DESIGNING FOR COMM[UNITY] EM[POWER]MENT:

A sustainable multi-purpose sports facility for social and environmental impact.

2023

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A sustainable multi-purpose sports facility for social and environmental impact.

This document is submitted in partial fulfilment of the degree:
Master of Architecture (Professional) at the University of the Witwatersrand, Johannesburg, South Africa, October 2024.

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Plagiarism Declaration

I, **Mvelo Buthelezi - 1667817** am a student registered for the course Master of Architecture (Professional) in the year 2024. I hereby declare the following:

I am aware that plagiarism (i.e the use of someone else's work without permission and/or without acknowledging the original sources) is wrong. I confirm that the work submitted for assessment is my own unaided work except where I have stated explicitly otherwise. I have followed the required conventions in referencing thoughts, ideas, and visual materials of others. I understand that the University of Witwatersrand may take disciplinary action against me if there is a belief that this is not my unaided work or that I have failed to acknowledge the sources of the ideas or words in my own work.

Mvelo Buthelezi
28 October 2024

ACKNOWLEGEMENT

Firstly, before any personal acknowledgement, I would like to thank God, for giving me the ability and knowledge to pursue this master dissertation, without him I would never be in the position to achieve an honor like this, and I always must give him thanks for putting specific individuals in my life that have assisted me immensely in my architecture journey. I wish to register my profuse gratitude to all the people who contributed, in many various ways, to my success.

It would be an infringement of obligation if I did not express sincere appreciation to my supervisor, Mr Garret Gantner. Having had him as my lecturer twice in my undergrad I can easily say he is the one lecturer I have learnt the most from. I was able to produce high-quality work thanks to his invaluable academic support and comments due to his professionalism and efficiency. His ability to be relatable to various students is impeccable and most importantly his ability to motivate and comfort in the same breath is second to none. His guidance and the discussion we've had over the past couple of months assisted in me being able to produce work at a high quality which has helped me further understand my topic and the way I approach architecture. I will forever be grateful.

I would love to give thanks to my friends and classmates who have helped me survive this degree thus far. I would like to thank David Pillay, Liam Wilson and Morena Malakoana, who made significant contributions in terms of advice and support during the process. I remain deeply beholden to all my friends.

I am eternally grateful to my family, my parents, my sister, and my friendship group for always making time for me and providing much needed inspiration through difficult times. They did, in fact, serve as an incentive. I congratulate them on their incredible selflessness. I finish off this acknowledgement with a quote that I have lived by, and which has continued to motivate me through these tough times.

"I am motivated by the fear of being average and therefore I will always strive for greatness, because when greatness becomes tradition, excellence has no limits"
Mvelo Buthelezi

Thank you.

CONTENTS

Fig 0: (HPP architekten, SAIC Motor Pudong Arena 2021)

ABSTRACT

This master's thesis focuses on the critical need for sports infrastructure in Africa, particularly in underdeveloped regions such as Alexandra Township. Sports are hindered by inadequate infrastructure and neglect, limiting potential for social and economic progress on the continent. This thesis attempts to create a multi-purpose sports complex in Alexandra Township that encourages community engagement, social empowerment, and environmental sustainability while also meeting immediate infrastructure demands.

The primary goal of this thesis is to construct a sports facility that can accommodate people of all ages and ability levels, fostering an active lifestyle and improving physical and mental well-being. The planned sports complex integrates adaptable architecture, including flexible and modular features to meet changing demands.These adaptable modules are intended for application in a variety of communities across the country, maintaining the facility's long-term usefulness. Beyond typical sporting activities, the stadium will incorporate mixed-use facilities with amenities such as educational rooms, leisure spaces, cafés, retail sections, and green spaces. An agriculture facility will also aid to cheap distribution of fresh goods throughout the neighborhood. Waste management solutions will help to make the environment cleaner and healthier.

To summarize, the goal of this architectural master's thesis is to design an adaptable, community-centered sports facility near Alexandra Township that not only provides accessible and high-quality sports infrastructure but also promotes social cohesion, environmental stewardship, and personal development. The facility aims to catalyze positive change by blending adaptable architectural concepts and mixed-use areas, influencing other communities to promote sports, community participation, and environmental responsibility. We hope to create a pattern for future architectural endeavors in the region by contributing to the overall well-being and empowerment of residents in Alexandra Township through this thesis.

METHODOLOGY

The research questions are a breakdown of the thesis's significant topic, and by posing relevant problems that will be met during the design process, they help to identify the project's key themes. The questions are significant because they provide insight into the challenges that are now affecting South African sports facilities and provide suggestions for future improvements. The primary goal is to guarantee adaptability and design for inclusion because community engagement is crucial for the facility's success. The issue still exists: Can you create an adaptable multipurpose sports facility that promotes sustainability through community incentives that ensure sports development and economic viability?

I. What design features of facilities are key components to meet the physical activity, recreation, and basic needs for people of community?

II. What challenges and successes are encountered when building multi-purpose community-based sports facilities?

III. What are the steps taken to create the vision of multi-purpose community based adaptive sports facility become a reality?

IV. Can adaptive architecture be used to reimagine the existing infrastructure of recreational and active spaces?

Methodology Breakdown

The methodology of the research report is structured in a way that is qualitative and comparative. By gathering various sources of research, you start to break down the effects history had on the growth of sports in the country, and you get to see the many missed opportunities to rectify these issues. Through gathering this data, you get exposed to the potential of a project of this magnitude but what is also highlighted are the barriers that need to be broken to ensure this intervention achieves its intended goal. Through international comparison, there are different ways to address this issue but not a lot have been successfully implemented in South Africa.

o Literature Review: I have conducted an extensive review of relevant literature, scholarly articles, books, and research papers on sports architecture, history of site with its context and various design concepts to inform community and adaptability. This has provided a comprehensive understanding of the historical development, current trends, and prospects of sports architecture.

o Case Studies: I have selected and analyzed multiple case studies of sports facilities, both past and present, to examine the evolution of sports architecture. Compare studies of project found in South Africa vs interventions all over the world. Evaluate the design concepts, architectural elements, and technological advancements employed in each case. Compared and contrasted different approaches to highlight the changes and innovations over time.

o Comparative Analysis: Compared sports facilities from different eras or regions to identify commonalities, differences, and design principles that have evolved. Analyzed the architectural features, construction techniques, materials used, and the impact on the fan experience and athletes' performance. Considered factors such as size, seating arrangement, accessibility, and sustainability.

o Qualitative research: These are in-depth interviews, and observations, and were valuable to capturing rich and nuanced insights into sports architecture. Through interviews and focus groups, perspectives from architects, facility managers, athletes, and spectators can be gathered to understand their experiences and perceptions. Observations of sports facilities allow for the exploration of user behavior, social dynamics, and usage patterns. By employing qualitative research, a deeper understanding of the subjective aspects of sports architecture can be achieved.

o Interviews: Semi-structured interviews were be followed by this research. This is defined as a meeting in which the interviewer loosely follows a formalized list of questions, and the rest of the questions will be influenced by the interviewee responses. Professional athletes were interviewed to be asked about their respective experiences of the lack of sports infrastructure in their upbring and asked for their opinion on how the future of developing sports in the city looks like for them. Various facility sports managers were selected to give different perspectives on the management of their sports facilities. In addition, sports facilitators such as gym owners or coaches were interviewed to assess perceptions on participation in sports and the need for it in the community respectively. These will be chosen at random from the facilities that exist in the city.

o Process Research: In the process of conducting this research, various methodologies have been used, including literature review, case studies, and interviews. While these traditional research methods provide valuable insights and context, a significant aspect of this study involves an innovative approach towards adaptability. This original research component revolves around the creation and exploration of adaptable design elements that may draw inspiration from existing precedents but also necessitate novel conceptualizations. The synthesis of adaptability as a focal point underscores the novelty of this research endeavor. From this process the various case studies explored will each have parameters that can be isolated and used to influence the design development which in the end will create a complete solution to an adaptive outlook to sports architecture.

Ethical Consideration:

The research report which included human participants was an integral aspect of this exploration endeavor, pivotal for gaining a comprehensive understanding of the material issues. Considering this, a deliberate and careful approach was consummate when involving individuals, with a loyal commitment to securing their privacy, rights, and quality.
This section therefore delves into an exploration of the ethical complications that surfaced during the study:

Informed Consent: This research involved conducting interviews with professionals within various sports facilities

and professionals in the sporting world. The interviews will also look to gather information from local community members that utilize the facilities that are being studied. Informed consent addresses the fact that a person should knowingly, voluntarily, and clearly give their consent before participating in any interviews that will be put into the research.

Anonymity and confidentiality: The identity and anonymity of each participant is guaranteed as their names, or any identifying characteristics, will be left out of the research. This section entails managing private information to protect the identity of those involved allowing for the interviewee to feel comfortable sharing the opinion. The ability of an individual to determine the kind of information they choose to share and withhold will be respected, giving them the control to allow for specific information to be used to their discretion. Therefore, the researcher will not pursue any information that a subject regard as an invasion of privacy.

INTRODUCTION

The need for sports facilities in Africa, particularly in areas like Alexandra Township, has been identified as a critical and urgent issue by various stakeholders, including government agencies, international investors, sports organizations, and local communities. (Mthombeni, 2023) The lack of adequate infrastructure and poorly maintained sports facilities pose significant barriers to the development of sports in the continent, hindering the growth and potential of talented athletes and limiting opportunities for social and economic mobility. "Sport continues to be short-changed in terms of resource allocation due to a lack of knowledge among decision-makers of its role in society as well as its potential as an instrument of transformation," said South Africa's sports minister. (Tshwete, 2009) As a result, there is an urgent need to solve these difficulties and provide accessible, high-quality sports facilities that can support individuals' hopes and desires in the community. While simultaneously catering to all the country's different communities. Through the provision of adaptable and modular features that can affect not just the designated location but also adjacent recreational places that lack suitable infrastructure.

This thesis aims to design a multi-purpose sports facility near Alexandra Township that not only addresses the immediate need for sports infrastructure but also promotes community involvement, social empowerment, and environmental sustainability. By creating a space that caters to a diverse range of sports activities, this facility will serve as a hub for talent development, recreational engagement, and provide innovative adaptable structures that promote mixed use modular components. It will provide opportunities for individuals of all ages and skill levels to participate, train, and excel in their chosen sports, fostering a culture of active living and promoting physical and mental well-being.

The proposed sports facility will embrace the concept of adaptive architecture, incorporating flexible and modular elements that can easily adapt and accommodate changing needs and future growth. These adaptable modules would be designed in a way that can allow for them to be implemented in various community around the continent by creating structures that can be implemented and edited in its given context. This adaptability will ensure that the facility remains relevant and functional as the community's needs evolve over time. Whether it be new sports activities, expanding events, or evolving community demands, the facility will have the capacity to adapt and accommodate, providing a sustainable and long-lasting infrastructure that meets the ever-changing requirements of the community.

Furthermore, the facility will feature mixed-use spaces that go beyond traditional sports functions, providing a range of amenities and services to enhance the overall user experience and cater to the diverse needs of the communities that surrounds the site. These mixed-use spaces will include educational areas for workshops and training programs, where individuals can learn and develop skills beyond their sporting abilities. By empowering the community with knowledge on topics such as nutrition, fitness, and sports management, these spaces will contribute to the holistic well-being and personal growth of individuals. Additionally, the sports facility will incorporate recreational and leisure spaces, such as cafés, retail areas, or green spaces, that serve as social gathering points, encouraging interaction and fostering a sense of community. The intervention will also include an agriculture building which will look to plant and produce fresh produce that can be sold to the community at an affordable rate given their involvement in the process.

These mixed-use spaces will provide individuals with opportunities to relax, socialize, and build connections, further enhancing the facility's role as a community-centered hub. The design of the sports facility will prioritize sustainability, integrating renewable energy sources, water conservation measures, and waste management strategies to minimize its environmental impact. By harnessing renewable energy and implementing efficient water usage practices, the facility will contribute to environmental conservation and serve as a model for responsible development. Waste management strategies will be implemented in the ecological barrier near rhe river to ensure the reduction, recycling, and proper disposal of waste, promoting a cleaner and healthier environment.

In conclusion, this architectural master's thesis seeks to design an adaptive, community-centered sports facility near Alexandra Township that not only provides accessible and high-quality sports infrastructure but also promotes social cohesion, environmental stewardship, and personal development. By integrating adaptive architecture principles and incorporating mixed-use spaces, the facility will serve as a catalyst for positive change, inspiring other communities to prioritize sports, community engagement, and environmental sustainability. Through this thesis, we aim to contribute to the overall well-being and empowerment of individuals in Alexandra Township and set an example for future architectural endeavors in the region.

Fig 1: Alexandra Densely Populated Township - (Harvey, Aerial view of the densely populated Alexandra township, Gauteng Province, South Africa 2019)

HISTORY OF SPORTS (South Africa)

Sports architecture was formerly not regarded to be necessary because sporting events could take place on a field or in a public courtyard. Early football games in England were known for taking place without specified dimensions and across the townscape. Nonetheless, sports architecture may be traced back to the oldest examples of architectural forms. In sports architecture, the rules of the game being played, and the simplest spatial dimensions required to begin that activity must already be established. "Sports architecture therefore emerges are the intersection of the codification of the rules of various games and means mode of design and construction."- (B, Flowers 2017). Nonetheless, the evolution of sports architecture traces its lineage far back into history, connecting to the earliest instances of constructed forms. This historical perspective emphasizes that even in old eras, the notion of sports and the spatial configurations within which they unfolded held significance. At the heart of sports architecture lies the obligation to orchestrate the rules governing each respective game, establishing a framework that delineates the permissible actions and interactions. Concurrently, there arises a necessity to ascertain the minimal spatial dimensions required for initiating and conducting the chosen sporting activity effectively.

"In the history of civilisations, the meaning of sport and its venues is a fundamental element of intellectual manifestation and representation that effectively reflects the importance the culture of sport and the cultivated management of leisure have had in the definition of the identity of peoples." - (Faroldi, 2020)

Sports architecture may be projected to evolve as an intricate relationship between the standardization of various game regulations and the art of architectural design and construction. The historical context of sports in South Africa holds special significance currently. The complex fabric of the nation's sports legacy, which is frequently linked with social tensions, reflects greater socioeconomic transformations. Notably, the apartheid era saw an enormous disparity in sports facilities, reflective of the nation's overall division.

Exploring the evolution of sports architecture in South Africa becomes an intriguing endeavour from this perspective. It enables us to unpack the historical meanings of sports in the context of the nation, providing insights into the interplay of architecture, politics, and community. As the research delves into contemporary approaches to reconciling the functional demands of sports facilities with the realities of resource constraints, it acknowledges the legacy of the past and seeks to forge a path toward equitable access, adaptable design, and societal cohesion.

It is worth noting that, while the goal of improving sports facilities is to increase participation in sports, the results have occasionally been contradictory, particularly in resource-constrained places. The hyper-formalization and specialization inherent in such institutions unwittingly limit their accessibility to places with significant financial resources, aggravating inequities. Through observations and study, there is an emphasis on the necessity for an alternative strategy, one that provides functioning without imposing extravagant expenses and, significantly, has the versatility to transcend specific places. This is where the notion of using containers comes into play, with the possibility to disseminate sporting facilities in a more modular and cost-effective manner. It is critical to emphasize in this section that the thesis's focus is not solely on historical research on sports in South Africa or apartheid-era planning disparities, but rather on the contemporary challenge of balancing functionality, affordability, and adaptability in sports facility design. This explanation contributes to establishing the research project's distinct scope and contribution. (Komphela, 2010)

Fig 2.1: Early Baseball Game, (Britannica, 2023)

The history of sports architecture is intertwined with the development of sports themselves and the evolution of human societies. Here's a brief overview of the key milestones and periods in the history of sports architecture:

Ancient and Classical Periods:

Ancient Greece: The ancient Greeks built the earliest known sports facilities, including the Olympic Stadium in Olympia, which hosted the Olympic Games starting in 776 BCE. These venues were open-air and featured simple seating arrangements for spectators.

Medieval and Renaissance Periods:

Medieval Europe: Sports activities during this period were often informal and took place in public spaces. Jousting tournaments, archery contests, and football matches were common but lacked dedicated sports architecture

Renaissance Italy: In the 15th and 16th centuries, the influence of the Renaissance led to the construction of dedicated sports facilities. Piazzas, courtyards, and gardens were used for various sports and games.

Industrial Revolution and Modern Era:

19th Century: The Industrial Revolution brought advancements in construction techniques and materials, leading to the development of purpose-built sports facilities. The Great Exhibition of 1851 in London showcased the Crystal Palace, an iconic iron and glass structure that housed various exhibitions, including sporting events.

Early 20th Century: The early 20th century witnessed the construction of notable sports venues, such as Newland Rugby Stadium in Cape Town (1888) and Fenway Park in Boston (1912). These stadiums featured concrete and steel construction and offered improved seating arrangements.

Post-World War II: The post-war era saw a surge in the construction of large-scale sports venues, particularly in the United States. Iconic stadiums, such as Yankee Stadium (1923) and the Los Angeles Memorial Coliseum (1923), were built during this period. These stadiums had increased seating capacities and improved amenities.

Late 20th Century: The latter half of the 20th century saw advancements in sports architecture, driven by the demand for larger venues, improved fan experiences, and safety considerations. Modern technologies, such as reinforced concrete, precast construction, and tensioned fabrics, were utilized in stadium design.

21st Century: Sports architecture in the 21st century has witnessed a shift towards sustainability, multi-functionality, and fan engagement. There is a focus on incorporating advanced technologies, energy efficiency, and integrating venues with the surrounding urban environment.

Overall, sports architecture has evolved in response to changing societal needs, technological advancements, and the desire to create memorable and immersive experiences for athletes and spectators.

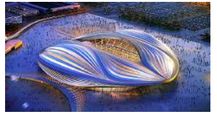
Fig 2.2 : (The Olympic Stadium in Athens pictured during the Games in 1896 (2016)

Fig 2.3: Calcio fiorentino (game played at Piazza Santa Croce 2016)

Fig 2.4: Crystal Palace was the birth of modern architecture 2019)

Fig 2.5: (Opening day at Yankee Stadium in 1923, New York (2019)

Fig 2.6: World Cup Stadium, Qatar, Zaha-Hadid Dezeen (2013)



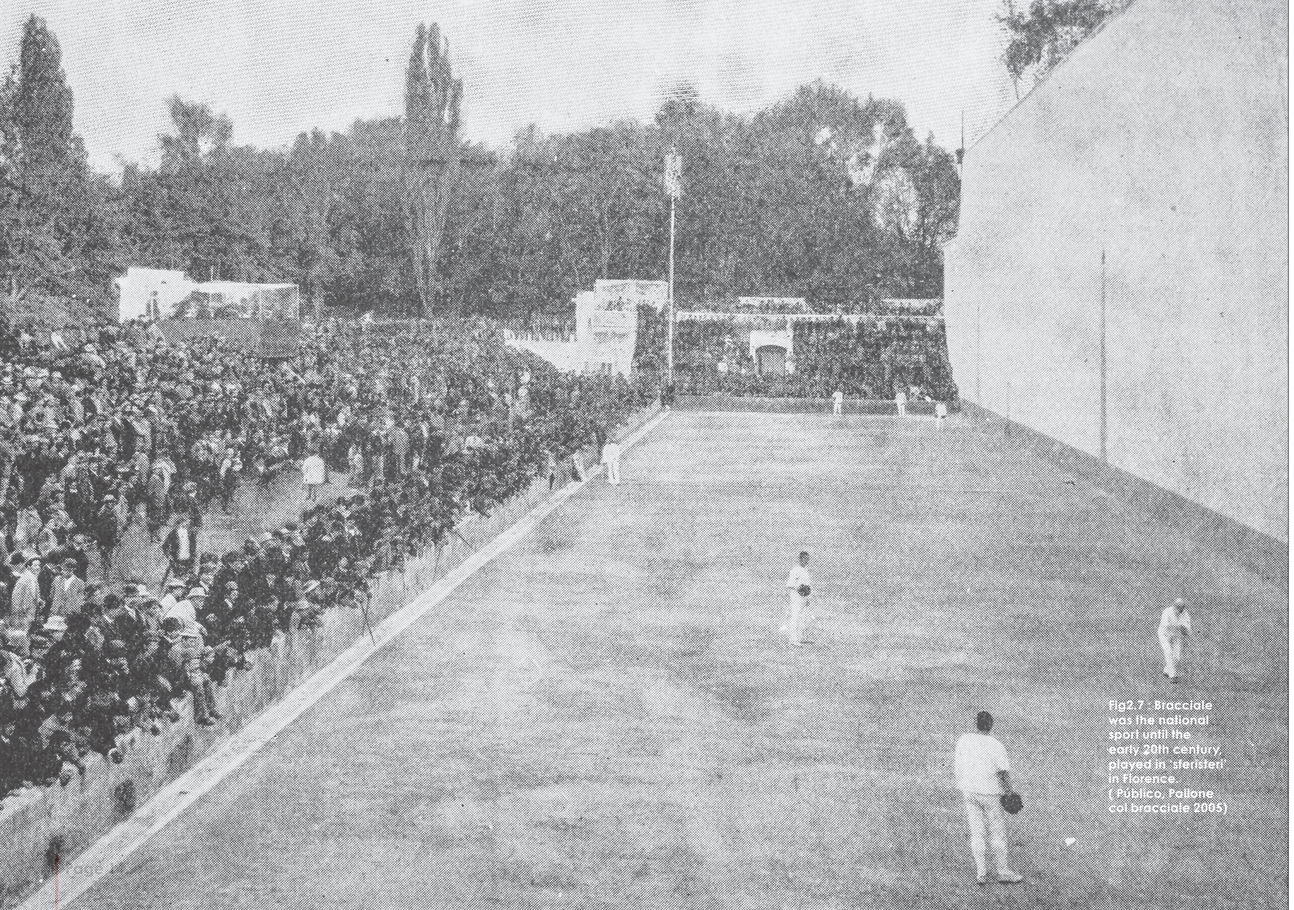


Fig2.7 : Bracciale was the national sport until the early 20th century, played in 'sferisteri' in Florence. (Público, Pallone col bracciale 2005)

SPORTS ARCHITECTURE

Historical Legacy Meets Contemporary Challenges: The Duality of Sports Facility Advancement:

Within the overarching exploration of sports architecture's evolution, a distinct segment gains prominence, one that deals with the unintended consequences of well-intentioned actions. This thematic discussion, fittingly placed within the broader sports architecture section, delves into an intriguing phenomenon. It highlights how the pursuit of promoting sports participation by increasing facilities has, in some instances, yielded outcomes contrary to the initial aspirations. The idea of building these large sports stadiums in less fortunate areas with the hopes to increase economic and social direction, end up having a negative affect on the communities it impacts, due to the lack of infrastructure surrounding this monumental structure. Despite their intention to promote better lifestyles, such initiatives have occasionally resulted in unforeseen consequences. Overcrowding, emphasis of elite athletes, economic constraints, gentrification, environmental consequences, abandonment of existing facilities, and equity concerns are among the issues that are faced when introducing these large facilities. These repercussions may contradict the original goals of promoting inclusion and health, putting light on the complex relationship between sports facility expansion and desired outcomes. A historical perspective intertwines with the contemporary narrative, revealing how this paradox has permeated through time. Notably, during South Africa's apartheid era, the harsh disparities in sports facilities underscored broader societal inequalities. This historical precedent magnifies the implications of resource allocation and access, echoing the complexities at play. As history intertwines with modernity, the persistent challenge of resource limitations further complexes the issue. (Stevens, 2018)

The concept of "hyper formalization" and "hyper specialization" emerges as a crucial pivot within this discourse. The dedication to create high-end, specialized sports facilities has inadvertently resulted in a divergence between aspiration and reality. In contexts where resources are constrained, the financial demands associated with these grandiose facilities act as insuperable barriers, restraining their implementation, potentially extending inequality and limit the use of the facilities. South Africa is currently dealing with a large issue with stadiums that are hyper formalized and hyper specialized, because of the economic implications that the 2010 world cup left behind. The mass production of sports facilities looked to create an issue that we still deal with to this day, which is that stadiums spend most of the years vacant and cannot be reimagined into facilities that can host a variety of sports codes and events. The relevance of this observation within the broader framework becomes evident. It substantiates the need for a concept shift, a reevaluation of how sports facilities are conceptualized and materialized. This dynamic aligns with the central theme of the research project which is to devise adaptable and resource-sensitive solutions. As the exploration extends into container-based alternatives, the aspiration to sidestep the limitations imposed by financial burdens and inflexibility is manifested. These modular, cost-effective solutions bear the

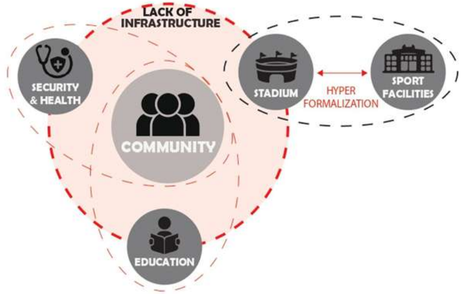


Fig 3.1: Diagram showing imbalances in a disadvantage's communities. (Author, 2023)

potential to transcend economic boundaries, catalyzing a democratization of sports infrastructure.
In this light, the historical echoes, coupled with the contemporary challenges, serve as a compelling backdrop for the research's primary goal. The endeavor to seamlessly merge practicality, adaptability, and equitable access in sports architecture is deeply rooted in the very paradoxes that have shaped the trajectory of sports engagement through architectural interventions. Both hyper formalization and hyper specialization have significant relevance to the broader discussion of sports architecture, particularly in the context of historical legacies and contemporary challenges. These concepts reflect the traditional approach to designing sports facilities, where grandiose and specialized structures were perceived as the ultimate solution for promoting sports engagement and excellence. However, the unintended consequences of these approaches become apparent when they clash with resource limitations, effectively excluding large segments of the population from benefiting.

The hyper formalization that is occurring in South Africa can be observed in various stadiums that remain in the country, with an emphasis on the Cape Town Stadium exposing the issues that exist. It refers to a method in which every part of a sports facility is meticulously designed, generally in accordance with established norms and conventions. Hyper formalized facilities emphasize adherence to specified models, resulting in uniformity and consistency across various components.

The Cape Town Stadium was originally scheduled to be erected in a different location before being settled on Green Point. The Metropolitan Golf Club in Cape Town was originally offered as the stadium's location. However, due to a variety of technical, environmental, and community problems, including worries about relocating the golf course and negatively harming residences, the decision was finally made to relocate to Green Point. This shift in location resulted in the development of the Cape Town Stadium in Green Point, Cape Town. Green Point was chosen because of its closeness to the city center and waterfront, making it a more accessible and central venue for big events. The city made compromises about allowing commercial uses of the site during the 2006 provincial Record of Decision (RoD) process. This was done to ensure that the stadium, which was six months behind the other major stadium construction projects in the nation in 2010, would be finished on time. This entailed building the stadium precinct in accordance with FIFA contractual standards. The city recognized at the time that there would be suboptimal commercial usage of Cape Town Stadium and its surroundings following the 2010 event. The City also admitted, in a cost-benefit study conducted at the time, that the stadium would be a huge future financial burden unless a' substantial and guaranteed external subsidy' was obtained. Despite the cost ramifications, it was expected that Cape Town Stadium and Green Point Park would serve as a 'green jewel' for the use and benefit of all Capetonians. ('Business plan for Cape Town Stadium and Green Point Park',2012)

"The stadium and park operate in an extremely fluid and challenging environment. The global recession, coupled with a highly competitive stadium business environment between 2010 host cities, have severely limited the opportunities for stadium usage. That usage is also restricted by current land use zoning, and commercial activities are not permitted unless they are directly related to approved events." Mitigation Consultants (Pty) Limited, I.R. (2013)

Fig 3.2: Diagram showing a balanced community. (Author, 2023)

The concepts of hyper formalization and hyper specialization align with the observation made regarding how efforts to promote sports through better facilities can paradoxically hinder accessibility. These approaches tend to create facilities that demand substantial financial investments, making them feasible only in areas with abundant resources. For regions grappling with economic constraints, the intricacies and costs associated with hyper formalization and hyper specialization can perpetuate the disparities they were intended to address. This context lays the foundation for the research's exploration of adaptable and cost-effective solutions, specifically the utilization of container-based designs. By stepping away from the norms of hyper formalization and hyper specialization, and instead embracing versatility and affordability, these solutions address the very limitations that have hindered sports engagement in resource-constrained areas. This shift in focus aligns with the project's aim of creating facilities that are both functional and socially inclusive, underscoring the significance of adaptable design within the sports architecture discourse.

