ASSIGNMENT 2 | ARC60104 ADVANCED ARCHITECTURAL CONSTRUCTION

CONSTRUCTION SOLUTIONS

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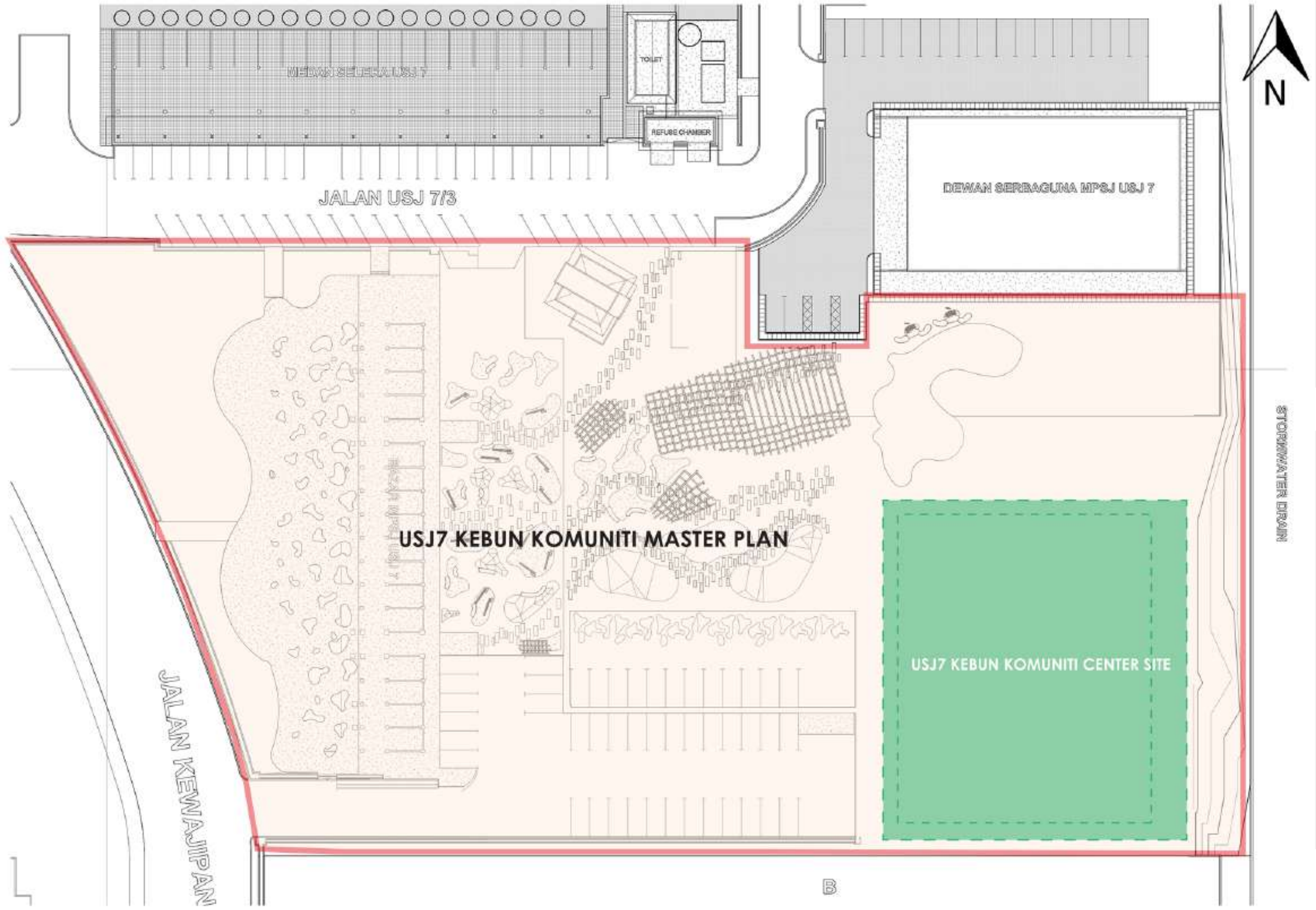
1 PROJECT INTRODUCTION

1.1 THE SITE



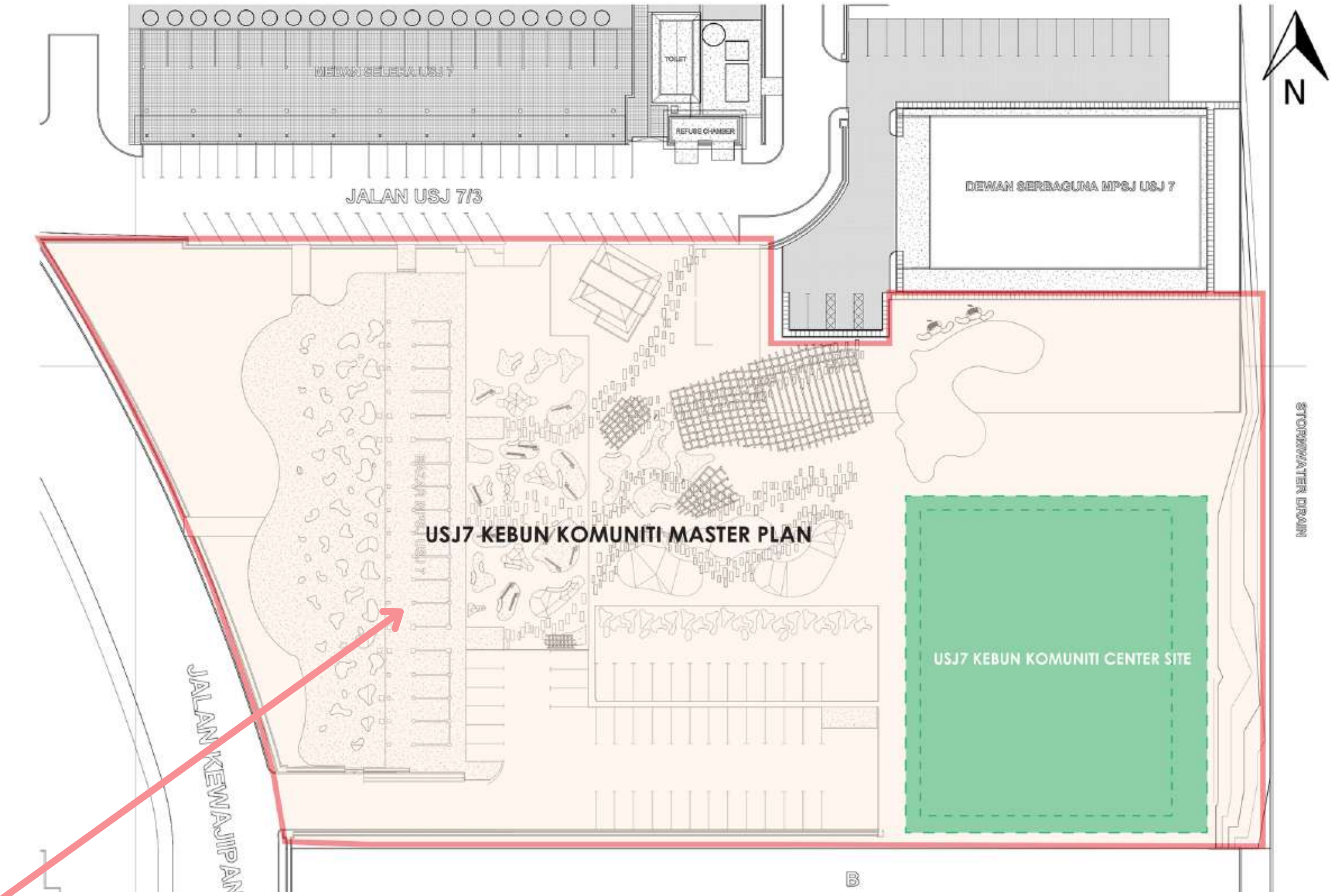
Welcome to the heart of sustainable living in Subang Jaya's USJ7, where the vibrant community has embraced the green revolution with open arms. Nestled within the urban landscape, this unique farming community has transformed the concrete jungle into a thriving oasis of fresh produce and communal harmony.

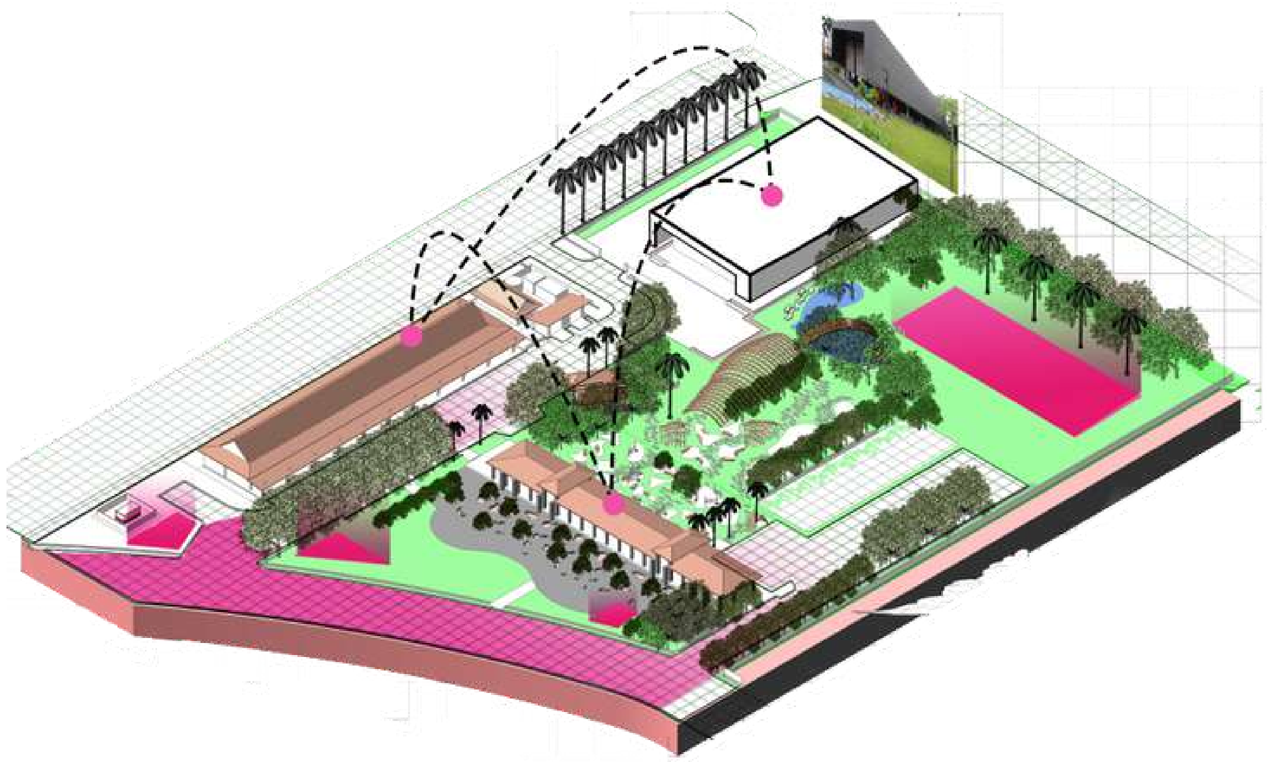
As you stroll through USJ7, you'll immediately notice the lush greenery that lines the pathways and open spaces, revealing the residents' commitment to integrating agriculture into the fabric of their urban lives. The community gardens are a testament to their dedication to self-sufficiency and environmental consciousness.

