

**A PROPOSED SPORT CENTER  
WITH FOCUS ON PANDEMIC ARCHITECTURE  
IN LAPTA-GIRNE, NORTHERN CYPRUS**

**A DISSERTATION SUBMITTED TO THE INSTITUTE  
OF GRADUATE STUDIES  
OF  
NEAR EAST UNIVERSITY**

**By  
EPHRAIM AROME NOAH**

**In partial fulfillment of the Requirements for  
the Degree of Master of Science  
in Non-Thesis Program of  
Architecture**

**NICOSIA, 2021**

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## **DECLARATION**

I declare that the work in the dissertation has been carried out by me in the Department of Architecture. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this dissertation was used previously for another degree or diploma at this or any other Institution.

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## ABSTRACT

The world has in the time past being struck with several epidemics, pandemics and health emergencies which prompted the response of humans in various ways to mitigate the effects. Today, with the current pandemic being experienced, the way we live our lives and interact with individuals has also being affected. Covid-19, the latest of such pandemic broke out in December 2019; this pandemic is also changing the architecture. Medical experts have stated that isolation, enhanced personal hygiene, quarantine and social distancing of individuals is one major way to curb its spread. Studies on the other hand has shown that isolation without social interaction on its own can lead to some form of depression and mental health disorder in a long run if not properly managed. In dealing with isolation and creating measures to boost the immune system of individuals during such difficult times, the need for regular exercise in a safe and conducive environment is needed. To this effect, a sport center in the context of Lapta, Kyrenia is provided, which puts into consideration the rules of social distancing and other medical guidelines in a manner that will foster healthy social interaction for the wellbeing of the users. The proposed sport center is aimed at not only providing a functional space for sporting activities but also serving as a platform for social interaction amongst people of different demography. In addition this architectural scheme involves a goal to bring a new paradigm in sport centers in the time of pandemics.

**Keywords:** Pandemic architecture; sport center; proposal; Lapta, Kyrenia

## ÖZET

Dünya geçmişte birçok salgın hastalık ve sağlıkla ilgili acil durumlarla karşı karşıya kalmıştır ve bu durum, sözkonusu etkileri hafifletmek için insanların çeşitli şekillerde yanıt vermesine neden olmuştur. Günümüzde yaşanan salgınla birlikte hayatlarımızı yaşama ve bireylerle etkileşim şeklimiz de değişim göstermektedir. Bu salgının sonuncusu olan Covid-19, Aralık 2019'da patlak verdi; bu salgın yapı mimarisini de değiştirmektedir. Uzmanlar, sosyal izolasyon, mesafe, kişisel hijyen ve karantinanın salgının yayılmasını engellemede önemli bir yol olduğunu belirtmişlerdir. Öte yandan araştırmalar, sosyal etkileşim olmadan izolasyonun, uygun şekilde yönetilmezse uzun vadede bir tür depresyon ve akıl sağlığı bozukluğuna yol açabileceğini göstermiştir. İzolasyon ile uğraşırken ve bu tür zor zamanlarda bireylerin bağışıklık sistemini güçlendirecek önlemler oluştururken, güvenli ve elverişli bir ortamda düzenli egzersiz yapma ihtiyacı gereklidir. Bu amaçla, Girne'nin Lapta bölgesinde, kullanıcıların refahı için sağlıklı sosyal etkileşimi teşvik edecek şekilde, sosyal mesafeyi ve diğer tıbbi kuralları dikkate alan bir spor merkezi önerilmiştir. Önerilen spor merkezinin sadece spor aktiviteleri için işlevsel bir alan sağlamayı değil, aynı zamanda farklı demografiden insanlar arasında sosyal etkileşim için bir platform görevi görmesi amaçlanmaktadır. Ayrıca bu mimari şema, pandemi zamanında spor merkezlerine yeni bir paradigma getirmeyi hedefliyor.

**Anahtar Kelimeler:** Pandemik mimari; spor merkezi; öneri; Lapta, Girne

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background to the Study

Diseases, epidemics and pandemics are not new to man. Several times before now, man has come in contact with dreaded and challenging outbreaks such as the Plague of Justinian, the Spanish flu and the Swine flu just to mention a few. For the sake of this study, it is important to highlight the definition of the word 'pandemic'. According to the World Health Organization (WHO), a pandemic is a worldwide blowout of a novel malady while an influenza pandemic ensues when a novel influenza virus begins and blowouts round the world, and many humans are not immune to (WHO, 2010).

The world started experiencing a new form of pandemic which broke out from Wuhan of China in December 2019 known as Covid-19. This new disease soon spread like a wildfire. After the World Health Organization's official pronouncement of Covid-19 as a pandemic on the 11<sup>th</sup> day of March 2020, records shows that a total of over 470,000 cases and 20,000 deaths have being recorded and spread to every continent of the world except for Antarctica as at 26<sup>th</sup> March 2020. With this wide and continuous spread of the pandemic, several measures has being put into place to curb the spread while experts put in efforts to get the vaccines needed.

A study by Chen (2020) opines that a twenty to forty minutes of moderate-intensity exercise per day is adequate to provide a positive boost to the immune system. This collaborates with studies that shows that routine exercise offers both immediate and long term benefits. Some of the immediate benefits includes helping to improve the mood of individuals, reduce stress and anxiety and also improve quality of sleep, while the long term benefits includes the prevention and lowering of individual's risk to Type 2 diabetes, heart disease, Hypertension, stroke, cancers (kidney, colon, bladder, endometrium, esophagus, lung, breast and stomach) and Dementia (Hill, 2020). Therefore as part of measures to help mitigate the effect of this pandemic, the need to boost individual's immune system has become imperative, as one of

the first thing any harmful pathogen does to the human body is to weaken and break down the immune system which serves as a defense mechanism humans. Regular exercise has been identified as one way to help boost the body's immune system. It is under this pandemic situation, that the sport center is created such that it will give users the desired safe and conducive environment to exercise their body and interact socially.

The Cambridge University Press defines a sport center as a building that houses different sports (Sport Center, 2021). That is to say a sport center is generally a functional space that provides several functional spaces for users to carry out sporting activities. It can also mean a building designed with facilities for a range of leisure activities such as meeting rooms, cafes and sport halls. From the definitions above, a sport center should primarily provide the required functional space that will meet up for any chosen sporting activity. A good sport center therefore, is one that puts into cognizance the different type of sport activities to be carried out within it, fitted with the standard space requirement, the different equipment and the best kind of material to be used in construction, the circulation pattern, safety and the best aesthetic appeal attainable within the budget. All these considerations help to enhance user's satisfaction, health and well-being within the sport center. Where these considerations are absent, the aim of a sport center will not be achieved.

