ECO - FACETED

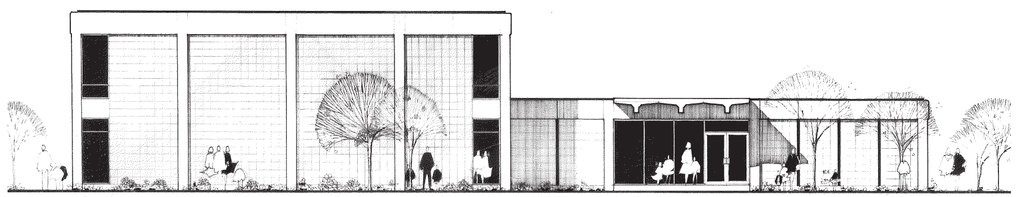


FIGURE 1

ECO - FACETED

DIAMOND HILL COMMUNITY RECREATION CENTER

Dalton M. Schroller

COMMITTEE

Chair
Mark Clayton

Member
Wei Yan

Member
Bruce Dvorak

ACKNOWLEDGEMENTS

First and foremost, I would like to express my heartfelt gratitude to my family, loved ones, and friends who have been my constant source of support and encouragement throughout my architecture career at Texas A&M University. Your continuous belief in me has been instrumental in shaping my journey. I am deeply grateful for your love, patience, and understanding.

I also extend my sincere appreciation to my committee members for their invaluable knowledge, expertise and guidance throughout my architectural project. Your feedback, insight, and wisdom has been critical throughout the process, as you have pushed me to strive for excellence. I am humbled and grateful for your time and dedication towards my project and academic growth.

Finally, I would like to thank Texas A&M University for providing me with an exceptional academic environment that has nurtured my intellectual curiosity and passion for architecture. The opportunities, experiences, and relationships I have gained here have been an invaluable asset to my architectural and personal growth.

Thank you,
Dalton Schroller

“Without addressing how we live together and finding a way that respects both nature and our universal humanity, we won't have the collective ability, strength, or shared vision necessary to protect our world or build a better one.”

-Diane Kalen-Sukra

CONTENTS

FOREWORD

Architecture in the 21st century started with a new tool: Building Information Modeling (BIM). It started with an old imperative but now imbued it with greater urgency: addressing environmental degradation and climate change. Having introduced Dalton to these ideas in an undergraduate design studio in 2020, it was my pleasure to see him embrace them in 2023 as the themes of his final studies project.

In his design for a community center in Fort Worth, Texas, Dalton has used BIM to model his design and it them through simulation and rigorous analysis. A pragmatic spatial solution is complemented by impressive and inspiring forms. Innovations such as dynamic facades, green walls, and roof gardens derive from the power of parametric modeling, the predictions of simulation, and a sensitivity to environment and greenhouse gas reduction. His solution is an approachable stage for community interaction, while being a machine for setting aright our natural and anthropogenic environments.

His process is a 21st century approach that was formulated in our BIM SIM Lab by Ozan Ozener, now a Doctor of Philosophy and faculty member at Istanbul Technical University. After developing a project BIM framework for site conditions, graphic standards, and integrated analysis, Dalton explored multiple schemes, using BIM to develop 3D models situated on the site in a vicinity.

A superior scheme was chosen by comparing the performance of each scheme using multiple technical, social, and aesthetic domains of knowledge. The scheme was refined by carefully considered details, largely focused on boosting performance in climate responsiveness.

Even at the quarter century mark, Dalton's final studies project is an exemplar for design process in the 21st century. Document your design ideas in a Building Information Model. Create architecture that does no harm to the environment and may even provide recurring and enduring benefit to the environment. Give people beautiful, functional, and inspiring spaces for living our lives.

Mark J. Clayton, PhD
William M. Pena Professor of Information Management

INTRODUCTION

Buildings have a profound impact on the quality of our lives. They serve as the backdrop for our daily activities, providing shelter, safety, and comfort. Beyond these basic needs, buildings also have the power to positively impact their users, their communities and the environment. The way we design buildings has far-reaching consequences that go beyond the individual user. A building can affect not only its immediate occupants but also the surrounding community and the environment.

The Eco-Faceted Diamond Hill Community Recreation Center is a testament to the power of sustainable and parametric design. The name of the project, Eco-Faceted, is derived from the diamond, which has many faces. The building, too, has many faces, all of which serve a unique purpose in promoting the three levels of ecology - individuals, the community, and the environment.

This book aims to take the reader on a journey through the 'Eco-Faceted' Diamond Hill Community Recreation Center, highlighting the various elements and features that make it a unique and groundbreaking sustainable building.

From its parametric design to its use of renewable energy sources, the building is a model for future sustainable development. Through beautiful images, detailed drawings and illustrations, and informative descriptions, the reader will gain a deeper understanding of how the building benefits the individual users, the community, and the environment.

This book is not just about the building itself, but also about the people who use it, the community that surrounds it and the environment which it aims to benefit.

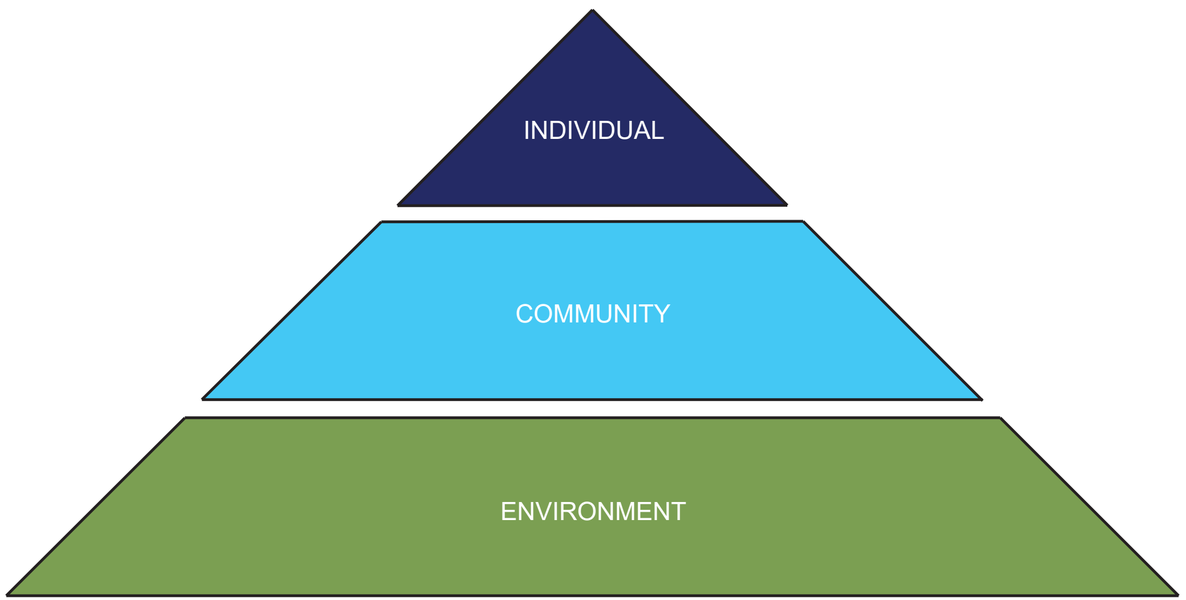
We hope that this book inspires architects, designers, and developers to think more deeply about sustainability and the impact that buildings can have on the environment and communities. The 'Eco-Faceted' Diamond Hill Community Recreation Center is a shining example of what can be achieved when sustainable design is prioritized, and we hope that this book will encourage others to follow in its footsteps.

CHAPTER 1:
RESEARCH

BIG QUESTION

How can architecture benefit the users, the community, and the environment within a single building?
These are three different levels of ecology – from individuals to the environment, my goal was to design a building that improves the lives of the users, betters the community where the building is located, and helps the environment. When deciding on a building typology, I figured a community and recreation center would be the best solution.

In order to successfully benefit the individuals, I needed to design a building that promotes a healthier lifestyle through fitness and diet for the users. In order to benefit the community, I needed to create a space that acts a central hub which brings the community together. In order to benefit the environment, I needed to design a sustainable building that focuses on being energy efficient and reducing negative impacts of on the environment.



WHY?

As a designer, I was motivated to create a community recreation center that could address personal health, community engagement, and environmental preservation, as these three factors are all very important to me. I believe that these are all interconnected and can positively influence one another. By designing a space where people can come together to exercise, socialize, and participate in community activities, we can promote personal health and wellbeing.

Additionally, by creating a space that encourages community engagement and involvement, we can strengthen social connections and promote a sense of belonging and unity. Finally, by incorporating sustainable design features such as renewable energy sources and energy-efficient systems, we can reduce the environmental impact of the building and promote conservation. Ultimately, my goal was to design a building that could positively impact individuals, the community, and the environment in a holistic way.

USERS

Overall health, both physical and mental, is important for individuals of all ages and regular physical activity can help promote a healthier lifestyle. Recreation centers can have a significant impact on physical and mental health, as well as reducing obesity rates and improving nutrition and diet.

Regular physical activity is associated with numerous health benefits, including reducing the risk of chronic diseases such as heart disease, stroke, diabetes, and certain cancers. Recreation centers can provide access to a variety of physical activities, such as aerobics, swimming, weightlifting, and sports, which can help community members meet the recommended amount of physical activity. According to the American Heart Association, adults should aim for at least 150 minutes of moderate-intensity aerobic exercise per week.

Physical activity has also been shown to have a positive impact on mental health, including reducing symptoms of anxiety and depression and improving mood and cognitive function. Recreation centers can provide a safe and supportive environment for community members to engage in physical activity, which can promote mental health and reduce stress.

Obesity rates in the United States are high, with approximately 42.4% of adults considered obese, according to the Centers for Disease Control and Prevention (CDC). Recreation centers can help address this issue by providing access to physical activities and promoting healthy behaviors such as regular exercise and healthy eating. Recreation centers can also play an important role in promoting healthy nutrition and diet. Many centers offer nutrition education programs, cooking classes, and healthy food options. According to the CDC, a healthy diet can help prevent chronic diseases such as heart disease, stroke, and diabetes.

Overall, recreation centers can provide numerous benefits for physical and mental health, as well as reducing obesity rates and promoting healthy nutrition and diet. By providing access to a variety of physical activities, promoting healthy behaviors, and offering nutrition education and healthy food options, recreation centers can play an important role in promoting a healthier lifestyle.

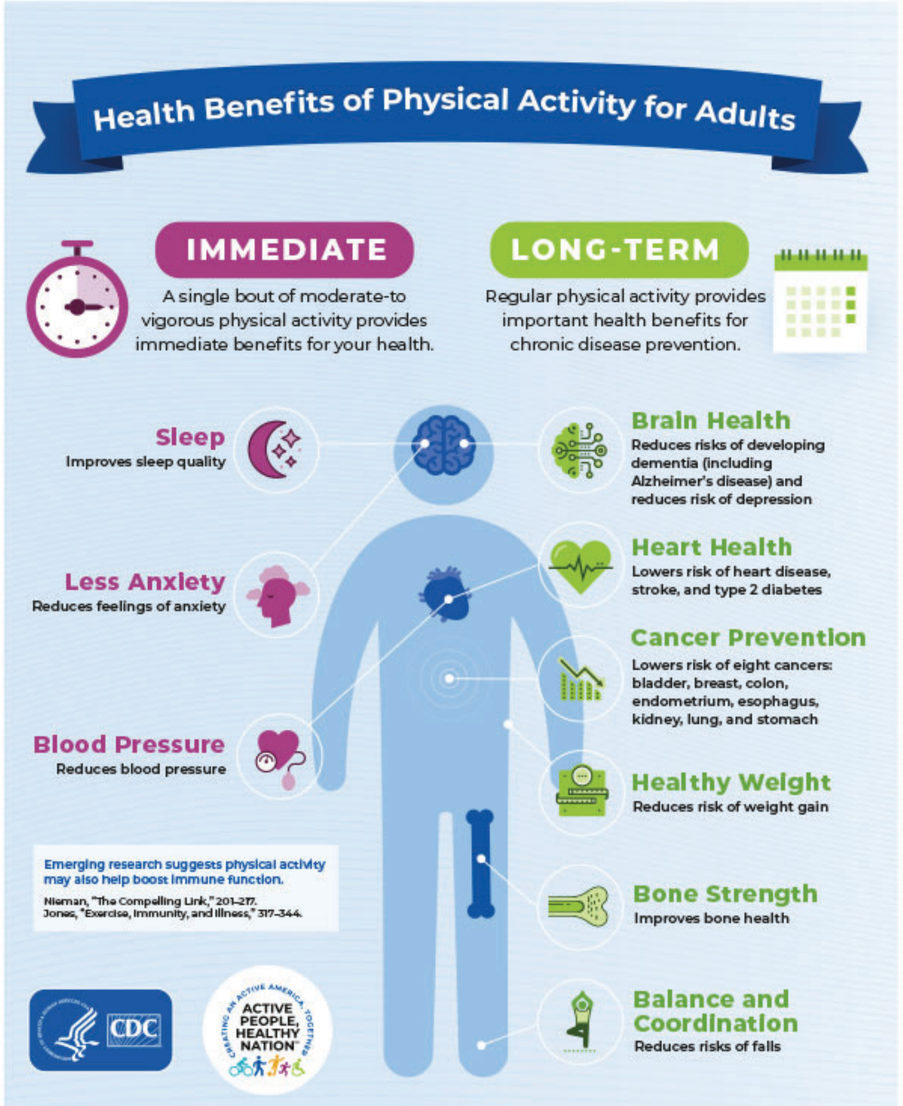


FIGURE 2

COMMUNITY

A community recreation center can provide a multitude of benefits to a community beyond just physical and mental health. By providing a safe and positive environment for community members to gather and engage in healthy activities, recreation centers can help reduce crime and improve community safety. The center can serve as a central hub for community events, meetings, and activities, bringing people together from diverse backgrounds and fostering a sense of community spirit and collaboration. This sense of community and belonging can help to address social issues such as isolation, disconnection, and conflict. The recreation center can also serve as an economic driver for the community, attracting visitors and promoting local businesses. Ultimately, a community recreation center has the potential to bring about positive social change and improve the quality of life for community members of all ages and backgrounds. The community of Fort Worth, Texas is a large city with a population of over 900,000 people. Community involvement, crime rates, and socialization are all important aspects of life in Fort Worth and a community recreation center can help improve those aspects. Community involvement is important for building a strong sense of community and promoting civic engagement. According to the National Conference on Citizenship, the percentage of adults who volunteer in Fort Worth is above the national average. In 2020, Fort Worth ranked 34th out of 51 cities in terms of volunteering rates. This indicates that the community in Fort Worth is already highly involved, but there is always room for improvement.

Crime rates are a concern in Fort Worth, as they are in many cities. According to NeighborhoodScout, Fort Worth has a crime rate that is higher than 84% of cities in the United States. By designing a community recreation center, this will give the community a central hub and help reduce the crime rate. Socialization is important for promoting mental health and building strong communities. Fort Worth has many opportunities for socialization, including festivals, community events, and recreational activities. However, not all residents may have equal access to these opportunities, which can contribute to social isolation.

A community recreation center can provide a range of benefits to the community of Fort Worth. Recreation centers can offer opportunities for physical activity, which can promote physical and mental health. They can also provide a safe and welcoming space for community members to gather and socialize, reducing social isolation and promoting a sense of community. Additionally, recreation centers can provide educational programs and job training, which can improve the overall well-being of community members and increase employment opportunities.

Recreation centers can also help to reduce crime rates by providing positive activities for young people and providing a safe and supervised space for residents to gather. By promoting physical activity, socialization, and community involvement, recreation centers can contribute to a healthier, safer, and more connected community in Fort Worth.

