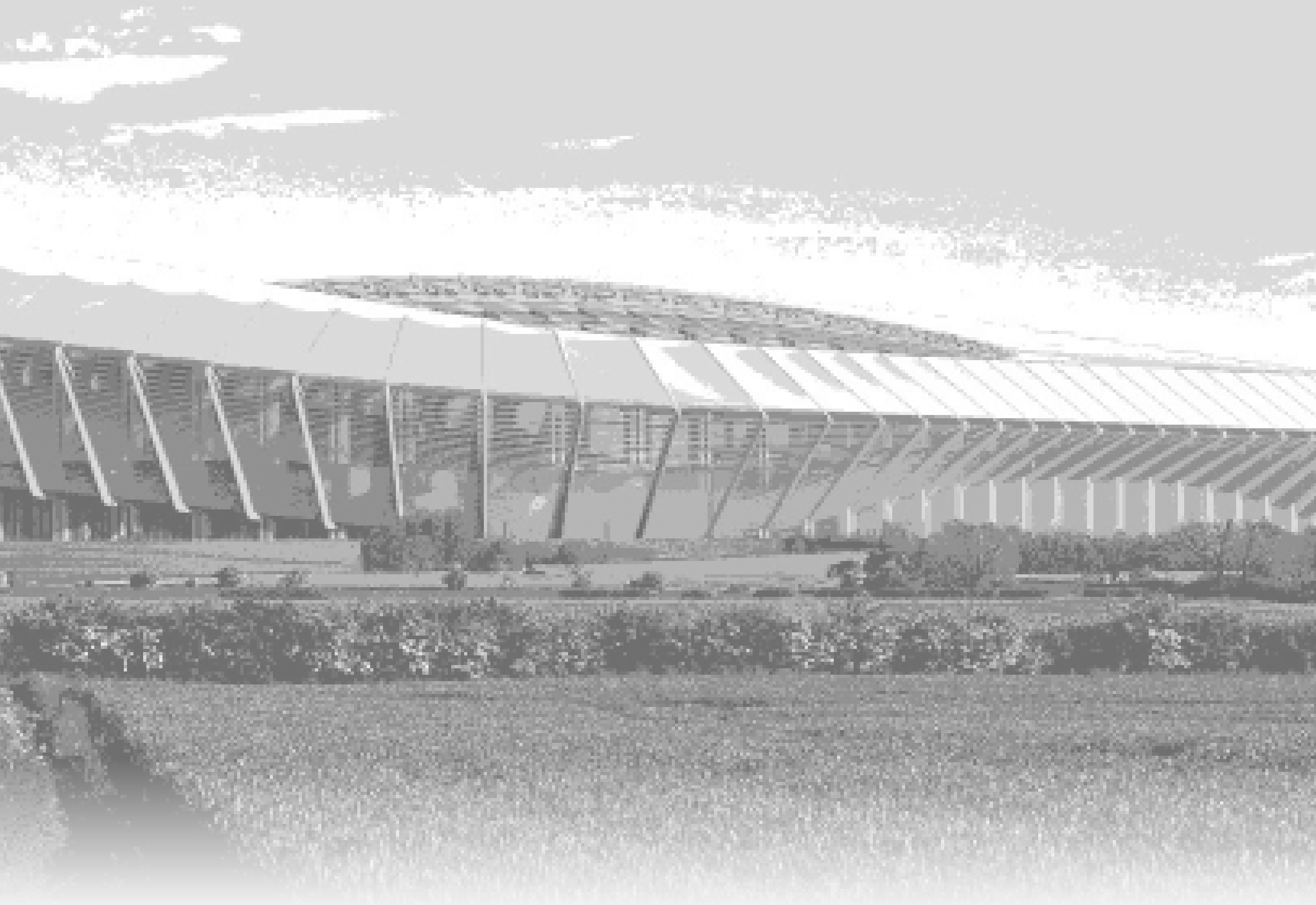
FOREST GREEN ROVERS STADIUM

Zaha Hadid Architects

Strout, United Kingdom

Capacity: 5000 - 10,000

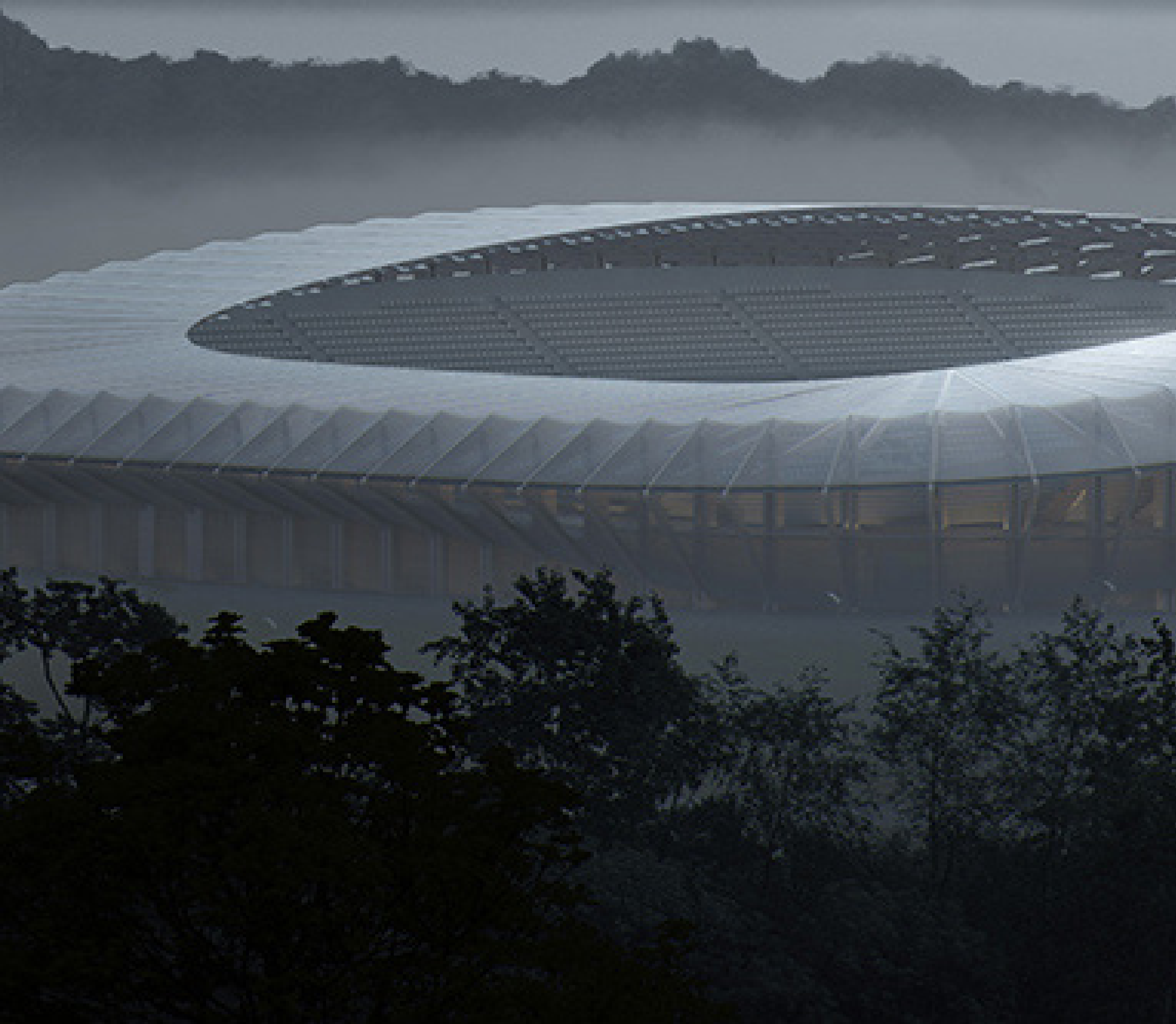


This project serves as a precedent for a few reasons. Most obviously it is a design that is visually and aesthetically incredible. The low sleek design reminds the spectator of an animal's vertebra which translates and conveys lightness and strength.
The stadium also adapts itself to the existing landscape. This cohesive integration enables the project to serve its purpose whilst not allowing it to disturb or change the site's sense of place.
This design has employed innovative research in the help of embodying low carbon construction and operational process. Not to mention as it is the first all wood stadium building, it will have the lowest embodied carbon of any stadium in the world.

With the structural element's close proximity to each other, the designers have allowed for even the seating terraces and floor slabs to be made out of tim-ber. They go even further by having a transparent roof membrane while in the same breath enables turf growth which leads to mini-mizing the volumetric im-pact on the surrounding when viewing from a distance.

The stadium also promotes versatility. The de-sign takes into consideration the club's future growth. Initially the stadium will be built for 5000 specta-tors, which is subjected to double with the club's success. This expansion represents the kind of trans-formation I wish to achieve in my thesis project.

It is also even more impressive that is achieved with-out an increase in major construction costs ‘as a building material, timber is highly dura-ble, recyclable and beautiful,. explains jim he-verin, director at ZHA. ‘the proximity of the stadium’s structural elements to each other has also been determined to enable the seating ter-races and floor slab to be made from timber. in most other stadiums, these elements are concrete or steel. with the team’s community and support-ers at its core, fans will be as close as five meters from the pitch and the position of every seat has been calculated to provide excellent, unrestricted views of the entire field of play. the stadium’s continuous spectator bowl sur-rounding the pitch will maximize matchday atmos-phere.’



PROGRAMMING

With the programming attention was primarily given to the seating capacity of stadium, its layout and its views.This was a main focus because without spectator satisfaction it would be extremely difficult for a stadium to be successful. Each seat will have a clear view of the performance arena. Premium seats will also be a part of the seating schedule for higher dignitaries and for others that choose to purchase for extra costs.

Then the focus was diverted to the athletes and their facilities. It is essential also that the athletes that these spectators come to watch, are comfortable and they have all their necessities met. For those reasons a therapy room, gym, lounge and preperation room will be included along with the locker rooms.

The other major requirements are that of the media and operational staff. Space will allocated and designated to the media for their coverage with addittional space for their equipment. The stadium operational staff will also have offices alloted in appropriate areas.

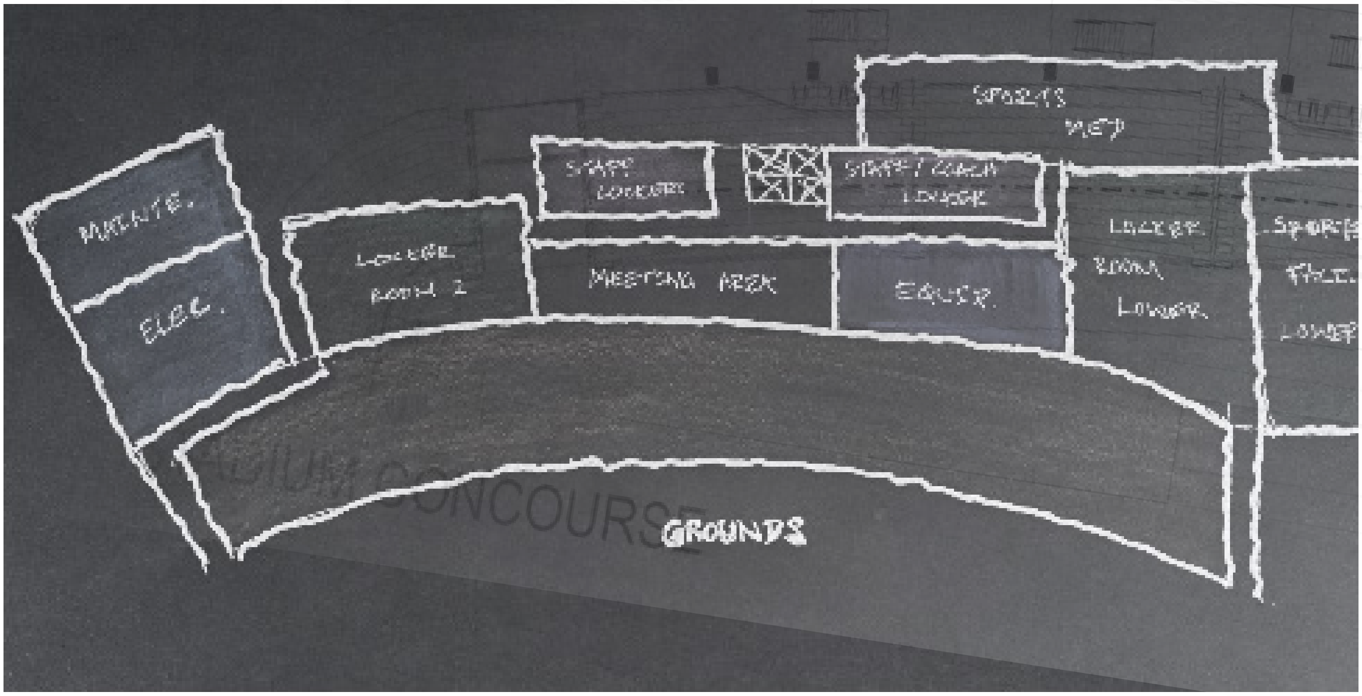
Restrooms will be located adequately throughout the building complying with ADA standards. finally at this moment for a stadium of 40,000 spectators, 4000 parking spots will be assigned to ensure that the transportaton portion of the event runs smoothly

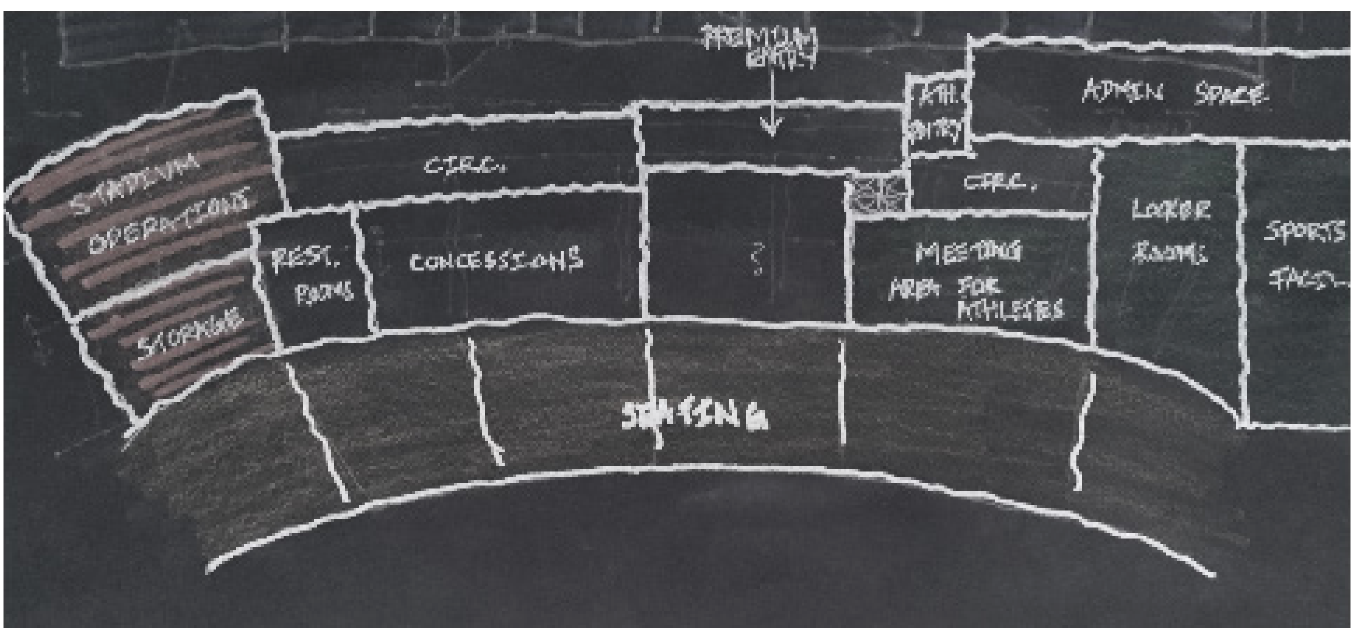
SPACE LIST

Function	Net Area	Net Area Subtotal
Entry		
Entry Lobby	8,191	
Public Restrooms	325	
Subtotal		
Spectator Facilities		
Spectator Capacity	209,000	
Suites	22,700	
Sideline Boxes	7,000	
Stadium Box/ Loge Seat	14,800	
Public Restrooms	27,500	
Guest Services	2,360	
Police Services	780	
Subtotal		**284,140**
Total Spectator Facilities		
Food Service	9,500	
Concession Stand	16,500	
Retail Sales	3190	
Subtotal		**29,190**
Athletes Facilities		
Total Locker Room	25,000	
Staff Lockers	3,000	
Sports Training and Weight Rooms	20,100	
Equipment/ Laundry	3,920	
Support and Officials	5,200	
Subtotal		**57,220**
Media Facilities		
Press Box	8,280	
Media Support	3,220	
Media/ Press Support	4,360	
Subtotal		**15,860**
Administration and Operations Facilities		
Ticket Office	1,950	
Office/Operations	3,557	
Dock/ Staging	4,804	
Storage	14,782	
MEP	32,551	
Janitorial	2855	
Subtotal		**60,499**
Circulation		
Concourse	75,000	
Vertical Circulation	13,000	
Service Corridor	27,690	
Subtotal		**115,690**
TOTAL APPROX. GROSS SQUARE FOOTAGE		**571,115**