## **1.2 Aim and Objectives**

To provide an interesting, functional, efficient and aesthetically pleasing Sport Center that will give users in a pandemic stricken or health challenging circumstances, the ample opportunity to engage in moderate-intensity exercise through sporting activities in a safe and health conscious environment. In order to achieve this aim, the following objective question will be answered by the research:

1. What role does a Sport Centre play in a case of a pandemic outbreak?
2. What measures can be put in place to ensure that Sport Centre contribute to the well-being of individuals in a case of a pandemic?
3. How can social interaction be enhanced in the sport center without posing a health challenge.

4. How can the use of certain modern materials be employed to enhance the quality of a Sport Center?

It entails the architectural and planning design considerations employed in designing a Sport Center that is safe and functional for use during a Pandemic Outbreak without necessarily compromising social interaction amongst users.

### **1.3 Research Method**

For the purpose of this study, the research method used is the case study. This is a research method that uses reports from past studies. Some selected projects will be analyzed and deductions taken are applied to this project. Other relevant literature materials both online and in prints is explored to identify important lessons to be adopted in the research.

### **1.4 Research Scope**

This study is to design a sport center that has provision for a selected sports to be incorporated into both outdoor and indoor areas, with provision for limited spectating ensuring that diligent considerations is given to the health and well-being of users within the context of pandemic architecture.

## CHAPTER 2

### THE INFLUENCE OF ARCHITECTURE ON PANDEMICS

#### 2.1 Space Interaction with Pandemics

According to Stinson (2020), the period following the outbreak of yellow fever to other epidemics like HIV, the fright of illness has stirred up a greater desire to live in sound health and this has become an important subject matter in deciding how our cities and urban settlements are shaped. At the 1854 outbreak of Cholera in London, many had thought that cholera was spread by bad air not until the London Physician John Snow made the contrary deduction stating germ polluted water as the major means of the spread (HistoryExtra, 2020). This discovery resulted into putting a lot of measures in place to curb the spread, amongst which included the introduction of modern sanitary system and sewer systems. This step significantly helped in containing the spread of Cholera. This action in turn spurred the cleaning of drainages in lower Manhattan by the New York City so as to allow for the efficient flow of water drainage. In later times, tuberculosis another terrible disease came into existence, this outbreak was what inspired modernist architects like the famous Le Corbusier to create architectural designs and spaces without formal superficialities in a bid to generate a concept of architectural hygiene that will allow for free flow of air and light.

The synergetic relationship between urban areas architecture, epidemics and pandemics has always been deemed complex (Stinson, 2020). This can be seen from the outcome of many of the epidemics and pandemics experienced. This has given occasion for urban areas to adjust and adapt its morphology to suite the inherent population density so as to reduce the impact of any health emergency since this urban areas play a significant role in curbing the spread. In the face of the new COVID-19 reality, the world populace is learning to navigate world under safe and healthy conditions despite its continuous spread to more urban areas.

From the foregoing, architecture has sort to always find a suitable means of responding positively to health crisis at different times in history. With the current precautionary



measures of social distancing, use of face mask and regular personal hygiene, this is bound to eventually influence how people live and interact in their spaces. Before the outbreak of the pandemic, it was common to have family, friends and love ones gather together and have communal interactions. Some aspect of personal hygiene that was neglected is now being prioritized.

In a similar development, South Africa in 2006 experienced a tuberculosis outbreak that was extensively resistant to drugs in a town called Tugela Ferry. In this case, the buildings there were believed to have played a key role in sustaining the spread of that epidemic. Usually the transmission mode of this disease causing pathogens are in tiny particles, so light that they be suspended in the air and where there is poor ventilation within a space or such a space is overcrowded, such particles can easily be inhaled. The hospitals that nursed patients in Tugela Ferry had two major spatial challenges that sustained the epidemics, the first was the issue of poor ventilation in the interior space and as well as small waiting areas that led to overcrowding. From this Tugela Ferry scenario, it can be deduced the death of many in that hospitals was a result of poor planning in terms of infection control. Judging from this precedence of event, it is therefore important for the Architects and other stakeholders to deliberately design spaces that will help prevent, contain the spread and enhance the treatment of any infectious disease, not excluding the present COVID-19.

Three epidemics of recent past has taught the world certain lessons. It has shown that architecture plays an important role in the fight against the spread of the virus, especially when it comes to dealing with the mode of transmission which is by water, surfaces and air (Murphy, 2020). There are concerns that coronavirus is aerosolized, that makes it similar with the bacteria responsible for tuberculosis, and this means the pathogens could stay up in the air and other people can breathe it in. Therefore, the consideration regarding the flow of air becomes both a design concern and a design solution. Epidemics like the extensively drug resistant TB outbreak seen earlier in Tugela Ferry teaches that elementary retrofit could help in both nonmedical and medical spaces (Murphy, 2020). Having windows opened, increases air movement, employing air filtration with filters, and putting on fans could make a change. Circumventing closed lobbies, waiting areas, any space planned without consideration for air circulation and possibly, keep people in outdoor areas while ensuring a safe social

distance could assist drastically as well. This simple rules of thumb around airflow would help greatly.

In 2014, Ebola brought up another spatial challenge. This highly transmissible virus is able to live on surfaces for close to two weeks. However severer new safety measures and infection protocols remained the key schemes in combating it, architects also contributed by refurbishing quarantine units, making inventive air circulation schemes, and redesigned surfaces that are pathogen-resistant, which helped curtail the spread of the disease. For some years now, the conventional infection-control protocols in hospitals advocates that every surface be treated with antimicrobials and lessen the porousness of the materials and fabric so as to check the blowout of pathogens when porosity could be of help. From recent studies by Mandavilli (2020), shows that the Covid-19 virus is further stable and can survive for 72 hours on surfaces of plastics and steels than on materials made from leather, cottons and cardboard which are rather more porous and so could only survive for not more than 24 hours.

Unlike the hospitals and other public facilities, Sport Centers, generally serve as a meeting point for conveying large numbers of fans and players alike for certain sporting activity. Engaging either passively or actively in these sporting activities could sometimes be rigorous and increase participant's heartbeat and breathing. This therefore stirs the need for continuous flow of fresh and unpolluted air in and around a sport center for the health and wellbeing of users. Under a pandemic condition, this need becomes more imperative since most disease carrying pathogens are transmitted through air, surfaces, water and contacts. On a closer view, every sport center and everyone participating in sporting activity will requires air (oxygen), touch surfaces, and at some point require physical contact, due consideration must be given to ensure that the sport center do not serve as a breeding ground for the spread of diseases.