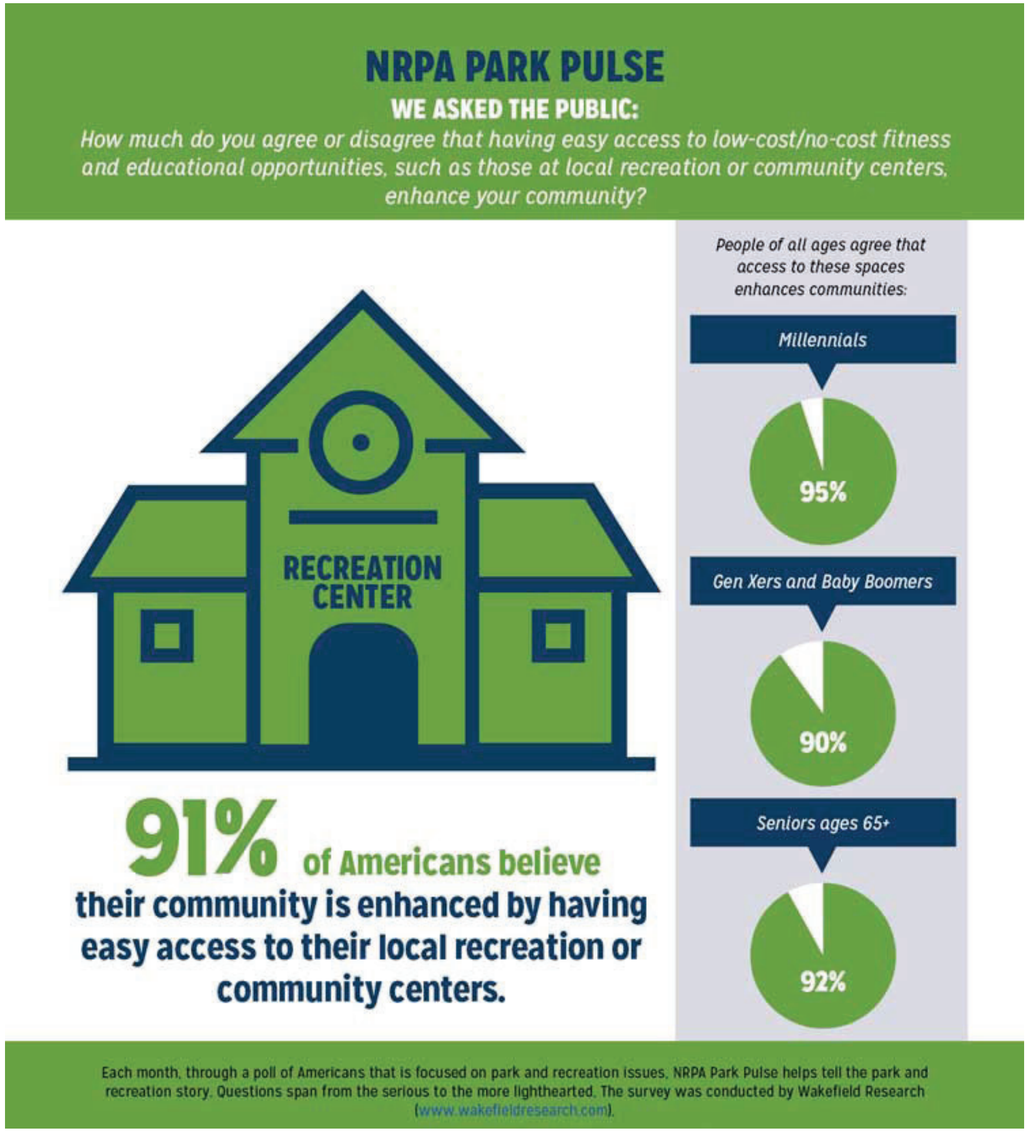


FIGURE 3

ENVIRONMENT

In addition to the benefits for the community, a community recreation center can also benefit the environment through sustainable design. Sustainable buildings are designed to use energy efficiently, with features such as energy-efficient lighting, heating, and cooling systems, as well as insulation and other materials that reduce energy consumption. This reduces the amount of energy needed to operate the building, which in turn reduces greenhouse gas emissions and air pollution.

Sustainable buildings can also incorporate features such as rainwater harvesting, low-flow fixtures, and landscaping that uses native, drought-tolerant plants. These features can significantly reduce the building's water consumption and help conserve water resources. Another sustainability feature buildings often include is re-using, recycling, and composting materials. This reduces the amount of waste generated by the building and reduces the need for landfill space.

Sustainable buildings are designed to minimize their impact on the environment, including reducing their carbon footprint. By using renewable energy sources, such as solar or wind power, sustainable buildings can significantly reduce their greenhouse gas emissions and help mitigate climate change. Sustainable buildings also often use non-toxic and low-emission materials, as well as ventilation systems that improve indoor air quality. This reduces the health risks associated with poor indoor air quality, such as respiratory illnesses and allergies.

Overall, sustainable buildings can help benefit the environment by reducing energy consumption, conserving water resources, reducing waste, reducing greenhouse gas emissions, and improving indoor air quality. These benefits not only help protect the environment but can also help reduce operating costs and improve the health and well-being of building occupants.

FIGURE 4

CHAPTER 2:
PRECEDENTS

MONTOPOLIS RECREATION AND COMMUNITY CENTER

FIGURE 5

Austin, Texas
McKinney York Architects
Project Year: 2020
Square Footage: 33,000

The Montopolis Recreation and Community Center is located in Austin, Texas, and was designed by the architecture firm, McKinney York Architects. The center was completed in 2018 and serves as a community hub for the Montopolis neighborhood.

The design of the center is focused on creating a welcoming and inviting space for community members of all ages.

The building is a two story building and is made up of three interconnected pavilions, each with its own distinct function. The first pavilion houses the gymnasium and fitness areas with an elevated walking/running track on the second level. The second pavilion, which is smaller than the first contains the community spaces such as the multipurpose room and classrooms. The third pavilion houses the administrative offices and support spaces.

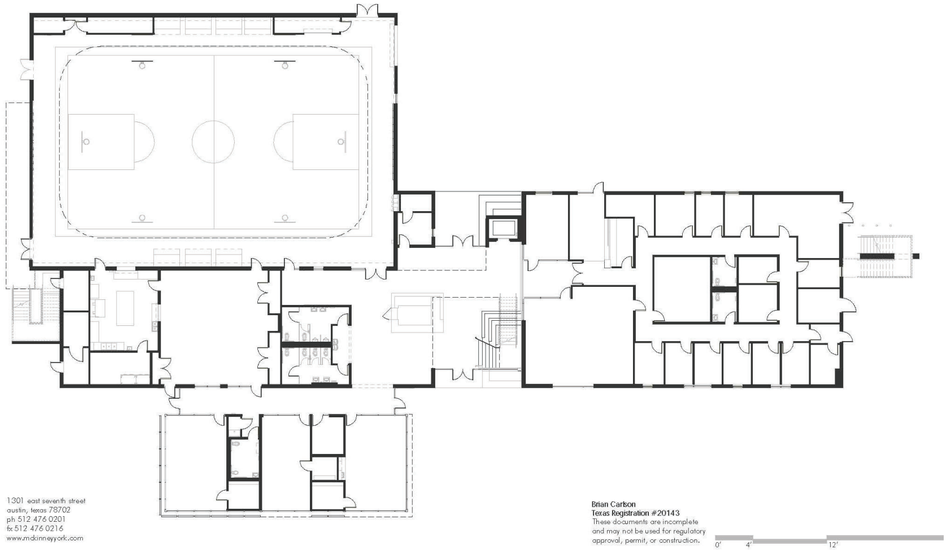
One of the key features of the center's design is the use of natural light and materials. The pavilions are constructed of locally sourced materials, including limestone and cedar, which blend in with the natural landscape of the area. Large windows and skylights allow natural light to flood the interior spaces, creating a bright and airy atmosphere.

The center also includes a number of sustainable design features, such as a rainwater harvesting system, which captures rainwater for irrigation and toilet flushing. The building's orientation and use of shading devices also helps to minimize solar heat gain and reduce energy consumption.

The Montopolis Recreation and Community Center is designed to be a sustainable, functional, and inviting space for the community to gather, learn, and play.

FIGURE 6

FIGURE 7



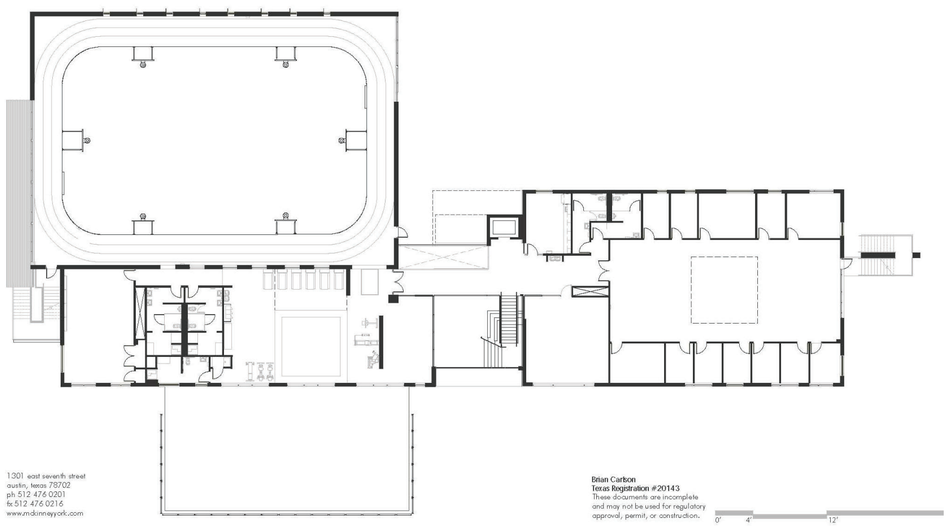
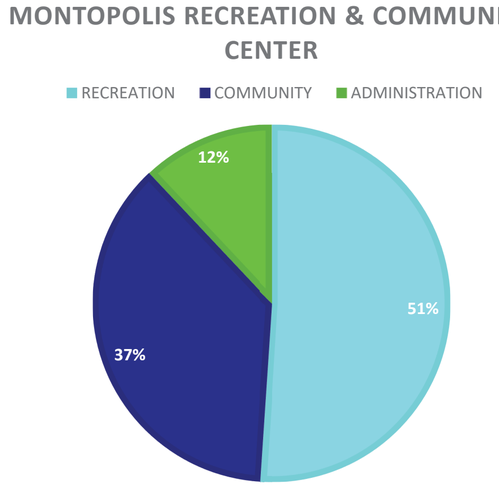


FIGURE 8



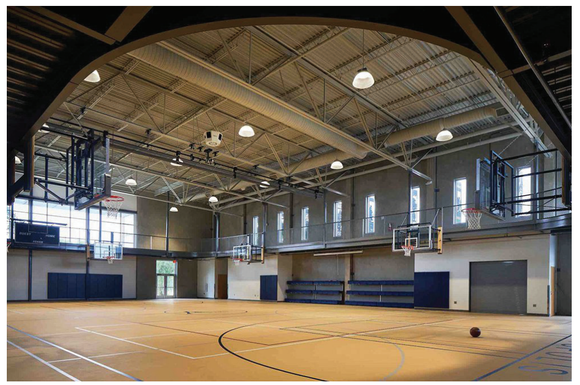


FIGURE 9

FIGURE 10

DAS REC
RECREATION CENTER

FIGURE 11

New Braunfels, Texas
Brinkley Sargent Wiginton
Project Year: 2018
Square Footage: 77,000

Das Rec is a modern, state-of-the-art recreation center located in New Braunfels, Texas. It was designed by the architectural firm Brinkley Sargent Wiginton Architects and opened in 2017.

The center is approximately 77,000 square feet and features a variety of recreational amenities for all ages. It includes a large fitness center with a wide range of cardio and strength training equipment, an indoor track, multiple group fitness studios, and a full-sized gymnasium. Additionally, there are multiple swimming pools, including a 25-yard lap pool, a leisure pool with water features, and a spa.

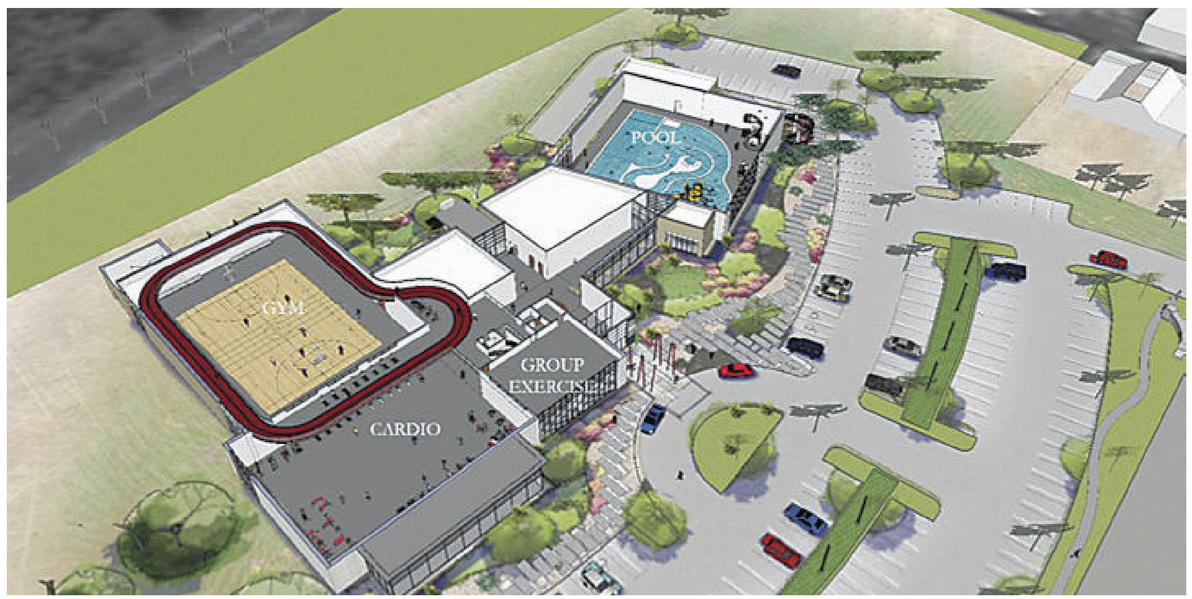
Das Rec also offers a variety of programming and classes, including youth sports leagues, swim lessons, fitness classes, and special events. The facility's outdoor areas include a splash pad, playground, and several sports fields.

One of the unique features of Das Rec is its focus on sustainable design. The building incorporates several energy-efficient features, including a solar panel array, rainwater harvesting system, and geothermal heating and cooling. The center also features a green roof, which helps to reduce the heat island effect and improve stormwater management.

In addition to its recreational amenities and sustainability features, Das Rec is designed to be a gathering place for the community. The center includes several meeting rooms, a catering kitchen, and a large event space, which can be used for a variety of community events and activities.

Overall, Das Rec is a modern and innovative recreation center that provides a wide range of recreational opportunities for the community while also incorporating sustainable design principles.

FIGURE 12



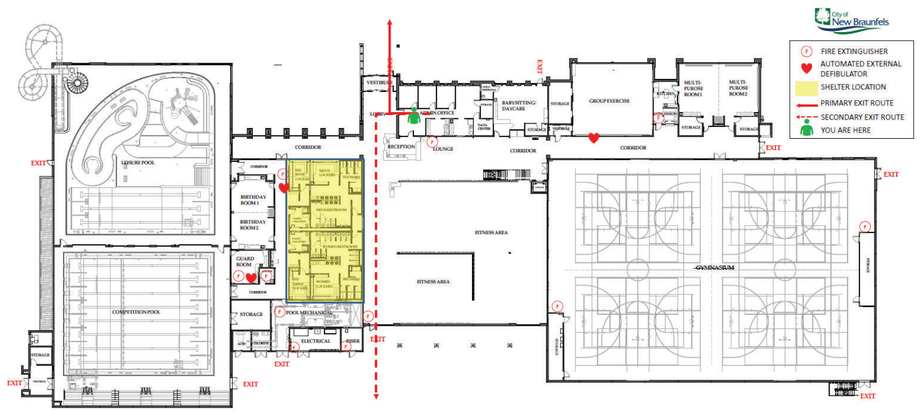


FIGURE 13

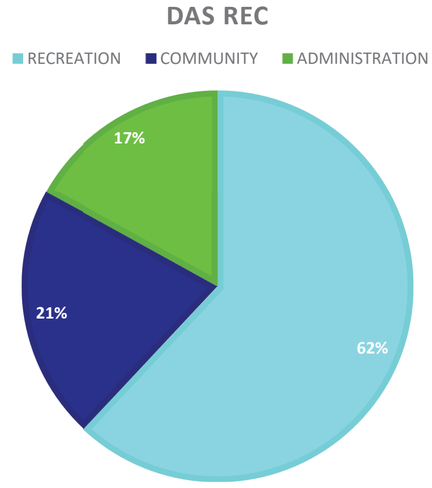


FIGURE 14

FIGURE 15

MARYLAND HEIGHTS COMMUNITY CENTER

FIGURE 16

Maryland Heights, Missouri
Cannon Design
Project Year: 2017
Square Footage: 92,000

The Maryland Heights Community Center is located in Maryland Heights, Missouri. It was designed by Cannon Design and opened in 2017. The center spans over 92,000 square feet and includes a variety of recreational amenities for all ages. The facility features a large indoor aquatics center, which includes a lap pool, leisure pool, and a hot tub. There is also a gymnasium with basketball and volleyball courts, a fitness center with cardio and strength training equipment, and several group exercise studios.