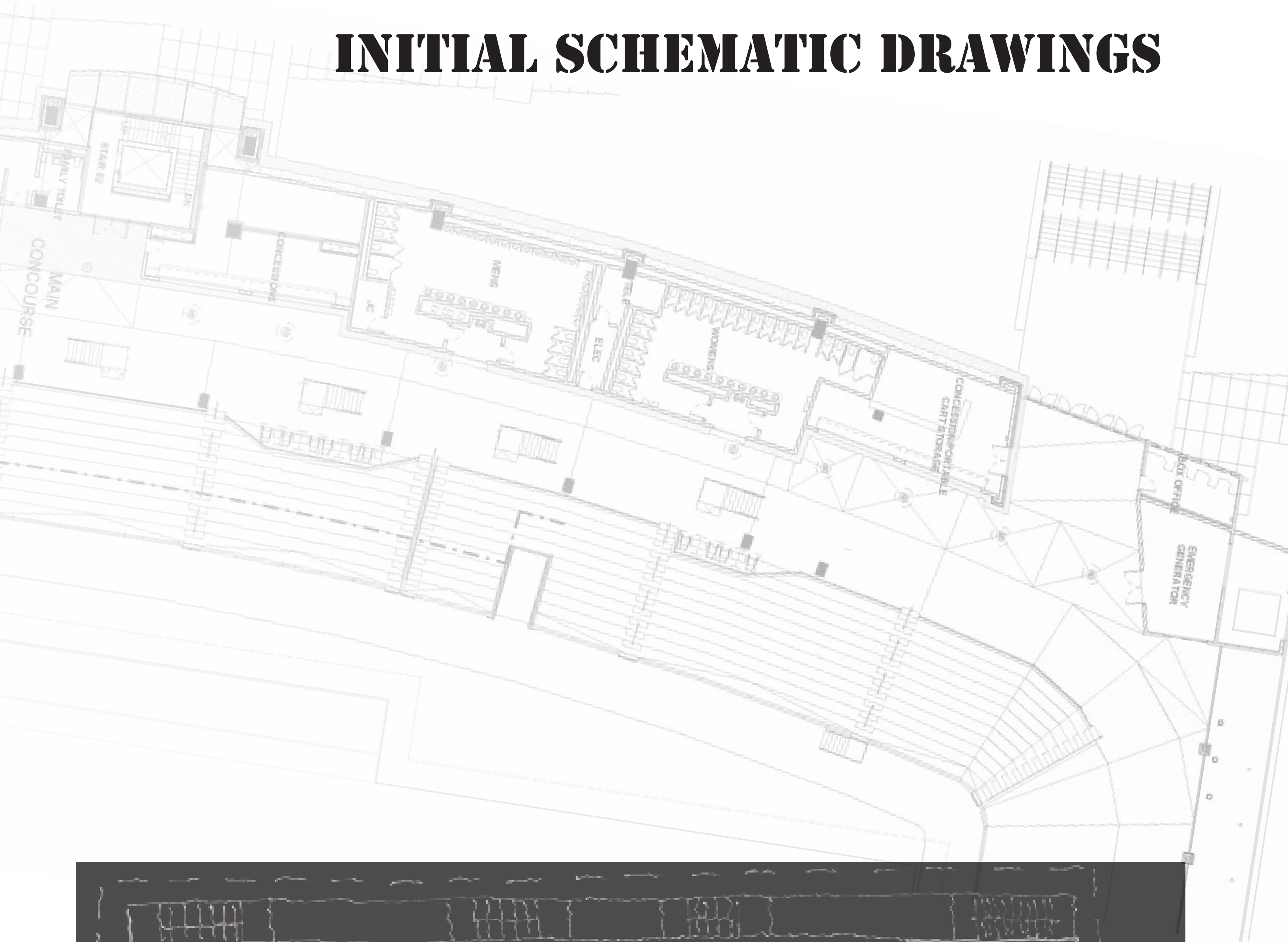
LAND USE REQUIREMENTS

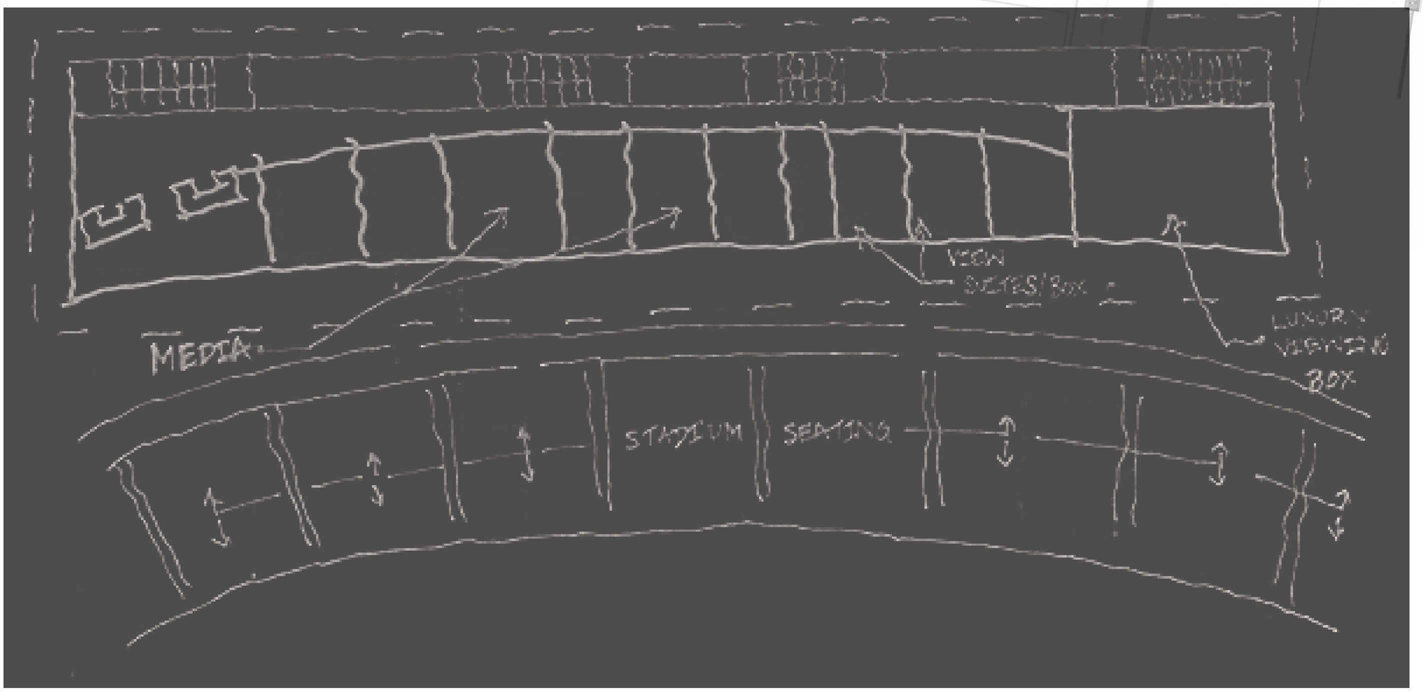
Land Use Area	PHASE 1					
	PEOPLE	GROSS AREA	FLOOR	BUILDING FOOTPRINT	GAC	LAND AREA
STADIUM FACILITY	**PEOPLE**					
Spectators	40,000	285,000	5	640,000	14%	800,000
Parking						
Staff	100	38,000	1	38,000	9%	42,020
Visitor	4000	1,520,000	5	304,000	5%	319,200
Service	10	3800	1	3800	1%	3,800
	4110	**1,561,800**				
Total Parking area Needed						**365,020**
Total Area with Building				800,000 + 365,020		**1,165,020**


MAINTE.
ELEC.
LOCKER ROOM 2
STAFF LOCKERS
SPORTS MED
STAFF / COACH LOUNGE
MEETING AREA
EQUIP.
LOCKER ROOM LOUNGE
GROUNDS


PREMIUM ENTRY
ATH. ENTRY
ADMIN SPACE
STADIUM OPERATIONS
STORAGE
CIRC.
CIRC.
REST. ROOMS
CONCESSIONS
?
MEETING AREA FOR ATHLETES
LOCKER ROOMS
SEATING

INITIAL SCHEMATIC DRAWINGS



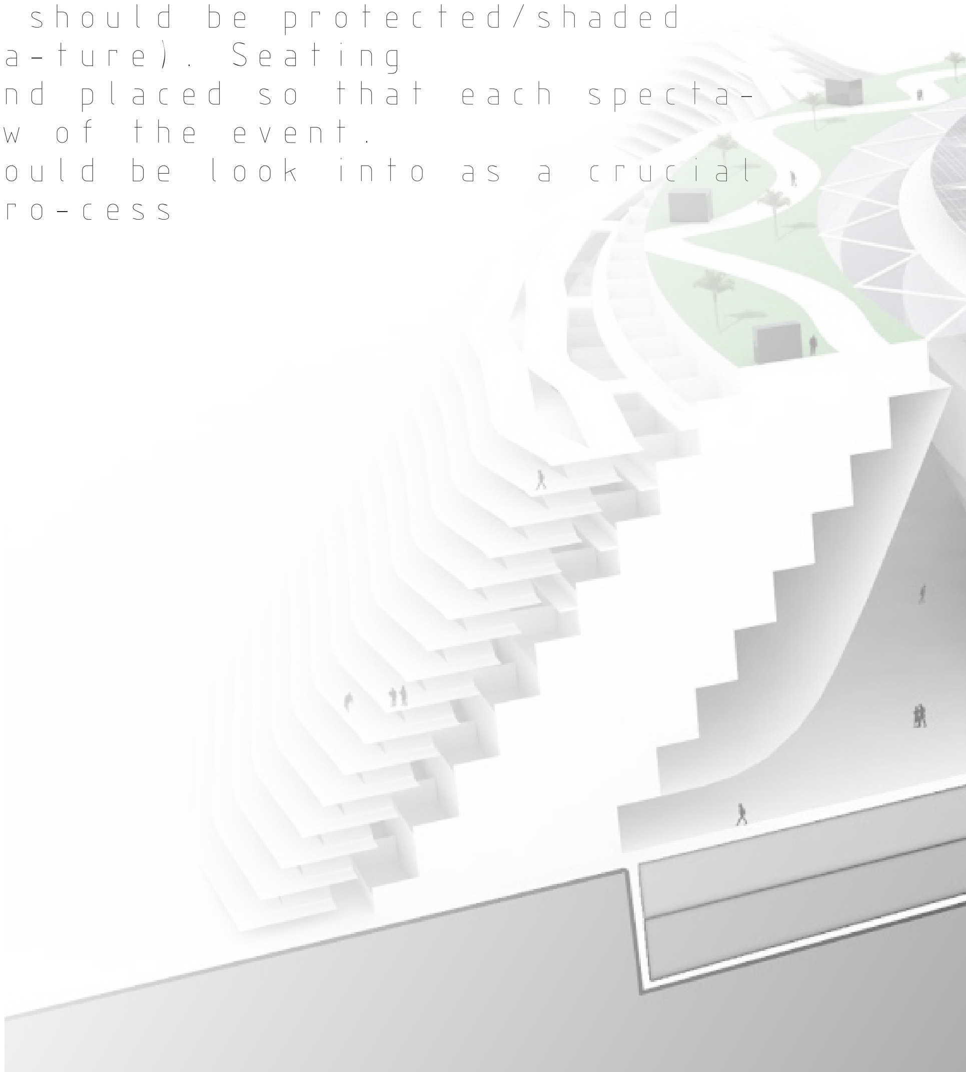


Function

The building needs to maintain its functionality at all times. This means that the building must be able to cater to different capacities and still function as if at full capacity. This may mean the incorporation of movable seating or structure or both.

Form

Practical yet has a sense of place. Design should bring about excitement as would the games hosted within it. Floorplan layout should be designed for open and easy circulation. Circulation should be uninterrupted because the large number of people using the same. Fire exits at all appropriate locations. Concession stands easily ac-cessible by all visitors. Restrooms should be the same. Box office or premium ticket holders should be viewing at a higher elevation. Space should be allocated for media cov-erage. The spectators as well as the field should be protected/shaded from the elements (na-ture). Seating should be designed and placed so that each spectator has a decent view of the event. Cross ventilation should be look into as a crucial part of the design pro-cess

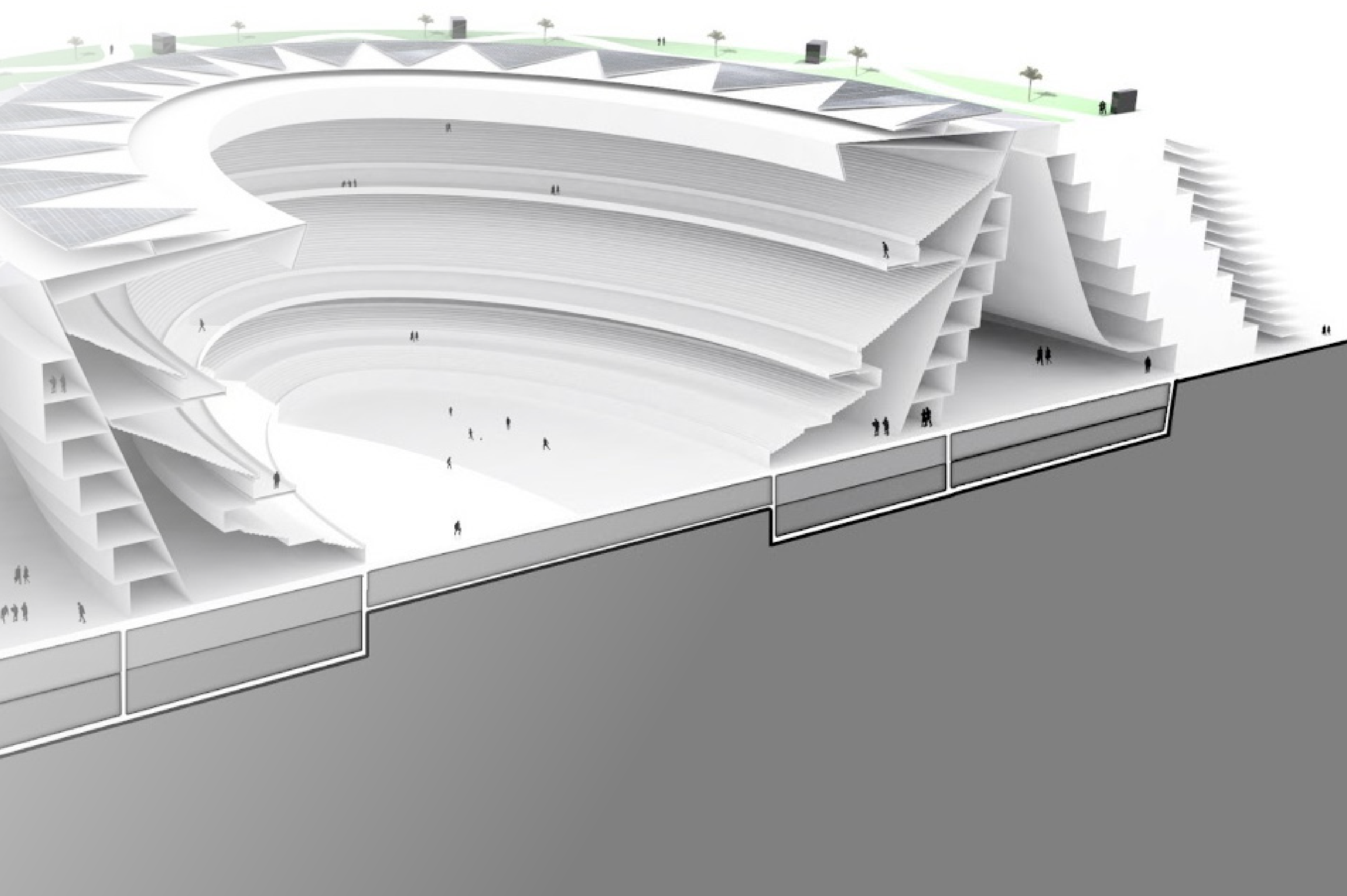


Economy

It is very important to make a return on the investment that was taken to construct this building. Therefore, design should be elegant, practical and most of all adaptable and usable throughout the year. Sustainable practices should take effect through the design process as well as construction. Building should be designed to be self-sufficient to a great extent but with adequate maintenance when needed.