In conclusion, it important for designers in spatial planning, to question the long time implication of their designs in order to help preparations for the next health crisis. Experts in the building environment need to question guiding principle made for prior maladies in the case where a different one with dissimilar qualities surfaces. In all of the past epidemics,

space mattered. The built environment and spaces played an enormous part in spreading of infections, while the efforts in redesigning of spaces also plays a major part in curtailing the pandemic's surge. Whether it is in creating abundant, uncontaminated air circulation to lessening contagion's existence, building functional mechanism to remove waste in water, or design spaces helpful in the control of infection; architecture has a part in fighting pandemics.

## **2.2 Sport in Primal, Neolithic and Ancient Times**

From the early times of human existence to around 10,000BC, man had this repeated voice in his mind saying "Run for your life". Physical exercise and development in that era had followed a natural pathway for humans, being necessitated as a survival skill for living in those wild environments. The constant need to escape from wild animals that could harm and threaten them as well as the need to get food for his survival. As part of the survival skills in those harsh environment, the early men had to learn how to besides running, to walk, jump, lift, carry, crawl, throw, balance, catch things and in other cases fight for self-defense. The movement and strength of the early men were developed by their day to day, instinctive, necessity-driven practice rather from a well-built program or method of development. From the dawn of early civilization times of agricultural revolution, where man transited from the nomadic hunting lifestyle to being a farmer, there came an intense change in these physical activities. The many demands for cattle raring and growing of food crops projected a lot of work for them. These farming activities were repetitive in nature and was limited in movement. In areas of the world where hunter-gatherers still exist today, the knowledge of what "caveman workout" or "primal fitness" is absent, as these exercises still forms an integral part of their daily lives.

After 476 AD fall of the Roman Empire, civilization fell and raised by wars and subjugation, this made room for the introduction of physical training for young men and boys in preparation for battles. Those ancient military training were similar to those survival skills and patterns adopted by the early men just that this time around it was well structured and had a different objective. The young men were trained, to run, walk on uneasy terrains, jump,

crawled and carry heavy things. Gradually, civilized population showed value for physical sport, and this is evident in the athletic competition from ancient Egypt and also from the Greek's renowned Olympic games. As in the case of the early Greeks, it was observed that their early sports were designed to test their readiness for war. They competed on practical movements like jumping, running, throwing and wrestling.

Outside the military's trainings and sports, the Roman and Greek people sort to celebrate the strength and beauty of the human body, this they did by embracing physical training as an integral part of their learning. They emphasized the notion of possessing a complete mind in a complete body and by this, bodily exercise began growing from just an applied necessity to the means to an end. The era from 1400 to 1600 (Renaissance era) brought about a greater interest in the open study of physical education, human body, health and biology. An Italian humanist and who also is amongst the early educationist in 1420 by name Vittorino da Feltre, opened a school that placed special focus on physical education in addition to other humanist subjects being taught.

### **2.3 Classification of Sport Centers**

Engaging in bodily exercises are actions that are essential for developing a person's social, physical capabilities, and considered necessary for the whole society's wellbeing. According to Ertas (2013), indicators to show that there is an improvement and widespread of sport in a country is when environments for sports are being created with adequate sporting structures and athletes.

Sports centers can generally be classified based on their sizes and based on the nature of the location where the sporting activities are carried out. When classifying sport centers in terms of its size, there are four kinds under these category and they are highlighted below:

1. **Small sport center:** this kind of sport center usually occupies an area less than 20 hectares. An example of this small sport center is the Crystal Palace National Sports Centre in London that occupies an area of 14.6 hectares having several tennis courts, a gymnasium and stadium that seats 38 thousand people.
2. **Medium sport center:** the medium sport center covers an area of between 20 to 60 hectares. An example of this medium sport center is the Montreal Olympic Sport

Center. It has a gymnasium, a stadium, swimming pools, track events ground and a bicycle racing hall.

3. **Large sport centers:** this kind of sport centers covers areas from 60- 200 hectares.
4. **Mega sport centers:** this kind of sport center covers areas above 200 hectares, though this kind is not so common, the Azadi Sport Complex in Tehran is a typical example of the mega sport center and seats on an area of 500 hectares. It has several sporting facilities like basketball courts, a number of stadiums and swimming pools.

When classifying sport centers according to siting of the sporting activities, there is the indoor sport center and the outdoor sport center. The major difference between the indoor sport center and the outdoor sport center is that outdoor sport centers are open to the direct effect of weather conditions since sporting activities are carried out outside without a permanent roof or shelter above unlike the indoor sport center that provides a permanent shelter for users when carrying out their sporting activities inside an enclosed space.

## **2.4 General Design Considerations for Sport Centers**

In the design and construction of a sport center whether an indoor, outdoor, small or mega sport center, a number of laid down design considerations is required to be put to thought in order to have an efficient and functional sport center. Some of these design considerations are as follows:

1. *Circulation:* this basically defines how the users of a space move through it. It is important to create a circulation pattern that is functional and efficient, meeting the desired expectations of the various users. When designing in relations to circulation, the architect will look at the common direction of movement, the frequency of use of that circulation path, (could be for emergency use or common use), type of use (whether is it is for private or public use), and also the time of use of the pathways are all essential factors to consider. As a thumb of rule, circulation paths must be clearly defined and not in any way obstructed, it should also provide the shortest distance between two points.
2. *Orientation:* Orientation is another important factor to be considered when designing a sport center. The siting of outdoor sporting courts and pitches should have their

longer side run north-south. This will allow for equal amount of natural sunlight to come on the users. As much as possible, it is also important to keep indoor users directly away from sun glare, this could be in some ways achieved by the use of certain shading devices and mechanism.