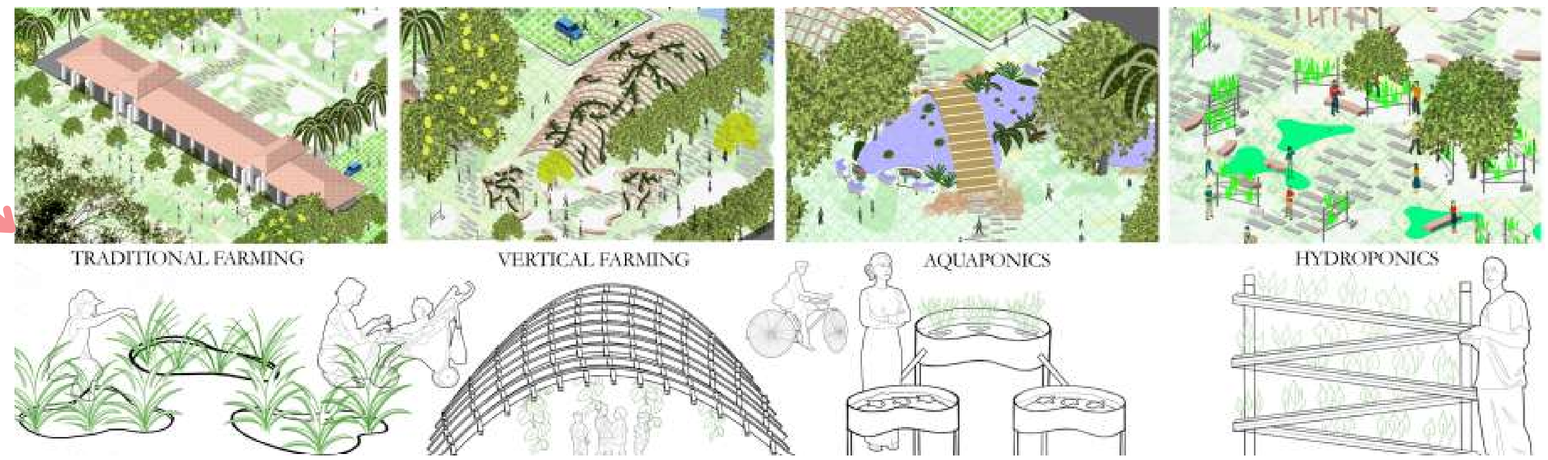
1.2 THE MASTERPLAN

KEBUN RIMBA - “FOREST INSPIRED FARM”

This visionary project seeks to redefine conventional farming by integrating a lush and biodiverse forest ecosystem into the existing agricultural landscape. Imagine wandering through a verdant labyrinth of native trees, vibrant wildflowers, and meandering pathways, all seamlessly woven into the fabric of the farm. This innovative approach aims to not only enhance the aesthetic appeal but also to elevate the farm's ecological significance.







The forest within the farm is carefully curated to mimic the complexity and diversity of a natural woodland. Native flora, strategically planted, will create microhabitats for local wildlife, fostering biodiversity and contributing to a healthier, balanced ecosystem. This green oasis within the urban sprawl will serve as a sanctuary, inviting residents to reconnect with nature and providing a serene escape from the hustle and bustle of city life.

1.3 PRELIMINARY DESIGN & FORM

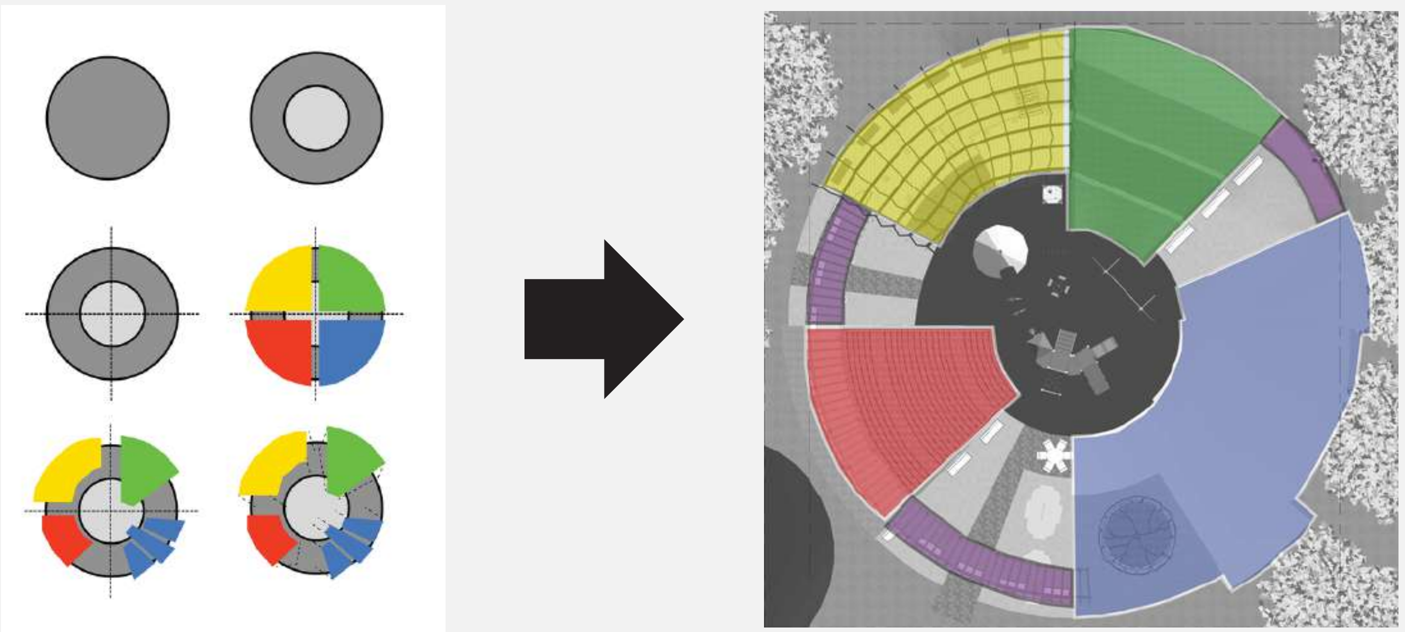
THE OASIS - *THE WATERINGHOLE OF USJ7*

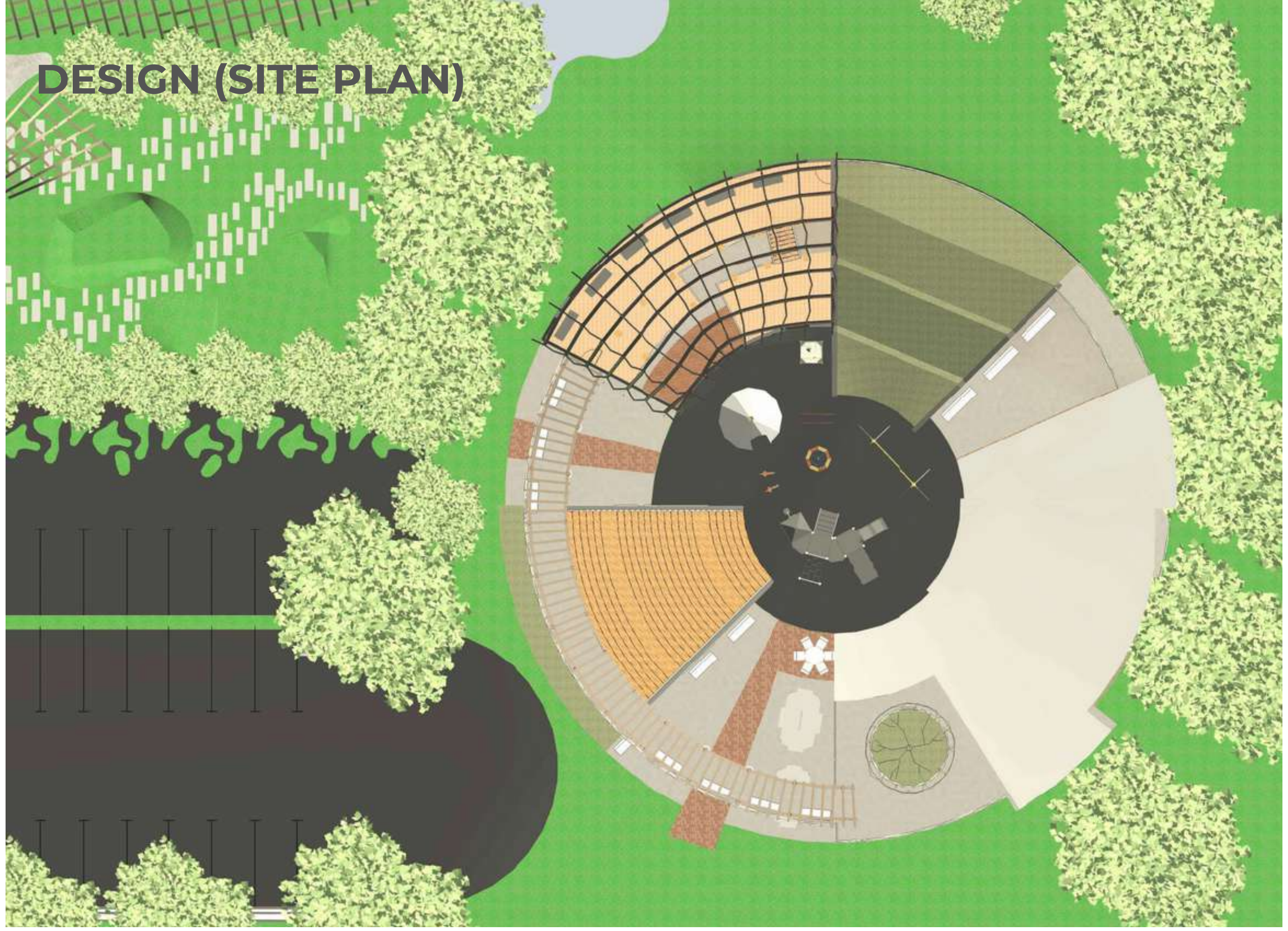
Function: Community Centre for Kebun Komuniti of USJ7
Typology: Radial Grid Structure
Brief : Built-up of 900sqm, 2-3 storeys

Aim: To create a harmonious blend of greenery, interactive spaces, and child-centric design elements to cultivate a vibrant community hub for all ages. This centre aims to bring together gardening enthusiasts but also embraces the diversity and joy of family life in the city.

FORM & MASSING

Based on a circular grid, the centre is where the targeted users will have their space (the children) as to make a fun playground for them to enjoy while the parents of the children can contribute to the community. Centralising the space for the children also allows for the parents to constantly keep an eye on their offspring.





TECTONICS

Roof System - Parametric Roof Shell

Structural System - Steel Columns

Roof System - Standing Seam Zinc Roofing

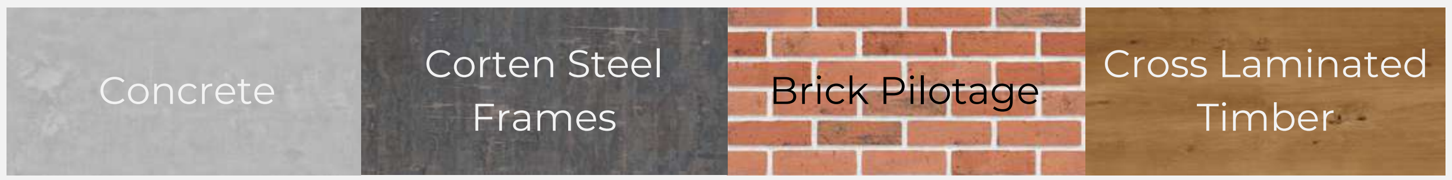
Facade System - Steel Framing Steel Louvres

Facade System - Steel Framing with Polycarbonate Cladding

Structural System - Glulam Timber Columns

Load Bearing System - Reinforced Concrete Wall

STRUCTURAL MATERIALS



2
PRECEDENT STUDIES

2.1 FACADE 1 : STEEL FRAME + CLADDING

2.1.1 Higgins Hall Insertion - Pratt Institute School of Architecture

Precedent Studies 1

Location:

200 Willoughby Ave, Brooklyn, NY 11205, United States.

Architect:

Steven Holl Architects

Built:

2005

Typology:

Private University

Size:

22500 ft²

Facade System:

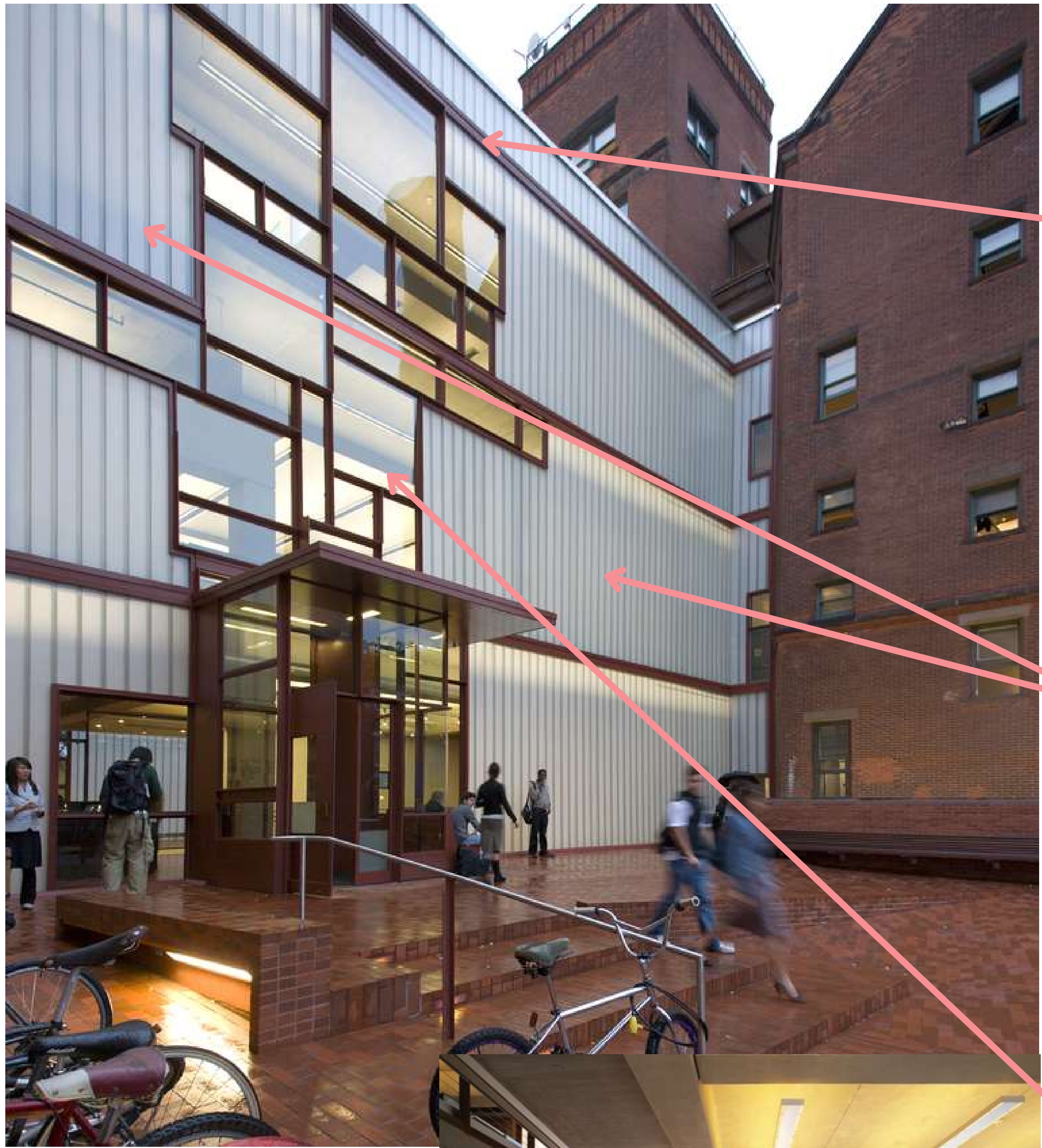
Pre-cast concrete columns as screening, and steel framing around the structural glass planks with translucent white insulation as cladding.

ARCHITECTS' DESCRIPTION

"The new Higgins Hall Center Section is an urban insertion which draws from the sections of the two adjacent historic landmarked buildings. Floor plates of the north and south wings do not align. By drawing this misalignment into the new glass section to meet at the center a "dissonant zone" is created which marks the new entry to the school. The two masonry buildings together with the new glass insertion form an "H" in plan. New courts facing east and west are paved in the reused red brick which was salvaged following the fire that took place in 1996."

2.1.1 Higgins Hall Insertion - Pratt Institute School of Architecture

Precedent Studies 1



Interior spaces are well-lit, with minimum heat energy entering into the structure due to low-E glass panels.

MATERIALITY

1 Steel Columns

The structural columns of Higgins Hall are constructed using pre-cast concrete. Steel columns are installed around the glass walls to hold the facade wall together as well as shape the windows for sunlight to enter the building.

Steel columns offers advantages such as rapid construction, consistent quality, and a high level of structural integrity. It is a durable material that can withstand the demands of an academic building.

2 Structural Glass Planks with Insulation

The facade system at the entrance incorporates structural glass planks. These planks are reinforced for load-bearing capacity while allowing natural light to penetrate the space through the translucent walls.

Beneath the structural glass planks, there is a layer of insulation to enhance thermal performance. This helps in maintaining a comfortable indoor environment and contributes to energy efficiency.

3 Low E-Glass Panels

The building's exterior features low emissivity (Low-E) glass. Low-E Glass has a special coating that minimizes heat transfer, helping to regulate interior temperatures and reduce the reliance on artificial heating or cooling.

The use of Low E glass contributes to efficient daylighting, allowing natural light to enter the building while controlling glare and UV radiation.

2.1.1 Higgins Hall Insertion - Pratt Institute School of Architecture

Precedent Studies 1

DESIGN & TECTONICS

1 Structural Components Integrated into Facade Wall

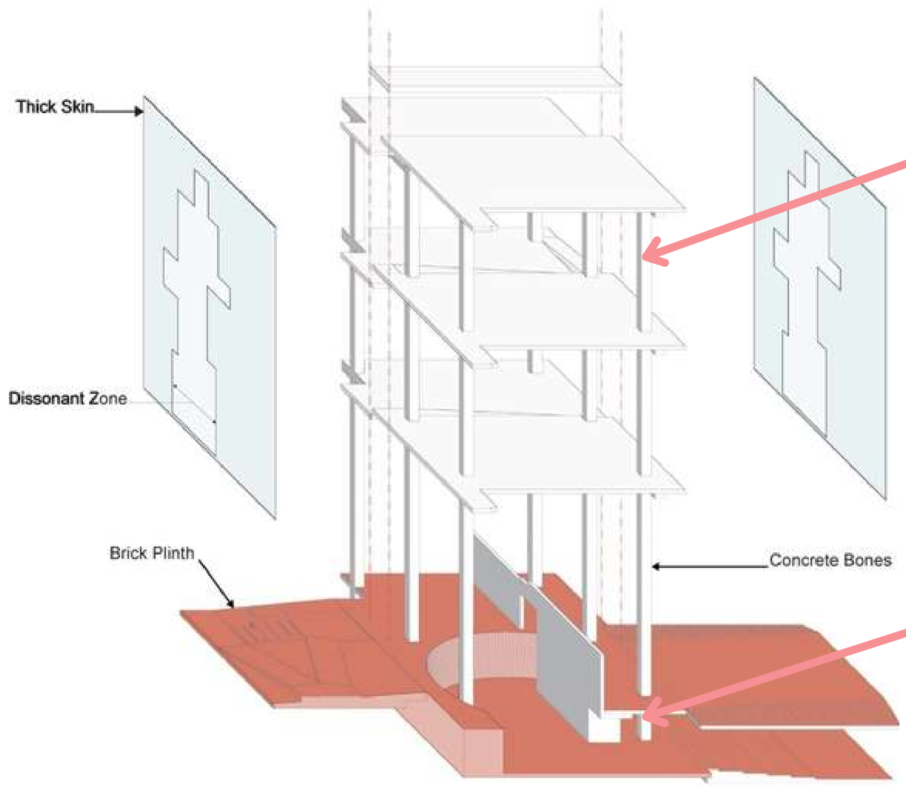
The steel structural components act as a grid for the support of each glass layer on the facade wall. The steel post and beams are also placed within the facade wall to create a integrated look with the facade.

2 Translucent Layer Facade - Thick Skin

The play of lines (columns) and planes (glass panels) give a unique touch of facade treatment, increasing the visual interest instead just conventional curtain wall.

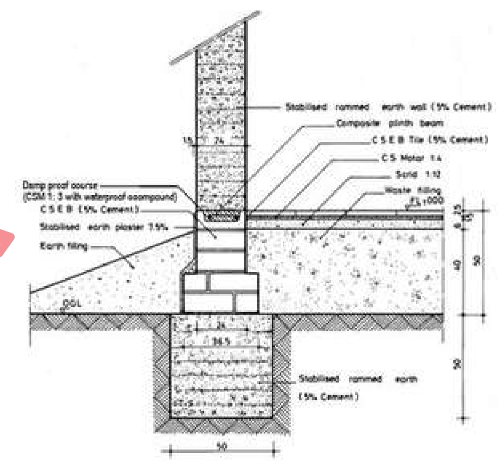
3 Varying Sizes and Shapes of Glazing

The glass glazing along the facade wall varies in size to create an visual appeal for the entrance of the structure as well as the interior spaces.



4 Concrete Bones

The concrete bone columns are supported and connected to the ground that transfer the load down to the foundation.



2.1.2 Lewis Arts Complex - Princeton University

Precedent Studies 2

Location:

120 Alexander St, Princeton, NJ 08540, United States.

Architect:

Steven Holl Architects

Built:

2017

Typology:

Private University

Size:

147000 ft^2

Facade System:

Concrete and stone wall columns around the structure and steel framing around structural glass planks with translucent coverings on glass glazing as cladding.

UNIVERSITY ARCHITECT QUOTE

“One of the things that makes Steven really exciting as an architect for Princeton is the tradition and the magic of the campus as a place where you wander through, very quietly, very slowly and you have a magical sense of space, and that quality is really what Steven brings to his architecture.”

2.1.2 Lewis Arts Complex - Princeton University

Precedent Studies 2

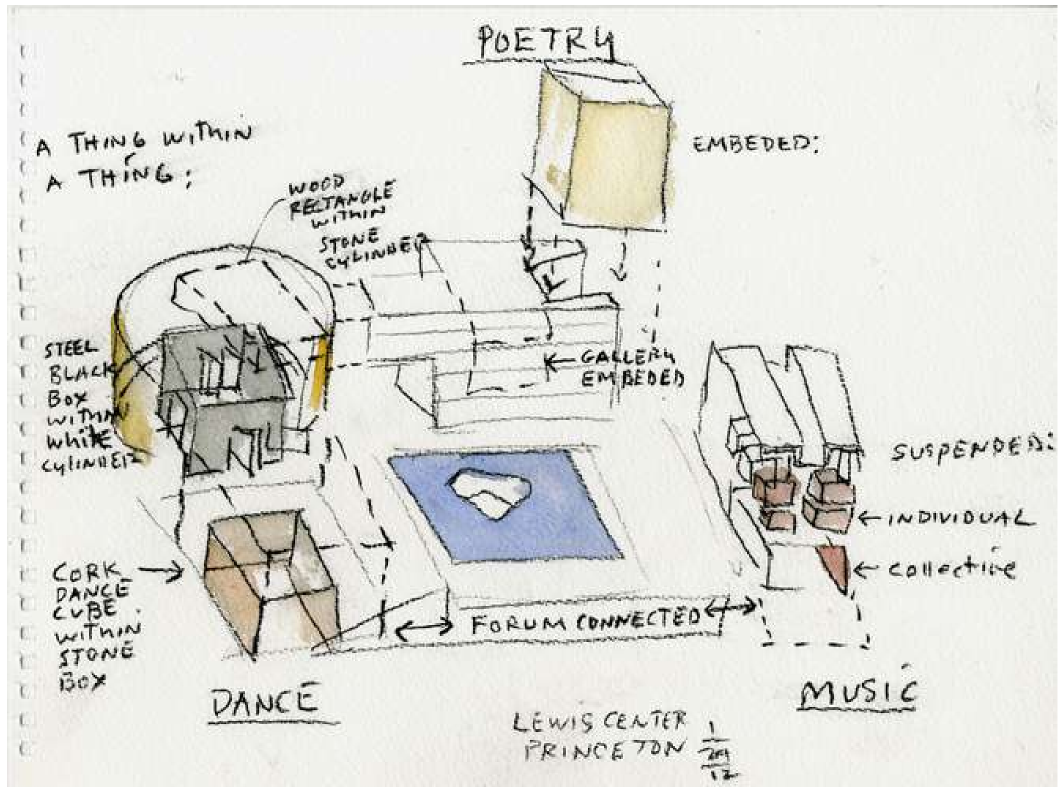
"The Lewis Arts Complex cleverly utilises multiple materials in the different sectors of the school, with traditional material choices for the arts building to compliment Princeton's historic Blair Arch. With that being said, the Wallace Theater and Dance Building is developed according to the idea of a "thing within a thing". Within the overall concrete frame, the black-box theatre is comprised of steel, while the dance theatres are foamed aluminum, white washed wood and board formed concrete."