Time

Time maybe the most important aspect to consider with my project as it is the essence of my thesis. This building should be designed in order to change with time, whether it is from month to month or day to day.



SITE ANALYSIS AND NARRATIVES

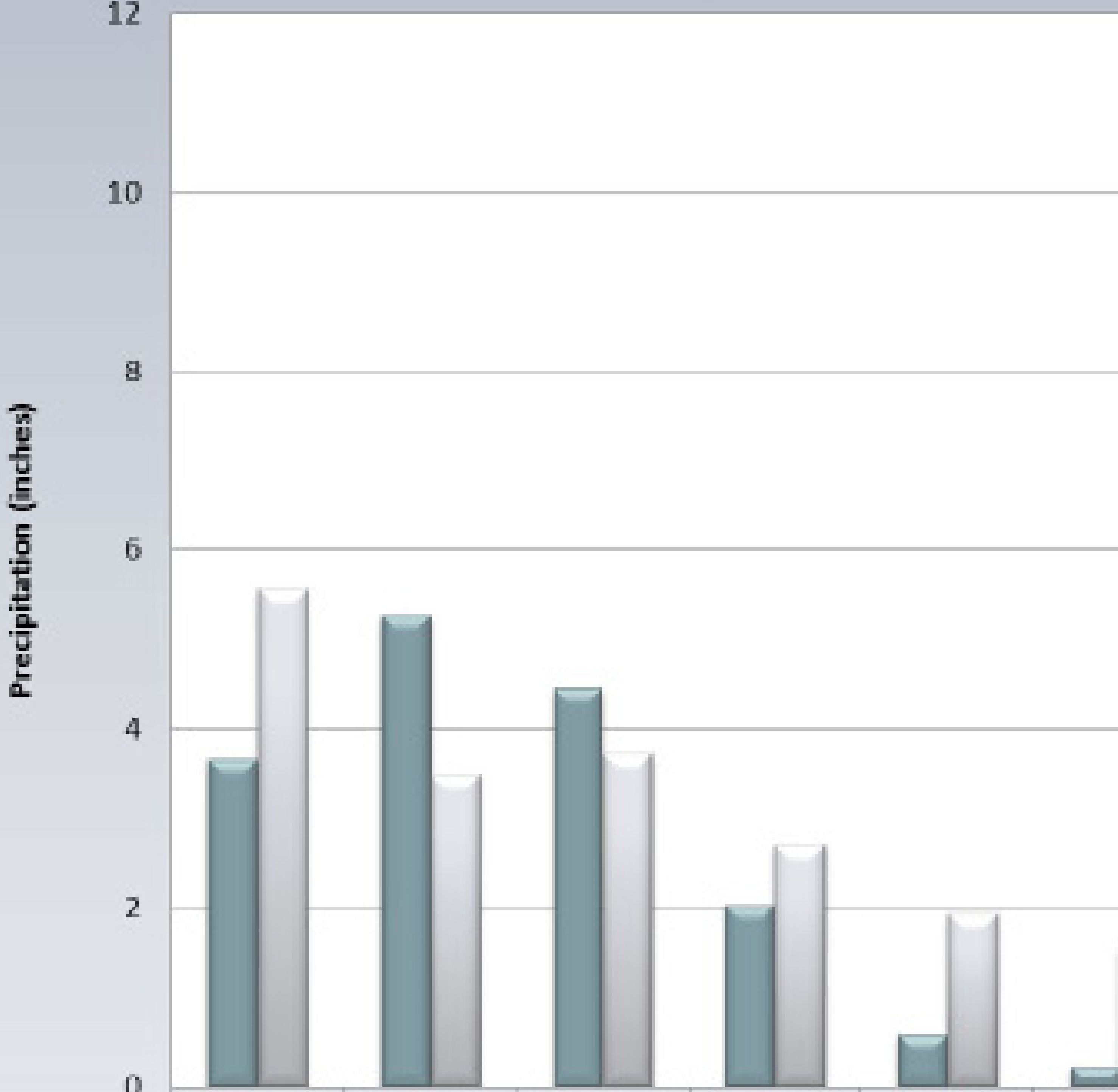
The site i've picked has already been proposed for a new major stadium in Seattle. Right north to the picked location, are two more stadiums, the Century Link and Safeco Stadium. Hence,the picked site would already have the major infustructure to support this project proposal.

In addition, the site is within close proximity to downtown which means that restaurants, bars and other commercial buildings that a stadium needs to remain successful are already present


South Lake Union
Uptown
Capitol Hill
Denny Triangle
Belltown
West Edge
Retail Core
Waterfront
First Hill
Century Link Stadium
Safeco Stadium
Site for New Stadium
Pioneer Square
Chinatown - International District
SoDo

Seattle Monthly Precipi

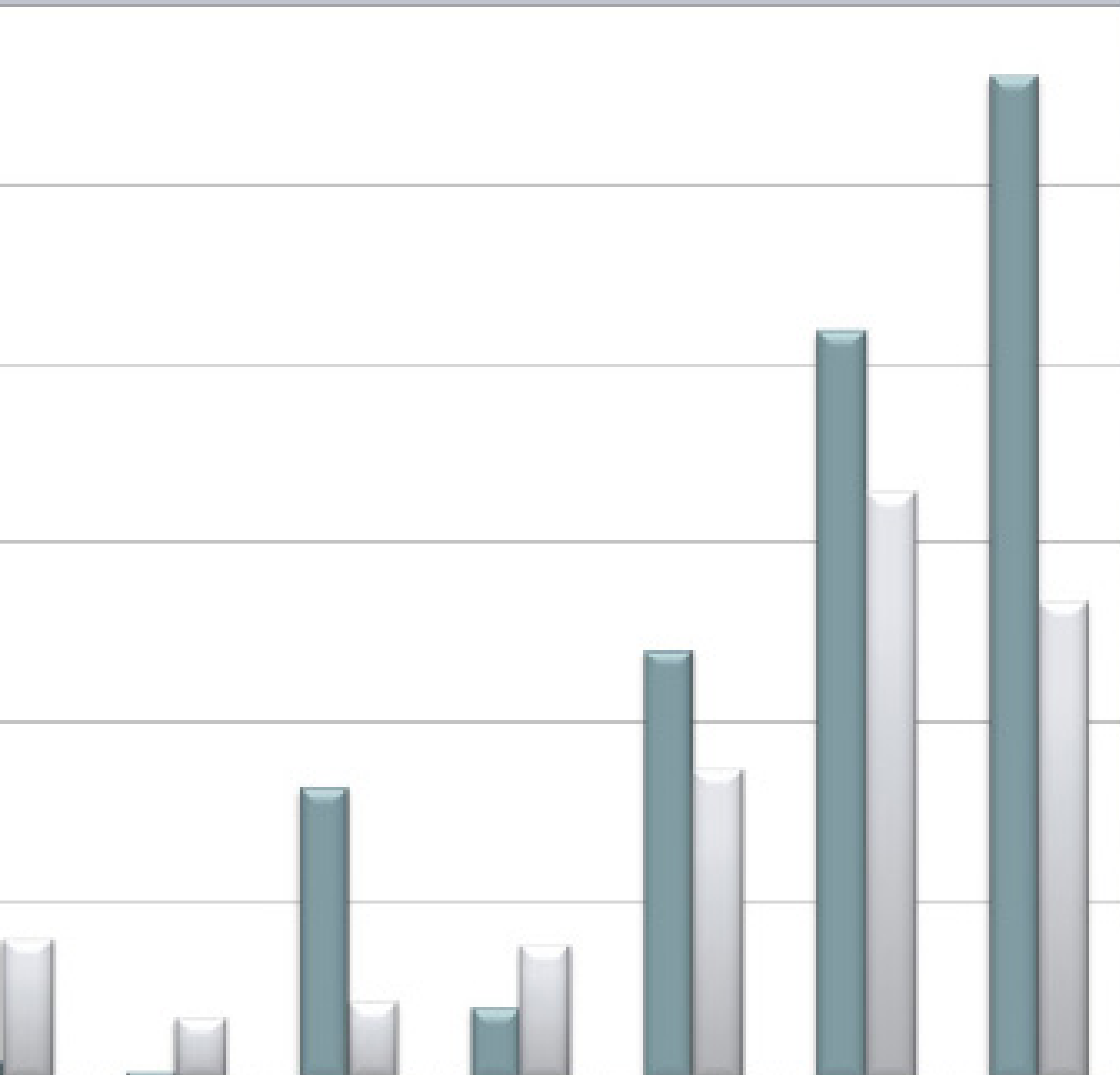
Yearly total: 44.83" (Averc



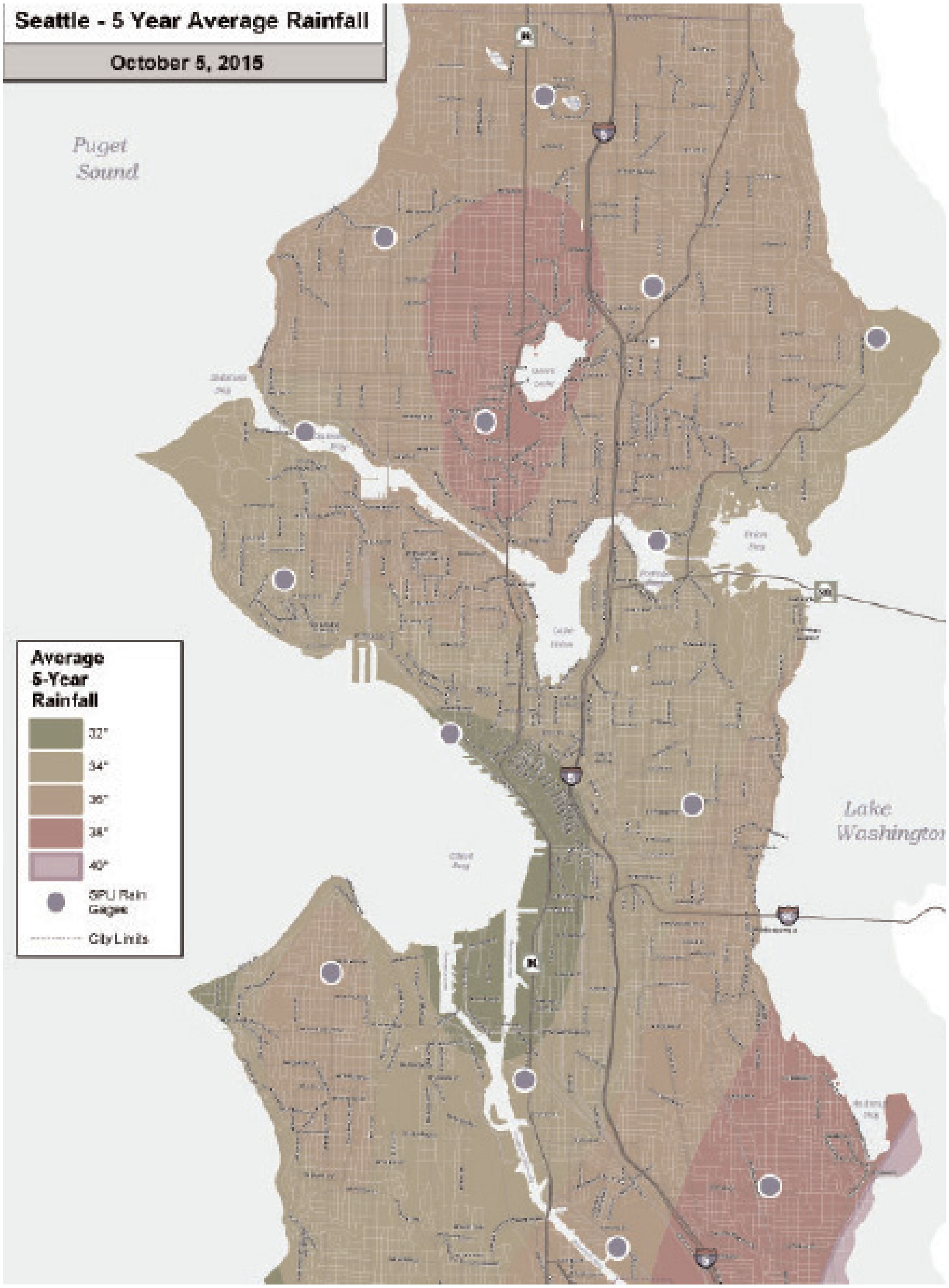
	Jan.	Feb.	Mar.	April	May	Ju
2015	3.66	5.27	4.47	2.03	0.58	0.
Average	5.57	3.50	3.72	2.71	1.94	1.

tation, 2015

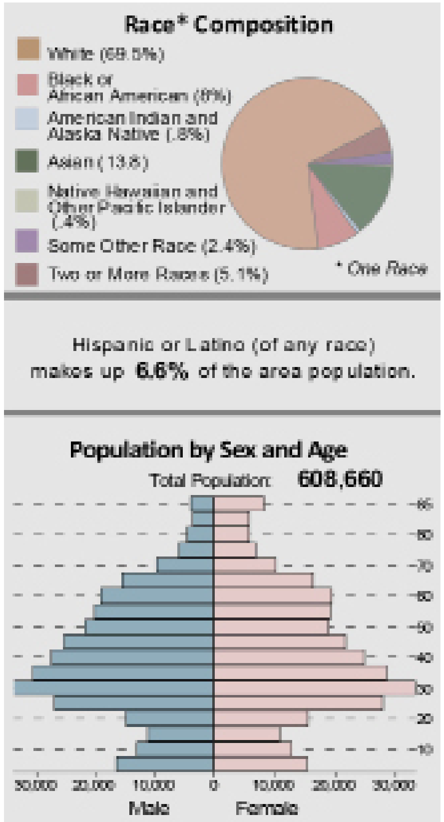
ge: 37.49")