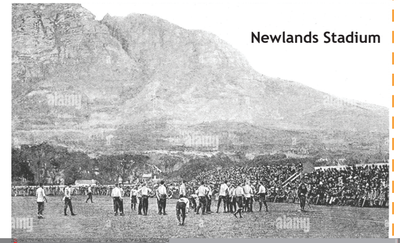
Fig 3.3: Empty Soccer City aka FNB Stadium (Angeles, 2020)

SPORTS HISTORY IN SOUTH AFRICA:

1880 - 1890

The Dawn of Organized Cricket:

The first recorded cricket match between teams representing different provinces in South Africa takes place, marking the beginning of organized cricket in the country.



Newlands Stadium

1900 - 1910

Establishment of the Chamber of Mines:

- South Africa competes in its first Davis Cup tennis tournament
- The South African Football Association (SAFA) is established,
- The first South African golf championship is held

1920 - 1930

Establishment of Alexandra Township:

Alexandra Township (Alex) is established as a residential area for black mine workers, providing cheap labor for the mining industry.

1940 - 1950

1938

The birth of Ellis Park Stadium:

The stadium was erected in eight months, and the first test against the All Blacks took place in June 1928. Ellis Park, which became worldwide known and connected with rugby, was thus formed.

Ellis Park Stadium

1960 - 1970

South Africa's Olympic Suspension:

The International Olympic Committee (IOC) suspends South Africa from the Olympic Games due to its apartheid policies.

1883

1886

The Birth of Rugby Governance:

The South African Rugby Board is founded, which later becomes the South African Rugby Union (SARU).

1888 - 1890

The Birth of the oldest stadium in SA

The Western Province Rugby and Football Union took the decision to purchase the land on which the stadium sits in 1888. Stellenbosch beat Villagers in front of a crowd of roughly 2,400 people in the inaugural official match at Newlands on May 31, 1890.

1890:

1903 - 1906

1909

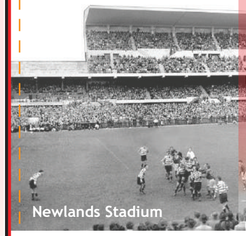
The Birth of the oldest stadium in SA

The Transvaal Rugby Football Union, petitioned for a lease on around twelve acres on the western side of Ellis Park. Furthermore, the council said that "all first-class matches should, as far as possible, be played on this ground." As a result, the Council tacitly confirmed the grounds' development into a sports arena.

1919 - 1931

Newlands Stadium first renovation :

The first permanent concrete stands on the site were not constructed until 1919. The new grandstand was built later, in 1927, and the field plan was altered to run north-south. More renovations occurred in 1931, when the South stand was expanded.



Newlands Stadium

1938 - 1948

Sports Struggle Under Segregation

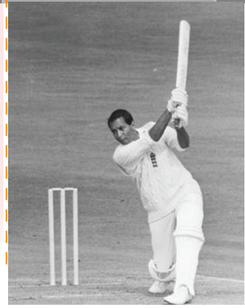
The National Party comes to power in South Africa and implements apartheid policies, leading to racial segregation in sports.

1950

Group Area Act Introduced

The South African government introduces the Group Areas Act, which separates sporting facilities based on race, severely restricting non-white participation.

1969



1970

Anti-Apartheid Resistance:

Basil D'Oliveira, a mixed-race cricketer, is excluded from the South African cricket team, sparking international outrage and resulting in South Africa's isolation from international cricket.

Fig 4.1 - 4.5: Timeline for the history of sports and sports architecture in South Africa (Author, 2023)

1980 - 1990

1976:

Odi Stadium :

Odi Stadium, constructed in the late 1980s, embodies a complex narrative woven into the fabric of South African history.

1990

Mandelas Freedom:

Nelson Mandela is released from prison, marking a significant turning point in South Africa's history and opening the door for political and social transformation.

1990 - 1994

1991

SARFU's Transformation towards Inclusivity:

The South African Rugby Union is reconstituted as the South African Rugby Football Union (SARFU) with a non-racial constitution, paving the way for the inclusion of players of all races.

South Africa's Olympic Readmission

South Africa is readmitted to the Olympic Games following the dismantling of apartheid, allowing the country's athletes to compete internationally once again.

1995 - 2000

1994

Apartheid's Demise: Madela becomes president

South Africa holds its first democratic elections, marking the end of apartheid. Gauteng plays a significant role in the transition to democracy, and Nelson Mandela becomes the country's first black president.

1995

1995 Rugby World Cup:

South Africa hosts and wins the Rugby World Cup, which becomes a unifying moment for the country and helps promote rugby as a major sport.

1996 - 2005

Joined host of ICC Cricket World cup:

The 2003 ICC Cricket World Cup was jointly hosted by three nations: South Africa, Zimbabwe and Kenya. The majority of the games were hosted in South Africa

1996:

AFCON Champions:

South Africa hosted African football's biggest tournament when the African Cup Of Nations came here in 1996, considering that South Africa had been banned from international soccer under apartheid, but the host nation went on to win the AFCON title

2003

2005 - 2010

2004

South Africa wins World Cup :

In a historic moment in 2004, South Africa clinched the right to host the 19th edition of the tournament after agonisingly missing out by a 12-11 vote count to Germany for the 2006 showpiece.

2007

2007 Rugby World Cup:

South Africa hosts the FIFA World Cup, becoming the first African nation to do so and showcasing the country's ability to organize major sporting events.

2010 - Now..

2010

2010 FIFA World Cup:

South Africa hosts the FIFA World Cup, becoming the first African nation to do so and showcasing the country's ability to organize major sporting events.

2019

2019 Rugby World Cup:

The first black player is named captain of the springboks and leads the national team to its third Rugby World Cup

Fig 4.6 - 4.14: Timeline for the history of sports and sports architecture in South Africa (Author, 2023)

ECONOMIC MARGINALIZATION

Economic marginalization in South Africa has deep-rooted historical origins that trace back to colonialism and apartheid. These discriminatory policies institutionalized racial segregation, leading to enduring economic disparities that persist to this day. High unemployment rates, particularly among black South Africans, have contributed to widespread poverty and hindered upward mobility. Income inequality remains a major challenge, with a small minority controlling a significant portion of the country's resources and capital. Unequal access to quality education perpetuates the cycle of marginalization, limiting opportunities for historically disadvantaged communities. Land reform, aimed at addressing historical injustices, has been slow and complex, further exacerbating issues of ownership and economic power. The informal economy, prevalent among marginalized populations, offers low-wage jobs and limited social protections. Corruption within government institutions diverts resources from programs intended to uplift marginalized communities. (Philip, 2011)

The South African economy exhibits a dual structure, comprising the formal and informal sectors. While the formal economy, with its well-established industries, contributes significantly to the country's GDP, it has limited positive effects on less fortunate communities due to historical inequalities. In contrast, the informal economy plays a vital role in the lives of marginalized individuals by offering income-generating opportunities, but it also poses challenges for sports development in these communities. Less fortunate areas struggle with limited funding and resources for sports initiatives, leading to poorly maintained sports infrastructure and reduced access to training and coaching. This inequality impacts youth development in sports, hindering the discovery and nurturing of athletic talent among disadvantaged youth. To address these disparities, efforts are needed to bridge the gap between affluent and less fortunate communities, with increased funding for sports facilities and coaching to promote inclusivity, equal opportunities, and the growth of sports in marginalized areas, fostering positive role models and contributing to social cohesion and empowerment.

"Many communities in South Africa have been affected by economic marginalization especially in the Alexandra Township. During the Apartheid regime era the policies of racial segregation and discrimination toward people of colour had a significant impact on the economic opportunities and resources allocated to marginalized communities. This later resulted in limited access to essential services, communities enduring socio-economic disparities which led to the growth of communities and people of colour to decline. On the other hand, townships like Alexandra were established as designated areas for people of colour predominately black residents. These townships were characterized by overcrowding, inadequate housing, limited infrastructure, and a lack of basic services. They were situated on the outskirts of cities, far away from employment opportunities, and often lacked proper transportation links which added to the marginalization of people of colour."

(Mafata, 2021)

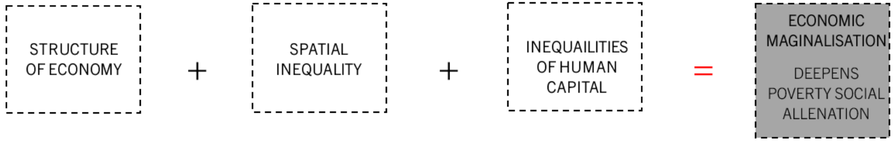


Fig 5.1 : Diagram showing the different factors for economic marginalization. (Author, 2023)

The map, which displays an economic indicator, highlights the lack of sports facilities in Gauteng's heavily populated area, indicating oversight in their location due to insufficient consideration of local infrastructure and community requirements. Despite the intended purpose of improving infrastructure by developing recreational places, the Hyper formalized and mismatched architecture make this goal impossible to achieve. The map illustrates a reduced focus on sporting facilities in places with lower population density due to poor supporting infrastructure, as well as a contradictory tendency of putting larger stadiums in areas ill-equipped to maintain them. The accompanying map depicts the complicated interplay between urban density, facility distribution, and infrastructure.

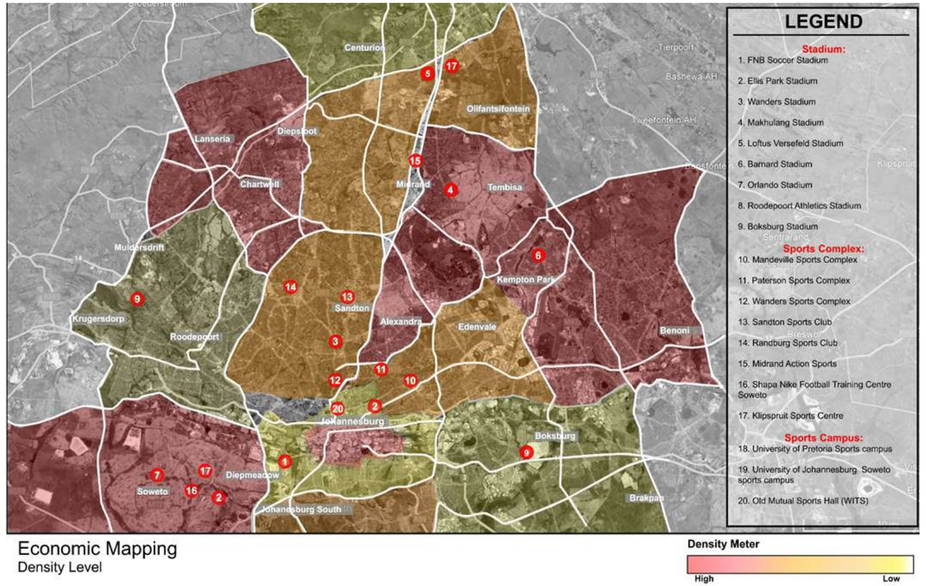


Fig 5.2: Mapping highlight density levels (Author, 2023)

Spatial Inequality

The distribution of sports facilities in Johannesburg, particularly in the Alexandra township (Alex), reflects the unequal planning legacy in South Africa. Affluent neighbourhoods have a higher per capita allocation of sports spaces due to historical advantages and concentrated wealth. In contrast, less fortunate areas like Alex face shortages of sports facilities per capita, resulting from high population density, limited urban planning, and historical inequities. This reflects the enduring impact of spatial segregation policies during apartheid. To address these disparities, targeted interventions and inclusive urban planning are needed, emphasizing investments in sports infrastructure in marginalized communities like Alexandra to promote community development and equal access to sports opportunities.

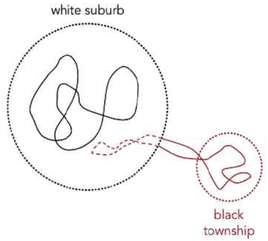


Fig 5.3 : Incongruence of racial geographies (Author, 2023). Derived from Mbembe, 2008. McKittrick, 2013)

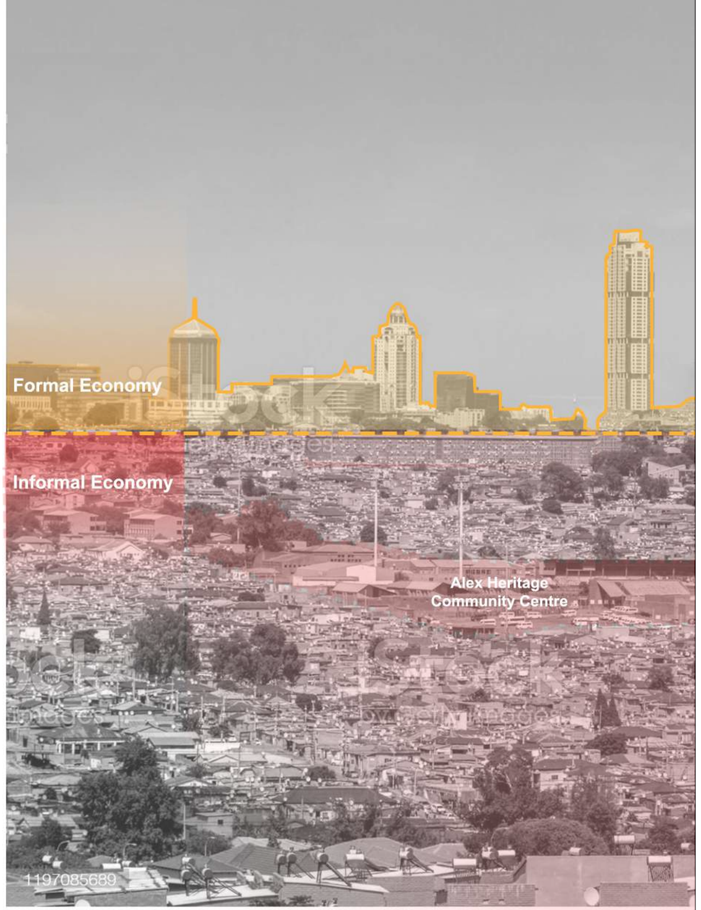


Fig 5.4 : Cityscape of Alexandra Township with Sandton City (2020) modified by Author(2023)

The following study compares the oldest stadium in South Africa, which has been built and adapted over the years to allow for various sporting codes to take place without drastically altering the existing context, to the historic stadium built in Northwest of Gauteng, which didn't experience the development and renovations it was due and ended up being neglected due to its location and lack of adaptivity.

Newlands Stadium:

Rugby sought a dedicated stadium in the late 1880s, driven on by TB Herold, secretary of the Western Province Rugby Union. In 1887, the Western Province Cricket Club purchased a ground in Newlands from the Breweries, but rugby's desire to share it was rebuffed by cricket officials. Herold persisted in convincing the rugby union to purchase its own stadium. Herold chose a patch of pine forest near Newlands train station as an appropriate location, especially considering the area's proximity to the railway line that connected the region's suburbs. The woodland was cleared in 1889 for 470 Pounds by James Ruck, who also erected a galvanized iron fence and built an entry road with two gates for an extra 207 Pounds. An abandoned shed from the Cricket Club was acquired for 40 Pounds and converted into a change room, tool shed, secretary's office, and a bar. In 1889, funds were gathered through a fancy fair.

The first encounter, a school game between Bishops and SACS, put the ground to the test. It first played a match on May 31, 1890, between Villagers and Stellenbosch. South Africa and the British touring team played the first Test match there in 1891. In 1894, the Union acquired the land from the Breweries' new owner, Anders Ohlson, for £2500. The field's direction was changed from east-west to north-south in 1927. The concrete stands were built in 1919, followed by the grandstand in 1927 and later extensions. Notably, new grandstand sections, enhanced amenities, and expanded seating were added throughout the 1950s. The stadium had extensive renovations in the 1970s and 1980s. SA Rugby's headquarters relocated to Newlands, necessitating several stand constructions and modifications. Private suites, event rooms, and seat extensions were also popular during this period.

In preparation for the 1995 Rugby World Cup, the stadium received substantial renovations and technical upgrades from 1990 to 1995. These upgrades were part of a larger rehabilitation plan that culminated in Newlands hosting the renowned tournament's first match. Newlands Stadium has grown from humble origins to become a symbol of athletic legacy, adjusting to new demands while maintaining an important facility in the sports environment. (Jordan, 2019)

Diagram description:

The evolution of Newlands Stadium in Cape Town exemplifies a transformation that began with a simple rugby field formed out of a basic patch of land, primarily to meet regulatory requirements rather than architectural distinction. Over time, however, the stadium's growth gained momentum in response to the improving sporting landscape and the burgeoning community that coalesced around the venue. The stadium's expansion reflects the progression of sports in the region and the concurrent rise of a vibrant community hub, both of which contributed to the stadium's architectural development.

1891 – Newlands Rugby Old Grounds | 1933 – Newlands Rugby Stadium | 1953 – Newlands Rugby Stadium

Fig 5.5 : Rugby match played over 100 years ago, Cape Town (2008) modified by Author (2023)

Fig 5.6: Sport. Rugby Union International. Newlands, Cape Town. 2016) modified by Author(2023)

Fig 5.7 : (Newlands Rugby stadium, 1953.(2017) modified by Author (2023)

Odi Stadium

Odi Stadium, constructed in the late 1980s, embodies a complex narrative woven into the fabric of South African history. Initially named the Independence Stadium, it stood as a symbol of authority in the Bophuthatswana Bantustan, reflecting both grandiosity and political rule. An architectural collaboration with Israel lent it soaring design, eliciting both wonder and contemplation. Over the years, the stadium transitioned from its original identity to becoming a hub for political rallies, music festivals, and exhilarating football matches, including those of Mamelodi Sundowns.

However, the stadium's evolution has been marred by challenges stemming from economic marginalization and hyper formalization. The tragic stampede during a Soweto Derby in 2001, although not directly related to Odi Stadium, heightened concerns about safety across South African stadiums. This incident ushered in a safety-first mentality, redirecting priorities towards security and crowd control, which impacted the way stadiums were perceived and maintained. Economic marginalization and insufficient investment manifested in the visible deterioration of the facility. Neglected maintenance led to compromised structural integrity and functionality. The stadium's inability to meet modern professional sports standards underlines how disregard and inadequate resources contributed to its current state of obsolescence. The absence of adherence to contemporary regulations and visible decay emphasizes the pressing need for comprehensive upgrades. (Davis, 2019)

During uncertainty about its future, discussions have revolved around repurposing Odi Stadium into a multipurpose sport and recreational park, driven by the community's persistence. Its decline into an unsafe and obsolete state serves as a poignant reminder of the challenges faced by historically marginalized areas in maintaining infrastructure. The stadium's potential revival rests on a commitment to not only repurpose but also rejuvenate, symbolizing a transformative journey that transcends its physical form. Interestingly, Odi Stadium's architectural similarity to Mmabatho Stadium raises questions about the divergent paths taken. Despite comparable architectural features, Odi Stadium was deemed irreparable due to potential hazards, while Mmabatho Stadium remains operational. This divergence illustrates the influence of location, governmental decisions, and the lack of attention to disadvantaged areas. Odi Stadium's decline and potential revival highlight the struggles marginalized regions face in maintaining vital infrastructure, underscoring the need for comprehensive rejuvenation efforts beyond just repurposing. In sum, Odi Stadium's transformation embodies a multifaceted narrative intertwined with South African history, shedding light on the complexities of architecture, neglect, community resilience, and the socio-political landscape. (Feltham, 2021)

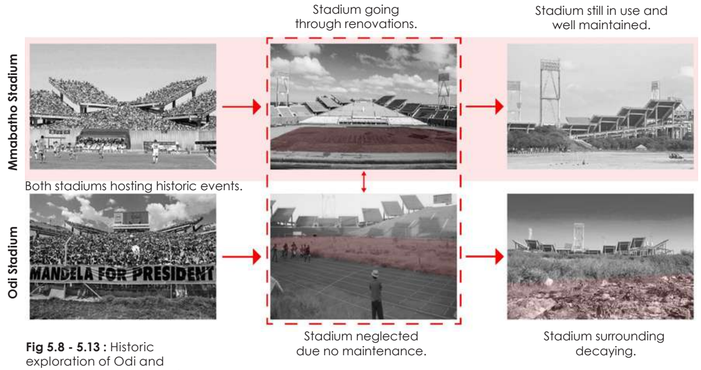


Fig 5.8 - 5.13 : Historic exploration of Odi and Mmabatho development. (Author, 2023)

Comparing the trajectories of Newlands Stadium and Odi Stadium reveals a stark contrast in how historic stadiums can experience vastly different developmental paths, influenced by the economic marginalization entrenched within their contexts. Newlands Stadium's rich history traces back to the late 19th century when rugby sought a dedicated space. Its evolution from a rudimentary patch of pine forest to a world-class facility showcases the dedication to ongoing development and adaptation. In contrast, Odi Stadium's story is marked by the complex tapestry of South African history. Originally the Independence Stadium, it was a testament to authority within the Bophuthatswana Bantustan. While both stadiums have transformed over time, economic marginalization and hyper formalization have cast a shadow over Odi Stadium's journey.

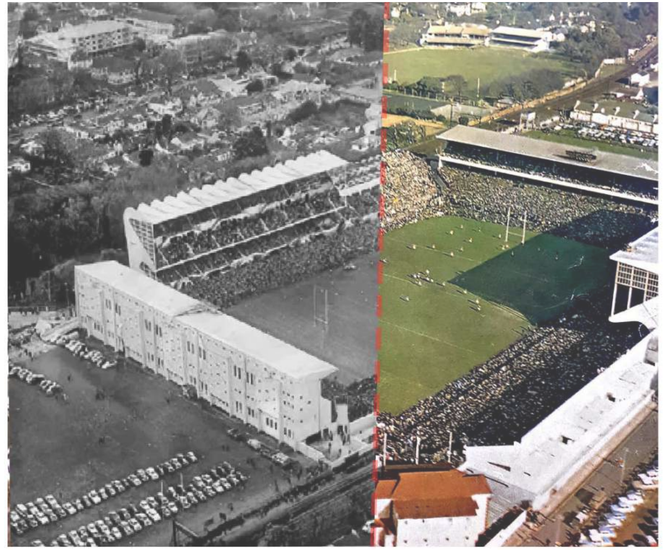
Newlands Stadium's growth mirrors a commitment to excellence. Through the years, it has undergone multiple upgrades, from the introduction of concrete stands to the expansion of seating, grandstands, and private suites. Its enduring relevance lies in continuous investment, resulting in modernization and adaptation to changing needs. This evolution reflects a profound understanding of the stadium's pivotal role and the ongoing integration of cutting-edge standards.

Conversely, Odi Stadium's trajectory has been plagued by neglect and the weight of economic marginalization. The tragic 2001 stampede at a different stadium heightened awareness of safety concerns within the broader sports industry, reshaping priorities towards security measures. Economic constraints and lack of consistent investment have resulted in visible decay and compromised infrastructure, culminating in its current state of obsolescence. The conversations about repurposing the stadium highlight the community's resilience, yet the journey towards revival remains uncertain.

This comparative analysis underscores how economic marginalization can perpetuate disparities in the care and development of historic stadiums. While Newlands Stadium's continuous growth is a testament to proactive investment and adaptability, Odi Stadium's decline reveals the consequences of neglect and inadequate resources. The indifference that emerges through their contrasting development trajectories serves as a stark reminder of the broader societal inequities that shape infrastructure and community empowerment.

Fig 5.14 : Newlands Stadium, Cape Town (1966) modified by (Author, 2023)

Fig 5.15 : , General views of Newlands Rugby Stadium. (Fourie, 2010) modified by (Author, 2023)



This conspicuous absence underscores a glaring oversight in facility placement, reflecting a deficiency in accounting for local infrastructure and community requisites. Despite the original aim of enhancing infrastructure through recreational space development, this intent is thwarted by the prevalence of hyper-formalized and architecturally mismatched structures. The map not only reveals a concentration of stadiums in economically disadvantaged areas, often coinciding with inadequate support infrastructure, but also paradoxically highlights the establishment of larger stadiums in regions ill-equipped for their maintenance.

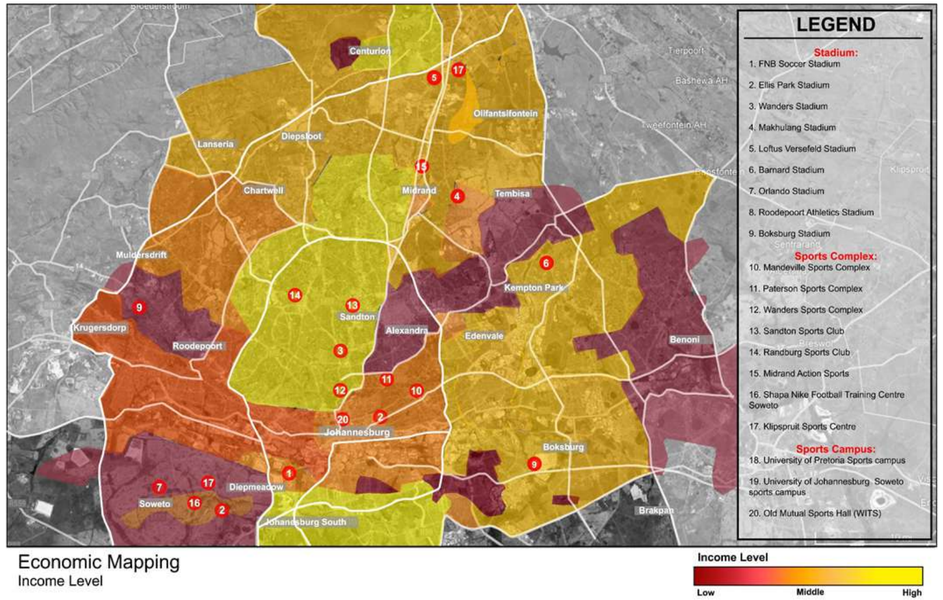


Fig 5.16 : Mapping highlight income levels
(Author, 2023)

ADAPTABILITIY IN ARCHITECTURE

Sports facilities are more than just infrastructure in communities like Alexandra Township; they represent empowerment, inclusion, and social upliftment. Adaptability emerges as a critical response to the numerous issues presented by this situation. Adaptable architecture goes beyond the constraints of traditional design to suit a wide range of sporting activities and societal ambitions. This method removes participation obstacles and maintains the facility's relevance by allowing spaces to develop and cater to changing demands. Adaptability emerges as a catalyst as sports accelerate transformation and advancement. The constant interaction of socioeconomic and environmental elements drives the necessity for adaptation in African sports facilities, particularly in places like Alexandra Township. These areas always have changing demands, making static buildings unsuitable for varied community requirements. This changing landscape mandates facilities that can swivel to accommodate a wide range of events, burgeoning sports, and increasing community needs. Adaptability emerges as a response to this difficulty, balancing the many functions within a changing context. Furthermore, the use of flexible components coincides with such places' economic reality, allowing for cost-effective improvements and repurposing while decreasing waste.