MATERIALITY

1 Concrete and Stone Frame
A concrete/stone frame wraps around the building to define the interior spaces within the block.

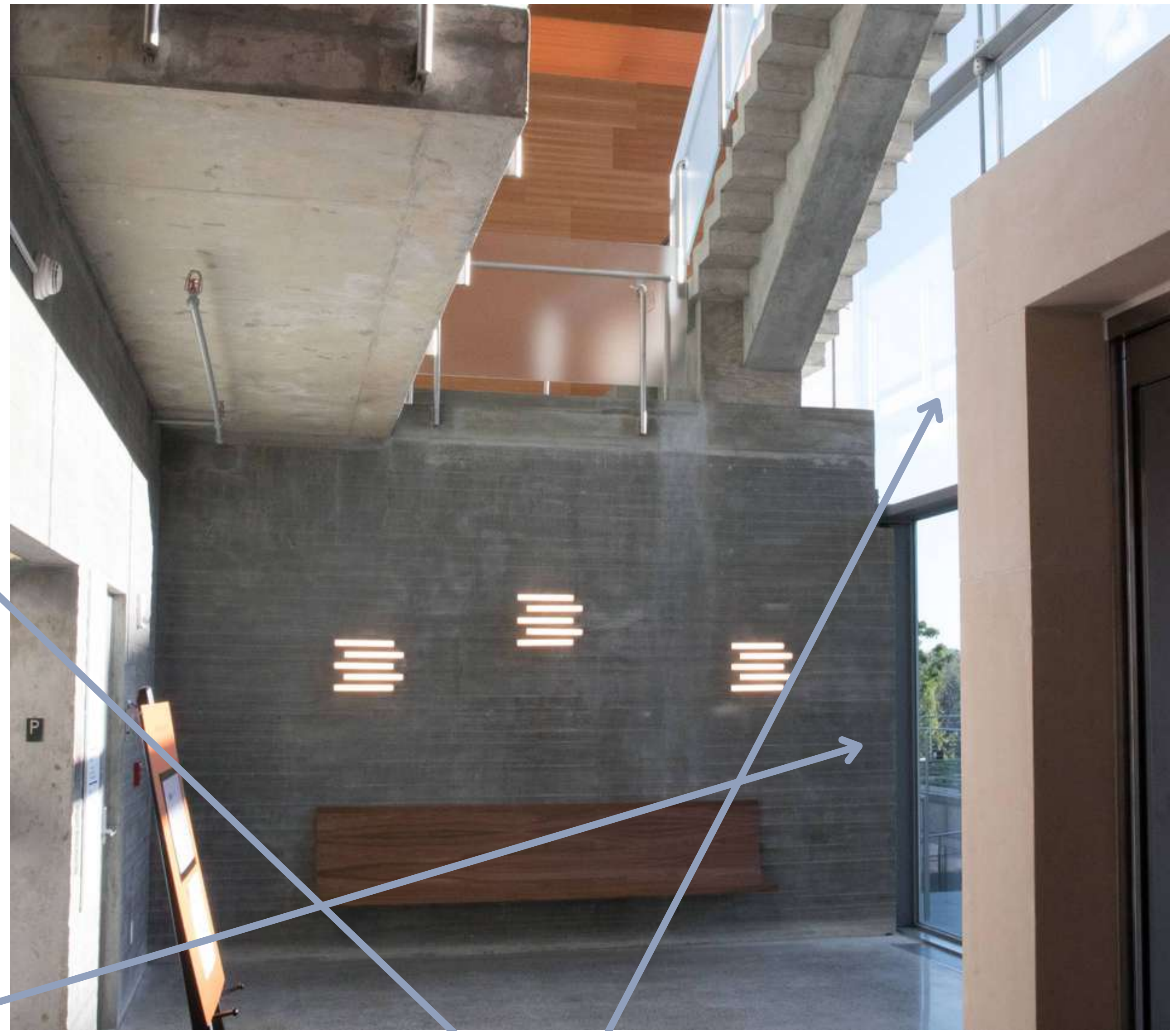
2 Steel Columns and Beams
Helps hold together the big glass curtain walls placed around the courtyard to maximise the view points toward the centre of the site.

3 Large Prismatic Glass
The large prismatic glass windows, which frame the exterior landscape, are covered with translucent layers to block out some sunlight from entering the building.



2.1.2 Lewis Arts Complex - Princeton University

Precedent Studies 2



DESIGN & TECTONICS

1 Structural Components Integrated into Facade Wall

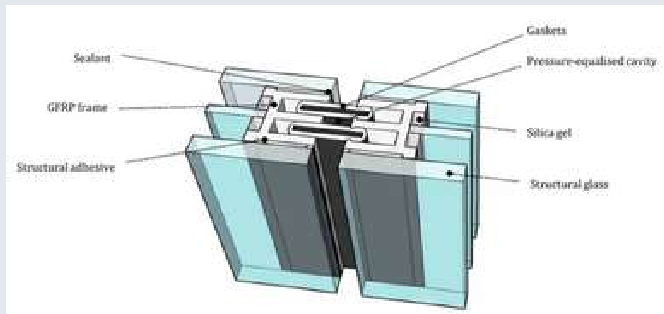
The steel structural components allows for support of the glass layer on the facade wall. The steel post and beams are also placed within the facade wall to create a integrated look with the facade.

2 Concrete Support Post & Beams

The concrete support beams aid in lifting up the facade wall to create a hierarchy and stable foundation for the glass panels to increase support and allow for the facade wall to stand firm.

3 Structural Glass with Translucent Covers

The structural glass glazing along the facade connects with the steel frame to minimise the obstruction of views with supports. This installation also allows for more flexibility of the facade wall.



2.1.3 Summary & Comparison

KEY TAKEAWAYS

1 Less is More

A great facade comes with minimising structural elements as much as possible. This can be achieved by intergrating glass panels and coverings onto thinner curtain walls which are supported to allow internal and external views of the building.

2 High Strength of Steel

Steel is a strong and durable material, providing structural integrity and longevity to the facade. It can withstand environmental forces and resist degradation over time.

3 Environmental Impact

The production of steel involves energy-intensive processes, contributing to environmental impacts. However, the recyclability of steel helps mitigate some of these concerns.

TABULATED SUMMARY

ADVANTAGES	DISADVANTAGES
1 Strength and Durability Steel is known for its high strength and durability, providing a robust structural framework that can withstand heavy loads and adverse weather conditions.	**1 High Initial Cost** The initial cost of steel can be higher than some other construction materials. The overall cost-effectiveness depends on factors such as project size, complexity, and local market conditions.
2 Design Flexibility Steel frames offer excellent design flexibility. They can be used to create open and spacious interiors, allowing for creative and modern architectural designs.	**2 Thermal Conductivity** Steel has high thermal conductivity, meaning it can transmit heat or cold. Without proper insulation, steel structures may require additional measures to control thermal transfer.
3 Longevity and Low Maintenance Steel structures have a long lifespan and require minimal maintenance compared to other materials. This can result in cost savings over the life of the building.	**3 Design Complexity** While steel allows for design flexibility, complex designs may increase fabrication and construction costs.

2.2 FACADE 2 : STEEL FRAME + STEEL LOUVRES

2.2.1 Juno Academy

Precedent Studies 3

Location:

710, Samseong-ro, Gangnam-gu, Seoul, South Korea

Architect:

SKM Architects

Built:

2015

Typology:

Office (Training Centre)

Size:

2710 m²

Facade System:

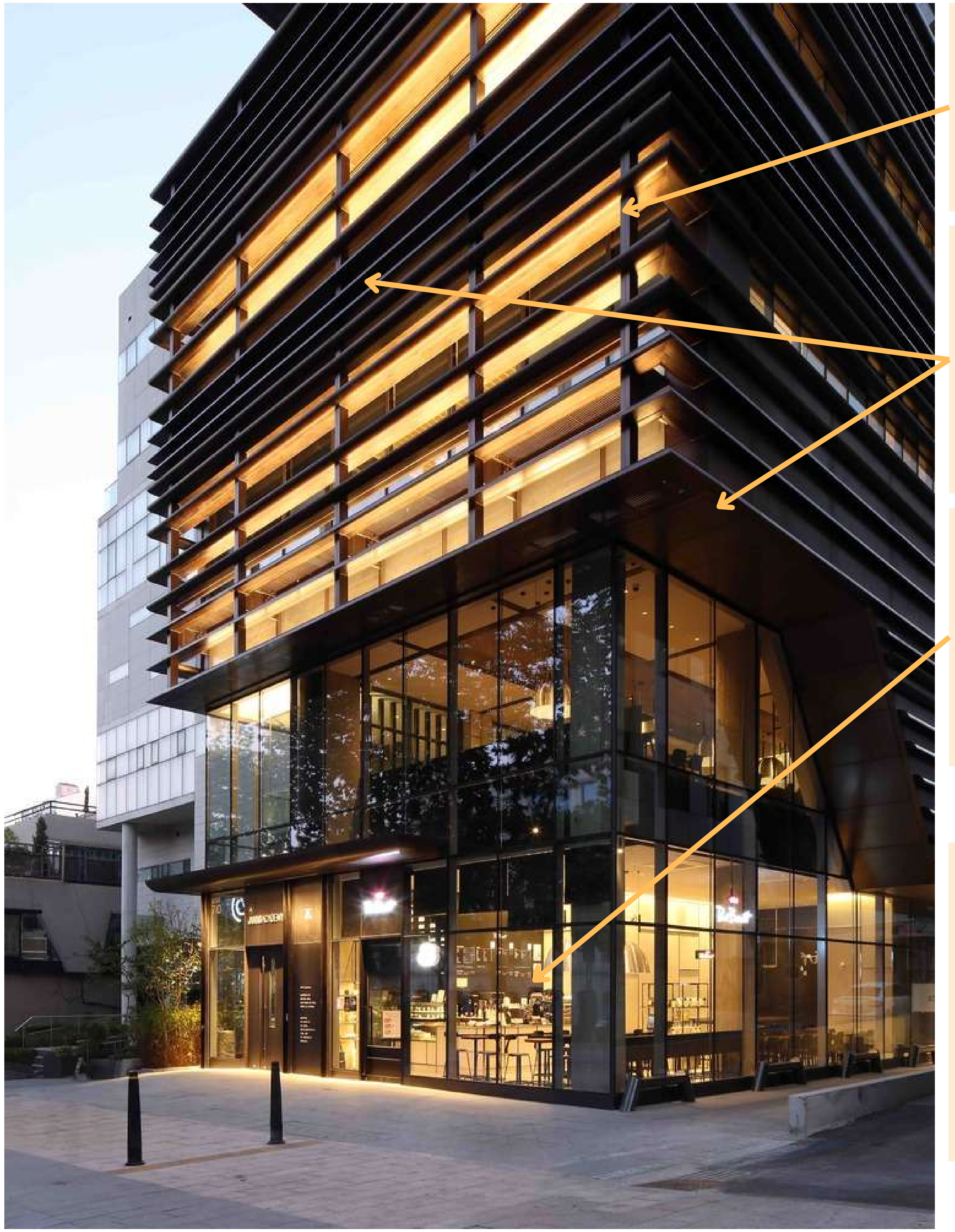
Steel frames with louvres fixed around the structure

ARCHITECTS' DESCRIPTION

"A company with a big market share in the Korean beauty industry wanted to build an institution for education in human resources in order to secure continuous growth their employees. Aside from maximizing the efficiency of a building on the expensive site in Cheongdam-dong, Gangnam district, the client hoped that their whole staff would not only have opportunity to learn and enjoy in their new training, but also feel proud of working at a great company in a space for various programmes like lectures and meetings. Moreover, their requirements also included and enhanced brand value of the company and a space where executives remain to communicate with employees."