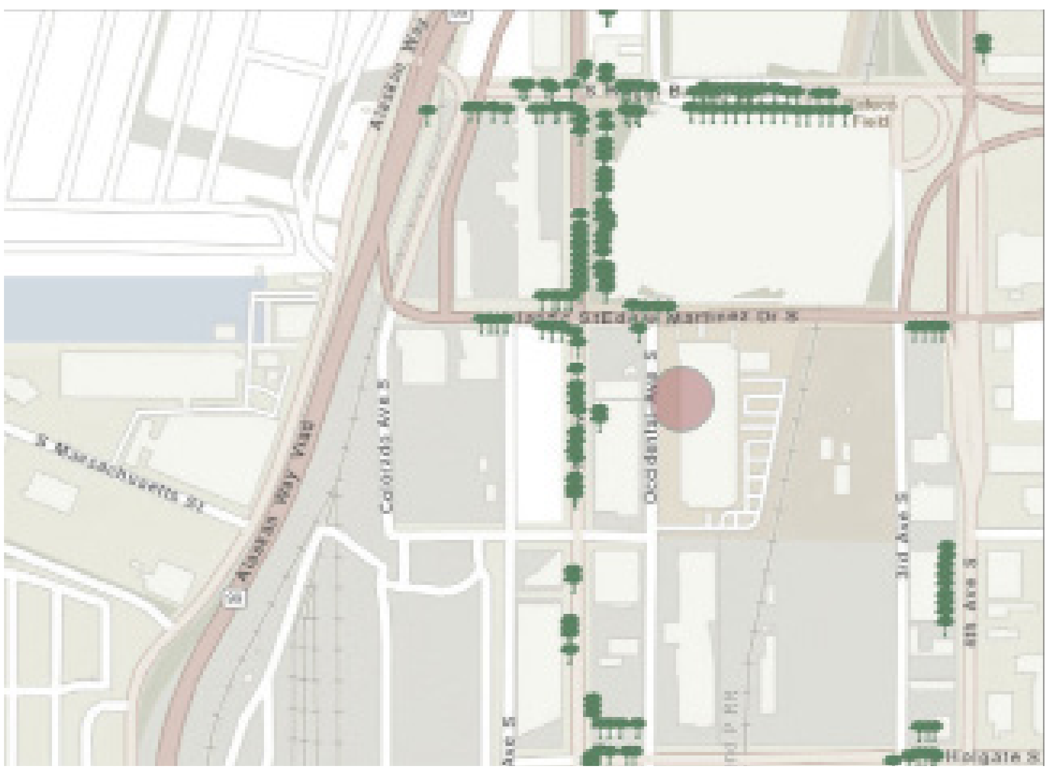
ne	July	Aug.	Sept.	Oct.	Nov.	Dec.
23	0.09	3.28	0.83	4.81	8.37	11.21
57	0.70	0.88	1.50	3.48	6.57	5.35



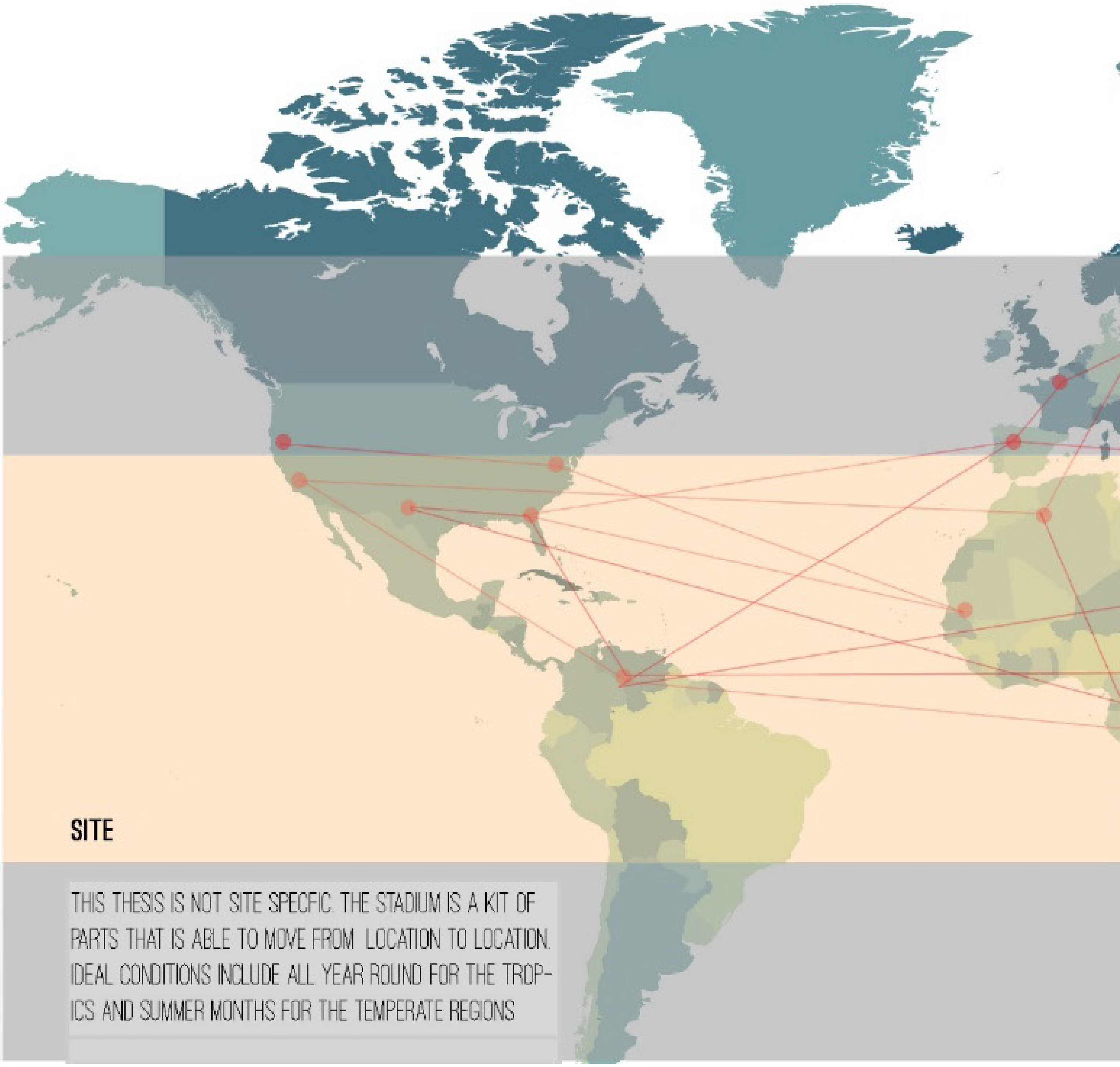
Seattle is one of five rainiest major US cities measured by the number of days per year.Therefore, it has the significant number of cloudy days. This is important to know for the design. The average per-cipitation is 34.1 inches, while the num-ber od days per year with percipitation is 152. Annual hours of sunshine is a total of 2019 hours



It's always important to understand the demographics for the area that you are designing.
For a sports complex it's particulary important because age and sex may determine use



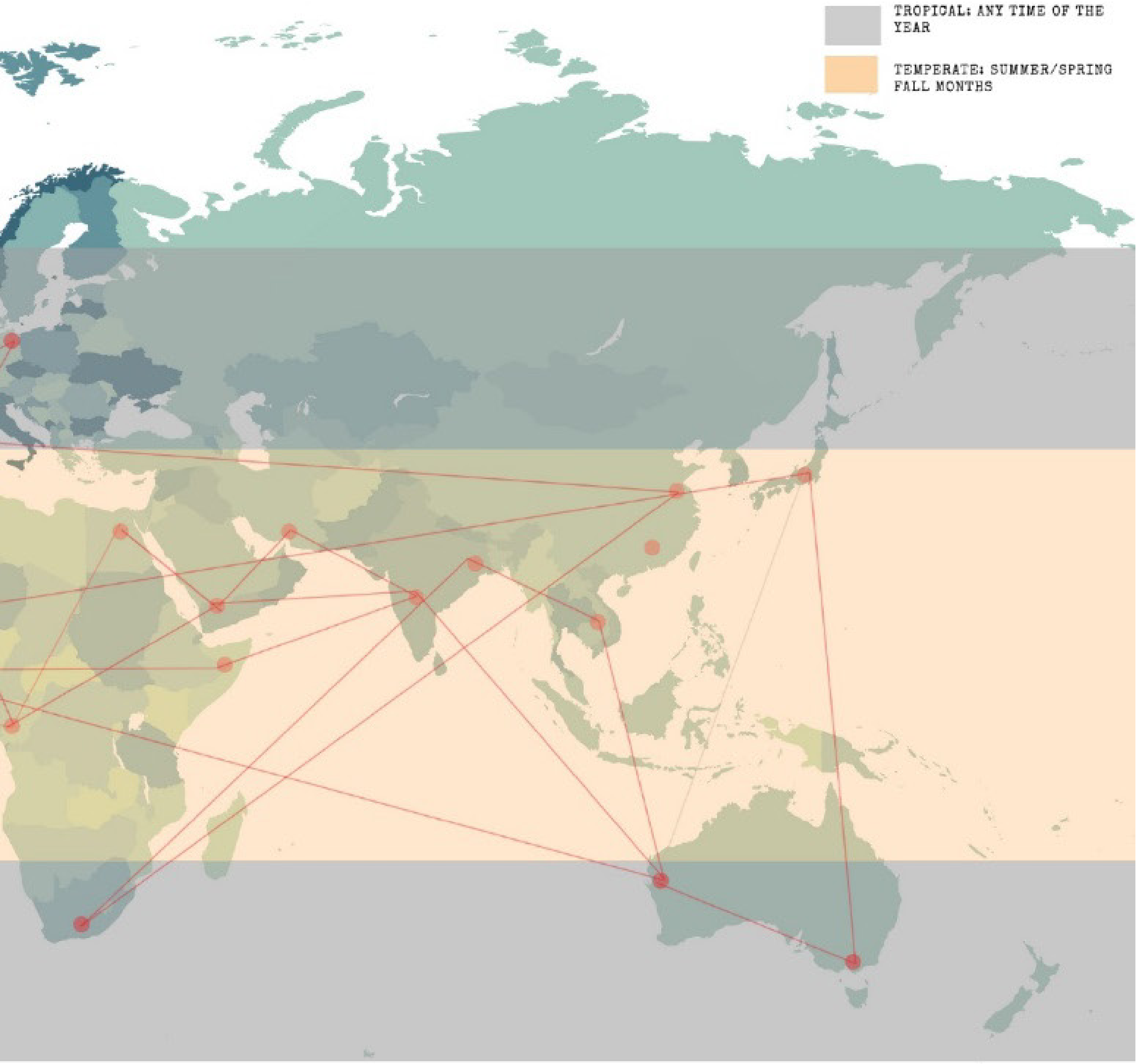
The site currently lacks planted trees.It is known that Landscape and foliage enhances the pedestrian experience and improves walkabilty.Thus is a priotity for the overall design