3. *Construction Material*: In choosing the material for construction of the sport center, aesthetic value should not be the only criteria for choice, it is important to choose materials that are durable, sustainable and easy to maintain.
4. *Landscaping*: landscaping also plays an important role in the designing of a sport center. The right and adequate use of landscape element, helps to not just beautify the environment but also helps to ensure the air quality around such facility. The use of sustainable materials for walkways, shrubs, lawns, grasses, hedges and trees all play vital roles in landscaping.
5. *Seating Arrangement*: in considering the seating arrangement for spectators, it is important to consider the seat type and seat positioning. While it is important to select a seat type that will enhance the comfort of the spectators, the seats for viewers of the court should be placed along the longer sides so every viewer can have a clear view of the activity in play.
6. *Safety and security*: the safety and security of users is another important factor to be considered when designing a sport center. The material for construction should not one that puts the users' health at risk, provision of clear exits in terms of emergencies should be made, and where applicable close circuit cameras could be installed to help monitor and observe events around the sport center. The use of caution signs where necessary should also be employed. The provision of adequate natural lighting and artificial lighting, within and around sporting areas is also very important.
7. *Supporting services*: Apart from just providing the space for carrying out sporting activities, it is important to also consider providing adequate spaces for car, motorcycle and bicycle parking for varying users, cafes, change rooms, and toilets. These spaces helps to make the sport center more enjoyable. Consideration for sustainable collection and management of waste is also necessary.

These general design principles are significant factors to be adopted in designing a sport center as it helps the architect in making functional spatial decisions. However, as in most

design principles, certain adjustments could be made in correlation with these principles depending on the peculiarity of its area of application.

## CHAPTER 3

### SPORT CENTERS AS INTERNATIONAL CASES

In this chapter, three international case studies of sport centers are analyzed, with the aim of identifying and adopting certain design elements, principles and consideration put into use. These case studies are carefully drawn from the United Kingdom, Brazil and Canada. These examples of sport facilities will be analyzed in relations to the general design principles for Sport Centers and at the end of the chapter, the summary of findings is made.

#### **3.1 International Case One: Crystal Palace National Sports Centre**

**Location:** Ledrington Road Crystal Palace London SE19 2BB

This amazing leisure center is situated in the heart of Crystal Palace offers a variety of activities at reasonable cost with free parking space. The contemporary gym is fitted with a hundred and twenty piece of equipment, swimming pools, fitness classes, pitches for football, courts for tennis and squash, diving boards, climbing walls, creche and athletics track. This facility was commissioned for use in 1964 and is sited in the core of South London on a two hundred acre of parkland.

**Facilities Available:** some of the facilities available in this sport center includes:

1. **Gym:** it is a well fitted air-conditioned, and provides a variety of equipment for fitness exercise for users. It has machines for cardiovascular exercise and others like the Resistance Machines, TRX, and Free Weights up to 40kg, Core functional training equipment, Smith Machine, Squat Rack, and an Area dedicated for Stretch, Multi Training Room all in over 100 stations.
2. **Swimming Pools:** has a training pool that measures 25m by 12.5m in length and width, having six lanes with a depth ranging from 0.9m –to 1.0m and a limited space



for viewers. It has also has a racing pool that is 50meters in length and 20meters in width, and 8 lanes with a depth ranging from 1.83m to 2.06m. It is also fitted with a Swiss time system using the Ares software and a scoreboard for record display.

3. **Studios:** these studios are where fitness exercise classes are taken as well as venues for birthday parties. There are two studios here, one measuring 17.37meters by 10.36meters in length and width while the other measures 13meters by 10meters in length and width, both having semi sprung wooden floor with mirrors on one wall and an array of aerobic equipment.
4. **Tennis Courts:** there are four hard outdoor tennis courts here which can also accommodate netballs.
5. **Athletic Stadium and Indoor Tracks:** has a 400meter eight lane Tartan Track with full facilities for field and track events. The infield grass area measures 95.1metres by 67.5metres in length and width. This space accommodates football pitches and is floodlighted. The stadium has seats for 16,500 spectators and out of which 9,500 seats has a covering above them. The indoor track measures 110m by 10m in length and width and accommodates a six lane 60metre Tartan Track. The area also provides a throwing cage and pits for jumping.
6. **Sport Halls:** The main bowl measures 46metres by 29.18metres wide and houses six courts for badminton, two basketball courts, one court for basketball show, two courts for volleyball and two show courts for volleyball. The sport halls has a 1500 seating capacity bleachers.
7. **Pitches:** it has four pitches namely, bar pitch (made of sand and is floodlighted), the dome, the North Pitch and the Indoor 5's.
8. **Squash Court:** has three squash courts, each measuring 9m by 6m with semi sprung floor with a spectator gallery.
9. **Climbing walls:** The facilities for bouldering integrates many features that ranges from double overhangs, exposed slabs to a cave and featured walls for bouldering.
10. **Beach Volleyball Court:** it consists of three communal beach volleyball courts that is well-lighted with seating areas.

11. **Crèche:** it has a crèche facility, that offers 'Play and Learn' for children under five years, this gives users the chance to take part in leisure activities, while their children are well taken care of.

The project took into consideration, the subject of accessibility by providing ramps and lifts access, toilets and parking space for people with disability and other people who can't use the stairs by virtue of the lack of strength or health constraints.

The access into the center is on a flat level from the parking area into the main entrance, this allows for a non-assisted full wheelchair access. The bathroom and toilet facility is designed with wheelchair accessibility, the use of hearing loop system was employed for communication in the facility. In it is a café, meeting rooms and conference rooms and sufficient on-site parking and consideration for blue badge parking as well. All these considerations and inputs in the design of National Sport Center are ideal for the comfort and well-being of various kind of users.