Adaptability is crucial at the intersection of sports and architecture. Sporting activities are dynamic in nature, reflecting altering patterns of community involvement and trends. Adaptability in design corresponds to this dynamic, allowing facilities to adapt in parallel with these changes. This strategy guarantees that facilities stay relevant to increasing user needs, from modular components that allow for variable rearrangements for diverse activities to areas that may expand with expanding demand. It welcomes new sports forms, shifting demographics, and technology advancements to ensure the facility's ongoing functioning, vibrancy, and resonance. Incorporating flexibility inside sports facilities represents a paradigm change perfectly suited to the sports environment. While traditional specialized sports facilities restrict themselves to certain activities, limiting cross-disciplinary interaction and emerging trends, adaptable sports facilities, as presented in this thesis, accommodate a diverse range of sports and leisure activities under one roof. This versatility guarantees that the facility can respond quickly to emergent sports or change community interests, allowing it to adeptly transform to match changing tastes. Furthermore, given varied equipment and space layouts for different sports, the flexibility of changeable components allows for simple reconfiguration to meet a variety of requirements. (Ill and Austin, 2016)

Adaptable architecture prioritizes flexibility, versatility, and longevity, enabling buildings to accommodate diverse uses, technological advancements, and societal changes over time. At the core of adaptable architecture is the concept of flexibility. This involves designing spaces that can be easily modified, reconfigured, or expanded to accommodate different activities, user requirements, and future adaptations. Flexible spaces are designed with movable partitions, modular components, and adjustable features, allowing users to customize and adapt the layout according to their changing needs. The ability to transform and reconfigure spaces ensures that buildings remain relevant and functional even as activities and functions within them evolve.

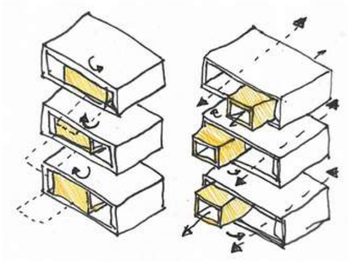


Fig 6.1 : Drawing showing adaptive modular sketch on movable components
(Author, 2023)

Another aspect of adaptable architecture is the consideration of scalability and expandability. Buildings designed with scalability in mind can easily accommodate growth and changing demands. This can be achieved using modular construction, where components can be added or removed as needed, or through the incorporation of flexible structural systems that allow for future expansions. By planning for expansion during the design phase, architects ensure that buildings can adapt to meet future requirements without significant redesign or disruption. Adaptable architecture also embraces the concept of adaptability to the immediate context. Buildings are designed to respond to their surroundings and the specific needs of the users. This can include considering the environmental conditions, local culture, and the potential for future developments in the area. By considering these factors, architects can create buildings that harmoniously integrate with their surroundings and respond and adapt to changes in the context. (Hudec and Rollová, 2016)

The advent of adaptable architecture fundamentally alters the parameters of design criteria, bringing in flexibility and user-centricity as key concepts. Instead of fixed boundaries, the architectural blueprint welcomes flexibility, modular structures, and future extension readiness. The incorporation of adaptability encourages a dynamic interaction with the environment, culture, and community, necessitating a thorough understanding of contextual complexities, spatial dynamics, and the ability to innovate to meet changing needs. Sustainability takes on a new meaning, embracing not just ecological concerns but also the facility's long-term resonance and socioeconomic impact. This revolutionary impact of adaptation is profoundly embedded in the foundations of sports facility design. Moving away from rigid goals and established functions, the emphasis shifts to envisioning places that are flexible, multidimensional, and adaptable. Flexibility emerges as a pillar, directing decisions about spatial organization, structural frameworks, and materials. The changeable nature needs careful consideration of modular components that may be reconfigured, expanded, or contracted as needed. As a result, the design requirements grow to include scalability, simplicity of reformation, and the use of adaptable parts. Furthermore, the requirement for flexibility prompts inspection of technological amalgamations since systems must align with the facility's ever-changing nature. Sustainability is integrated into the requirements, ensuring that flexibility coexists peacefully with the facility's environmental effect.

Finally, this thesis investigates the substantial implications of flexible design in sports facilities. It investigates why flexibility is important in our environment, how it interacts with the complex world of sports infrastructure, and how it revolutionizes design criteria. This study catalyzes a paradigm change by weaving flexibility into the very fabric of sports facility design—an evolution that echoes in every aspect of the community and resonates with the goals of Alexandra Township and beyond. The notion of adaptable architecture emerges not just as a creative approach in sports facility design, but as an imperative customized to the unique demands of our context. This thesis embarks on a journey that deeply explores adaptability's indispensable role, its tangible application in sports facilities, and its transformative impact on design criteria.

Fig 6.2 : Drawing showing adaptive modular sketch on movable components (Author, 2023)

MIXED-USE SPACE IN ARCHITECTURE

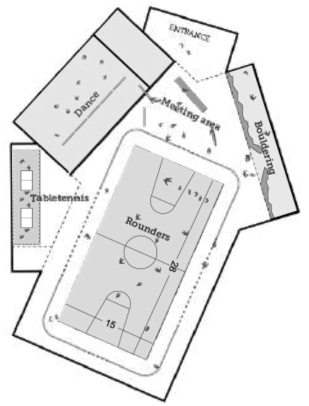
Mixed-use spaces in architecture refer to buildings or areas that combine multiple functions or activities within a single building or complex. These spaces are designed to accommodate a variety of uses, such as commercial, retail, office, recreational, and cultural activities, all in one cohesive environment. The concept of mixed-use spaces has gained popularity in recent years as a response to urbanization, the need for efficient land use, and the desire for vibrant, inclusive communities.

One of the key benefits of mixed-use spaces is its ability to create vibrant multipurpose spaces which is achieved by integrating various functions into a single area, residents can live, work, and play within proximity, reducing the need for long commutes and promoting a sense of community. People can easily access amenities, shops, restaurants, and entertainment options, fostering social interactions and creating a lively urban environment. The mix of activities also helps to activate the streetscape, making it more visually appealing and enhancing the overall vitality of the area. Mixed-use spaces also contribute to sustainable development and environmental efficiency. By consolidating different uses within a compact footprint, these spaces minimize the need for sprawling development and excessive land consumption. This approach promotes density and reduces urban spread, allowing for more efficient use of resources and infrastructure. Additionally, mixed-use developments often incorporate sustainable design principles, such as energy-efficient buildings, green spaces, and public transportation access, which further contribute to a more sustainable and eco-friendlier environment.

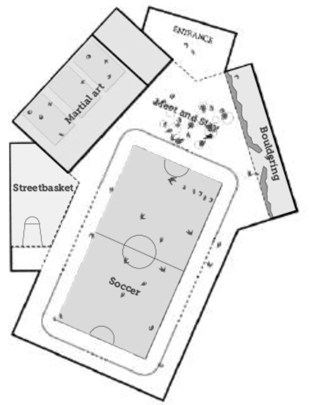
From an economic perspective, mixed-use spaces can be financially beneficial. By combining various functions, developers can optimize land use and maximize the potential for revenue generation. Retail and commercial spaces can support residential components, attracting a diverse mix of tenants and customers. This diverse user base can help create a stable income stream and enhance the overall economic viability of the development. Mixed-use spaces also have the potential to generate employment opportunities, as they often require a variety of services and businesses to support the different activities within the area.

Designing successful mixed-use spaces requires careful planning and consideration of various factors. Architects and urban planners must consider the compatibility of different uses, ensuring that they complement each other and do not create conflicts or disturbances. The design should also prioritize pedestrian-friendly environments, with well-designed public spaces, adequate parking facilities, and convenient transportation options. Furthermore, it is essential to consider the social and cultural aspects of the community, incorporating elements that foster a sense of place and identity.

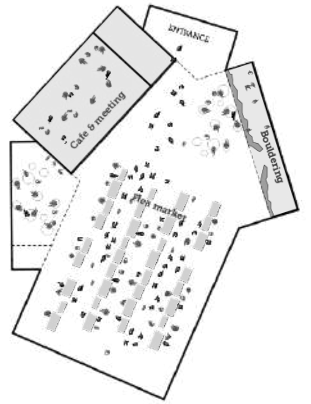
"We must always have an eye on the future. Buildings, of all kinds, are no longer able to be static. Today's architects must design to accommodate for future requirements and for new resources that may become available. Stadiums and arenas are no exception and must be designed so that they have the flexibility to evolve." (Populous, 2016)



PRIMARY SCHOOL LAYOUT



SPORTS FACILITY LAYOUT



EVENT & MARKET LAYOUT

Fig 6.3 : Floor plans showing the different scenarios that can be activated in one space (Mørk, 2017)

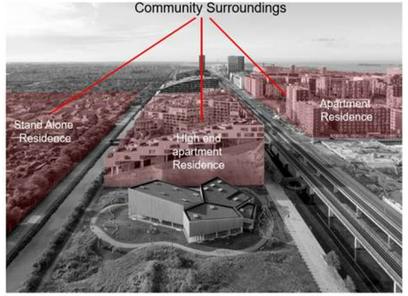
PROGRAMMATIC - Precedent Studies

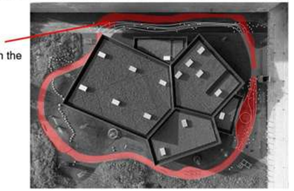
The following precedent studies focus on the programmatic features that can be explored in each sports facility, with the consideration of the context that surround them. The themes that are evident can help influence the design and how the locals utilise the spaces.

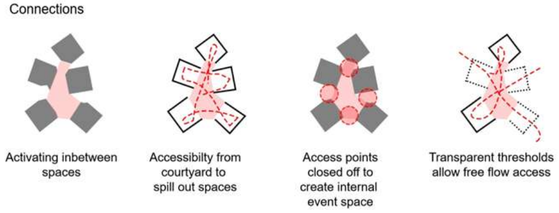
Multi-Purpose Sports Facility in Orestad City

NORD Architects
Copenhagen | Denmark
2012-2017

The Multi-purpose Sports and Community Facility is developed through a process based on collaboration with a dedicated group of users, local stakeholders, and inhabitants to cater specific local needs. During an open process in the early and developing phase, NORD Architects facilitated workshops where the users dealt with priorities of activities and functions. The building is open 24/7 to the public, school classes and local sports clubs and is divided into heated and unheated areas, with the unheated part as the biggest multifunctional spaces for different activities as basketball and floorball and the heated part as a space for dance, yoga, material arts or floor exercises for smaller groups. The building is unstaffed, and all activities and events are arranged and held by the users themselves whether organized in groups or private initiatives. As opposed to the surrounding buildings, the lowest point of the multi-purpose facility is facing Orestad Boulevard, and in this way meeting and welcoming the people in the neighborhood on ground level. Furthermore, the building stands out due to its green roof and wooden materials.







Spill out space is a big theme in this sports facility which allows for mixed use spaces to either be connected or separated to create different sets of programs in one main space. The building has a multipurpose court which caters for various sports and the spill out spaces surrounding the main court provide a transparent connectivity between the various events taking place in and around the different spaces.

This makes the space have a very communal and cohesive activity where all users should feel inclusive and safe as there is visibility everywhere. The exterior of this intervention is primarily glass facade which ensure the space is well lite with natural lighting and well-ventilated given that its important because of the activity happening with the sports complex.

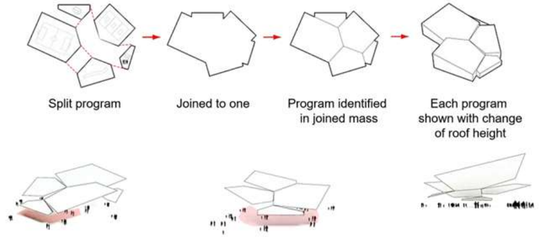
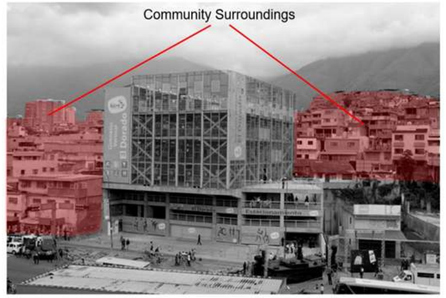


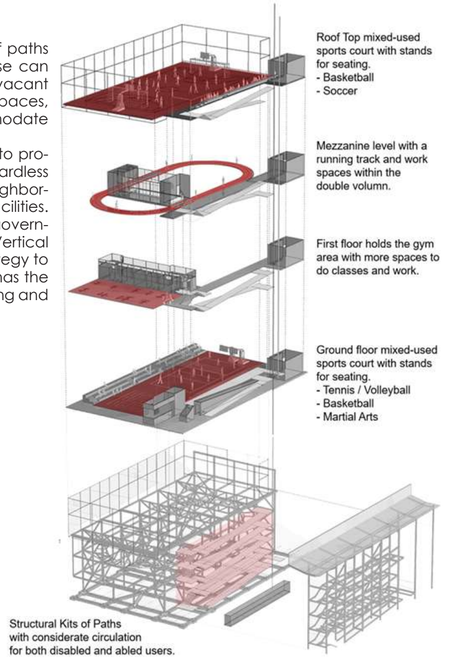
Fig 7.1: User Scenarios, More sports , More Architecture (Mørk, A , 2017)

Vertical Gym | Urban Think Tank

Alfredo Brillembourg & Hubert Klumpner
Caracas | Venezuela
2013

The Vertical Gym by Urban-Think Tank is a groundbreaking prefabricated kit of paths that can transform any urban space into a multi-level sports complex. Its base can be installed on top of existing community basketball courts, soccer fields, or vacant lots, making it adaptable to any location. By leveraging the potential of city spaces, particularly in areas with a high-density urban fabric, the design can accommodate hundreds of people at a time.
As an architecture student, I am fascinated by Urban-Think Tank commitment to promoting exercise and social activity as a fundamental right for all city dwellers, regardless of their social and economic status. This is particularly relevant in low-income neighborhoods and informal settlements worldwide where there is a dire need for such facilities. I am impressed by Urban-Think Tank's proposal to collaborate with municipal governments, private businesses, industry, and community organizations to bring the Vertical Gym to cities around the world. This collaborative approach is an excellent strategy to ensure that the gym's design meets the needs of the local community, and it has the potential to empower communities by creating spaces that promote healthy living and social interaction.

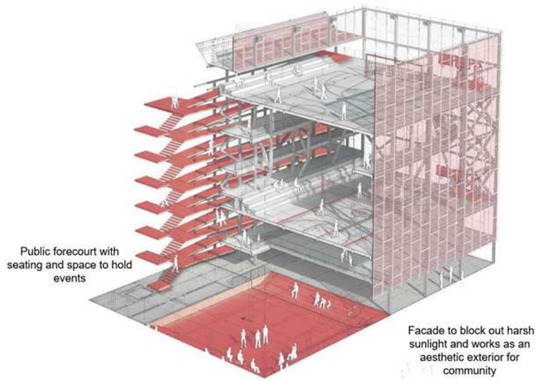




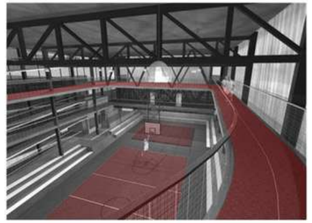
The idea of having such a heavy live load above a huge double volume is risky and that is why the structural kits of paths in important cause of the complex structure its holding with the various activities that are taking place. There are large aluminum transfer truss beams that help to distribute the live loads above.

The triple volume allows for the various sports to be played within the space and it also creates split levels for either spectator to view and for great stack ventilation which is needed in a sports facility that houses many sports.

In a highly dense community this intervention works well given that it doesn't utilize a lot of space and allows for the community members to use the space for healthy and positive activities.




Mixed Use sports court with large glass facade for natural lighting and ventilation


There is a running track that activates one of the split level.

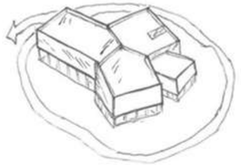

Structural elements that make up the kit of paths

Fig 7.2: Vertical Gym: Sports for social. (Urban Think, 2021)

PARAMATERS EXTRACTED

Multi-Purpose Sports Facility in Orestad City

Axonometric exploration of program

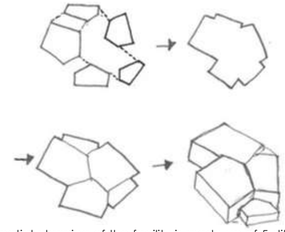


The axonometric shows that the sports facility is made up of various components which sit at different height , with the ground floor being made up of mainly curtain walls and a running track surrounding it.

Longitudinal section of mixed use spaces

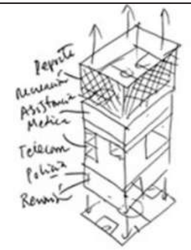
This sketch shows the section of the facility and how different ceiling heights are used for different spaces, different sports need more height the others and the consideration of having a well venetilated space.

Spatial planning of facility

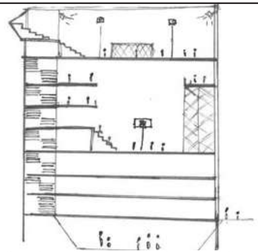


The spatial planning of the facility is made up of 5 different components which house they own individual program and as shown are brought together to to make one facility that has elements of mixed uses and many different functions.

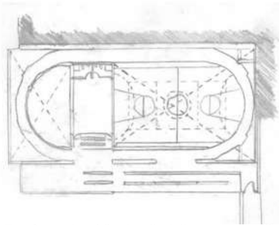
VERTICAL GYM



This sketch is a semi-exploded axonometric looking at the different programs all under one roof and how it different levels are organised.



The section shows that structural layout of the verticle gym with the various voids in place for the various programs and the ciruclation core on the edge of the structure with multiple mezzane levels.



The floor plan idicates that there are multiple voids in the space which is good for ventilation as there are a lot of sports activities that occur in a singular space, with a running track surrounding the main court space and the court represents the potential of different sports occuring .

SPILL OUT SPACE

The term "spill out space" in architecture refers to an area or zone that extends beyond the enclosed or defined spaces of a building. It is often designed to create a transition between the interior and exterior environments, providing a place for people to gather, interact, and engage with the surrounding context. The concept of spill out space has a rich history in architectural design, with examples dating back to ancient civilizations. In ancient Roman architecture, for instance, the atrium served as a spill out space within residential dwellings. It was an open central courtyard that allowed light and air to enter the building while providing a social gathering space for the residents.

In the modern era, the idea of spill out space gained prominence with the emergence of the International Style and modernist architecture. Architects like Le Corbusier and Ludwig Mies van der Rohe emphasized the integration of indoor and outdoor spaces, blurring the boundaries between them. They created buildings with open floor plans and large windows that connected the interior with the surrounding landscape, enabling a seamless flow of space. "The German Pavilion was especially significant and revolutionary because here, Mies challenged the accepted belief that walls must support a building. It seems that during this time in his career, Mies suddenly became aware that structural elements and space-defining elements could be entirely separate entities." (Chen, 2002)

In contemporary architecture, spill out spaces continue to be an integral part of design thinking. They can take the form of terraces, balconies, plazas, or landscaped areas that extend beyond the building envelope. These spaces are often designed to facilitate social interaction, accommodate outdoor activities, and enhance the overall experience of the building's occupants. Therefore, with the increasing emphasis on sustainability and biophilic design, spill out spaces are being integrated as green spaces and urban gardens within buildings. These spaces not only provide a connection to nature but also contribute to environmental sustainability by promoting biodiversity, reducing heat island effect, and improving air quality.

Overall, spill out spaces in architecture have evolved over time, responding to cultural, social, and technological changes. They have become an essential element in creating dynamic, engaging, and contextually sensitive built environments, enriching the relationship between the built form and its surroundings

Architecture is always the will of the age conceived as space - nothing else. Until this simple truth is clearly recognized, the struggle over the foundation of a new architecture confident in its aims and powerful in its impact cannot be realized; until then, it is destined to remain a chaos of uncoordinated forces.

Ludwig Mies van der Rohe

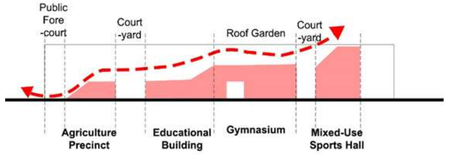


Fig 8.1: Diagrams exploring the ideology of spill out spaces (Author, 2023)

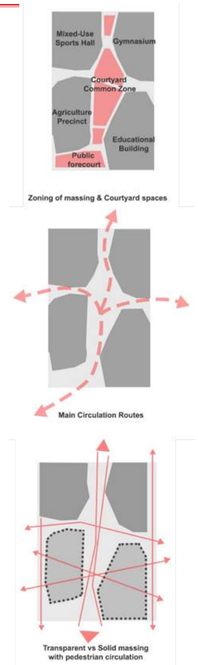


Fig 8.2: Diagrams exploring the ideaology of spill out spaces (Author, 2023)

COMMUNITY ARCHITECTURE

Community architecture, also known as social architecture, is an approach to architectural design and urban planning that prioritizes community engagement, collaboration, and empowerment. It recognizes that the built environment should be shaped by and for the people who will use and inhabit it. This approach emerged as a response to the limitations of traditional top-down design processes, which often neglected the needs, aspirations, and cultural context of the communities they aimed to serve.

In addition to engaging communities in the design process, community architecture emphasizes social responsibility. It addresses social, economic, and environmental challenges within communities, focusing on issues like affordable housing, sustainable design, accessibility, and the promotion of social cohesion. By addressing these challenges, community architecture seeks to improve the quality of life and well-being of community members. Alternative aspects of community architecture are the adaptive reuse and regeneration of existing buildings or areas. This approach recognizes the value of preserving local identity and heritage while adapting spaces to meet contemporary needs. It often involves revitalizing neglected or underutilized spaces through community-led initiatives. This process not only provides functional and meaningful spaces but also fosters a sense of ownership, pride, and social cohesion within the community. (N.Flowers, 2022)

Tactical urbanism has emerged as a notable strategy in the realm of community architecture, involving the implementation of small-scale, temporary interventions within urban spaces to enhance community areas and stimulate community engagement. These interventions, encompassing initiatives like pop-up parks, street art installations, and temporary structures, are typically cost-effective and swiftly executed. They empower communities to swiftly transform their surroundings and experiment with concepts before committing to more extensive endeavours. Over time, community architecture has gained substantial recognition and prominence within architectural and urban planning circles. (Anderson, 2023)

Numerous architects, urban planners, and entities have embraced the ethos of community architecture, focusing their energies on projects that are community centric. Esteemed organizations such as the Open Architecture Collaborative, MASS Design Group, and The Rural Studio have been instrumental in advancing the principles of community architecture. Their endeavours revolve around collaborative initiatives that address multifaceted challenges spanning social, economic, and environmental dimensions, working hand in hand with local communities.

In a remarkable illustration of tactical urbanism, adaptive containers are being designed to serve as transformative tools. These containers are strategically stationed and can be relocated from proposed sites to sports fields in underserved communities. This innovative approach addresses diverse needs such as seating, storage, and facilities. By employing adaptive containers, this intervention effectively combines tactical urbanism with practical utility, fostering positive change within communities in need. In summary, community architecture is an approach that places community engagement, collaboration, and empowerment at the centre of architectural design and urban planning. It seeks to create built environments that are responsive to the needs, aspirations, and cultural context of communities. By involving community members in the design process, addressing social challenges, repurposing existing .

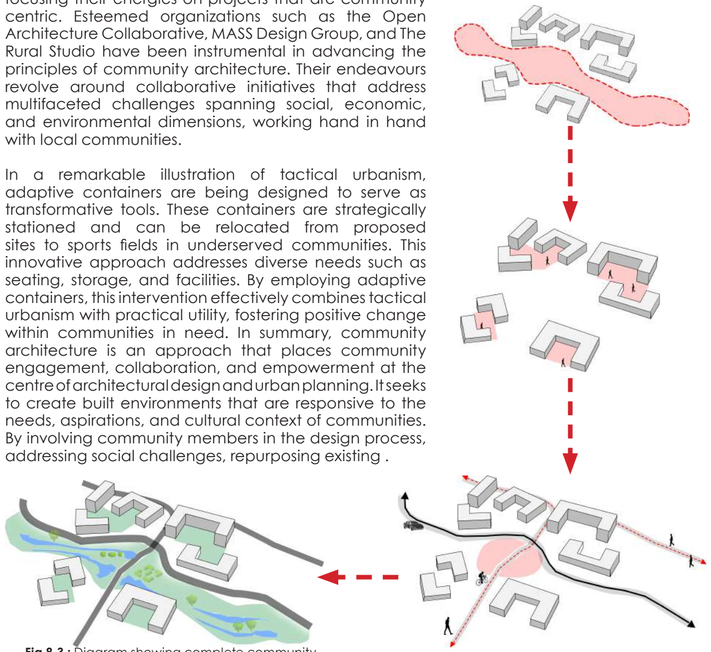


Fig 8.3 : Diagram showing complete community with the added components (Author, 2023)

LOCAL SPORTS FACILITIES

Nike Shapa Community Sports centre

Nike has unveiled a brand-new multidisciplinary sports centre, aimed at inspiring and empowering the next generation of athletes. The new centre, based in Soweto Johannesburg, includes a 400m running track, a skate park, training studio and dance studios, two FIFA-accredited football fields, as well as two small-sided fields.

ANALYSIS

The Nike Shapa community sports center is situated in a good place in terms of the lack of sports development in the township and the need for more recreational spaces with good infrastructure. The issue is that the facility isn't communal, and it works on a booking system or very controlled hours

Paterson Park Multipurpose Centre

ANALYSIS

This is a good example of a community-based sports facility that is designed in an inclusive and cohesive manner. From personal experiences there is a large range of sports activities and spaces for community members to participate in all kinds of activities. It's a secure space and all the outdoor courts are accessible to the public during the day and in the evening, there is a booking system for the indoor facility.

While benefiting the community of Norwood, Orchards, Orange Grove, and nearby areas. This modern facility offers a safe space for development through activities like reading, writing, sports, and health. The centre's strategic placement within the Louis Botha Corridor, connected by the Phase 1C BRT route, optimizes existing clusters for current and future use. Equipped with various sports facilities including swimming pools, soccer fields, tennis courts, and a fully equipped gym, the centre offers a range of programs and activities.

Wanderers Sports Club

The Wanderer's Sports Club is a prominent sporting club located in Johannesburg, South Africa. It is known for its rich history and contributions to various sports, particularly cricket and rugby. The club's facilities also includeds tennis courts, squash courts, and a gymnasium. The Wanderer's Sports Club has hosted numerous international crickets matches and is home to the Highveld Lions cricket team. The club is highly regarded for its sporting achievements, community engagement, and the vibrant atmosphere it provides for both players and spectators.

Wanderers is a prestigious sports club that has a similar programming to the sports facility that's being proposed in this thesis, the only issue is the fact that it's a member only facility that only caters to those who can afford it. It's connected to an upper-class community, but it acts as a private intertie so it's not very inclusive and user-friendly.

ANALYSIS

Fig 8.4 - 8.6 : Local facility analysis , Paterson Park, Nike Shapa, Wanderes (Author, 2023)

CONTAINER - Precedent Studies

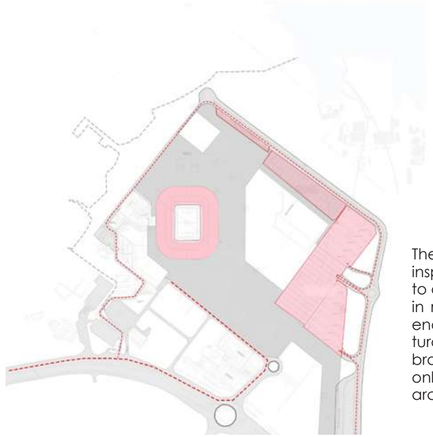
The following precedent studies focus on different building concepts that explore the use of shipping containers and modular construction. These precedents re-invent the idea of traditional sports facilities and focus on the adaptable components that are evident when the use of containers is reconfigured and adjusted to act as different programmatic modules.

