

RE-IMAGINING SOCCER STADIUM DESIGN

ARCHITECTURE MASTER'S THESIS
NORTH DAKOTA STATE
UNIVERSITY

A DESIGN THESIS BY:
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DESIGN AND CONSTRUCT A SOCCER STADIUM IN MILWAUKEE THAT COULD
MAXIMIZE ACCESSIBILITY, SUSTAINABILITY, AND POTENTIAL COMMUNITY
BENEFITS

A DESIGN THESIS SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE AND
LANDSCAPE ARCHITECTURE OF NORTH DAKOTA STATE UNIVERSITY

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MASTER'S OF ARCHITECTURE

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Thesis Abstract:

We know of the existence of many stadiums around the world, but as technology and culture change, so must we change the way we design sporting venues. At one point, we saw the Roman Coliseum as a standard for designing sporting venues. We can speculate that the focus during the time was built for functionality and capacity. There was no attention to fan experience and aesthetics. Since then, we have learned to condense the scale of these stadiums while updating to the newest technologies and practices that are being applied to these stadiums across the world. We have also cultivated sports in our cultures and cities.

This thesis proposes a soccer stadium located in the downtown area of Milwaukee, Wisconsin, known as the Iron District, to bring back pedestrian foot traffic by creating a soccer stadium venue and fan base in the city. This idea could introduce many opportunities for the city of Milwaukee by integrating a professional soccer team that would be ingrained into the culture and multi-generational group in the area. It would also open up opportunities for economic, social, and environmental growth.



Figure 2

Thesis Narrative:

Soccer is a sport that crosses borders, cultures, and languages, and is currently the most popular sport in the world. There are over 4 billion fans globally. Soccer stadiums are the center points where fans gather to rally their teams, celebrate, and share every emotion, whether that is drama, excitement, happiness, or even sadness. The soccer stadium is more than just a venue for the sport. It is a place where people come together and share their love of the game. The feeling of thrill upon victory or heartbreak and agony on defeat. It's a place where cultures come together or collide, rivalries are born, and memories are made.

As an architecture student, I believe that there is a different way of thinking when creating new spaces for people to interact with. We should be designing to tailor in different aspects of human health. To design not solely from form and function but design with a full scope of understanding of user experience. I believe that as time goes on the state of our mental health impacts our daily lives. There are ways for us as designers to create spaces that address these growing issues.



Figure 3

PROJECT TYPOLOGY:

The typology of this project will be a soccer stadium in the city of Milwaukee, Wisconsin. It will be designed in the downtown area in the location of the Milwaukee Iron District. The reasons for this typology are stated as the following.

1. Scale and availability
2. Possible future planning
3. Historic evolution
4. Impact of typology on spectators

This design will potentially be used to create an example of how this could benefit the city of Milwaukee. It will have a futuristic design that is innovative to the city and demonstrates the sustainable practices that are used in modern stadiums. The stadium will pay homage to the city of Milwaukee through the city's distinct materials and landmarks.



Figure 4

Typological Research:

Things to Consider:

- 1) Project Typology: Medium scale sporting venue building that will be able to seat 15 to 30 thousand people
- 2) Sustainable Strategies: Material studies and finishes, reduce and reuse water consumption , reduce the overall energy consumption, Active sustainable design, Passive Sustainable Design
- 3) Context: Central downtown city, redevelopment plans, and master planning
- 4) Community Impact: Create a building that blends into the rest of the community. A building that allows for future community development.

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Figure 5



Figure 6

Minnesota, USA

Architects: Populous
Tenant: Minnesota United FC
Minnesota United FC 2

Capacity: 19,400
Opened: April 13, 2019

The stadium was designed with an intention to create an intimate atmosphere. One way was by creating the pitch 6 meters below the concourse level. This was a result of soil that was removed by the contamination of the previous bus depot and mall. This decision provided both an atmospheric advantage and optimized cost. The cost was lowered by the incorporation of the lower North and East stands. The atmospheric advantage allowed sight to the pitch as fans enter the stadium and realizing how close the pitch is. The second way that an intimate atmosphere was demonstrated was by allowing the first row of seating to be just 17 ft from the pitch. Allowing fans to be an arm's length away. The farthest seat sits at 125 ft away from the field. This was with the intention to provide the best fan experience while attending a soccer match, no matter how far or high.



Figure 7



Figure 8

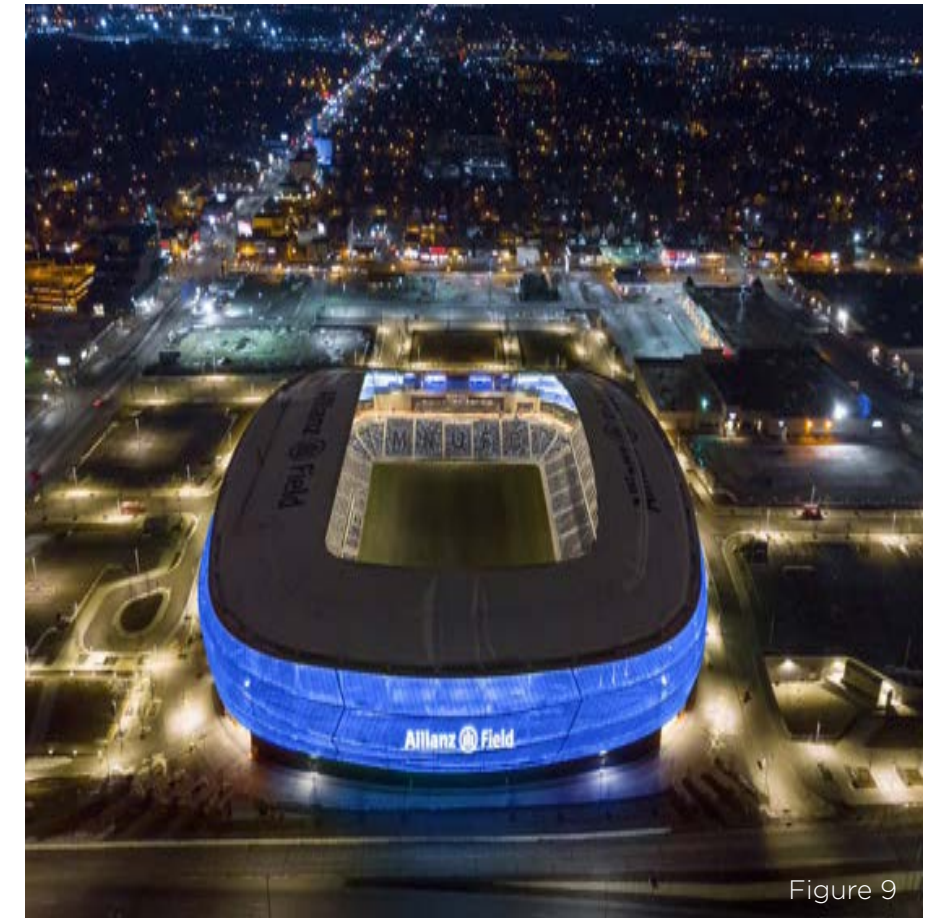


Figure 9



Figure 10

Sustainable Strategies

Allianz field has many key features that create such a unique structure. These key features are what make this stadium successful in so many ways, The pitch is one of the primary key features spanning at a total of 120 yards by 75 yards. The field has a advanced drainage system that irrigates the water better than the first installment that retained too much water. The field also has hydronic field heating system which allows the field to be regulated and maintained to the highest of levels. The field material was also sourced locally from Health Farms in Wisconsin. The exterior of the building used prefabricated building components that allowed the construction to keep on schedule. The exterior facade is made up of a glass like polymer mesh thats made of clad PTFE. This is a translucent material that is reflective during the day and transparent during the night time.

Construction Considerations

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Figure 12

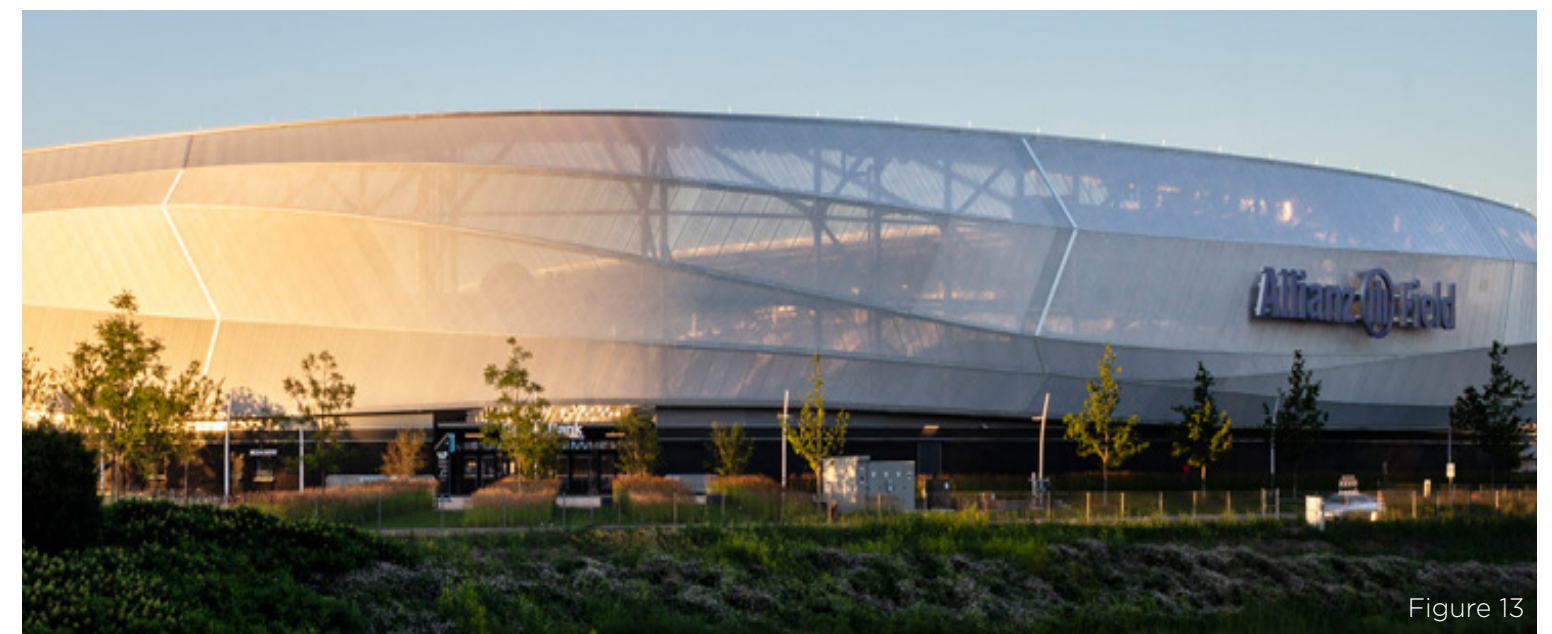


Figure 13

Important Takeaways

Looking closely at the overall of the design of the Allianz field in Minnesota there is no doubt that the idea behind the construction and design of the stadium well thought out in its entirety. One of the biggest takeaways from the stadium and the location is the accessibility to the site. The stadium is in a neighborhood known as Midway in St. Paul. The location of this neighborhood is relatively close to major highways such as I-94, I-35, and MN-280. Aside from the major highways there is several public transportations available in the area such as buses, commuter rail line, and light rail. The metro green line offers a stop directly in front of the stadium which allows accessibility for the fans traveling from downtown Minneapolis or St. Paul. For the fans that are driving to support their visiting team in the area there are also several parking lot options available such as on-site parking, and nearby parking lots.

Metro Transit

- KEY**
- (S) Team Store
 - (P) Premium Entry
 - (M) Media Entry
 - (T) Ticket Office
 - (E) Employee Entry
 - Light Rail
 - LRT Station
 - Bus Station
- UNITED**
- Sculpture
 - Road Closed
 - Charter Shuttle
 - Route 84 [30 min]
 - A-Line [10 min]
 - Route 16 [30 min]
 - Route 21 [6-15 min]



Figure 15



Figure 14

Bike

- KEY**
- (S) Team Store
 - (P) Premium Entry
 - (M) Media Entry
 - (T) Ticket Office
 - (E) Employee Entry
 - Bus Station
- UNITED**
- Sculpture
 - Road Closed
 - Bike Parking
 - Bag Check Location

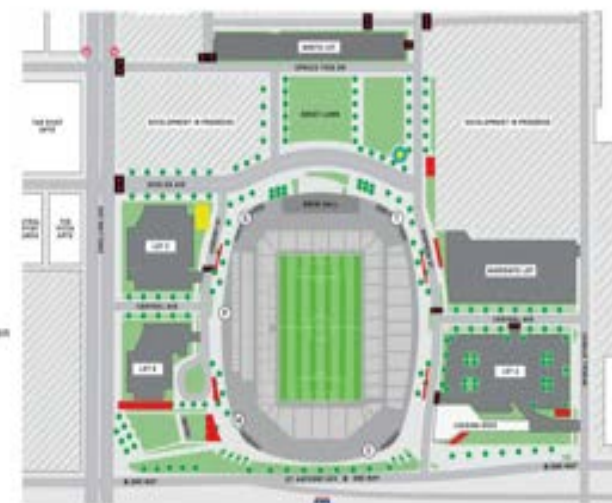


Figure 16

Ride Share

- KEY**
- (S) Team Store
 - (P) Premium Entry
 - (M) Media Entry
 - (T) Ticket Office
 - (E) Employee Entry
 - Bus Station
- UNITED**
- Sculpture
 - Road Closed
 - App-based Ride Drop-off / Pick-up Zone
 - Bag Check Location



Figure 17

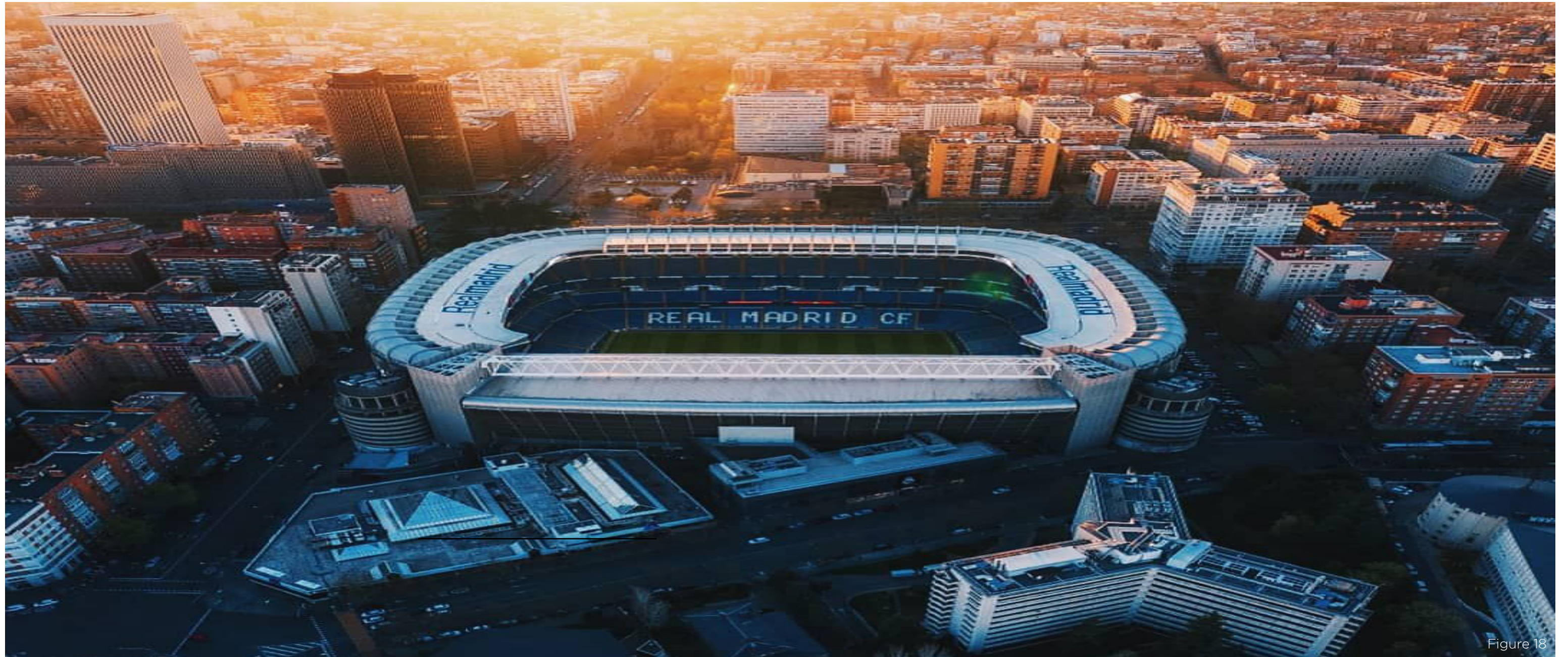


Figure 18

Architects: Manuel Muñoz
Tenant: Real Madrid CF
Spain National Football Team

Capacity: 81,044
Opened: December 14, 1947

El Santiago Bernabeu is located just north of the center of Madrid, Spain. Designed by Manuel Muñoz and Luis Alemany Soler, this stadium is an iconic representation of luxury at its finest. The stadium was designed with a unique bow shape design. This design in the 1940's gave seating and a unique experience to the fans to experience such a spectral when watching "los blancos". As many renovation occurred in 1982, 2001, and now 2021, the seating was one of the biggest that got an update amongst many other things. The total seating that was available within the stadium was a total of 81,044 seats making it one of the biggest stadiums around the world. Another astonishing structural remark was the cantilever roof. This cantilever roof was able to cover the entire seating area without the support of additional columns. This is still considered to be quite the engineering accomplishment.



Figure 19



Figure 20



Figure



Figure 22

Santiago Bernabeu

Important Structure Considerations

What I found interesting about the Santiago Bernabeu is the stability in the overall design. The main structure is made of reinforced concrete, which provides stability and durability since its been operating since the mid 1900s. Another structural consideration was the thought behind the circulation. The circulation was something that is quite impressive that would allow for smooth flow for spectators before, during, and after the game. Ranging from the spaces of corridors to concession stands and restrooms, the circulation hallways are all clearly marked and noticeable. One of the newest additions to the stadium is the incorporation of the new facade that extends out 21 meters. Giving the stadium a new face lift and using structural tubing to help support the weight of the facade onto the existing stadium.

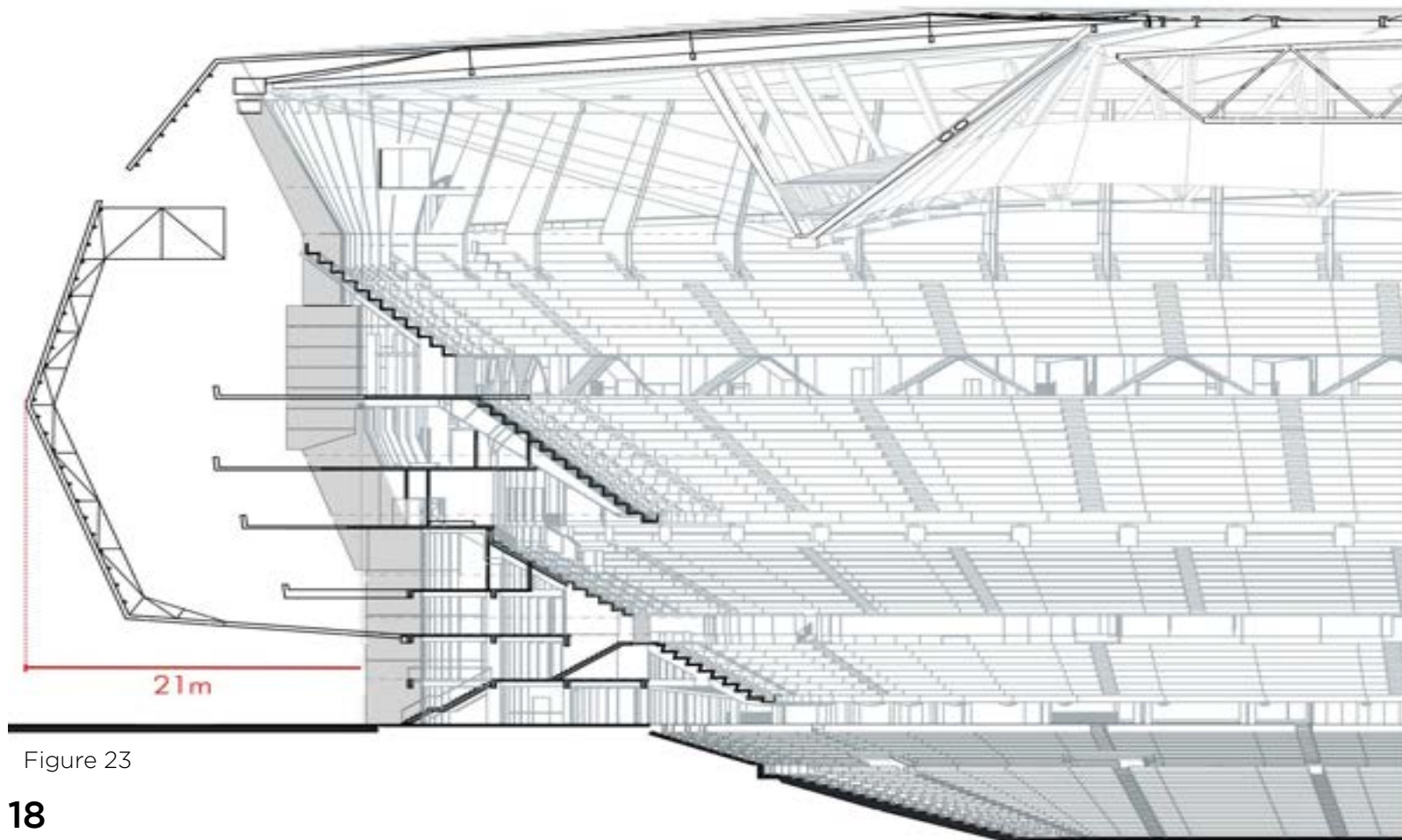


Figure 23

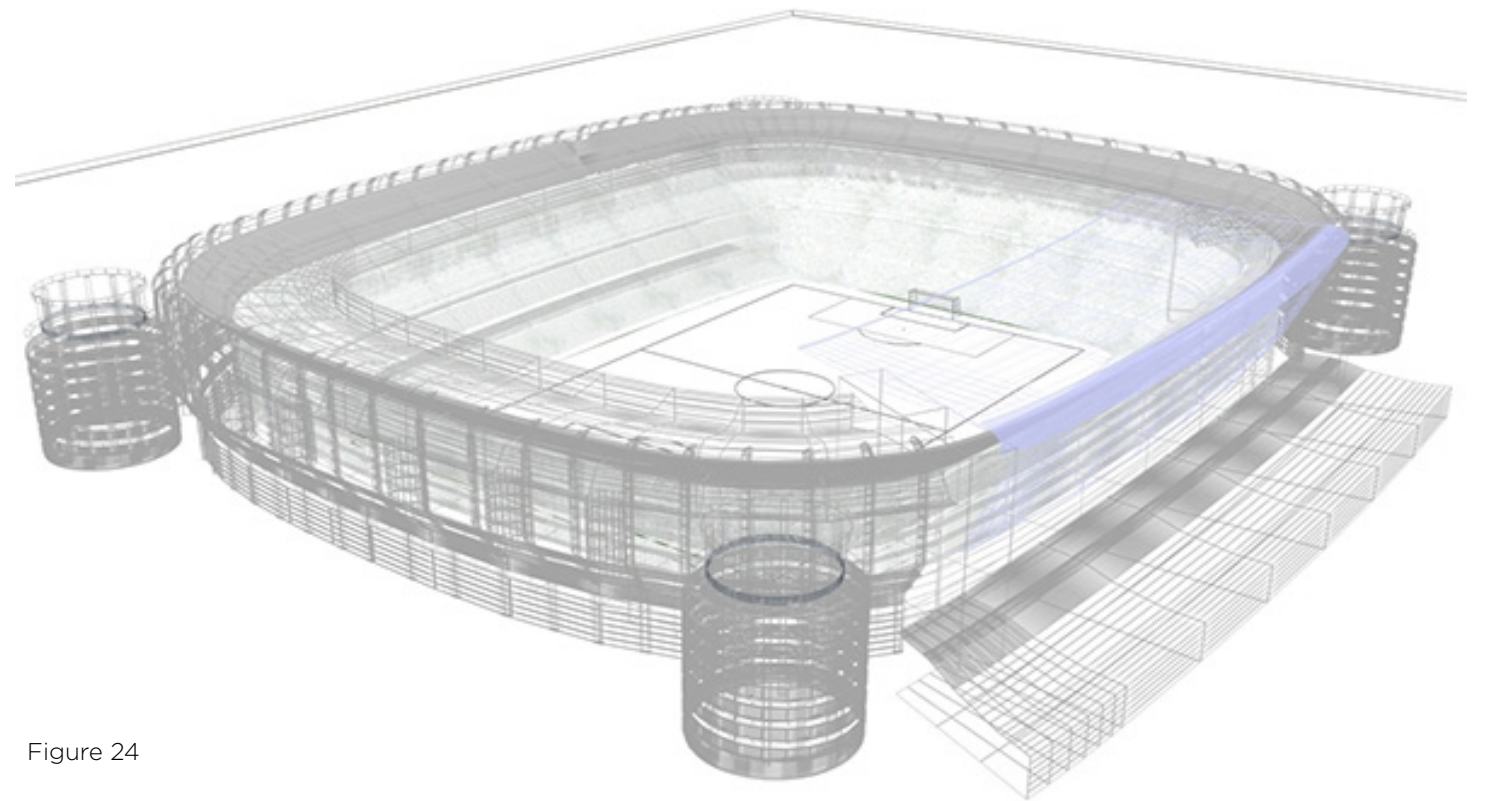


Figure 24

Important Takeaways

1. Santiago Bernabeu is a structure like no other. It is the home of Real Madrid FC and has a rich history of football. The stadium can not only host football matches but its used for hosting several other events. Other events that take place here are concerts, community events, and other sporting events.

2. The architecture of the Bernabeu is quite unique. The inital features that catch your eye are the two spiral towers. The spiral towers are a symbol to the stadium and makes it recognizable by anyone who is familiar with sporting venues. Not only are they an architectural landmark for the stadium but the practicality with them is for circulation for spectator within the stadium.

3. The ability to change with time. Since the construction of the Bernabeu, the stadium has undergone several construction updates. These updates have ranged from structural changes to aesthetic changes. It has remained up to date with the latest trends and amenities. A few examples of the amenities range from restaurants, VIP viewing rooms. As for architectural changes, the stadium is currently going through a renovation to the exterior of the stadium. The design is changing to look like the images to the right. A modern approach to the stadium.

4. The Santiago Bernabeu is a landmark to the city of Madrid. It is both cultural and a sporting symbol in the city and around the world. This stadium is situated near the center of the city among residential building. This is different than most sporting venues in the United States where the stadium is near the edge of town.



Etihad Stadium | Manchester | England



Figure 28

Architects: Arup (stadium design)
KSS Design Group (interior fitout)
Populous (stadium expansion)

Tenant: Manchester City F.C.

Capacity: 53,400

Opened: December 14, 1947

The Etihad stadium is located on the east side of Manchester. The stadium was originally designed for the 2000 summer Olympics but was re-imagined for the 2002 commonwealth games. The construction began in 1999 and opened in July 25, 2002. The stadium was then changed to a football stadium. The football pitch was lowered during construction to make way for lower level seating which also helped with construction costs.



Figure 29



Figure 30



Figure 31



Figure 32

Important Structure Considerations

What I found interesting about the Etihad Stadium was the overall form that was used in the design of the stadium. There was careful planning on behalf of ARUP to take into consideration the neighborhood. The orientation of the stadium was constructed to have the highest point of the stadium near the middle of the stadium. The north and south sides pay close attention to the surroundings where the nose level can be disruptive.

The stadium's circulation is an effective design that helps navigate the crowd throughout the stadium in both a quickly and effective manner. These factors not only help the fan move through the space but also help provide a positive experience.