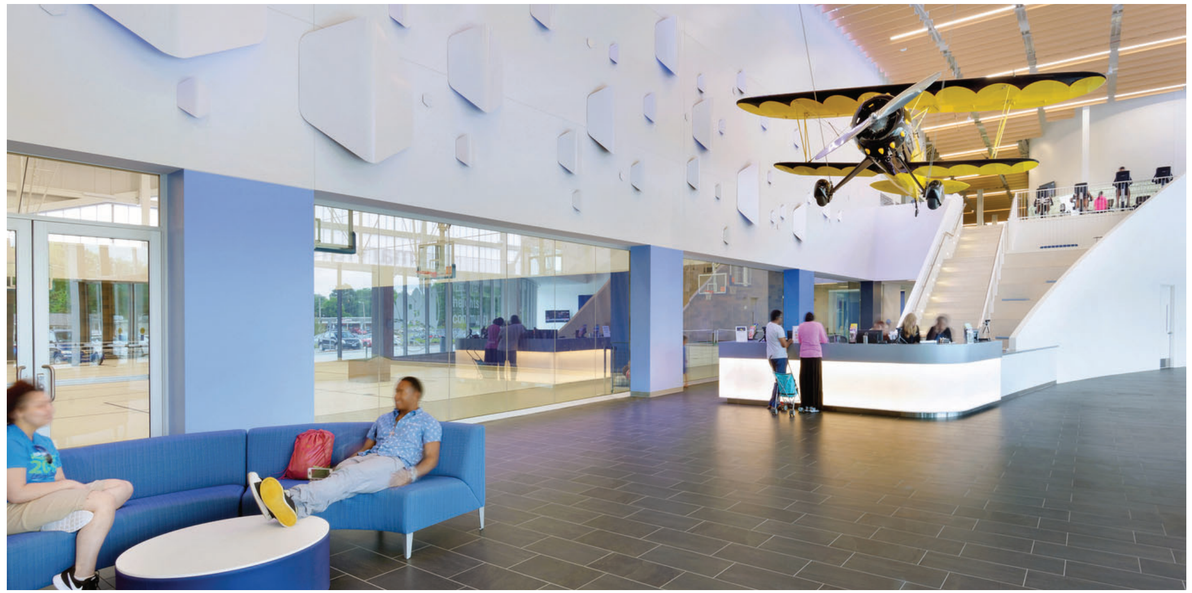
In addition to its recreational amenities, the Maryland Heights Community Center is designed to be a gathering place for the community. The facility includes a large banquet hall and meeting rooms, which can be used for a variety of events and activities. The community space also includes a lounge, a computer lab, and a kitchen.

The center's design is focused on creating a welcoming environment for visitors. The interior spaces are bright with natural light flooding the building through large windows and skylights. The use of wood and warm colors throughout the building creates a comfortable atmosphere.

The Maryland Heights Community Center also incorporates several sustainable design features, including a green roof, a rain garden, and a geothermal heating and cooling system. The center's building materials were carefully selected to minimize environmental impact and reduce energy consumption.

Overall, the Maryland Heights Community Center is an innovative facility that provides a wide range of recreational opportunities for the community while also serving as a gathering place for events and activities.

FIGURE 17



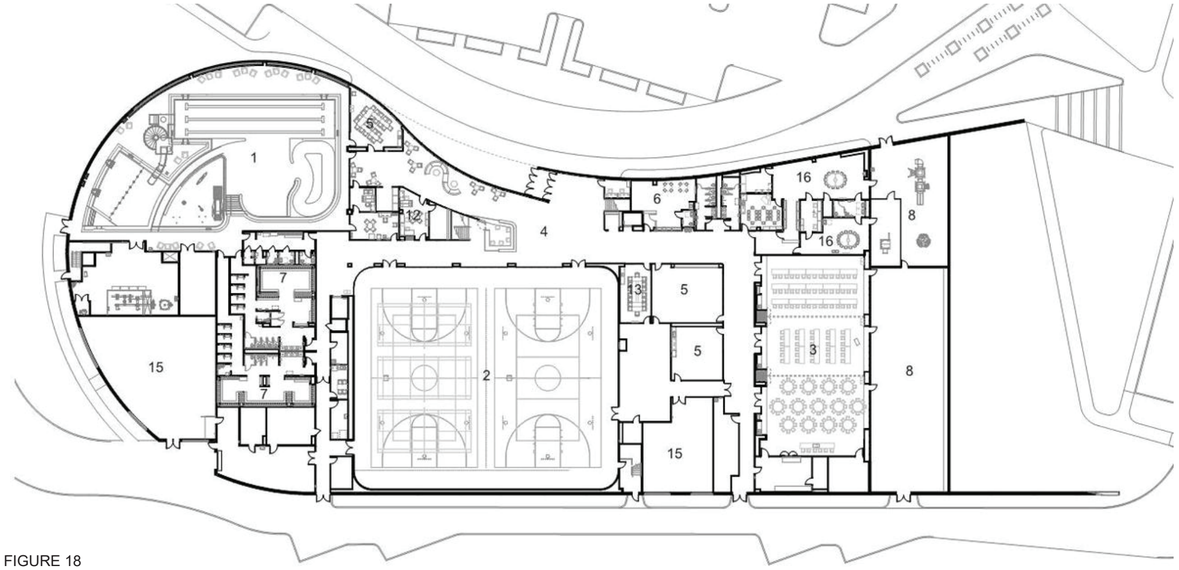


FIGURE 18

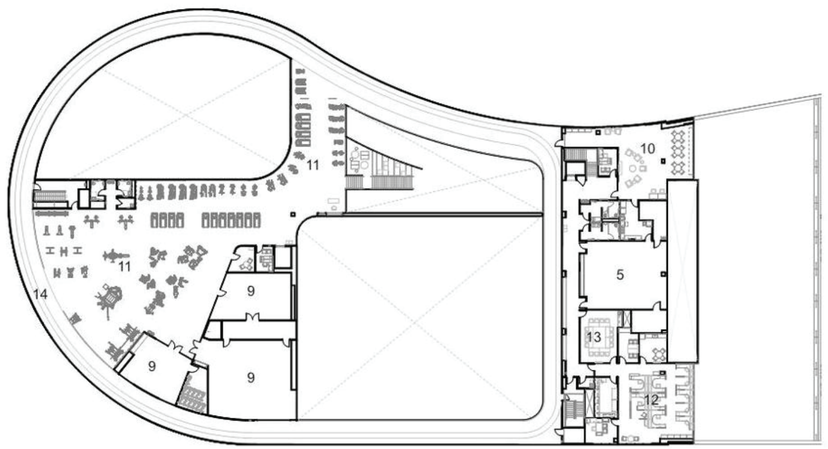
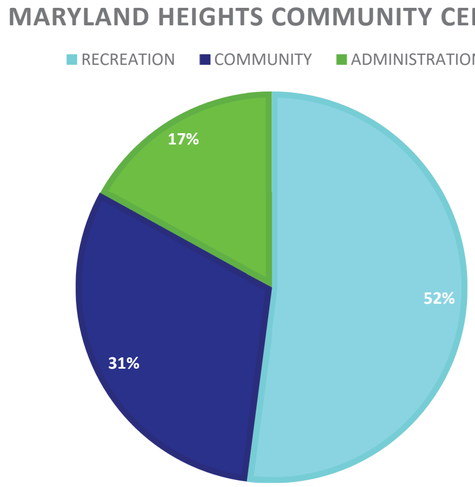


FIGURE 19



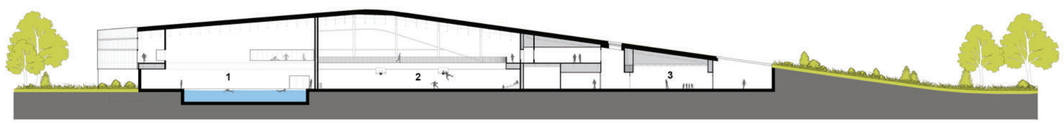


FIGURE 20

SINGING HILLS RECREATION CENTER

FIGURE 21

Dallas, Texas
Perkins and Will
Project Year: 2020
Square Footage: 26,000

The Singing Hills Recreation Center is a modern and sustainable facility located in the southern part of Dallas. The center spans over 26,000 square feet and includes a variety of amenities for the community. The building's design focuses on sustainability, with the goal of achieving a LEED Platinum certification.

The center's facilities include a fitness center, an indoor track, a multipurpose room, and a full-sized gymnasium. There is also a community kitchen, a computer lab, and a space for children's activities. Additionally, there are several outdoor amenities, including a playground, a basketball court, and a walking trail.

The Singing Hills Recreation Center incorporates several sustainable design features, such as a green roof, a rainwater harvesting system, and geothermal heating and cooling. The building's orientation and use of shading devices helps to reduce energy consumption and minimize solar heat gain. The center also features natural daylighting and low-emitting materials to promote a healthy indoor environment.

Overall, the Singing Hills Recreation Center is a sustainable and modern facility that provides a variety of amenities for the community. Its design is focused on creating a healthy and welcoming environment for visitors while also minimizing its environmental impact.

FIGURE 22

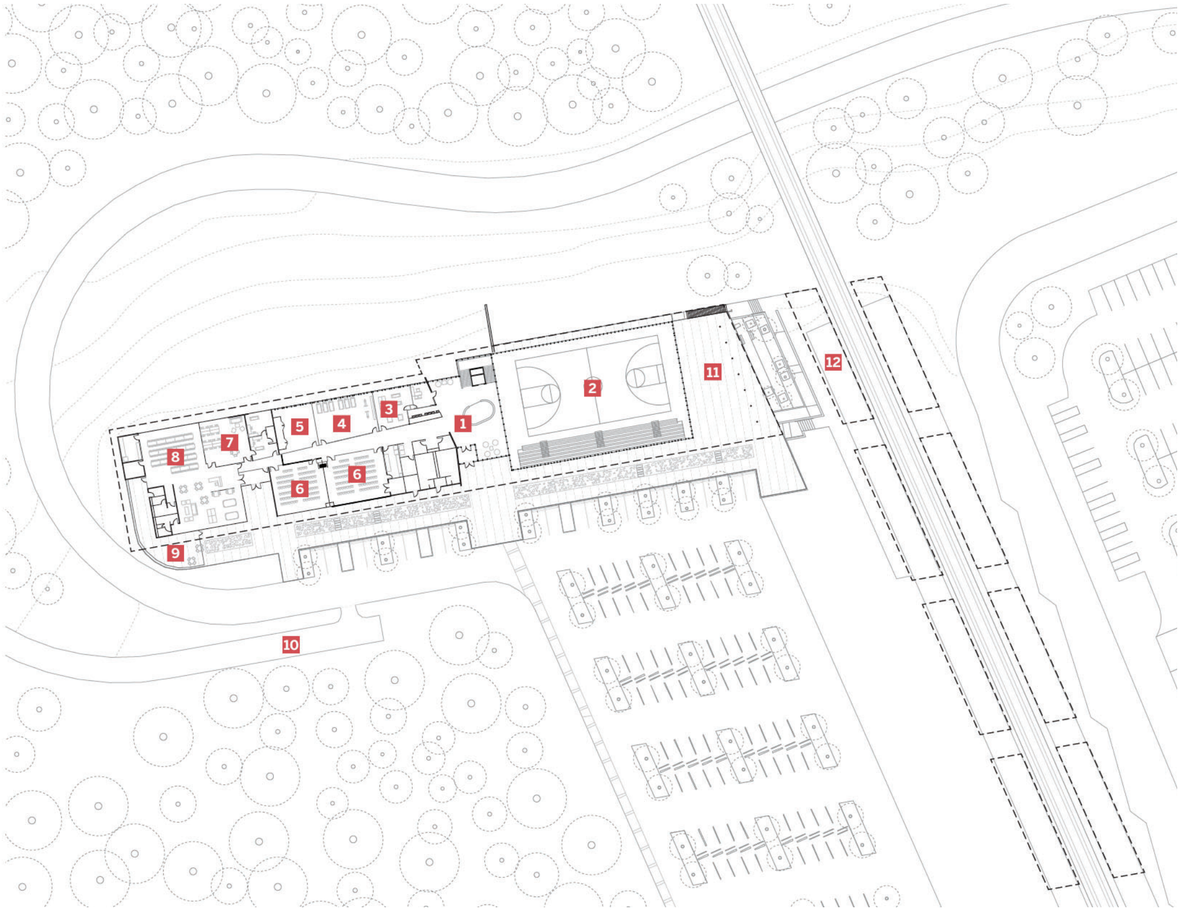


FIGURE 23

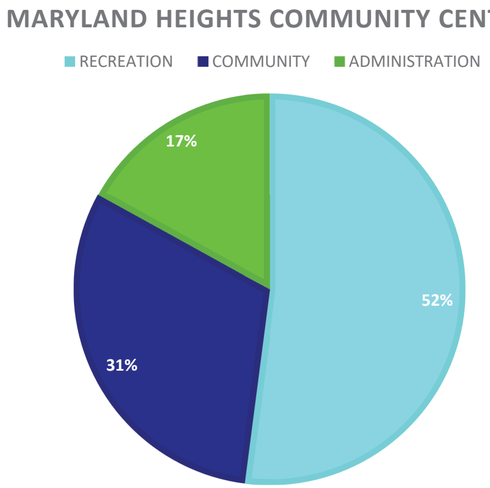
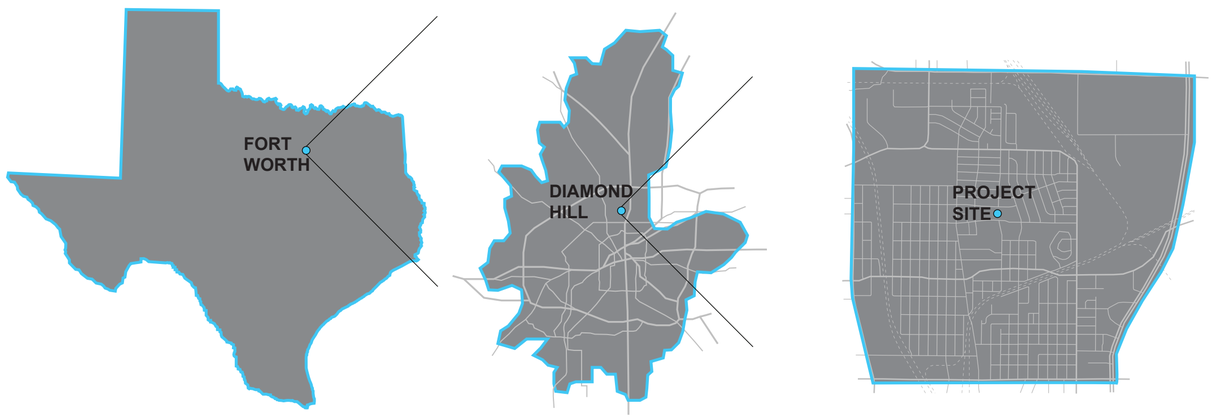


FIGURE 24

CHAPTER 3:
SITE AND CONTEXT

PROJECT SITE LOCATION



DIAMOND HILL COMMUNITY

Diamond Hill is a neighborhood in Fort Worth, Texas, located approximately five miles north of downtown Fort Worth. It is an economically underserved community with a predominantly Hispanic and African-American population. According to the United States Census Bureau, Diamond Hill has a population of around 8,000 people, with a median household income of $37,000 per year, significantly lower than the Fort Worth average. The poverty rate in Diamond Hill is also higher than the national average, with over 25% of families living below the poverty line.