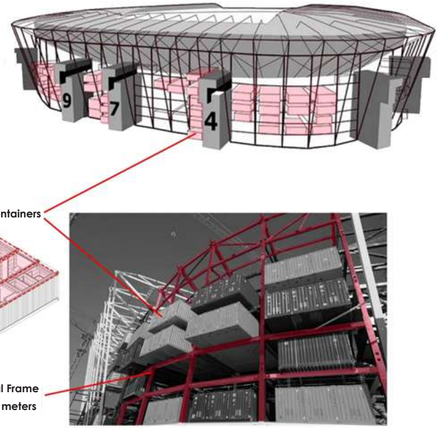
Stadium 974

Fenwick Iribarren Architects
Ras Abu Aboud | Doha, Qatar
2021

Stadium 974, situated in Ras Abu Aboud, Doha, gets its name from Qatar's dialing code and the number of modular components (974 transport containers) used to construct it. Embracing shipping container architecture on an unprecedented scale, the stadium is lightweight and flexible, accommodating up to 40,000 spectators. It boasts picturesque views of Doha Bay and the corniche and is well-connected to airports and the city through the metro system.

The innovative concept originated from an architectural competition held by Qatar's Supreme Committee for Delivery & Legacy. The design team, Fenwick Iribarren Architects, conceived the stadium as a 'kit of parts,' inspired by Meccano and Lego concepts. They combined a grid column-and-beam structure (Meccano) with modular volumes for various stadium uses (Lego), creating a unique and adaptable design.



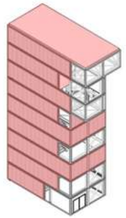


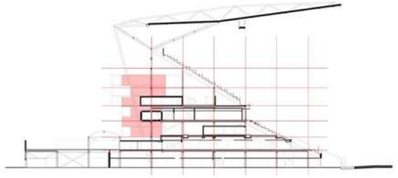
The process of constructing the stadium was focused on modular construction, inspired by direct references like Meccano and Lego concepts. This approach led to a uniform structural frame made from identical construction elements, resulting in repetitive modules. The frame's beams and columns were of the same size, enabling easy assembly and disassembly through bolted connections. The structural grid mostly measured 9 meters x 8.5 meters, except for radial corners. Steel bracing and angled columns provided extra support as needed. Impressively, only 10 unique modules were required to build the entire stadium, showcasing the architects' strong dedication to their original concept.

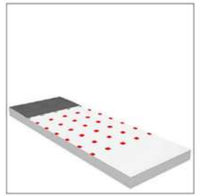
Fig 9.1: Stadium 947, Qatar (Fenwick Iribarren Architects , 2021)

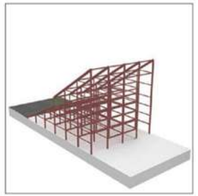
During the design process, cost-effectiveness was a key consideration, leading to a simple yet visually striking façade design that showcased the containers as an iconic identity without unnecessary ornamentation. This was achieved by combining individual containers into larger prefab modules, which, after interior partitioning and finishing, could be easily.
integrated according to functional requirements. These modules were painted to create a vibrant exterior. Fenwick Iribarren Architects designed various modules for purposes like toilets, seating, concessions, offices, and skyboxes. The building services also followed a modular approach, with open piping, ducting, and cables for flexibility and rapid installation.

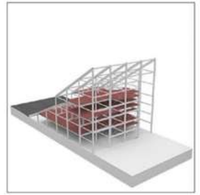
The stadium's most intriguing aspect lies in its potential for Legacy configurations. After hosting seven tournament matches the entire structure is planned to be dismantled. The architects envision two possibilities: firstly, repurposing the stadium components to create smaller venues in countries lacking sports infrastructure, and secondly, completely relocating and reconstructing the stadium at a different site.

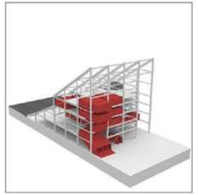





Site Foundation


Structural Frame


Prefabricated Slab


Shipping Containers


Circulation Core

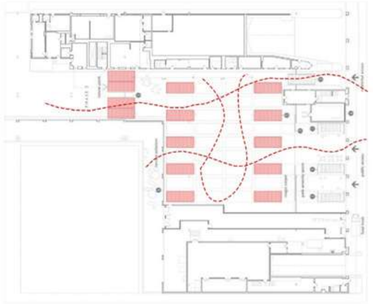
The diagram shows the "Kit of Paths" of how one of the modular constructioned components is used to create the entire stadium, the only time the system differs is when it's used by the curved edges.

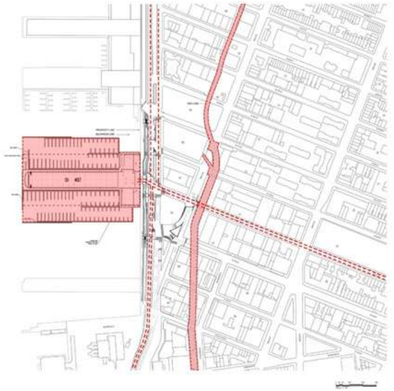
Fig 9.1: Stadium 947, Qatar (Fenwick Iribarren Architects , 2021)

Pier 57

Churtichaga + Quadra-Salcedo arquitectos
New York | United States
2013

At the Aviation Pier located on Pier 57, the upcoming New York Superpier, a captivating installation has been implemented. Shipping containers sourced from Spain have been suspended from the ceiling, evoking the imagery of a magic carpet. These containers are equipped with motors, enabling them to be raised and lowered. This dynamic feature offers a multitude of transformative possibilities, accommodating a diverse range of events. The suspended array of shipping containers creates a vibrant and colorful ceiling, establishing a flexible grid of potential configurations. This innovative design defies gravity, presenting a singular layered backdrop that ingeniously addresses various spatial requirements.





The High Line Bridge

The High Line bridge is a remarkable pedestrian bridge that provides an elevated vantage point overlooking Pier 57.

Pier 57 - Elevated containers

This is the shipping containers lifted to allow activity to happen underneath and some are left down and can be opened depending on the program inside. This is an adaptive system that services multiple functions in an open plan space.

Fig 9.2: Pier 57 (Auadra-Salceo , 2016)

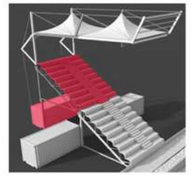
Stadium in Motion

Boogertman + Partners
Victoria | Seychelles
2023 – 2025

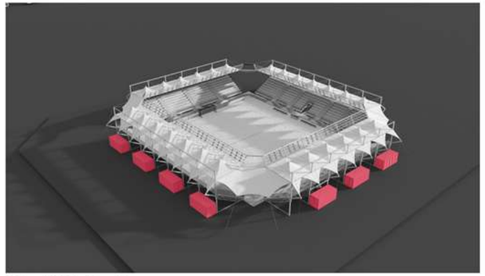
Boogertman + Partners and Fortem Consulting presented the proposal for this project on behalf of the Seychelles Football Association, with the aim of hosting the 2025 FIFA Beach Soccer World Cup. Seychelles is set to become the first African nation to host this event. The stadium boasts a seating capacity of 4,000 spectators and fully adheres to all FIFA event requirements.

Following the conclusion of the World Cup, the stadium will be transformed into two smaller, equally sized arenas. These components will be transported to separate locations on the island and reassembled. The stadium's design revolves around a concept of prefabricated pieces created off-site, which are then transported to the construction site, assembled, and later disassembled to create the two smaller arenas. This innovative approach is driven by the island's limited resources.

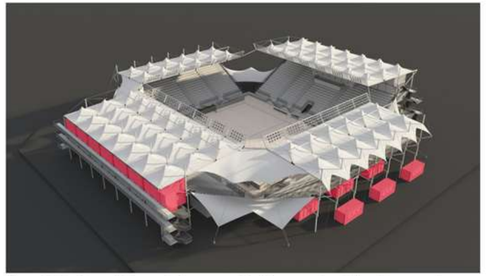
This is the first look at the "Kit of Path" of the Stadium in Motion where the steel frame structure holds up the grandstand seating and the container is used as a structural base. This "Kits of Path" allowed for there to be additions on the structure



The second version of the stadiums "Kit of Path" continues the construction process by 2 containers for additional structural support which allows to add another couple of rows for seating.



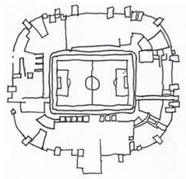
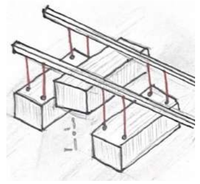
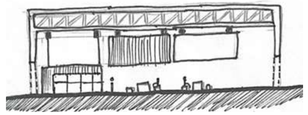
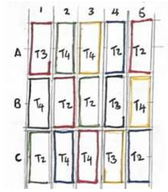
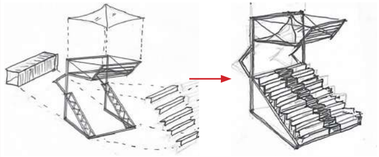
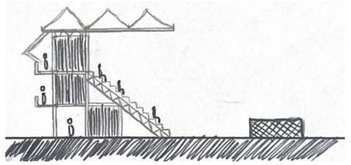
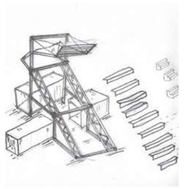
2 Small Stadium 2000 Seats | The containers are being used structural base which holds up the structural frame holding the canterliver shading devices.



Event Stadium 4000 Seats | The containers are added for support and there is a row of containers that are activated for retail and abolutions.

Fig 9.3: Boogertman + Partners, Stadium in Motions (Boogertman 2022)

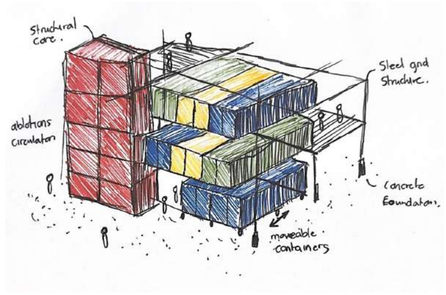
PARAMATERS EXTRACTED

	Axonometric exploration showing containers	Longitudinal section of container layout	Spatial planning of containers
QATAR 974	The Axonometric shows that the containers are protuding which helps with the apperance of the stadium facade and you can also see the circulation core and the structural system . 	 This sketch shows the modular construction layout of the structural steel frame which holds the containers. The randomisation of the containers is shown by the different colours and you can see they have a structural core centred	 The spatial planning of this stadium has the container modules on the outside of the perimeter and the interior peremeiter of the stadium, leaving the space inbetween for ciruclation and leftover programming.
PIER 57	The shipping containers are being hung from two thick steel beams which have a pully system that allow the containers to be raised or dropped due to whatever program occurs on that particular day. 	 This section explores the movement of the containers which are elevated when not being use and specifc containers are brought down to create activity. You also see the truss roof system which holds up the containers which allows for the drastic span.	 The spatial planning in Pier 57 appears to be random but each container from T1 - T4 has is own indiviual programming, therefore making the configuration of the containers relative to what ever program will occupy the space when being used.
STADIUM OF MOTION	 The “kit of path” system shown from deconstruction to assembly and how there could potentially be more additions.	 This sketch shows the stacked containers being activated and used for different programing and also being used as a structural support system.	 This is the final form of the assembly of the stadium stands that used 2 extra shipping containers for more structural stability as there are an additional number of seating and shading that are added to make the grandstands larger.

MODULAR CONSTRUCTION

Modular construction has evolved as a revolutionary idea in architectural design and construction, providing a plethora of benefits that particularly correspond with the aims of creating a multi-purpose sports complex near Alexandra Township. This chapter goes into the modular building idea and its implications for designing adaptive and sustainable sports facilities. In addition, we will investigate the use of shipping container modules as a potential approach of attaining flexibility in the proposed facility's architecture.

Modular construction is a form of constructing that involves the manufacture of prefabricated building components or modules in a controlled industrial setting, followed by transportation to the construction site for assembly. This method differs from typical construction methods, which requires assembling components on-site. The use of modular construction for the sports complex in Alexandra Township is supported by several major benefits.



Process Diagram of the Modular

Modular Construction: A Conceptual Overview

Modular construction, first and foremost, excels in terms of speed and efficiency. This technology drastically decreases building timetables by allowing for the simultaneous production of modules with on-site foundation. As a result, the grandstands may be constructed in a fraction of the time that traditional building processes would require. This increased efficiency is especially important in meeting the area's critical demand for sports infrastructure. Another significant advantage of modular construction is quality control. Modules are manufactured in a controlled environment, ensuring excellent precision and quality. Quality control measures are strict, resulting in a structurally solid and very durable building. This not only protects user safety, but it also increases the facility's longevity, lowering long-term maintenance expenses. Cost-effectiveness is also an important factor to consider.

Although the initial building costs for modular projects may be equivalent to those of traditional construction, the time saved during construction dramatically reduces labor and financing costs. Furthermore, the inherent longevity of modular structures may result in significant savings in terms of maintenance and continuous operation, making it a financially wise choice. One of the most appealing characteristics of modular construction is its inherent versatility. Modules can be developed with flexibility in mind, making them readily reconfigurable, extendable, or reproable as needs change over time. This precisely matches with the purpose of constructing a sports facility capable of supporting changing sporting activities, growing events, and evolving community demands. In essence, modular construction not only provides a quick and cost-effective solution, but it also secures the sports complex in Alexandra Township's long-term relevance and sustainability.

Fig 10.1 : Drawing showing adaptive modular construction components (Author, 2023)

Shipping Container Modules: A flexible Solution

Shipping containers have grown in popularity as adaptable building components, particularly in the context of sports facilities like the one at Alexandra Township. Their basic modularity and abundant availability make them a particularly appealing alternative for building flexible areas inside the facility, and this article delves into the several advantages they provide to improve the facility's flexibility. The availability of shipping containers, first and foremost, is a big benefit. These containers are plentiful and widely available around the world, including Africa. Shipping containers are also known for their extraordinary strength and durability therefore allowing us to use them in different ways not only as program but in some case as a structural element.

Originally intended to survive the extreme circumstances of shipping by sea, they inherently possess the robustness necessary to withstand the demands of athletic activities and stand the test of time, assuring the facility's components' lifetime. Another significant advantage is the ability to customize. Shipping containers may be easily customized to meet the demands of the sports complex. This versatility enables the introduction of diverse facilities such as changing rooms, storage areas, or even classrooms for educational activities, which ideally aligns with the facility's mixed-use concept and increasing community needs. The transportability of shipping container components is another significant benefit. Because of the simplicity with which they may be transported to and from the facility site, they provide a great degree of flexibility in terms of layout and function. Modules may be added or removed as the requirements of the community change over time to create a dynamic and flexible solution, ensuring that the sports facility stays relevant and responsive to changing demands.

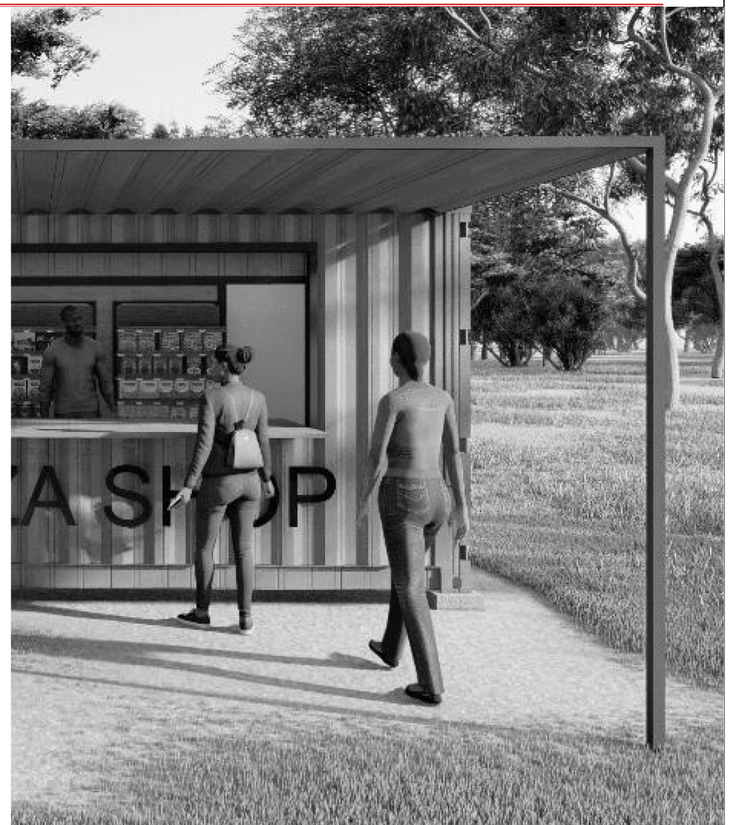


Fig 10.2 : Render showing container module activated (Author, 2024)

Design Considerations for Adaptability

The use of modular construction and shipping container modules into the design of the sports facility in Alexandra Township is a complicated undertaking that necessitates careful planning and consideration of numerous important design components to ensure the facility's flexibility. First and foremost, the layout of the facility must be planned with flexibility in mind. It is critical to design an architecture that allows for quick module rearrangement or extension, ensuring that the facility can easily adapt to changing demands while remaining functional and relevant over time. It is also critical to arrange for modular utility connections, such as plumbing and electrical systems. These connections should be designed to be quickly updated or expanded, easing the process of adding or moving modules as needed, allowing the system to be more adaptable. It is also critical to consider the aesthetic integration of shipping container modules within the facility.

Creative architectural design may turn these modules into aesthetically beautiful pieces that not only fulfill their practical purpose but also improve the overall aesthetics of the sports facility, resulting in a welcoming and appealing setting. Furthermore, community involvement is an essential component of the design process. Involving the local population in the planning and decision-making process allows useful thoughts and preferences to be gathered. By including community members, you can guarantee that the facility is created to fulfill their unique requirements and corresponds with their vision for a community-centered hub, promoting a feeling of ownership and connection to the facility. This collaborative approach not only improves the facility's flexibility but also reinforces its status as a resource. gathered. By including community members, you can guarantee that the facility is created to fulfill their unique requirements and corresponds with their vision for a community-centered hub, promoting a feeling of ownership and connection to the facility. This collaborative approach not only improves the facility's flexibility but also reinforces its status as a resource.

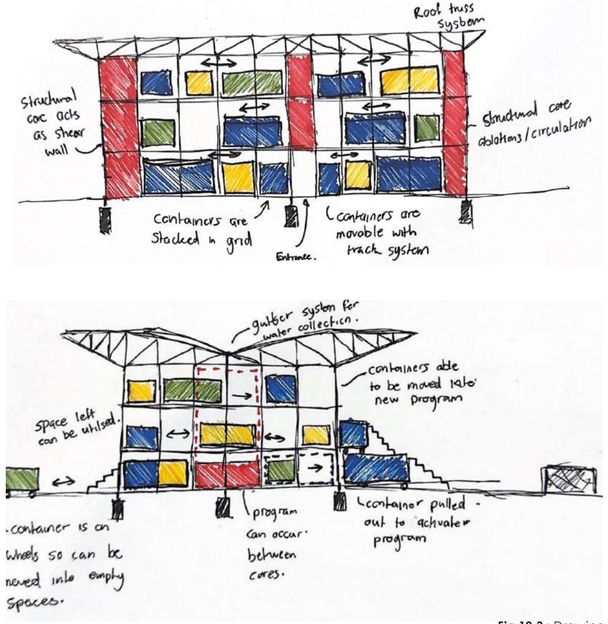
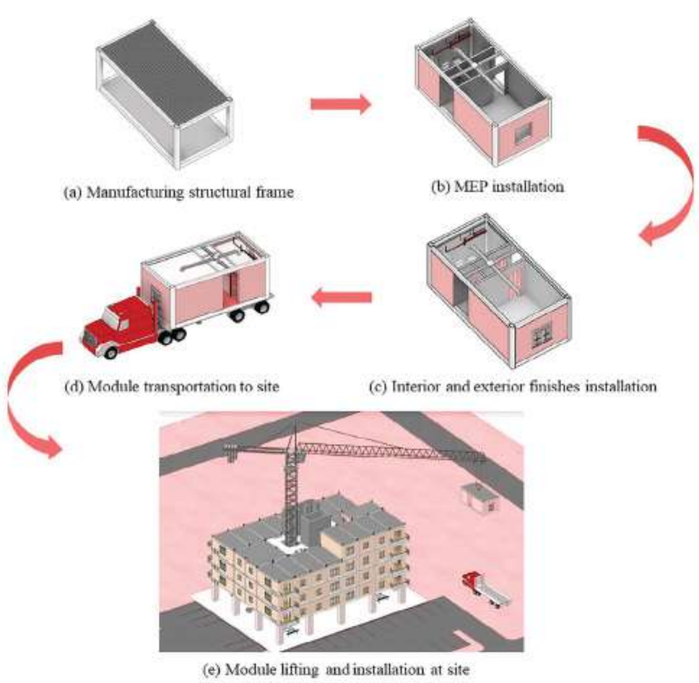


Fig 10.3 : Drawing showing adaptive modular sketch on movable components (Author, 2023)



In conclusion, modular construction, particularly the integration of shipping container modules, offers a powerful solution for designing an adaptable sports facility near Alexandra Township. The benefits of speed, quality, cost-effectiveness, and sustainability make modular construction an ideal choice. By carefully considering design considerations for adaptability, we can create a sports facility that not only addresses the immediate need for sports infrastructure but also evolves with the changing demands of the community, promoting a culture of active living and environmental stewardship. This chapter has laid the groundwork for the practical implementation of modular construction principles in the design of our innovative sports facility.

Fig 10.4 : Modular construction-from manufacturing to site installation. (Sue Chua, 2019)

LOT-EK ARCHITECTS

Lo-Tek Architects, a prominent design studio headquartered in New York, has earned renown for its groundbreaking approach to architecture and design, particularly through the innovative repurposing of industrial materials. Established in 1993 by the visionary Italian architects Ada Tolla and Giuseppe Lignano, Lo-Tek Architects has garnered acclaim for its diverse portfolio encompassing residential, commercial, and institutional projects spanning across the United States and internationally.

At the core of Lo-Tek's ethos lies a steadfast commitment to ecologically responsible and intelligent building practices. The studio has cultivated a critical architectural discourse by delving into the realm of adaptive reuse, or what they term "upcycling," of infrastructural and industrial objects, with particular emphasis on the ubiquitous 40-foot shipping container. Notably, Lo-Tek Architects stands as a pioneer in popularizing the concept of utilizing shipping containers as modular building components, showcasing its viability through numerous award-winning projects.

Beyond their utilization of shipping containers, Lo-Tek Architects has demonstrated a penchant for repurposing a diverse array of objects, including truck bodies, airplane fuselages, and salvaged wood or steel doors, as structural elements in architectural and interior design. Their overarching objective extends beyond mere recycling; they seek to imbue these objects with new life while preserving and celebrating the ingenuity embedded within their original design and construction.

Central to Lo-Tek's ongoing research endeavors is an exploration of man-made objects and systems and their intricate relationships with the built and natural environment on a global scale. This ethos underpins their sustainable approach to construction, characterized by the adaptive reuse of existing industrial objects and systems across projects of varying scales. Through their work, Lo-Tek Architects endeavors to bridge the realms of functionality and aesthetics, cultivating inadvertent elegance and uncovering unexpected beauty by juxtaposing the old with the new, the familiar with the unfamiliar.

In essence, Lo-Tek Architects seeks to showcase the transformative potential inherent within ordinary objects, demonstrating how the mundane can transcend its inherent limitations to become truly extraordinary. Their pioneering spirit and dedication to sustainable design principles serve as a beacon for the architectural community, inspiring future generations to harness the latent potential of adaptive reuse in crafting spaces that resonate with both ecological consciousness and aesthetic allure.

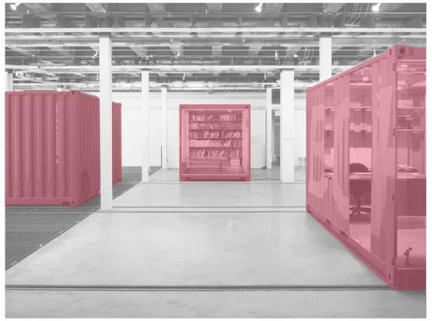
Ada Tolla & Giuseppe Lignano
Founders and CEO of Lo-Tek Architects

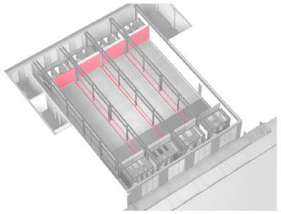
Fig 11.1 : (Koenig, Grundung von LOT-EK in New York 2009)

Bohen Foundation
Lo-Tek Architect
New York | United States
2001

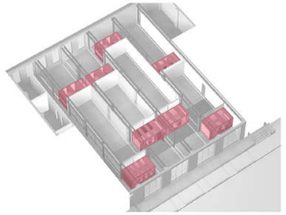
The Bohen Foundation, a major supporter of contemporary art and culture, frequently undertook ambitious projects that went beyond the confines of traditional gallery spaces. One of the noted projects involved working with LOT-EK to convert a former printing facility into a dynamic exhibition space. Faced with the challenge of accommodating a wide range of media formats, including drawings, paintings, projections, sculptures, site-specific works, and multimedia installations, LOT-EK devised an innovative solution.

Their design called for the creation of eight shipping container sections that would fit seamlessly into the facility's rigid square structural grid. Two container sections were strategically placed within each nave of the ground floor, following the existing layout. These sections not only housed necessary facilities like offices, conference rooms, video libraries/projection rooms, and lounges, but they also functioned as adaptable enclosures.

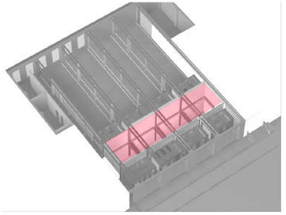




Movable Wall Panel and Track system



8 Custom movable containers



Enclosed space created by containers

Each container section was outfitted with movable wall panels measuring 4.6 x 3.7 meters and packed along its sides. These panels enabled the creation of exhibition spaces by sliding along tracks to predetermined locations. Once positioned, the wall panels were used to separate exhibition areas. The modularity of these panels enabled the customization of exhibition spaces based on various curatorial requirements, accommodating a wide range of sizes and shapes.

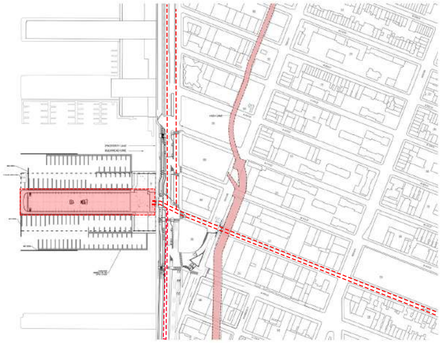
This precedent study demonstrates the successful integration of architectural innovation and functional adaptability to meet the needs of contemporary art exhibition practices. Such efforts provide valuable insights for future architectural projects aiming to improve spatial flexibility and accommodate diverse artistic expressions within institutional settings.