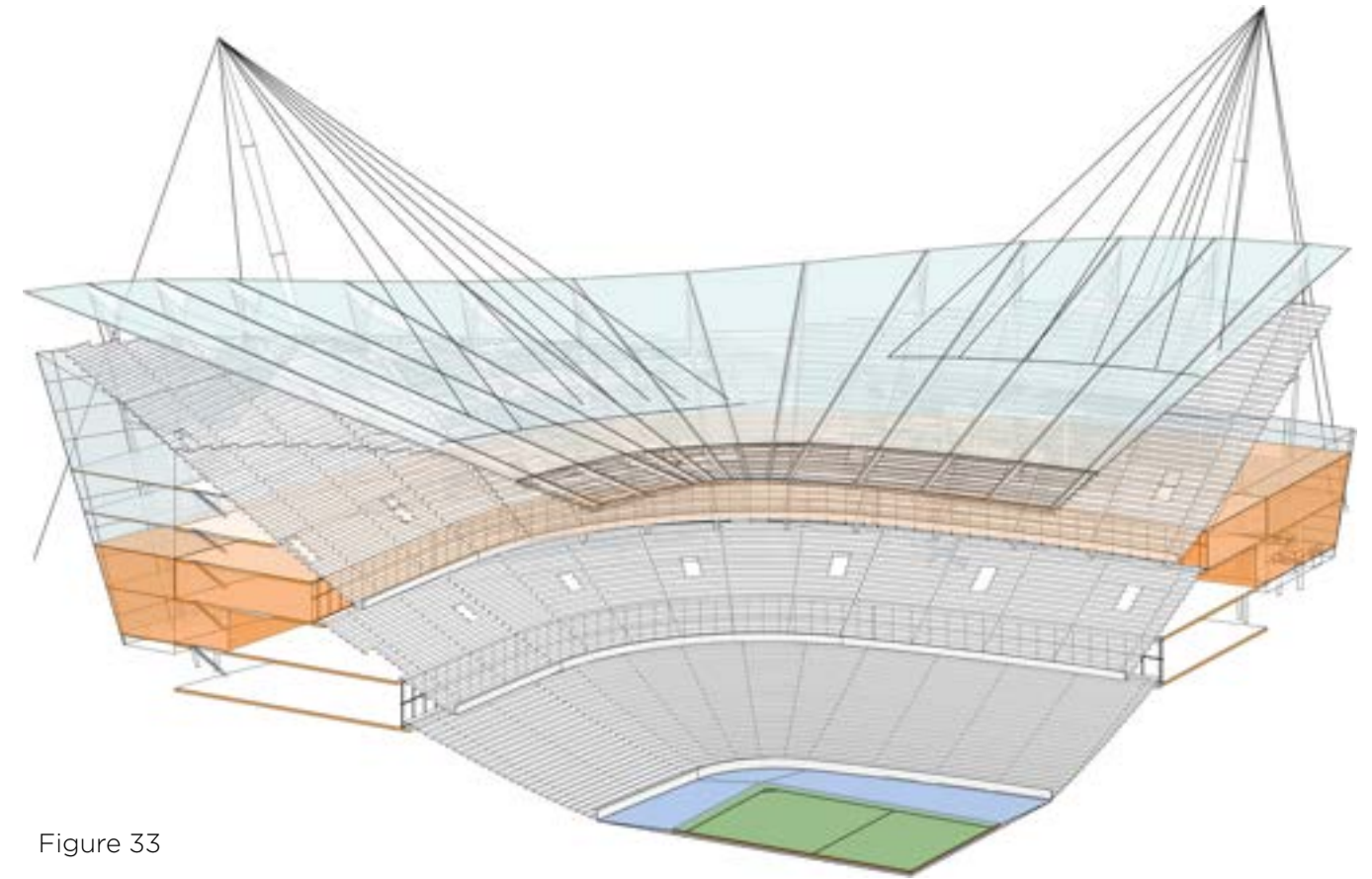
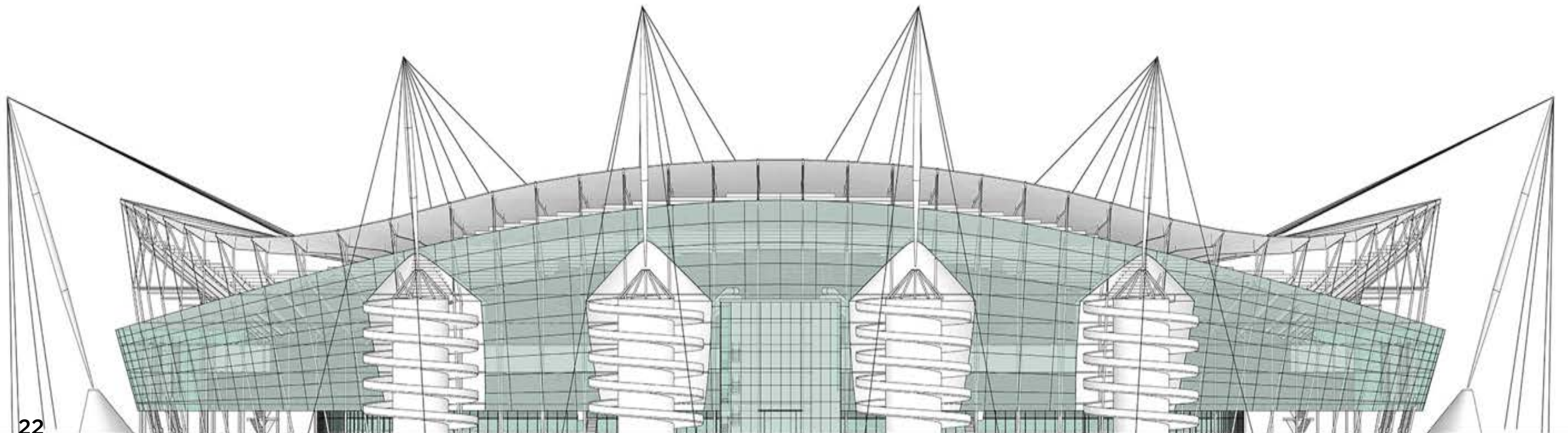


Figure 33

Figure 34



Important Takeaways

1. Etihad stadium has a state-of-the-art LED lighting system. This lighting system provides a great illumination to the venue, but it also helps reduce the consumption of energy by about 70%. A few other great additions to the stadium are the incorporation of an advanced sound system to create a stellar fan experience. This is significantly impressive because it helps to reduce the carbon footprint from stadiums of this caliber.
2. The unique construction design that the Etihad stadium has is also a very innovative approach with the steel frame design that allows for an unobstructed view of the field regardless of the location of the spectator. The stadium also allows for the roof to be retractable which can be beneficial for match day given that the weather in England can consist of rainier days than most other places around the world.
3. Etihad stadium also incorporates a sustainable practice throughout the stadium. The use of green energy sources, efficient water fixtures, and an integral recycling program. The stadium uses solar panels that have been installed on the roof of the structure. There is also an incorporation of wind turbines on the existing site. They help produce partial of the energy that is consumed at the stadium and they source the remainder of the energy from renewable energy providers. The other sustainable practice is the efficient water fixtures and that is done by incorporating water-efficient toilets and urinals. Along side of toilets and urinals, there is low-flow faucets and showers. The structure also does a good job of retaining rainwater to water the pitch and surrounding landscape.

Figure 35



Figure 36



Figure 37



Mercedes Benz Stadium | Atlanta | GA



Figure 38

Figure 39

Mercedes Benz Stadium

Architects: HOK
Tenant: Atlanta Falcons
Atlanta United FC

Capacity: 71,000
Opened: August 26, 2017

The Mercedes Benz Stadium is a very unique stadium as a whole. The stadium was designed from a top down perspective. The roof was the first part that was looked at when the design started. It replicated the idea of a camera aperture. HOK's inspiration came from Rome's Pantheon, specifically the oculus. The construction of the stadium is something like no other. While the roof is made up of sheets of metal that resemble petals, they expand more than 200 feet. The Stadium is used almost all year around by the Atlanta Falcons and Atlanta United FC. The stadium also accommodates soccer configuration by retracting the lower bowl seats to allow the playing field to be widened.

Figure 40

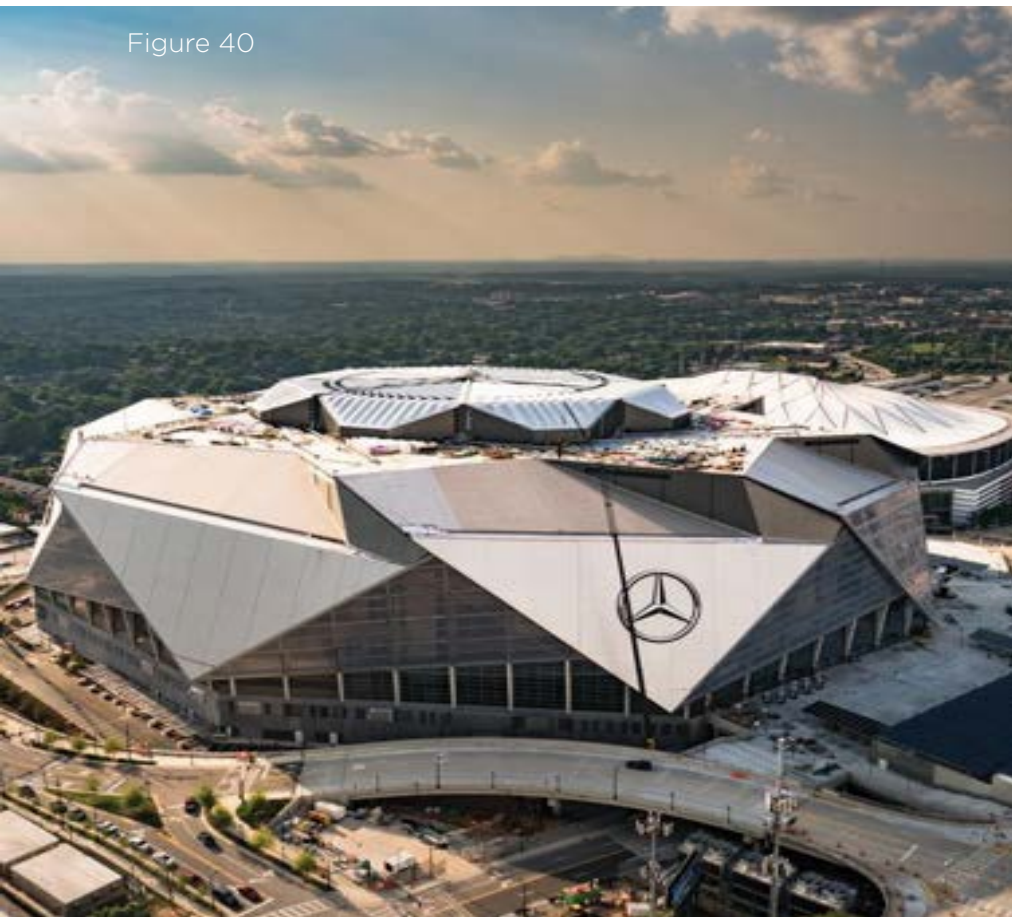


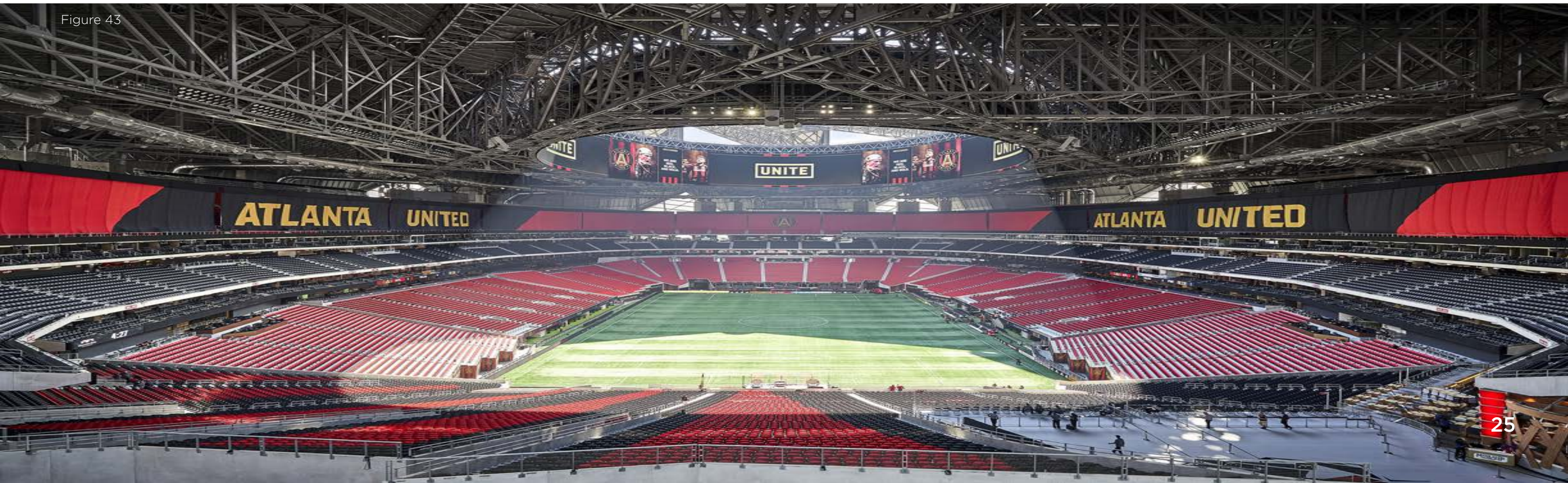
Figure 41



Figure 42



Figure 43



Sustainable Strategies

1. LED lighting - Energy efficient LED lighting system uses 60% less energy
2. Rainwater harvesting - collects about 1.1 million gallons of rainwater into cisterns
3. Grey water treatment - uses treatment system to filter and use for irrigation
4. Solar panels - 4,000 solar panels installed which generate 1.6 MW of power
5. Green space - over 33,000 sq ft of green space on site
6. Green cleaning - The stadium uses non-toxic cleaning material for better air quality
7. Sustainable materials - construction material are recycled and sourced locally
8. Innovative HVAC - A newer HVAC system that uses 50% less energy
9. Waste reduction - Added composting programs to reduce was by 40%
10. LEED Certification | Platinum

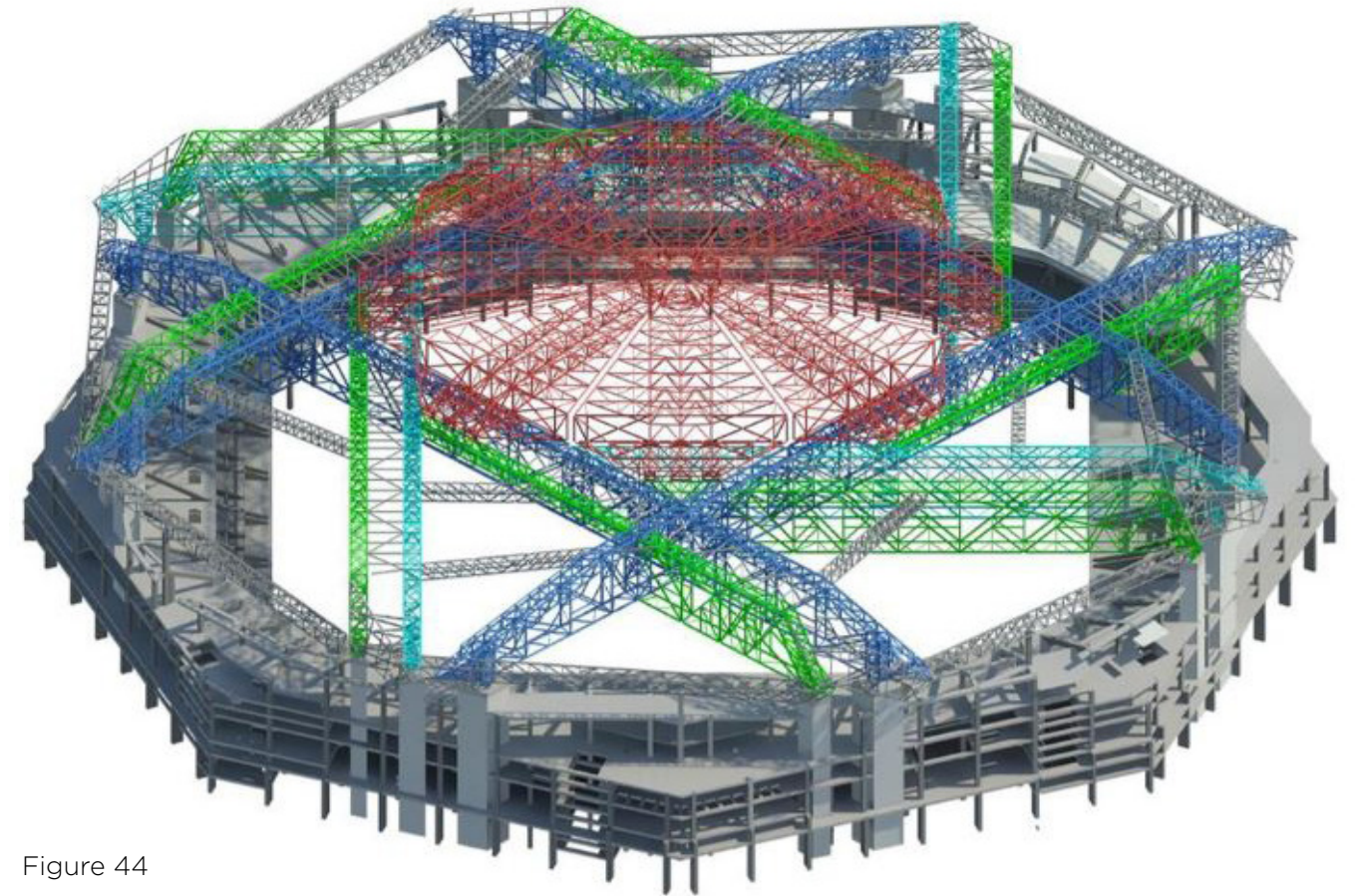


Figure 44

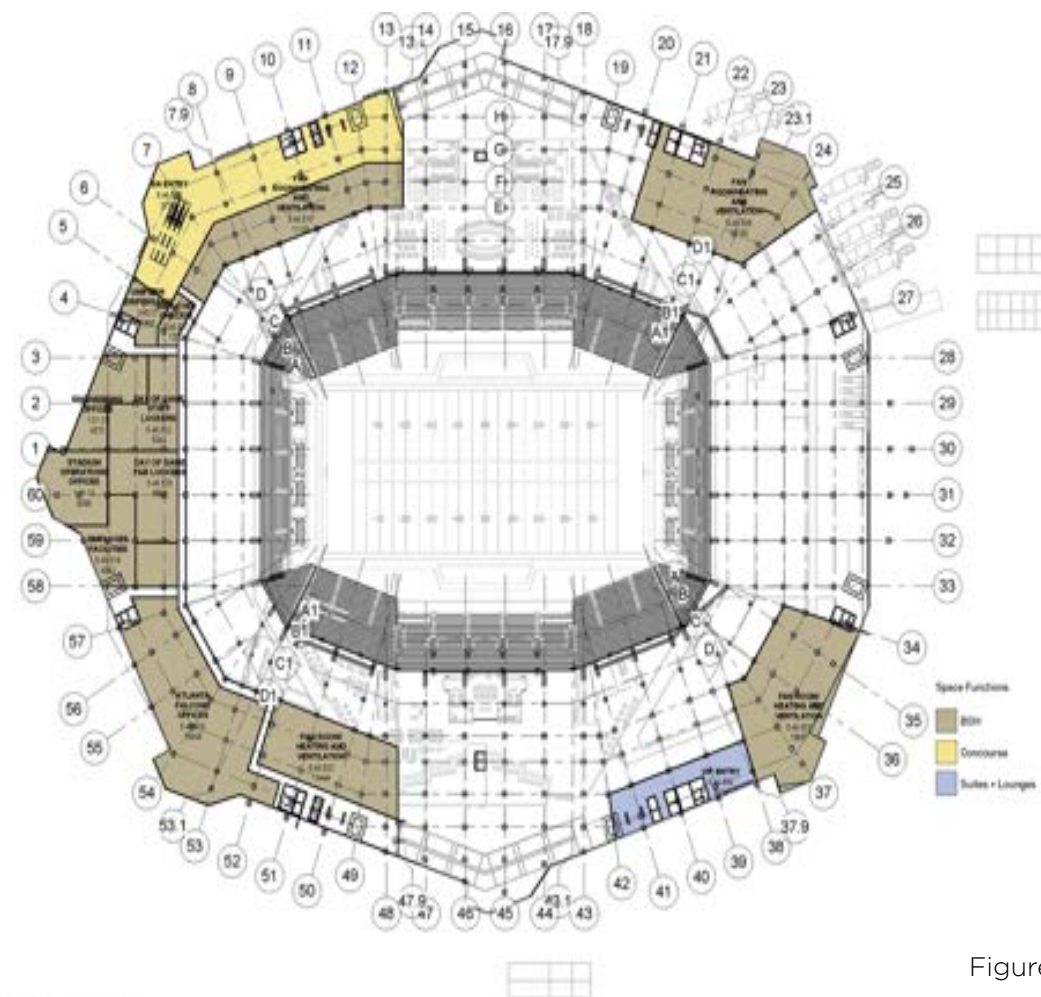


Figure 45



Figure 46

Figure 47



Important Takeaways

The stadium design is an overall work of art. From the conceptual design to the execution of the building itself. The building has received numerous accolades that set the building apart from other stadiums in the country. With the stadium achieving LEED Platinum certification it proves that structures with this typology can and will be designed on focusing towards a greener and environmental friendly construction. The stadiums exterior is a unique approach with the angular design that is a change in stadium exteriors across the world. The façade is a combination of glass and metal panels that highly emphasize the reflective landscape surrounding the stadium. It also reflects the city of Atlanta not only in a literal sense but in a figurative sense by demonstrating how Atlanta has a reputation of moving towards a modern and innovative approach.

Figure 48

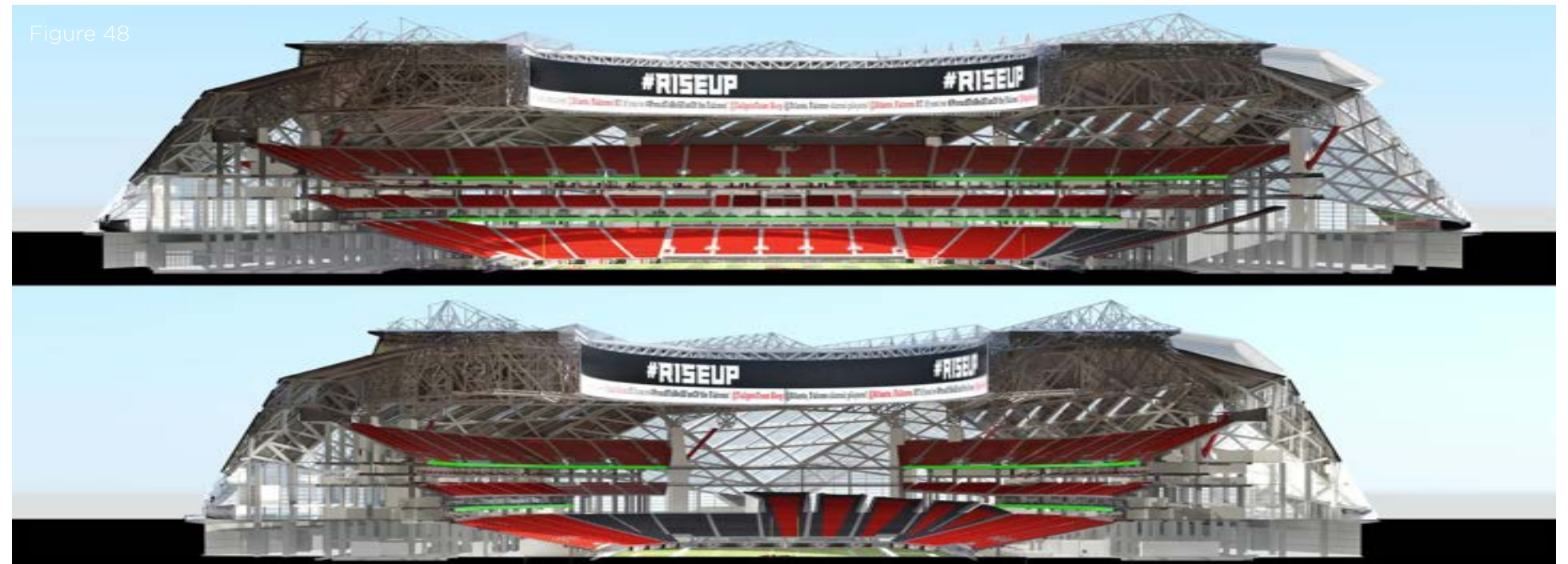


Figure 49



Figure 42



Figure 50

Architects: Populous
Tenant: Sporting Kansas City
Sporting Kansas City II

Capacity: 18,467
Opened: June 9, 2011

The stadium now known as Children's Mercy Park was previously known as LIVESTRONG Sporting Park or just Sporting Park was designed by Populous. The price tag for the stadium was roughly \$200 million. The partnership came about in 2015 when Sporting KC teamed up with Children's Mercy medical center which included a 10-year naming rights deal. The stadium is a mid sized soccer stadium that seats 18,500 seats and is a total of 340,000 square feet in size. Additionally, there is 36 luxury suites and has the adaptability to change into a rugby, lacrosse and a concert. The stadium was designed and constructed in 22 months which allowed the first game to be held on June 9, 2011.



Figure 51



Figure 52



Figure 53



Figure 54

Sustainable Strategies

Children's Mercy Park had consideration for sustainability in several aspects of construction. One of the consideration was the already developed site that it was constructed on. Having been already developed it helped preserve the biodiversity in the area. The stadium has a few features that help manage storm water and runoff to help reduce the water pollution in the area. The use of water conservation has also been featured in the low-flow plumbing fixtures that reduce the consumption of water by 40% of conventional water fixtures. The uses of 250 kW photo voltaic panels have helped reduce the energy consumption of the stadium and generated about 12% of the stadiums annual energy. The waste produced in the stadium has implemented a program that diverts about 70% of the stadiums waste from landfills.

Important Construction Considerations

What I found interesting about the stadium was the use precast concrete components. Using this construction method helps to speed up the on site construction and reduce waste that is generated in the construction process. Steel framing was also used on this stadium that provided an innovative approach and created a sleek and modern design. The design has helped in strength and durability but also to allow open spaces within the stadium and reduced the obstruction of columns in fan viewing experience. Beside the sustainable strategies that are involved with construction the stadium used material that was sourced locally from wood, recycled steel, and low volatile organic compound.





Figure 57



Figure 58



Figure 59



The Users:

1. Athletes

- The primary users of the space will be for the athletes that will be using the field and facilities on match days and training days. Design decisions will be carefully thought out when thinking of the layout and construction of the pitch, training facilities, and locker rooms.

2. Fans & Local community

- The spectators are the life of the stadium that will fill up during games and events. They give the stadium the life and vibrant ambiance, so there must be careful considerations when designing seating, amenities and overall fan experience. People within the community that have needs that must be considered when designing accessibility, parking and traffic flow, and communal engagement.

3. Maintenance & Staff

- The people working the events to allow a successful event. Those workers are security personnel, concessions workers, ticket sellers, Thus, their needs must be considered when designing their amenities. The people behind the scenes are those that allow the building to function even when people aren't around. Their needs must be considered when creating amenities for them.

4.. Media

- Their proper installments and should have careful consideration when covering events at the Stadium thus, creating a designated media facilities and access for these individuals.

5. Future Users

- The importance to think about the future and what the possibility of future uses of the stadium could be. A few examples could be; youth sports, concerts, conventions, and other events. This is great to consider when designing the stadium to make its more adaptable.

Project Emphasis:

1. Developing and creating an environmental friendly stadium

-This is an important step to consider throughout the project and keeping in mind the design decisions that are made. Trying not to over do the project and making and taking note of where materials are sourced and what would lead to designing a greener and small carbon footprint for the stadium.

2. Incorporation of public transportation within the site

- By allowing public transportation on site it greatly influences the accessibility and convenience of the stadium for visitors. The incorporation of transportation hubs it avoids traffic congestion, parking issues, and relieves the stress of driving to attend games or events. This could also increase the connectivity of the community to the stadium through public transportation and help reduce carbon emissions.

3. Designing and providing safety within the stadium

- Considering the safety and security of the visitors, fans, players, and staff is an important aspect to consider when designing the stadium. Making sure to consider closely the layout of spaces and features such as sight lines, crowd control, illumination of walkways, and easy access to emergency exits is important to allow visitors to navigate safely to the stadium.