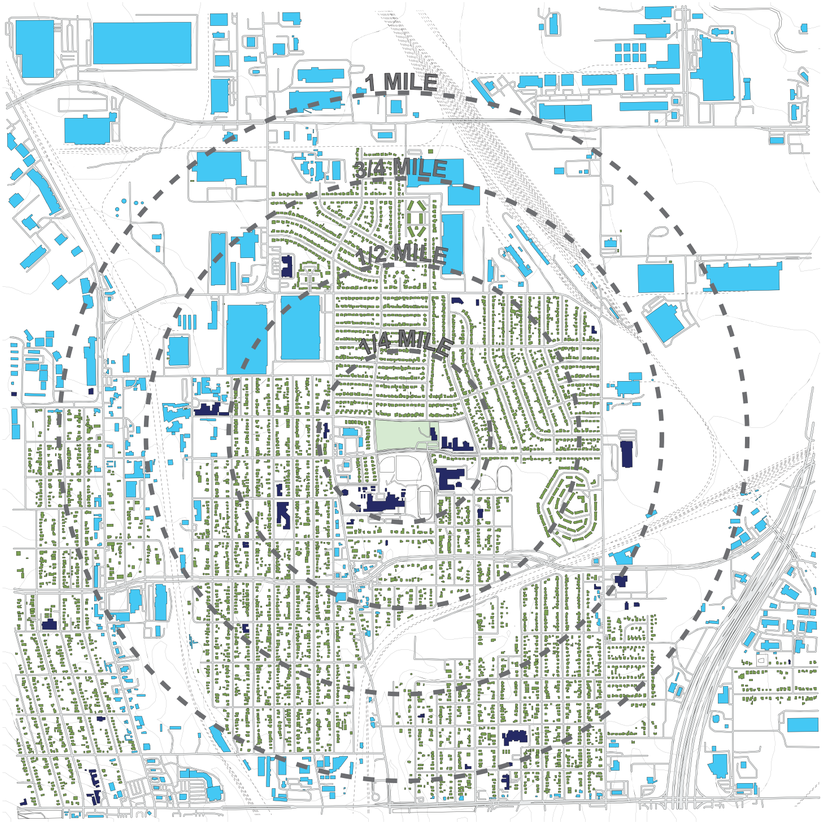
The crime rate in Diamond Hill is higher than the national average, with higher rates of property crimes, such as burglary and theft, as well as violent crimes like assault and robbery. This has contributed to the perception of Diamond Hill as an unsafe neighborhood. In order to help improve the community and the challenges it faces, I have proposed to design a community recreation center in Diamond Hill.

This facility can provide a safe and positive environment for children and families to engage in physical activity and community events. A community recreation center can also provide job opportunities for local residents, as well as a place for people to come together and build relationships. By offering programs and activities such as after-school programs, summer camps, fitness classes, and sports leagues, a community recreation center can help improve the health and well-being of residents, as well as provide a sense of pride and ownership in the community.

In conclusion, Diamond Hill is an underserved community in Fort Worth, Texas, with a low median household income, high poverty rate, and higher-than-average crime rate. However, a community recreation center can help provide opportunities for physical activity, community engagement, and job creation, leading to a better quality of life for residents.

SURROUNDING BUILDINGS

Site plan that shows the public buildings, commercial buildings, and residential buildings within a mile radius of the project site which helps understand the layout of the community.



PUBLIC
COMMERCIAL
RESIDENTIAL

0' 500' 1000' 2000' 4000'

TRANSPORTAION PATHS

Site plan that shows the pahts of transportaion, including major roads, minor roads, bike paths, and bus stop locations around the project site. This plan helps understand the various ways citizens can access the site.

MAJOR ROAD
MINOR ROAD
BUS STOP
BIKE & WALK PATH

0' 200' 400' 800' 1600'

SITE ANALYSIS

Site plan that analyzes the existing site and current conditions. The analysis shows the existing building, parking, and trees on the site, as well as the sun path during the summer and winter solstices and the the typical wind path which normally comes from the Southeast direction.

PROPERTY LINE
EXISTING PARKING
EXISTING TREES
SUN PATH
WIND PATH

0' 100' 200' 400' 800'

POTENTIAL BUILDING

Site plan that shows the potential building location, potential site entrance points, the existing building being demolished, and areas where construction should not take place due to existing trees that I am trying to preserve.

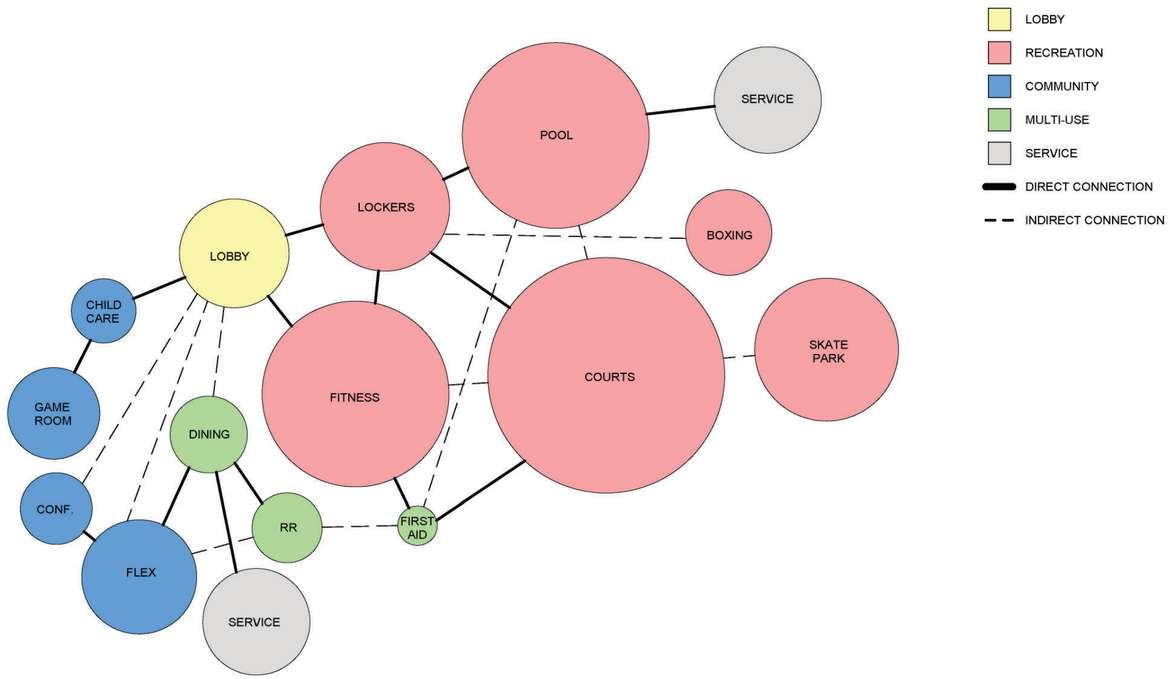
PROPERTY LINE
EXISTING PARKING
EXISTING TREES
VOID
POTENTIAL BUILDING
SITE ENTRANCE
DEMO

0' 100' 200' 400' 800'

CHAPTER 4:
PROPOSAL AND EXECUTION

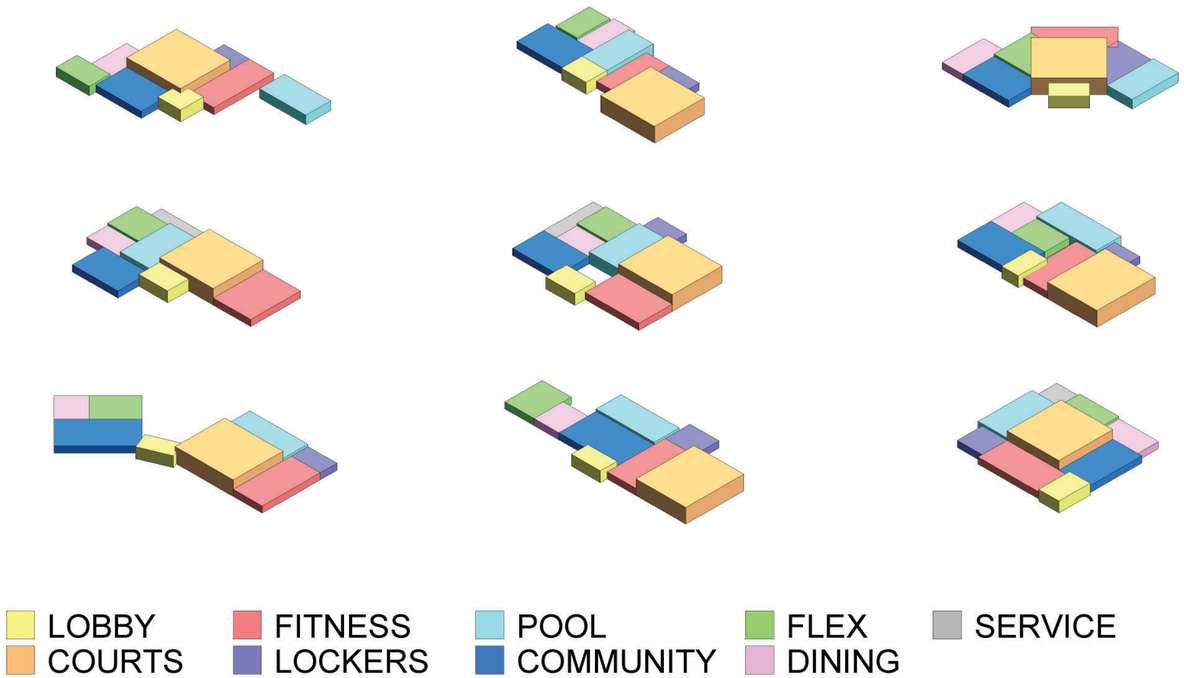
ADJACENCY DIAGRAM

After developing the building's program, I began making decisions about which spaces needed to be next to each other. In this adjacency diagram you can see which spaces need to have a direct connection meaning they need to be right next to each other. These spaces are connected with a thick solid line. Some of the other spaces in the building need to have an indirect connection, meaning they need to be near each other, but not necessarily next to each other. These spaces are connected by a dashed line.



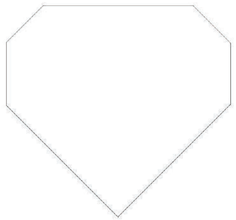
MASSING STUDIES

Below are variations and iterations of masses that I worked through and explored when trying to figure out how I could lay out the spaces in the building in order to see the different possibilities of what the form could look like. The top left massing structure is what I decided to utilize when moving forward.

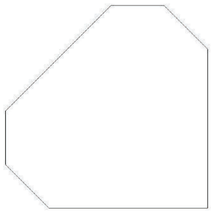


PARTI DIAGRAM

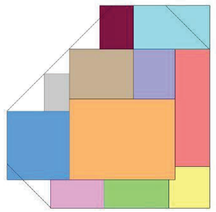
When beginning my design, I started with the concept of a diamond. I then rotated the diamond shape 45 degrees and filled the shape with masses. Next, I rearranged the masses to make sure that the correct spaces were next to each other. I then decided that the form needed some balance, so I shifted masses around to balance it out. Lastly, I rotated the pool mass (light blue) in order to allow more natural light and to allow space for the existing trees to stay where they were originally planted.



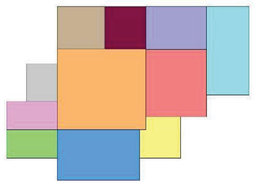
DIAMOND SHAPE



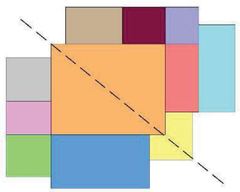
45° ROTATION



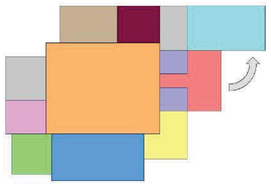
FILL SHAPE W/ MASSES



RE-ARRANGE MASSES



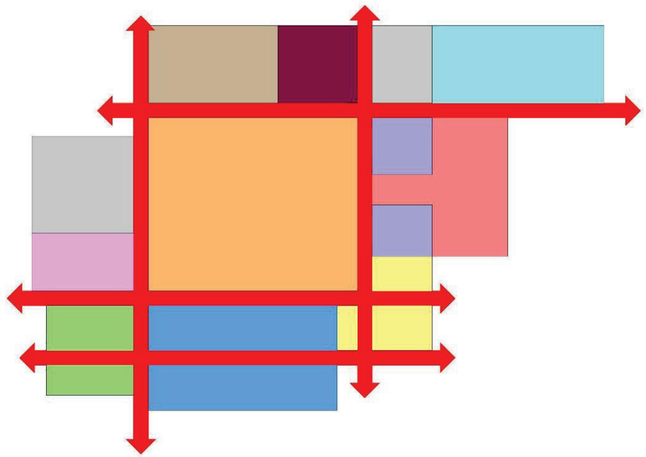
BALANCE



ROTATE POOL FOR VOID

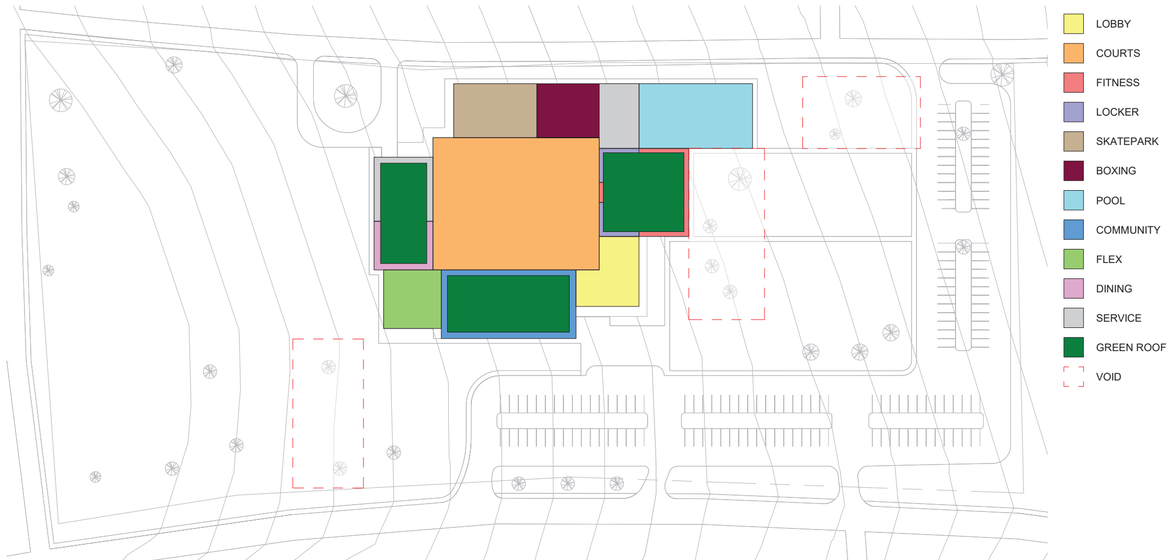
AXIS DESIGN STRATEGY

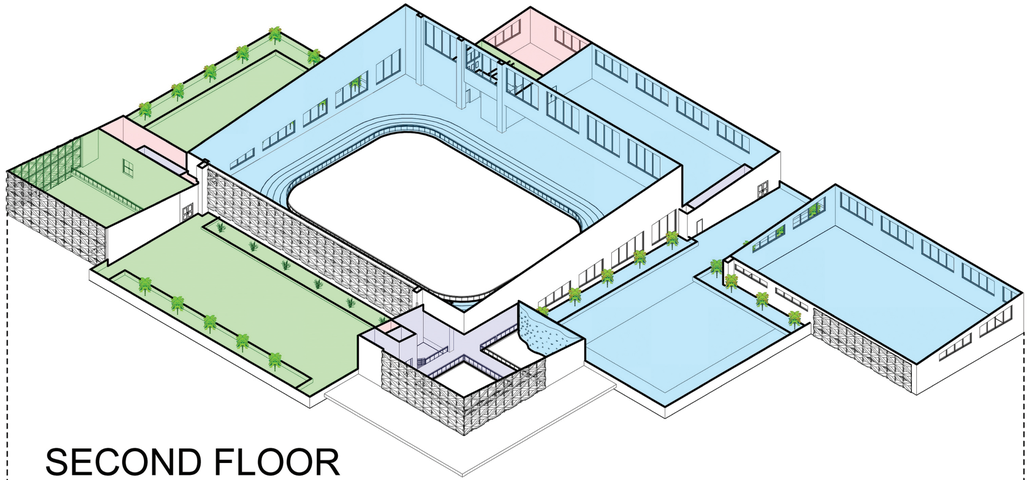
One design strategy I used when designing the form of the building was to have axes, which will later become corridors in the building. These axes will allow for people to easily circulate through the building and give users more space for social interaction.