2.2.1 Juno Academy

Precedent Studies 3



MATERIALITY

1 Steel Columns

The structural columns of the Juno Academy are constructed using steel columns, which contribute to the building's robust framework, symbolizing strength and resilience.

2 Steel Louvres

These horizontal louvres that gracefully weave around the structure, serve a dual purpose. They offer a dynamic visual appeal while providing efficient sun shading. The steel louvres, with their sleek and angular design, create a play of light and shadow, casting intriguing patterns across the building's surface throughout the day.

3 Glass Panels

A significant portion of the facade is dedicated to expansive glass glazing, fostering a seamless connection between the interior spaces and the surrounding landscape. The use of high-performance glass ensures an abundance of natural light, promoting a bright and inviting atmosphere within the academy.

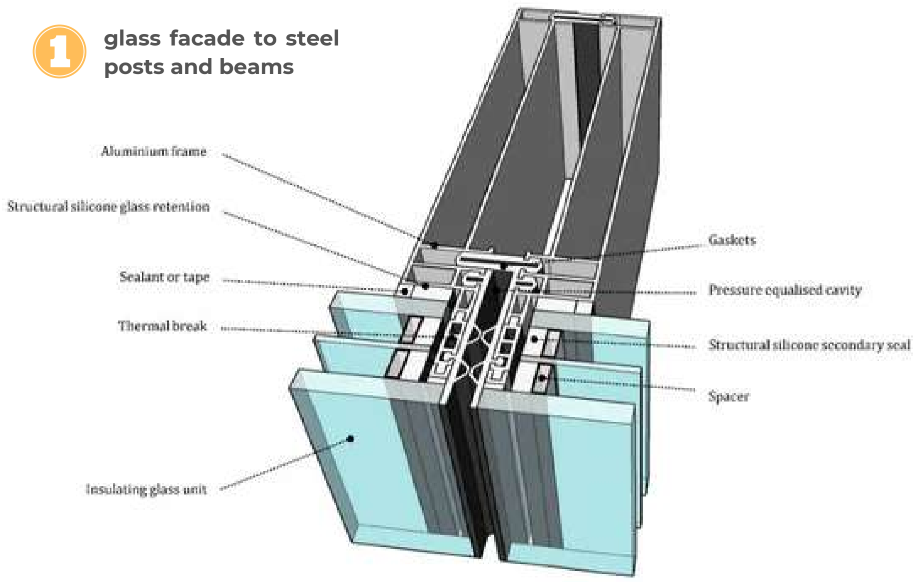
Functional Spaces

The transparent steel curtain wall on 1st and 2nd floor give a feeling of openness and the steel frame stairs exposed to the outside plays a role of 'an Objet'. The 5th and 6th floor, especially, as the core spaces for the training are recessed from the main volume so that the floors above could be recognized as a 'floating' in a way of massing. The two floors are vertically opened to provide special spatial quality.

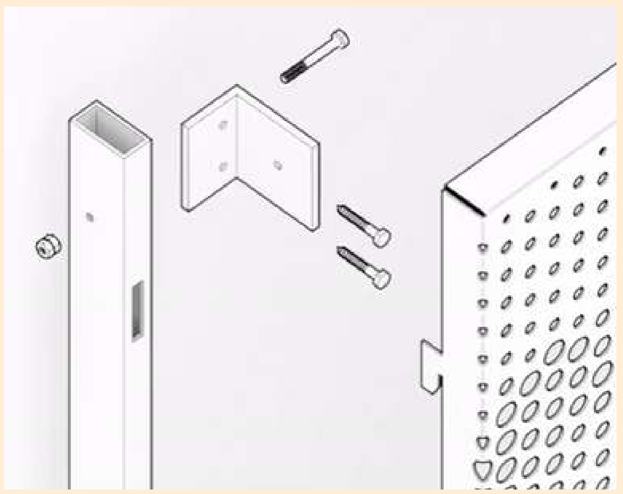
2.2.1 Juno Academy

Precedent Studies 3

1 glass facade to steel posts and beams



2 perforated aluminium panels installation to steel beams



DESIGN & TECTONICS

1 Glass Curtain Wall with Steel Mullions

The steel structural components are connected to the ground and support the glass layer on the facade wall. A thicker steel beam is placed on the ground for added structure to the glass panels.

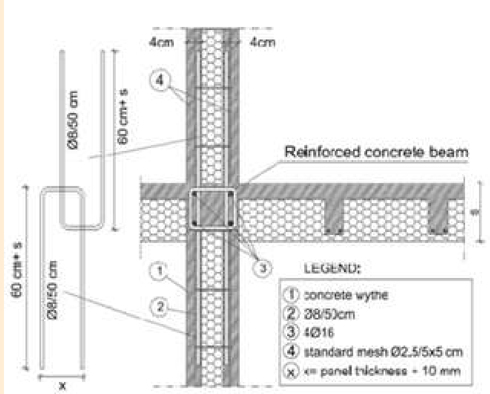
2 Perforated Aluminium Panels

The perforated aluminium panels are placed below and above the steel framing facade to increase support to the overall louvres facade as well as create a distinguised border around the framing.

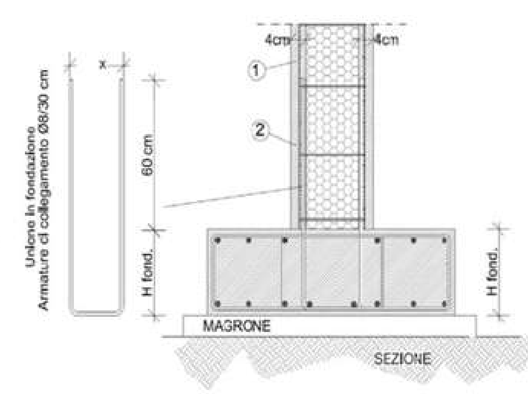
3 Concrete Columns

The concrete columns help the building stand and are connected to the ground that transfer the load down to the foundation. The columns allow for the connections of the floors and the facade walls.

(a) concrete columns to floor and wall



(b) concrete columns to foundation



2.2.2 AC House

Precedent Studies 4

Location:

Colinas del Limonar Málaga, Spain.

Architect:

Marina Uno Arquitectos

Built:

2023

Typology:

Private House (Residence)

Facade System:

Pre-cast concrete slabs as frontage screening, with steel beams, timber shading facades and glass windows.

ARCHITECTS' DESCRIPTION

"The AC house is located in the recent extension to the north of the well-known Limonar neighborhood in Málaga, on a perfectly flat plot, with a square plan and facing south. The house is organized through a system of parallel bands in a north-south arrangement and they are crossed by a circulation axis that connects the different parts of the program."

"Following the principles of Mediterranean architecture, the house is designed looking for shade: The openings are protected from direct sun with shutters that allow cross ventilation, the patio generates shade and coolness and the pergola protects the large openings in the living room and kitchen from direct radiation."

2.2.2 AC House

Precedent Studies 4

Louvres and Pergolas

The kitchen and living room are located in the southern area of the house, they are completely open to the garden and they are shaded by a pergola that builds the porch: the main space of the building.

MATERIALITY

1 Thin Reinforced Concrete Slabs

The house is built with thin reinforced concrete slabs supported on manual brick walls. Pre-cast concrete has several benefits, including quick construction, reliable quality, and strong structural integrity. It is a robust substance that will ensure for a safe and firm home.

2 Timber Shading Devices

The carpentry is made with tropical woods, that are intricately place around the house for shading and privacy purposes. The shading devices also prevent direct sunlight from entering the building as well as allow prevailling winds into the building for cool ventilation throughout the structure.

3 Steel Columns and Beams

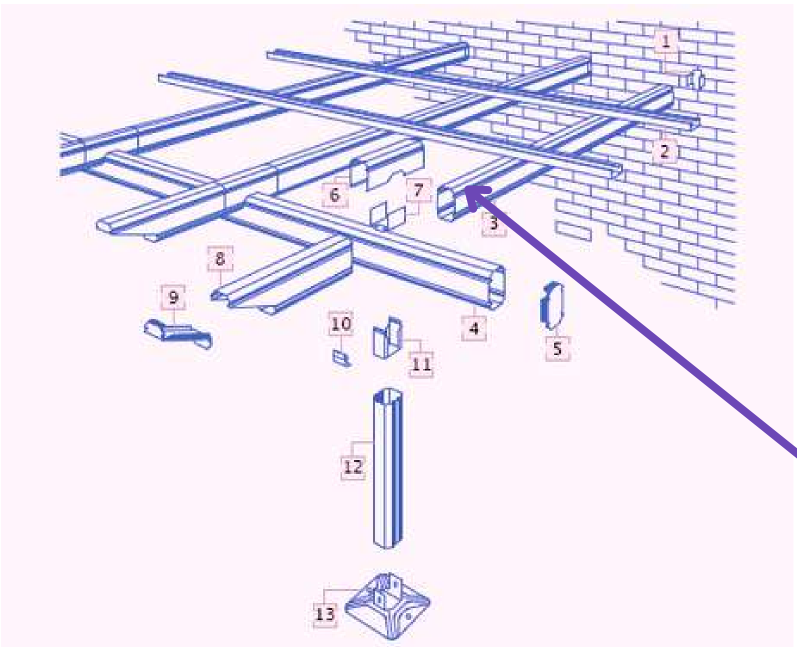
A thin metal structure exposes itself on the garden side, acting as a support system for the shading and ventilation system for the house. These shading devices are fixated on the steel columns and beams.

4 Limestone Pavements

The pavements on the ground are made with limestone, which is a common material found in the mediterranean countries like Spain. It helps regulate temperature and create a nice clean finish on the flooring for aesthetic reasons.

2.2.2 AC House

Precedent Studies 4

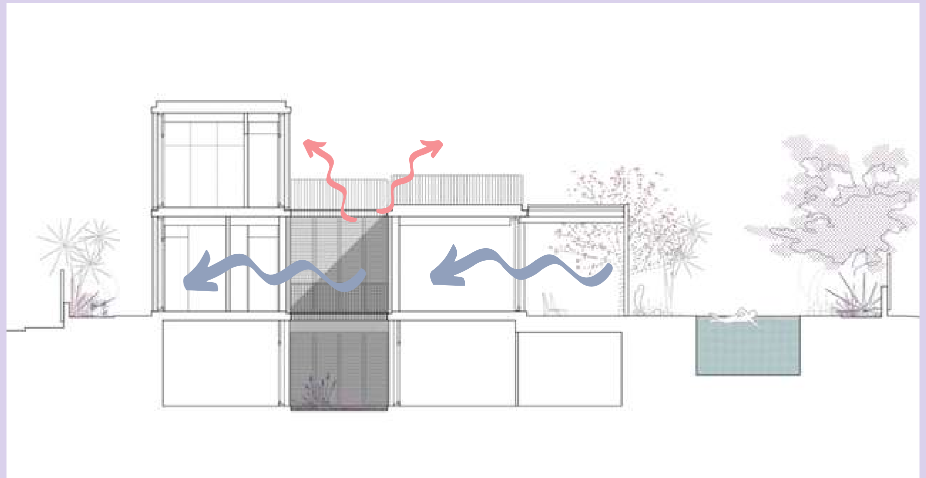


DESIGN & TECTONICS

1 Shading Devices - Pergolas and Louvres

Strategic placement of pergolas further enhances the control over sunlight, creating inviting outdoor spaces shielded from the direct rays. These pergolas, crafted from durable and sustainable timber, extend the living areas into the open air while providing essential shade. The interplay of light and shadow beneath the pergolas transforms outdoor spaces into comfortable retreats, perfect for relaxation or social gatherings.

2 Green Design - Ventilation



Ventilation is seamlessly integrated into the design, with strategically placed openings that allow for cross-ventilation, facilitating the free flow of fresh air. The combination of timber shading devices and well-placed pergolas not only mitigates solar heat gain but also enhances natural ventilation, creating a refreshing and enjoyable living environment.