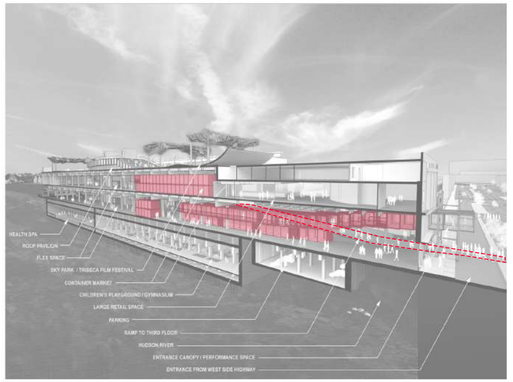
Fig 11.2 :
Warchol & Koenig, Bohen Foundation (2001)

Pier 57 – Superpier Market
Lo-Tek Architects
United States | New York
2008

Pier 57's redevelopment represents a significant effort to transform a once-utilitarian industrial space into a vibrant hub of cultural and leisure activities that blend seamlessly with the scenic Hudson River Park. This precedent study delves into the multifaceted transformation of the four-level structure, imagining a dynamic interplay between indoor and outdoor environments to promote community engagement. It is important to note that this project was only a concept and was never built.

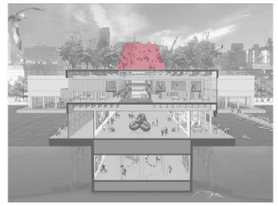
The conversion is centered on the establishment of a 15 793.52 square meter covered, open-air food and retail market, which is New York's first concentration of year-round, affordable work/sell space for craftspeople and small businesses. Ground and second-level restaurants complement this bustling marketplace, while a rooftop park with an outdoor movie and performance amphitheater adds to the recreational offerings. Along with these amenities, a boat marina with café spaces along the exterior esplanades adds to the





Containers and Ramp system

The retail/urban market's interior architecture incorporates the innovative reuse of shipping containers, emphasizing environmental consciousness while paying homage to the site's history.



At the rooftop level, the ramp motif expands to form an open amphitheater within the elevated park, serving as both a shelter for the ramp below and a versatile social space during the day, transitioning into an event venue for outdoor screenings and performances

Fig 11.3 :
(LOT-EK Architects, PIER 57 - SUPERPIER MARKET 2008)

INTERVIEW : Giuseppe Lignano

Maximizing Sustainability and Functionality in Container-Based Architecture:

Insights from Giuseppe Lignano's Interview
In the quest for sustainable architectural solutions, the integration of shipping containers has emerged as a promising avenue for innovation. In an interview with Giuseppe Lignano, the co-founder of LOT-EK architects, insights were gleaned from over 30 years of experience in the field. Lignano's expertise sheds light on the structural potential, adaptability, and sustainability considerations inherent in container-based architecture. This write up aims to extract key points from Lignano's interview, providing valuable insights for architects and researchers seeking to maximize the sustainability and functionality of container-based designs.

Structural Integration and Sustainability:

Central to Lignano's discourse is the imperative of utilizing shipping containers structurally in construction projects. Rather than relegating containers to mere enclosures, Lignano advocates for their integration into the structural framework. This approach not only maximizes sustainability by repurposing surplus containers but also minimizes the environmental footprint associated with traditional building materials. By harnessing the inherent strength of containers, architects can create robust structures that withstand the test of time while mitigating resource depletion and carbon emissions.

Adaptive Reuse and Human-Centric Design:

Lignano emphasizes the concept of adaptive reuse, wherein containers are integrated into existing structures to create human-scale spaces. Through adaptive reuse, architects can repurpose warehouses and industrial buildings, breathing new life into neglected urban landscapes. By incorporating containers into the fabric of these structures, Lignano contends that architects can foster more intimate and environmentally conscious environments. This approach not only reduces energy consumption but also enhances the human experience, fostering connectivity and community within architectural spaces.

Enhancing Mobility and Flexibility in my project :

A key aspect highlighted by Lignano is the need to enhance the mobility and flexibility of container-based designs. By reimagining the structural framework, he suggested that I should facilitate the seamless movement of containers within a space. Lignano suggests incorporating tracks or adopting a more open layout akin to a hangar, enabling containers to be easily repositioned to accommodate changing needs. This emphasis on mobility and flexibility not only enhances the adaptability of container-based designs but also fosters a culture of innovation and experimentation within the architectural community.

Diversifying Design and Historical Context:

In advocating for a departure from a one-to-one ratio between new structures and containers, Lignano draws inspiration from historical architectural practices. He references Michelangelo's design of the Capitol buildings in Rome, highlighting the importance of integrating different scales and orders within a structure. By diversifying design approaches, architects can create more dynamic and adaptable spaces that resonate with contemporary sensibilities while honoring architectural traditions. This synthesis of past and present exemplifies Lignano's commitment to pushing the boundaries of container-based architecture and fostering sustainable design solutions.

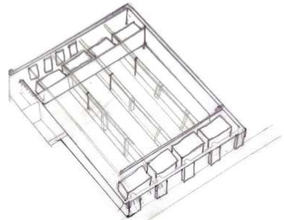
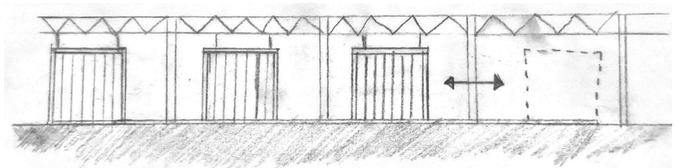
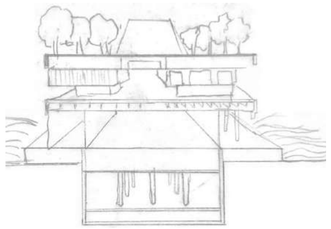
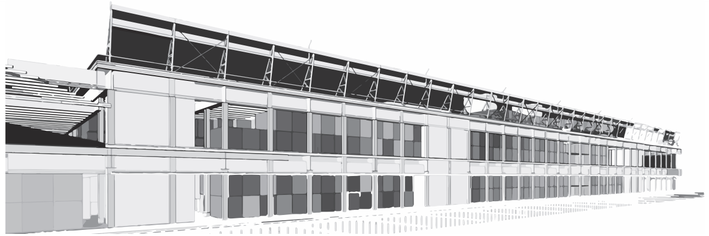
Conclusion:

Giuseppe Lignano's insights offer valuable perspectives on maximizing sustainability and functionality in container-based architecture. By embracing structural integration, adaptive reuse, mobility, and diversifying design, architects can unlock the full potential of shipping containers as a versatile and sustainable building material. As the architectural community continues to grapple with the challenges of urbanization and climate change, Lignano's interview serves as a beacon of inspiration, guiding future research and practice towards more sustainable and human-centric architectural solutions.

Giuseppe Lignano
Co-Founder of LOT-EK Architect

Fig 11.4 : Giuseppe Lignano - Artbridge - connects the public to the arts (2023)

PARAMATERS EXTRACTED

	Axonometric exploration of program	Longitudinal section of mixed use spaces	Spatial planning of facility
Bohen Foundation	 The axonometric demonstrates that LOT-EK transformed and repurposed an existing warehouse by adding containers, which are then moved and controlled via track system. Lignano emphasizes the concept of adaptive reuse, which involves integrating containers into existing structures.	 The longitudinal section highlights the movement of the containers as well as the mechanics' simplicity. The idea that a space is subject to various programs because of its vast size, allowing containers to occupy and activate any space they desire. Lignano suggests that by reimagining the structural framework, I can facilitate the seamless movement of containers within a given space.	
Pier 57 - Superpier market	 This basic axonometric depicts the various levels in Pier 57 that can be activated, as well as how the containers can be used as enclosures for retail programming.	 The longitudinal diagram investigates the concept of the container as a structural element; in a large industrial building with limited programming, the containers are placed on the structure's exterior edges to serve as a structural element. Lignano promotes their integration into the structural framework. This approach maximizes sustainability by repurposing surplus containers while also reducing the environmental impact of traditional building materials.	

PLUG & PLAY: Mobilizing Moving Parts

The concept of plug & play in the context of movable containers extends far beyond mere structural adaptability; it embodies a dynamic approach to intervention, particularly exemplified in Alexandra's narrative. The history of these containers mirrors Alexandra's own journey—a tale of reinvention and multifunctionality born out of necessity in South African townships.

A Legacy of Adaptation:

In Alexandra, these containers have transcended their original purpose, evolving into versatile units catering to many needs. Initially serving as mere storage or temporary shelters, they have morphed into essential components of the township's fabric. Each container bears the marks of its history, embodying resilience, and adaptability—a testament to Alexandra's spirit.

Originally, these containers were simple structures erected for storage or makeshift housing. However, over time, they have undergone a remarkable transformation, becoming integral to the daily lives of Alexandra's residents. Through years of repurposing and modification, they have acquired a symbolic significance, symbolizing the community's ability to adapt and thrive in challenging circumstances. Each container tells a story of resilience, serving as a tangible reminder of Alexandra's enduring spirit in the face of adversity.

Multi-functional Marvels:

The versatility of these containers knows no bounds. From ablutions to tuck shops, adjustable grandstands to medical consultant rooms, food stands to retail spaces, they seamlessly transform to fulfill diverse requirements. Their modular design allows for quick reconfiguration, catering to changing demands with ease. This adaptability ensures that Alexandra's needs are met promptly and efficiently, fostering a sense of empowerment within the community.

These containers have become indispensable fixtures in Alexandra, serving a myriad of functions that range from meeting basic needs to facilitating economic activity. Their ability to adapt to various purposes underscores their importance as flexible assets within the township. Whether it's providing essential services or creating entrepreneurial opportunities, these containers play a vital role in sustaining the social and economic ecosystem of Alexandra.

Deploying Mobility:

The mobility of these containers amplifies their impact, extending Alexandra's reach beyond its borders. Deployed strategically, they act as catalysts for change in neighboring areas, bringing essential services and opportunities to underserved communities. Whether transported by truck or repurposed as pop-up installations, they bridge gaps and foster connections, embodying the ethos of inclusivity and accessibility.

By leveraging their mobility, these containers become agents of transformation, breaking down barriers and expanding access to resources. They serve as conduits for social change, enabling communities to overcome geographical constraints and benefit from shared resources. Through strategic deployment, they create pathways for collaboration and mutual support, strengthening the bonds between Alexandra and its neighboring areas.

Flexibility in Action:

The plug-and-play nature of these containers facilitates endless possibilities. With countless combinations and configurations, they can be tailored to suit any context or requirement. Whether deployed individually or as part of a larger network, they seamlessly integrate into their surroundings, adapting to the unique needs of each community they serve. This flexibility ensures that Alexandra remains at the forefront of innovation, continuously evolving to meet future challenges.

These containers serve as dynamic platforms for innovation, allowing communities to experiment with different models of service delivery and economic development. Their adaptability enables them to respond swiftly to changing circumstances, ensuring that they remain relevant and effective over time. By embracing flexibility, Alexandra harnesses the full potential of these containers to create sustainable solutions that address the evolving needs of its residents.

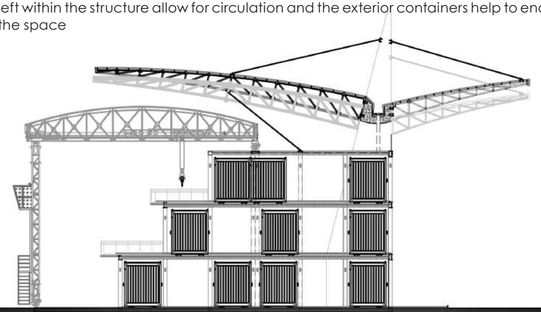
Conclusion:

In essence, the mobility of these containers transcends mere physical transportation—it embodies the spirit of adaptation and resilience that defines Alexandra. As they journey from one location to another, they carry with them the legacy of reinvention and the promise of a brighter future for all who encounter them. By serving as versatile building blocks that can be easily transported and repurposed, these container modules become agents of positive change, bringing essential interventions to communities in need. Their ability to adapt to diverse contexts and requirements makes them invaluable tools for addressing social, economic, and environmental challenges. As Alexandra continues to harness the potential of these containers, it not only transforms its own landscape but also inspires other communities to embrace innovation and creativity in pursuit of a more sustainable and inclusive future. In this way, the humble container emerges as a symbol of empowerment, bridging gaps, fostering connections, and paving the way for meaningful progress in communities around the world.

Fig 12.1 : Render demonstrating the container modules off-site (Author 2024)

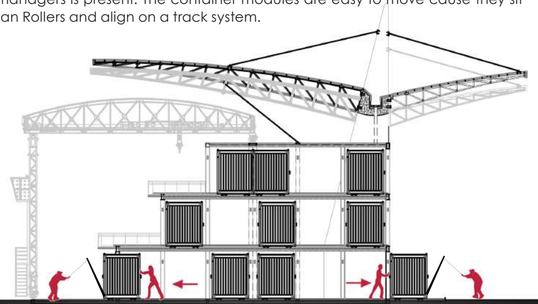
1. Plug & Play: Mobilizing Moving Parts

The structure sits closed which indicates that the facility itself is also closed. The gaps left within the structure allow for circulation and the exterior containers help to enclose the space



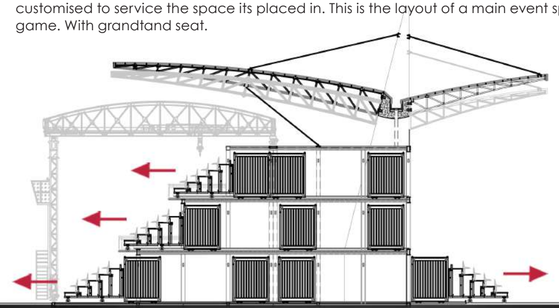
2. Moving and Opening structure for various event

The structure can be opened up by locals or employees of the facility as long as the facility managers is present. The container modules are easy to move cause they sit on Hillman Rollers and align on a track system.



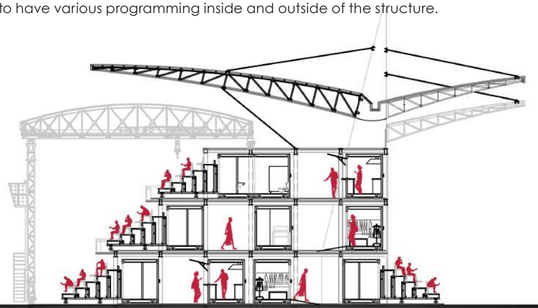
3. Containers open up to activate the space

The container modules are designed in a way that allows them to be opened up and customised to service the space its placed in. This is the layout of a main event sports game. With grandtand seat.



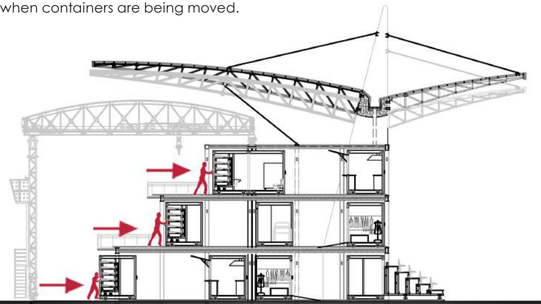
4. Main Event: The structure is fully activated

When the structure is open and fully active , the moving of the containers allow for the space to have various programming inside and outside of the structure.



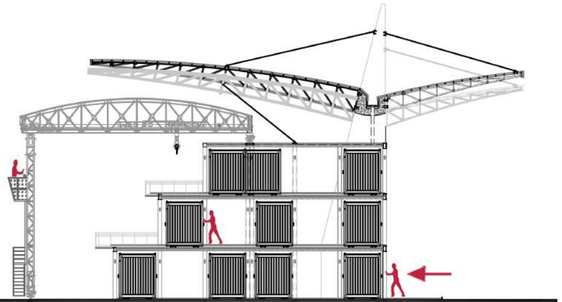
5. Container modules assembly

The container modules are simple to activate and does not require the user to be professional or a specialist. There do however have to be the facility manager present when containers are being moved.



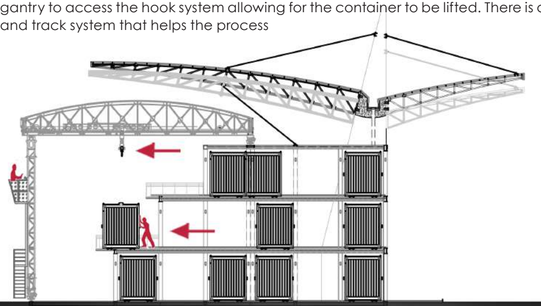
6. Containers moving off-site

The only specialist need for the structure is the gantry crane specialist and the person who assisting with connect the crane with the container.



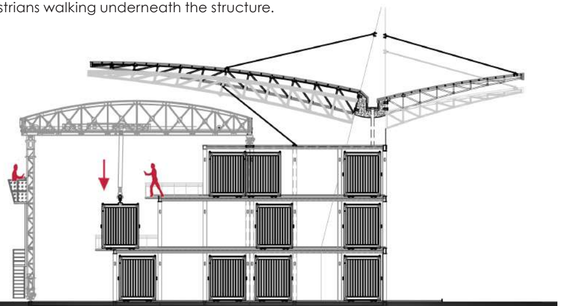
7. Container and gantry crane

The containers are pushed out to the edges of the stepped structure allowing for the gantry to access the hook system allowing for the container to be lifted. There is a grid and track system that helps the process

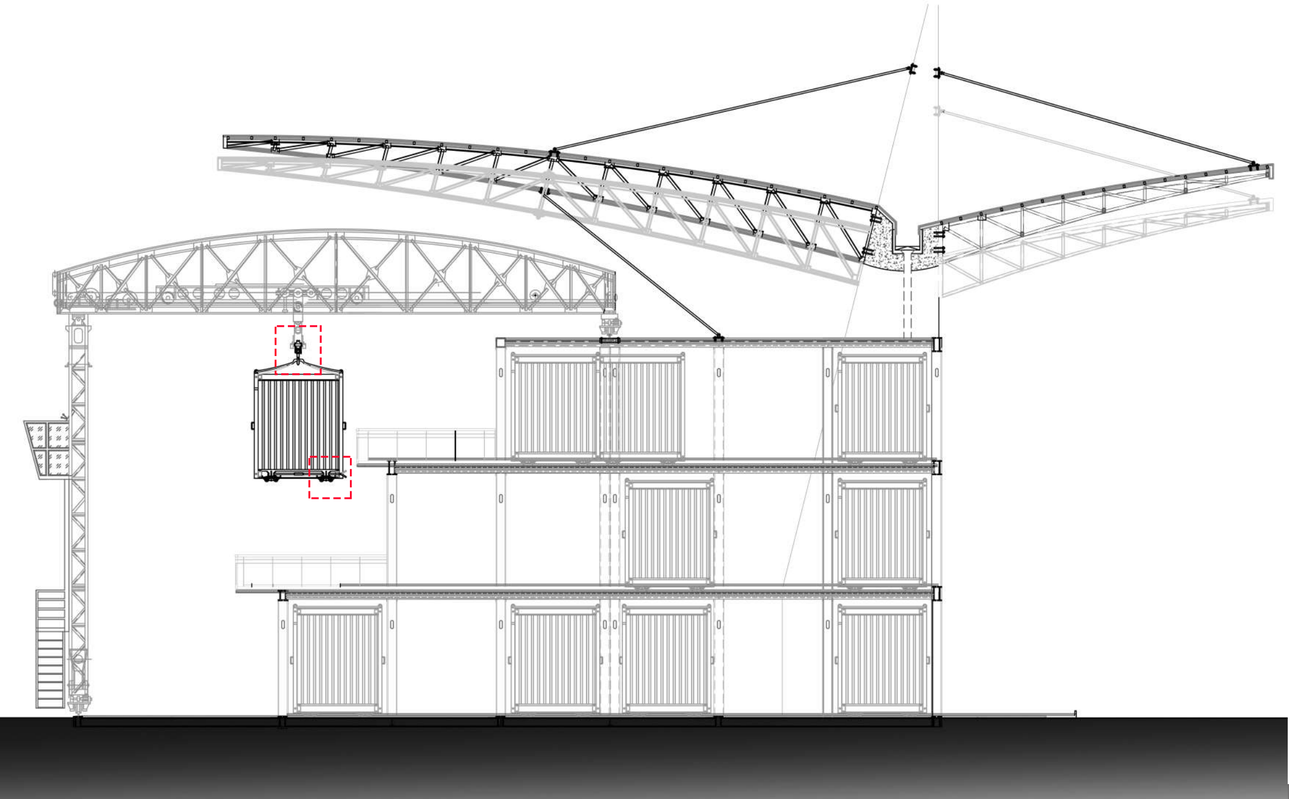


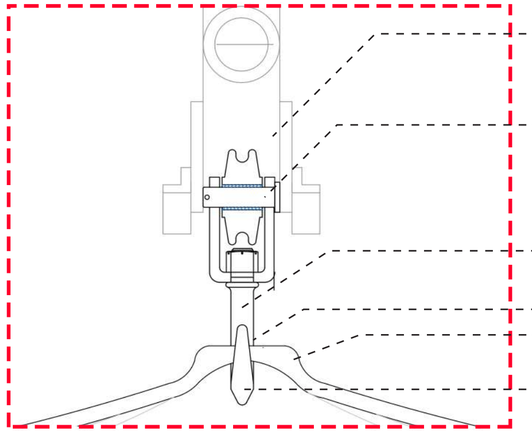
8. Connection between Gantry & Container

The two specialist help with connect the container and ensuring there are no pedestrians walking underneath the structure.



DETAIL CONSTRUCTION : Hillman Roller and Gantry





Crane Connection
The crane is connected to a hook and locked inplace to ensure stability.

Locking Cap
The container has a steel structure welded to the container and the top of the Hillman Rollers.

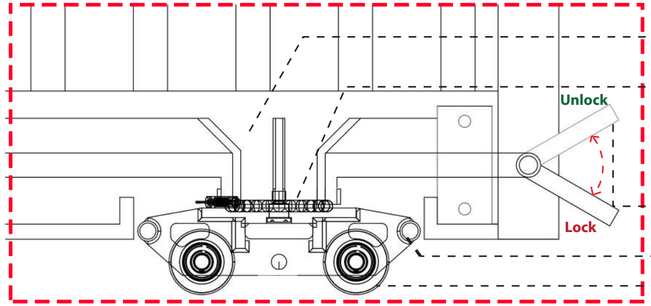
Eye Hook
Crane hooks are typically made of high-strength steel or alloy and are engineered to withstand the stress and strain of lifting operations

Hook Saddle

Wired Rope
Wired roped is connected to the four corners of the container and allows for the container to be lifted by the crane.

Load Hook

CRANE HOOK CONNECTED TO GANTRY



Connection Hillam to Container
The container has a steel structure welded to the container and the top of the Hillman Rollers.

P Padded
Padded steel tops, with built-in neoprene pad, allow some compression and provide a non-slip surface for moving on less than perfect floors.

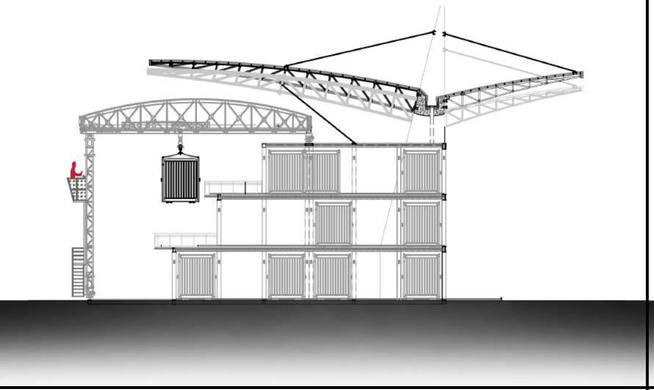
Lock / Unlock Paddle
The paddle allows for the container modules to lock in place so that it doesnt move while active. Then unlocked when needed to be moved.

Hillman Roller

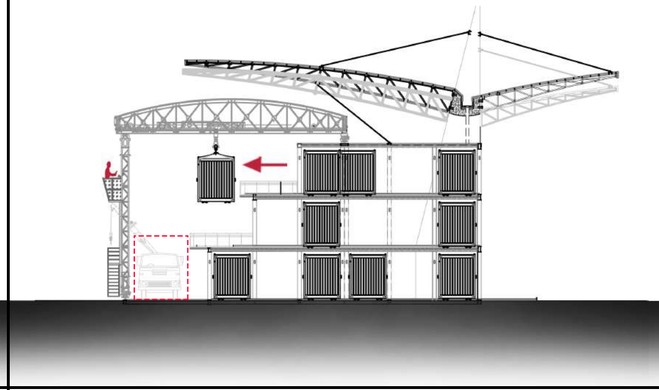
Wheels
For straight line moving choose the Rigid style rollers. Whether the rollers are placed in a track or used a stand alone movers, they move the heavy-weights back and forth with ease.

HILLMAN ROLLER CONNECTED TO CONTAINER

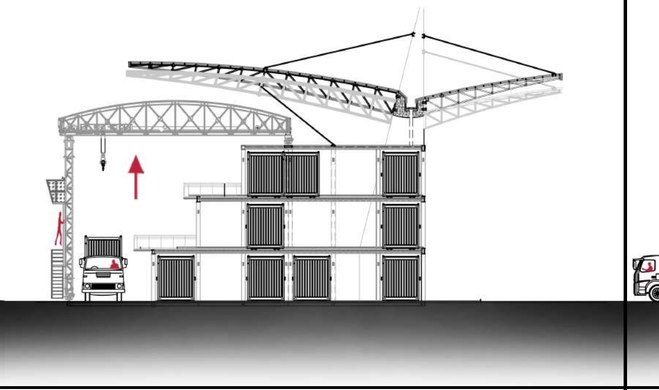
9. Container is lifted



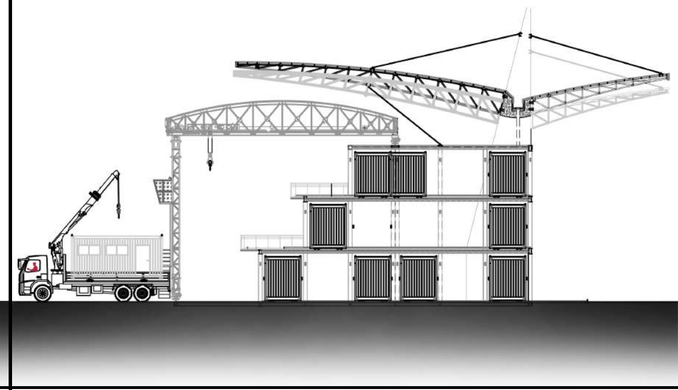
10. The Truck arrives at pick up



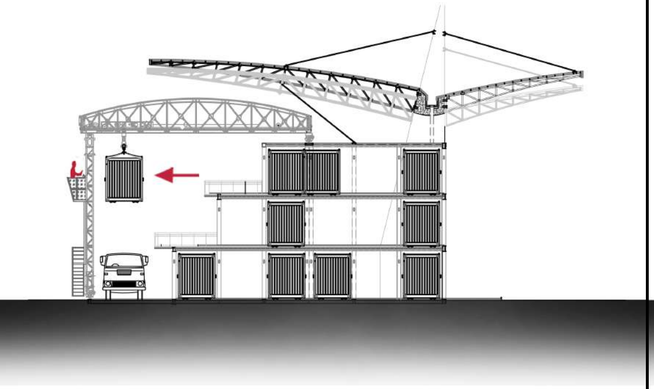
13. Gantry disabled and specialist entres truck



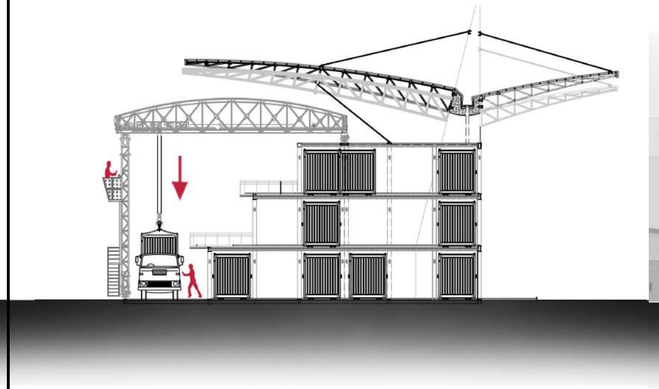
14. Truck leaves structure



11. Container moved to drop off lane



12. Container dropped in Truck



15. Truck leave facility going to site

16. Truck offload container

Fig 12.2 : Hunters Pick n Pay, Balshaw & Fogarty Commercial Architects (2020) (Modified by Author 2024)

Fig 12.3 : Stock, Children playing outside a workers' hostel in Alexandra Township; Johannesburg (2016) (Modified by Author 2023)

This shows that the containers can be dismantled and moved off site and set up to create various interventions

Fig 12.4 : Render demonstrating the container modules off-site (Author 2024)

CONTAINER PARK: Mobilizing Moving Parts

The container concept proposed for the multi-purpose sports facility not only draws upon the historical significance of containers in township and rural areas but also emphasizes adaptability and the inherent rawness that makes it relatable to the communities it serves. This section delves deeper into these concepts and their implications for community empowerment while also showing that since the site is outside of Alexandra the idea of considering community is multilayered.