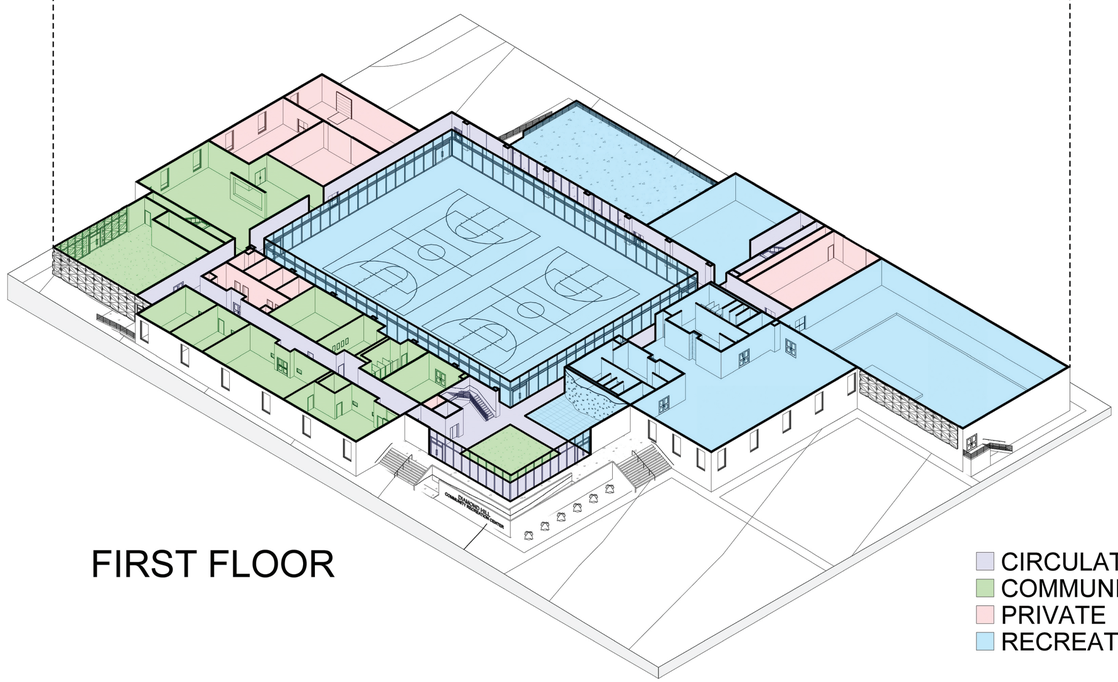
VOIDS FOR EXISTING TREES

Another design strategy I utilized when designing the form of the building was to design around the existing trees on the site. Before I laid out the masses, I places rectangles which serve as void spaces around the existing trees. This helped me to avoid placing masses on those spaces in order to leave those existing trees where they were originally planted.





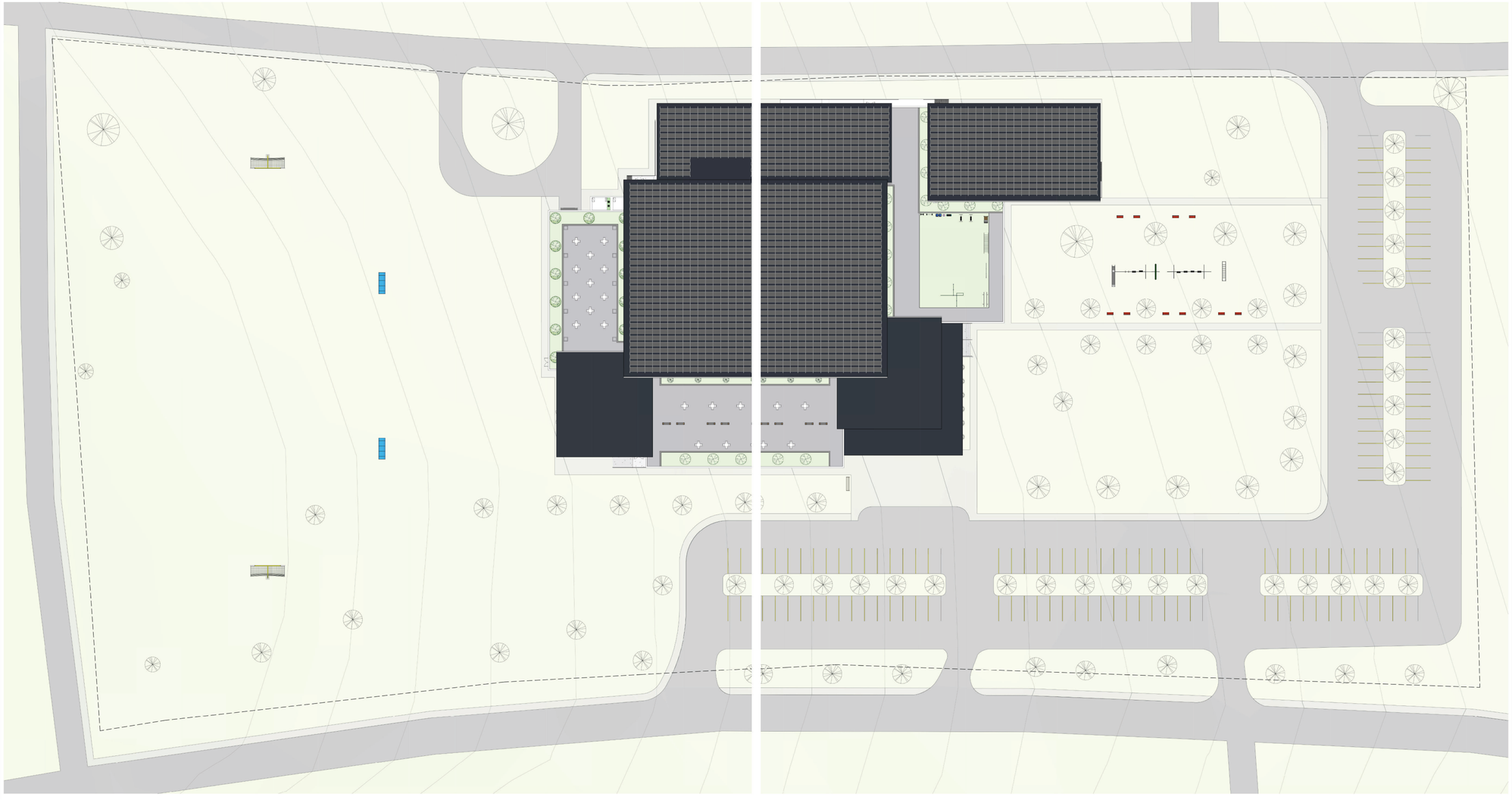
SECOND FLOOR



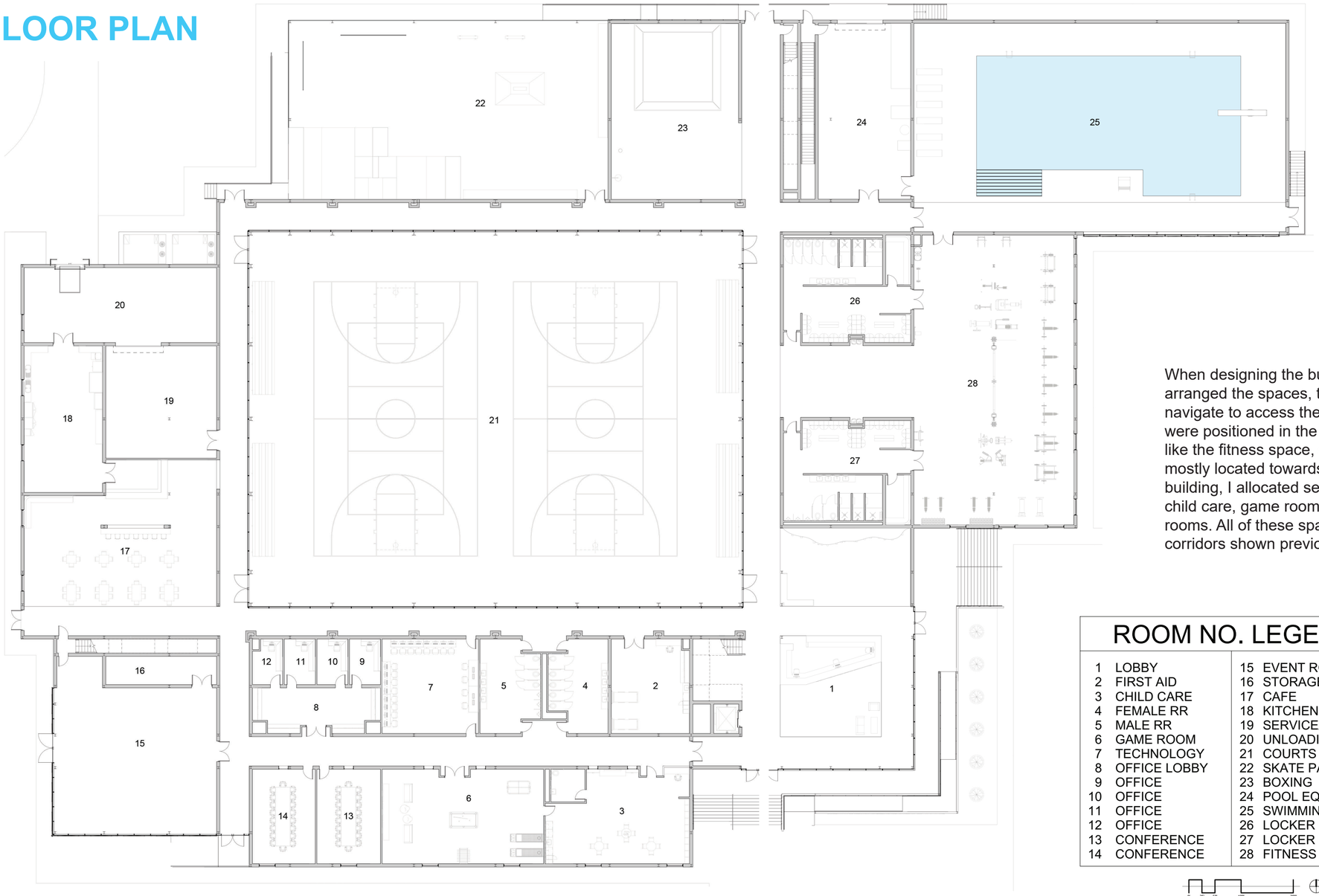
FIRST FLOOR

CIRCULATION
COMMUNITY
PRIVATE
RECREATION

OVERALL SITE PLAN



LEVEL 1 FLOOR PLAN

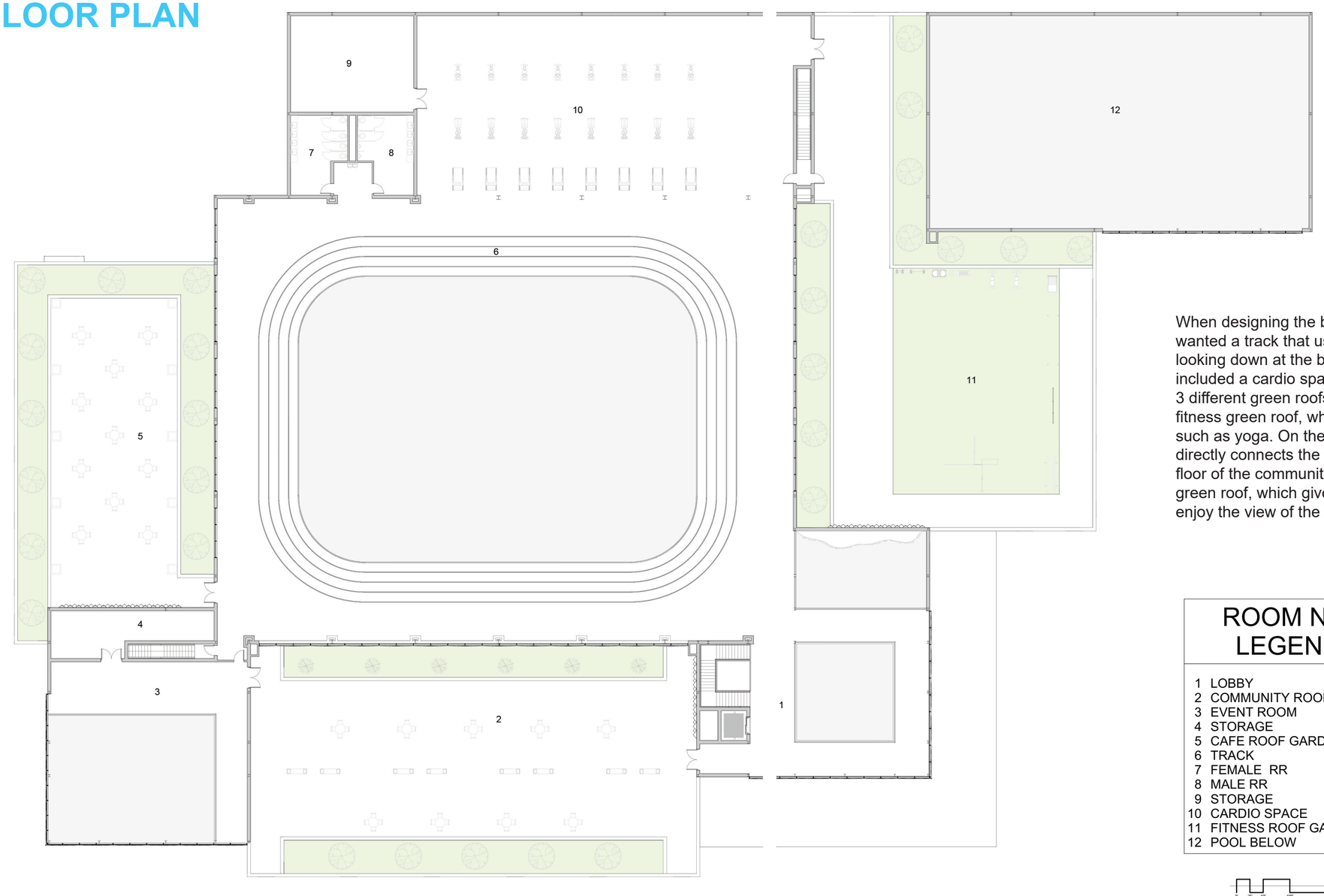


When designing the building's first floor plan, I strategically arranged the spaces, taking into account how the users would navigate to access them. The basketball and volleyball courts were positioned in the center, while other recreational facilities like the fitness space, swimming pool, and boxing room were mostly located towards the east. On the Southern side of the building, I allocated several community spaces, such as the child care, game room, technology room, and conference rooms. All of these spaces are connected through the 5 main corridors shown previously in the axis design strategy diagram.