4. State of the art lighting system that serves aesthetics and function

- When designing the lighting system it plays an important part with safety, functionality, and aesthetics of the overall design. The lighting is crucial for illuminating the soccer field

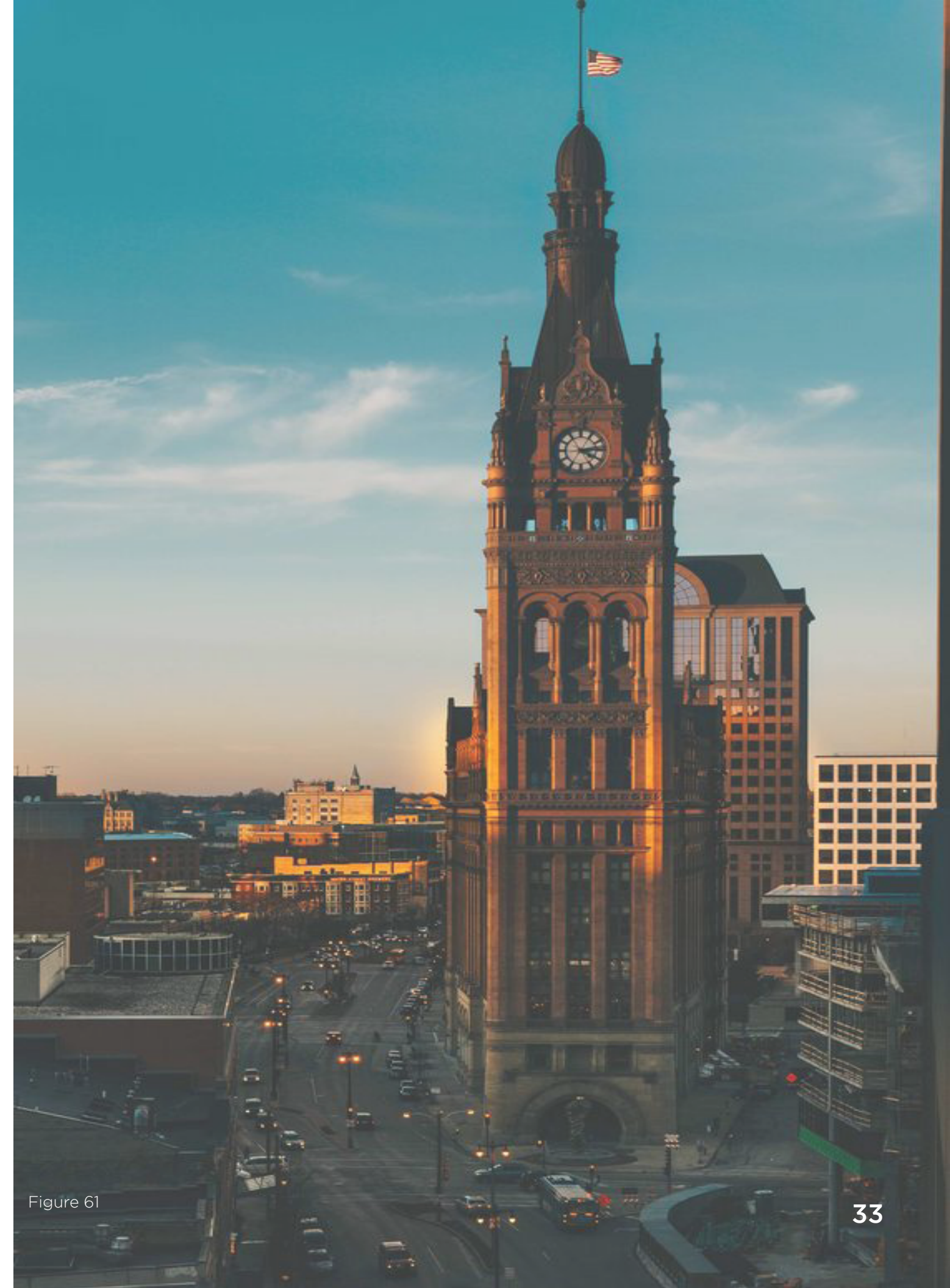


Figure 61



Thesis Goals:

1. Design and determine the best possible sustainable solution
 - Determine what environmental-friendly practice and materials are best suitable for the design and construction of the stadium
2. Explore the accessibility on site and within the stadium to best accommodate the users
 - By researching the newest innovations and accessibility designs, I will be able to best determine the best accessibility to all members of the community, including those with disabilities
3. Study and analyze total capacity of the stadium
 - Determine the most suitable size and layout of the stadium that best meets the needs of the team and the community
4. Investigate the successful way to improve the fan experience
 - Learning about amenities that are offered to fans in other stadiums and making an educated determination of what can be incorporated and revamped to enhance the fan experience such as variety of seating options, food and beverage options, and the latest technology.
5. Provide an a building that will flourish the community engagement
 - Integrating the needs and specifics of the city into the overall construction of the stadium.
6. Learn about the best way to implement safety and security
 - Learning about the proper security and safety measures that are needed to be implemented into the design and development of the stadium. Help meet the safety and security standards and proper regulations.

Presentation intention:

The finalized documentation and presentation will be summarized with the design and processes used during the course of thesis. A few items that will be presented with the final document are:

Thesis project book: The thesis project book is a combination of the proposal document and a full report of a design process, solution, and final project. This book will be turned in

Project boards: Graphic boards will be presented along side of the presentation. Boards will be completed before the digital copy is due on April 20th

Digital animation: The digital aspect of this project will be a simulation and a fly through video to create a experience for the user. The video will demonstrate and showcase the design process, the overall construction, and then computerized environment.

Thesis presentation: The presentation will consist of an oral and digital presentation. This will have all the requirements presented to us at the beginning of the school year and a summarized version of our thesis book. It will be the conclusion of a years work of work.

Plan For Proceeding:

My hopes as presented is to stay consistent with my project schedule. My plan is to continue to work progressively on the proposal document and to stay on top of things at a timely manner. My goal is that the proposal document is up to project standards.

Then once that is completed I can focus on the research and programming stage. The steps to complete the programming and research phase will be assessed after feedback from professor. All of the necessary changes will done prior entering into the design phase (3)

The design phase will be composed of several methods that were developed in the previous phases during this thesis. The difficulty of the following phase can be divided into 4 categories.

1. Schematic planning and analysis
2. Design development and approval
3. Construction detail and modeling
4. Final presentation and deliverables

The final design and developmental solution will be finished by early-April to allow for review, updates, critiques and composite the final presentation

Monthly Project Schedule:

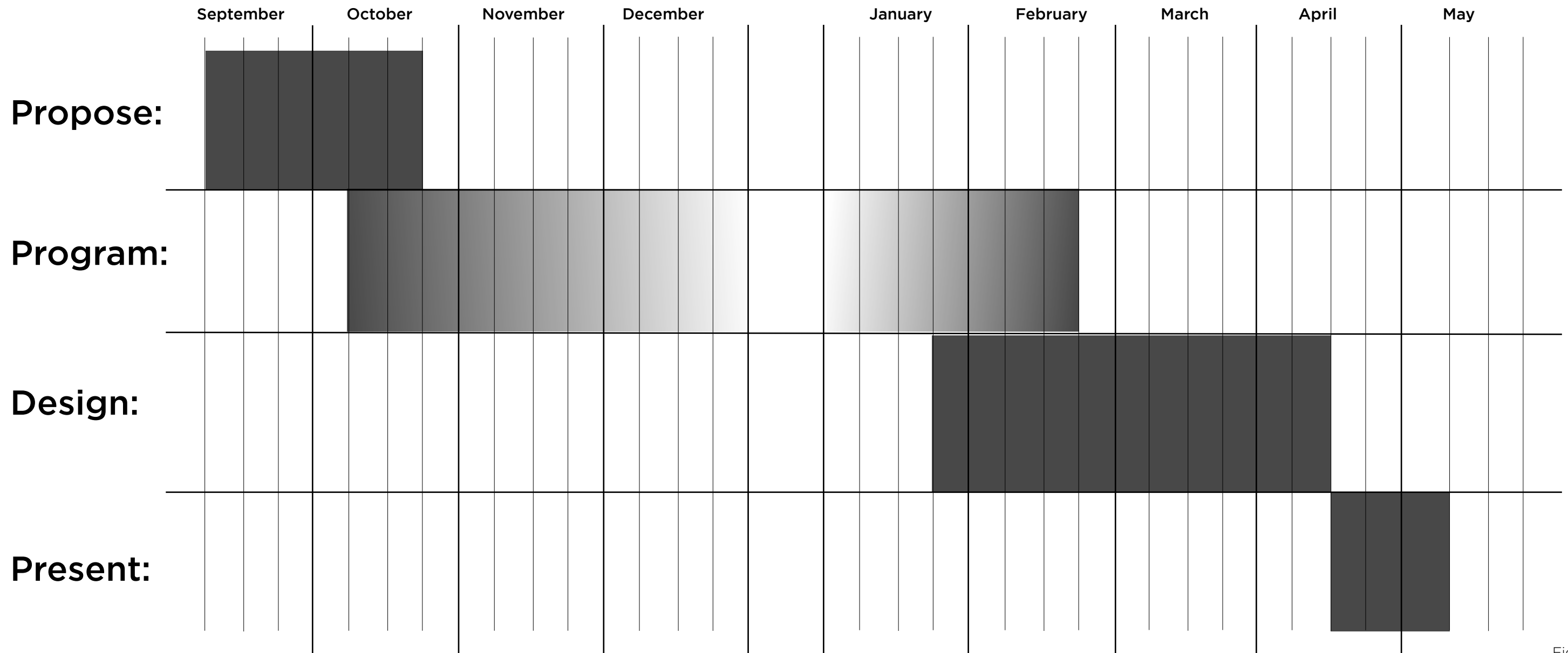


Figure 63

Propose:

The proposal was a process that was highly encouraged by our professors to start pondering on ideas and subjects that we would like to potentially do our thesis project on and concludes with a thesis proposal submittal.

Program:

The programming phase is to determine our layout once we had chosen our site. With that it was concluded with a draft of our programming and continuation of site analysis and further research.

Design:

The design phase is intended to start near the end of December when the programming has finalized. Once finalized, the design strategies will be implemented alongside the research that is completed and submitted.

Present:

The last phase is once the project is fully turned in and oral and digital presentations are presented. This phase will start near the end of April and will conclude at the beginning of May.

Important Dates :

Thesis Proposal Due: 10/11 | Thesis Program Due: 12/12 | Digital Exhibit Due: 4/22 | Thesis Book Due: 5/10

THESIS RESEARCH DOCUMENT

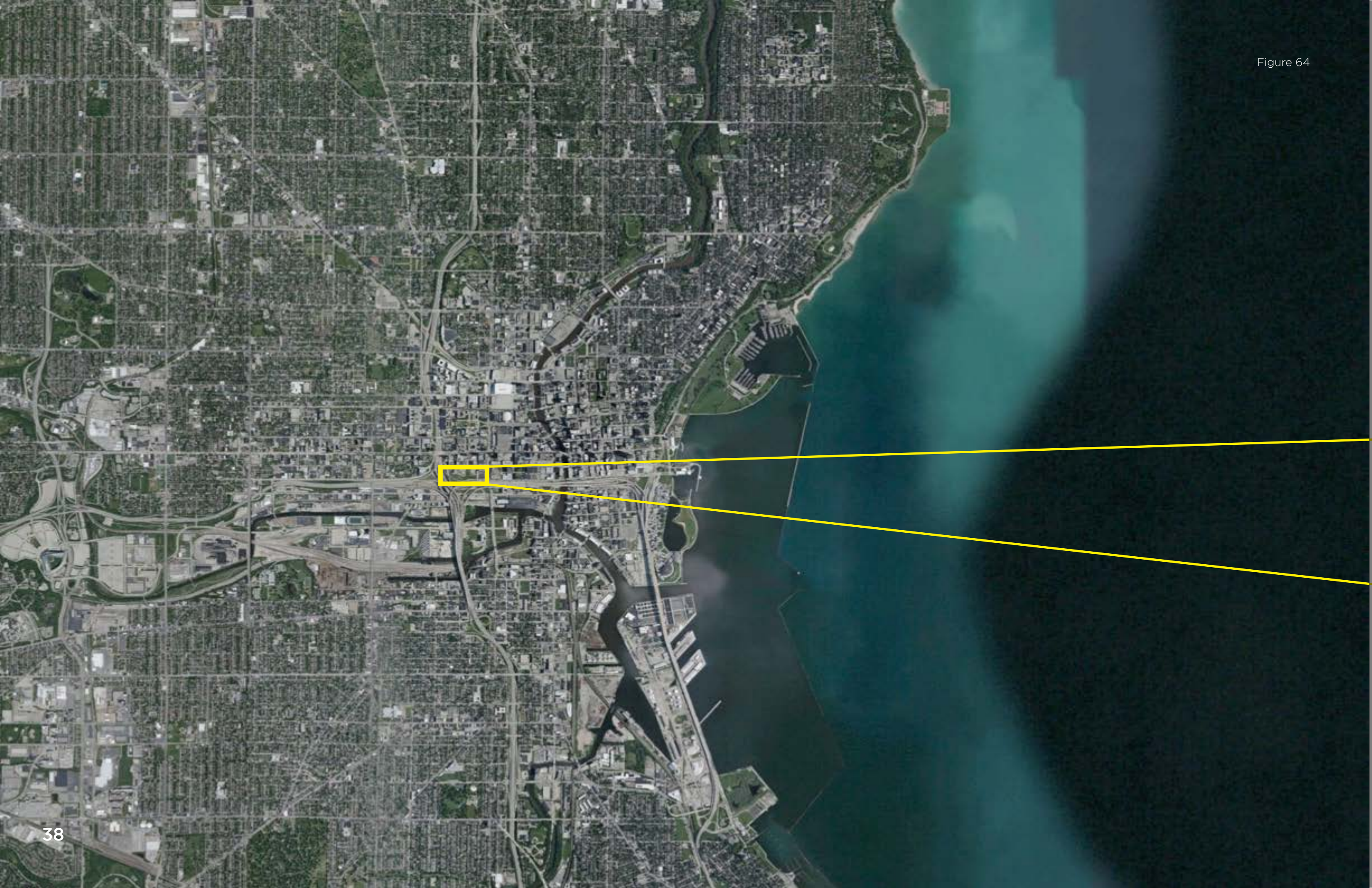
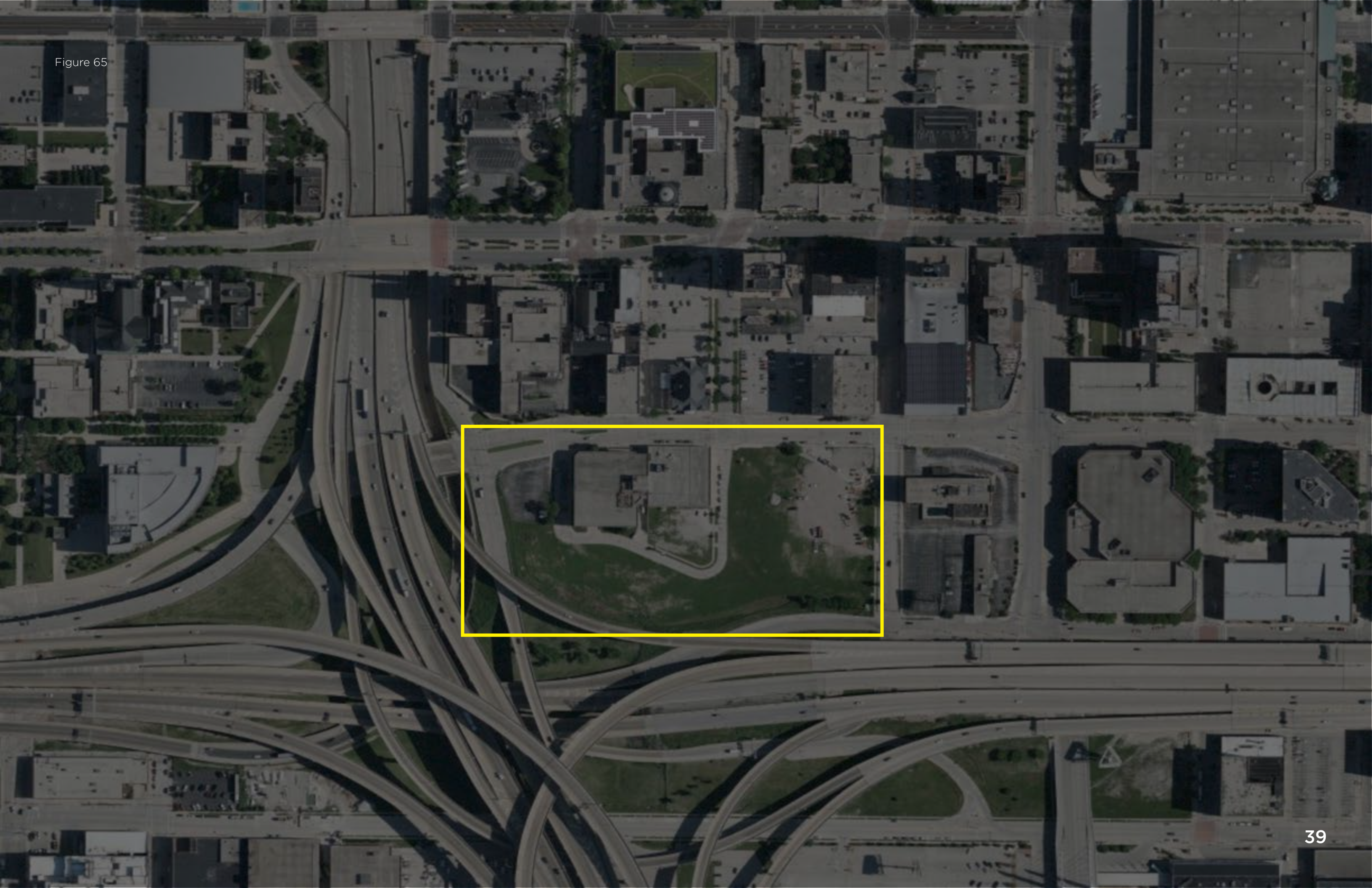


Figure 65





WHY MILWAUKEE?

Milwaukee as a city is a very rich and dense historical area. The area has grown in a rapid fashion and established itself as a center point for many people to come thanks the body of water near it.

In the 1850's the city becomes a center for grain trading and manufacturing, and factories located in the downtown area. It soon experiences a rapid growth in development with infrastructure being built one after another. During the 1870's streetcars are introduced in Milwaukee which allows greater access to the downtown area by residents and visitors.

In the 1900's Milwaukee continues to grow and new infrastructure is introduced such as hotels, theaters, and skyscrapers. Between the 1920s and 30s the prohibition leads to several breweries and taverns to close in the downtown area. The area took a economic hit with the loss of alcohol being sold in the area thus, leaving some areas of the downtown area to lose business.

During the 1980s there was a period to bring the downtown area back to what it use to be, with the creation of the River walk, Grand Avenue Mall, and Milwaukee Art Museum's Quadracci.

Today, the downtown area continues to implement changes for the better of the community. The development of the Fiserv Forum, the Milwaukee Bucks' Arena, and renewing the Pabst Brewery complex. The city is a vibrant and resilient center for business, entertainment and culture.

Thesis Site:

Location:

Milwaukee Iron District, Milwaukee, WI

Size:

205,538 ft (4.71 acres)

Land Use:

Commercial | Central Business | Mixed-use

History of Milwaukee

Milwaukee is the largest city in Wisconsin. The economy was famously known for the manufacturing through heavy machinery, tools, engines and brewing. Since then, the economy has grown through health care, banking, insurance, and retail stores.

Milwaukee Demographics

Population: 555,640

Land Area - 96.2 sq mi

Density - 5,964 sq mi

Milwaukee Median Age -

Male : 30.5

Female: 32.4

Milwaukee's racial composition

White - 42.05%

African American - 38.79%

Other race - 8.36%

Two or more races - 5.63%

Asian - 4.60%

Native American - 0.53%

Native Hawaiian or Pacific Islander - .04%

Figure 67

WHY MILWAUKEE CONTINUED?

This city and site is the perfect place to design and construct a soccer stadium. The existing site, known as the Iron District, is an abandoned site with a building on it that would eventually be demolished. The area has seen a decline in foot traffic in that particular area leading to more people going east towards the Milwaukee river. This would be a good way to bring people back to this area that have slowly transition away and bring that presence back to the Iron District.

The city of Milwaukee currently does not have a soccer team nor does it have a stadium to host a soccer team. Since the city is rich in many aspects such as sports history, culture, and history, the city would benefit greatly from the incorporation of a soccer team to the city. It would help in more than just one way to create a soccer team that would flourish the downtown area of Milwaukee.

Marquette University, which is the current owners of the site, had the intention to design a sporting venue for the college by never came around to design anything. Since then they BEAR development has ownership. There is current talk about constructing a soccer stadium on the same ground that I am proposing a soccer stadium which gives me a credibility as to why I believe that the city needs a soccer stadium. The proposed project is a soccer stadium venue that would also host athletic events for Marquette University as well as other community events. There is a possibility of incorporating a retail area as well as a hotel.



Figure 68

SOCIAL, CULTURAL, AND HISTORICAL CONTEXT

SOCIAL CONTEXT:

Milwaukee, Wisconsin, has a diverse social context, exceeding more than 590,000 people in the area. The city is rich with diversity of both ethnicities and cultures. Milwaukee's social context is very complex, shaped by its economic status, history, and diverse population. The city, as many others in the world, face challenges, but it offers countless opportunities for cultural submersion and community engagement.

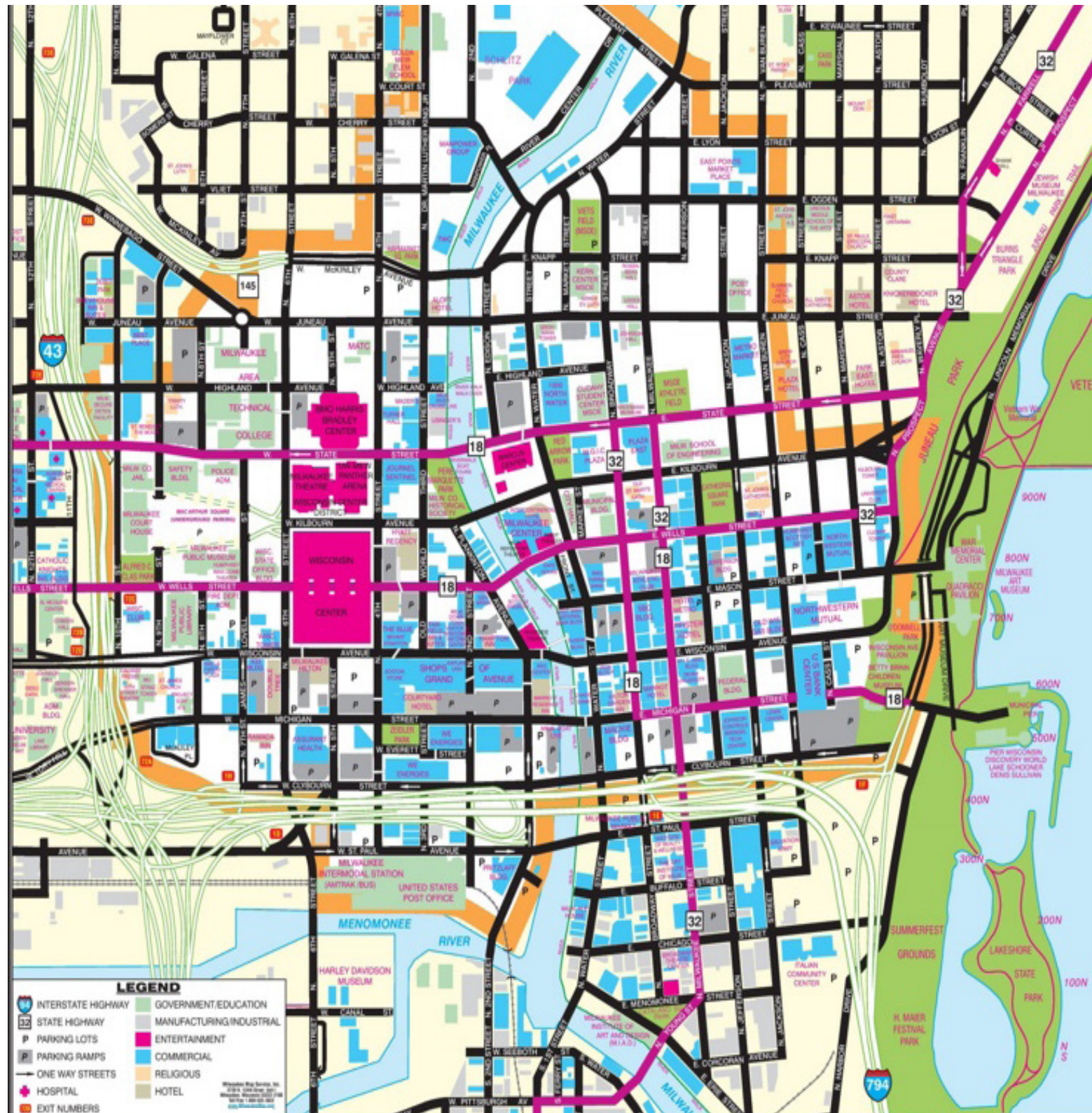
CULTURAL CONTEXT:

Milwaukee has an exuberant culture scene, with a strong art community, countless festivals and events throughout the year, and a delightful local music and culinary culture. The city reflects the history of its immigrants and location. The city is rich with diverse and dynamic influences in many aspects not just one. It provides many experiences and opportunities to the residents and visitors.

HISTORICAL CONTEXT:

The city has seen a lot of change in a short amount of time. It dates back to the 17th century when the land was inhabited by Native American tribes. In the 19th century, the city rapidly grew and was known as a center for industry and commerce, quickly becoming a transporting hub. While all of this was going on, the city faced social and political issues that resulted in protests against racial inequality and police brutality. To this day, the resilience and growth of the city continues to address the challenges of its past and present.

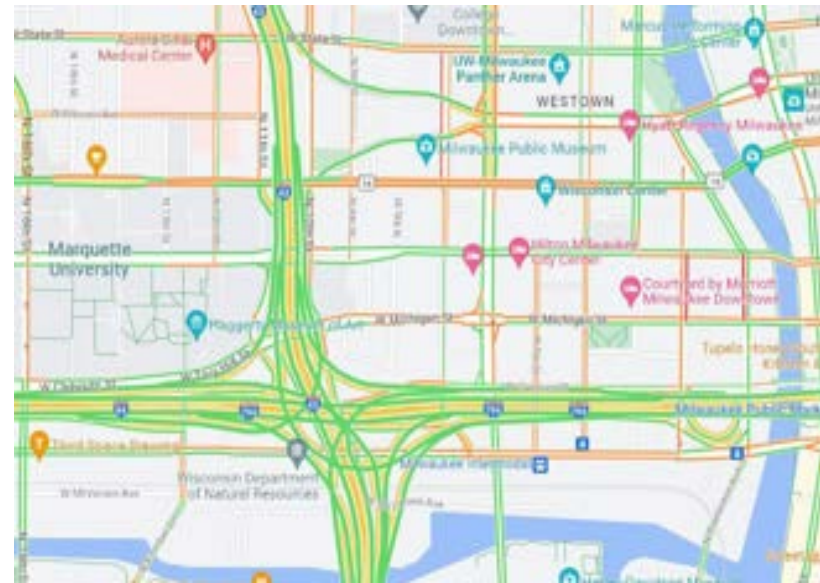
CITY CONTEXT



The image to the left is a contextual map of the downtown area of Milwaukee. It displays a lot of useful information to understand the downtown area and what it has to offer. The downtown area is a lively and vibrant area with both modern and historic architecture. There is plenty of places to visit while being in the area such as the Milwaukee Art Museum, the River walk, and the Fiserv Forum. There is an abundant amount of shopping and dining options located nearby as well.

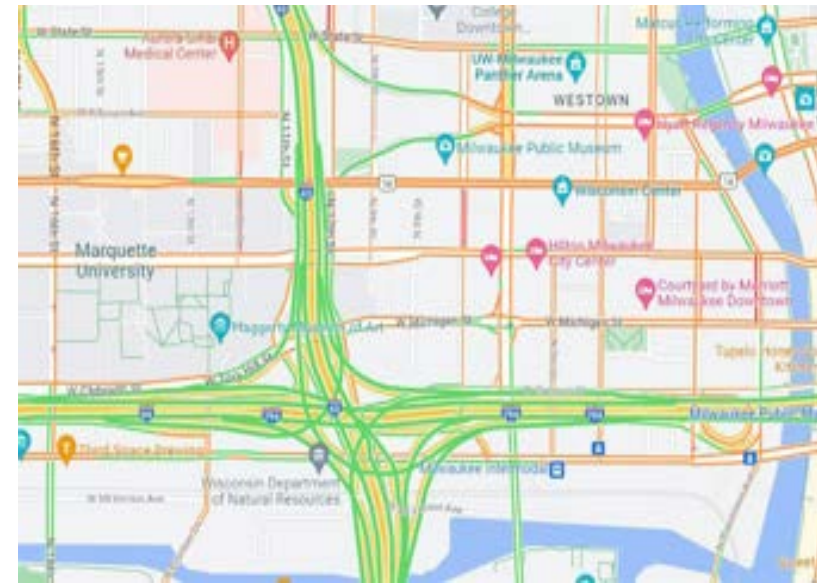
Figure 69

TRAFFIC CIRCULATION



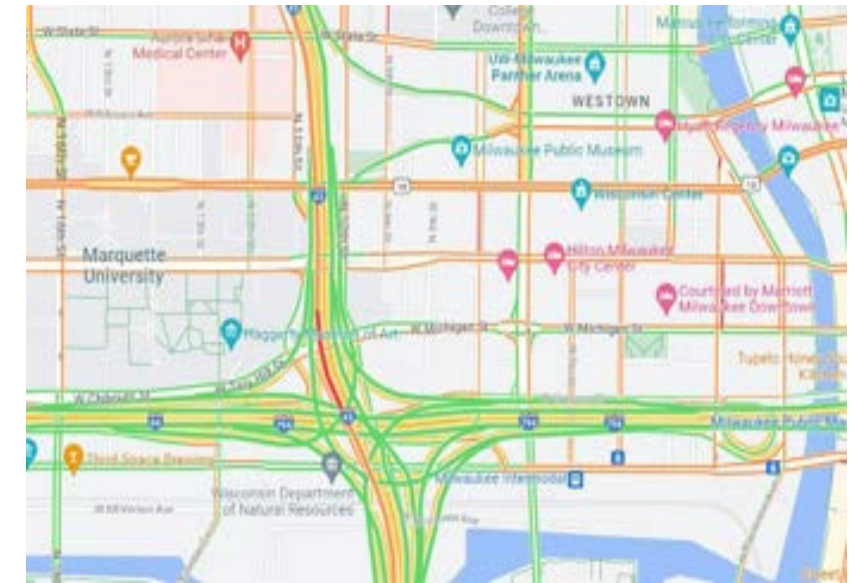
8:00 AM

Figure 70



12:00 PM

Figure 71



5:00 PM

Figure 72

 Fast Traffic

 Moderate Traffic

 Slow Traffic

The images above are traffic circulation during the three most busiest times of the day. 8 AM, 12 PM, and 5 PM. 8 AM is a time period where traffic is light to moderate as commuters are arriving to the downtown area arriving for work, some roads may see more congestion. 12 PM is moderately light with less people driving around but the occasional person leaving for a lunch break may see moderate traffic. 5 PM is likely to have a heavy presence of commuters leaving the inner downtown area and making their way towards the interstate which would result in a congestion on inner roads and merging onto the interstate.