Adaptability in Design:

Central to the container concept is its adaptability. Unlike traditional brick-and-mortar structures, containers offer a level of flexibility that aligns with the ever-changing needs of communities. The modular nature of containers allows for easy customization and expansion, ensuring that the facility can evolve alongside the community it serves. This adaptability extends beyond physical design to encompass programming and functionality, enabling the facility to cater to various activities and initiatives.

Honoring Tradition:

The concept of the container is not to reinvent the wheel but to shine a light on a concept that has stood the test of time. Containers have long been integral to township communities, serving as versatile solutions for housing, storage, and commerce. By incorporating containers into the design of the multi-purpose sports facility, the project honors this tradition while infusing it with modern functionality. This approach acknowledges the resilience and resourcefulness of township communities, highlighting their ability to thrive in challenging circumstances.

The project seeks to modernize the container concept in many aspects, integrating cutting-edge technology and sustainable design practices. However, it is the rawness of the container that resonates most deeply with the communities it serves. The unadorned, industrial aesthetic of containers evokes a sense of authenticity and simplicity, creating a space that feels genuine and accessible. This rawness serves as a reminder of the community's roots and fosters a sense of pride in its heritage.

Containers displaying sporting event - Off-site

Fig 12.5 : Render demonstrating the container modules off-site in sports field layout (Author 2024)

Community Relatability:

Ultimately, it is this combination of adaptability and rawness that makes the container concept so relatable to the communities it serves. By embracing the familiar while embracing the innovative, the multi-purpose sports facility becomes more than just a physical structure; it becomes a symbol of community empowerment. Through collaborative design processes and ongoing engagement, the facility reflects the community's values and aspirations, driving positive social change from within. The containers play a large role in this by their movement through the site and off-site. The container concepts were built on relatability and flexibility. The relatability of these modules allows for the community to be comfortable to filter into the sports facility but because the adaptability goes both ways the containers are also able to be dismantled and transported into these communities in need. This concept looks to consistently give neighboring communities interventions that could potentially revitalize the area and then these interventions could also positively affect the informal trade allowing for freelancers to occupy these containers and bring them to life.

Strategic Location and Container Movement:

The centrality and accessibility of Marlboro and Gautrain make them ideal locations for the proposed sports facility. Situated within reach of the broader community, these areas ensure inclusivity and ease of access, essential factors in promoting participation and engagement. The location also assists with the movement of the container of the site into the communities, the location ensures a quick and easy route from the site to wherever the container interventions are needed. Furthermore, the proximity to the Gautrain station facilitates seamless transportation for individuals from diverse parts of Johannesburg, enhancing the facility's reach and impact. Building upon the foundation laid by community involvement and strategic location considerations, the integration of the container concept emerges as a compelling approach to facility development.

In conclusion, the container concept represents a nuanced approach to community empowerment, blending adaptability with time-tested rawness to create functional and meaningful spaces. By embracing the inherent qualities of containers and building upon their rich history, the proposed multi-purpose sports facility offers a beacon of hope and opportunity for the township of Alexandra and beyond.

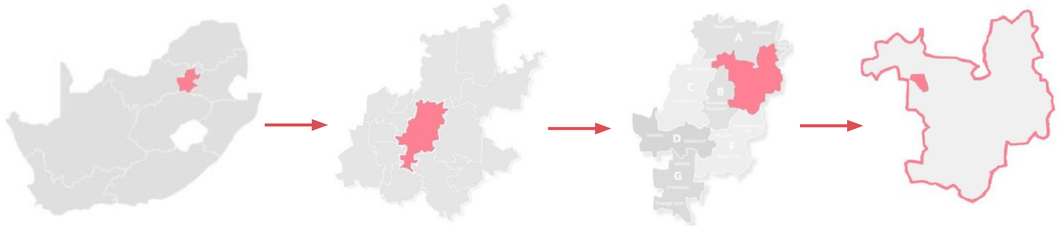
Containers displaying a retail hub - Off-site

Fig 12.6 : Render demonstrating the container modules off-site showing a market layout (Author 2024)

This shows that when placed correctly and activated the containers can create a market spaces.

Fig 12.7 : : Render demonstrating the container modules off-site showing a market layout (Author 2024)

SITE ANAYLSIS



SITE SELECTION

The site selection process underwent multiple iterations in pursuit of aligning with the core ideologies explored in this thesis. Several key factors drove the selection, notably access, space, and the aspiration to foster inclusivity and professionalism within the chosen community. Accessibility was a paramount consideration, encompassing proximity to major transport arteries and the availability of public transportation to ensure ease of commuting for all, including those without personal vehicles. Additionally, the scale of the envisioned facility necessitated ample space to accommodate its diverse activities and expansive layout.

Conducting site visits across Midrand, Sandton, and Alexandra revealed Alexandra as the most fitting location. Here, the absence of robust sports infrastructure underscored the pressing need for a facility designed to cater to all members of the community. However, initial assessments of potential sites within Alexandra revealed challenges, such as unstable soil conditions that rendered the initially favored location near the Gautrain terminus unsuitable for heavy construction.

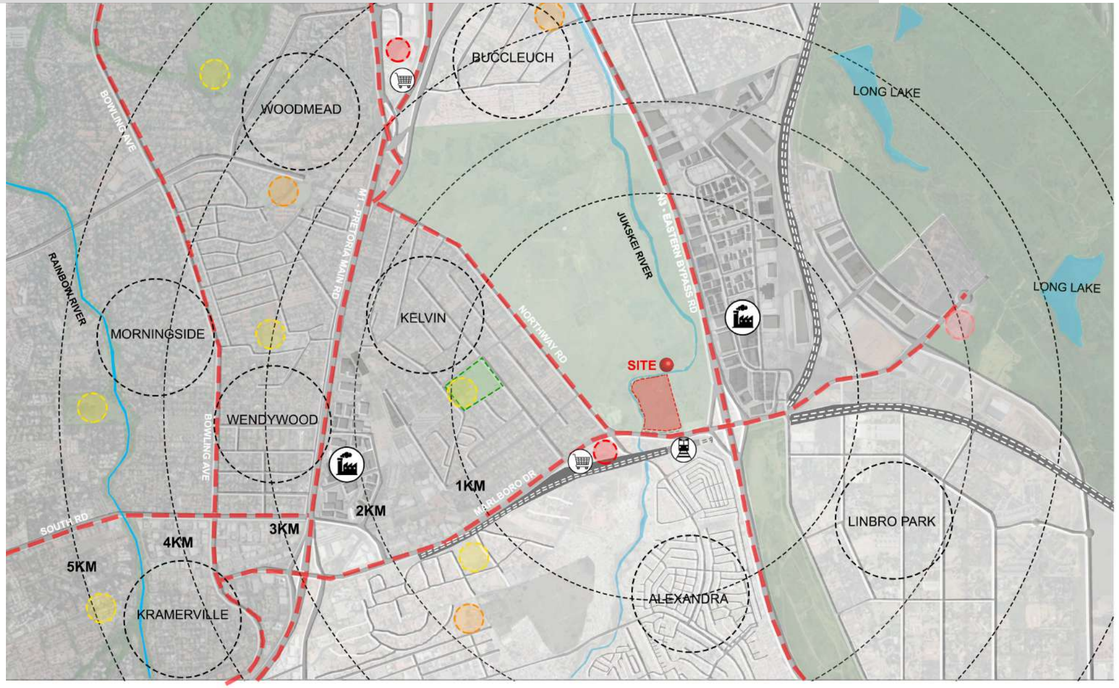
Subsequently, attention turned to the Frankewald site, situated opposite the Gautrain and Alexandra. This alternative not only addressed the accessibility concerns but also presented a wealth of opportunities. Its strategic positioning facilitated engagement with surrounding communities while laying the groundwork for future urban development initiatives. In essence, the selection of the Frankewald site not only fulfilled immediate project requirements but also aligned with broader aspirations for community empowerment and sustainable urban growth.

Site Information

Locality: Linbro Park, Alexandra
ERF: RE/5/37-IR
Area: (2 906 990m2)
Street: Marlboro Drive
Restrictions: 10m flood line along Jukskei River
Town planning scheme: City of Johannesburg Land use scheme, 2018
Zoning: EDUCATIONAL

Fig 13.1: Google Earth export edited by author (Author, 2023)

Macro Map | Primary road network , retail & facility zoning



- Main Transport route
- Region zoning
- Private Hospital
- Retail
- Schools with sports facilities
- Informal recreational parks

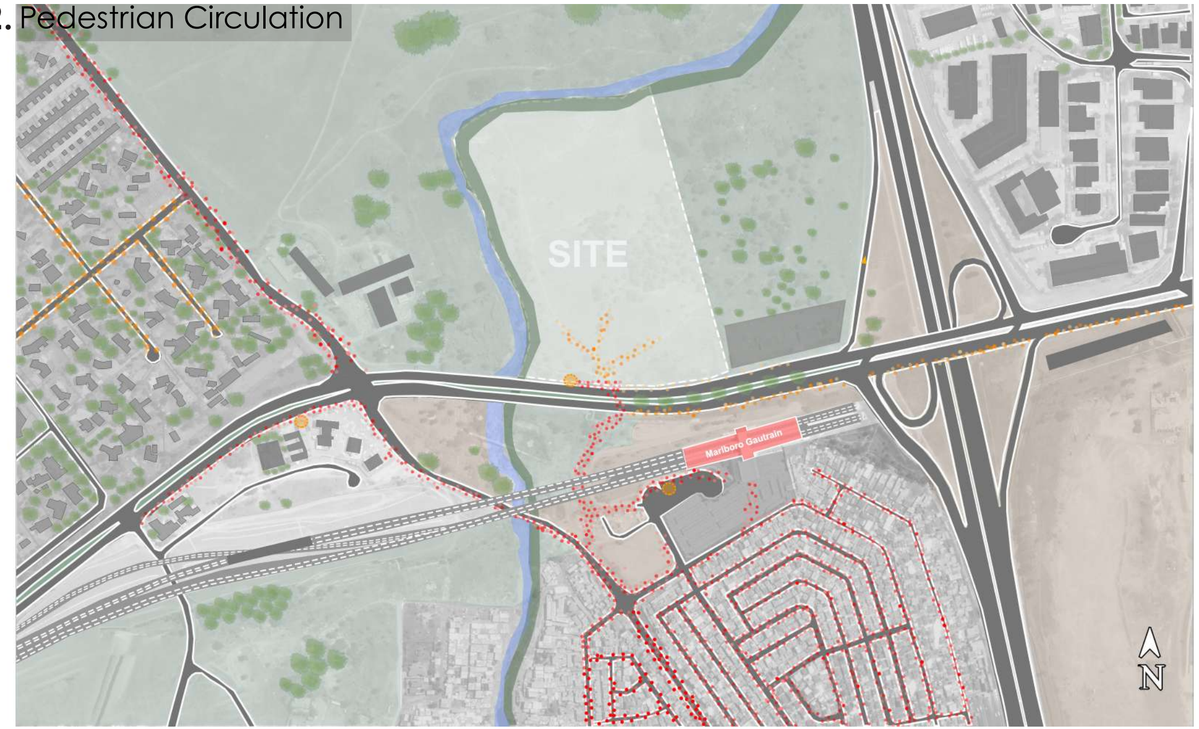
Fig 13.2: Google Earth export edited by author (Author, 2023)

1. Transportation Routes & Zoning residential

The vechile circulation routes show that there will have to be an alternative parking solution that will allow for vechiles to offload comfortably off the busy road witho causing traffic. The site is in a isolated area but there are residential communities that are near by that travel past the site everyday and there is a small retail area where theres a garage and fast food restaraunt.

Fig 13.3: Google Earth export edited by author (Author, 2024)

2. Pedestrian Circulation



This map shows the pedestrian movement routes and as shown the most dense movement occurs in Alexandra. The movement routes are infomal in some case which created man made walkways through specific areas of the propsed site which began to inform the design. The river has been given an ecological buffer which will allow for the Juksei river to be revided and kept after and there will be various plants planted around the river to emphasixe the buffer.

Fig 13.4: Google Earth export edited by author (Author, 2024)

CHARETTE EXPLORATION

1. Collage

This collage delves into the site's context and the community enveloping it. My primary focus revolves around empowerment and unity, as I aim to foster a meaningful link between the suggested intervention and the underserved, isolated township amidst ongoing developments. The collage visually emphasizes the opportunities for forging connections and underscores how the proposed sports facility might alleviate the prevailing challenges within the township.

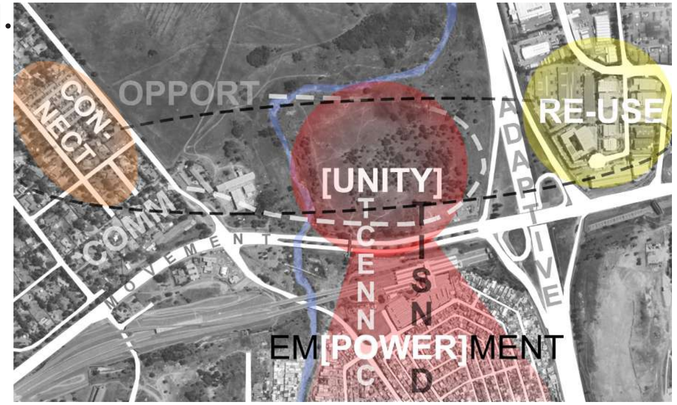
2. Materiality

A. These are smaller scaled material explorations with clay turned into a brick, with the intention of exploring different patterns through models.

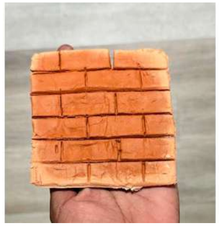
B. Casted off shatter concrete, which will be a material that will be explored as the project develops

C. Brick being a one of the primary building material in this intervention, there was a need to explore different ways to make this brick façade interesting. This specific brick has multiple frogs which will allow you to run reinforced steel beams through them to hold the slanted bricks in place.

1.



2.



A.

B.

C.

Fig 13.5: Google Earth export edited by author (Author, 2023)

Fig 13.6 : Photos by (Author, 2023)

3D SPATIAL EXPLORATION - Option 1

Site Model

The design charette became about linking conceptual design to main themes that I will be exploring in my sport's complex masterplan. The intention is to experiment with model making, mapping and materiality to ensure that you start imagining the look and feel of the proposed intervention. The key theme that each explorations would link back to are community, adaptivity, sustainability and sports development

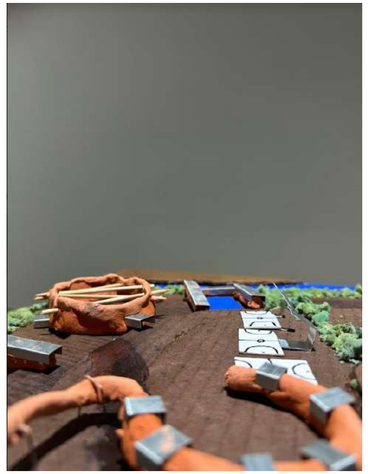
Comments:

The organic design of the project effectively harmonizes with the contextual surroundings and provides a natural flow for movement throughout the site. The utilization of clay in shaping these organic forms prompts consideration of the materials suitable for constructing these expansive yet gentle structures. The placement of the buildings takes into account various forms of hierarchy, while the bridge connection seamlessly integrates with the community building, contributing to a cohesive and well-thought-out design.

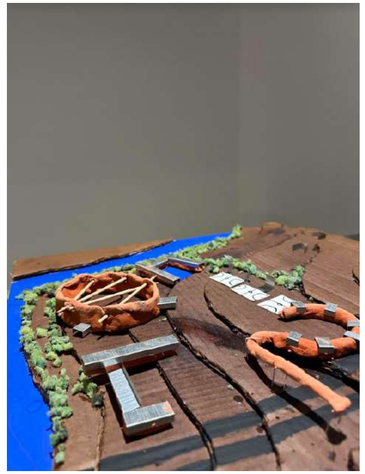
Fig 13.7: Photos by (Author, 2023)

Organic vs Rigid

SITE MODEL



VIEW 1



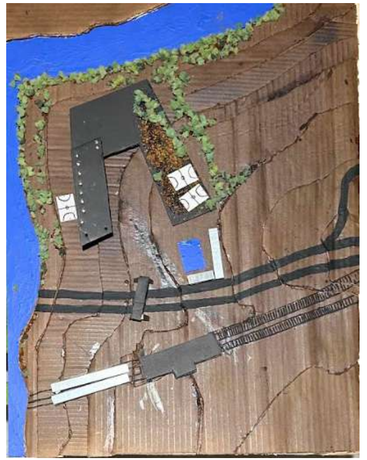
VIEW 2

3D SPATIAL EXPLORATION - Option 2

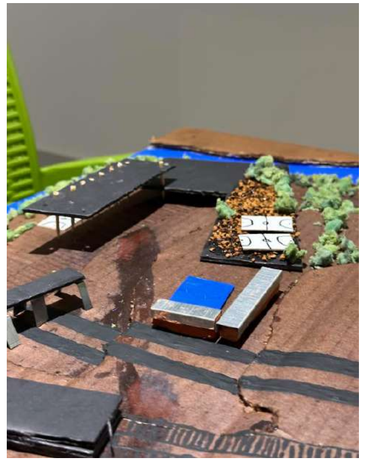
Comments:

The initial concept for the building design starts to cleverly engage with the dramatic variations in site elevation. Notably, the utilization of rooftop spaces adds an intriguing dimension to the project. Elevating the primary structure along the riverfront is a commendable choice, although it's important to consider potential unintended consequences, such as redirecting traffic into areas that might not align with the intended programmatic layout. Additionally, there appears to be a substantial amount of unused space between the buildings that warrants further attention and consideration..

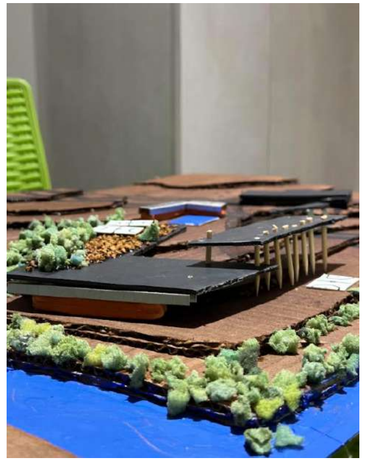
Fig 13.8 : Photos by (Author, 2023)



SITE MODEL



VIEW 1

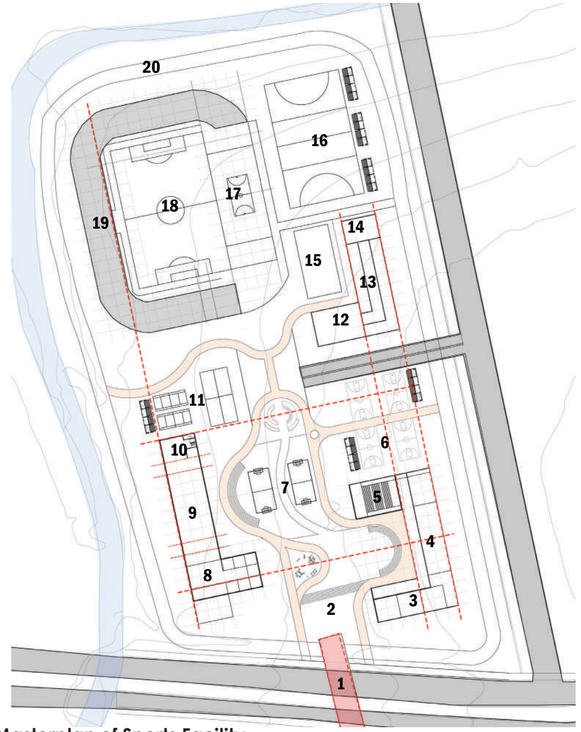


VIEW 2

DESIGN DEVELOPMENT

Design Development has been left out of the draft of the research report as I have been focused on the writing components of the booklet. I will be displaying the process of my design journey from where it started to where it is now, I just need to curate it in a way that translate the development process clearly.

REVIEW 2



Masterplan of Sports Facility

LEGEND:

1. PROPOSED PEDESTRIAN BRIDGE
2. PUBLIC INTERFACE
3. SEMINAR ROOM
4. COMMUNITY HALL
5. AUDITORIUM
6. OUTDOOR BASKETBALL / NETBALL COURTS
7. 5 A SIDE FUTSAL
8. RETAIL ZONE (FORMAL/INFORMAL)
9. AGRICULTURE CENTRE
10. RECEPTION
11. PADDLE TENNIS & TENNIS COURTS
12. GYM
13. WORK SPACES / MEDICAL ROOMS
14. SPORTS SCIENCE CORNER
15. SWIMMING POOL
16. ASTRO TURF
17. MULTI - PURPOSE CENTRE
18. SOCCER FIELD
19. STADIUM STANDS / CHANGE ROOM
20. RUNNING TRACK

Connections

Activating inbetween spaces

Accessibilty from courtyard to spill out spaces

Access points closed off to create internal event space

Transparent thresholds allow free flow access

Site Plan

The initial masterplan successfully integrated a cohesive design language and program layout. In particular, the landscape architecture was deliberately crafted with organic forms, providing a striking contrast to the more structured and rigid building forms.

The core objective of the building layout is to establish inviting spill-out spaces that breathe life into the central spine traversing the site.

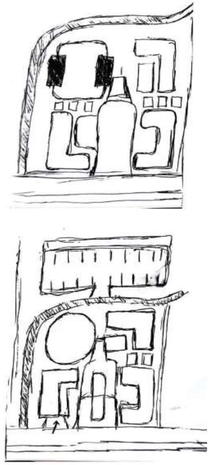
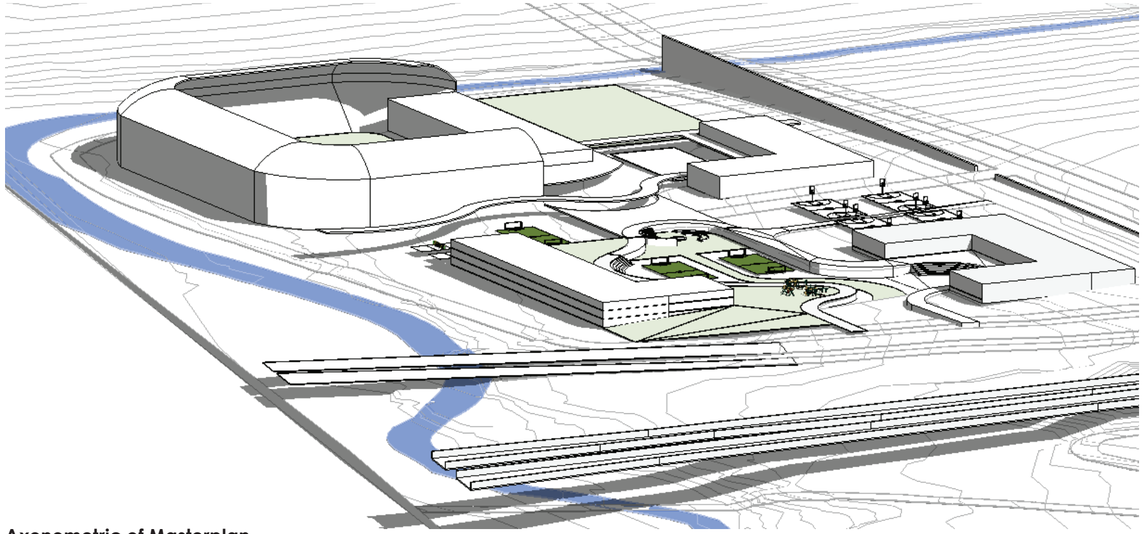


Fig 14.0 : Concept sketches.
(Author, 2023)



Axonometric of Masterplan

Fig 14.2 : Review 2 submission showing the axonometric of site
(Author, 2023)

Site Plan

The initial masterplan successfully integrated a cohesive design language and program layout. In particular, the landscape architecture was deliberately crafted with organic forms, providing a striking contrast to the more structured and rigid building forms.

The core objective of the building layout is to establish inviting spill-out spaces that breathe life into the central spine traversing the site.

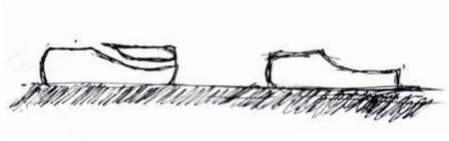


Fig 14.3 : Review 2 submission showing rendered sectional elevation
(Author, 2023)

ADAPTIVE CONTAINERS

Container modules

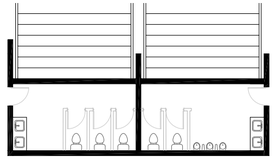
This marks the initial rendition of the container modules designed to serve as versatile mixed-use units. They will be initially stationed on-site and have the potential to be relocated to recreational areas lacking proper infrastructure. Each of these shipping containers is equipped with foldable grandstand seating that can be easily extended or retracted according to demand, optimizing space utilization. The remaining space within the container lends itself to a variety of purposes, such as ablutions, retail spaces, or medical bays.

Ideally, these modules are designed to be mobile and adaptable, with the primary objective being the creation of a modular design that can be customized to suit any given context. This concept envisions these modules as a central theme for the sports facility, drawing inspiration from the familiar structures found in Alexandra and other disadvantaged communities, where similar container-based programs have been successfully implemented.

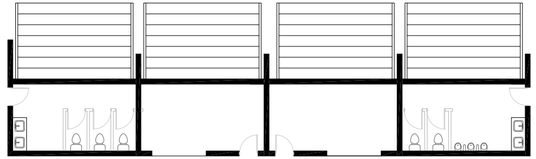
Lecturers comments:

The current design appears to have issues with scale and lacks the necessary level of detail regarding the operational aspects of the structure. It is imperative to delve deeper into spatial planning by incorporating precise measurements of the containers that will be accessible. Additionally, it's vital to ensure that the proposed ideas align with the capabilities of standard shipping containers.

To enhance the project, consider addressing essential questions such as: How will the containers be transported to various locations? Where will they be stored when not in use? And, most importantly, how adaptable are these structures to different environments and needs? By addressing these aspects with practical solutions and measurements in mind, the project can achieve a more robust and viable design.