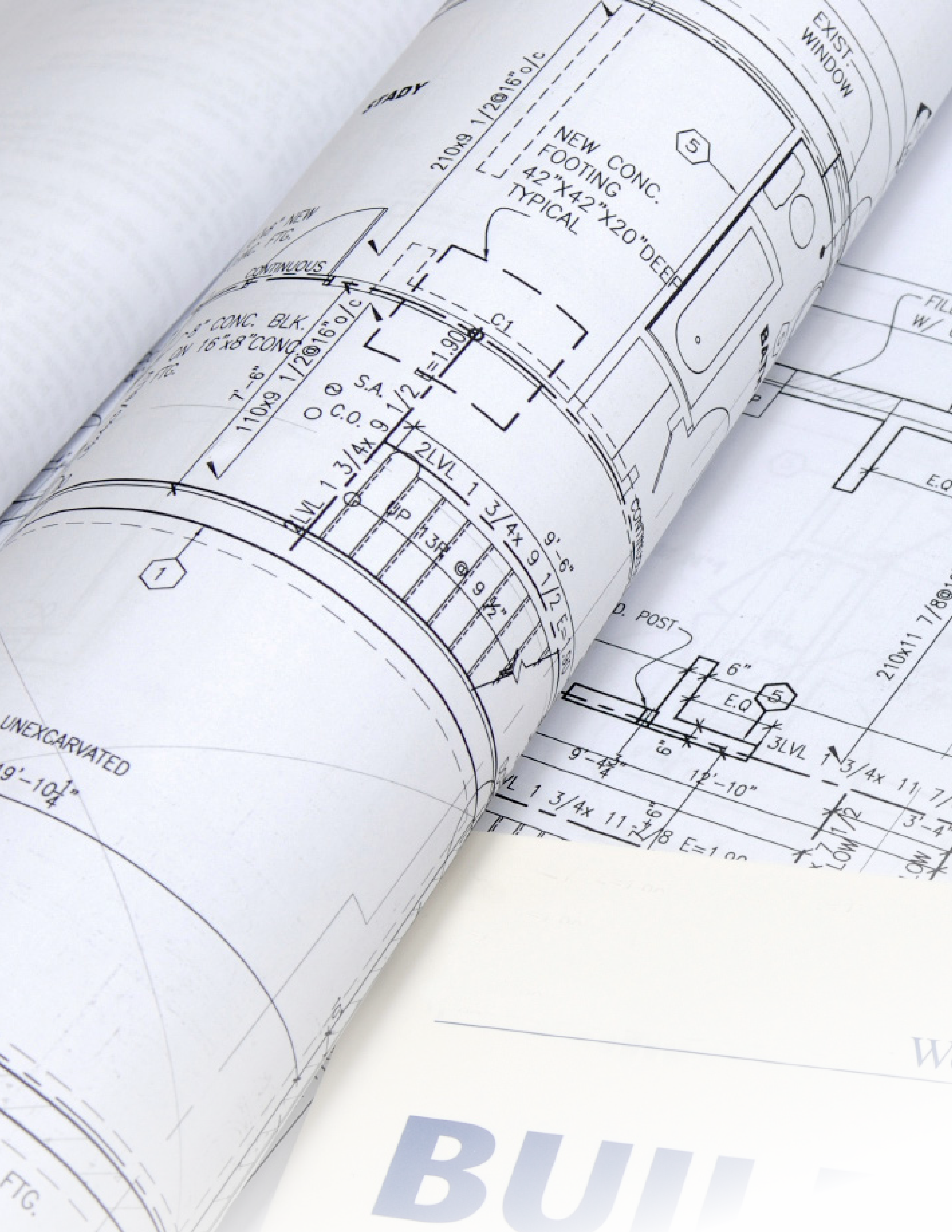


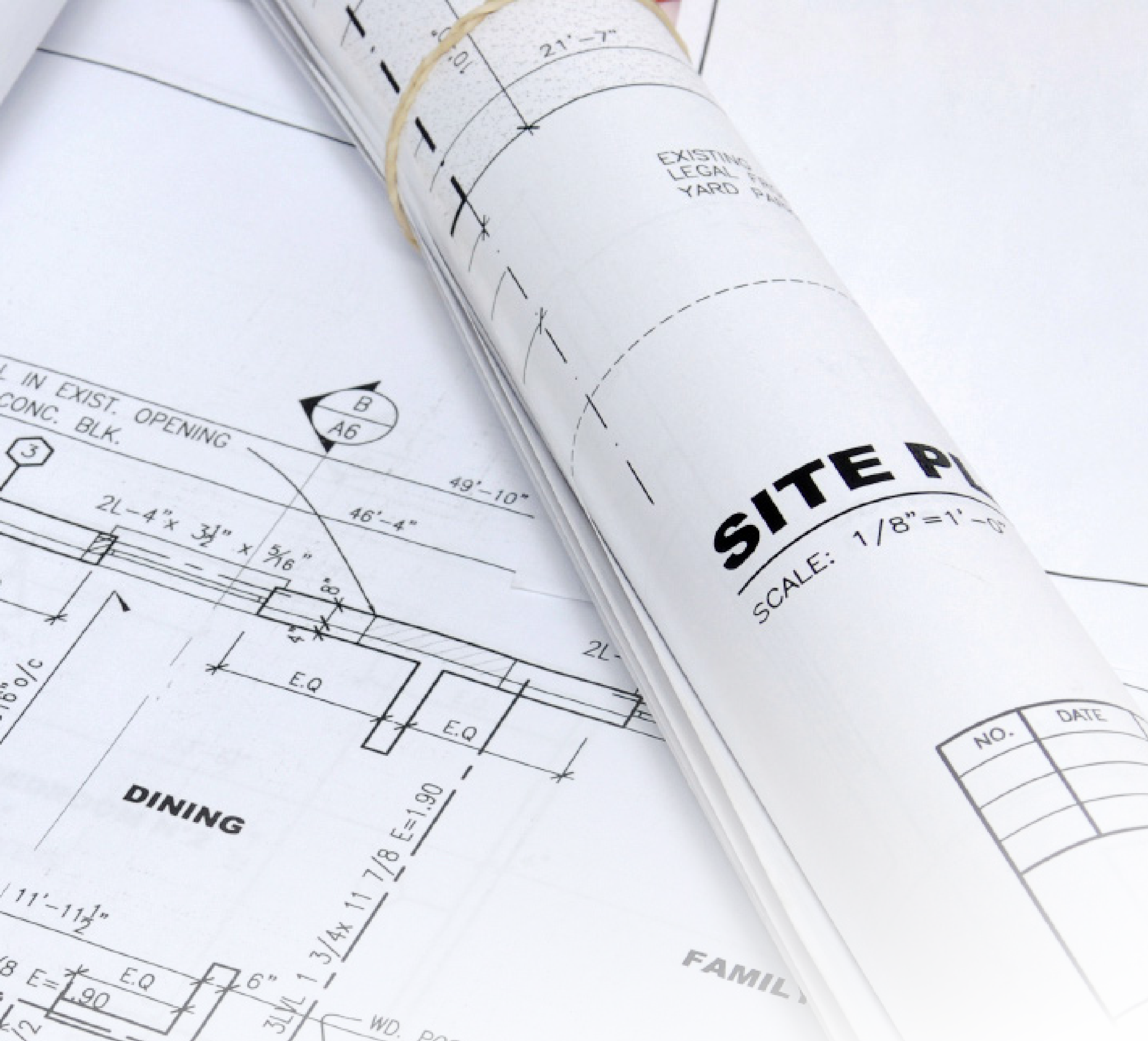
SITE

THIS THESIS IS NOT SITE SPECFIC. THE STADIUM IS A KIT OF PARTS THAT IS ABLE TO MOVE FROM LOCATION TO LOCATION. IDEAL CONDITIONS INCLUDE ALL YEAR ROUND FOR THE TROPICS AND SUMMER MONTHS FOR THE TEMPERATE REGIONS

The idea was to have Seattle as the chosen site. However, as research progressed it was determined that the stadiumj design would be portable and not designed for one specific sight. The chart below shows the ideal regions and times that would be most sutable. Coastal areas are also favorable when taking transport costs into consideration




EXIST. WINDOW
NEW CONC. FOOTING 42"X42"X20"DEEP TYPICAL
CONTINUOUS
UNEXCARVATED
D. POST
FTG.



CODE ANALYSIS AND NARRATIVES

Another crucial aspect to consider that is sometimes overlooked is staffing.
Facility staff are critical for fire pro-tection and life safety for building oc-cupants during a game day event.
Proper protocol and operational proce-dures for crowd control, security and way-finding
Should be well thought out and planned during the design stage

ASSEMBLY _ GROUP A-5

D: UNLIMITED

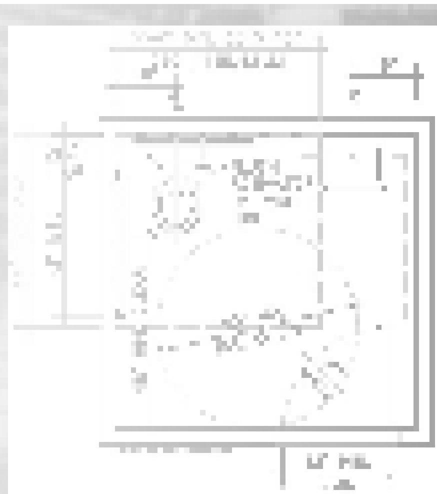
MAXIMUM EXT

CONSTRUCTIO

The smoke control system must be designed so that the smoke will remain at-least 6 feet above the means of egress.

Because of the size and nature of this typology, structural fire protection will need to be assessed based on and engineering analyses of anticipated fire exposures.

The sprinkler system protection will vary heavily with an open roof structure to an enclosed space.

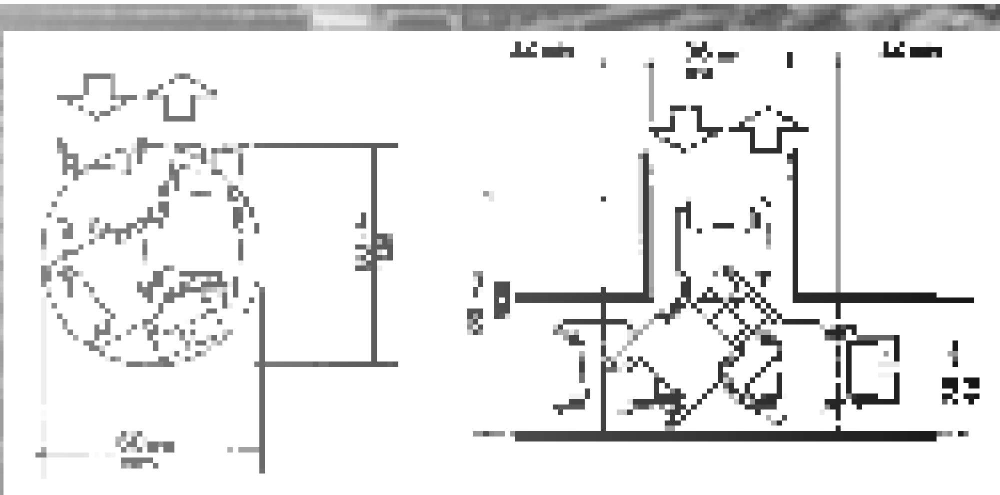


T WIDTH: 125FT

N TYPE: TYPE I

MAXIMUM HEIGHT: UNLIMITED

SF PER GROUND AREA: UNLIMITED

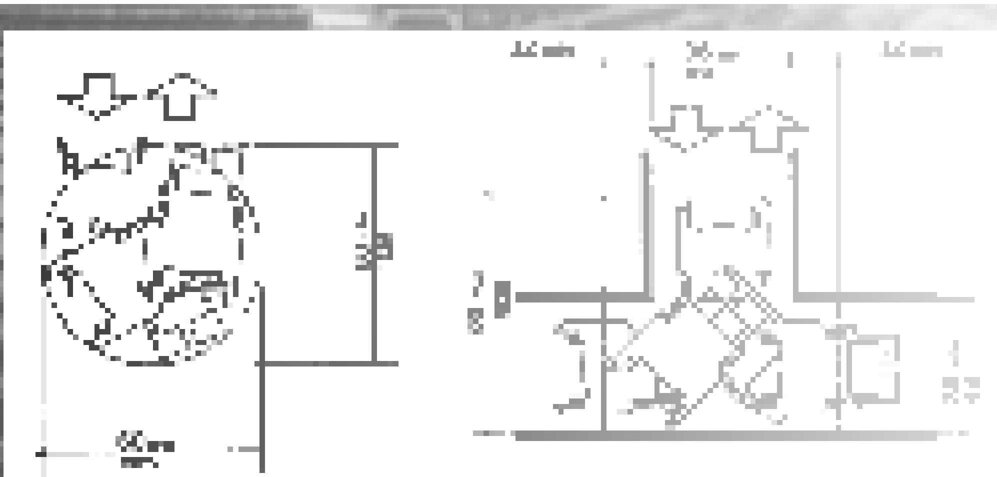


CLASSIFICATION: ASSEMBLY _ GROUP A-5

OCCUPANCY LOAD: UNLIMITED

MAXIMUM EXI

CONSTRUCTIO



Another crucial aspect to consider that is sometimes overlooked is staffing.

Facility staff are critical for fire protection and life safety for building occupants during a game day event.

Proper protocol and operational procedures for crowd control, security and way-finding Should be well thought out and planned during the design stage

DESIGN METHODOLOGY

The design methadology used here is interpretive, qualitative and logical arguement.

The interpretive is representanted by research such as precedant analyses and site analyses.These will convey my take on what already exists.

For qualitative research I have prodused hard facts which will be found in the research paper portion.Another qualitative method I plan to utlize is personal interviews.For this I will speak with professionals that have worked with and have experience with stadium construction.

Lastly, once I have done substantial research I plan to give my own iteration of what I have found. My ability to critically think and the education I have received thus far allows me to put forth an intelligent solution to this problem facing stadium architecture

PLANS FOR PROCEEDING

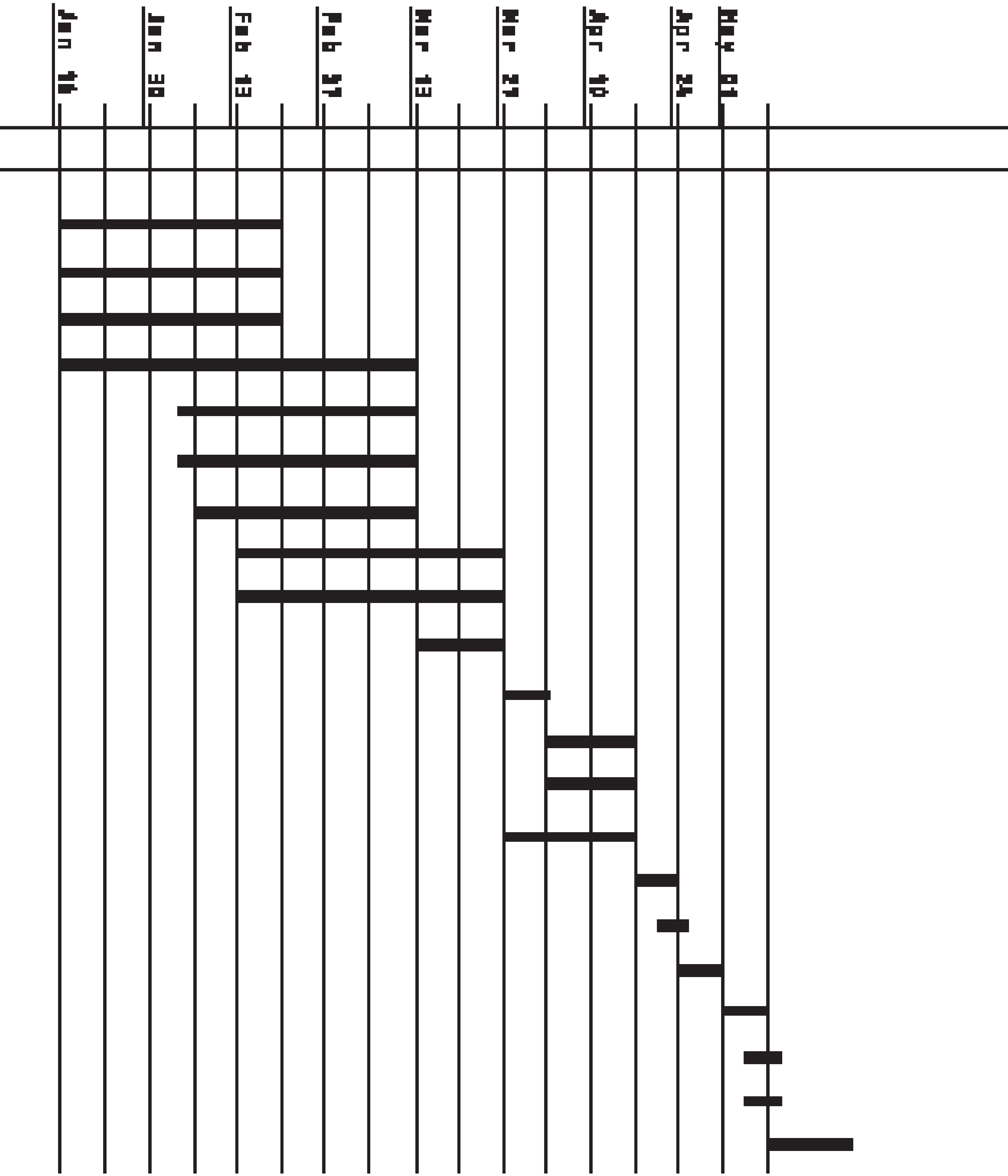
After a discussion with my thesis studio professor, I foresee many of my current ideas chang-ing. While the main premise of creating a positive change in the socio economic stance of stadium con-struction will remain the same, the path to it and the methods used to reconcile this issue will either take a small turn or even change completely.

Research will continue until mid semester, even after the designing process is well on its way. If an idea or method seems more pragmatic than the current, a decision will likely be made to go back and revise the original argument.

If I find a break in next semester s work-load, I plan to make a visit to my chosen site, Seattle, Washington. Here I hope to get a sense of the site and document the more detailed elements of the site and its surrounding.

Professor Crutchfield mentioned getting me in touch with a few of his previous colleagues that work at Populous, the renowned architecture firm that specializes in stadium design and construction. With this, I hope to grasp a deeper understanding of the process that follows when designing for this typology. Lastly, I plan to have the design completed two weeks before presentations so that I am able to go back and revise this thesis book proposal.

Context Analysis	------------1/16/17
Conceptual Analysis	------------1/16/17
Spatial Analysis	------------1/18/17
Floor plan Development	------------1/18/17
ECS Passive analysis	------------2/01/17
Section Development	------------2/01/17
Structural Development	------------2/08/17
Materials Development	------------2/13/17
ECS Active Analysis	------------2/13/17
--Midterm Reviews	------------3/23/17
Project Documentation	------------4/03/17
Context Redevelopment	------------4/16/17
Structural Redevelopment	------------4/16/17
Project Revisions	------------4/16/17
Presentation Layout	------------4/17/17
Plotting and Model Building	------------4/21/17
Preparation for Presentations	------------4/26/17
Final Thesis Review	------------5/01/17
CD Due to Thesis Advisors	------------5/08/17
Final Thesis Document Due	------------5/16/17
Commencement	------------5/12/17


Jan 16
Jan 30
Feb 13
Feb 27
Mar 13
Mar 27
Apr 10
Apr 24
May 01

PROJECT JUSTIFICATION -

COSTS OF STADIUMS

2000 Sydney Olympic Stadium - $690 million

New South Wales taxpayers are paying about $30.1 million a year to maintain

2004 Athens Olympic Stadium - $290 million

An annual maintenance cost of $10 million

2008 Beijing Olympic Stadium - $ 423 million

An annual maintenance cost of $9 million

2012 London Olympic Stadium - $605 million

Conversion costs - $355 million,
Maintenance costs – 6.5 million

2020 Tokyo Olympics Stadium - $1.26 billion

WHAT HAPPENS TO THEM

Athens, Greece - The Greek government had to pay for everything, and, sadly, there just wasn't any use for most of the buildings, stadiums, and courses after the games.

Beijing, China- 'Bird's Nest' cost $423 million to be built which might take China 30 years to pay off. Hasn't been used since the Olympics

Montreal, Canada - This tower was originally built to open and close the Olympic Stadium roof for the Montreal 1976 Summer Olympics. Now it's used solely to keep the roof, which is no longer retractable, from collapsing into the stadium.