**Figure 3.1:** Aerial view (Source: URL1)



**Figure 3.2:** Approach view (Source: URL1)



**Figure 3.3:** Changing room (Source: URL1)



**Figure 3.4:** Well lit Court (Source: URL1)



**Figure 3.5:** Indoor swimming pool (source: URL 1)    **Figure 3.6:** Retractable seating (source: URL 1)

### **3.2 International Case Two: Commonwealth Community Recreation Center (CCRC)**

**Name: Location:** Edmonton, Alberta Canada

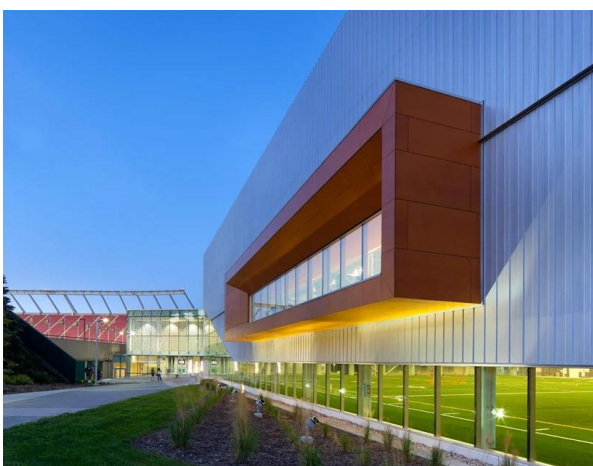
This recreational facility (CCRC) is a product of a combined partnership between the football club of Edmonton Eskimo, the city of Edmonton and in relations with HIP Architects. The ample facility blends an 18,000m<sup>2</sup> of aquatic-facilities, 24,000m<sup>2</sup> field house, 9,000m<sup>2</sup> of fitness and community program centre, and 9,000m<sup>2</sup> space for administrative functions and the successive urban planning employed in ensuring an effective flow and circulation for both pedestrian and vehicles alike, safely incorporating it with the existing light rail transit system and neighborhood. The project is structured around 3 major areas – the gymnasium, field house, and the aquatics center, and that delineate a central lobby. The building's form is in consonance with the interior functions that suggests movement and speed, with glazing sections large enough for natural lighting and views yet using necessary overhangs for shading. The walls within the interior space are clad with fritted glazed ceramic tiles that passively controls heat absorption and glare coupled with a threefold-glazed window. On the upper south side is a black corrugated metal that naturally heats the air in-flow during the cold winter months and openable openings allows for ventilation through all parts of the facility. The 1978 original recreation center design is adapted and incorporated into the new facility which helped in reducing cost to be accrued by demolition. The adjoining landscape is also pedestrian friendly and invigorated to return the community' public green space.



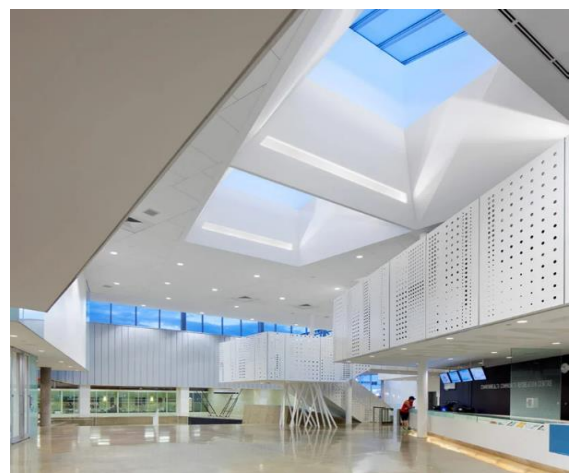
**Figure 3.7:** Approach Elevation (Source: URL 2, 2020)



**Figure 3.8:** Central Lobby (Source: URL2, 2020)



**Figure 3.9:** Use of Shading Device (source:URL2)



**Figure 3.10:** use of natural lighting (source:URL2)



### **3.3 International Case three: São Luis Sports & Arts Gymnasium**

**Name: Location:** São Paulo, Brazil

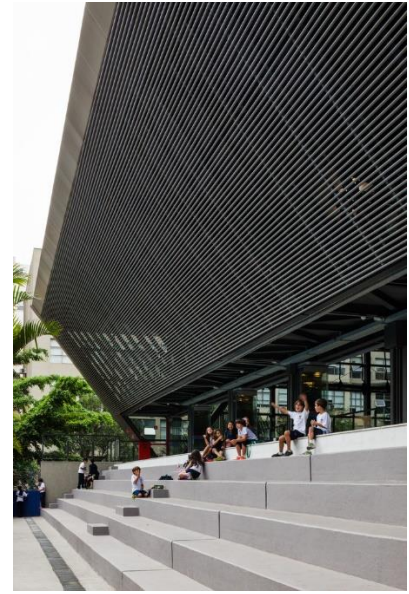
This Sport facility is part of an architectural program undertaken in various schools in over 12 years, to enhance educational principles. The restructuring of the sporting sector empirically requires a surge in the quantity of sporting activities and facilities. This project brief includes the addition of functional spaces to the existing sport complex such that there is no interruption in the school's everyday activity. This facility occupies the same area as the former structure that was demolished completely, the school increased its single sports fields to four, with two as grass football pitch on the upper floor while the other two are seen when the retractable bleacher is slided.

One key feature of this new building is in its climate control measures. A comfortable air and temperature exchange is realized by the design quality of the facades. The permanently installed openings are tactically placed, ensuring the inflow of fresh air, while the distinctive glass panels controls the inward heat from the sun. The opportunity of having the slide doors at the northward building's façade of the building open, helps controls the amount of wind through all times. The angular inclination of the brise-soleil's design increases continuous air circulation devoid of exposing the students when it is raining, in addition to decreasing the occurrence of the sun's heat within the facility.

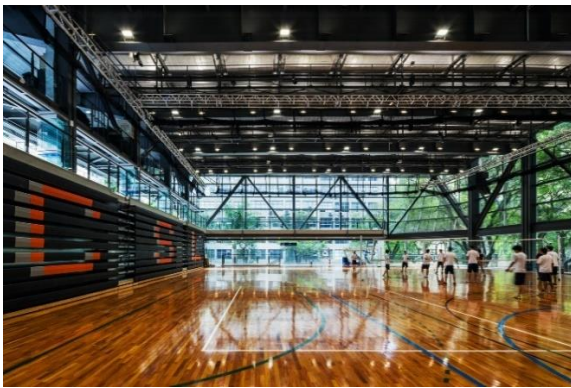
The use of nature's sunlight is in abundance in the gym, this sunlight is filtered through diverse glass panels' treatments on the facades. Rainwater is preserved in a 60,000 liter tank and is used to service the water need of the facility. The acoustic treatment of the building does not only accommodates sport events, but some other cultural and institutional occasions the school holds. The facility also supports an ample theater setup, the spaces has a sound echo and acoustic padding fitly earmarked for all anticipated usage. The center offers a great measure of excellence and comfort, without disquieting the neighboring vicinity. The whole environs is planned to embolden social interaction.