SUN: HOURS OF DAYLIGHT & TWILIGHT



Figure 73

The length of a typical Milwaukee day can range a few minutes and hours throughout the year. 5:11 AM on June 15 is the earliest recorded sunrise while the latest is 7:29 AM on November 4th.

In terms of sunset, the earliest was at 4:16 PM on December 9th while the latest was at 8:35 PM on June 26th.

TEMPERATURE AND PRECIPITATION

Average Temperature: 71 Degrees

Warmest Month: July | 80 Degrees

Coldest Month: January | 16 Degrees

Warmth Season: approximately a 3.6 month duration beginning in June and ending in September.

Cold Season: approximately a 3.2 month duration beginning in December and ending in March.

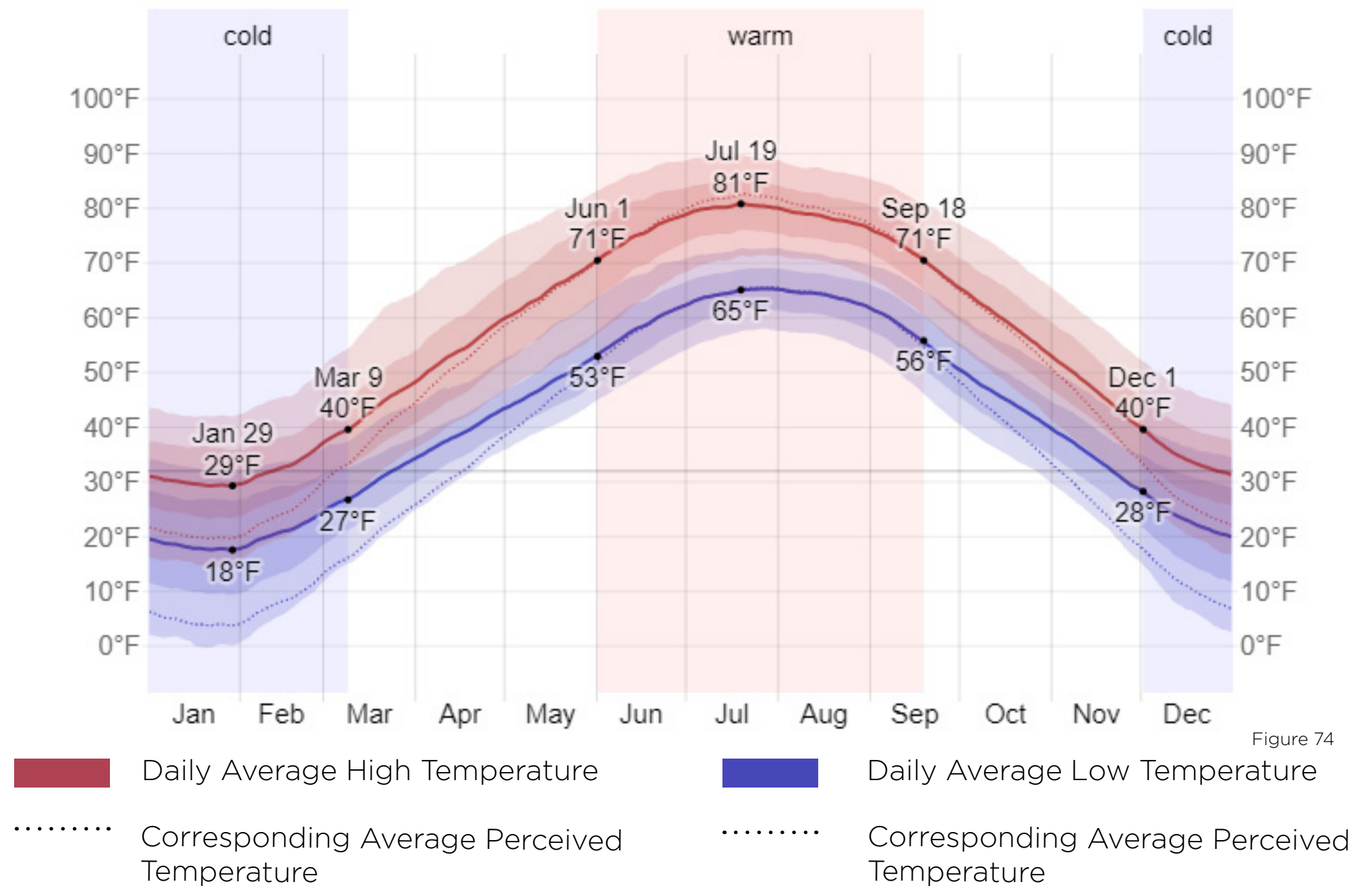
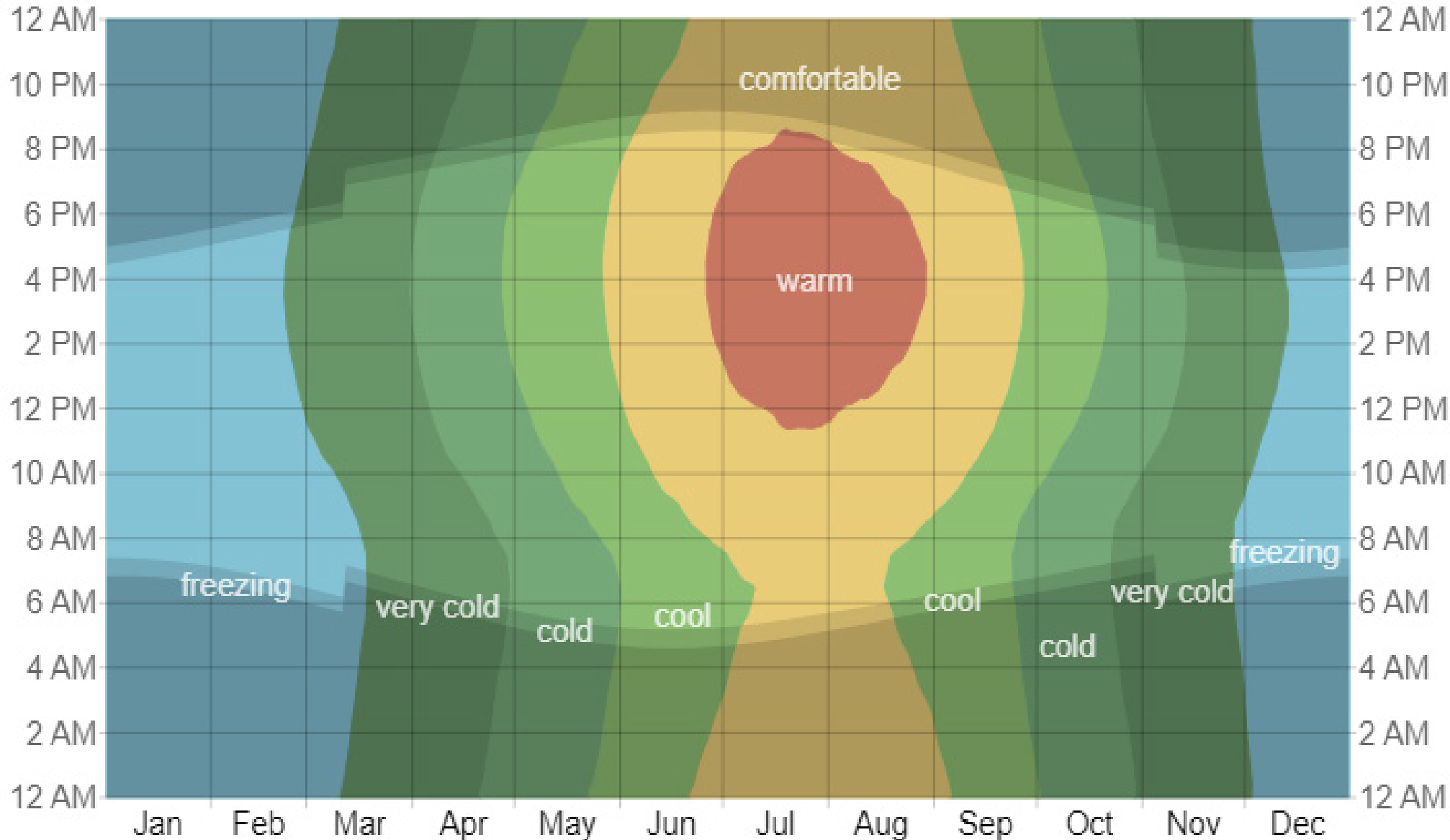


Figure 74

AVERAGE HOURLY TEMPERATURE

Adjacent figure displays a compact characterization of the hourly average temperatures for a year duration. The shaded overlays indicate night and civil twilight



Horizontal Axis: Day of the Year
 Vertical Axis: Hour of the Day
 Color: Average Temperature for Coordinating Hour and Day

Figure 75

RAINFALL

Average Monthly Rainfall

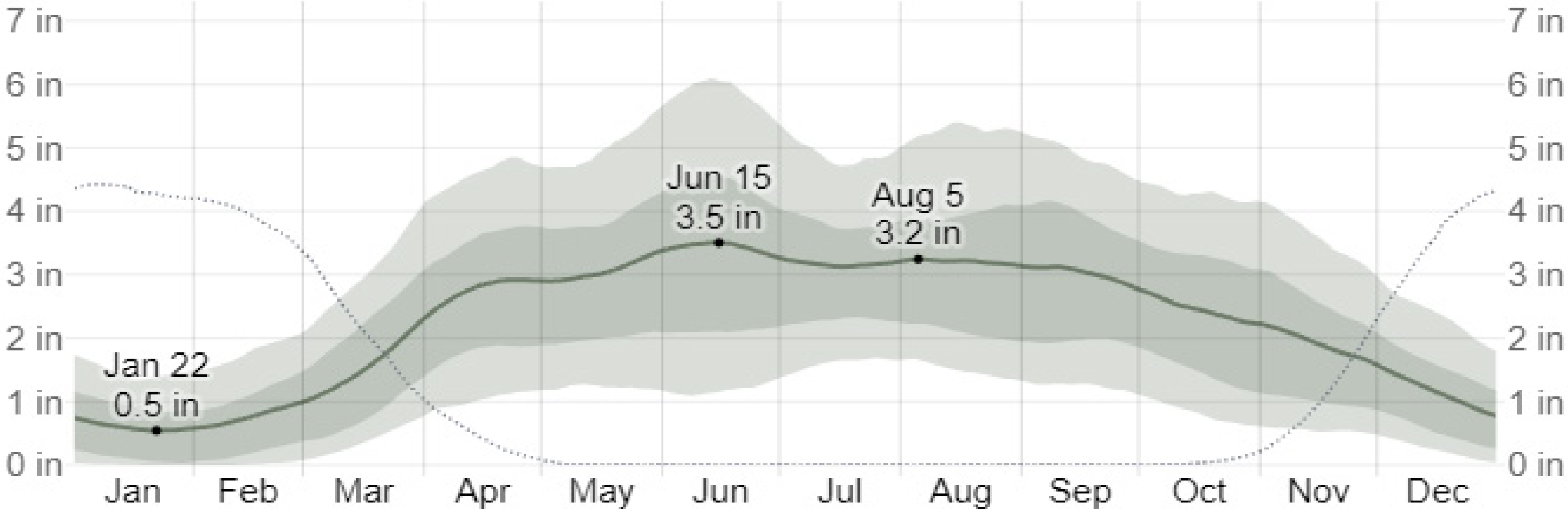


Figure 76

- Average Rainfall (accumulated over the course of a sliding 31-day period)
- Corresponding Average Snowfall

The rainfall in the month of June typically averages 3.5 inches and is the month with the most rainfall.

The rainfall in the month of January typically averages 0.6 inches and is the month with the least rainfall.

WIND STUDY

Wind Rose Diagram in Milwaukee

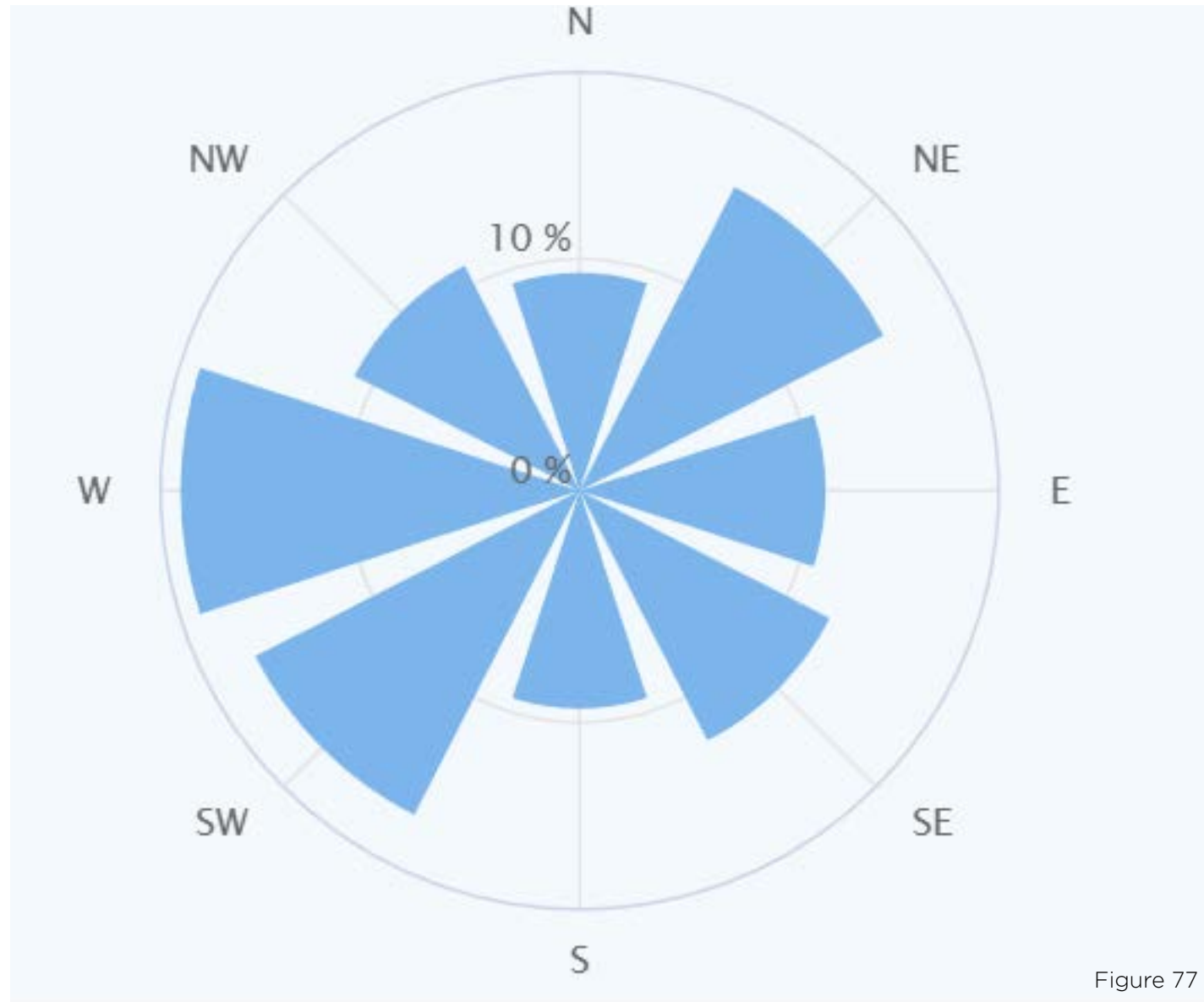


Figure 77

The diagram displayed to the left (Wind Rose) is an average wind chart that captures the winds in Milwaukee.

The Wind Rose demonstrates that the strongest winds come from the West going to the Southwest throughout the year.

On occasion, the Northeast will also have a strong amount of wind throughout the year.

The least prevalent wind comes from North and South ends.

N ▼ Northern	NE ▲ Northeastern	E ◀ Eeastern	SE ▼ Southeastern	S ▲ Southern	SW ▼ Southwestern	W ▶ Western	NW ▲ Northwestern
9.4%	14.7%	10.6%	12.1%	9.4%	15.7%	17.2%	10.9%

Figure 78

SUN STUDY

Sun Path Diagram

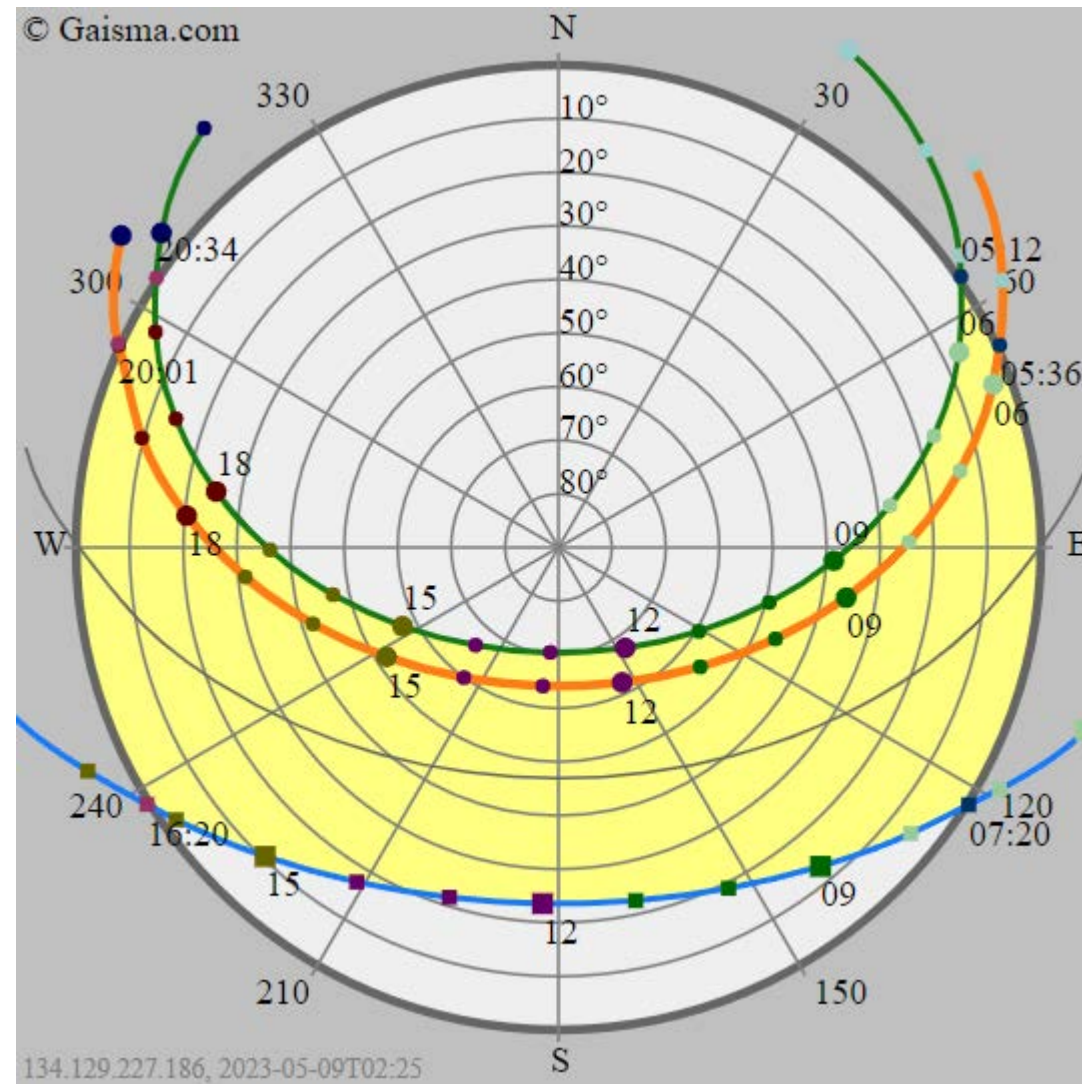
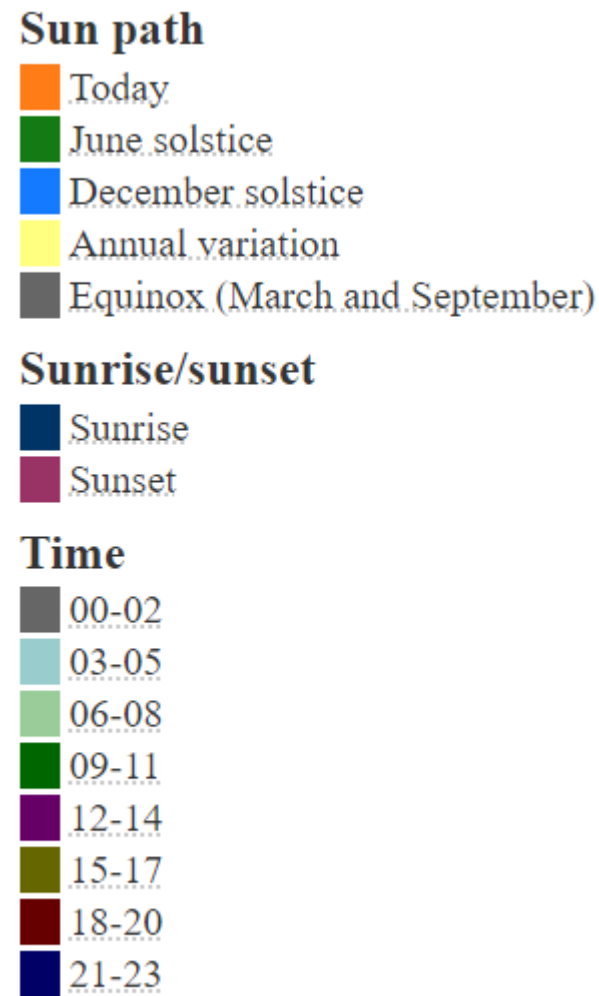


Figure 79

The chart above is a visualization of the sun's path through the sky, providing relevant information regarding where the sun rises and sets in relation to the structure, which side of the structure receives the most sunlight, and positioning of solar panels, if necessary.

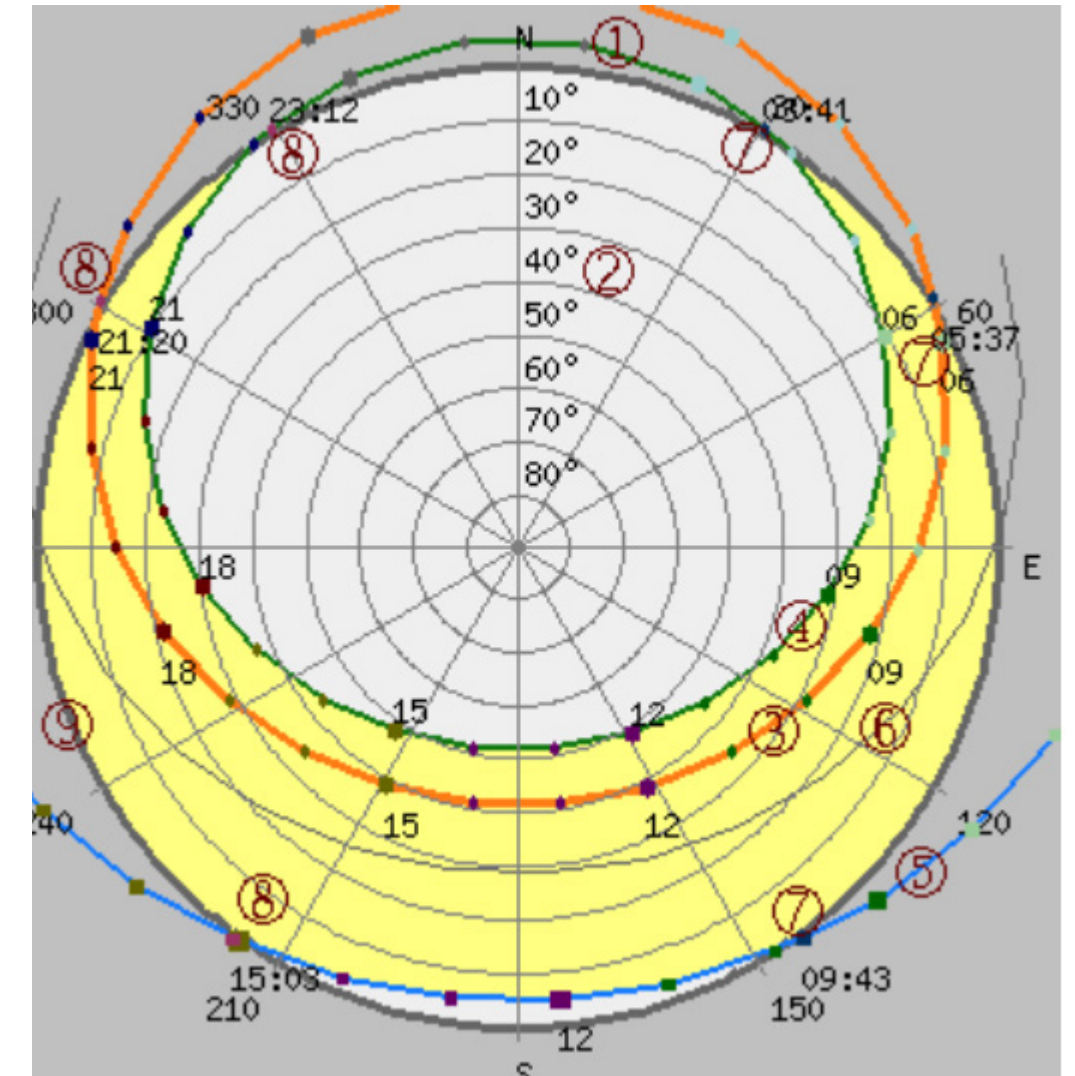


Figure 80

1. Azimuth Angle
2. Elevation Angle
3. Sun's Path Today
4. Sun's Path on June 21st
5. Sun's Path on December 21st
6. Sun's Path during Equinox
7. Sunrise
8. Sunset
9. Horizon