ROOM NO. LEGEND

1	LOBBY	15	EVENT ROOM
2	FIRST AID	16	STORAGE
3	CHILD CARE	17	CAFE
4	FEMALE RR	18	KITCHEN
5	MALE RR	19	SERVICE/MECH
6	GAME ROOM	20	UNLOADING
7	TECHNOLOGY	21	COURTS
8	OFFICE LOBBY	22	SKATE PARK
9	OFFICE	23	BOXING
10	OFFICE	24	POOL EQUIPMENT
11	OFFICE	25	SWIMMING POOL
12	OFFICE	26	LOCKER ROOM
13	CONFERENCE	27	LOCKER ROOM
14	CONFERENCE	28	FITNESS

LEVEL 2 FLOOR PLAN

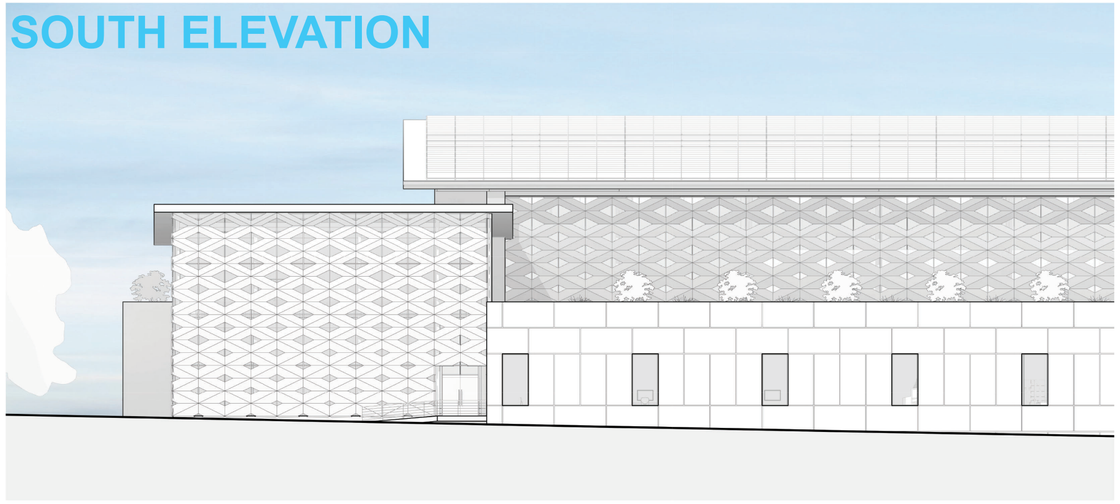


When designing the building's second floor plan, I knew I wanted a track that users could walk or run around while looking down at the basketball and volleyball courts. I aslo included a cardio space to the north of the track. There is also 3 different green roofs on the second floor. On the East is the fitness green roof, where user can do outdoor fitness activities such as yoga. On the south is the community green roof which directly connects the second floor of the lobby and the second floor of the community event room. On the west is the cafe green roof, which gives the users a space to eat outdoors and enjoy the view of the surrounding community.

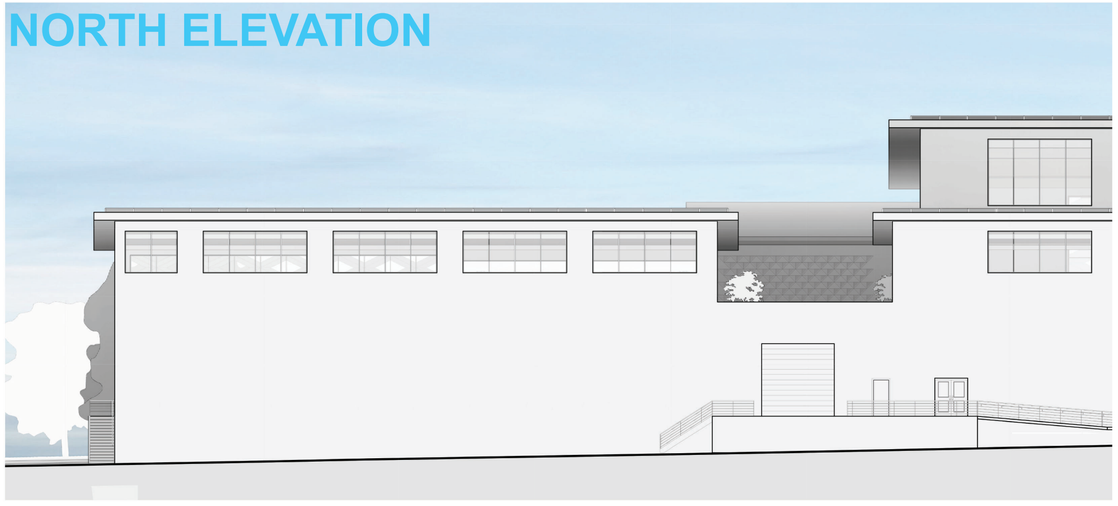
ROOM NO. LEGEND

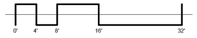
1	LOBBY
2	COMMUNITY ROOF GARDEN
3	EVENT ROOM
4	STORAGE
5	CAFE ROOF GARDEN
6	TRACK
7	FEMALE RR
8	MALE RR
9	STORAGE
10	CARDIO SPACE
11	FITNESS ROOF GARDEN
12	POOL BELOW