3 Steel Structure

The steel columns and beams are placed in grids while having fastners as joineries to connect the steel structure together, then timber louvres are fixed on the structure to shade the sunlight.

4 Louvres

While there are shading devices outdoors, the indoor spaces are also shaded with vertical louvres that create a grid like shadow in the ground.

2.2.3 Summary & Comparison

KEY TAKEAWAYS

1 Modern Aesthetics

Steel cladding can provide a sleek and modern appearance, contributing to contemporary architectural styles. The reflective surface of steel can add a dynamic visual element to the building.

2 Rain Protection

Well-designed steel louvers can protect windows and openings from rain ingress while allowing for adequate ventilation with strong winds from the rain.

3 Ventilation and Airflow

Adjustable steel louvers can facilitate natural ventilation, promoting airflow and improving indoor air quality. It can also aid in passive cooling by channeling cooler outdoor air into the building, reducing reliance on mechanical ventilation or air conditioning systems.

TABULATED SUMMARY

ADVANTAGES	DISADVANTAGES
1 Ventilation and Airflow Adjustable louvres allow for control over natural ventilation which can help regulate airflow and improve indoor air quality.	**1 Maintenance** Steel louvres may require regular maintenance to prevent corrosion and ensure proper functioning. The need for maintenance can add to the overall cost of ownership.
2 Aesthetic Appeal Steel louvres and shading devices can add a modern and aesthetically pleasing element to the building's facade. They offer design flexibility to complement the overall architectural style.	**2 High Construction Cost** Depending on the design complexity and materials used, the installation of steel louvres can be relatively expensive.
3 Privacy and Security Louvres provide an effective way to control views into and out of a building. They can enhance privacy for occupants while also serving as a security measure.	**3 Weight** Depending on the design and thickness of the steel, the weight of louvres can be significant. This may require careful consideration in terms of structural support and engineering.

2.3 STRUCTURAL SYSTEM - STEEL POST & BEAM + FLOORING

2.3.1 Factory in the Forest

Precedent Studies 5

Location:

Lorong Perindustrian Bukit Minyak 21, 14100 Simpang Ampat, Pulau Pinang, Malaysia

Architect:

Design Unit Architects

Built:

2017

Typology:

Office and Factory

Size:

15000 m²

Structural System:

Steel post and beam as main structural member; RC floor with tiles and epoxy finishes

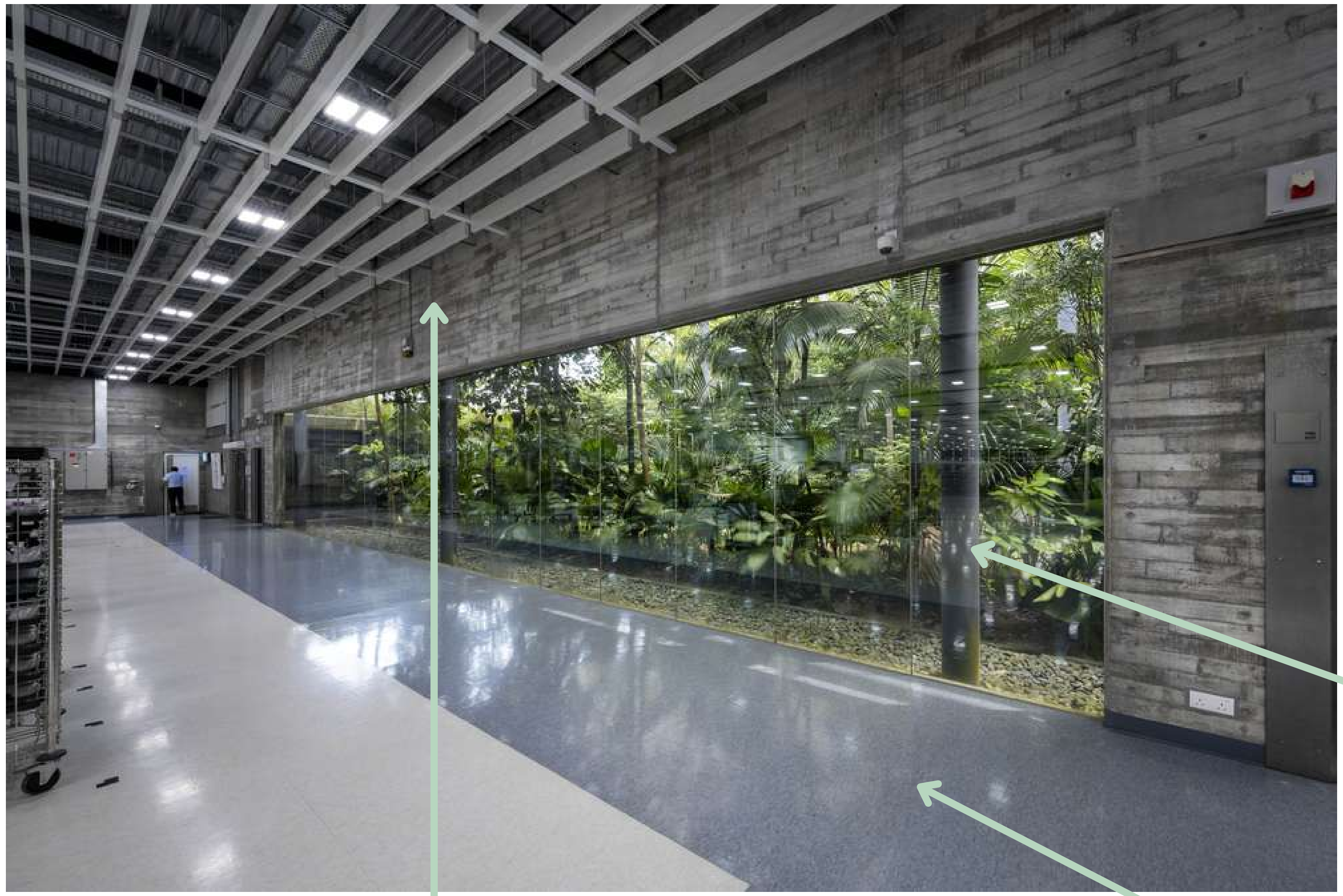
ARCHITECTS' DESCRIPTION

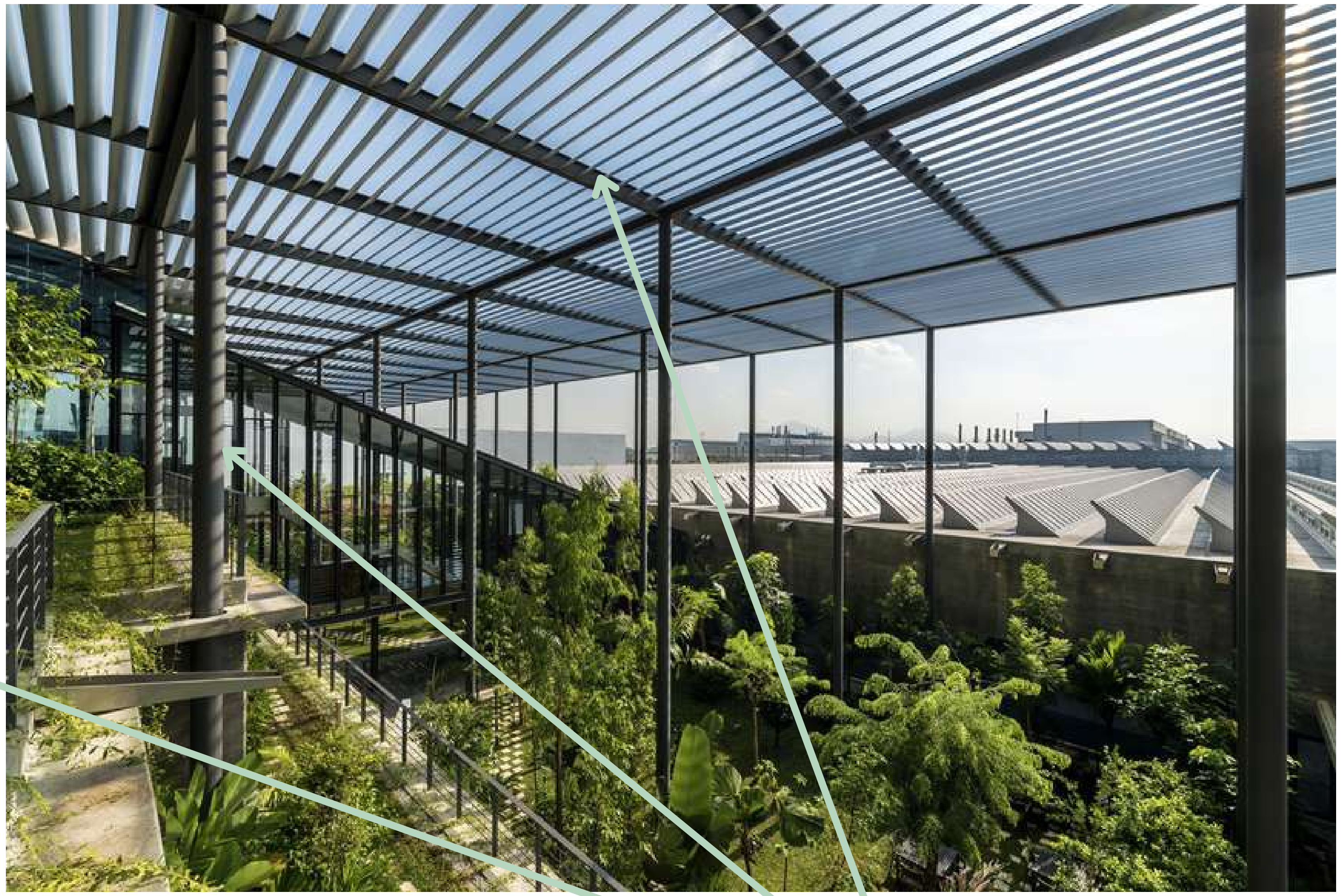
"Architectural competition winning entry for an electronics manufacturing plant. This site is conceived as a forest that penetrates, surrounds & steps over the building creating maximum contact with nature – green, breeze, scent, sound, touch. A canopy supported by a 'forest' of columns creates unity to office & courtyard while giving protection from the tropical sun. Office levels give access to roof gardens and staff are encouraged out for breaks, meetings or just contemplation."

"The building is designed to shield against the hot & glaring tropical sun, while allowing diffused natural daylight to filter into the building. The office & courtyard are shaded by a louver canopy designed to provide effective solar protection during the hottest part of the day."

2.3.1 Factory in the Forest

Precedent Studies 5





MATERIALITY

1 BOARD-FORM REINFORCED CONCRETE

Textured finishes are applied to reinforced concrete walls in architectural projects to enhance visual appeal, especially in long corridors and expansive spaces that might seem monotonous if left plain. These treated panels serve a dual purpose by integrating both aesthetic texture and structural elements, seamlessly combining form and function in construction.

2 EPOXY FLOORING

Epoxy floor finishing serves as a cost-effective solution, particularly in high-traffic areas such as factories where material wear-and-tear is noticeable. In architectural projects, it offers a practical choice, delivering an easily maintainable surface ideal for domestic cleaning.

3 STEEL STRUCTURES

Steel structures prove to be a swift and cost-efficient installation choice, significantly reducing construction time, which is an essential consideration for factory projects. Beyond their quick assembly, these structures are easily maintained and boast a robust load-bearing capacity, making them a valuable asset in architectural construction projects.