PRE-DESIGN
SCHEMATIC DESIGN

FORM DEVELOPMENT



Figure 81



Figure 82



Figure 83

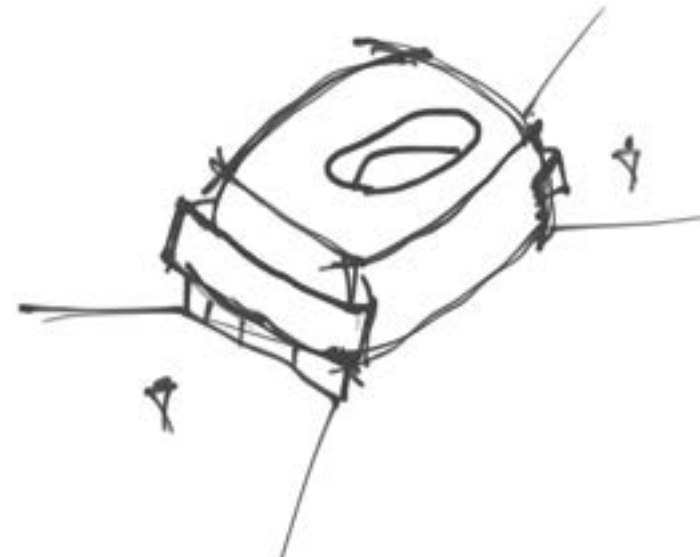


Figure 84

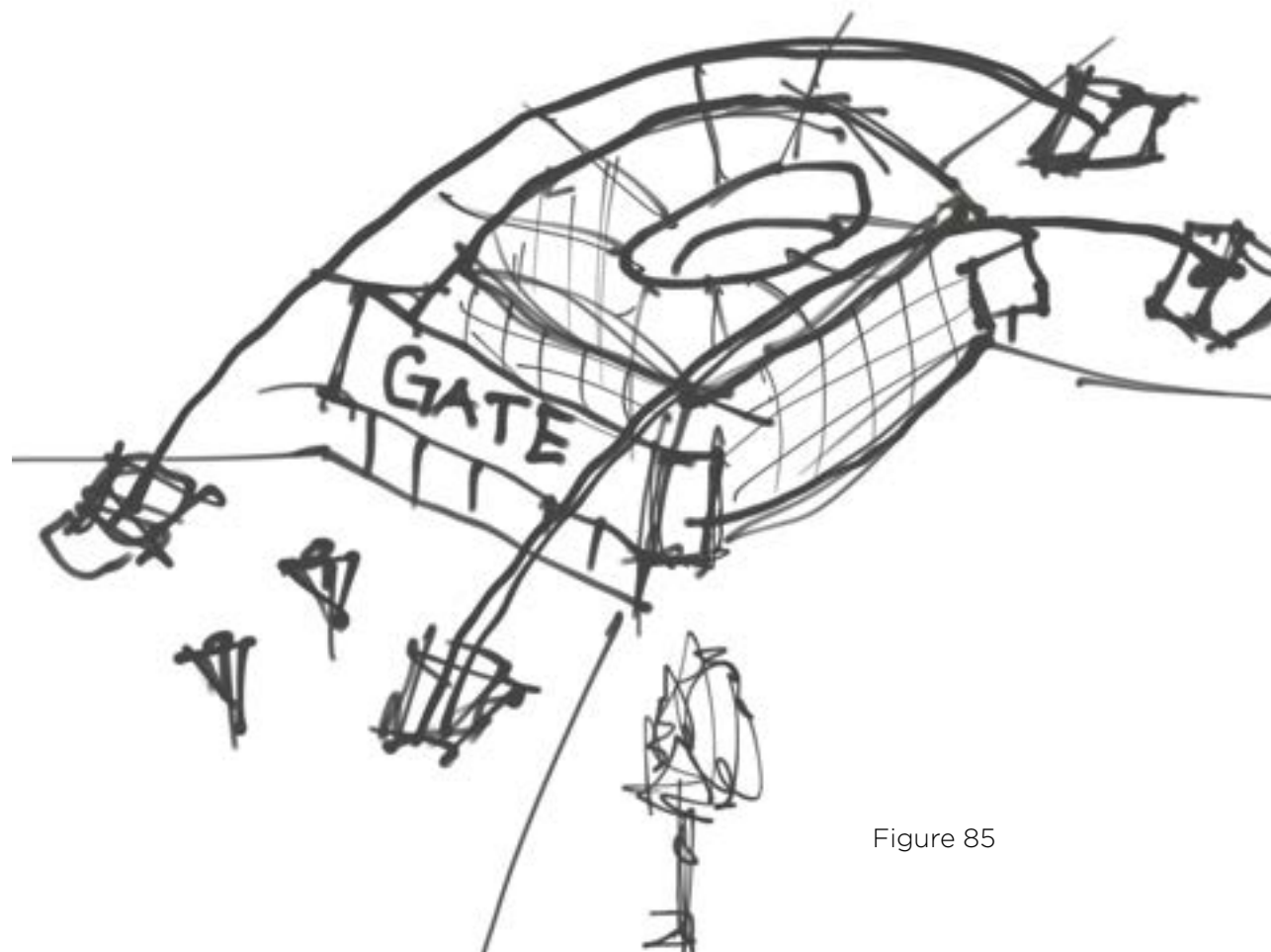


Figure 85

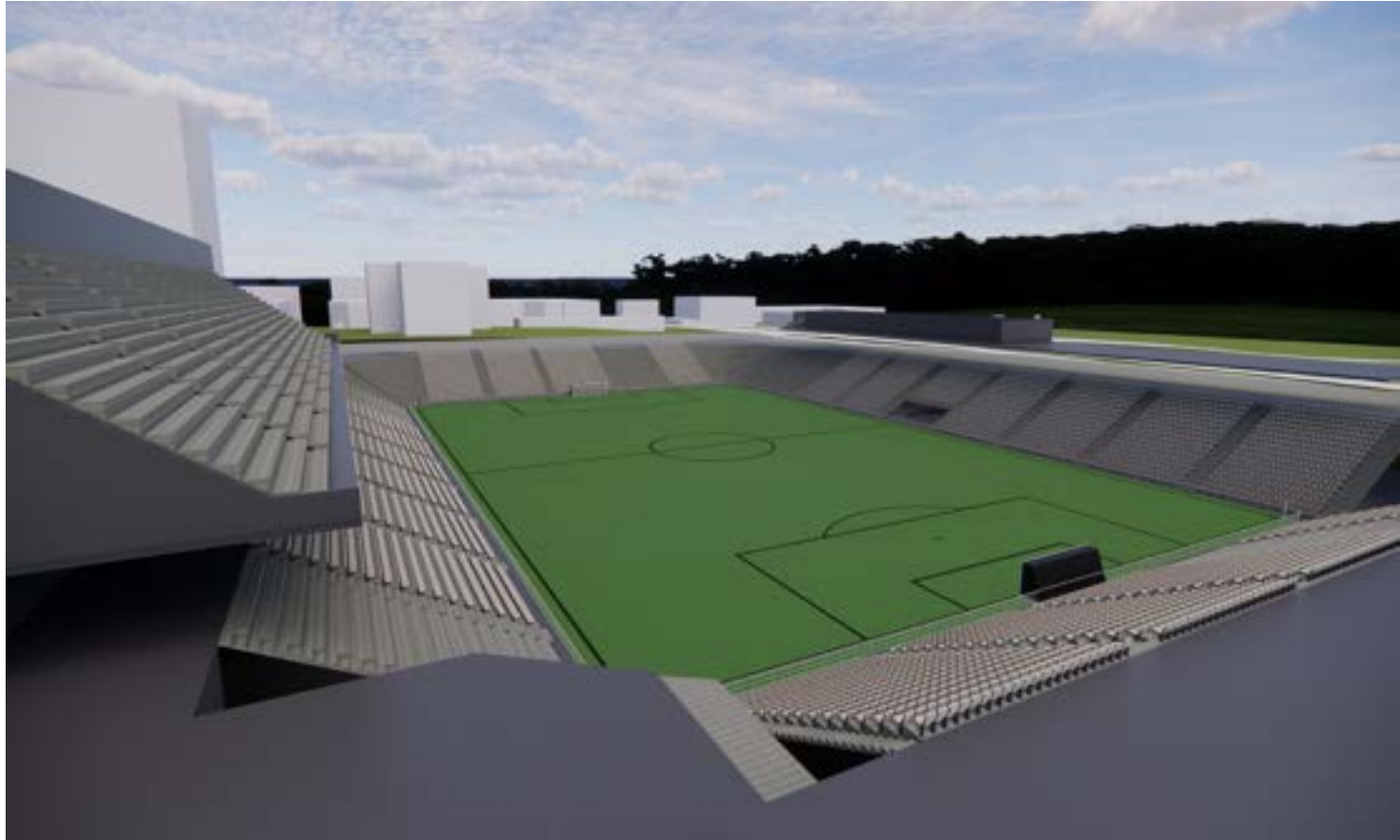


Figure 86



Figure 87



Figure 88



Figure 89



Figure 90



Figure 91

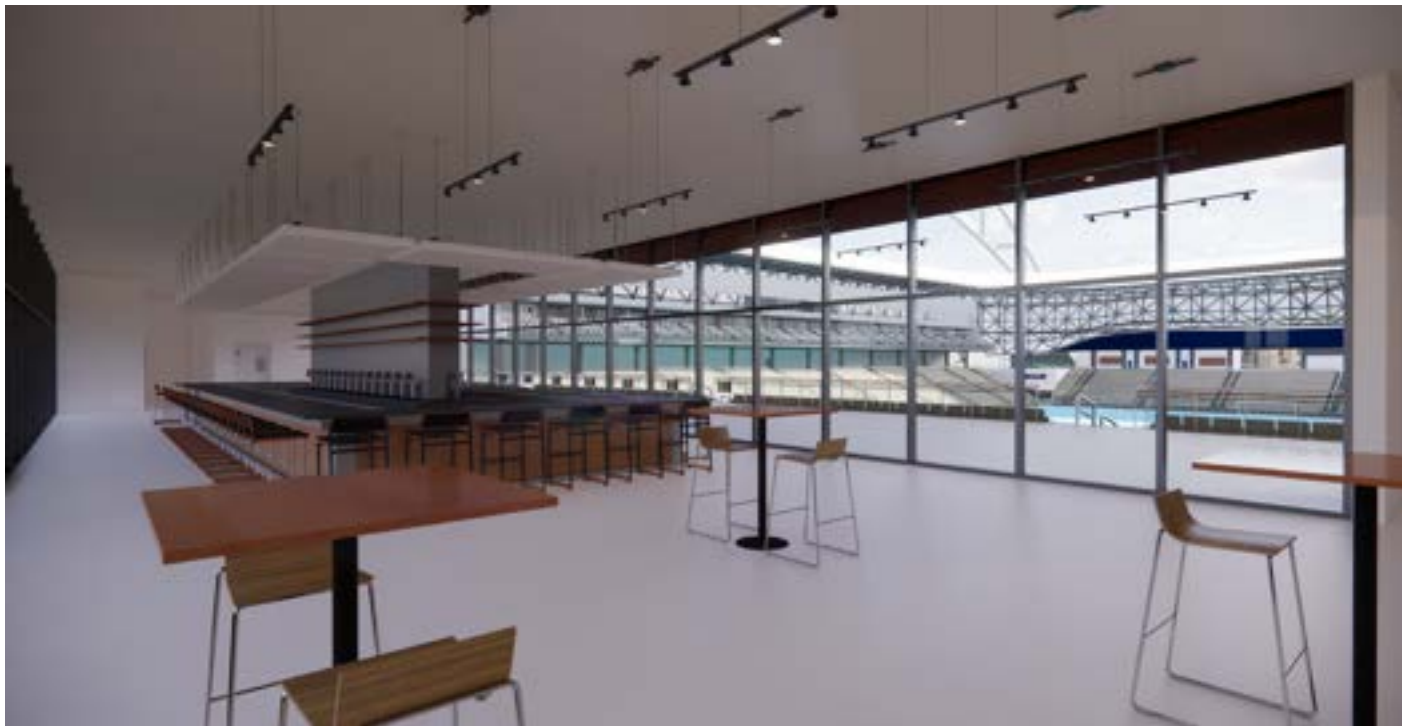


Figure 92



Figure 93

FINAL DESIGN

Site Map



Figure 94

The site is intended to welcome fans from the East and West sides. The west side has access to underground parking meant for soccer players, match officials, media, and emergency personnel. There is also an additional bus stop to allow for easier commute to the stadium. The east side has a plaza meant for fans to come together before the game and take pictures and interact with one another. There is four available gate two on the east side and two on the west side.

EXTERIOR



Figure 95

The exterior of the stadium, as stated in the site map, was intended to create a welcoming plaza for people to spend time before the game takes place. It would be a gathering space to chant and cheer as people come and take pictures near the Mavericks sign. The incorporation of lighting bollard were included to help provide safety during the night when people are exiting the venue.

SUPPORTER STANDS



Figure 96

The point of this picture is to demonstrate the point-of-view of the home supporter stand. The idea is to demonstrate what that view and experience would be while watching the soccer game. This allows the user to experience the game in a close proximity to the pitch while also enjoying the construction of the stadium.

CORNER CONCOURSE



Figure 97

This particular image is to capture what the fans would see upon arrival to the stadium after going through the security gates. The initial feeling should be a wow factor to show the fans of Milwaukee the stadium and the field. This design was intended to create an unobstructed stadium that no matter where you were to sit, you would have full view of the pitch.

CONCESSION STANDS



Figure 98

While the seating areas are important, paying attention to

BREWERY



Figure 99

The city of Milwaukee is known for the breweries around the city. The goal was to continue that experience and bring that into the soccer stadium. Allowing fans to enjoy that same brewery feeling and enjoy a local pint of their choosing. During the away games, this area would be accessible to allow fans to come together and cheer the team on from inside the brewery.

BREWERY: UPPER DECK



Figure 100

The upper deck for the brewery was intended to allow individuals to enjoy a beer or meal while also being exposed to the fan experience and the chanting. It goes without saying that the experience is worth the extra money to enjoy a good view and good food.

VIP PRIVATE BOX



Figure 101

These VIP private rooms are intended to have a bit more privacy while enjoying the game at the same time. The indoor is furnished for a small lounging area, private mini-bar, and bathroom. The outer area allows you to enjoy the game while having comfortable seating.

MATERIALS | EXPLODED VIEW

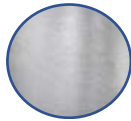
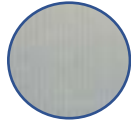
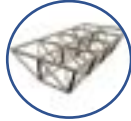

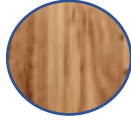
-  Weldox 1100
-  Polytetrafluoroethylene
-  Space trusses
-  Kentucky bluegrass
-  Reclaimed wood

Figure 102

The construction of the stadium was carefully thought out. While making a modern, sleek, and sustainable design, the idea was to pay tribute to the city of Milwaukee. The steel used throughout the stadium is a tribute to the steel production of the earlier years. The arches are a tribute to the 16 bridges around the city. The exterior brick material is a tribute to the surrounding building and the use of brick while the reclaimed wood and bluegrass are sourced locally.



Figure 103

Concourse Floor plan

1. Stadium Entrances
2. Concession Stands
3. Information Office
4. Stadium Brewery
5. VIP Entrance
6. Team Store
7. Public Restroom
8. Accessibility Seating

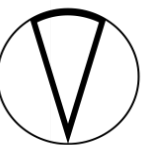
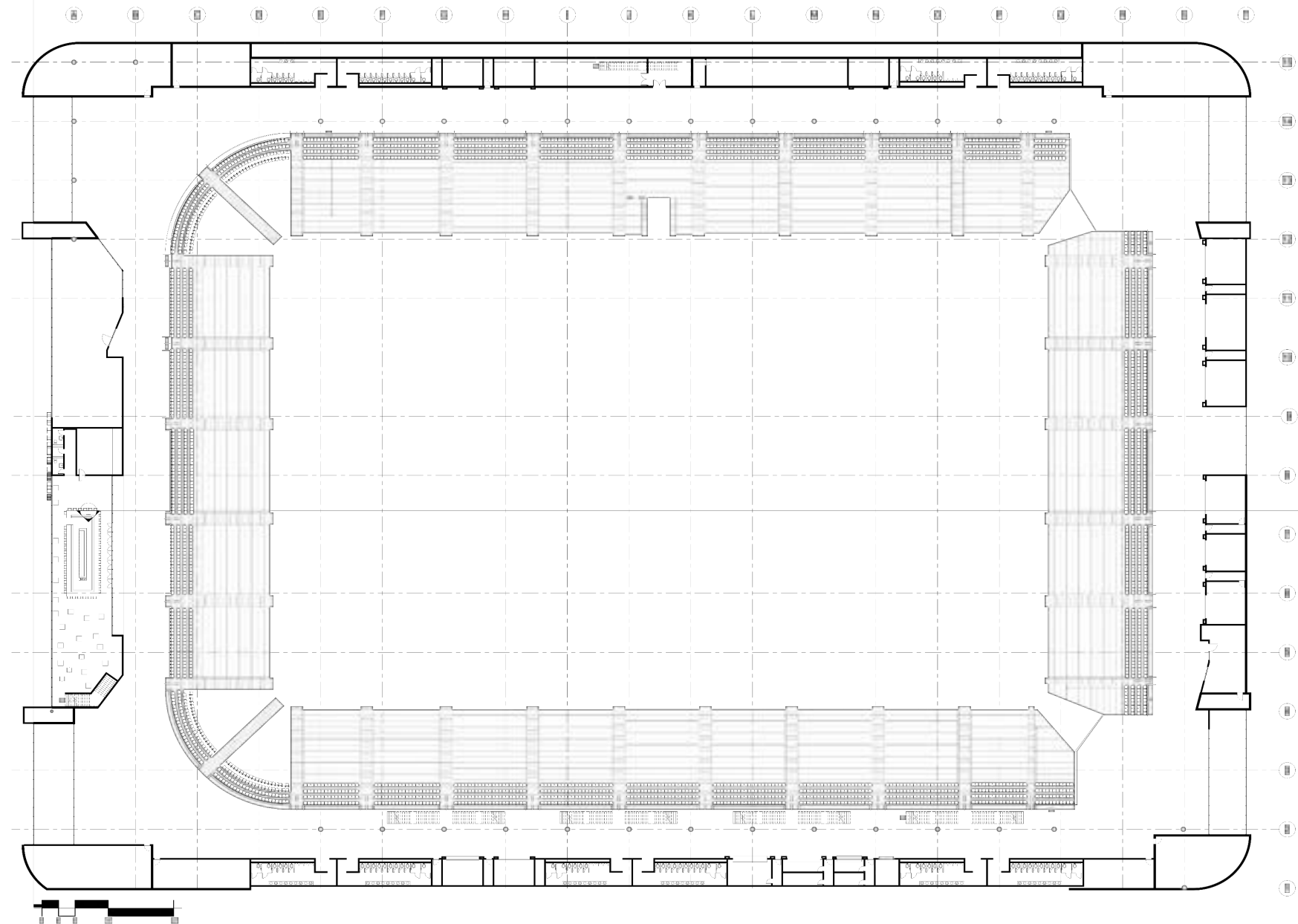
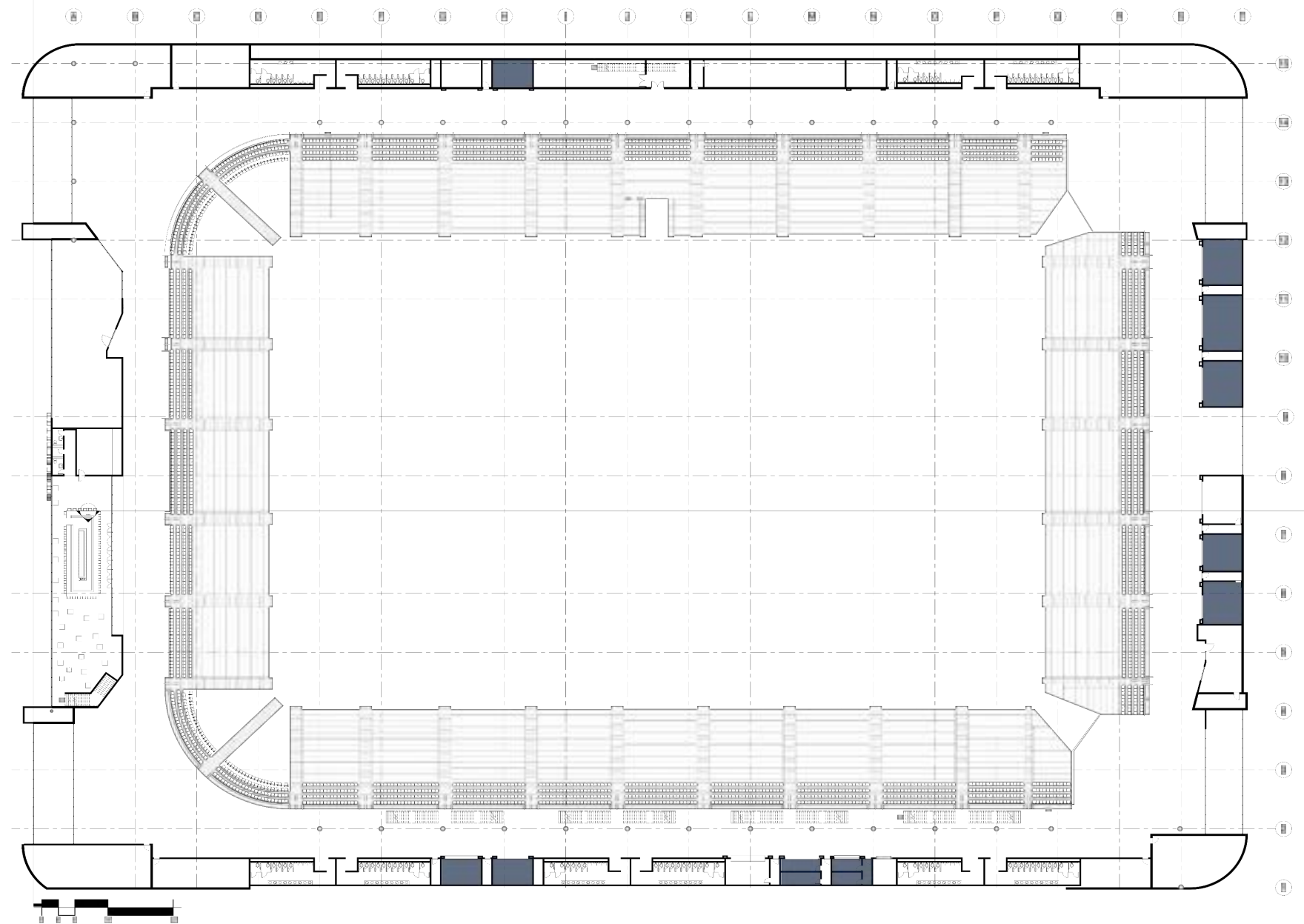


Figure 104

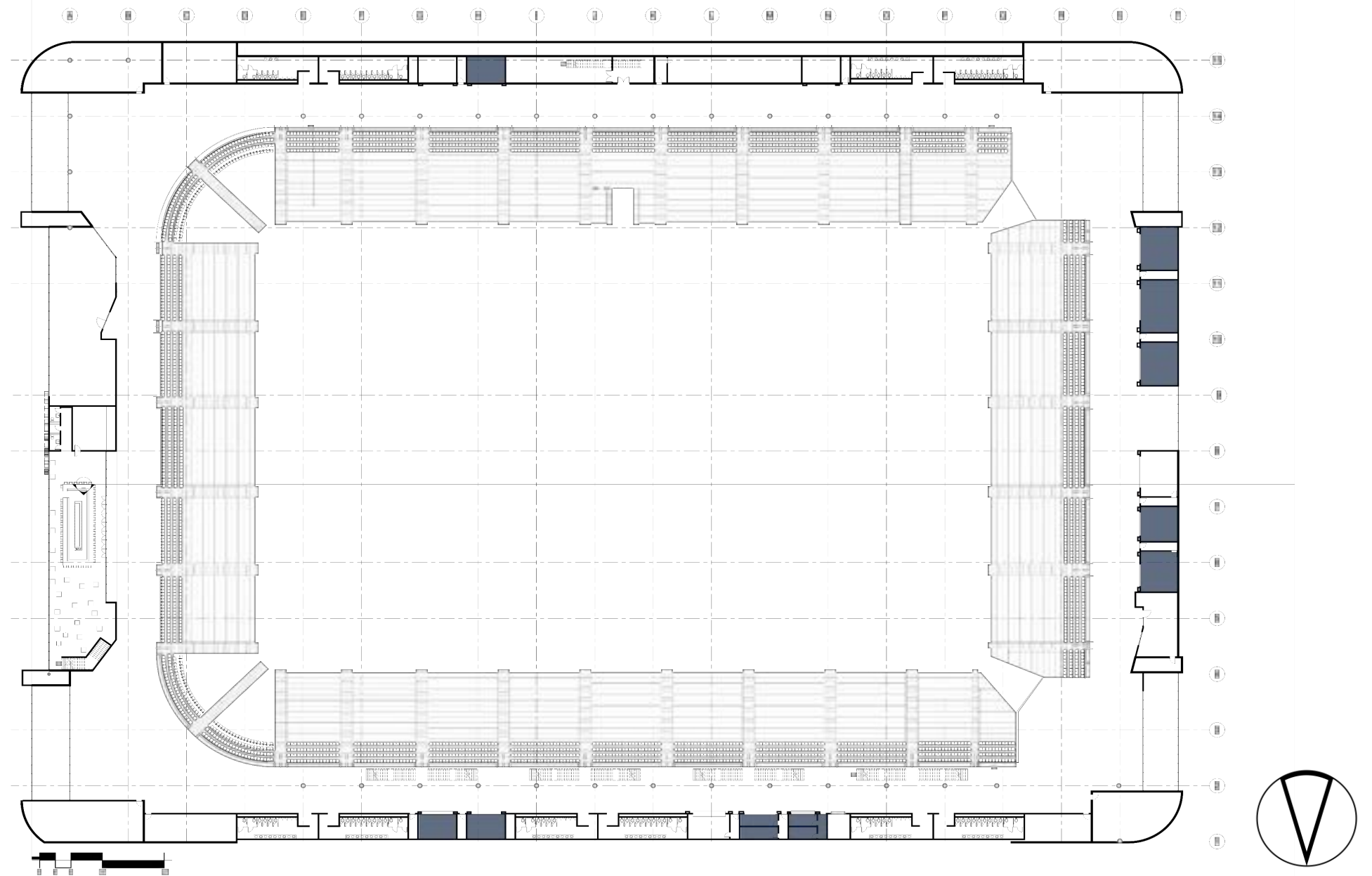
Concourse Floor plan

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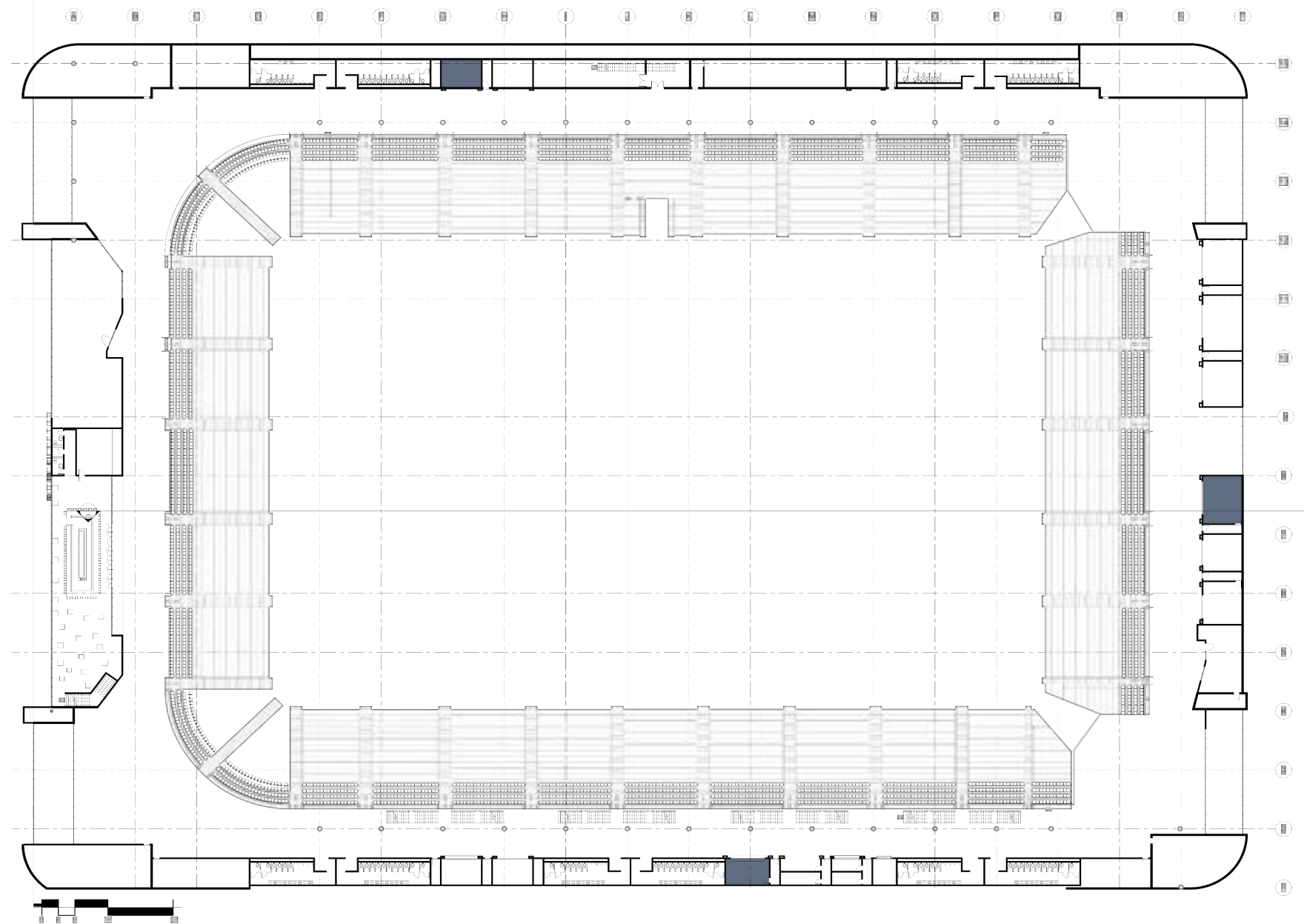
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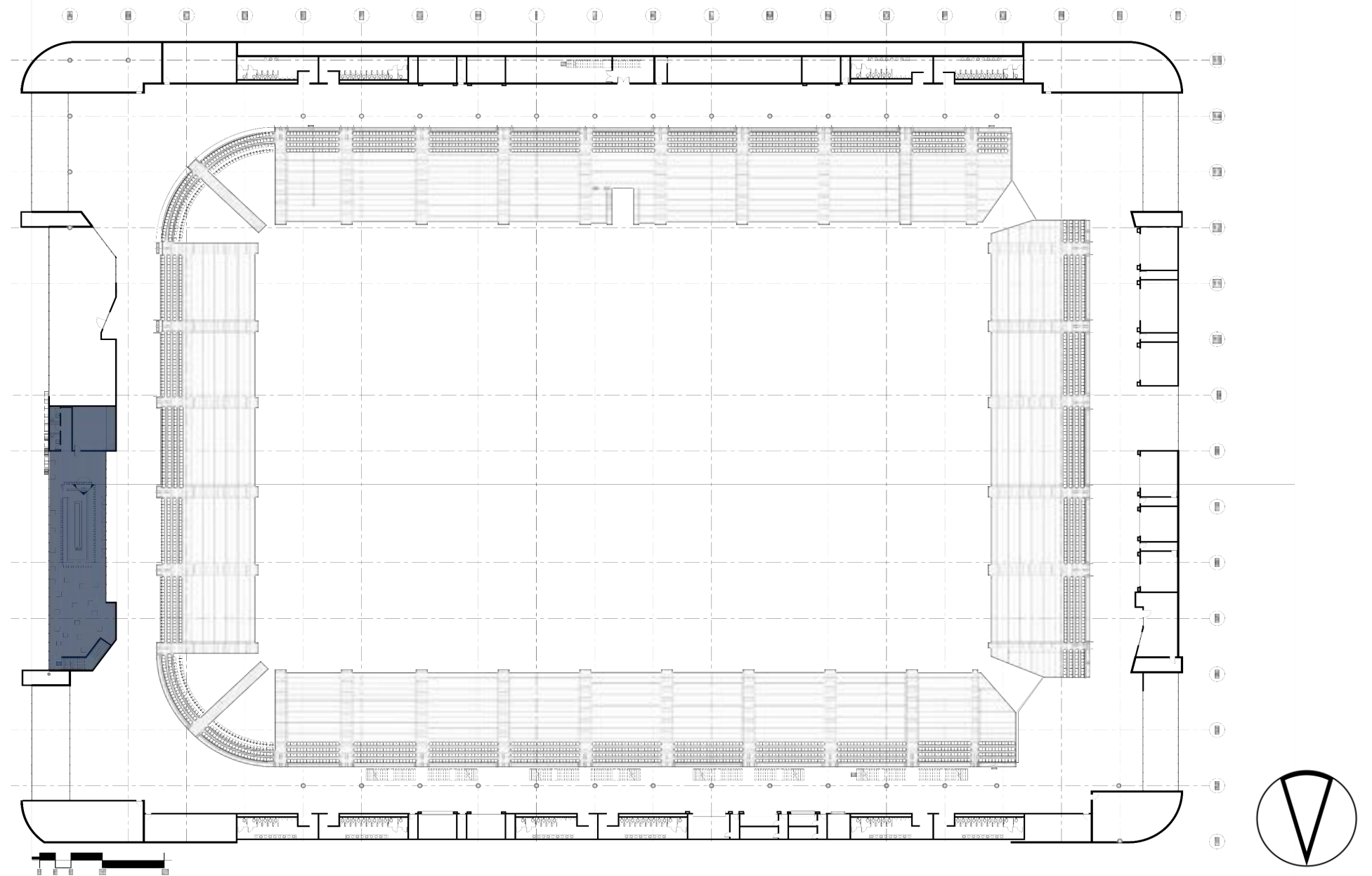
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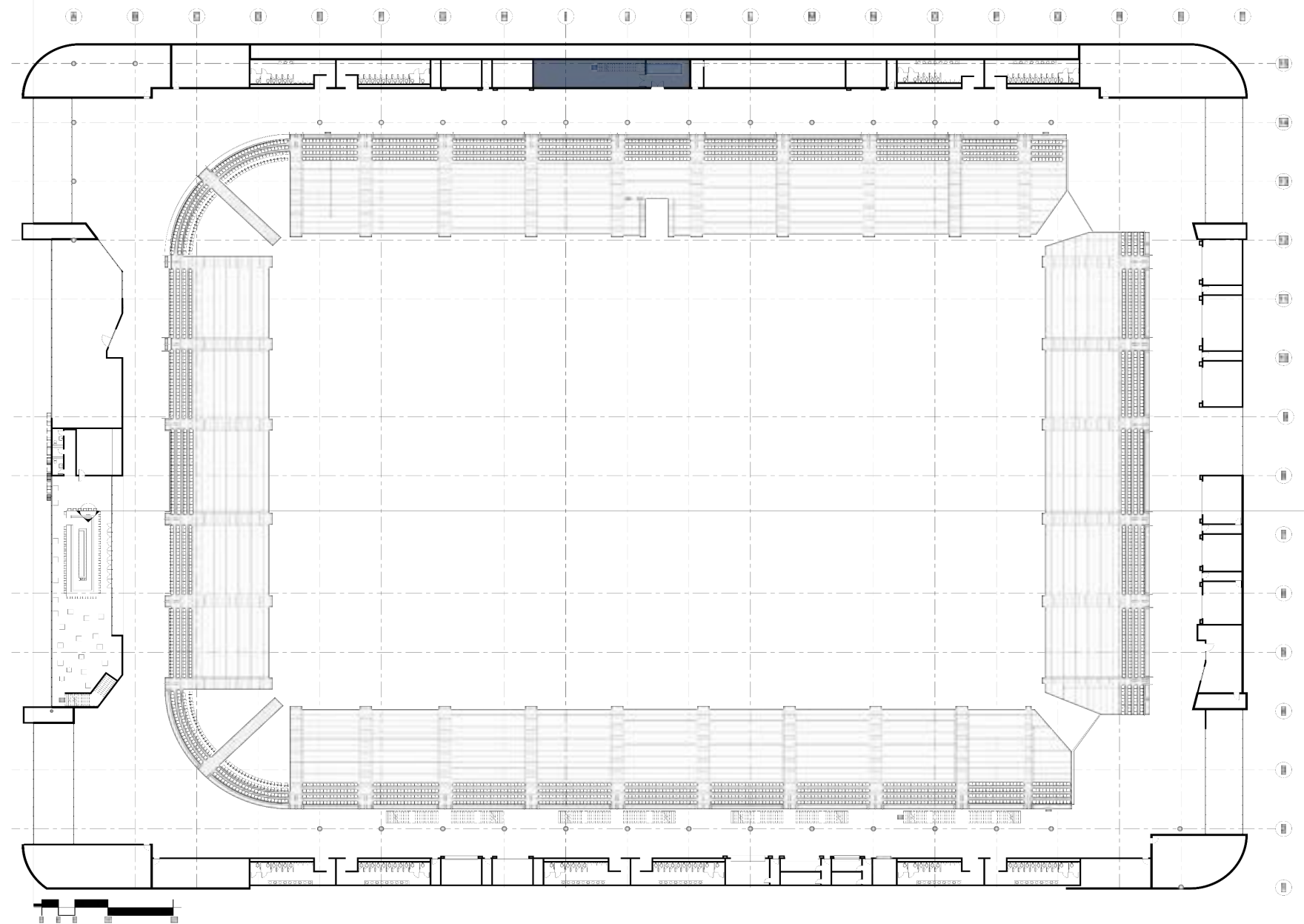
Concourse Floor plan