**Figure 3.11:** Aerial View (source- URL3)



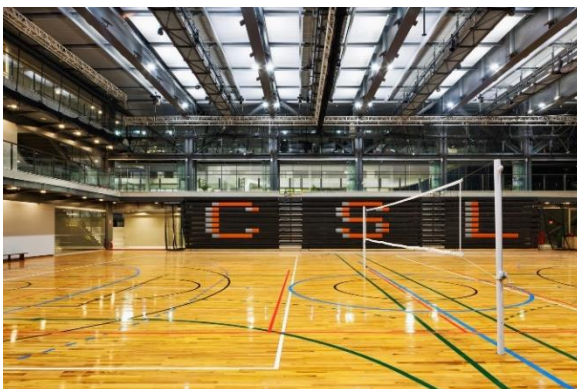
**Figure 3.12:** Use of brise-soleil (source- URL3)



**Figure 3.13:** Well lighted Court (source-URL3)



**Figure 3.14:** Trees for shading (source-URL3)



**Figure 3.15:** Multi-purpose courts (source-URL3)



**Figure 3.16:** Outdoor sport Area (source-URL3)

### **3.4 Summary of Chapter**

In summary, from these three international case studies, it has been observed that the design principles for Sport Centers were carefully employed in handling the projects. In terms of lighting of interior spaces, all three case-studies employed adequate measures to provide lighting especially by natural means. This was achieved by the use of clear glazing and the use of covered atriums. In consideration to accessibility and circulation for users, the use of convenient ramps and stairs were employed by the examples. The São Luis Sports & Arts Gymnasium employed the use of acoustic insulation which helps to reduce the noise within from disturbing the neighborhood. This measure helps to contain and reduce noise that is likely to result from sporting activities which may become a nuisance to the neighborhood. Also in this sport center, water sustainability measures were employed where rain water gathered into a reservoir and used to maintain the facility. This water conservation measure is sustainable and is adopted for use in this proposal.

In order to enhance the thermal comfort of users, different means of shading mechanism were employed. Like in the case of São Luis Sports & Arts Gymnasium, brise-soleil and trees were used to help reduce the direct impact of sun radiation on interior spaces. Sun shading will be needed in this proposal, taking cognizance of the building orientation requirement for this proposal, the shading mechanics to be adopted is the use of umbrella like trees.

## **CHAPTER 4**

### **PROPOSAL OF A SPORT CENTER WITH FOCUS ON PANDEMIC ARCHITECTURE**

#### **4.1 Brief History of Lapta**

Lapta is geographically found on the western part of Girne and northwards of the peak of the five fingers mountains Selvili Tepe. It is a small renowned and beautiful city in North Cyprus that is steeped in history. The soil favors the growing of orange groves, lemon and other fruits orchards, this explains why they are found in virtually all part of the city. Lapta main water source comes from a run of spring known as “Baspinar”. It was identified through times past as “Lapethos or Lapithos”, this metropolis was once the capital of one of the 9 kingdoms Cyprus had. The city began to become wealthy and important at around 800 BC, when the Phoenicians who controlled trade and business in eastern Mediterranean began to rule them. And further gained relevance when it became one of the dioceses during the Christian period. The peak of its importance was attained when at a time where the city was renamed “Lambousa” as which meant brilliant as a result of the much amassment of wealth in the time where the Byzantines and Romans ruled. At the close of the Roman era and beginning of the early Byzantines and Christian era, the city of Lambousa moved its locality to the seashore which turn out to be the area well-known for prosperity. A good number facilities like theaters and gymnasium were erected in the city for usage by entire public. Until the Arabian incursion in 700 BC, Lambousa was an important settlement.

#### **4.2 Site Location**

The project site for this sport center is situated in an eco-friendly site at Lapta Girne -Nicosia ( $5^{\circ} 10'N$   $33^{\circ} 22'E$ ). It is a province in the Turkish Republic of Northern Cyprus (TRNC). Lapta has an area of  $18.22\text{km}^2$  and a population of about 8,000 inhabitants (TRNC State Planning Organization, 2011). The project site for the Sport Center is cut out from an area of 10 hectares which serves as an Urban Pandemic Resilient Community. The site has an undulating surface with varying terrace levels and it is bounded by the Mediterranean Sea. Lapta has a high rate of oxygen which helps in eliminating rise of air borne diseases this



due to its proximity to the mountain, the sea and dense vegetation around the area. The site itself being secluded makes it a perfect zone for the pandemic project as the site is an area cut off from the busy city thereby making it a plus for possible prevention of an outbreak. Contributions of available vegetation in the environment improves the air quality, the climate, conserving water and preserving the soil.

### **4.3 Site Analysis**

**Noise:** The major source of noise to the site comes from two avenues; the military barrack close by which makes use of heavy moving machineries and from the waves of the sea. Though the noise from vehicular movement plying the access round by the site is minimal. The peak noise when measured is 80 decibels while the lowest is 40 decibels.

**Temperature:** The general weather temperature of the site goes from 37<sup>0</sup>C as its hottest in summer and gets to as low as 8<sup>0</sup>C in winter, with heavier winds coming from the southwest and northwest direction. During the day time, cool air moves from the seaside into the landside, causing warm air from the land to rise up and take the place of cool air at high temperature thus pushing cool air towards the sea. While at night time, cool air transfers from the landside to the sea while warm air from the sea arises and takes the place of cool air at high temperature and gets cool air pushed down towards the land.

**Terrain/Soil Type:** Given the sloppy nature of the site, a careful design consideration was given to mitigate the effect of erosion due to surface water runoff by installing plant materials at natural angles for soil repose. Seeing the soil type to be made up of loamy and clayey soil, a slab on grade foundation is employed to carry the structural load of the buildings, despite the expanding and contracting nature of the soil bearing in mind also that outdoor plants grow better on loamy soil.

**Vegetation:** the site is densely populated with trees that helps make the environment cool even in summer. There are also the presence of shrubs and grasses.

**Accessibility:** the site can be accessed through a small narrow pliable road the site from the major access road. A new road is proposed in relation with the overall site so as to service this project.

**Existing Structures:** there exist a number of permanently erected building structures on site. Some of which includes a café, some offices, staff houses and a football field with spectators platform. A number of them are dilapidated.

As part of measures to diligently assess the proposed site, a SWOT analysis was undertaken and Table 4.1 below shows the findings.

**Table 4.1:** SWOT analysis

<b>Strength</b>	Great amount of security is gotten as a result of its proximity to a military barrack
	The site's closeness to the sea can provide an alternative means of transportation and development of economic activities.
	The site is located in a secluded and serene and environment is suitable for relaxation and other sporting activity
	The single road entering the site, provides an access control of people into the neighborhood.
	The leveled ground where the sport center is to be sited will cut the cost of creating different foundation levels.
<b>Weakness</b>	Some existing dilapidated structures will be demolished to give way for this new project.
	Noise is gotten from the movement and activities of heavy military hardware from the adjoining military barrack.
<b>Opportunity</b>	The existing vegetation provides shade, carbon sink and wind breakers
	Water from the sea can be used in addition with rainwater to service the facility.
	Available trees on site contributes to the ecology by providing oxygen, air quality improvement, climate amelioration through water conservation and soil preservation.
<b>Threats</b>	The existing trees provide a beautiful addition to the landscape and provide edible fruits and nuts
	As a result of the site location, it is susceptible to flooding.
	Height of trees may disturb power line cables and installations.
	The absence of a perimeter fencing can grant unauthorized access in and out of the neighborhood.
	Deep taproots of trees may affect the building foundation

#### 4.4 Design Solution

The design solution for the Sport center puts into consideration the design principles for the design of a sport center as well as considerations in respect to the pandemic. These solutions have being put together into an architectural program that makes up the framework for the proposal. Below is Table 1 which shows an array of the architectural program that contains the space functions, services and offices and other measures intended for use in order to meet the aim of the project. This architectural programs serves as the framework for the project.