2.3.1 Factory in the Forest

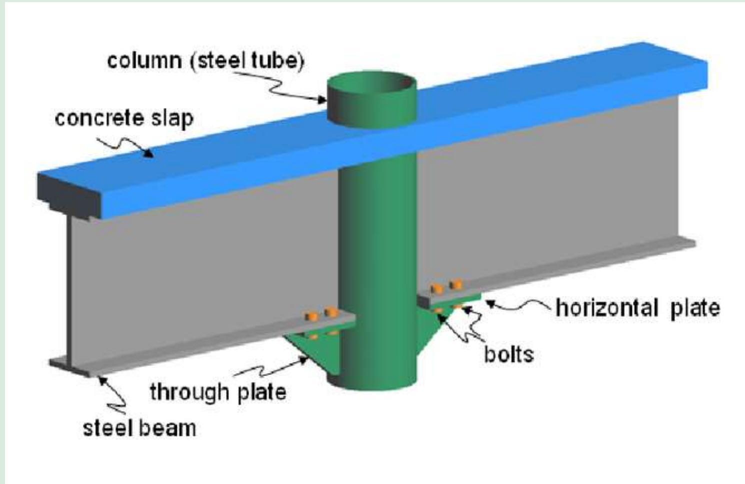
Precedent Studies 5

DESIGN & TECTONICS

1 Structural & Non-Structural Components

A - Steel Circular Steel Columns
B - Steel H-Columns
C - Steel T-Beams
D - Steel I-Beams
E - Steel Roof Fins
F - RC Board Form Wall Panel
G - RC Board Form Floor Slab

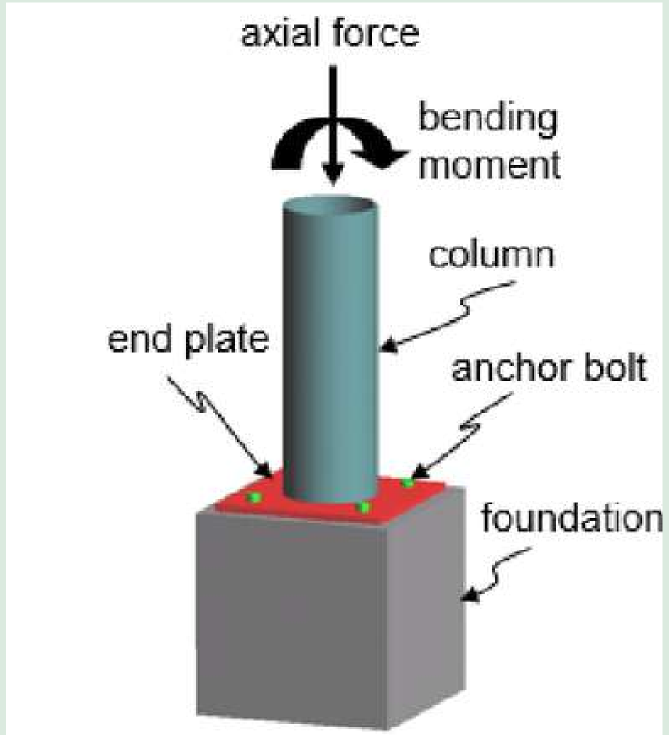
2 Connections and Joineries



a) beam-to-column joint

Circular steel column connected to I-beam at roof and supporting floor structure with the stiffening of through plate and horizontal plates that increases the contact area for the joinery.

Circular steel column connected to ground through fixing onto a steel plate that is connected to foundation pieces underground



b) column base

2.3.2 Garden Pavilion

Precedent Studies 6

Location:

Bratislava, Slovakia

Architect:

coolstock

Built:

2023

Typology:

Private House (Residence)

Size:

106 m²

Stuctural System:

Steel post and beam as main structural member with reinforced concrete (RC) flooring system

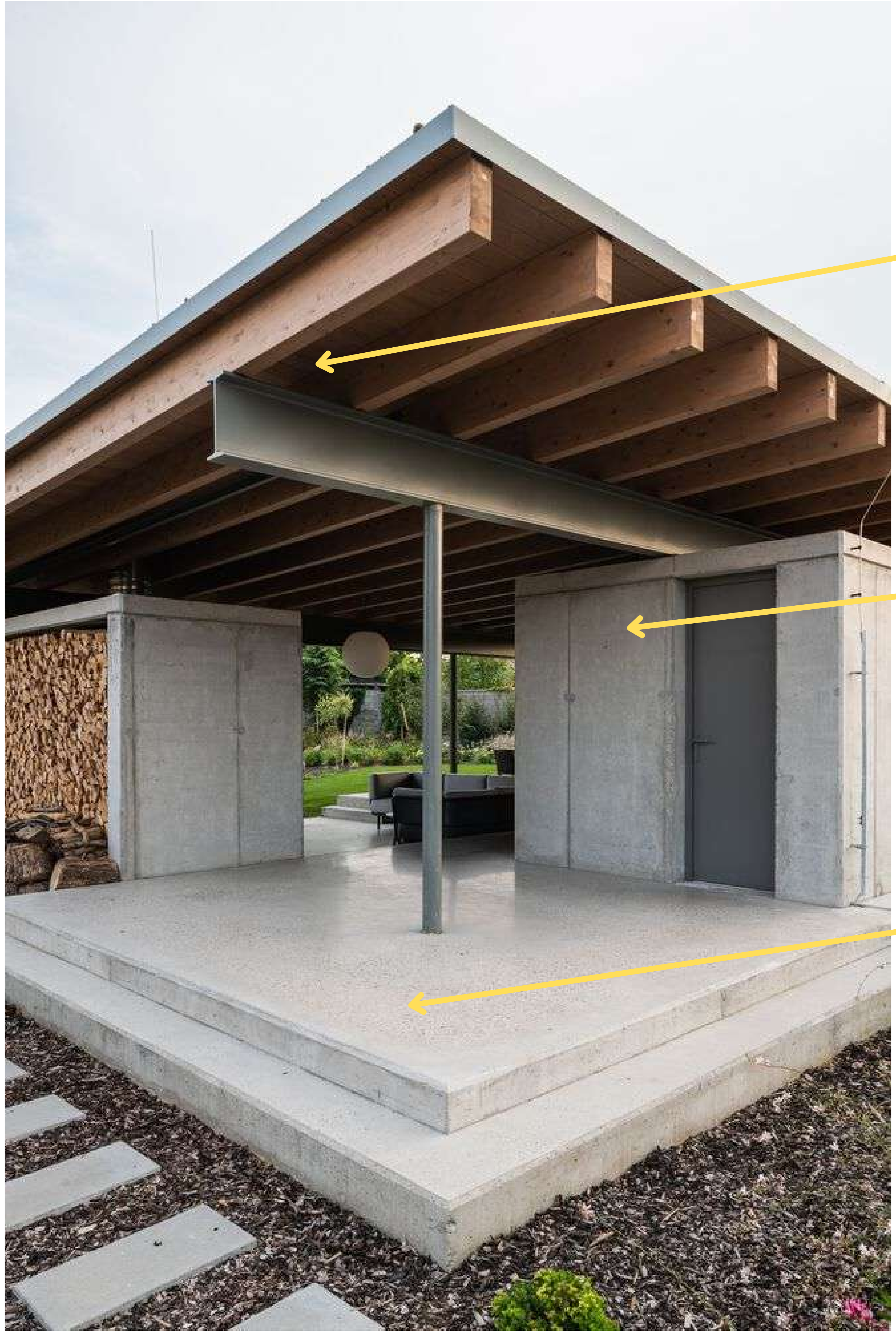
ARCHITECTS' DESCRIPTION

"The garden pavilion is located on land that is directly accessible from the family house of its owners from the south side. It thus expands the possibilities of spending their free time in the garden and creates a covered space for recreational activities."

"It includes a summer kitchen with dining, an outdoor living space with seating and a fireplace, sanitary facilities, and storage areas for food, tools, and garden furniture. The pavilion will be used mainly in the summer when it will create a roofed and shaded space, optically and physically open to the surrounding garden."

2.3.2 Garden Pavilion

Precedent Studies 6



MATERIALITY

1 Steel Columns and I-Beams

The structural columns of this small project are exposed to show a rustic and authentic look to the pavilion.

Steel structures are wisely applied in the backyard structure to facilitate any expansion or demolition works in future, while supporting the roof structure of the pavilion. It's often coated with waterproofing paint to be applied outdoors.

2 Reinforced Concrete Walls

The house is built with solid reinforced concrete slabs. Pre-cast concrete has several benefits, including quick construction, reliable quality, and strong structural integrity. It is a robust substance that will ensure for a safe and firm home.

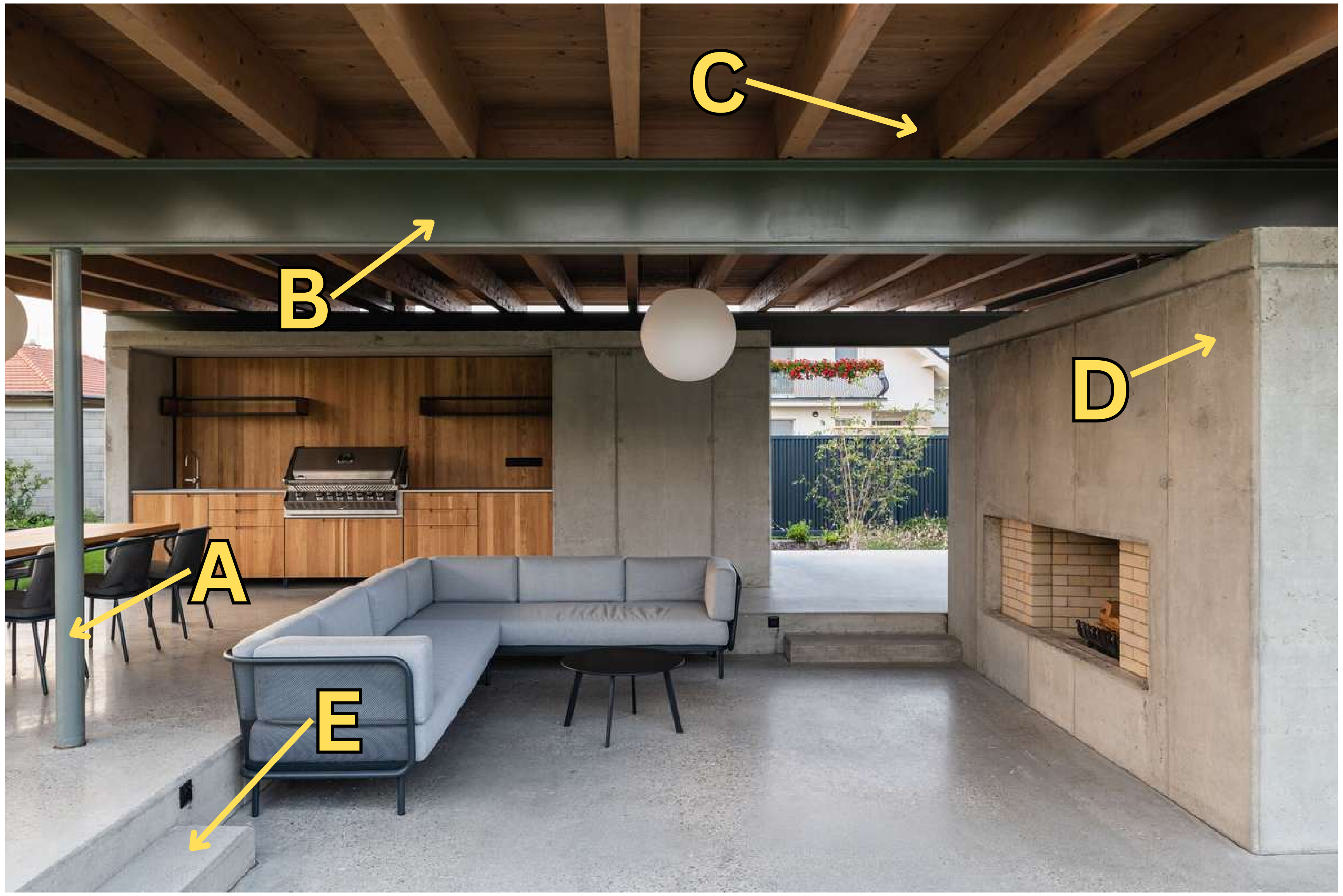
3 Reinforced Concrete Flooring

The integration of concrete flooring with steel columns and beams not only enhances the overall structural integrity but also ensures a cohesive and durable assembly, combining the strength of reinforced concrete with the flexibility and efficiency of steel columns and beams. The result is a harmonious architectural system that optimizes both the load-bearing capacity and design versatility of the structure.