Post-Olympic financial problems are common for Olympic host cities, particularly for the host of the larger and more expensive Summer Games. Spending billions to host the two-week event, cities almost never make a profit and usually spend years paying off their Olympic-size debt. Furthermore, these cities are often left with unused venues and "white elephant" main stadiums.

Cummings, Denis. "Beijing's Empty Venues Reveal Heavy Cost of Olympics.

"If the I.O.C. did more to encourage temporary venues or to reuse existing ones, then more cities would have a chance," said former Salt Lake City Deputy Mayor Brian Hatch to Forbes. "Instead, the I.O.C. has encouraged gigantism; spending massive amounts on sports that come around every four years."

For the Summer Olympics, a city must build an extravagant main stadium that tends to seat between 70,000 and 110,000 people. Often these stadiums have no primary tenant after the Games and cost cities millions of dollars every year in maintenance.

Cummings, Denis. "Beijing's Empty Venues Reveal Heavy Cost of Olympics.

RESEARCH METHODS

STRATEGIES

Interpretive - Precedents Or Previous Case Studies

Qualitative - Social and Economic issues

Simulation - Digital Models

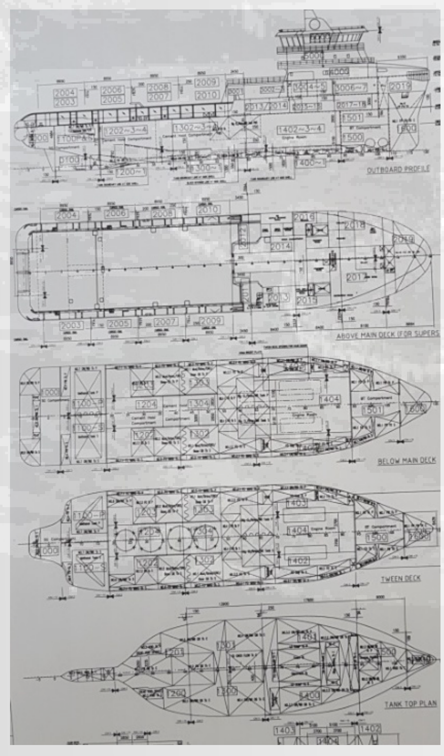
TACTICS

Personal Interviews

Literature Reviews

Logical Iterations - Based on or with the help of my research

MODULAR DESIGN
MODULAR SHIP CONSTRUCTION



Interview 1 - Rohithe Amarasignhe
Mechanical Engineer - Colombo Dockyard

Ship construction goes through most of the same processes as building construction

Highly efficient method of construction. Saves time and costs.

The same design can be used to build different ships (buildings) with slight variations specific to owner or client needs

Main takeaways -

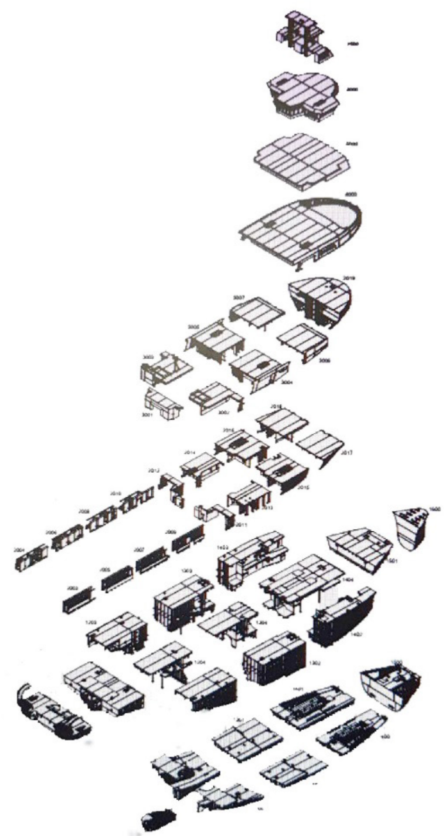
Size of modular components- Components have to fit in storage

Capacity of lifting equipment- Components cannot be too heavy for lifting equipment

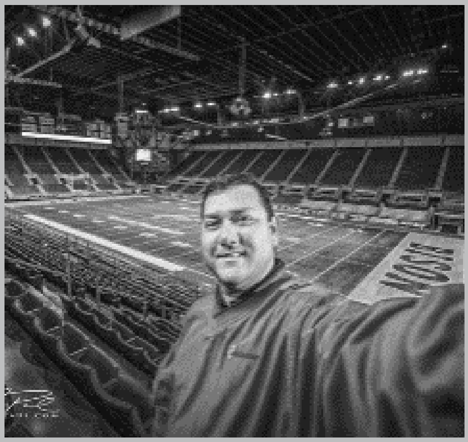
Importance of scheduling and planning - Building components need to arrive in sequence. Storage takes space and costs money

Interview 1 - Rohithe Amarasignhe
Mechanical Engineer - Colombo Dockyard

- Modular design is a proven method of efficiency. The most important aspects of construction are alignment, scheduling, maintenance and adequate capability of lifting equipment



TOURING THE FARGODOME



interview 2 - Bernie Larson
AssistantGeneral Manager - Fargodome

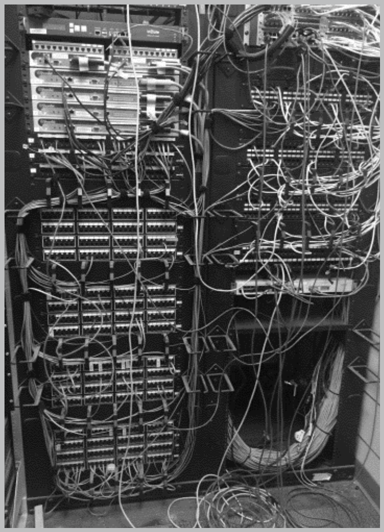
Main takeaways

Being able to finance a stadium with alternative methods. In this instance the Fargo dome rents out their own equipment

Space for storage and mechanical

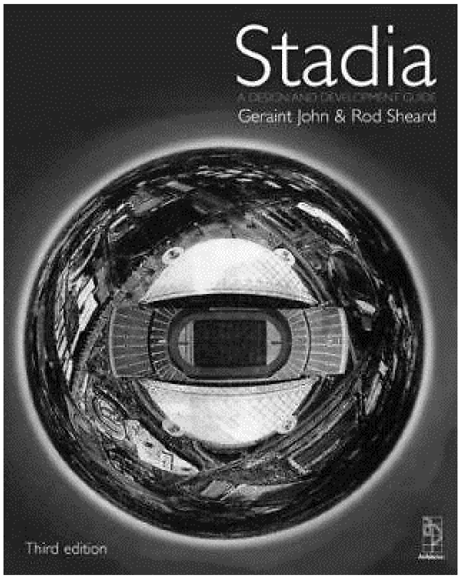
- A lot of stadiums run at a loss because the revenue from the ticket sales alone isn't enough to cover its running costs. This ends up costing the city a lot of money

TOURING THE FARGODOME



Touring the fargodome was an unique opportunity that allowed for me to see into the
back of house operations required to running, mainitaining
and sustaining a stadium. a clearer, more
accurate plan was able to be formed through the
information i gathered.
Not all stadiums end their fiscal year breaking even,
let alone making a profit, this is one of the main
setbacks of running a stadium. the far-godome is
successful in this department because it takes
advantage of renting out their own equipment to
clients that they play host to. I was told that
they if not for this extra income the fardome may
also not be able to cover it's over-heads
i was also able to see first hand how a stadium
setup works with respects to mechani-cal, electrical,
staging and storage
One of the main take aways that I took from this
tour was importance of being able to finnance the
stadiums runing costs. The other is the amount of
storage needed for this type of Venue Architecture

LITERATURE REVIEW



Stadia, Third Edition: A Design and Development Guide

Geraint John, Rod Sheard and Ben Vickery

Takeaways-

Master Planning

Form and Structure

HVAC

Seating

This publication allowed for a better understanding of the above by referencing different existing examples of stadiums under each criteria

The truth is that it is now very difficult for a sports stadium to be financially viable without some degree of subsidy

SOLUTION

Modular Components
   Risers (Folded Steel plates)

Kit of Parts
   Roof
   Riser (Structure) - Post and Beams

Usage Of A Temporary Canopy System Vs A Permanent Roof Structure

Shipping Containers

SHIPPING CONTAINER PROCESS

Shipping containers are integral part in this kit of parts

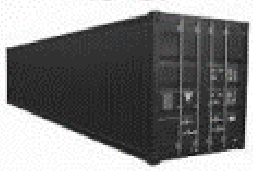
Serves two main purposes

It is the vessel that transports all parts if most parts needed to assemble the building

It also plays host to the spaces that make up a conventional stadium

40’

40’ GP

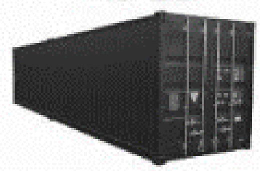


	L	W	H
External	40'0" 12.19m	8'0" 2.44m	8'6" 2.59m
Internal	39'6" 12.03m	7'8" 2.35m	7'1" 2.39m
Door Opening	39'6" 12.03m	7'8" 2.35m	7'6" 2.28m
Max.Capacity	2390-2397 (cu ft) 58820-60740 (lbs) 67.70-37.80 (m) 26860-27550 (kgs)		
Tare Weights	6460-8380 (lbs) 2390-3800 (kgs)		

40’ HQ

	L	W	H
External	40'0" 12.19m	8'0" 2.44m	9'6" 2.91m
Internal	39'6" 12.03m	7'8" 2.35m	8'10" 2.71m
Min. Door Opening	39'6" 12.03m	7'8" 2.35m	8'6" 2.59m
Max.Capacity	2700-2715 (cu ft) 58970-60400 (lbs) 76.40-76.88 (m) 27650-27400 (kgs)		
Tare Weights	6800-8230 (lbs) 3080-3730 (kgs)		

40’ DD

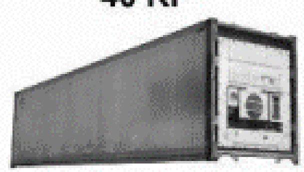


	L	W	H
External	40'0" 12.19m	8'0" 2.44m	8'6" 2.59m
Internal	39'6" 12.03m	7'8" 2.35m	7'10" 2.39m
Door Opening	39'6" 12.03m	7'8" 2.35m	7'6" 2.28m
Max.Capacity	2390-2397 (cu ft) 58820-60740 (lbs) 67.7-37.80 (m) 26860-27550 (kgs)		
Tare Weights	6460-8380 (lbs) 2930-3800 (kgs)		

40’ OT

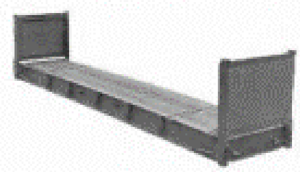
	L	W	H
External	40'0" 12.19m	8'0" 2.44m	8'6" 2.59m
Internal	39'5" 12.02m	7'8" 2.33m	7'9" 2.38m
Door Opening			
Max.Capacity	2295 (cu ft) 58490 (lbs) 65 (m) 26530 (kgs)		
Tare Weights	8050 (lbs) 3650 (kgs)		

40’RF



	L	W	H
External	40'0" 12.19m	8'0" 2.44m	8'6" 2.59m
Internal	37'8" 11.48m	7'4" 2.24m	7'1" 2.18m
Door Opening	37'8" 11.48m	7'4" 2.24m	7'0" 2.13m
Max.Capacity	1963-2055 (cu ft) 56990-58180 (lbs) 55.60-59.29 (m) 25850-26390 (kgs)		
Tare Weights	9020-10210 (lbs) 4090-4630 (kgs)		

40’ FR



	L	W	H
External	40'0" 12.19m	8'0" 2.44m	8'6" 2.59m
Internal	39'5" 12.01m	7'7" 2.31m	6'6" 1.98m
Min. Door Opening			
Max.Capacity	56188 (lbs) 25485 (kgs)		
Tare Weights	11012 (lbs) 4995 (kgs)		

40’ Container

New - DNV, GL or ABS Certified

Used - Under IICL, Cargo Worthy,Wind Water Tight

Customized - Upon request

20'

20' GP

	L	W	H
External	20'0" 6.10m	8'0" 2.44m	8'6" 2.59m
Internal	19'4" 5.90m	7'8" 2.34m	7'9" 2.38m
Door Opening	19'4" 5.90m	7'8" 2.34m	7'6" 2.27m
Max.Capacity	1158-1186 (cu ft) 39380-47880 (lbs) 32.85-33.58 (m) 17860-21700 (kgs)		
Tare Weights	5030-5490 (lbs) 2280-2490 (kgs)		

20' HQ

	L	W	H
External	20'0" 6.10m	8'0" 2.44m	9'6" 2.91m
Internal	19'4" 5.90m	7'8" 2.34m	8'10" 2.71m
Door Opening	19'4" 5.90m	7'8" 2.34m	8'6" 2.59m
Max.Capacity	1350-1390 (cu ft) 39380-47880 (lbs) 38.23-39.36 (m) 17860-21700 (kgs)		
Tare Weights	5350-5550 (lbs) 2427-2495 (kgs)		

20' DD

	L	W	H
External	20'0" 6.10m	8'0" 2.44m	8'6" 2.59m
Internal	19'4" 5.90m	7'8" 2.34m	7'9" 2.38m
Door Opening	19'4" 5.90m	7'8" 2.34m	7'6" 2.27m
Max.Capacity	1158-1186 (cu ft) 39380-47880 (lbs) 32.85-33.58 (m) 17860-21700 (kgs)		
Tare Weights	5030-5490 (lbs) 2280-2490 (kgs)		

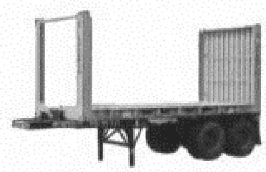
20' Side Open

	L	W	H
External	20'0" 6.10m	8'0" 2.44m	8'6" 2.59m
Internal	19'4" 5.90m	7'8" 2.34m	7'9" 2.38m
Door Opening	19'4" 5.90m	7'8" 2.34m	7'6" 2.27m
Max.Capacity	1158-1186 (cu ft) 39380-47880 (lbs) 32.85-33.58 (m) 17860-21700 (kgs)		
Tare Weights	5030-5490 (lbs) 2280-2490 (kgs)		

20' OT

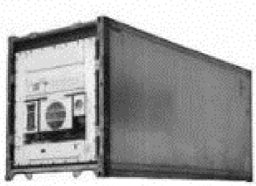
	L	W	H
External	20'0" 6.10m	8'0" 2.44m	8'6" 2.59m
Internal	19'4" 5.90m	7'8" 2.34m	7'9" 2.38m
Door Opening			
Max.Capacity	1158-1186 (cu ft) 48280-62240 (lbs) 32.85-33.58 (m) 21900-28230 (kgs)		
Tare Weights	4630-4960 (lbs) 2100-2250 (kgs)		

20' FR



	L	W	H
External	20'0" 6.10m	8'0" 2.44m	8'6" 2.59m
Internal	18'1"-19'6" 5.51-5.94m	8'0" 2.44m	7'1"-7'7" 2.16-2.31m
Door Opening			
Max.Capacity	46910-39900 (lbs) 21280-30005 (kgs)		
Tare Weights	4850-6000 (lbs) 2200-2720 (kgs)		

20'RF



	L	W	H
External	20'0" 6.10 m	8'0" 2.44m	8'6" 2.59m
Internal	17'6" 5.34 m	7'2" 2.20m	7'4" 2.25m
Door Opening	17'6" 5.34 m	7'3" 2.21m	7'3" 2.21m
Max.Capacity	932-1003 (cu ft) 45460-60450 (lbs) 26.4-28.4 (m) 20620-27420 (kgs)		
Tare Weights	6750-7450 (lbs) 3060-3380 (kgs)		

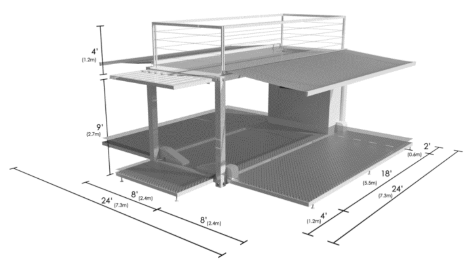
20' Container

New - DNV, GL or ABS Certified

Used - Under IICL, Cargo Worthy,Wind Water Tight

Customized - Upon request

SHIPPING CONTAINER PROCESS



The images represent the process of loading building parts and components into containers from where they will be shipped to their destination venue.