SOUTH ELEVATION

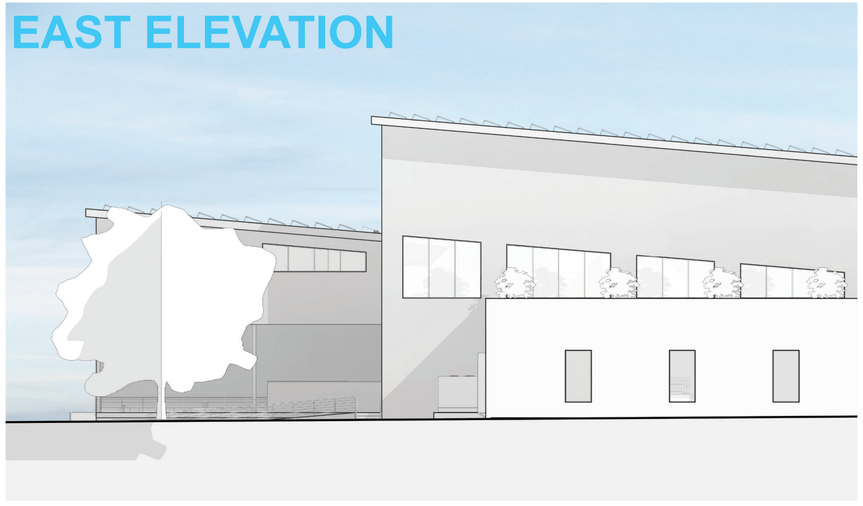


NORTH ELEVATION

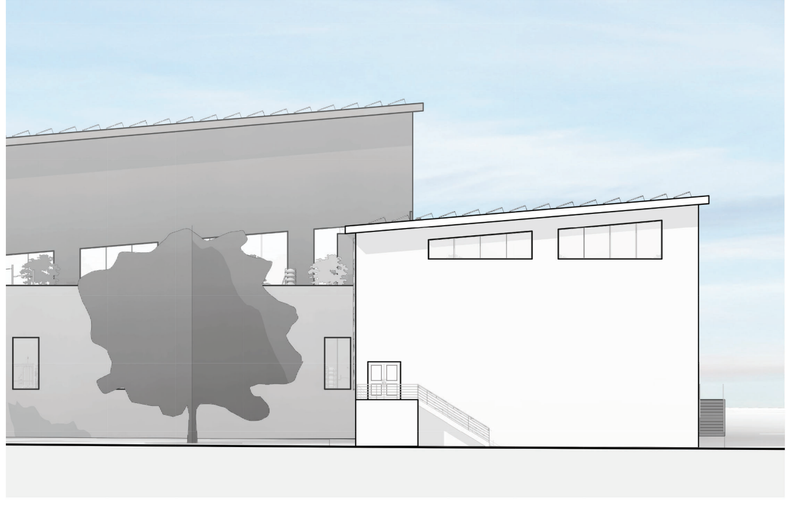


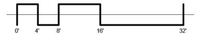


EAST ELEVATION

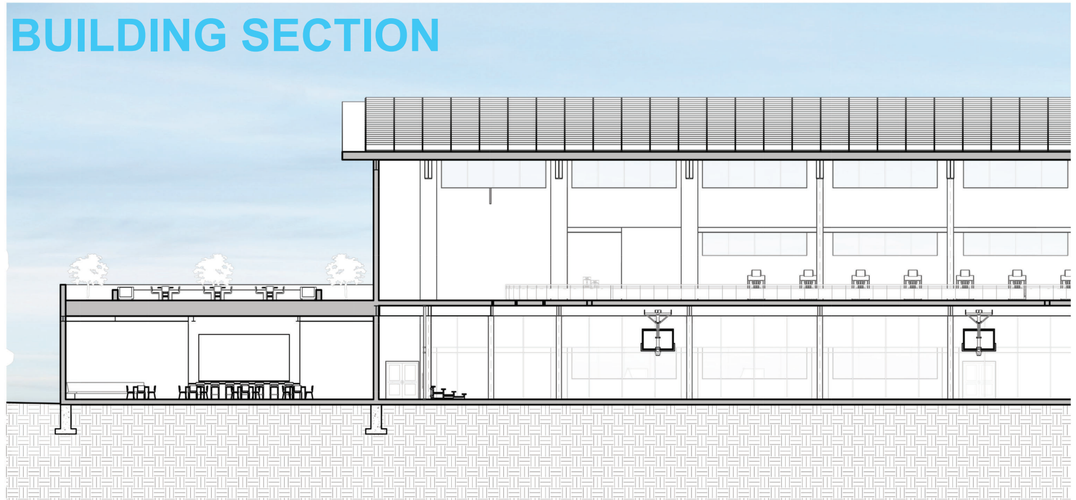


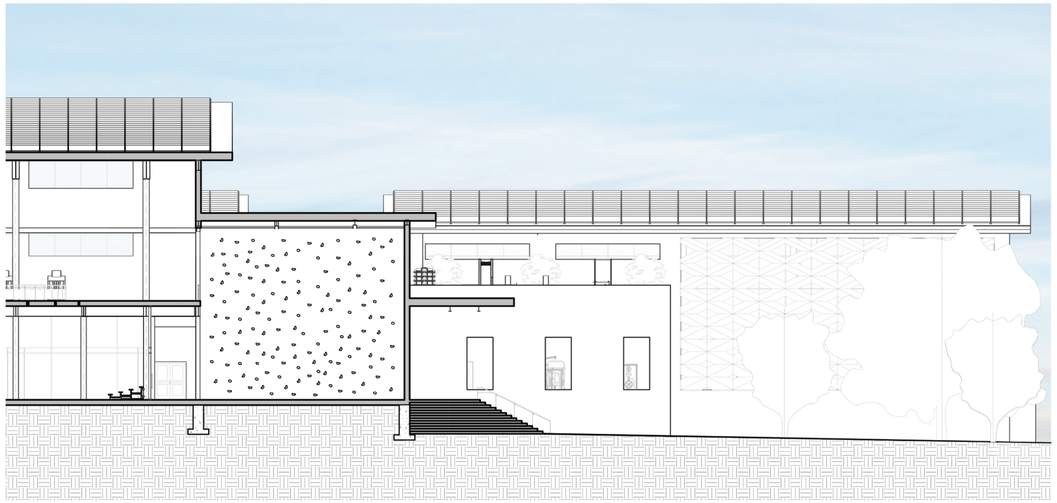
WEST ELEVATION



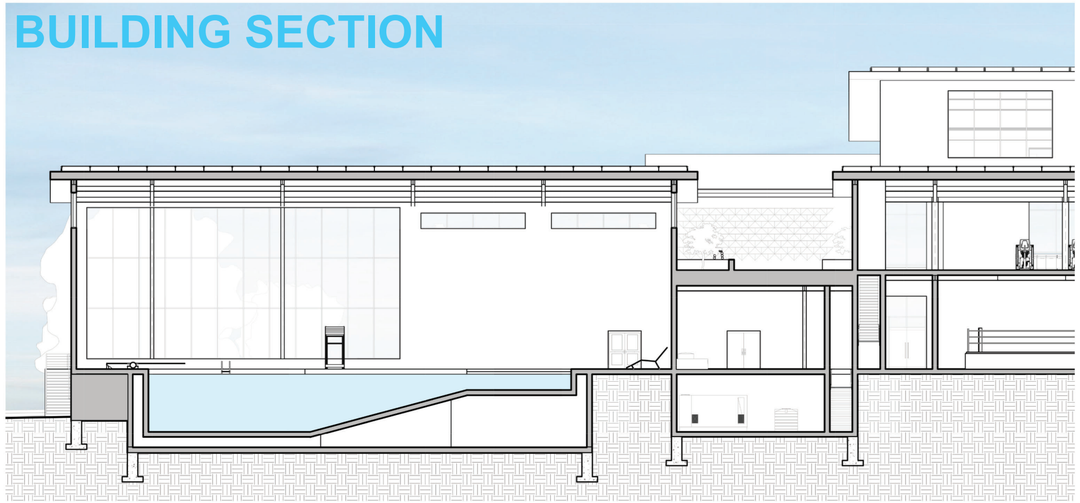


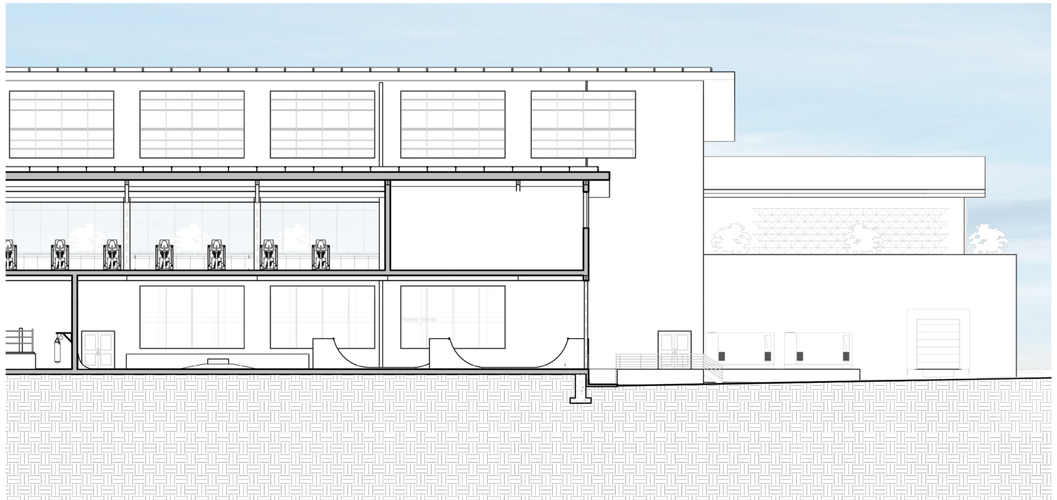
BUILDING SECTION

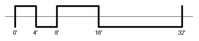




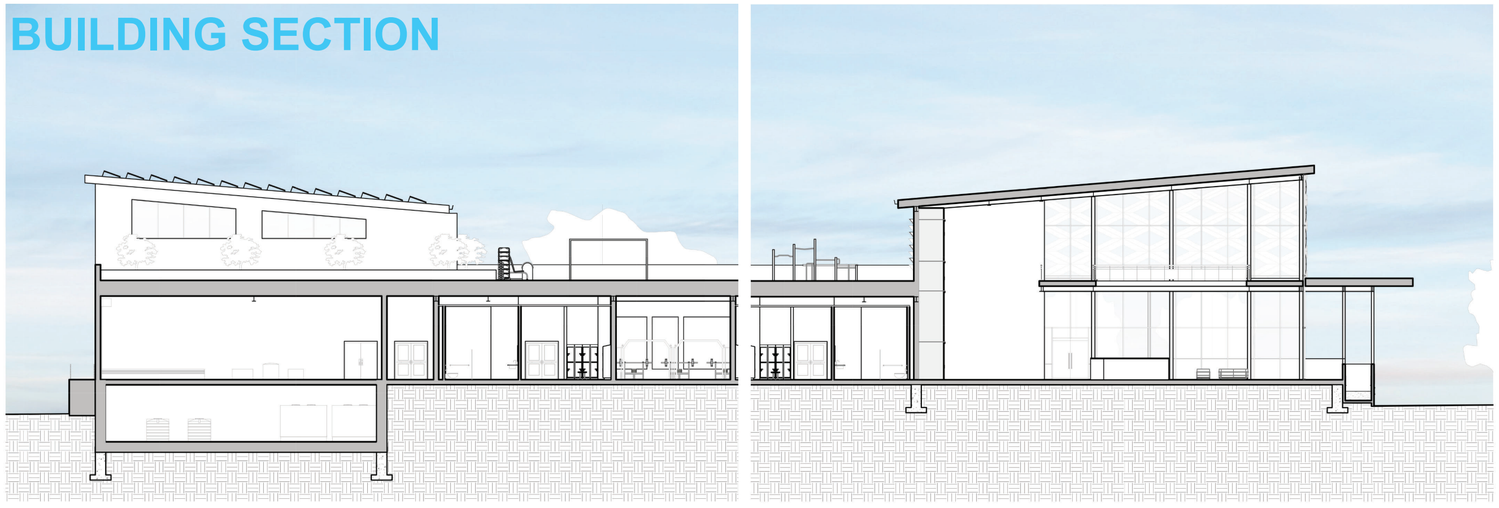
BUILDING SECTION



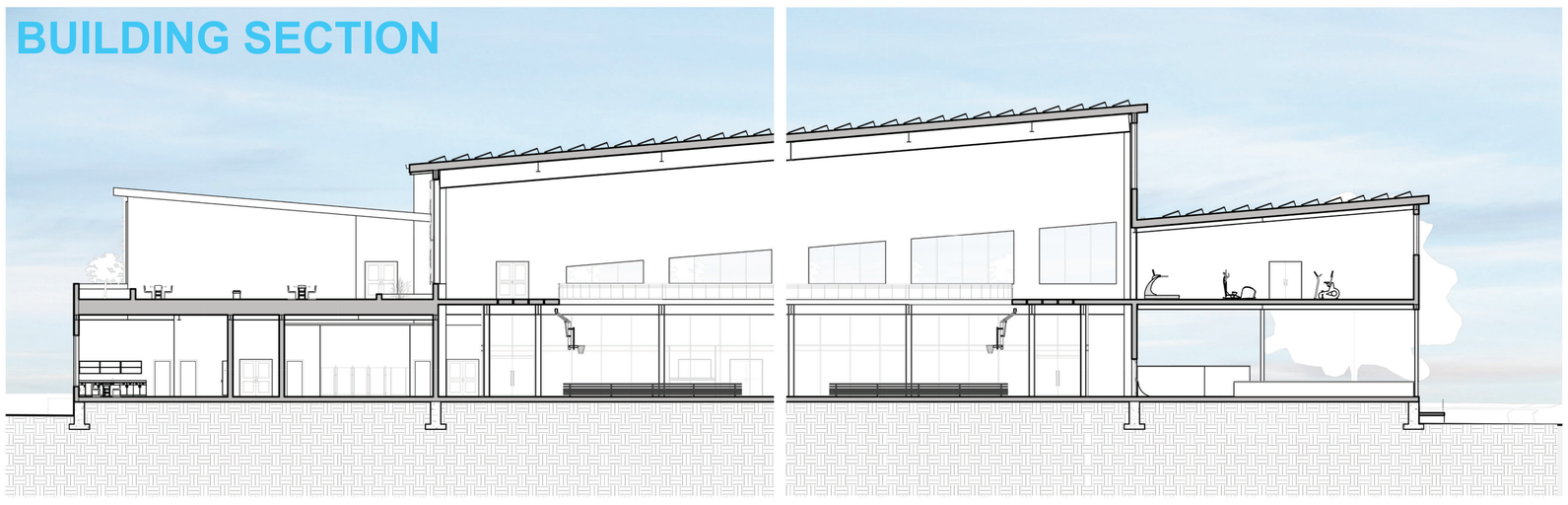




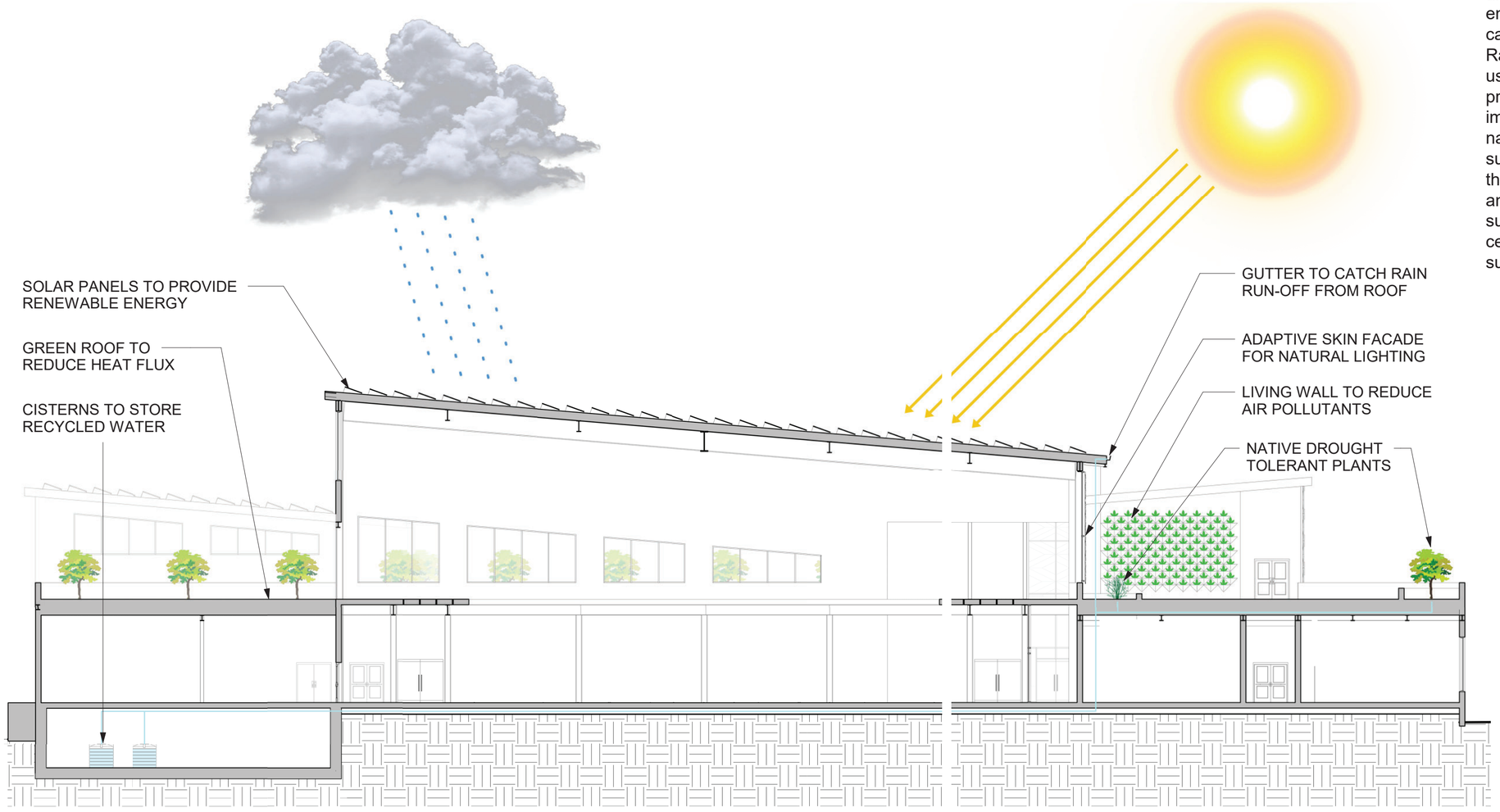
BUILDING SECTION



BUILDING SECTION



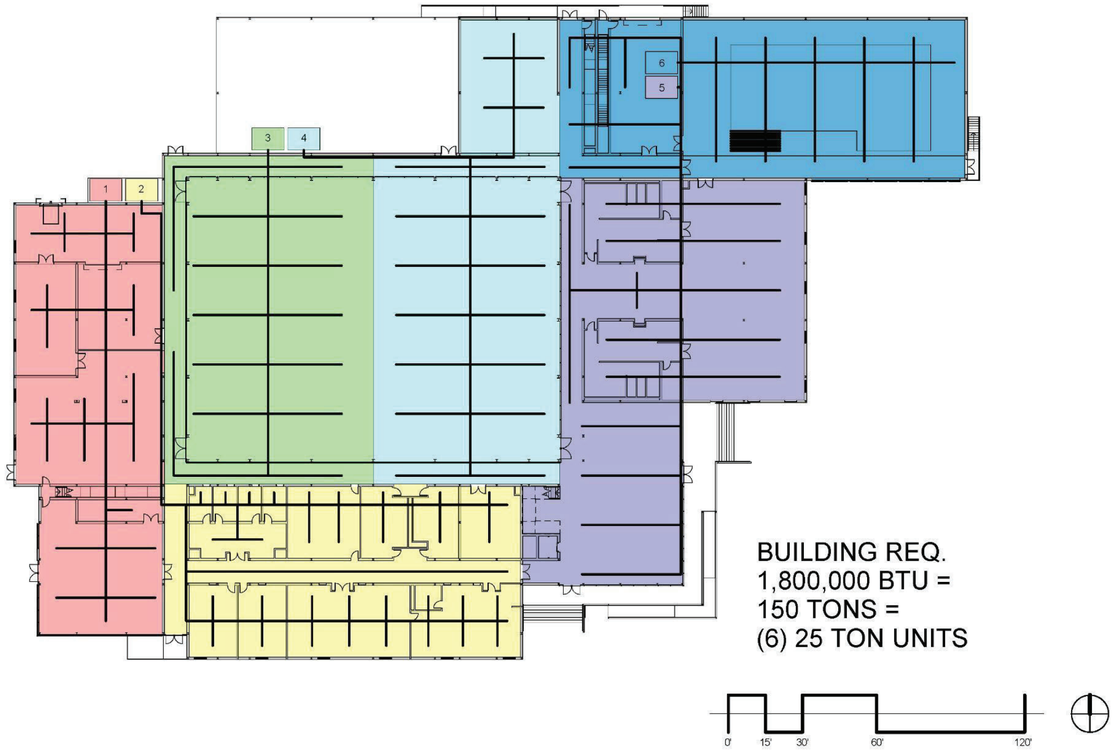
SUSTAINABLE FEATURES



Incorporating features such as solar panels, rainwater capture and recycling systems, green roofs, plant walls, native drought-tolerant plants, and an adaptive building skin facade that allows for proper natural lighting can reduce the building's environmental impact and promote sustainability. Solar panels can utilize sunlight to provide clean energy for the building. Rainwater capture and recycling systems can reduce water usage and prevent runoff. Green roofs and plant walls can provide insulation and reduce the heat island effect, while also improving air quality and providing habitat for wildlife. Using native, drought-tolerant plants can reduce water usage and support the local ecosystem. An adaptive building skin facade that allows for proper natural lighting can reduce energy usage and promote a healthy indoor environment. By incorporating sustainable design features, a community recreation center can lead by example and inspire others to prioritize sustainability in their own communities.

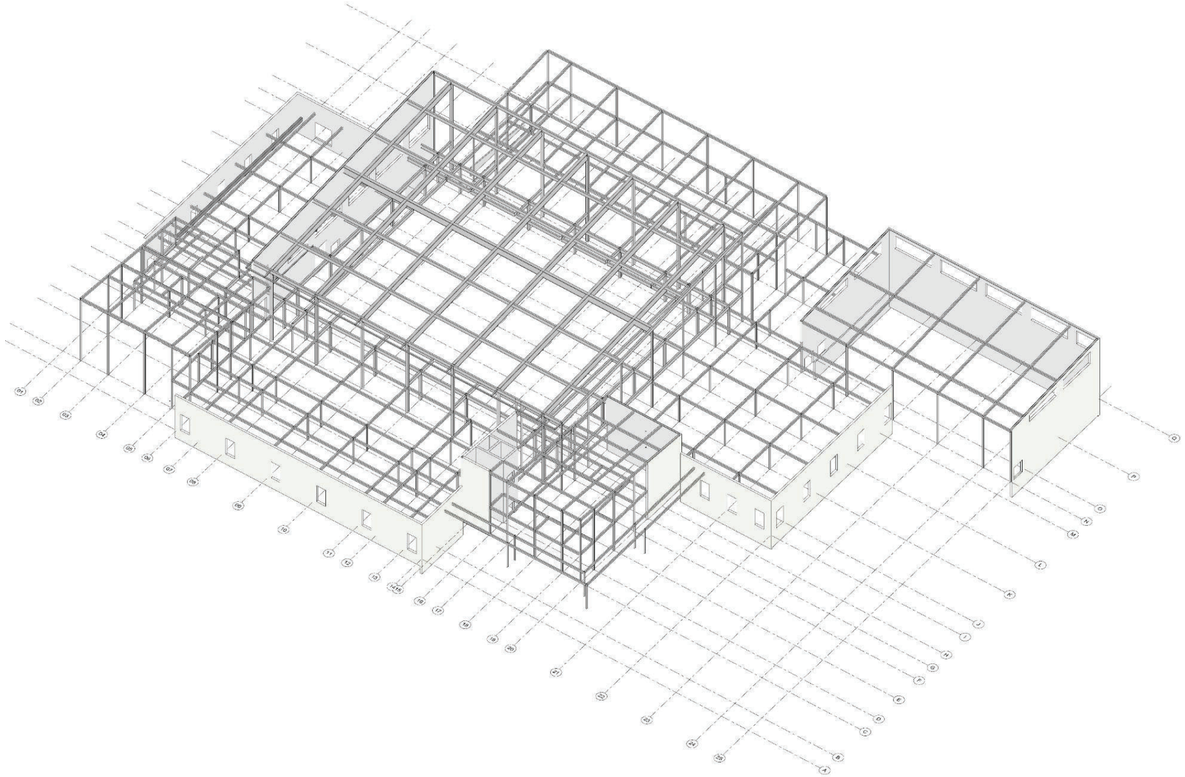
HVAC PLAN

HVAC plan which shows the utilization of six zones with a single 25-ton unit for each zone, All six units combined produce 1,800,000 BTUs of heating and cooling capacity, which can effectively maintain comfortable temperatures in a 100,000 square foot building. This layout allows for precise temperature control in each zone, optimizing energy efficiency and reducing operating costs.

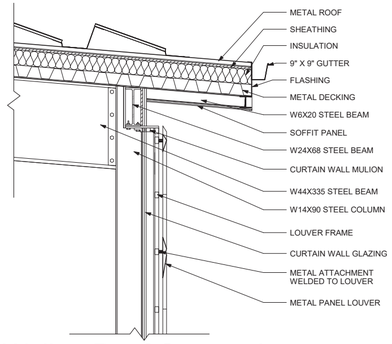


STRUCTURAL BONES MODEL

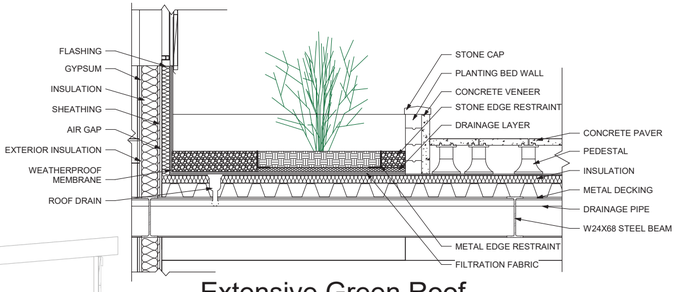
A structural bones model that incorporates W14x90 and W8x31 steel columns, W44x335, W24x68, W12x45, and W8x20 steel beams, and load-bearing walls to effectively provide structural support for the building. The use of steel columns and beams allows for a strong and durable support system, while load-bearing walls add additional stability to the structure.