**Table 4.2:** Architectural Program for the Sport Center

Space Functions	Services	Offices
Café (Kitchen, Dining area, Storage)	Reception Area	Gym instructor office
Swimming Pools	Storage	Yoga instructor office
Art Gallery Hall	Fans Viewing Area	Janitor office
Volley ball court	Outdoor sitting Area	Manager Office
Yoga hall	Heating and Cooling	First Aid room
Badminton Court	Mechanical/Electrical service room	
Badminton court	Sterilization area	
Dance Hall/studio	Changing rooms/ WCs	
Outdoor Seating Area/Garden	Biophilia feature (Wetlands)	
Gymnasium		

As part of measures to further enhance the quality of the space functions, services and offices in the Sport Center program, the design principles were also considered in relation to pandemic architecture and the results are highlighted below:

**Circulation:** in providing adequate and functional circulation path in this sport center, the use of ramps were employed where applicable. These ramps had slopes gradients not exceeding 5%, this is to provide ease for people using manually propelled wheelchairs. Since the site is relatively flat, and no significant change in levels in the design, there was no need to provide steps. To avoid the risk of slipping, the ramps surface is finished with a slip resistant floor finish mixed with antimicrobial elements. Walkways within the sport facility has a width of 3m, this is to minimize the chances of physical contact while walking.

**Landscaping:** The use of adequate soft landscaping elements is employed so as to help enhance the air quality in and around the building and as well create a beautiful ambience for users. Umbrella shaped trees were used to provide shade, serve as wind breakers and reduce the impact of sun glare to the building, thereby enhancing the thermal comfort of the interior space. Outdoor furniture like benches were also introduced in and around the sport center so people can seat and enjoy the beautiful environment. The use of permeable walkways and wetlands is also introduced to help improve the ecosystem. To further boost the sustainability of the environment and economy, a fruit garden, vegetable garden and herbs garden were introduced around the sport center to serve for the health and wellness of visitors. These gardens gives users the access to fresh edible fruits and vegetables for their food.

**Lighting/Ventilation:** As part of sustainable measures in reducing the cost of running the Sport Center and enhancing the health and safety of users, adequate lighting and ventilation of interior spaces will be solely dependent on natural means and where necessary, artificial means will then be employed for day time lighting. This was achieved by introducing two open courtyards fitted with greenery and urban furniture inside the indoor sporting area, this will improve the air quality circulation and provide natural daylighting. To ensure proper and adequate ventilation within enclosed spaces, cross ventilation was ensured in such spaces with provisions for high level windows in all indoor space.

**Noise Insulation:** In considering the impact of sounds and noise within the indoor sport areas, sports with closely associated activities were zoned closed to each other to share services and as well create a sense of harmony. The use of sound and noise insulating floor, wall and ceiling material is incorporated. The use of polyester acoustic panels is employed

for partitioning. This panel is light and thin, non-carcinogenic, resistant to water deformation and is fire retardant and insulates heat.

**Building Orientation:** The outdoor courts are oriented such that both sides of the court can maximize natural lighting from the sun at equal amount, the shorter side of the courts are tilted a little off the North-South direction at an angle not exceeding 20 degrees.

**Waste disposal:** in managing waste collection on the sport center, the use of finely crafted urban furniture will be employed to serve as waste collecting bins that incorporates a bit of infographics. Rainwater from the roof is collected and stored up in a reservoir, this water is then treated by means of ultra-filtration for use in servicing the water need of the facility. In collecting this rainwater from the green roof, siphonic downpipes are used. This pipe is used because it eliminates the need for large diameter downpipes affixed to the structural columns.

**Seating Arrangement:** In considering the seating arrangement for spectators under this condition, seating furniture are distributed apart a distance to incorporate social distancing. The seats are placed on elevated platforms along the longer sides of the court so fans can have an equal view of players. Due consideration is given to distribute seats in a manner that will portray social distancing and reduce overcrowding.

**Material Finishes:** The floor surfaces, wall surfaces, window panes and door handles is treated with antimicrobial finishing, this will help serve as antiseptics. Although disinfecting surfaces and hand washing maybe effective in lessening the spread of pathogenic bacteria, the choice of this antimicrobial finishes in materials enhances the hygiene and health of the sport center.

**Safety and Security:** In addressing the safety and security need for the sport center, access into the sport center is controlled. The placement of sterilization area is introduced at both the entrance to the outdoor and indoor area with a reception area. That way users coming in can be properly decontaminated and accounted for.

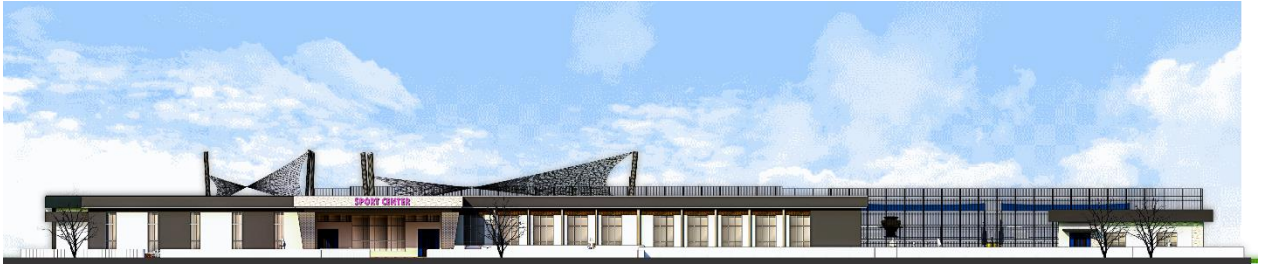
**Supporting Services:** as part of supporting services to the site, car parking lots for vehicles were provided, both for members of staff and visitors alike. Provision is also made for bicycle racks and parking space for people using wheelchair.