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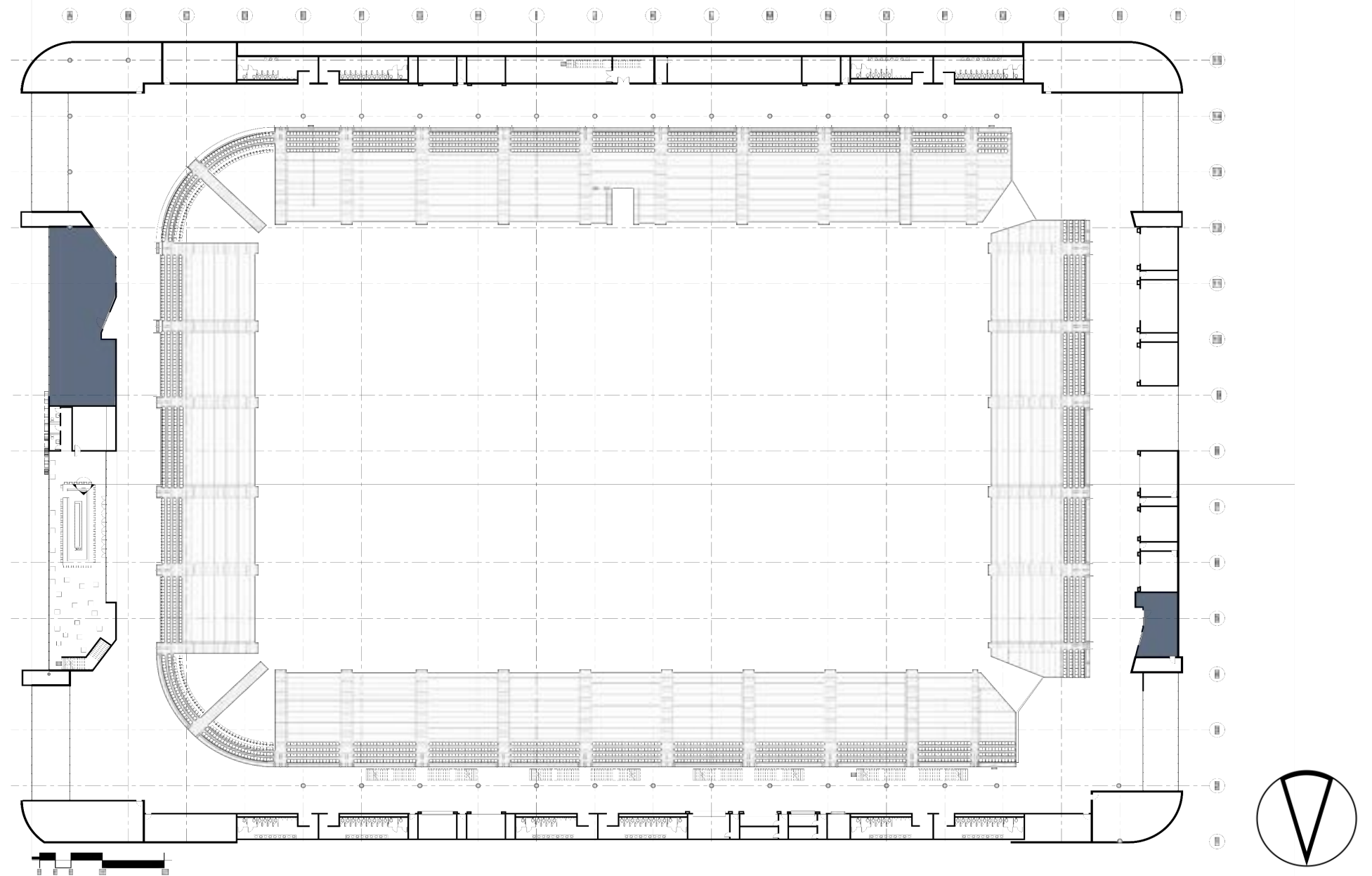
Concourse Floor plan

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3. Information Office
4. Stadium Brewery
5. **VIP Entrance**
6. Team Store
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8. Accessibility Seating



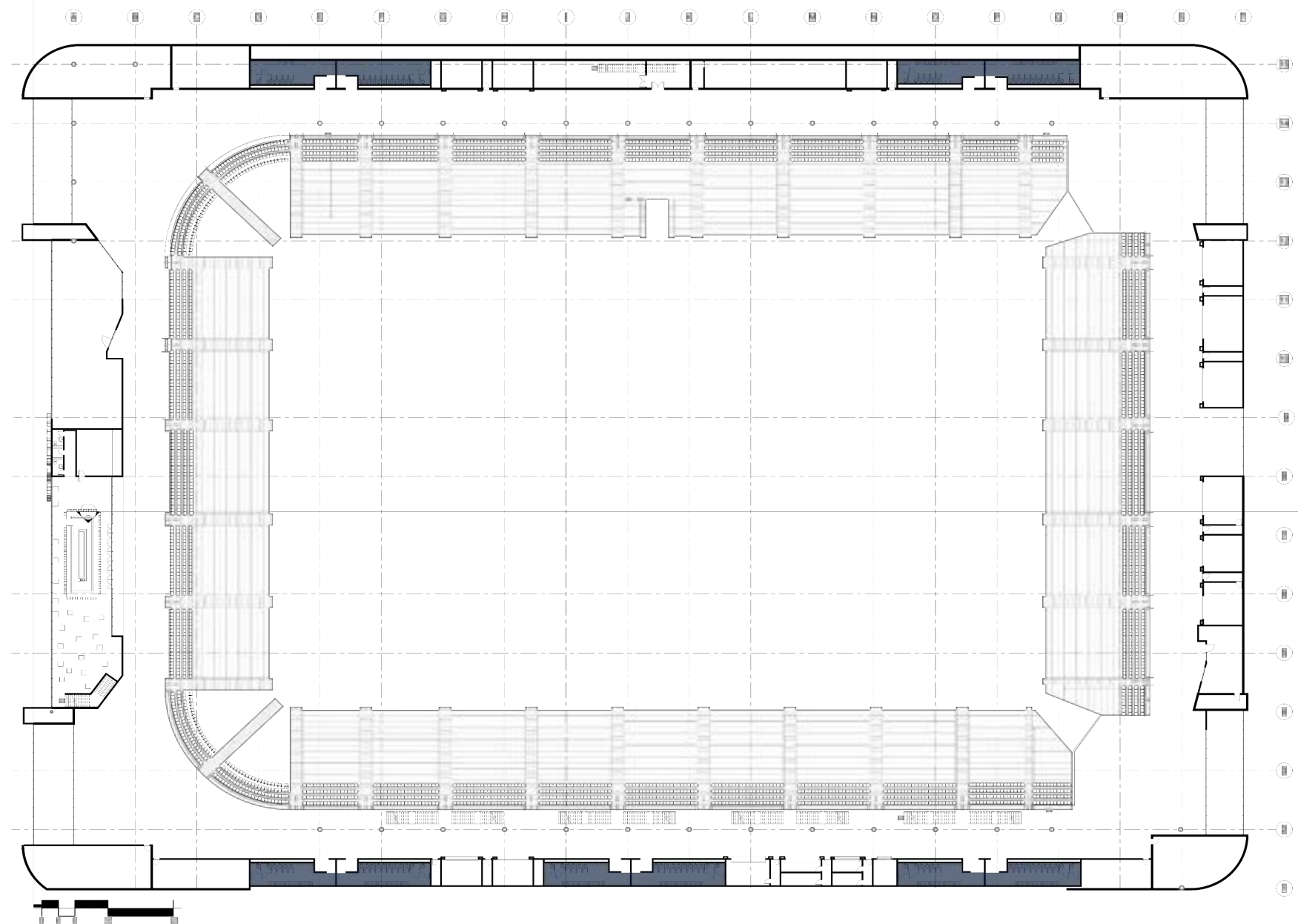
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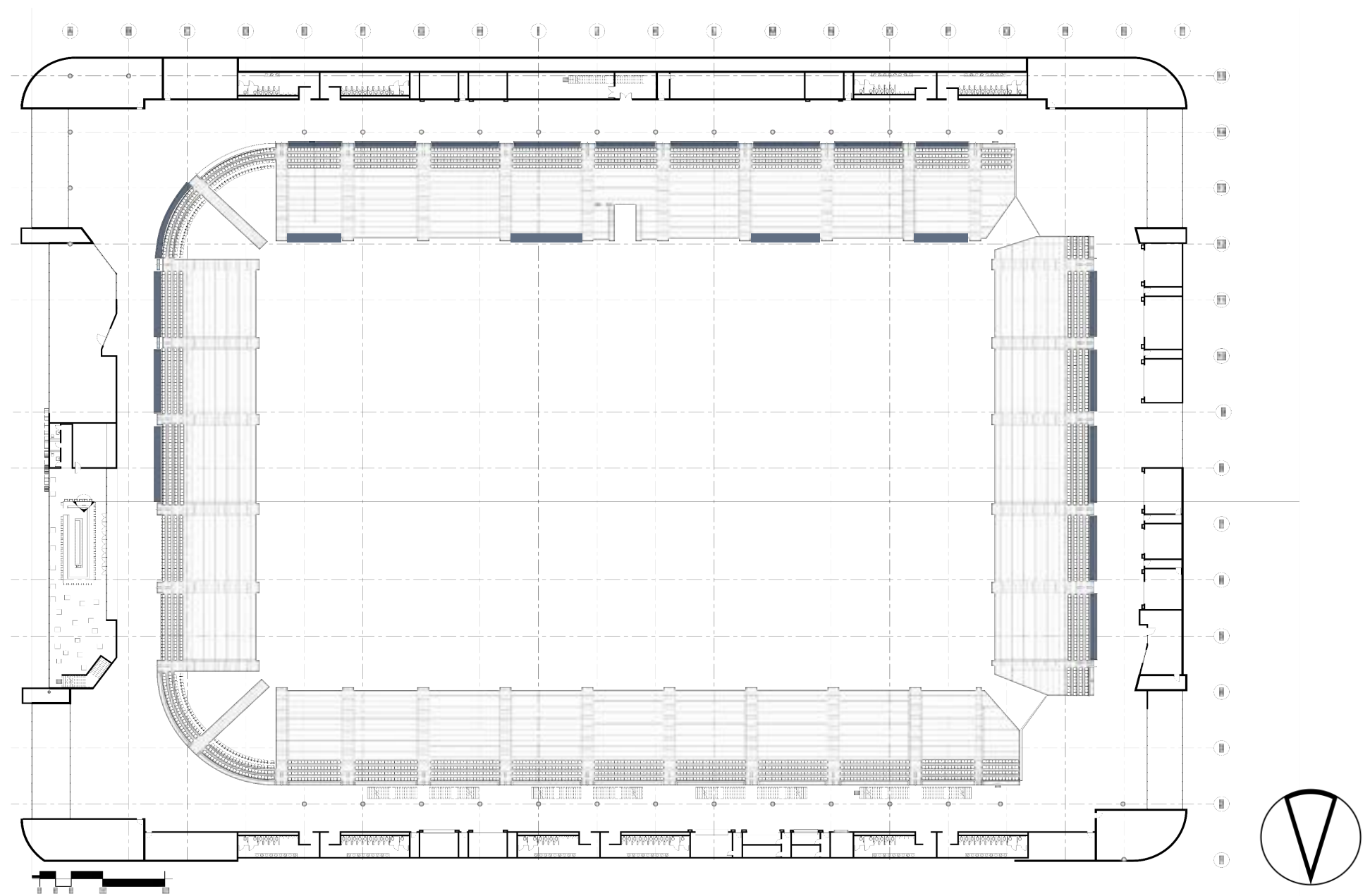
Concourse Floor plan

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Concourse Floor plan

1. Stadium Entrances
2. Concession Stands
3. Information Office
4. Stadium Brewery
5. VIP Entrance
6. Team Store
7. Public Restroom
8. Accessibility Seating



Underground Floor plan

1. Team locker rooms
2. Medical room
3. Doping room
4. Match official's room
5. Ballboy room
6. Media break room
7. Break out space
8. Underground parking
9. Water cistern room
10. Storage space
11. Office spaces
12. Interview room
13. Mechanical space
14. Workout room

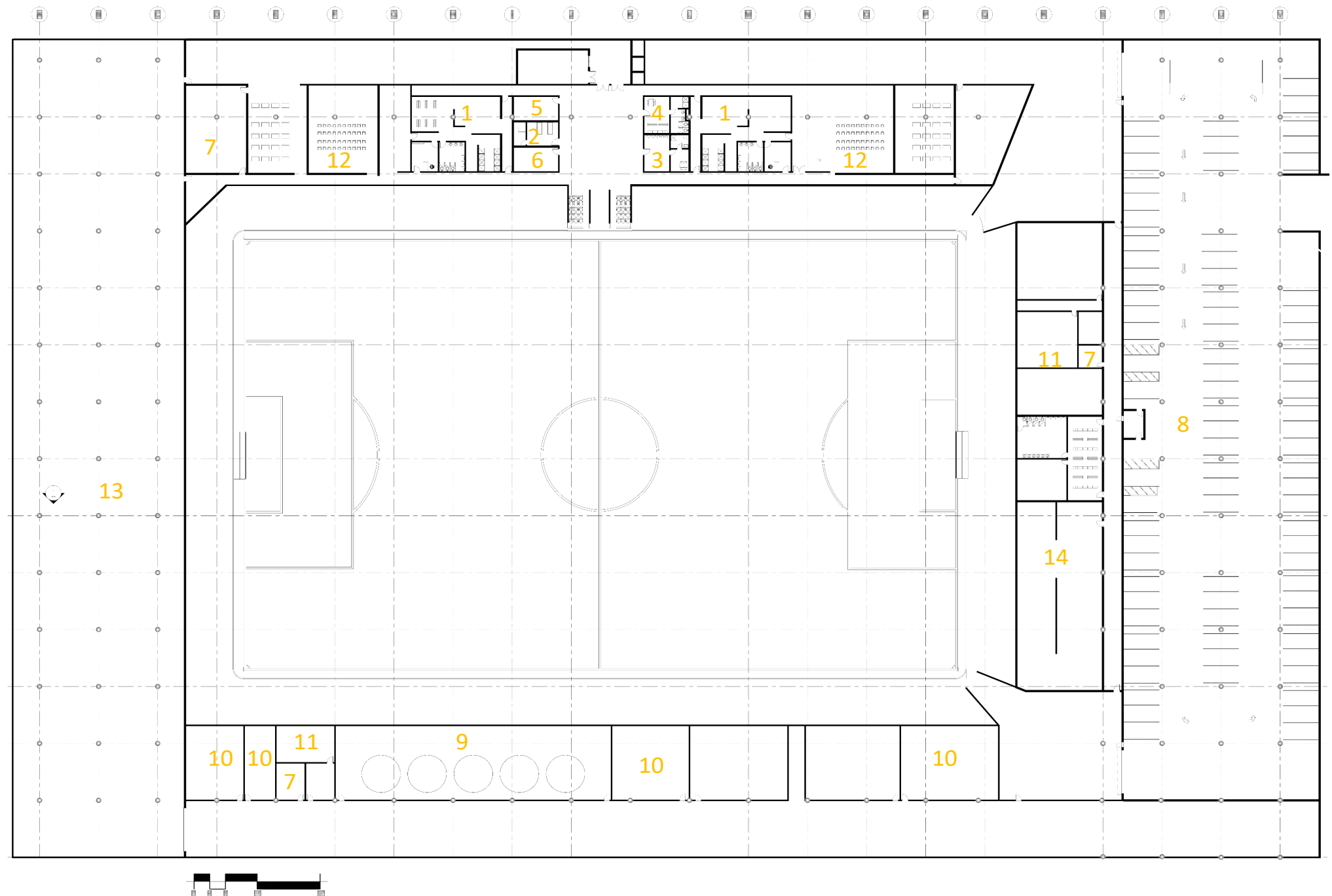


Figure 105

DIGITAL PRESENTATION

THESIS PRESENTATION

RE-IMAGING SOCCER STADIUM DESIGN

**CREATING A NEW STANDARD OF
COMMUNITY AND CULTURAL INCLUSION**

A 3D rendering of a puzzle with one red piece standing out among many white pieces. The red piece is in the center-right of the frame, and the white pieces are scattered around it, some overlapping and some not. The lighting is soft, creating subtle shadows and highlights on the pieces.

THESIS QUESTION

How can the design and construction of a soccer stadium in the Iron District of downtown Milwaukee be an approach to maximize accessibility, sustainability, and potential community benefits?

THESIS ABSTRACT



Changing how we see what stadiums stand for and how we design them.



Thesis Proposal: Soccer stadium in The Iron District of Milwaukee, WI



THESIS NARRATIVE



**CONTEXTUAL
INFORMATION**



RESEARCH



LOCATION



SOLUTION



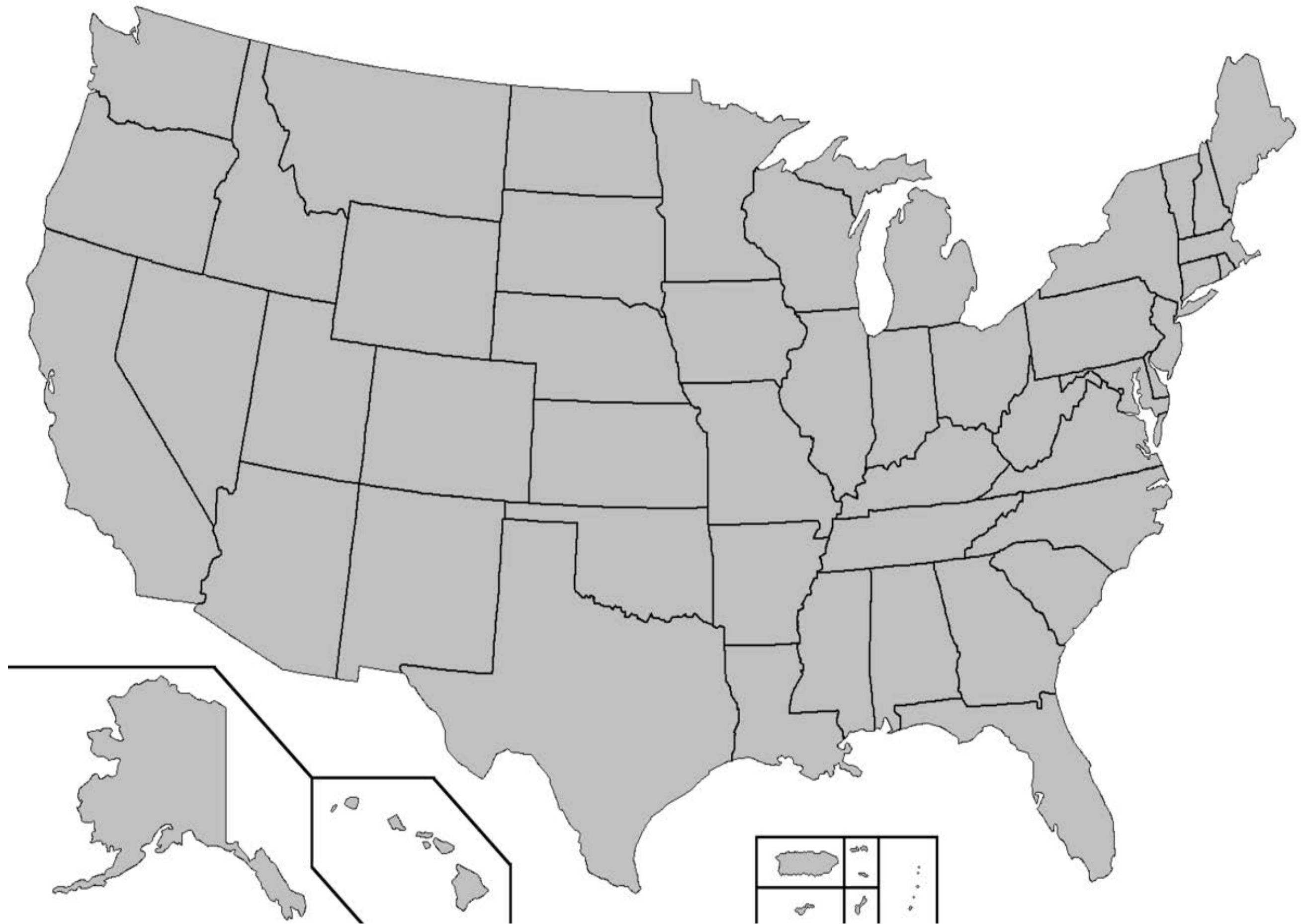
HISTORY OF SOCCER



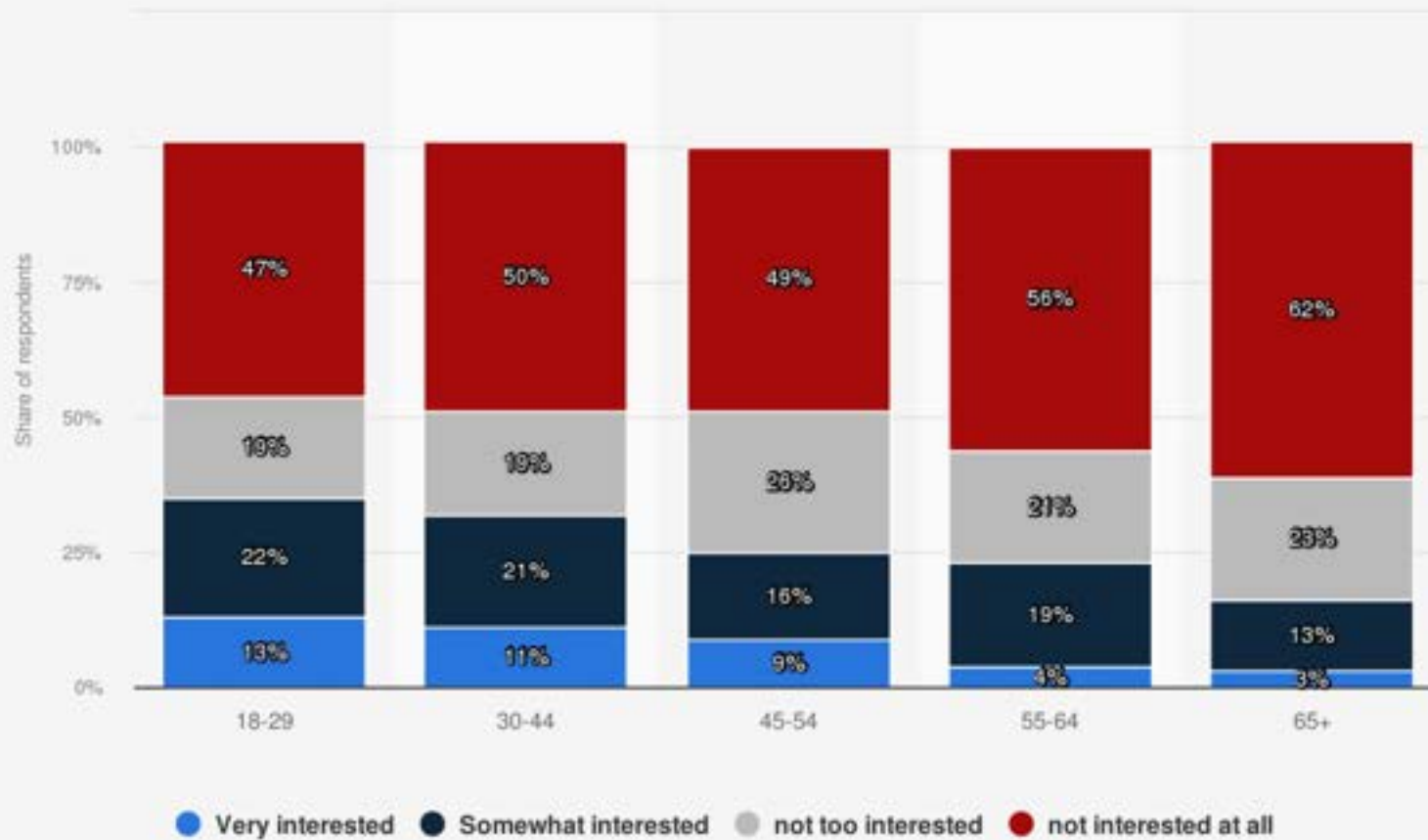




NO TO RACISM NO TO RACISM NO TO RACISM NO TO RACISM NO TO RACISM NO TO RACISM 85



Level of interest in soccer in the United States as of January 2020, by age

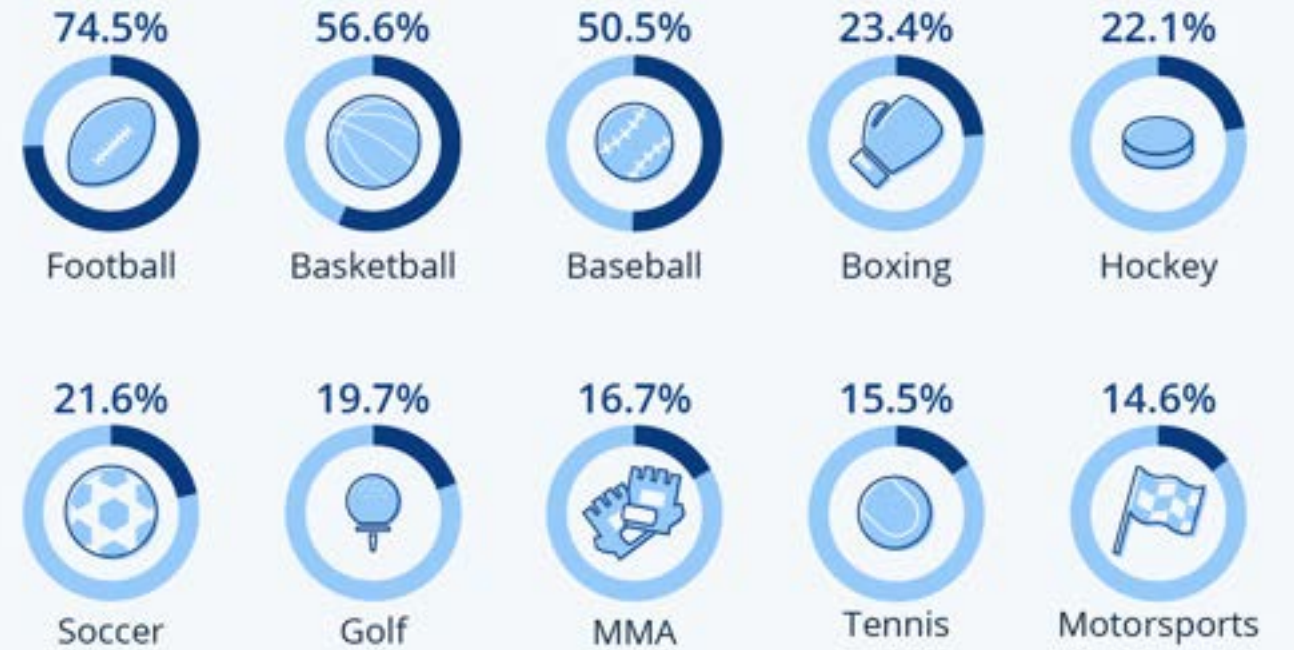


Source
Morning Consult
© Statista 2022

Additional Information:
Morning Consult; January 17-19, 2020; 2,200 respondents; 18 years and older; Online survey

Which Sports Do Americans Follow?