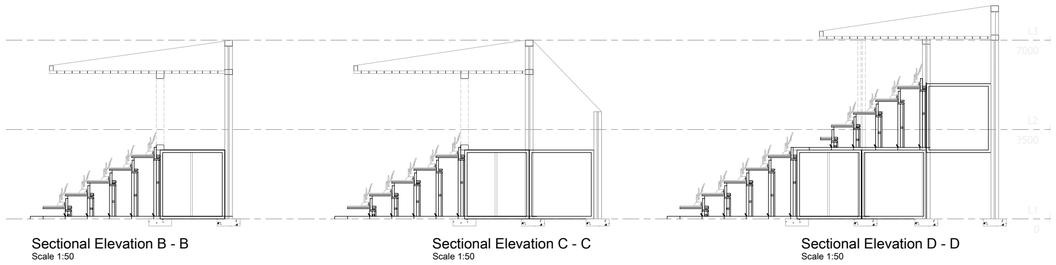
Option 1



Option 2

Option 3

Fig 14.4 : Plans showing adaptive modular of containers
(Author, 2023)



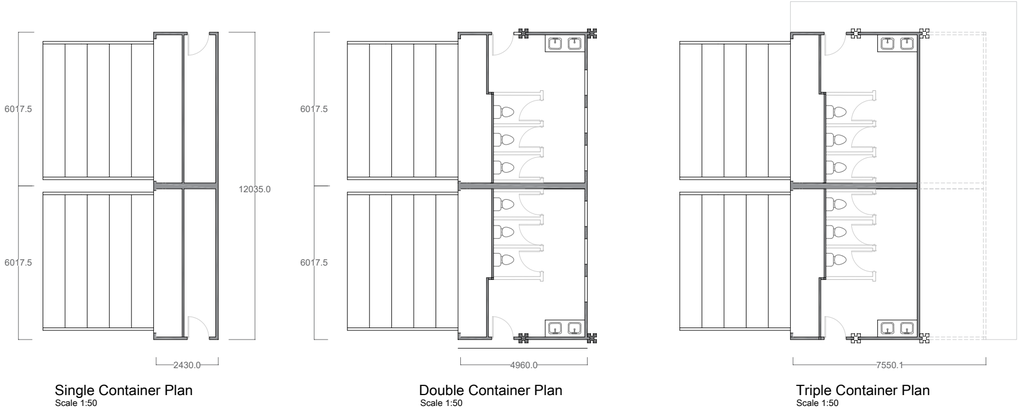


Fig 14.5 : Plans showing adaptive modular of containers (Author, 2023)

REVIEW 3

Stadium design

I envisioned the stadium as a crucial architectural design, a massive structure capable of hosting huge events while also housing a multipurpose indoor center which connects to the field.

The stadium's façade was created with moveable panels that were firmly attached to a structural structure. These panels may swing and react to the power of the wind, giving the stadium a more dynamic aspect.

Although this creative approach had the potential to be included in my thesis, it ultimately did not connect with the broader objective of developing an adaptable structure that could effectively adjust to various initiatives and the possibility of relocation.

Comments:
While this stadium design demonstrates merit, it veers away from the original concepts and themes centered around creating an adaptive structure capable of being modified to suit specific activities and needs.

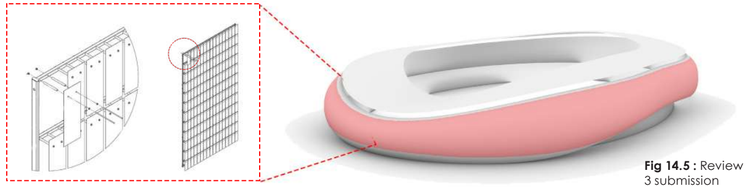
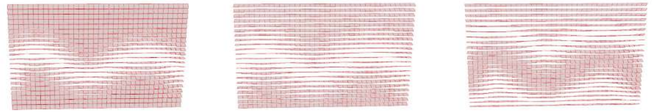
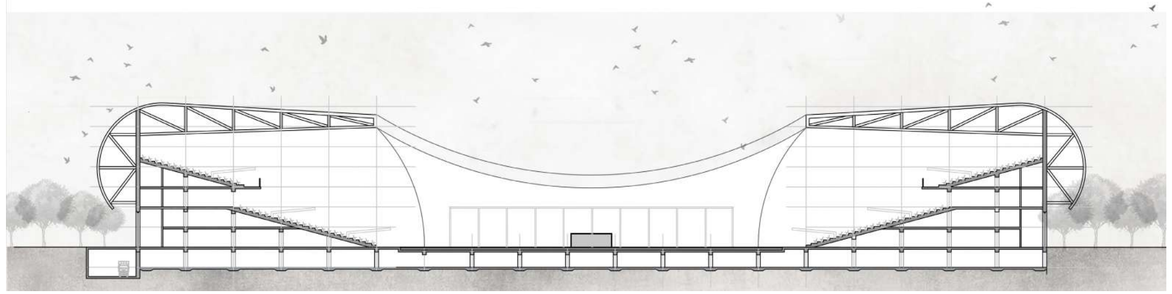
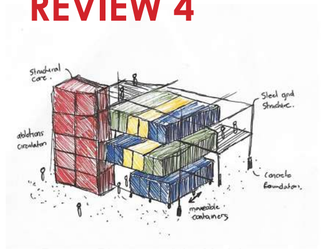


Fig 14.5 : Review 3 submission showing rendered sectional elevation (Author, 2023)

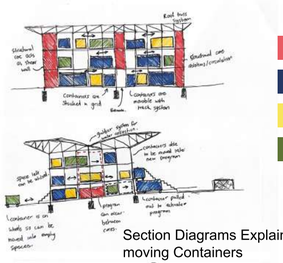




REVIEW 4

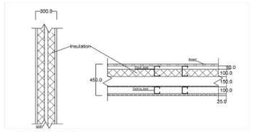


Process Diagrams of the Modular



Section Diagrams Explaining moving Containers

- Structural Core
  Abultions / Circulation
- Seating/Grandstand
- Medical Bay
- Retail



Sectional Elevation of Containers
Scale 1:50

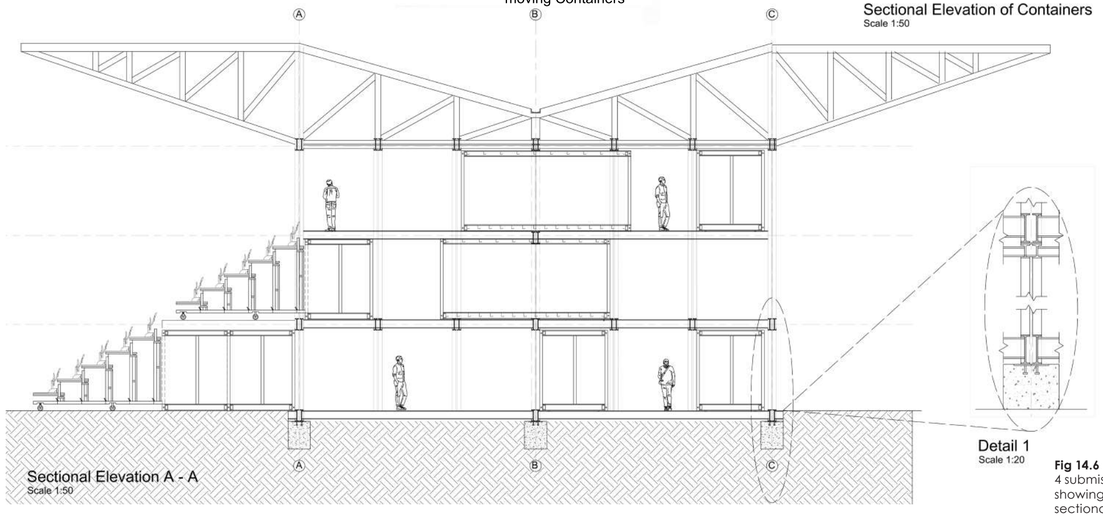
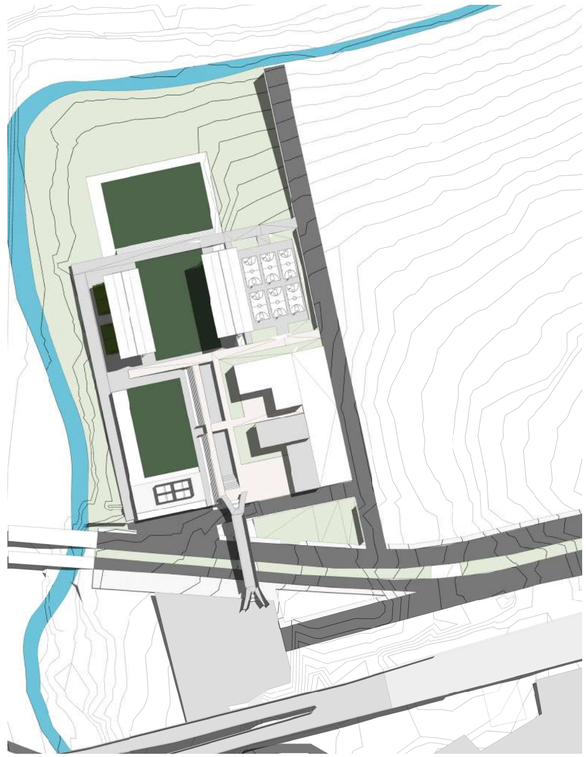


Fig 14.6 : Review 4 submission showing rendered sectional elevation (Author, 2023)

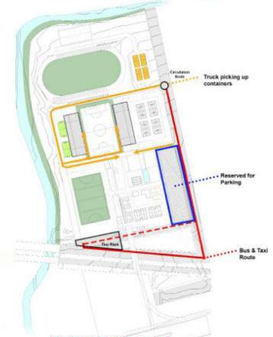


FINAL DESIGN

Design Development has been left out of the draft of the research report as I have been focused on the writing components of the booklet. I will be displaying the process of my design journey from where it started to where it is now, I just need to curate it in a way that translate the development process clearly.

Site Plan
1 : 1000

Pedestrian Circulation Diagram



Vehicle Diagram

The Spine - Stepped seating that serve as a welcome to facility

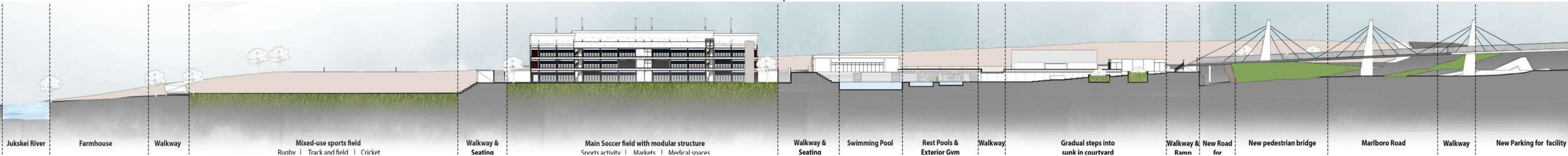
The site slopes downward toward the river, providing numerous opportunities for manipulating the topography through cutting and filling to accommodate various programs. The stadium structure stands prominently in an otherwise vacant landscape, with its ever-changing program and façade serving as a constant indicator to passersby that the facility is open and active.

Mixed-use Indoor sports court with Gymnasim

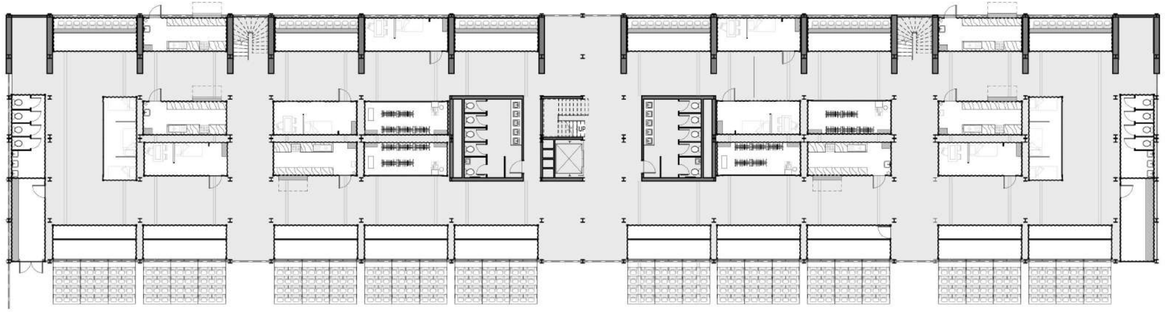
While Structure 87 remains the primary focus of the sports facility, the surrounding area hosts additional sports courts and a versatile indoor sports facility accommodating various indoor sporting events. The overarching concept emphasizes the utilization of all available space on-site to offer a diverse range of sporting activities. The indoor sports building incorporates various spill-out spaces, promoting engagement from all sides of the structure and underlining the facility's inclusivity. With amenities such as outdoor gym equipment and a beach volleyball pit, it caters to a wide spectrum of recreational preferences, further enhancing its appeal.

Pedestrian Bridge - Connecting Gautrain and Alexandra to Site

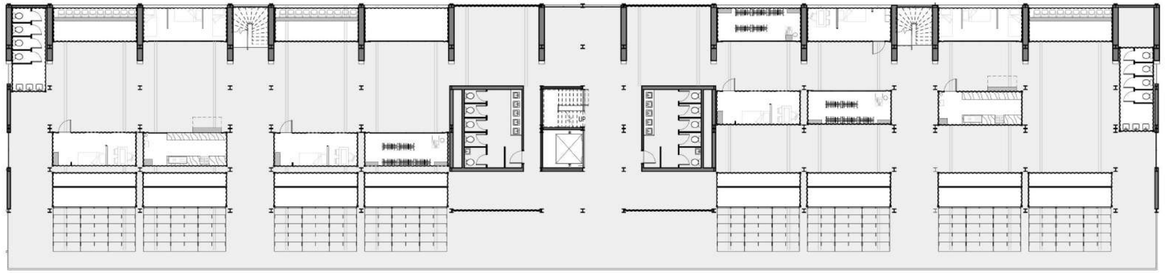
The walkway played a pivotal role in linking the Alexandra community to the sports facility. It was imperative to extend this connectivity by integrating the bridge directly with the Gautrain, ensuring safe passage across the bustling thoroughfare for commuters utilizing public transport services available at the proposed site's foyer. The concept involved rejuvenating an existing bridge to establish a secure and welcoming passage accessible to all, thereby enhancing accessibility to the site while promoting safety and convenience.



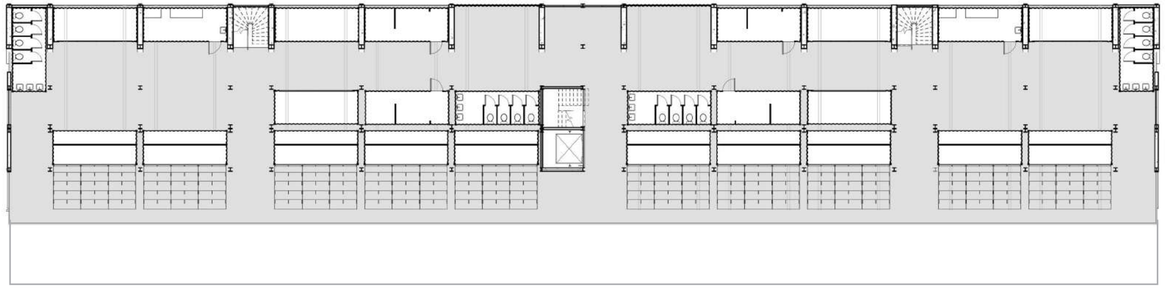
STRUCTURE 87's FLOOR PLANS



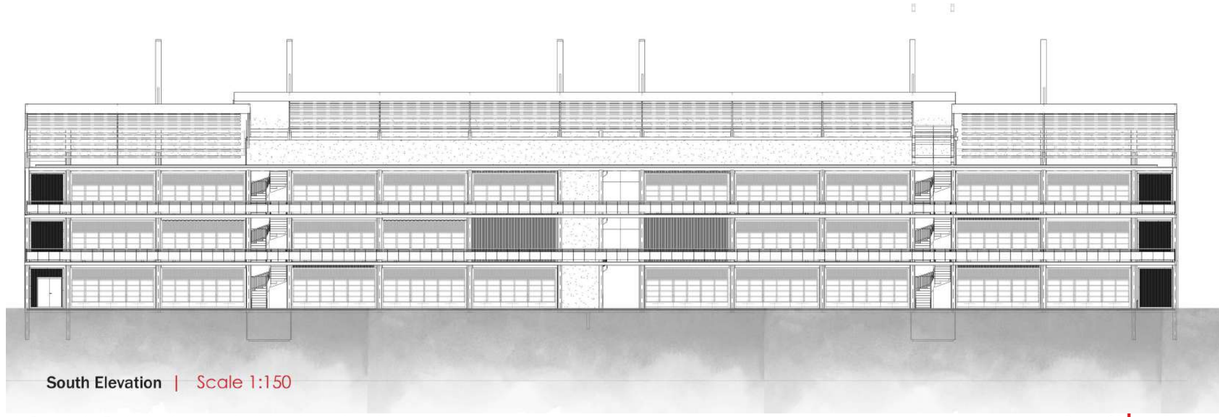
Ground Floor Plan | Scale 1:150



First Floor Plan | Scale 1:150



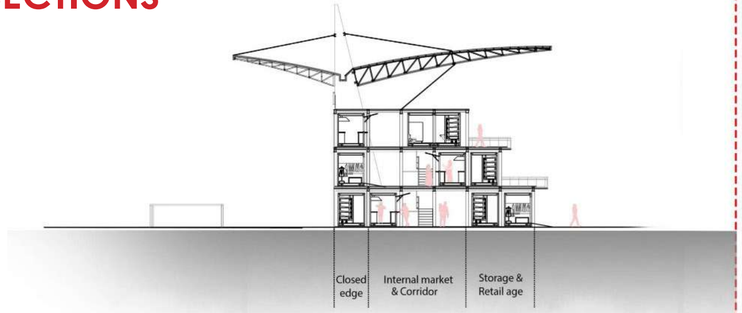
Second Floor Plan | Scale 1:150



South Elevation | Scale 1:150

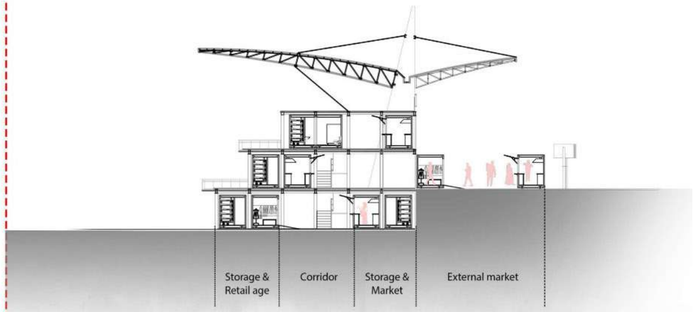
STRUCTURE 87' STADIUM SECTIONS

RENDER SHOWING STRUCTURE SET TO SPORTS DAY LAYOUT

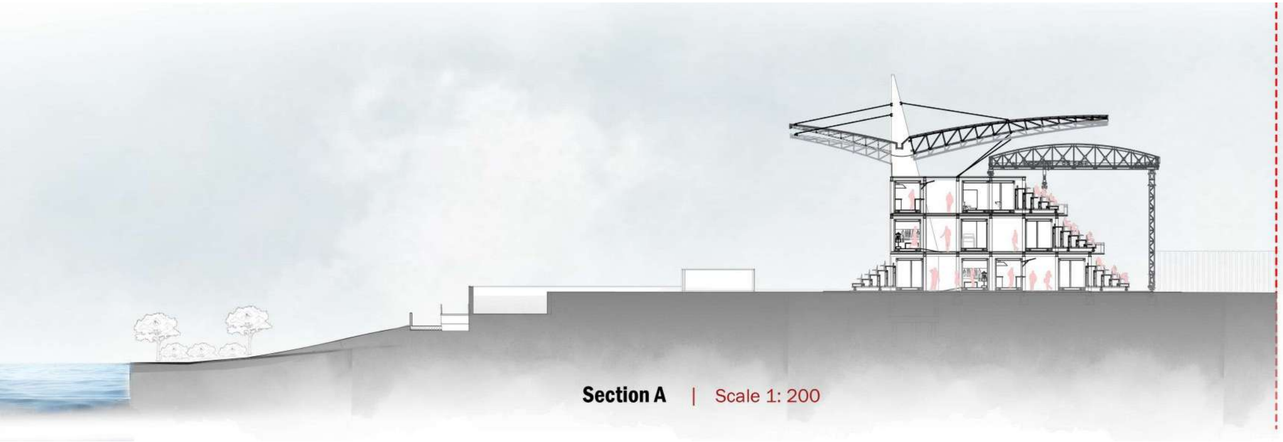


Section B | Scale 1: 200

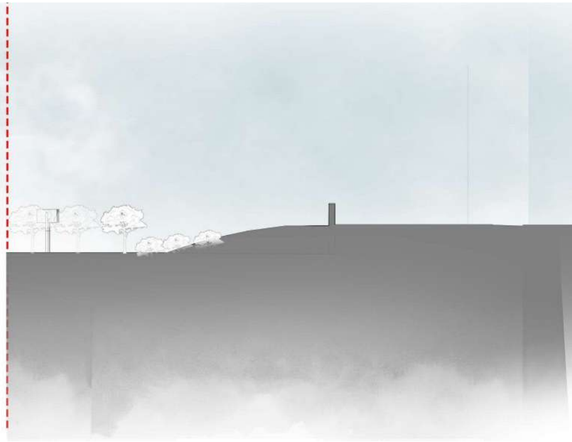
MARKET LAYOUT



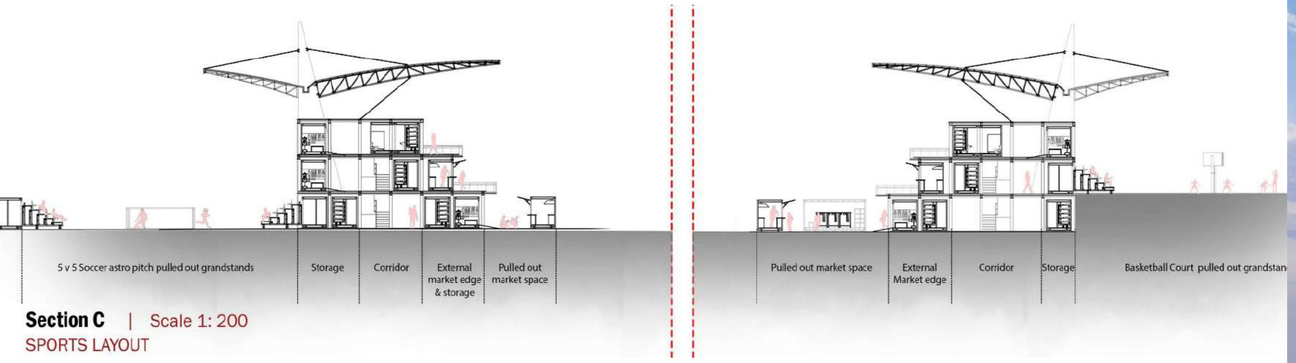
RENDER SHOWING STRUCTURE SET TO SPORTS DAY LAYOUT



Section A | Scale 1: 200

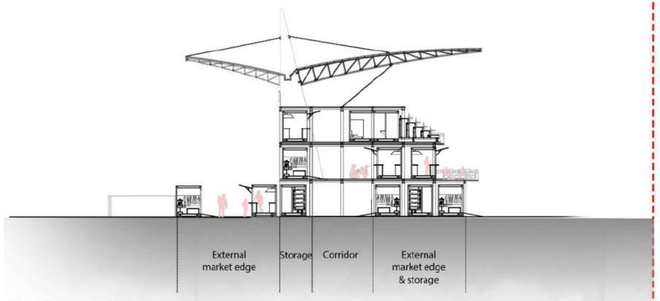


STRUCTURE 87 STADIUM SECTIONS



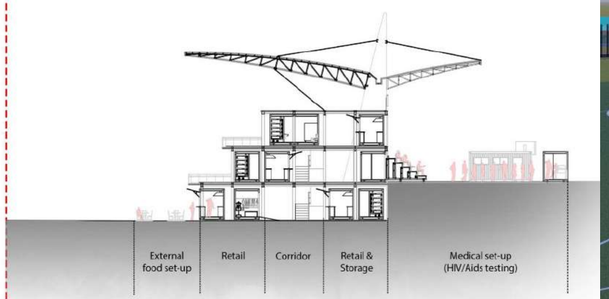
Section C | Scale 1: 200

SPORTS LAYOUT



Section D | Scale 1: 200

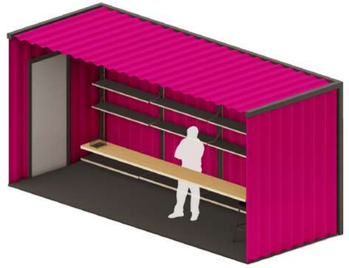
EXTERNAL RETAIL LAYOUT



CONTAINERS AND LAYOUT :