After which the parts will be unloaded on site and the containers then used for other purposes throughout the event

Once the event has ended the parts will be packed and loaded back into containers and on to a ship, where it will store the parts till the next event

SHIPPING CONTAINER PROCESS

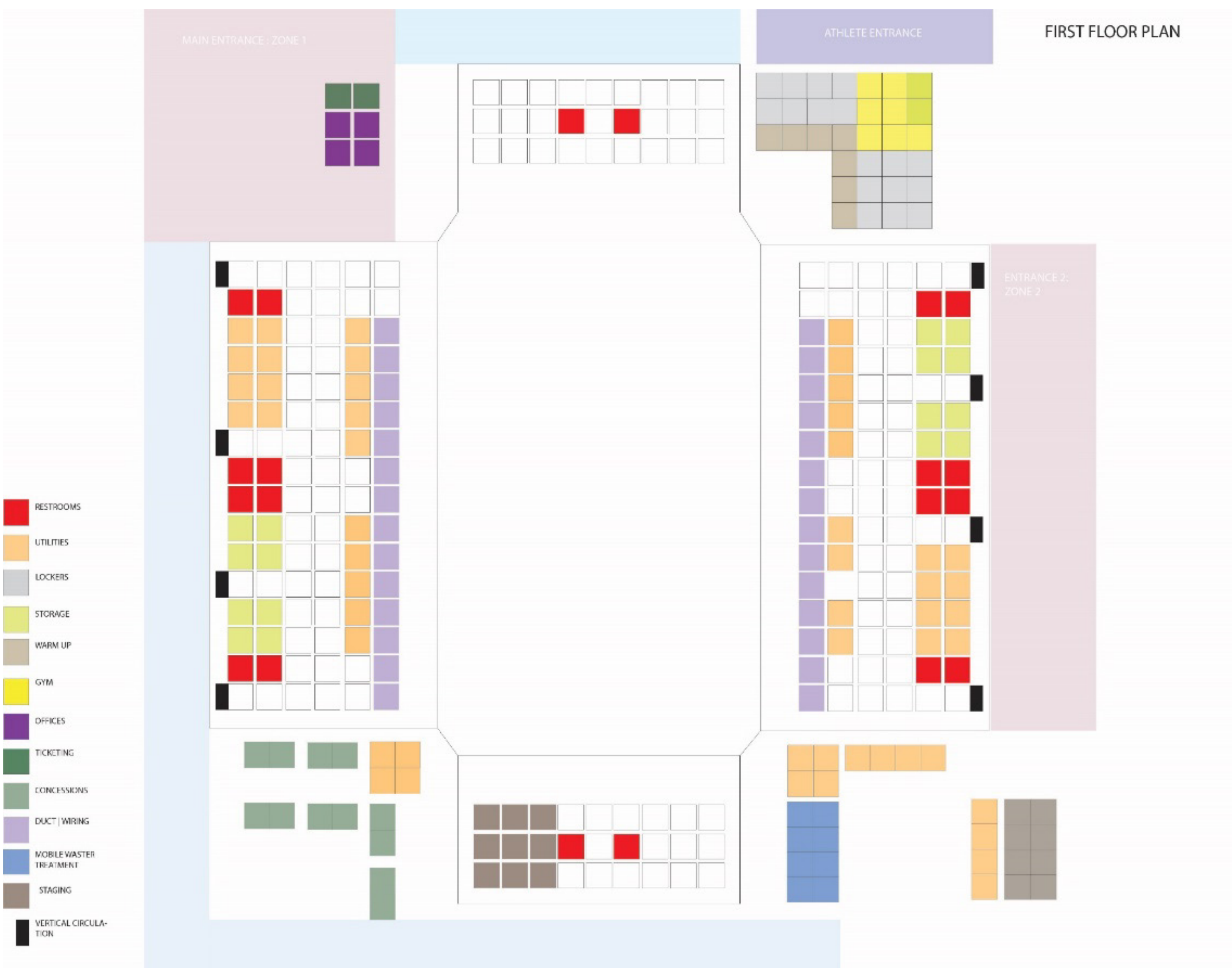
The graph seen here represents the spaces and their square foortage.it shows ho many shipping containers would be needed in order to make up the sqft needed for that specfic space.

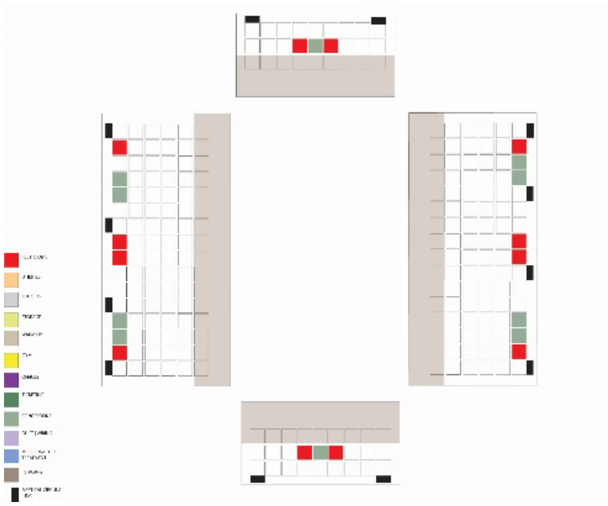
SPACE
Concessions
Offices
Storage
Bathrooms
Lockers
Utilities
Warm up space
Gym
Risers
Field
Track
Roof/ Wrap

40x10 SF	# of SC	Needs Mech.
20,000	50	
5500	14	
15,000	38	
27,500	69	
28,000	70	
40,000	100	
10,000	25	
10,000	25	
250,000		
77056		
75000		
Total SC	**391**	

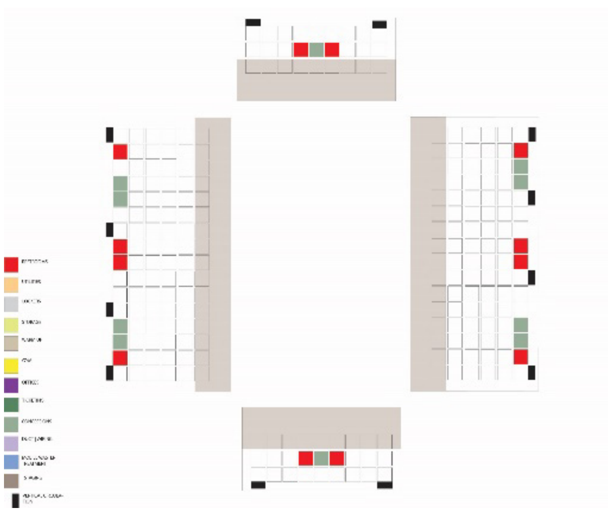
FLOOR PLAN LAYOUTS

Each square in the graph below represents 4 shipping containers. Making the square footing of each square 400sqft. The primary spaces all lie on the first floor. The four corners by the stands are dedicated to the Entrance, Athletes Area, Concessions and mechanical. The restrooms, mechanical space and storage have been situated mostly under the spectator stands. Restrooms and concessions have also been provided on the 2nd, 3rd and 4th floors for convenience.

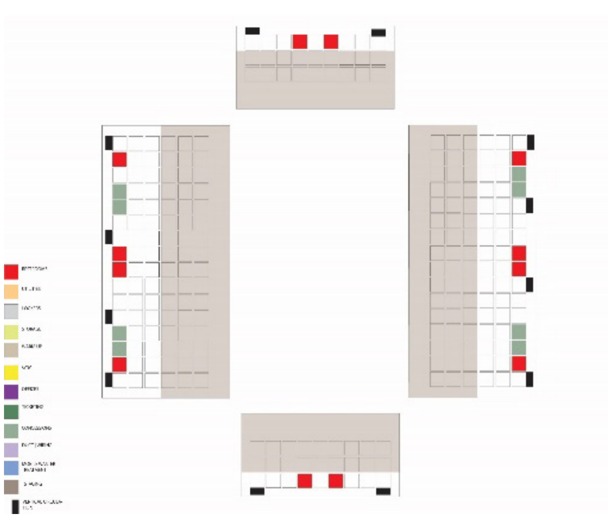




SECOND FLOOR PLAN



THIRD FLOOR PLAN

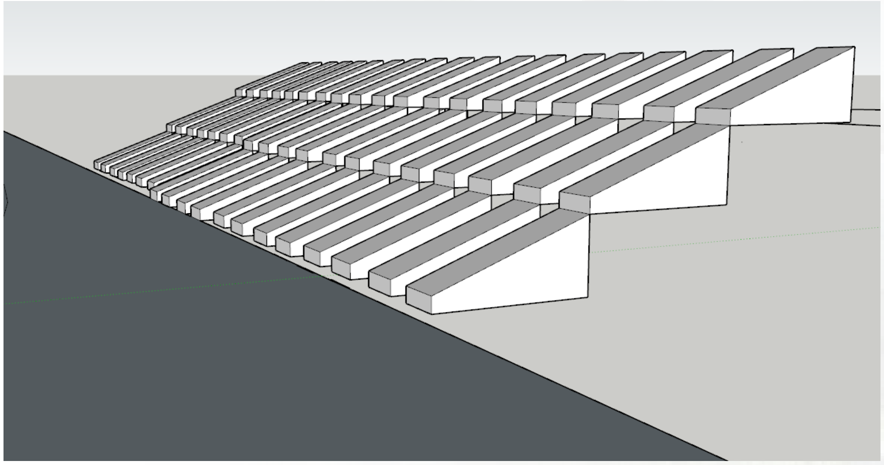


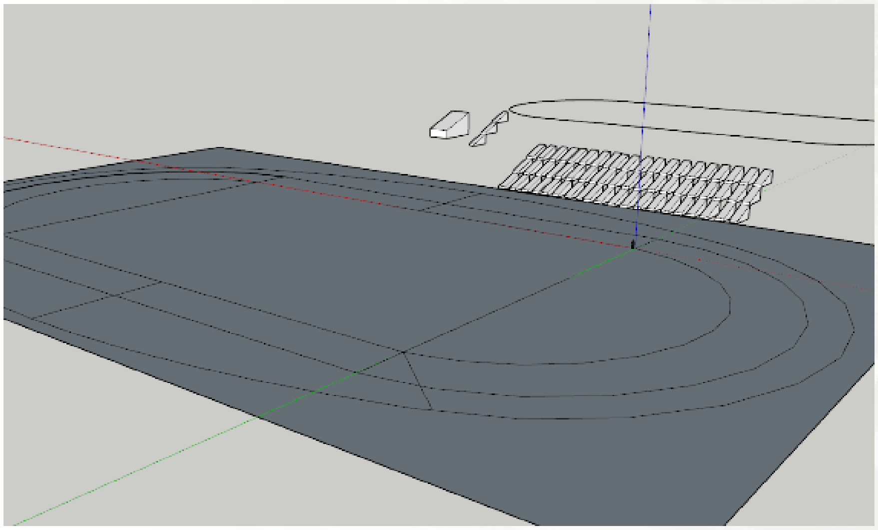
FOURTH FLOOR PLAN

ITERATIONS

The risers and also spaces that are usually beneath them began as a modular block concept that would fit in to the constraints of a shipping container

However, it became obvious that that would not be feasible.



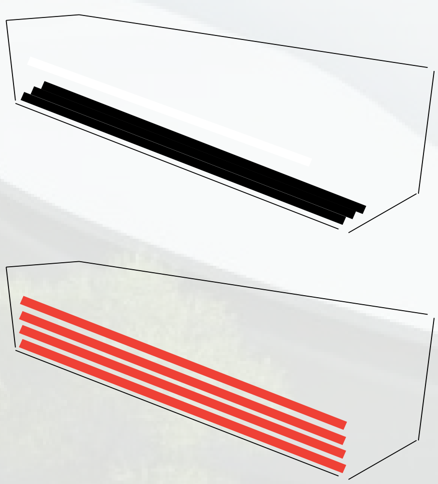


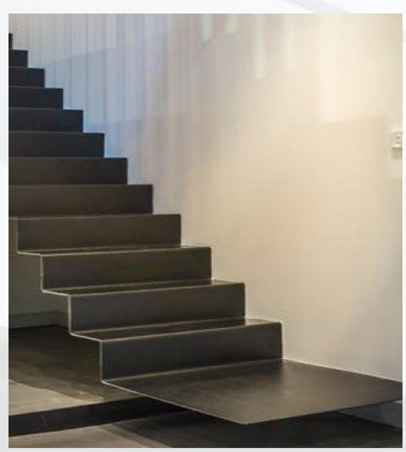
Kit Parts Concept -

All parts that would fit in standard SC models (columns, beams, girders, nuts , bolts)would be shipped accordingly

Risers will be consist of folded steel plates, that are modular in size

These will be welded on site to the girder

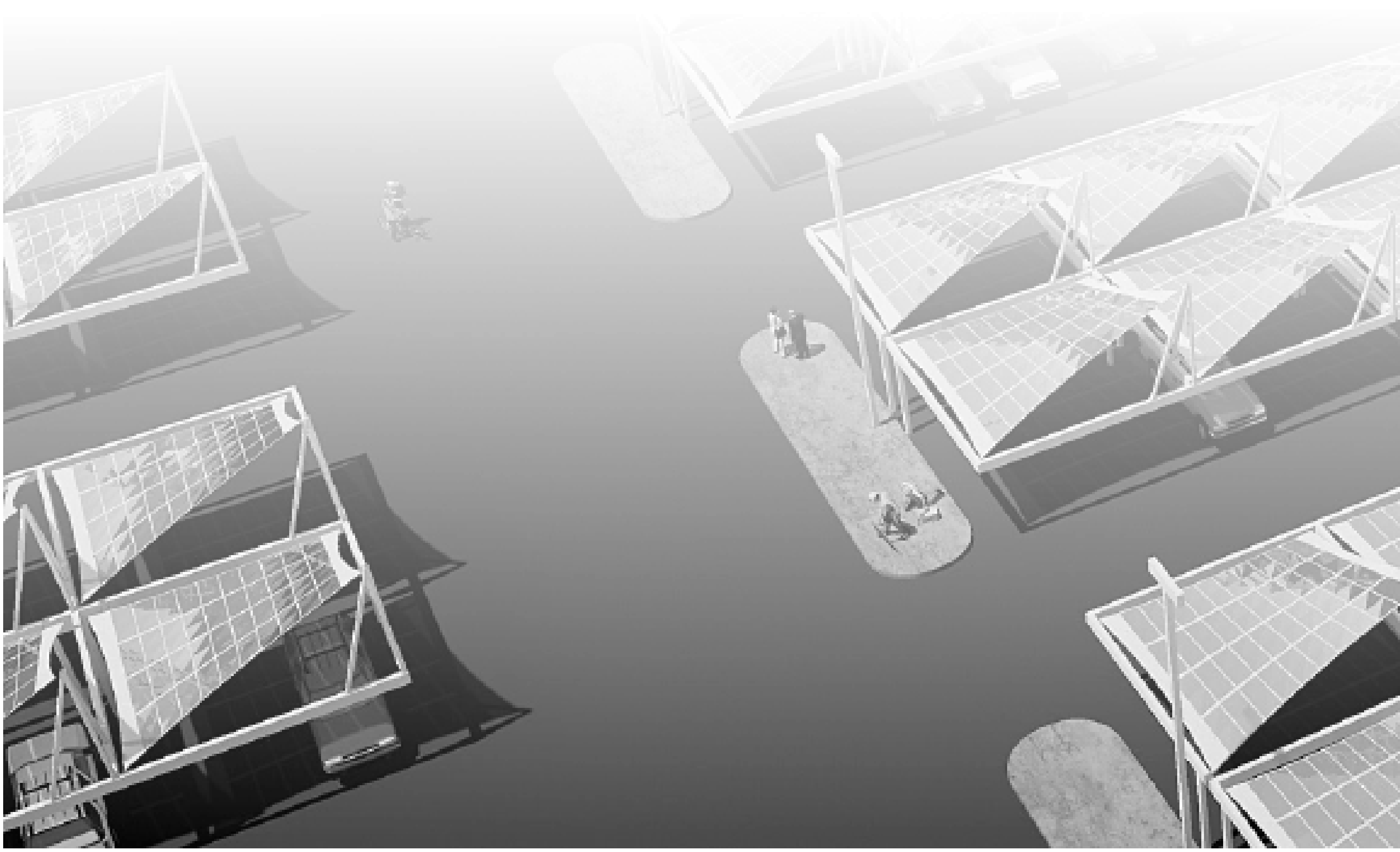




Solar panels

Natural heat generation from solar panels can be used to reduce a stadium's dependence on conventional sources and also reduce overall energy consumption.