**Figure 4.2** Ground Floor Plan





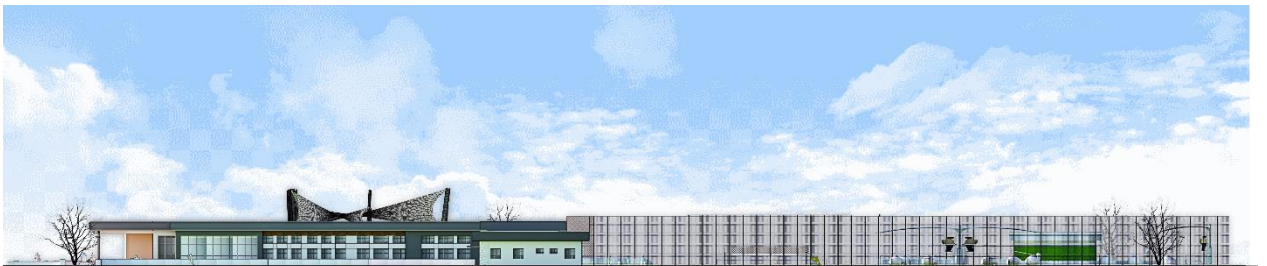
**Figure 4.3:** North East Elevation



**Figure 4.4:** South East Elevation



**Figure 4.5:** South West Elevation



**Figure 4.6:** North West Elevation





**Figure 4.7:** Arial View 1



**Figure 4.8:** Arial View 2



**Figure 4.9:** Outdoor Activity Area

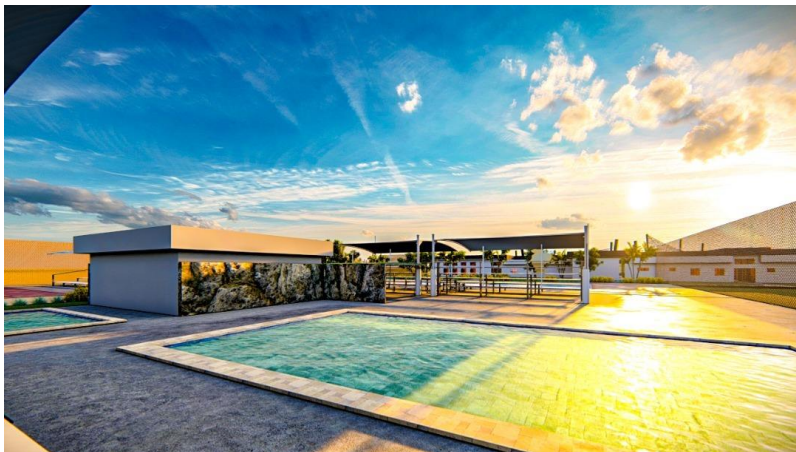




**Figure 4.10:** Permeable Walkway



**Figure 4.11:** Hedges



**Figure 4.12:** Swimming Pool



**Figure 4.13: Courtyard**



**Figure 4.14: Tennis Court**



**Figure 4.15: Bleacher**

## CHAPTER 5

### CONCLUSION AND RECOMMENDATIONS

#### 5.1 Conclusion

This study, shows a deliberate implementation of design considerations required for creating a sport center that would serve the interest of users in a case of health emergencies like the covid-19 pandemic. The project recognizes the importance of urban sustainability by employing the use of eco-friendly ideas to provide sun shading that will not only help improve the air quality of the neighborhood but also ensure the well-being of the users in line with what some studies has shown as one means of disease transmission; air. Outdoor spaces were designed with adequate vegetation in order to enhance users comfort even during the hot summer season. The introduction of therapeutic garden, fruits gardens and outdoor activity area provides room for social interaction and at the same time provide a non-pharmacological approach for physical therapy and easing of stress. Passive design approach is incorporated in refreshing the air within the indoor space through the use of cross-ventilation and the use of an open courtyard furnished with urban furniture for seating and the presence of greeneries to give a cool ambience.

Furthermore, the project's spatial design employed a form of zoning triage that has sterilization areas provided for both indoor and outdoor sporting areas. This sterilization area is fitted with disinfection machines, that way visitors coming into the facility are sterilized from every likely contamination before proceeding into the sporting areas. In addition, there is a one-way pattern of movement such that the entrance and exit of the facility is different, that way the likelihood of visitors leaving the facility from picking up any contamination from the sterilization area to the outside world is eliminated. The use of antimicrobial finishes on surfaces provides a germicidal approach to destroy or inhibit the growth and sustenance of any microbe that may have found its way in or around the facility. With that in place, the hygienic condition of the facility is enhanced. In saving cost and ensuring the sustainability of bio resources, an extensive green roofing system was used. This helps

amongst others to reduce the effect of Urban Heat Island Effect, improves air quality, building insulation, reducing greenhouse gas effect and improves the management of storm water.

In conclusion, the proposed Sport Center in Lapta, will serve the Urban Community in providing a recreational facility for users in the pandemic stricken condition, having employed the various design and health considerations that have being put forth by relevant experts. This sport facility provides users that space where they can enjoy the twenty to forty minutes of moderate-intensity exercise per day that is adequate to provide a positive boost to the immune system. Spaces and building materials have being carefully provided in a way users can get the required comfort to interact socially and exercise physically under pandemic conditions in a sustainable manner, hence making the proposed sport center serve as a vehicle for social interaction amongst people of different demography and not just a functional space for sporting activities. This architectural scheme brings a new paradigm in sport centers in the time of pandemics.

## **5.2 Recommendations**

In as much as repetition of this Sport Center may be advised, the degree of visual appeal and incorporation of construction materials and elements may vary from place to place, difference in site size, nature and difference in design scopes may also pose a limitation. For these reasons, it is important to adopt the various design consideration highlighted and put into use in creating this design. This Sport Center is therefore recommended for execution in Urban Communities, where sporting activities may be desired during health crisis and emergencies, since this proposal not only engenders the building of body immune system by virtue of physical exercise but also addresses the need for a healthy social interaction during the cause of a pandemic.

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## APPENDIX 1

### SIMILARITY REPORT

In carrying out the similarity and plagiarism index test check for this project, an online report grading software called “Turnitin” was employed. This software shows the text percentage in a study that matches other sources other than the author’s. The project is broken down into abstract, chapters one, two, three, four, five and thereafter as a complete text before running it through the software. The result shows 0% in the abstract section, 1% in chapter one, 0% in chapter two, 1% in chapter three, 2% in chapter four, 2% in chapter five, making a total of 6% in the complete text. A copy of the originality test result is shown in Appendix 1 below.

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