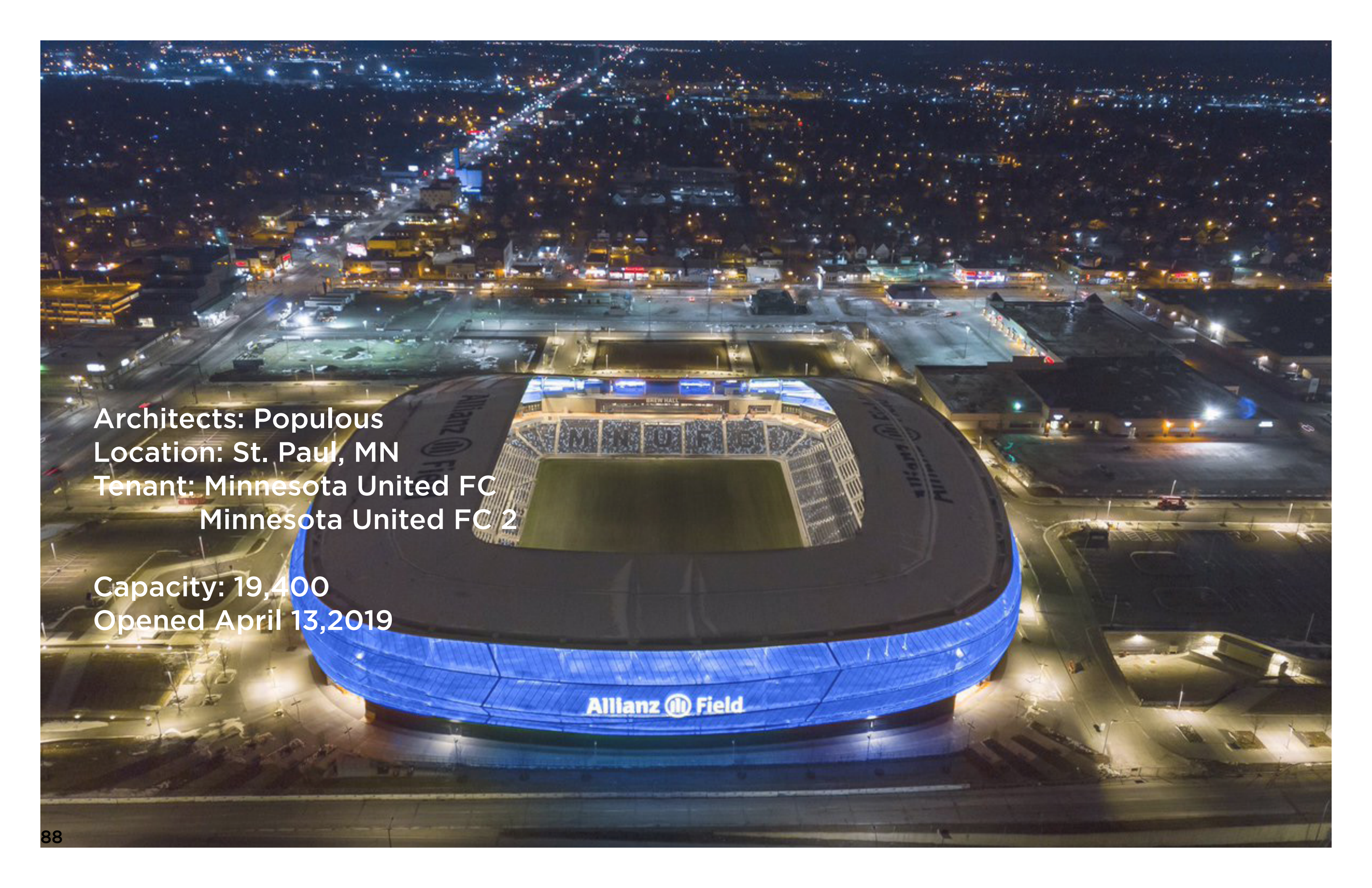
Share of U.S. sports fans saying they follow these professional sports



7,962 U.S. adults who follow sports surveyed between Jul 2021 and Jun 2022
Source: Statista Global Consumer Survey



statista



Architects: Populous
Location: St. Paul, MN
Tenant: Minnesota United FC
Minnesota United FC 2

Capacity: 19,400
Opened April 13, 2019

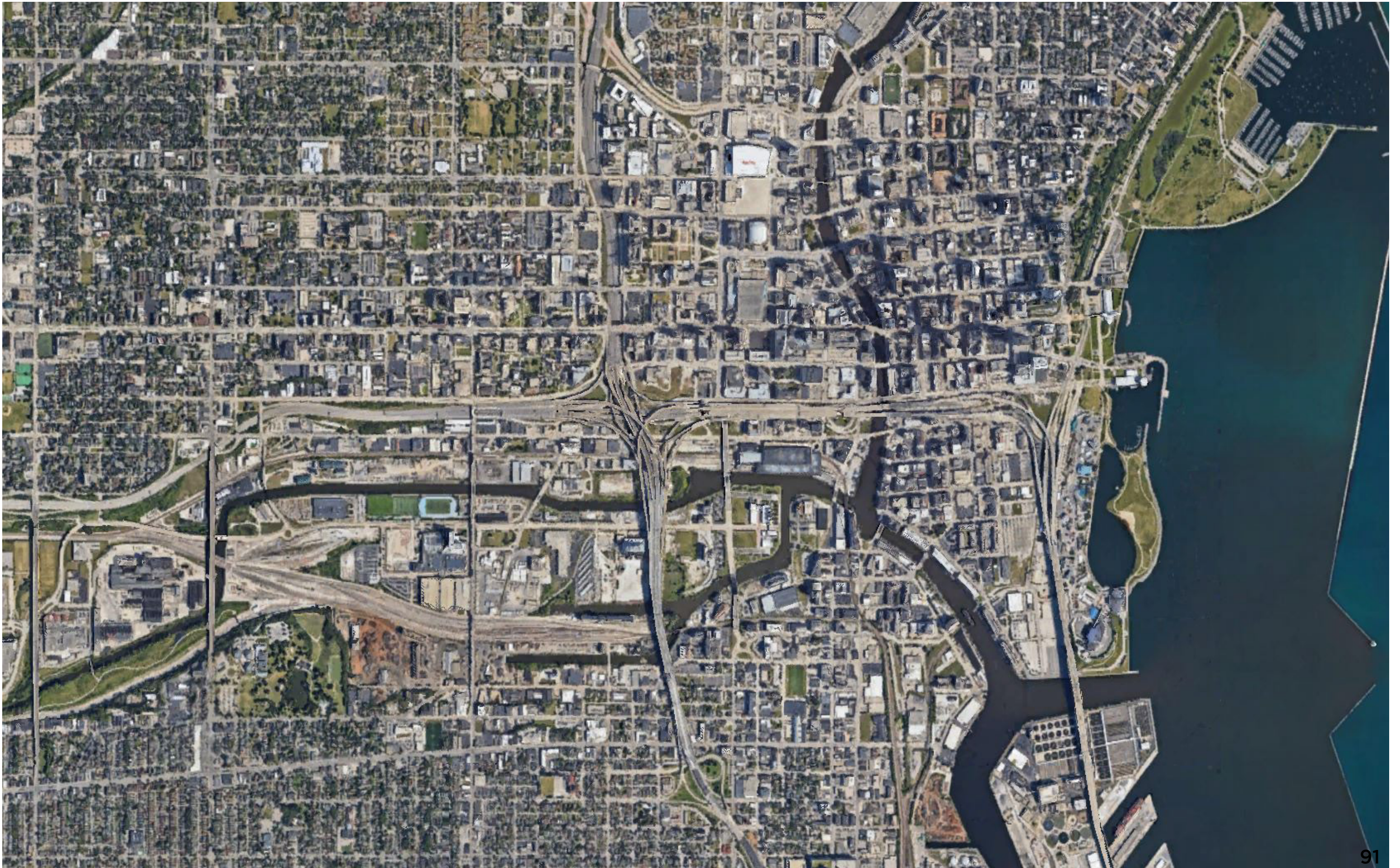
Allianz  Field

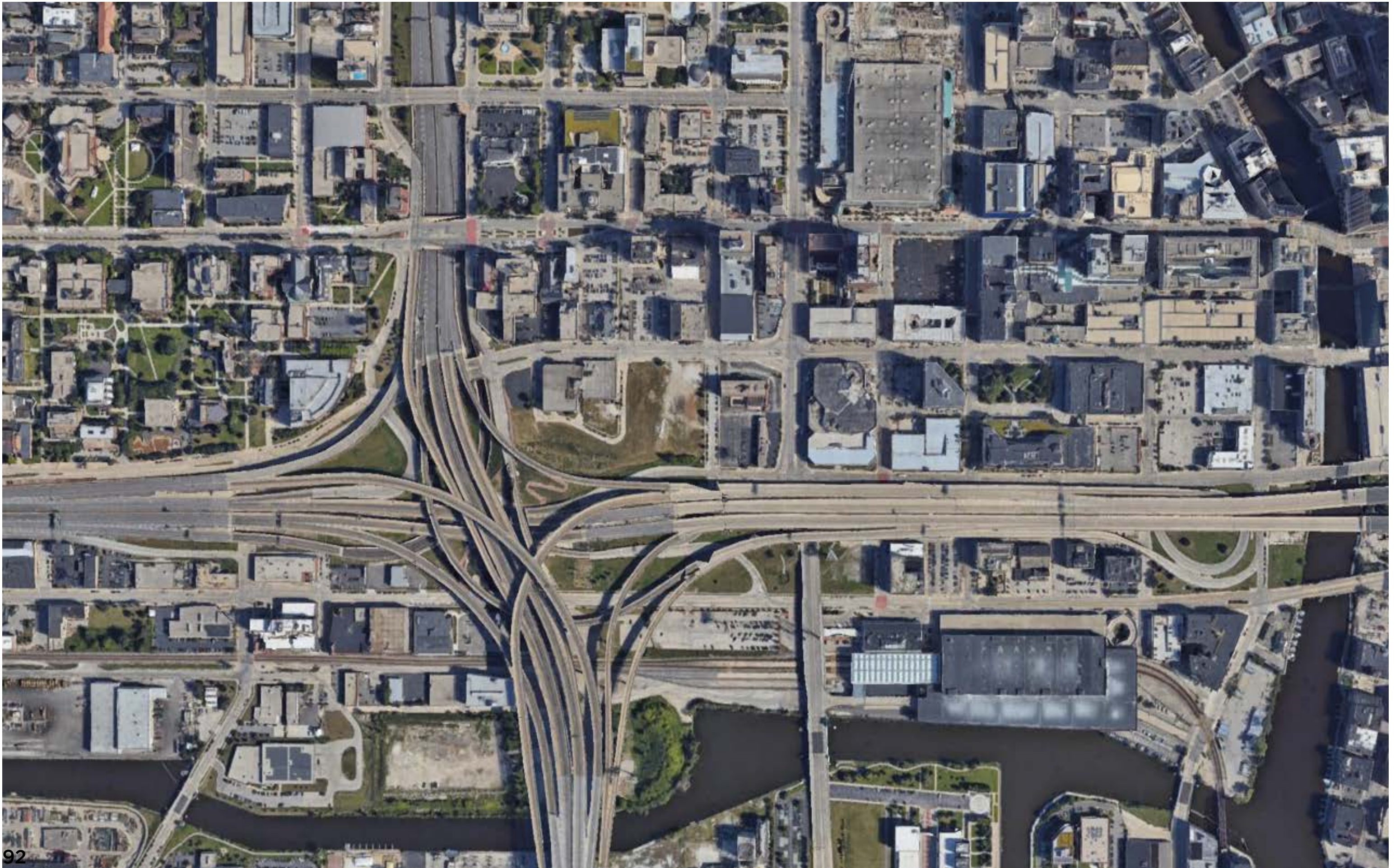


Architects: Populous
Location: Kansas City, Kansas
Tenant: Sporting Kansas City
Sporting Kansas City II

Capacity: 18,467
Opened June 9, 2011







The Iron District

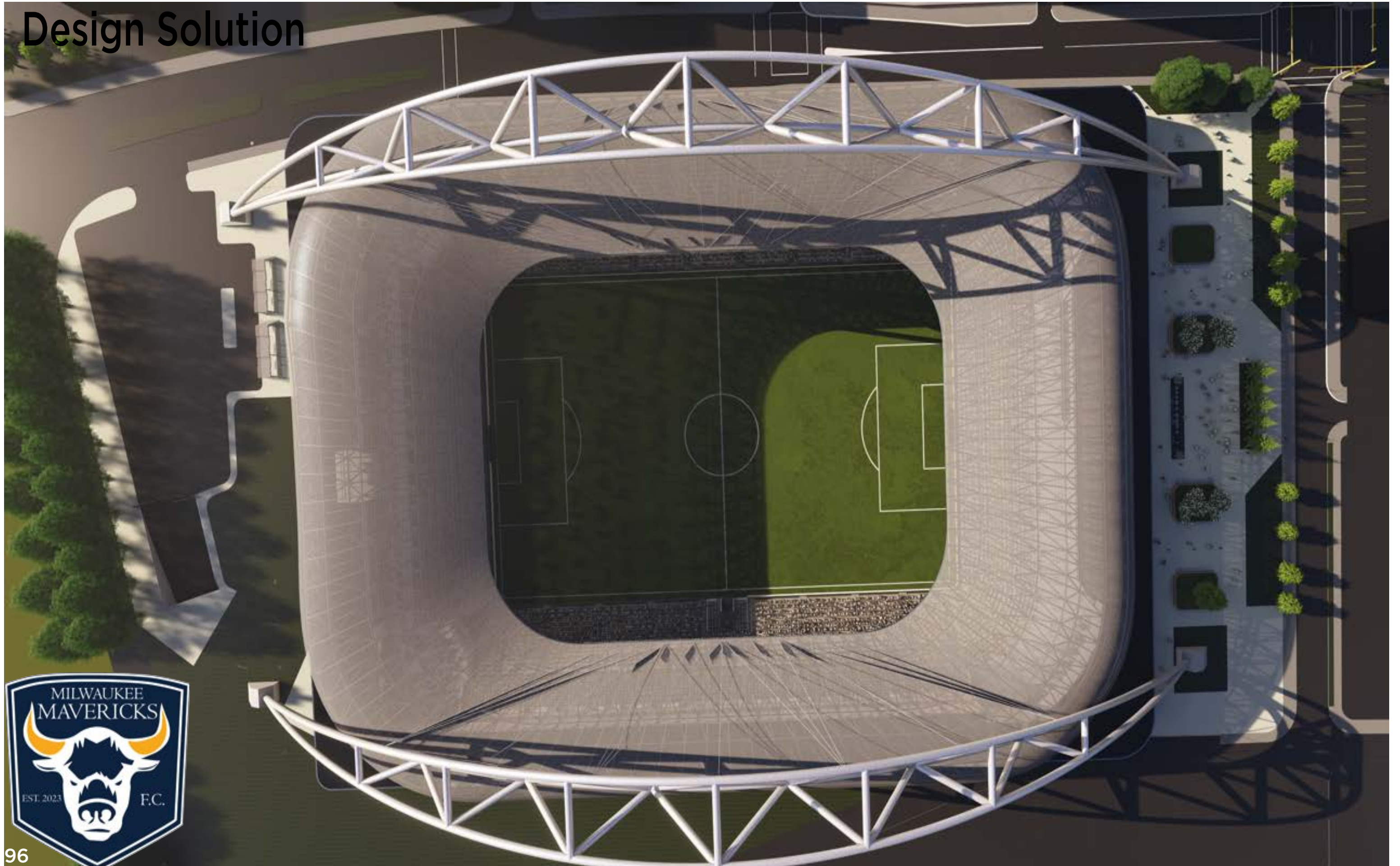




Design Solution

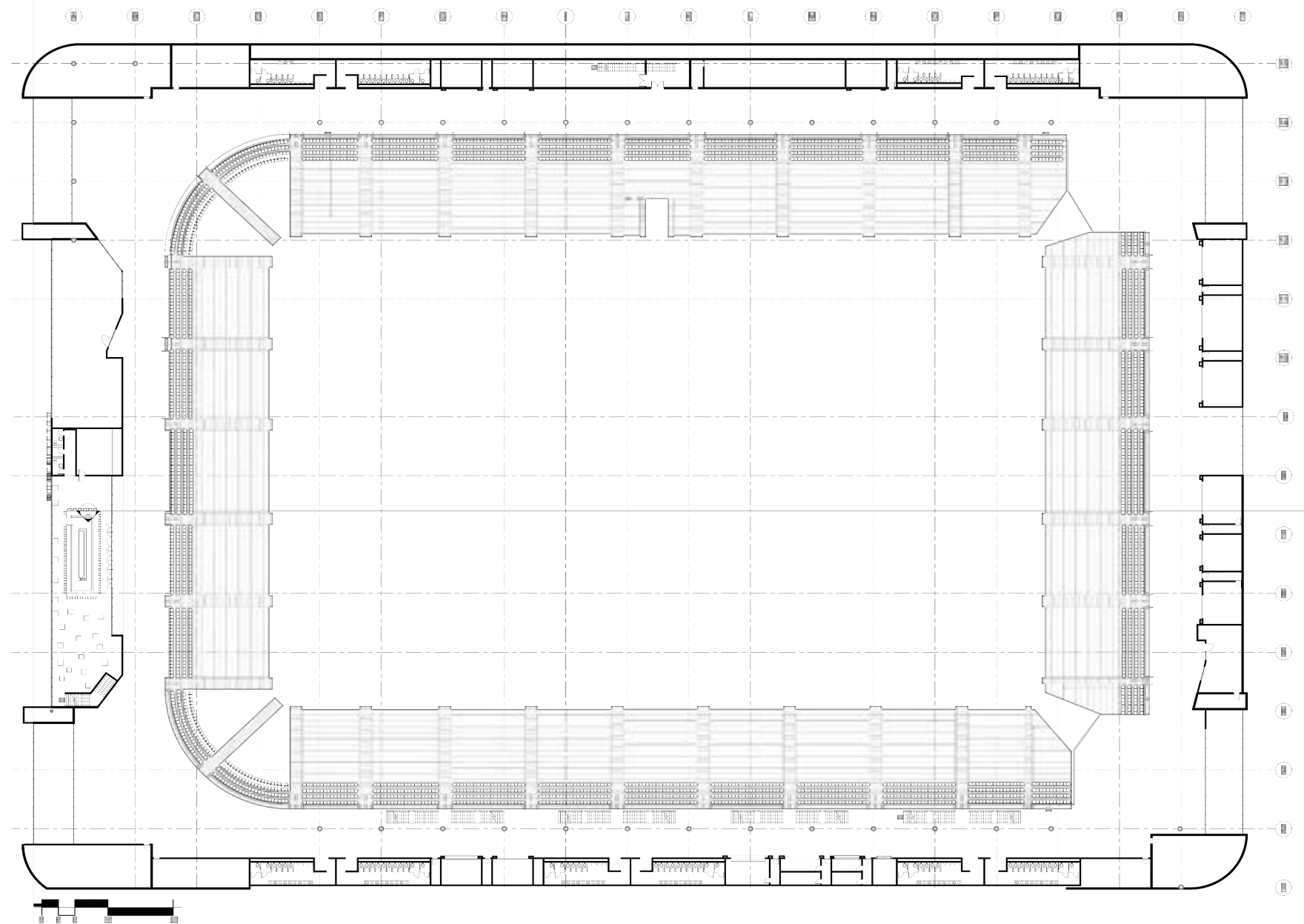


Design Solution



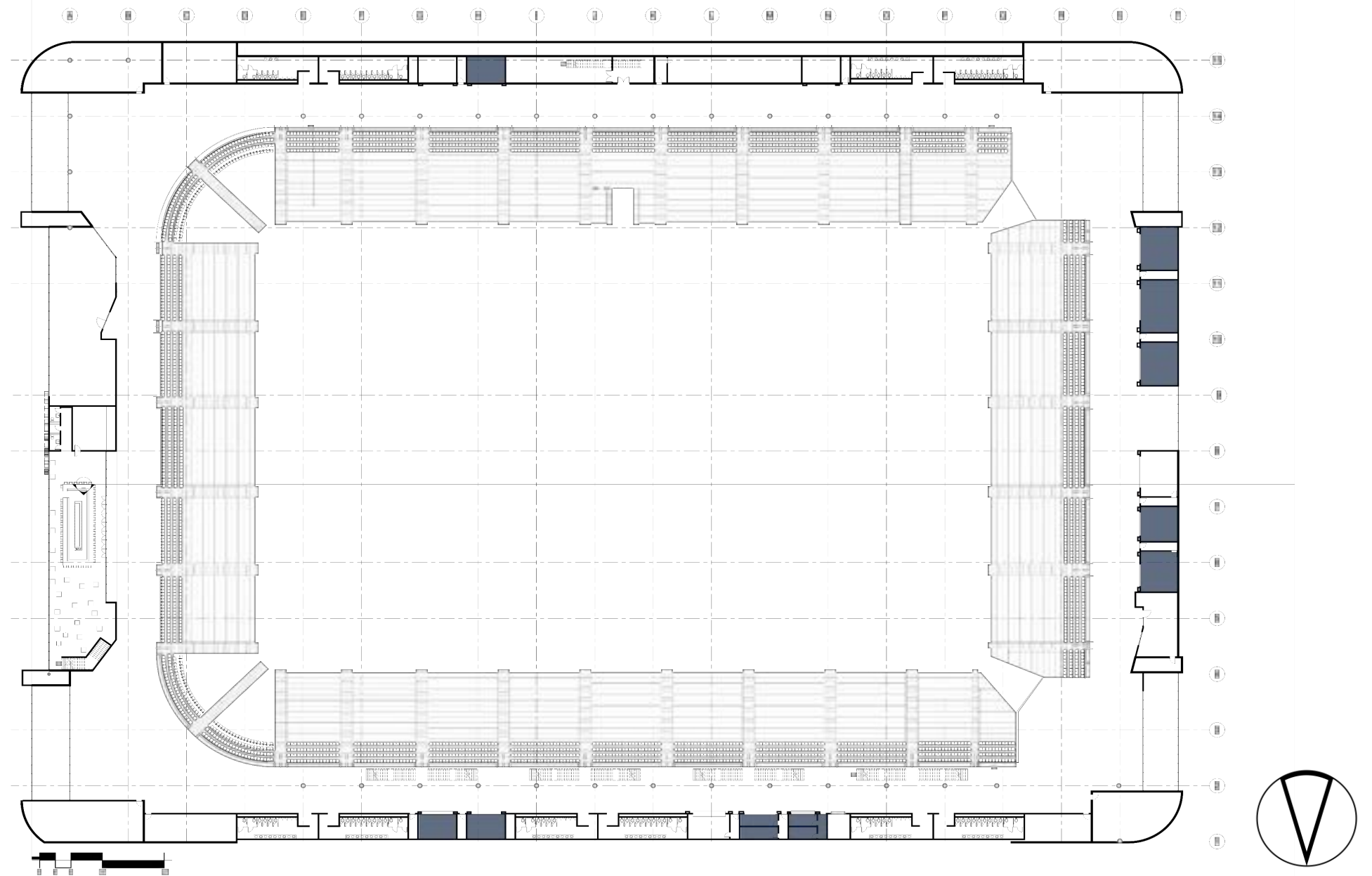
Concourse Floor plan

1. Stadium Entrances
2. Concession Stands
3. Information Office
4. Stadium Brewery
5. VIP Entrance
6. Team Store
7. Public Restroom
8. Accessibility Seating