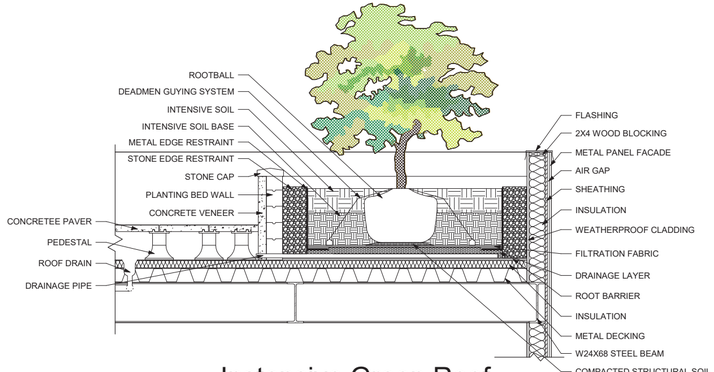
GREEN ROOFS



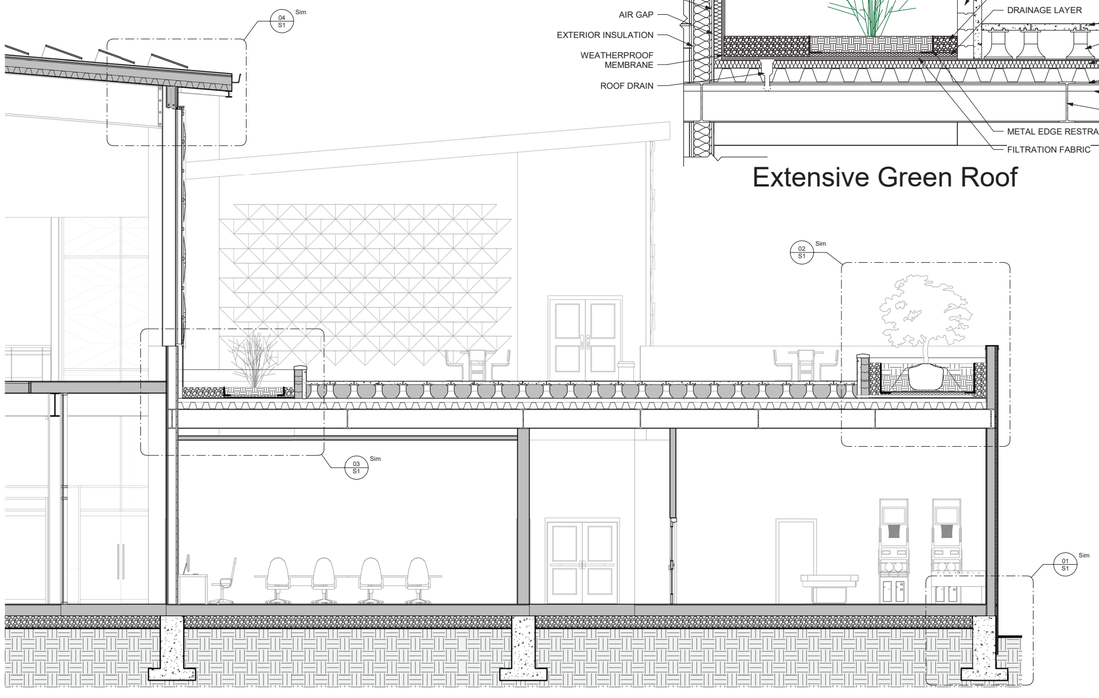
Wall to Roof Connection

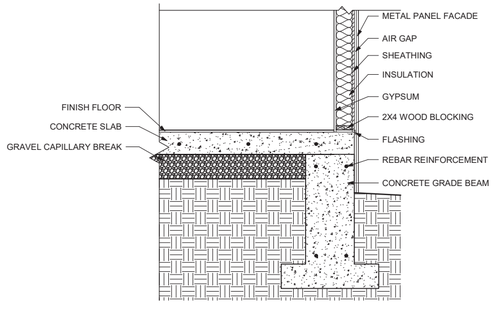


Extensive Green Roof



Instensive Green Roof

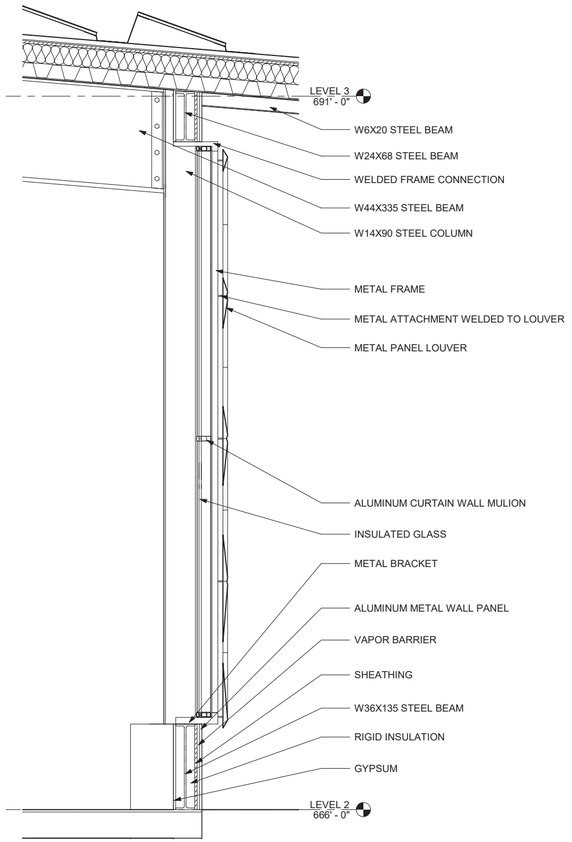


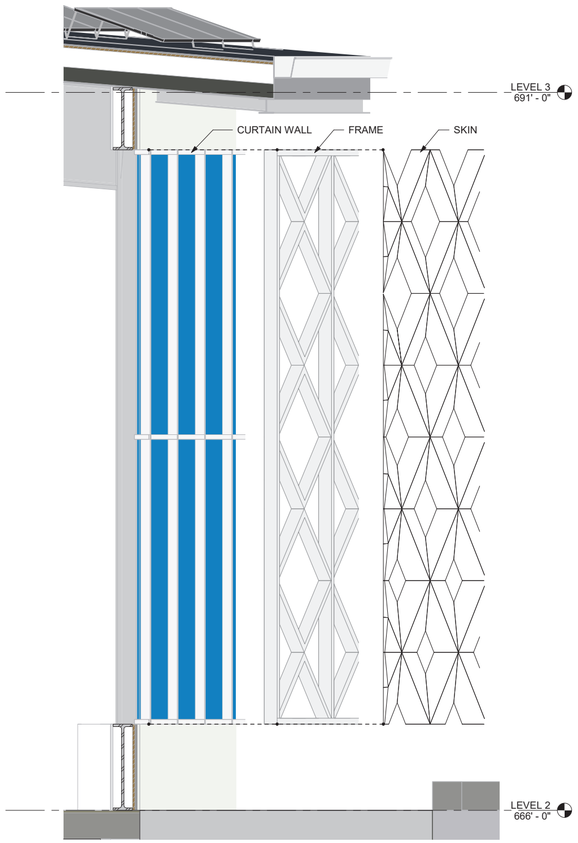


Wall to Slab Connection

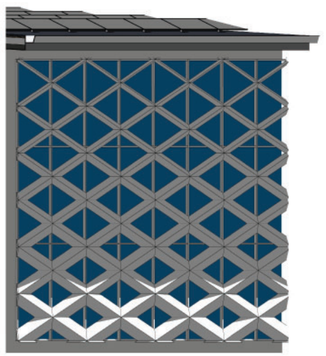
Extensive green roofs have a shallow substrate layer and are typically planted with grasses and low-growing plants. They require less maintenance and irrigation than intensive green roofs and are lighter in weight.
Intensive green roofs are characterized by their deep substrate layer, which allows for a wider variety of plants to be grown, including trees and shrubs. These roofs require more maintenance and irrigation than extensive green roofs due to the heavier plant load.
Green roofs are a great sustainable feature as they can help to reduce the urban heat island effect, reduce energy consumption, improve air quality, and promote biodiversity.

ADAPTIVE SKIN

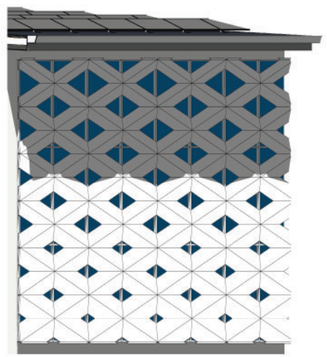




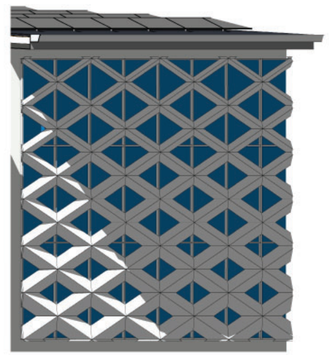
On many facades of the building is an adaptive skin that opens and closes based on the intensity of sunlight. The skin functions similar to a camera shutter, adjusting to allow larger or smaller openings based on the amount of light it receives. When exposed to direct sunlight, the skin's openings become smaller, while in lower light conditions, they expand to allow more light in. This skin system helps regulate temperature and lighting in indoor spaces.



10 AM - Indirect Light



1 PM - Direct Light



4 PM - Indirect Light


DIAMOND
COMMUNITY RECRE


HILL
ATION CENTER

MAIN ENTRANCE PERSPECTIVE

EAST ENTRANCE PERSPECTIVE

SPORTS FIELD PERSPECTIVE

LOADING ZONE PERSPECTIVE

FIRST FLOOR LOBBY PERSPECTIVE

SECOND FLOOR LOBBY PERSPECTIVE

SPORT COURTS PERSPECTIVE

FITNESS SPACE PERSPECTIVE

BOXING ROOM PERSPECTIVE

SWIMMING POOL PERSPECTIVE

SKATE PARK PERSPECTIVE

TRACK AND CARDIO SPACE PERSPECTIVE

CHILD CARE PERSPECTIVE

GAME ROOM PERSPECTIVE

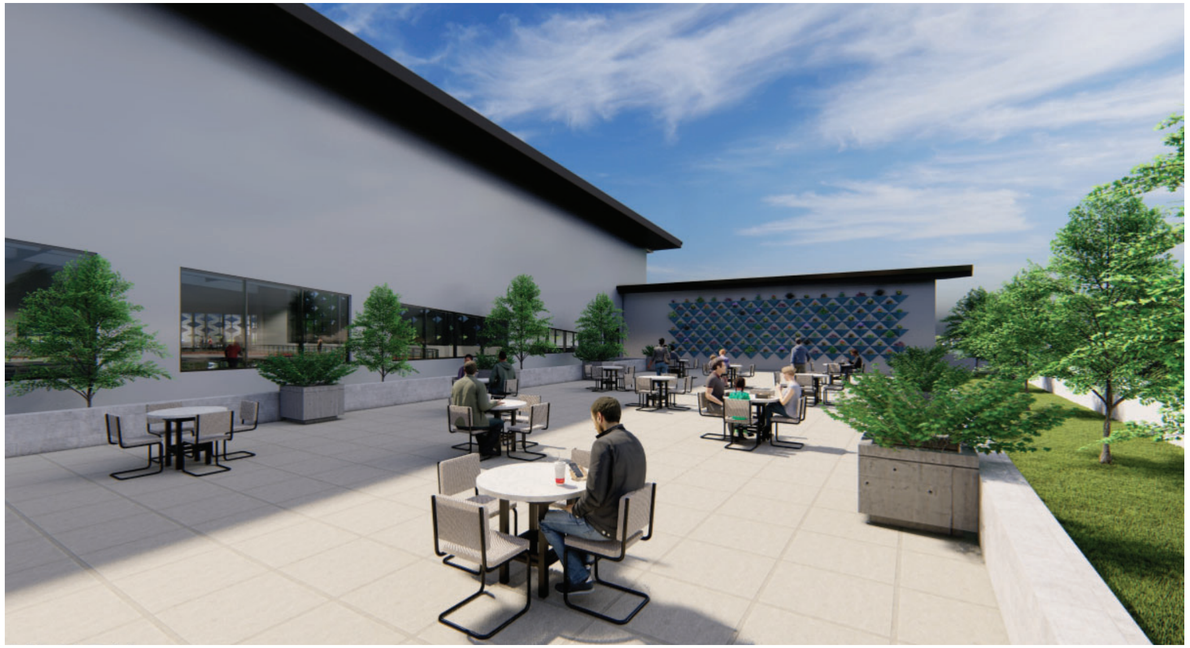
CONFERENCE ROOM PERSPECTIVE

OFFICE PERSPECTIVE

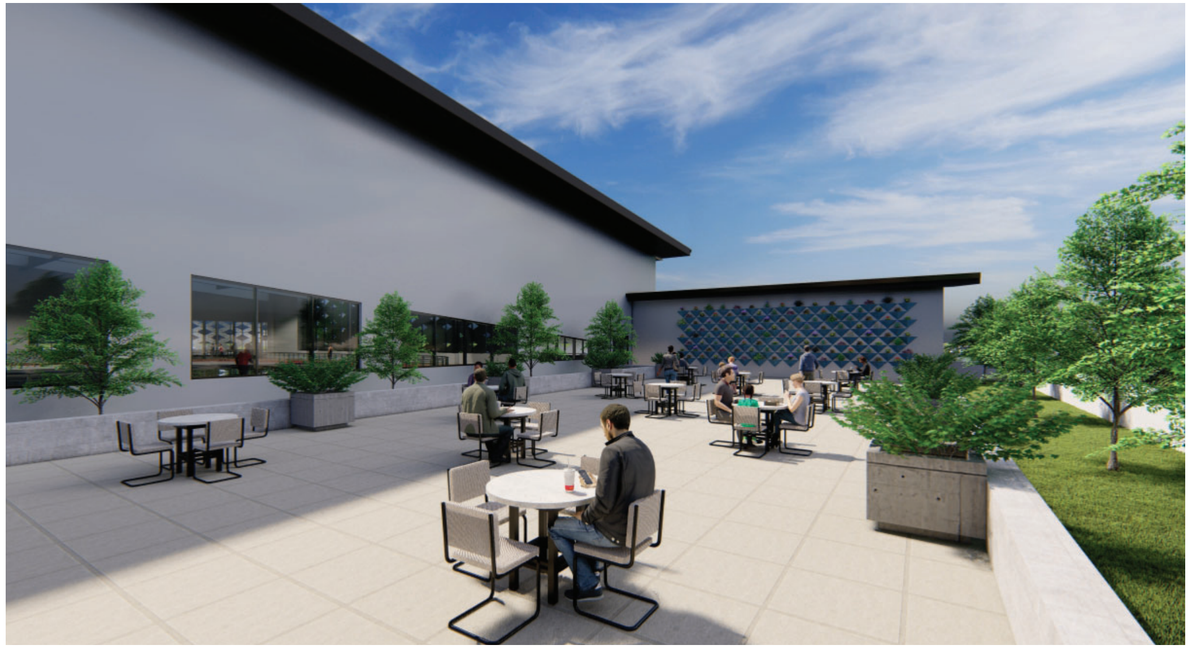
TECHNOLOGY ROOM PERSPECTIVE

COMMUNITY FLEX ROOM PERSPECTIVE

CAFE PERSPECTIVE



COMMUNITY GREEN ROOF PERSPECTIVE



SPORT COURTS PERSPECTIVE

FITNESS SPACE PERSPECTIVE

CONCLUSION

In conclusion, the ‘Eco-Faceted’ Diamond Hill Community Recreation Center, which took inspiration from a Diamond, has been designed to benefit its users, the community, and the environment. By taking a multifaceted approach, the building is designed to enhance the user experience, promote social interaction, and foster a sense of community, while also being energy-efficient and promoting sustainable practices. The building was designed using a parametric design approach. The spaces within the building such as basketball and volleyball courts, a swimming pool, a weight room, a running track, a cafeteria, conference rooms, a computer and study space, a cafe, and a child care center, are all designed to promote personal well-being and improve the health of the users.

The center also benefits the community by being an economic generator, reducing crime rates, reducing healthcare, social service, and police/justice costs, and being a central hub by bringing the community together. Additionally, the building prioritizes the environment by incorporating sustainable design practices such as preserving existing trees, capturing and recycling rainwater, using solar panels, green roofs and plant walls, and an adaptive skin that allows the propoer amount of natural light into the building. By designing a building that prioritizes the needs of the individual, the community, and the environment, the Diamond Hill Community Recreation Center becomes a powerful force for positive change.

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