For example, hot water for sinks and showers can be provided by the collection, storage and use of solar energy, produced by solar panels.



Photovoltaic panels

PV panels produce electricity whenever sunlight shines on them.

They require little maintenance and are highly effective

Using these features can supply clean energy back to the main grid on a day to day basis and draw out energy on the day of the event

MOBILE WASTE WATER TREATMENT PLANT

Using a waste water treatment plant is not only more sustainable but it can also ensure that the water demands of the stadium facility is being supported without adding too much strain on the city's main water system

HOW THIS FITS WELL WITH A TEMPORARY VENUE STADIUM DESIGN?

Container wastewater treatment plants are treatment systems fully installed in a container intended for the biological treatment of wastewater.

The plant will be installed in 20- or 40-foot containers.

Due to the modular design, plants can be configured easily and quickly according to the customers' demands.

Features

Modular Construction

Simple Transport Because Of Container Construction

Multiple Usage Possible Due To Mobile Application

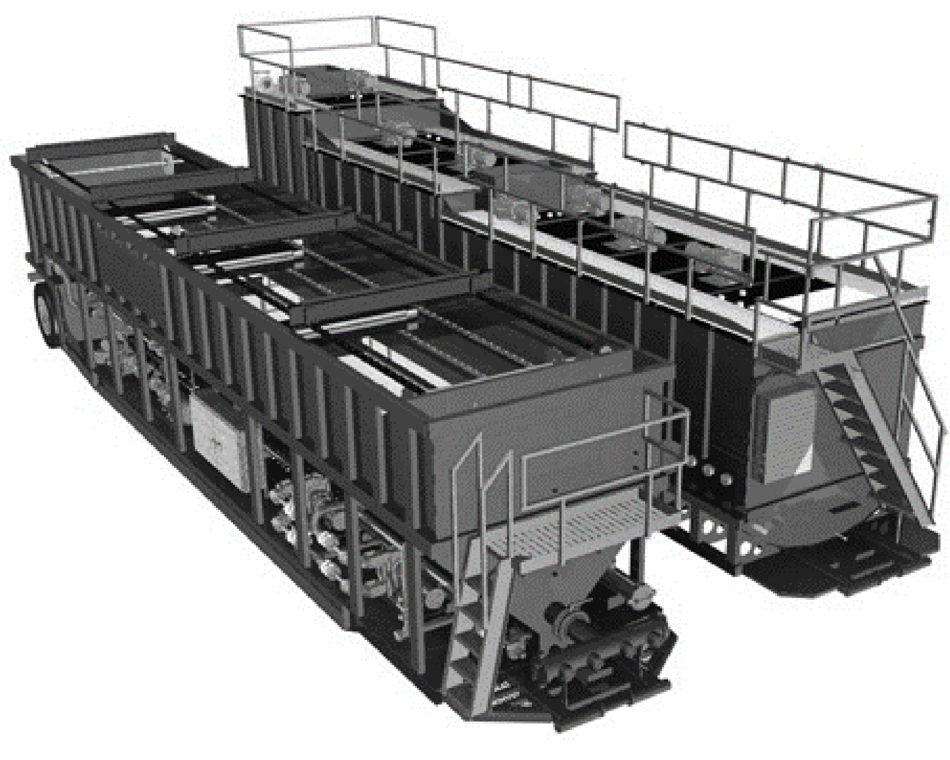
Fully Automatic System Operation

Ready To Use Delivery

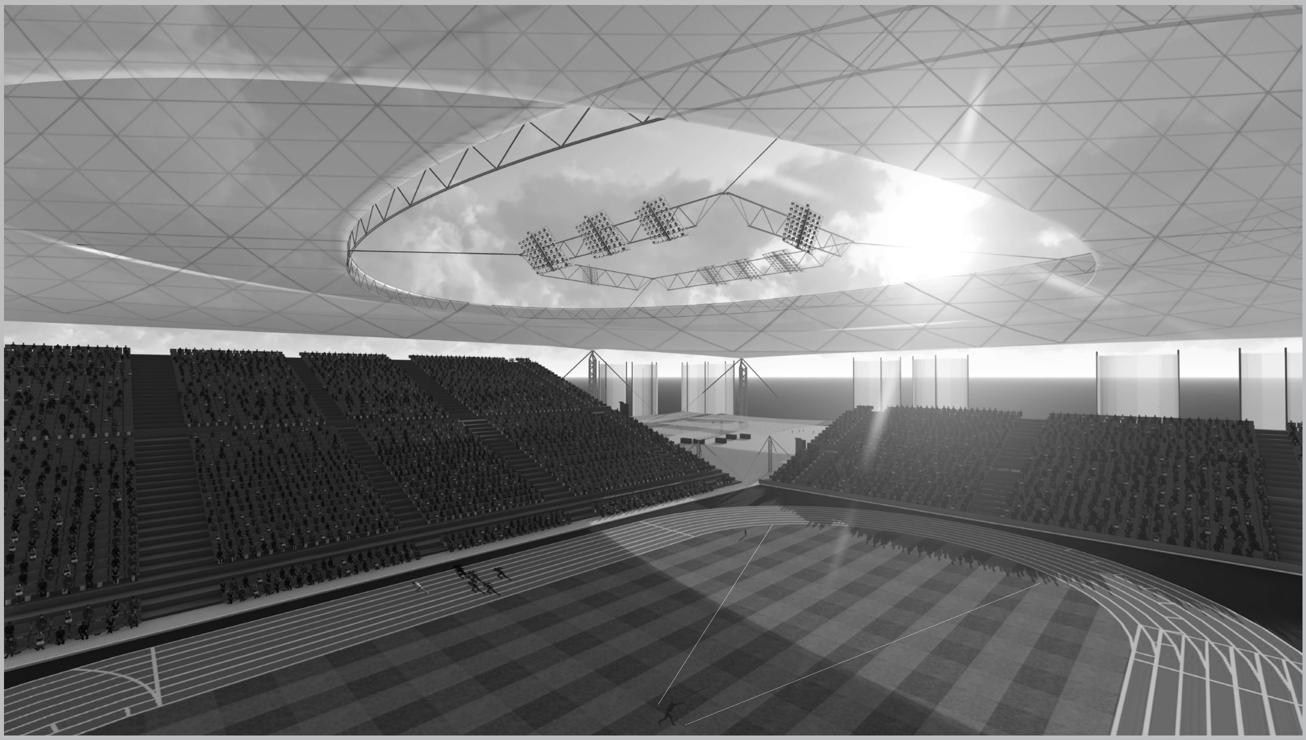
Durable Uncomplicated Operation

Robust And Space-saving

Homogenization About 24 Hours



FINAL DRAWINGS



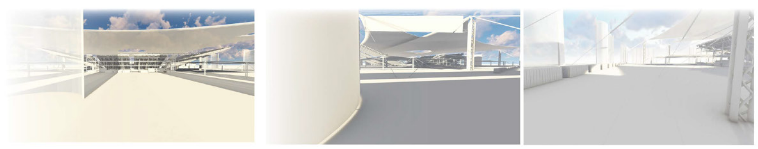
MINIMALISM, TECHNOLOGY AND OPPORTUNITY

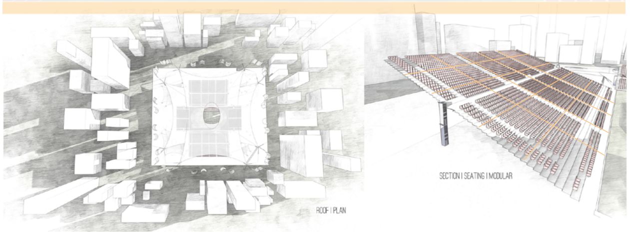
DEVELOPING A NEW OLYMPIC PROTOTYPE

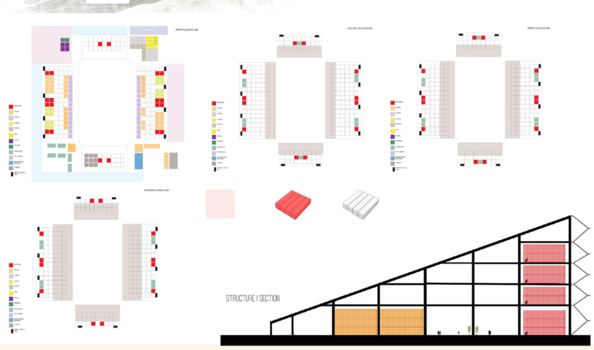
STADIUMS TODAY COST A LARGE AMOUNT OF MONEY TO BUILD, AND EVEN MORE TO MAINTAIN. FURTHERMORE, THE EMBODIED ENERGY REQUIRED AND THE ENERGY FOOTPRINT THAT IS LEFT BEHIND, IS A CAUSE FOR CONCERN FOR A SUSTAINABLE FUTURE.

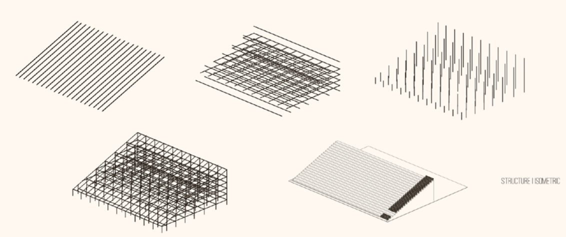
TO MITIGATE THE SOCIO-ECONOMIC IMPACT OF STADIUM ARCHITECTURE ON OUR ENVIRONMENT, IT IS IMPORTANT TO TURN OUR ATTENTION TO SELF-CONTAINED, TEMPORARY VENUE ARCHITECTURE AND TO RETHINK THE FUTURE OF STADIUM DESIGN.

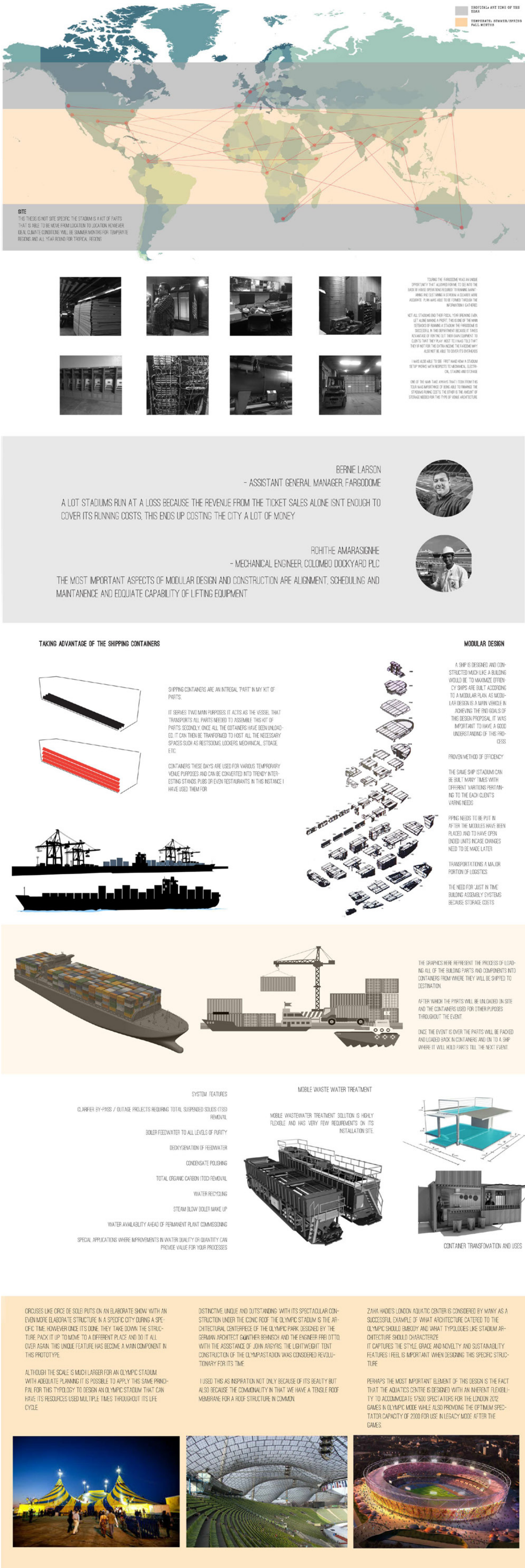
AS WE ARE ALSO MOVING CLOSER TO AN ENTIRELY DIGITAL AGE, IT WOULD DEEM UNNECESSARY TO EVEN CREATE STRUCTURES OF SUCH A LARGE MAGNITUDE. THUS, THE PREMISE FOR MY THESIS REVOLVES AROUND A MORE PROMINENT DIGITAL AUDIENCE, WHILST STILL GIVING SIGNIFICANCE TO A PHYSICAL AUDIENCE, BY DESIGNING AND CONSTRUCTING A VENUE THAT IS MORE TEMPORARY AND IN TURN MORE SUSTAINABLE. THIS IS ACHIEVED THROUGH A STADIUM DESIGNED TO BE CONSTRUCTED, TAKEN DOWN AND EVENTUALLY TRANSPORTED TO THE NEXT OLYMPIC DESTINATION, MUCH LIKE A CIRCUS.











FINAL BOARDS

FINAL DISPLAY

APPENDIX

ADDITIONAL IMAGE CITATION

SITE PHOTOS

http://65.media.tumblr.com/7f4d6984cd817b49a88fdc3b3a1f-3c9b/tumblr_nly01eGNS81qg9duoo1_1280.jpg

http://cdnfiles.hdrcreme.com/20972/original/Seattle.jpg?1426840961

https://upload.wikimedia.org/wikipedia/commons/e/e4/Bell_Harbor_Marina,_Seattle,_Washington.JPG

http://www.layoverguide.com/wp-content/uploads/2010/03/Mount-Rainier-from-Lake-Washington-Seattle.jpg

STADIUM IMAGES

http://www.bancrete.com/wp-content/uploads/2011/12/Aviva-Stadium-1.jpg

http://www.umhb.edu/masterplan/sites/www.umhb.edu.masterplan/files/imagecache/original-image/stadium_concourse_0.jpg

http://www.metropolismag.com/UC%20Berkeley%20Memorial%20Stadium%20and%20Training%20Center_%20Image%20%C2%A9%20Jim%20Simmons%20(1).jpg

https://qzprod.files.wordpress.com/2015/07/lead_ap_386989733038.jpg?quality=80&strip=all&w=1600

OTHER IMAGES

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