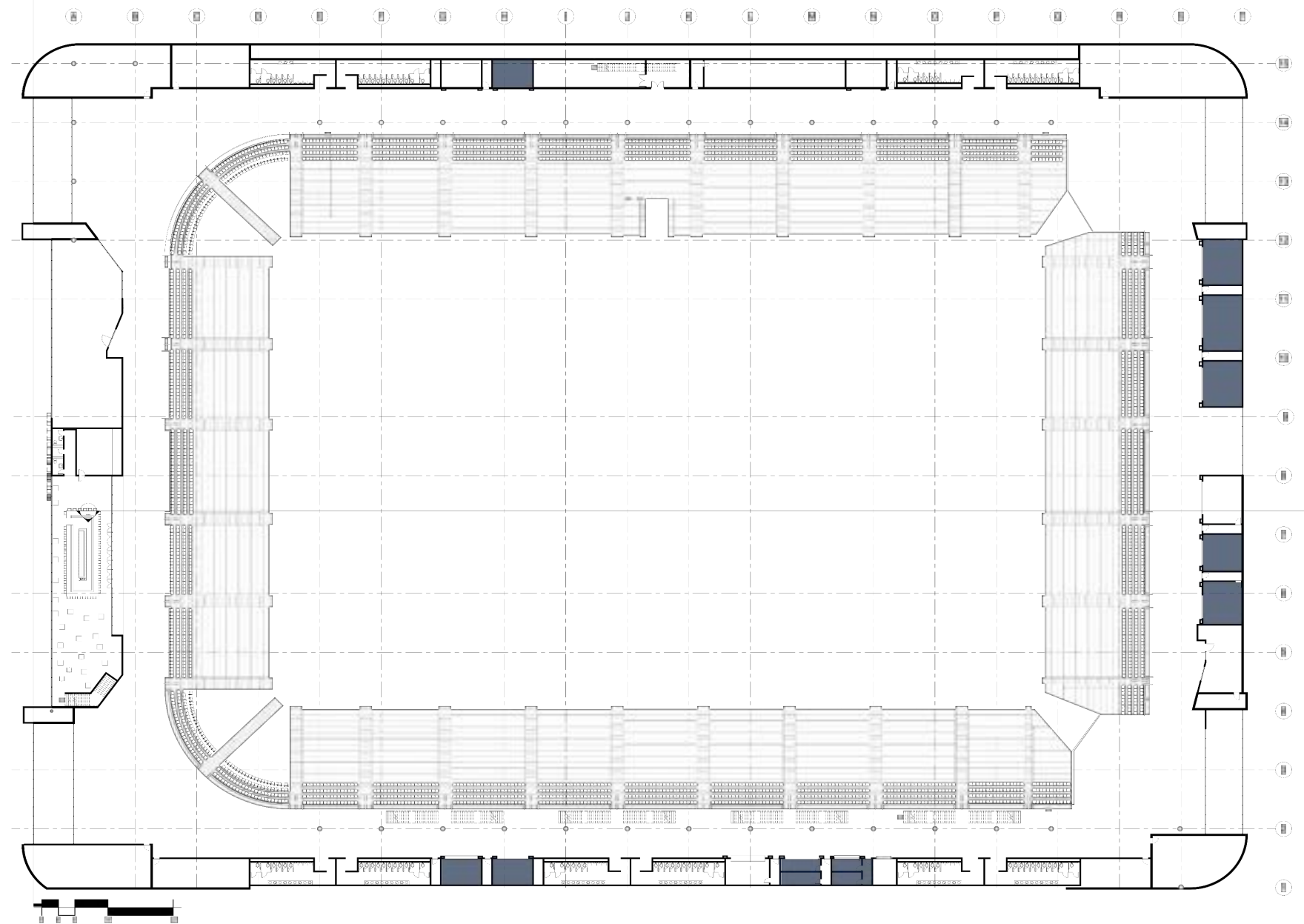
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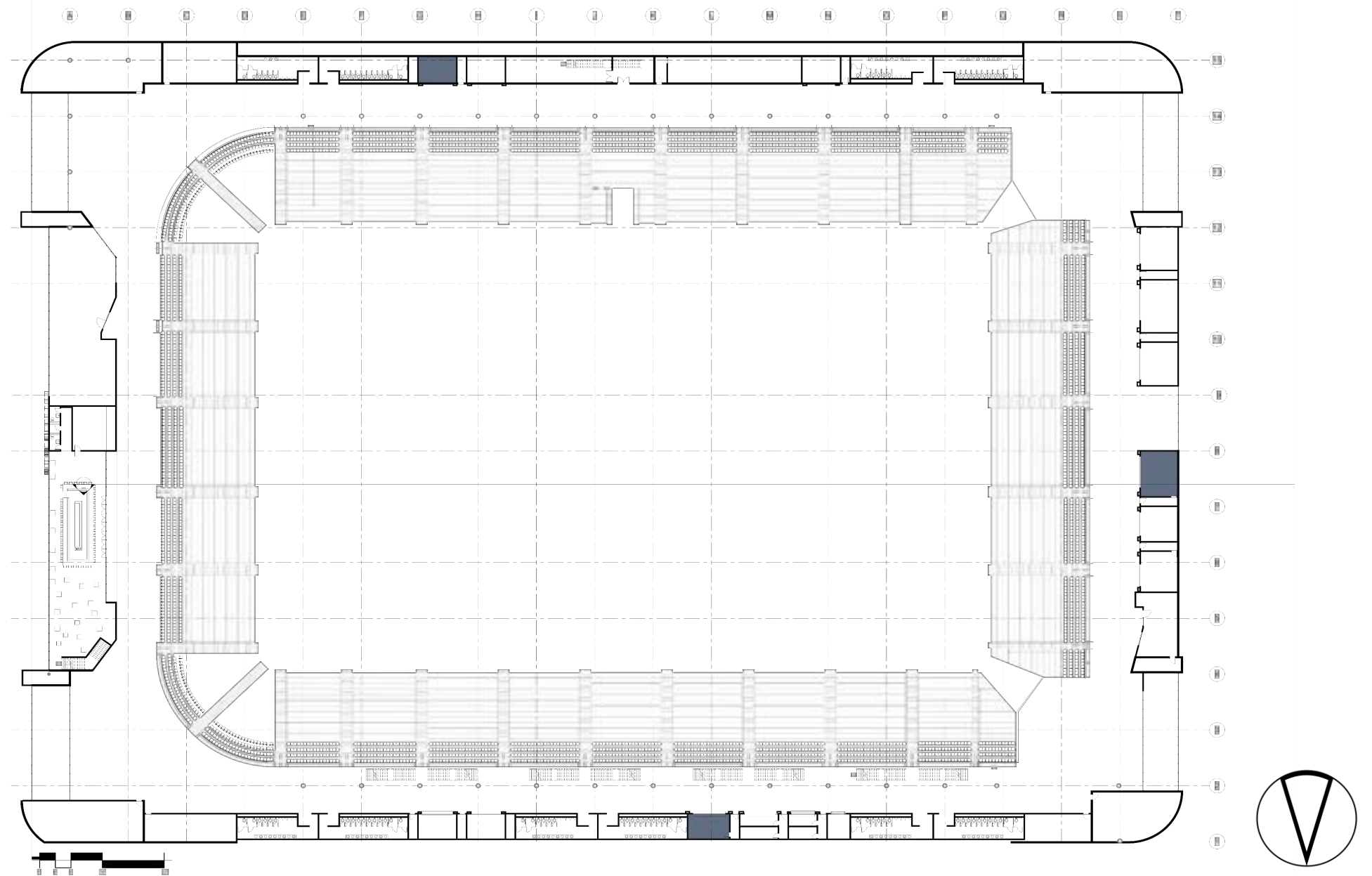
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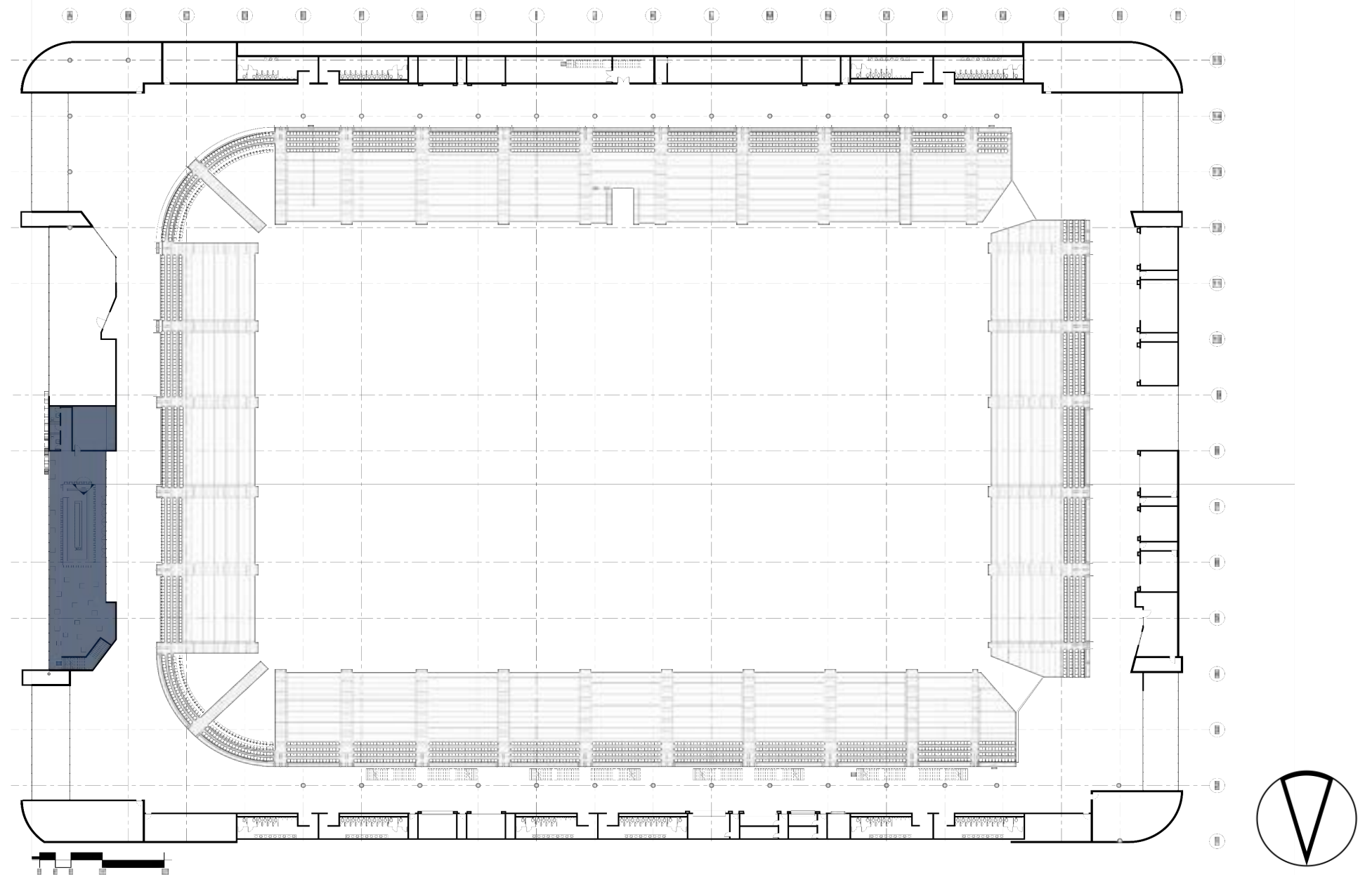
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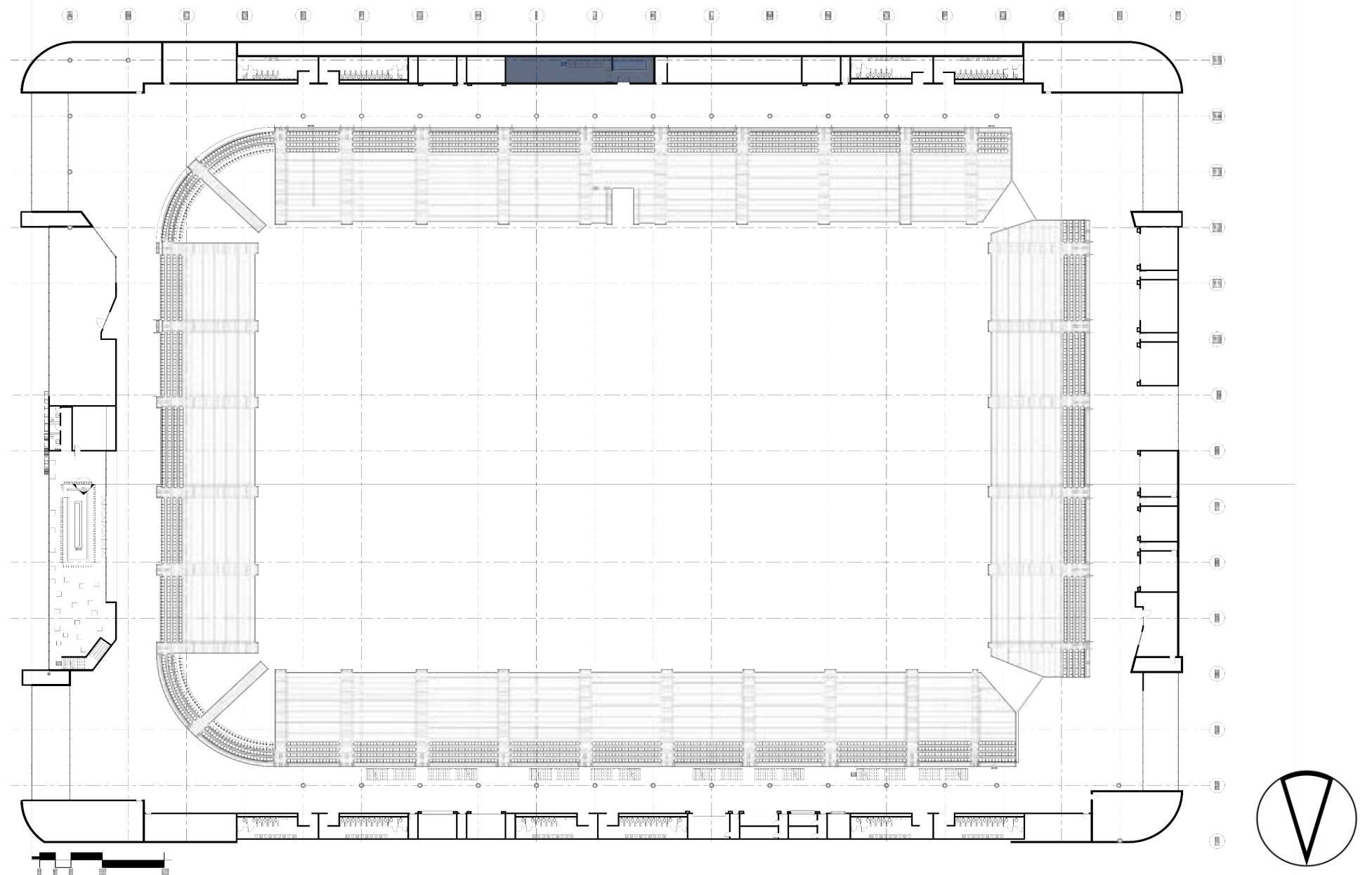
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8. Accessibility Seating



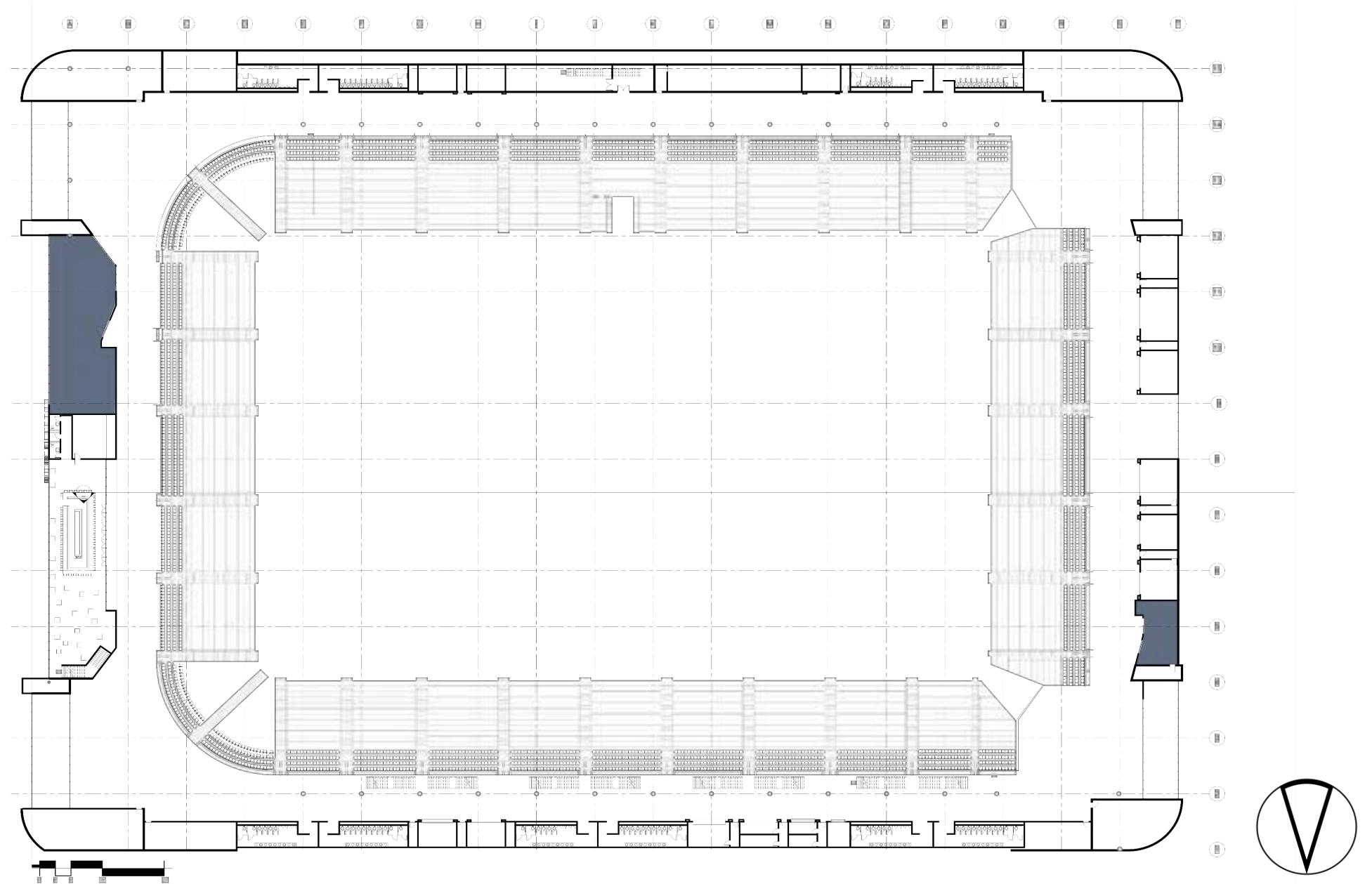
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3. Information Office
4. Stadium Brewery
5. **VIP Entrance**
6. Team Store
7. Public Restroom
8. Accessibility Seating



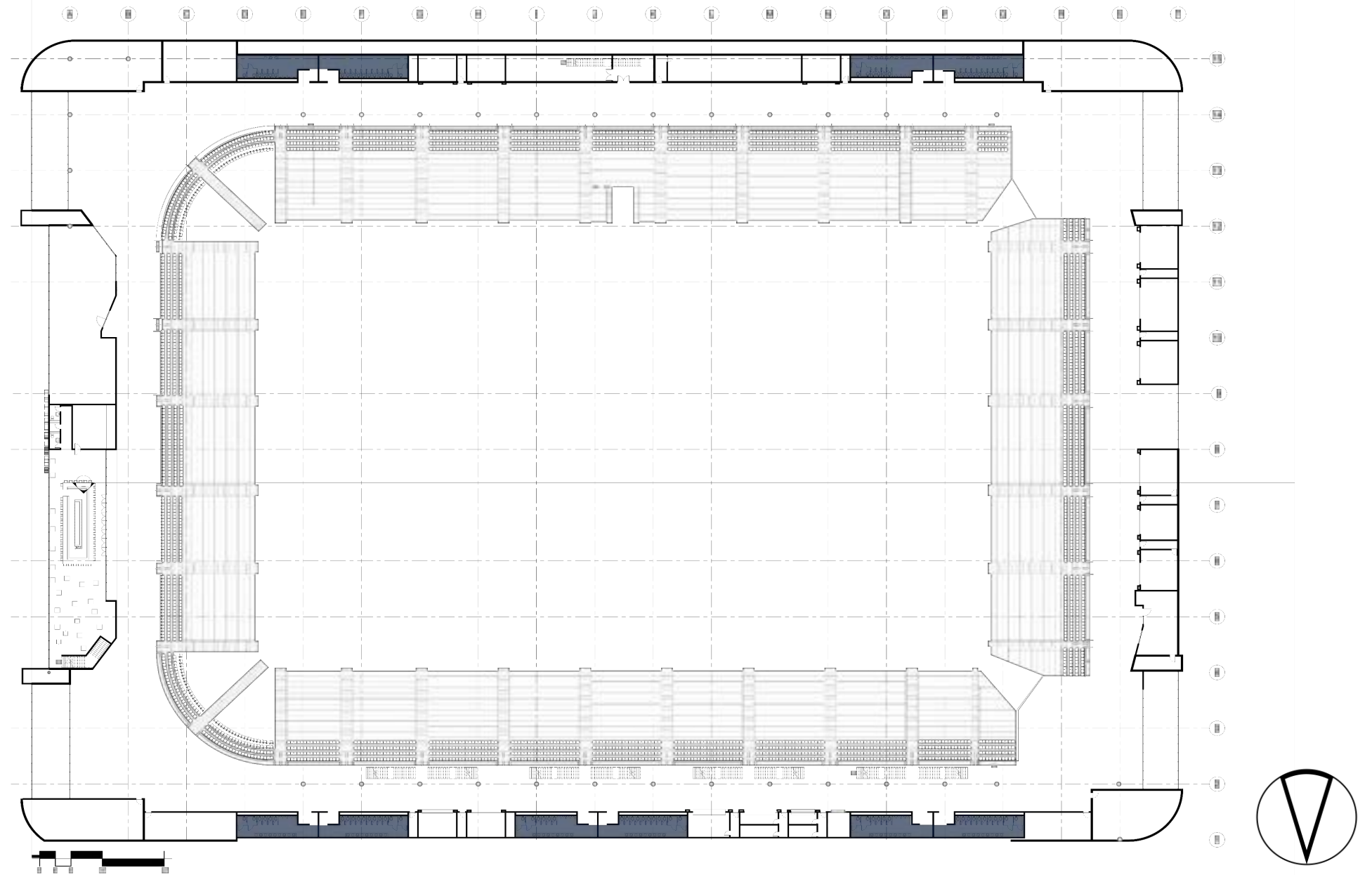
Concourse Floor plan

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5. VIP Entrance
6. Team Store
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8. Accessibility Seating



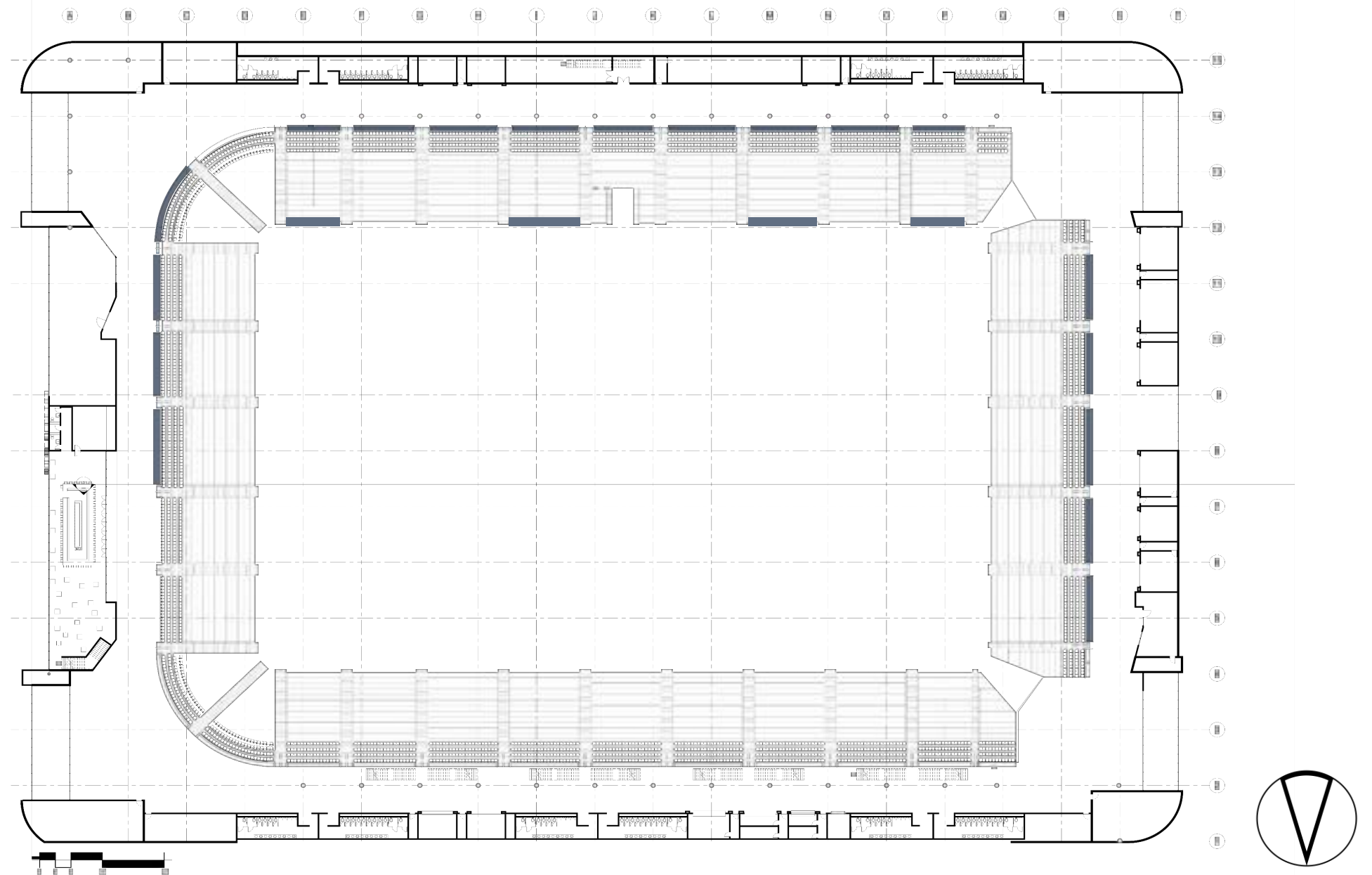
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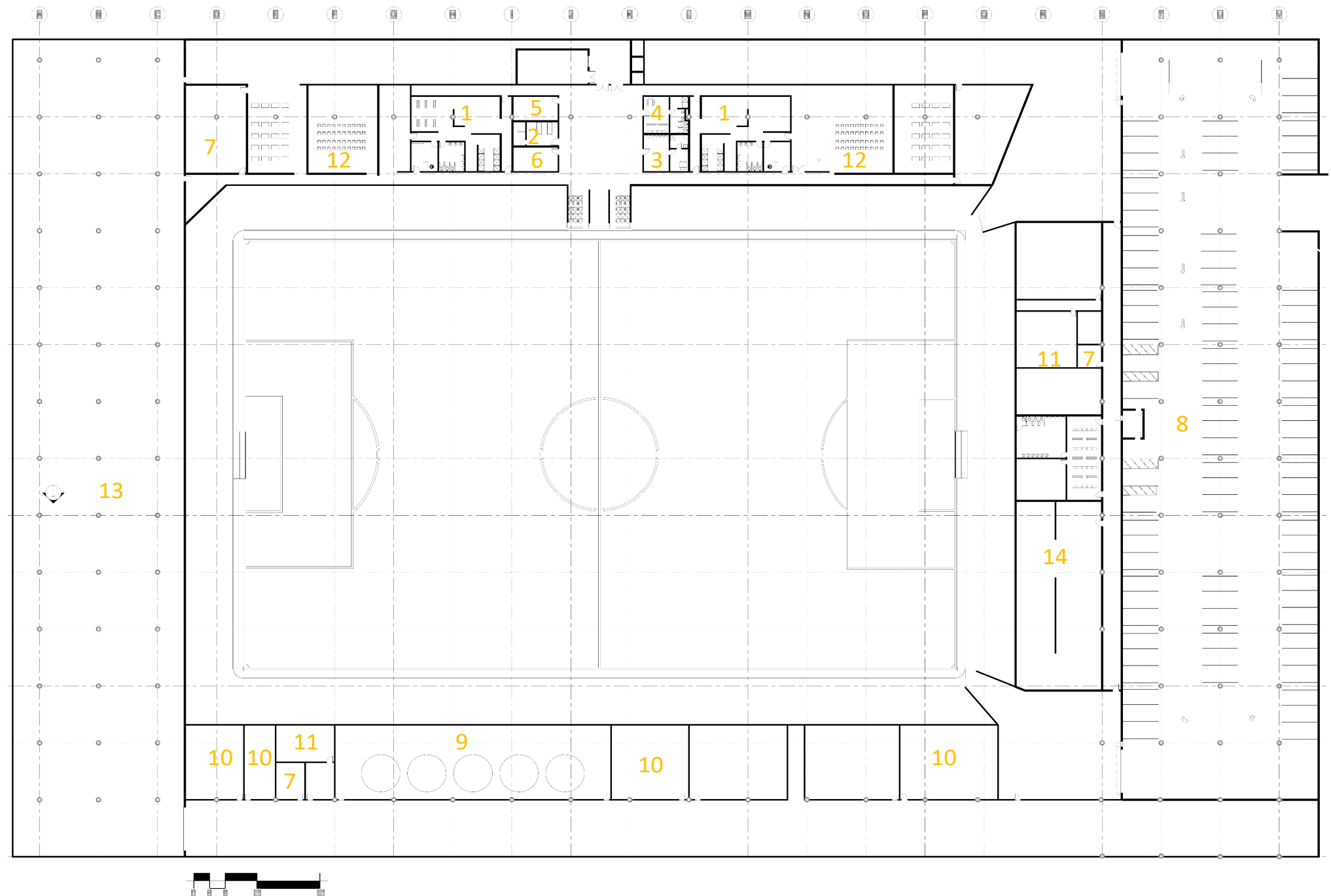
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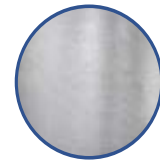


Underground Floor plan

1. Team locker rooms
2. Medical room
3. Doping room
4. Match official's room
5. Ballboy room
6. Media break room
7. Break out space
8. Underground parking
9. Water cistern room
10. Storage space
11. Office spaces
12. Interview room
13. Mechanical space
14. Workout room

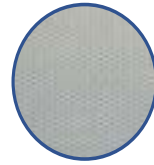


MATERIALS



WELDOX 1100

POLYTETRAFLUOROETHYLENE



SPACE TRUSSES

KENTUCKY BLUEGRASS



RECLAIMED WOOD













FINAL BOARD DISPLAYED



THE APPENDIX

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Studio Experience:

1st Year Studio

Fall 2018

Jason Moore
- Jobson House

Spring 2019

Heather Fischer
- Continual Delay | metaphor on delaying art

2nd Year Studio

Fall 2019

Milton Yergens
- Boat House

Spring 2020

Emily Guo
- Crisis Center

3rd Year Studio

Fall 2020

Bakr Aly Ahmed
- Olympic Resort

Spring 2021

Paul Gleye
- Dan Lance Project

4th Year Studio

Fall 2021

Cindy Urness
- Capstone High-rise

Spring 2022

David Crutchfield
- Affordable Housing

5th Year Studio

Fall 2022

Ronald Ramsay
- Re-imagining Stadium Design | Thesis Project