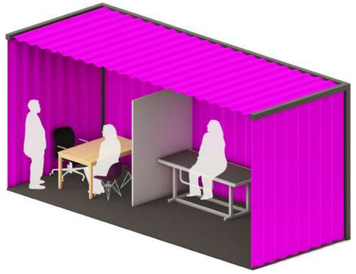
Orange Container | Food stand

Blue Container | Grandstands



Pick Container | Spaza Shop

Yellow Container | Medical Bays

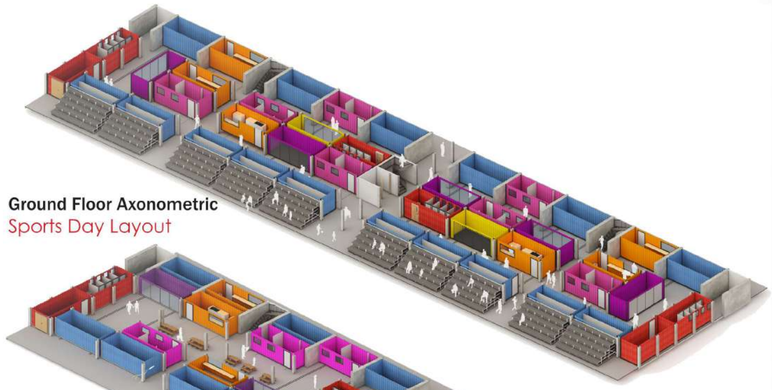


Purple Container | Medical Consult

Red Container | Toilets

Green Container | Mixed-use /Classroom

Brown Container | Mixed-Use/Meeting room

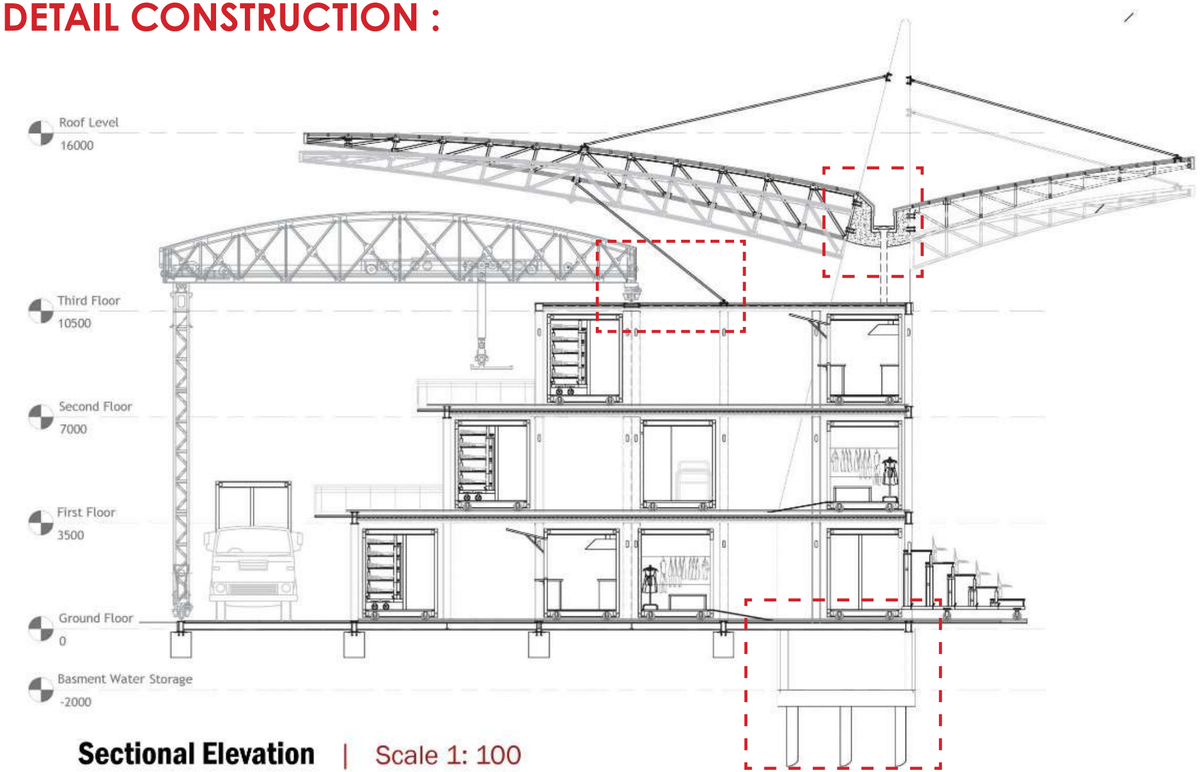


Ground Floor Axonometric
Sports Day Layout

Ground Floor Axonometric
Internal Market Layout

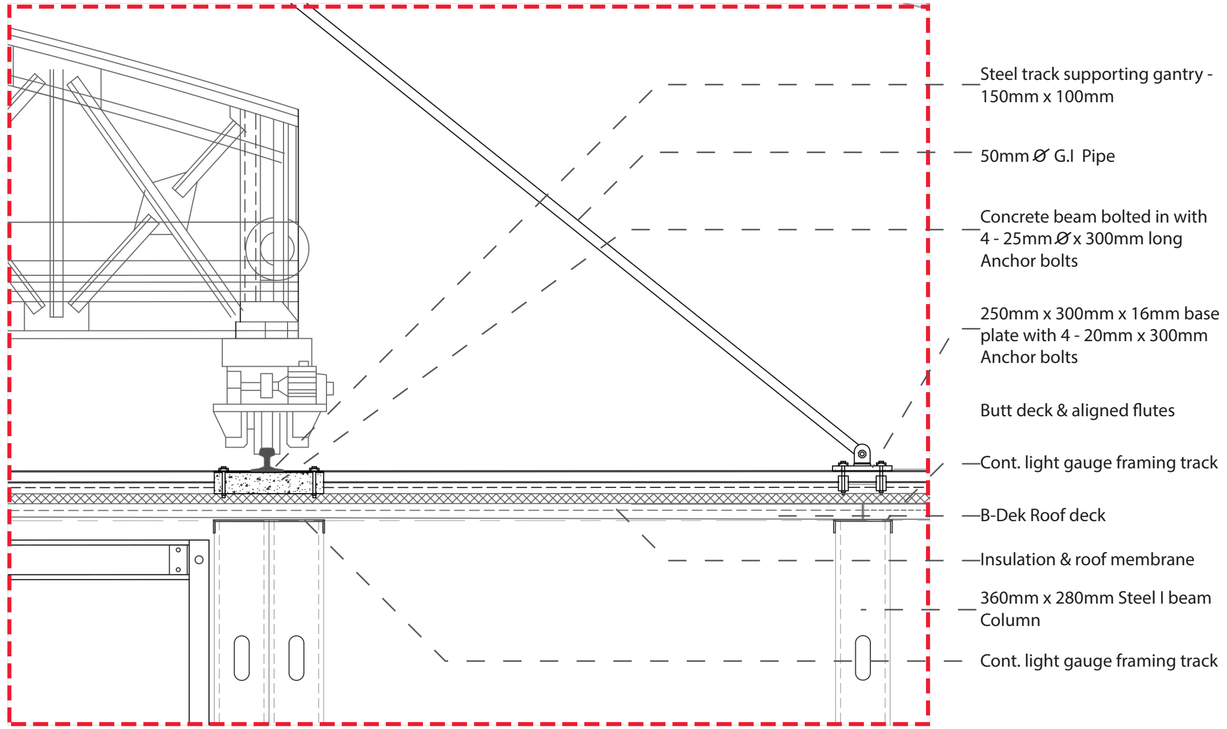
Ground Floor Axonometric
Exterior Market Layout

DETAIL CONSTRUCTION :



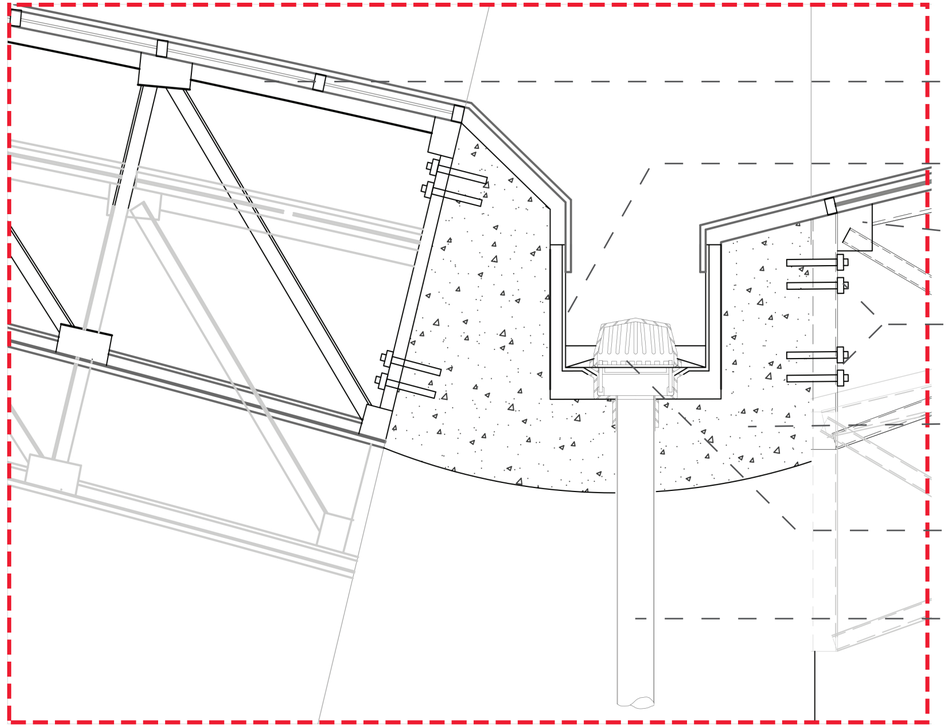
Sectional Elevation | Scale 1: 100

Callout 1 - Tension cable & Gantryconnection to structure



Scale 1:20

Callout 2 - Cast-instu beam with gutter box



50mm x 75mm x 3mm Tublar purlins @700mm O.C

500mm x 600mm x 75mm Custom metal boc gutter

6mm Thick Gusset Plates

4 - 25mm Ø x 300mm long Anchor bolts

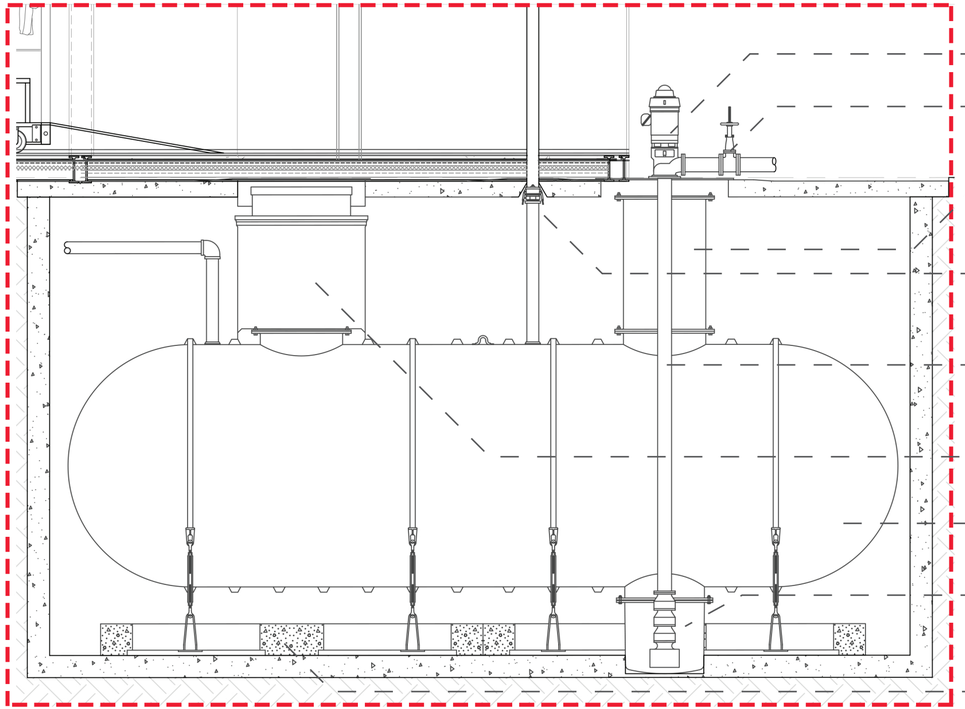
Cast in-situ concrete beam with box cutter cut out

300mm Ø Ecoguss® roof drains from EDT EuroDrain-KESSEL

200mm Ø PVC downpipe to be cast into concrete column and fixed to metal gutter

Scale 1:20

Callout 3 -Underground water tank



Vertical pump w/discharge head & mounting plate

Discharge valve & Piping

800mm Manway with Blank cover

250mm Fill w/cam lock connection

300mm Ø Vertical pump shaft housing w/bowl assembly & strainer

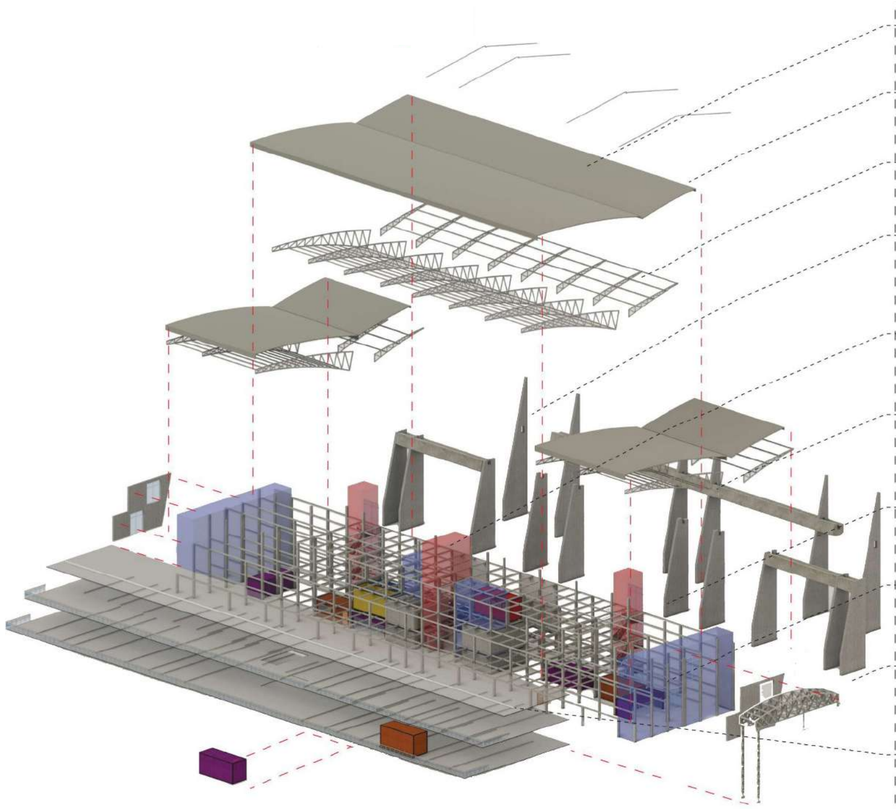
1000mm Collar & riser with 800mm opening, 300 high with waertight top

Xerxes Single wall FRP Tank

500mm FRP flanged bottom sump

Xerxes precast deadman system w/hold down strap and turnbuckle assembly

Scale 1:20



Tension Cables

The roof of the structure is held up with tension cables for the exaggerated cantiliver

Roof - Alumnium Cliplock

The roof system is held up by the tension cables and uses a truss system.

Steel Truss System

The steel truss system was manipulated to work with the concrete columns that are cut at an angle

Precast Concrete Columns

This is an important moment in the structure hwere steel meets concrete with its heavy load being balanced
with the tension cables and the steel truss system is bolted to it. Off shutter concrete

Red - Circulation

The Circulation is located here with 2 fire stairs and main circulation core with ducts and elevator

Cast-in-Stu Concrete Beam

The beam is cast in situ to hold up the metal gutter spanning across the structure. the concrete beam also helps with the spanning of the steel structure helping to distrabute loads

Modular Steel Frame Structure

The steel struture works with modularity and simple structure methodolgies. This allows for the structure to be built anywhere in the world.

Blue - Toilets

Bathrooms are situated in a way that doesnt cause cluster in the corridors and the change rooms are located at the ends of the structure to ensure no mixing of the opponents.

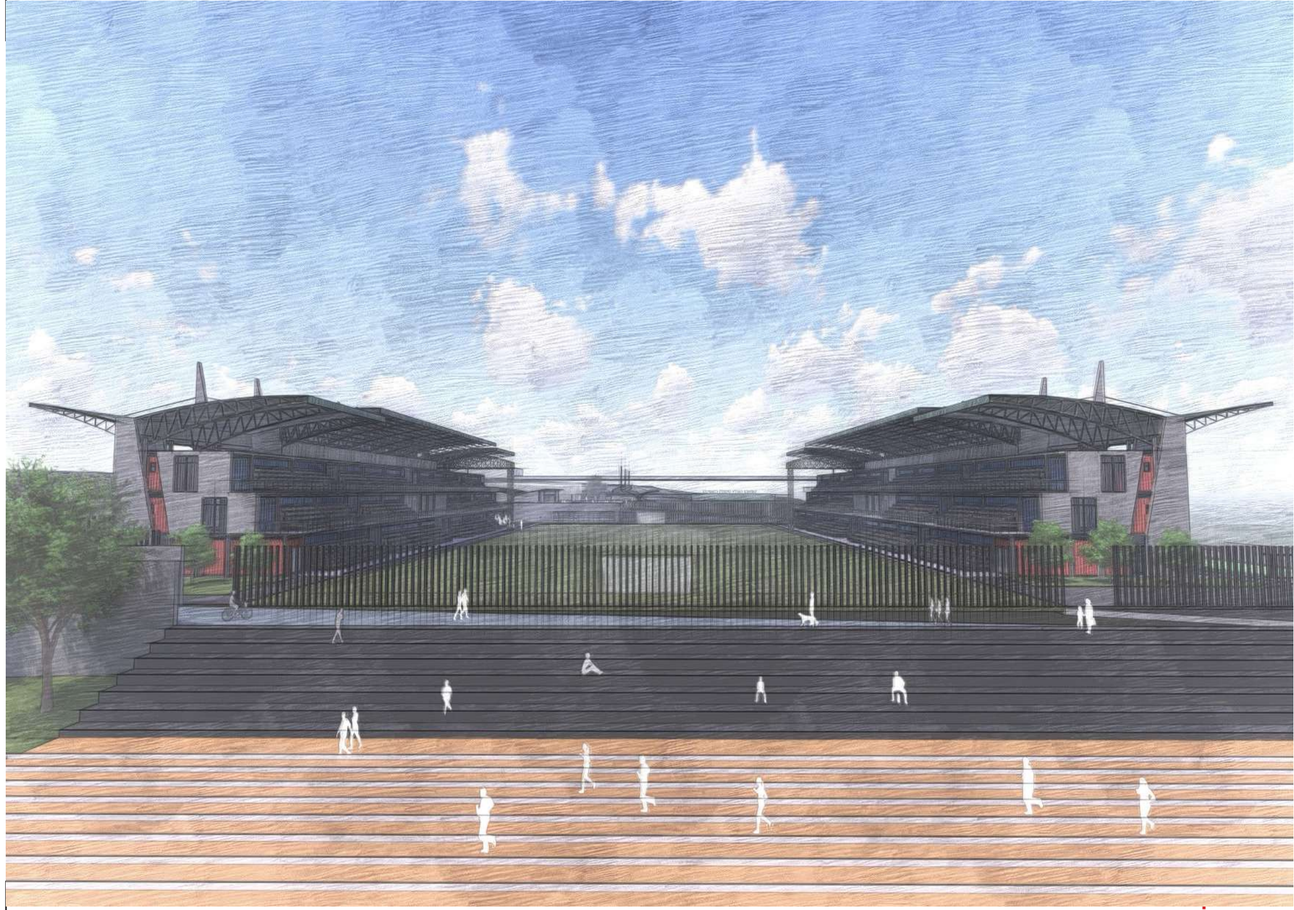
Gantry

This crane is customised to fit the roof curve and is used to lift the containers and either place them on a truck or the track system in the structure. It moves on the longitudinal axis.

Concrete floor with Tracks

The concrete flooring has tracksystem that allows for teh containers to be moved and adjusted for different programs.

Exploded Axonometric



Research report Reflection

The master's thesis presents a compelling argument for the necessity of sports infrastructure in underdeveloped regions like Alexandra Township. The focus on addressing the lack of adequate facilities and the potential for social and economic progress through sports engagement is commendable. The envisioned multi-purpose sports complex not only fills the immediate infrastructure gap but also aims to foster community engagement, social empowerment, and environmental sustainability.

One strength of the thesis lies in its emphasis on inclusivity, with a design intended to accommodate people of all ages and ability levels. Incorporating adaptable architecture and modular features reflects a forward-thinking approach to meet the community's evolving needs. Additionally, the integration of mixed-use facilities such as educational rooms, leisure spaces, and green areas demonstrates a holistic understanding of community needs beyond just sports infrastructure.

However, further exploration could enhance the project's effectiveness. For instance, conducting a more comprehensive analysis of community needs and preferences could refine the design. Additionally, while the concept of using container architecture combined with modular construction is innovative, more research into the feasibility and scalability of these components would strengthen the overall proposal. A deeper analysis of their long-term viability and impact on the environment would enrich the project's sustainability aspect.

Furthermore, the thesis would benefit from a more thorough exploration of potential challenges and barriers to implementation. Understanding the practical realities of executing such a project in a resource-constrained environment like Alexandra Township is crucial for its success.

In conclusion, while the master's thesis presents a compelling vision for a community-centered sports facility in Alexandra Township, there are opportunities for improvement. By further exploring elements such as sustainability and addressing potential implementation challenges, the concept could be strengthened to better serve the needs of the community and contribute to positive social change in the region.

Appendices

Sub-Appendix A: Programme Schedule

The program selection for this sports facility emerged from a comprehensive analysis of sports facilities worldwide, combined with my personal experiences visiting sports facilities around the globe. The central concept revolves around creating a sports hub that not only offers standardized infrastructure for the community but also takes into account the fundamental needs that may be lacking within that community. Recognizing that not all facility users have equal access to resources, the goal is to level the playing field across various social classes. This approach seeks to address the disparities caused by ongoing economic marginalization, which can hinder community growth. Consequently, designing the sports facility with a range of programs that can catalyze positive change within the surrounding community is a critical perspective in shaping its development.

Programme Type	Quantity	Size - m^2
Public Forecourt, Reception & Entrance foyer The public forecourt will be an interior/exterior lobby space which will receive the users and provide a space for the users to get directions to navigate around the site. This will be a generous space with a strong and transparent connection between indoor and outdoor space, which spills out to the extended vehicle lobby area created to allow cars to off lamp comfortably from the main road.	1	**250m²**
Outdoor Courts – Basketball, Netball, Paddle Tennis & Tennis courts These courts will be situated along side each other and will be connected to a series of grandstands that will be design through the adaptable reusable design. Under the grandstand they will be the necessary services to service the multiple courts provided. **1 x Basketball Court - 420m²** **2 x Netball Courts - 420m²** **4 x Paddle Tennis Courts – 800m²** **2 x Tennis Court – 800m²**	1	**2500m²**
Educational Spaces These will be spaces that are accessible to the public but certain spaces will have restricted access unless with facility manager/employee. **2 x Seminar Room for 15 people - 30m² each** **1 x Computer Room (20 Computers) – 80m²** **1 x Small Auditorium (100 people racked – 200m²** **4 x Lettable Offices (Flexible and sub-divided spaces which can be locked) – 100m²**	1	**500m²**
Public Interface This will be a large courtyard space which connects the buildings surrounding it. This space will consist of a series of public spaces which areas with public viewing into the multi-purpose building and the swimming pool & Gymnasium. Green Park spaces which connect to the public courtyard,	1	**350m²**
Commercial Space A series of informal spaces which could be used as a retail zone to provide a space for the informal street venders to use the space to sell their goods. This will be intergraded into the public forecourt building to allow for an activation on the ground floor.	1	**300m²**
Multi-purpose Sports Hall There will be a large mixed used sports court that can used for various indoor sports and can be turned into a venue for events. The mixed used courts will have spill out spaces which could increase the size of the space and allow for various events to take place at the simultaneously. This building will be situated on the more private side of the site with limited access and will house up to 2000 people.	1	**1500m²**
Gymnasium This building will relate to the swimming pool area which will provide various spaces that focus on sports health and rehabilitation. This facility will look to hold the gym equipment and various rooms that will be occupied with on call medical professionals and spaces for athletes / the users learn about physical and physiological health through sports and activity. **1 x Gymnasium – 800m²** **1 x Outdoor swimming pool – 325m²** **1 x New Technologies laboratory – 200m²** **4 x Medical rooms – 15m² each** **4 x Office spaces for Staff – 15m² each** **2 x Seminar rooms for 15 people - 30m² each**	1	**1505m²**
Agricultural centre This will be a collaborative space which would look to teach community members agricultural skill whiles also providing the infostructure to be able to produce and grow fresh produce to be consumed and sold at the commercial retail spaces provided on site.	1	**1000m²**
Administration This will be situated in the main building connected to the public forecourt which will oversee the running of the sport complex and its maintenance. **1 x Office for Building Manager – 25m²** **4 x Offices for Admin Staff - 15m² each** **1 x Kitchenette – 10m²** **1 x Staff Room – 15m²**	1	**110m²**
Parking and Delivery The various buildings all require separate parking which will be controlled with specific driveway which will be access controlled. For the main multipurpose parking there will be 1 basement parking which will have limited access monitored by manager. The rest of the parking will be outdoor parking with a selective amount of the covered and some not which will be accessible by disabled, visitors and staff members. Deliveries will be provided with their own service lanes.	1	**1000m²**
TOTAL SQUARE METRE:		**9015m²**

Sub-Appendix B: Construction Cost

Programme Type	Rate/m² (excl. VAT)	Total Area	Total Cost
Retail			
Rates/m² (R 9,100 – R 12,000) **(Not exceeding 5 000m²) - Local convenience centers**	R9 100	1000m²	R9 100 000
Schools			
Rates/m² (R 7,600 – R 8,800) Educational Spaces	R8 500	500m²	R4 250 000
Sports & Recreation			
Rates/m² (R650 000 each - Floodlit) **1 x Basketball Court - 420m²** **2 x Netball Courts - 620m²** **4 x Paddle Tennis Courts – 800m²** **2 x Tennis Court – 800m²**	R650 000	2640m²	R1 716 000
Stadium – Multipurpose Sports Hall			
Rates/m² (R 39,000 – R 60,000) Rate per seat (excl. VAT) Stadium to PSL standards	R50 000	1500m²	75 000 000
Site Services			
Electrical installation: Office: (R 900 – R 1,300) Medical Centre: (R 1,850 – R 2,700) **Air-conditioning Installation:** Offices: Console/split units (R 1,100 – R 1,750) Central plant (R 2,000 – R 3,100) Medical Centre: Central plant (R 2,600 – R 4,100)	R1 100 R2 200 R1 300 R2 500 R3 150	500m²	R550 000 R1 100 000 R650 000 R1 250 000 R1 575 000
Offices			
Rates/m² R 9,300 – R 11,500 Low-rise office park development with standard specification	R9 800	170m²	R1 666 000
Parking			
Parking on grade, including integral landscaping (R 650 – R 850) Parking in basement (R 5,300 – R 9,300)	R700 R6 000	500m² 500m²	R350 000 R3 000 000
Total Construction Cost:			R100 207 000

ETHICS CLEARANCE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG | SCHOOL OF ARCHITECTURE PLANNING

23 August 2023

Dear Mvelo Buthelezi (1667817)

This letter confirms that your clearance/waiver application has been approved. Your protocol/clearance number is: SOAP017/04/2023

Yours sincerely

Lerato Nkosi

References

LIST OF FIGURES

Chapter 1:

Fig 0: HPP architekten (2021) SAIC Motor Pudong Arena, HPP Architekten. Available at: https://www.hpp.com/en/projects/fallstudien/saic-motor-pudong-arena/ (Accessed: 20 September 2023).

Fig 1: Harvey, M. (2019) Aerial view of the densely populated Alexandra township, Gauteng Province, South Africa. Johannesburg. Getty Images. Available at: https://www.gettyimages.com/detail/photo/aerial-view-of-the-densely-populated-alexandra-royalty-free-image/1255917874 (Accessed: 3 September 2023)

Chapter 2:

Fig 2.1: Britannica, E. (2023) Early Baseball Game, Encyclopædia Britannica. Available at: https://www.britannica.com/sports/sports#/media/1/561041/70832 (Accessed: 27 August 2023).

Fig 2.2: Images, G. (2016) The Olympic Stadium in Athens pictured during the Games in 1896, Mirror. Athens, Greece. Available at: https://cdn.britannica.com/61/18361-050-64BC6B3A/Panathenaic-Stadium-athletics-events-Athens-1896-Olympic-1896.jpg?w=400&h=300&c=crop (Accessed: 03 September 2023).

Fig 2.3: Bini, P. di L. (2016) Calcio fiorentino, Wikimedia Commons. Available at: https://upload.wikimedia.org/wikipedia/commons/a/a7/Calcio_fiorentino_1688.jpg (Accessed: 03 September 2023).

Fig 2.4: Frearson, A. (2013) 2022 World Cup Stadium, Qatar, Zaha-Hadid Dezeen , Dezeen. Qatar. Available at: https://www.dezeen.com/2013/11/18/zaha-hadid-unveils-design-for-qatar-2022-world-cup-stadium/ (Accessed: 05 September 2023).

Fig 2.5: Público, D. (2005) Pallone col bracciale, Wikimedia Commons. Sferisterio delle Cascine. Available at: https://commons.wikimedia.org/wiki/File:Pallone_col_bracciale.jpg?uselang=pt#/media/File:Pallone_col_bracciale.jpg (Accessed: 03 September 2023).

Fig 2.6: Frearson, A. (2013) 2022 World Cup Stadium, Qatar, Zaha-Hadid Dezeen , Dezeen. Qatar. Available at: https://www.dezeen.com/2013/11/18/zaha-hadid-unveils-design-for-qatar-2022-world-cup-stadium/ (Accessed: 05 September 2023).

Fig 2.7: Público, D. (2005) Pallone col bracciale, Wikimedia Commons. Sferisterio delle Cascine. Available at: https://commons.wikimedia.org/wiki/File:Pallone_col_bracciale.jpg?uselang=pt#/media/File:Pallone_col_bracciale.jpg (Accessed: 03 September 2023).

Chapter 3:

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