2.3.2 Garden Pavilion

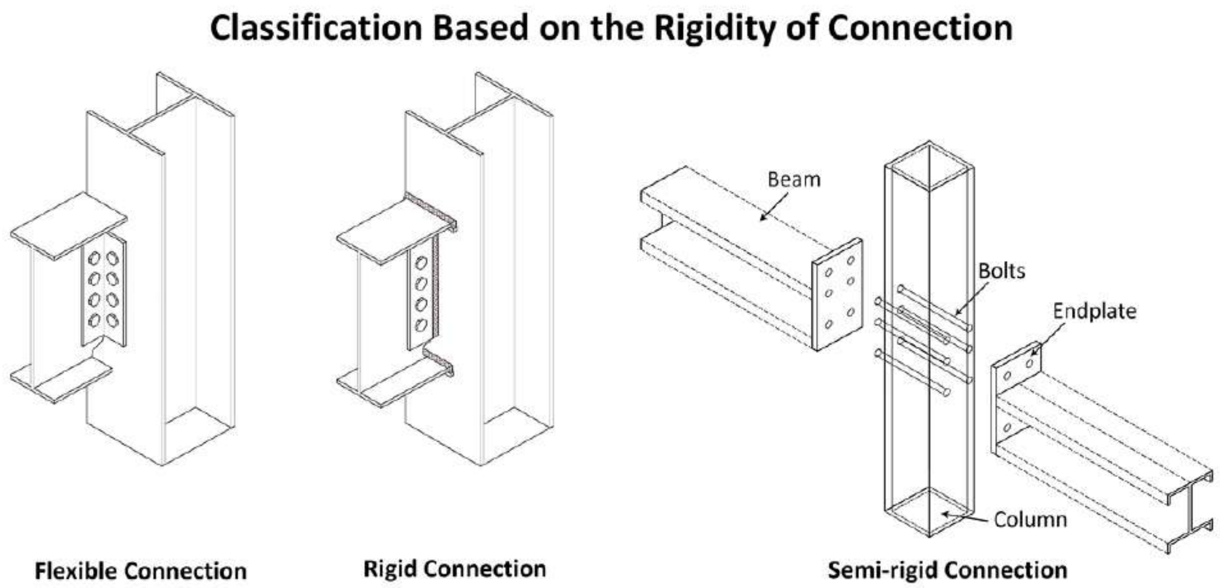
Precedent Studies 6

DESIGN & TECTONICS



2 Steel Columns & Beams

The steel structural components provide a strong support for ceiling elements such as a roof. The columns connect to the concrete foundation block under the structure for maximised sturdiness and a firm foundation for construction.

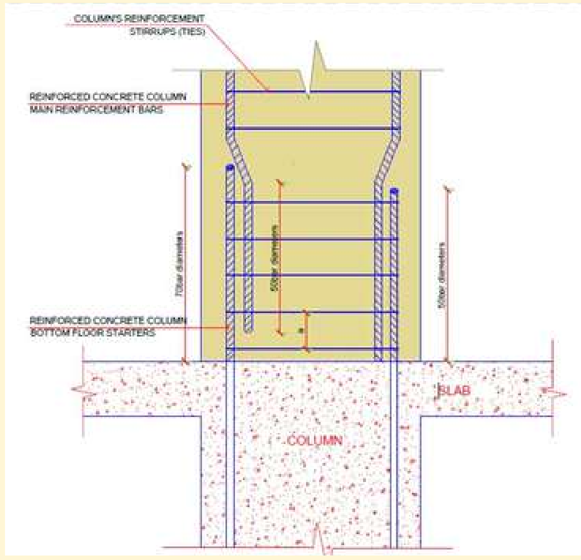


1 Structural & Non-Structural Components

A - Steel Circular Steel Columns
B - Steel I-Beams
C- Wooden Standing Seam Roof
D - RC Board Form Wall Panel
E - RC Board Form Floor Slab

3 Reinforced Concrete Flooring Connections

As a foundational component, the reinforced concrete floor provides essential support and stability, acting as a reliable connector between the load-bearing steel framework.



2.3.3 Summary & Comparison

KEY TAKEAWAYS

1 Large Span Capabilities

Post and beam systems are well-suited for large spans. This allows for the creation of expansive, open spaces without the need for numerous intermediate supports, enhancing the visual and functional aspects of the interior.

2 Adaptability for Renovations

Post and beam structures are often adaptable to renovations and modifications. Changes to the interior layout can be made more easily compared to structures with load-bearing walls.

3 Potential for High Ceilings

Post and beam structures allow for the creation of spaces with high ceilings. This can contribute to a sense of openness and grandeur in architectural design.

TABULATED SUMMARY

ADVANTAGES	DISADVANTAGES
1 Structural Strength Steel is known for its high strength, making it suitable for supporting heavy loads. Combining steel posts and beams with concrete flooring results in a robust and durable structural system.	**1 Corrosion** Steel is susceptible to corrosion, especially in humid environments. Protective coatings or galvanization may be required to tackle this issue, adding to the overall cost.
2 Construction Speed The use of steel can expedite construction due to its prefabricated nature. Steel components can be manufactured off-site, reducing on-site assembly time.	**2 Acoustic Transmission** Steel structures can transmit sound more readily than some other materials. Additional soundproofing measures may be necessary for certain applications.
3 Longevity and Low Maintenance Steel structures are durable and require minimal maintenance over their lifespan. This can result in cost savings and a longer building life cycle.	**3 Construction Precision:** The precision required during the construction process is high, and errors in fabrication or assembly can impact the overall structural integrity. Skilled labor and precise construction practices are crucial.

2.4 ROOF SYSTEM - STANDING SEAM METAL ROOFING

2.4.1 Festival Hall

Precedent Studies 7

Location:

La Norville, France

Architect:

Figures Architectes + Depeyre Morand Architectures

Built:

2023

Typology:

Community Hall (Town Hall)

Size:

296 m^2

Roof System:

Pre-Weathered Zinc Standing Seam Roof

ARCHITECTS' DESCRIPTION

"The project, a collaboration between Figures Architectes and Depeyre Morand Architectures, consists of the construction of multifunctional hall for the town of La Norville (Essone, 91, France). The hall will be used both as a village hall and as a private space available for rentals."

"The plan articulates three volumes: two parallel technical wings frame the main hall to the north and south. Facing east-west and benefiting from natural light and through-views, the two accordion-style glass façades open out completely towards the woods and fields."

2.4.1 Festival Hall

Precedent Studies 7

MATERIALITY

1 Wooden Framework & Timber-Framed Walls

Wooden framework is utilized to form the structural skeleton of the community hall, supporting the overall construction. Timber-framed walls add warmth and character to the building while providing a sustainable and durable enclosure.

Wood imparts a natural and inviting ambiance, and timber-framed walls contribute to efficient insulation, ensuring a comfortable interior environment.

2 Aluminium Door Frames

Aluminium door frames are incorporated for entrances and exits, combining strength with a sleek and modern aesthetic. The lightweight nature of aluminium makes it easy to install and maintain.

Aluminium door frames offer durability, resistance to corrosion, and minimal maintenance, making them suitable for high-traffic areas like a community hall.

3 Reinforced Concrete Flooring

Reinforced concrete flooring forms the sturdy base of the community hall, providing stability and load-bearing capacity. It serves as a durable surface capable of withstanding the demands of diverse events and foot traffic.

Reinforced concrete flooring offers longevity, easy maintenance, and the ability to accommodate various floor finishes, contributing to the versatility of the hall.

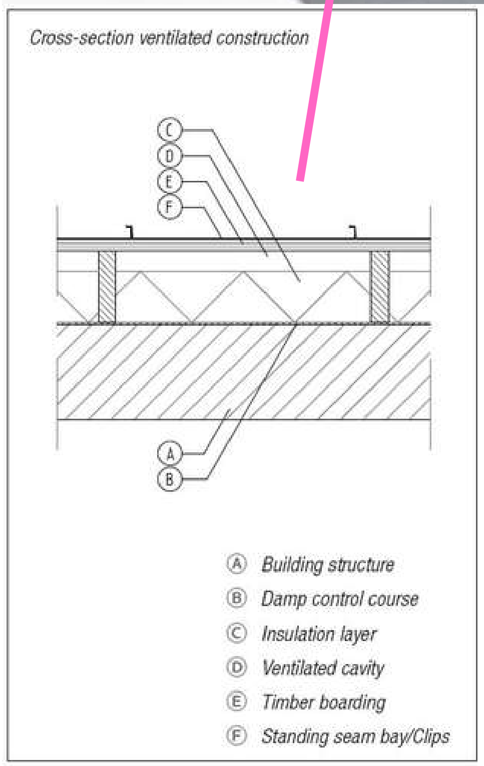
4 Metallic Zinc Standing Seam Roof

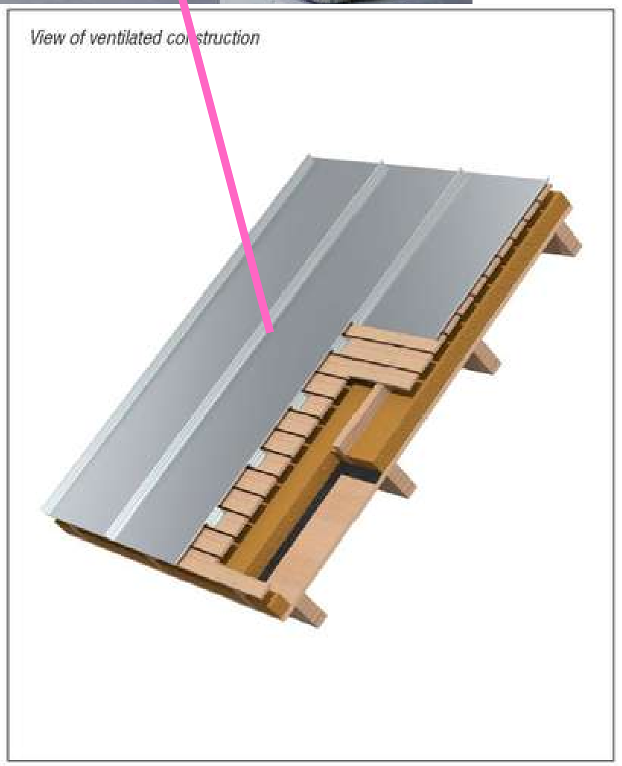
The metallic zinc standing seam roof is applied to create a durable and weather-resistant covering. This roofing system is designed with raised seams that interlock, providing protection against the elements.

Metallic zinc roofs are known for their longevity, resistance to corrosion, and low maintenance. The standing seam design enhances water runoff, ensuring efficient drainage during rain.

2.4.1 Festival Hall

Precedent Studies 7





DESIGN & TECTONICS

1 Wooden Truss System

High-quality timber, often treated for durability and resistance to decay, is selected for the construction of the truss system. Trusses are designed to provide structural support to the roof. They typically consist of rafters, bottom chords, and webs, creating a framework that supports the roof load.

2 Zinc Standing Seam Roof Installation

The timber truss system is installed and prepared to receive the zinc standing seam roof. The trusses are spaced according to design specifications. A suitable underlayment, often made of synthetic materials or felt, is installed over the timber trusses to provide an additional layer of weather protection.

3 Fastening to Trusses

The standing seam panels are securely fastened to the timber trusses using concealed fasteners or clips. This ensures a secure attachment while maintaining the clean aesthetic of the standing seam design.

4 Flashing and Edging

Flashing details are installed around roof penetrations, such as chimneys or vents, to prevent water infiltration. The perimeter edges of the roof are finished with appropriate edge details, ensuring a neat and water-resistant finish.

5 Sealing and Finishing

Sealants are applied to areas where panels meet, ensuring a watertight seal. This is especially important in areas prone to heavy rain or snow. The construction is finalized with any necessary finishing touches, such as trim or caps, to enhance the aesthetic and weather resistance of the roof.

2.4.2 Green Forest Middle School

Precedent Studies 8

Location:

701 School Dr, Green Forest, AR 72638,
United States

Architect:
Modus Studio

Typology:

School (Education Centre)

Size:

2010 m^2

Roof System:

Pre-cast concrete columns as frontage screening and structural glass planks with translucent white insulation as cladding.

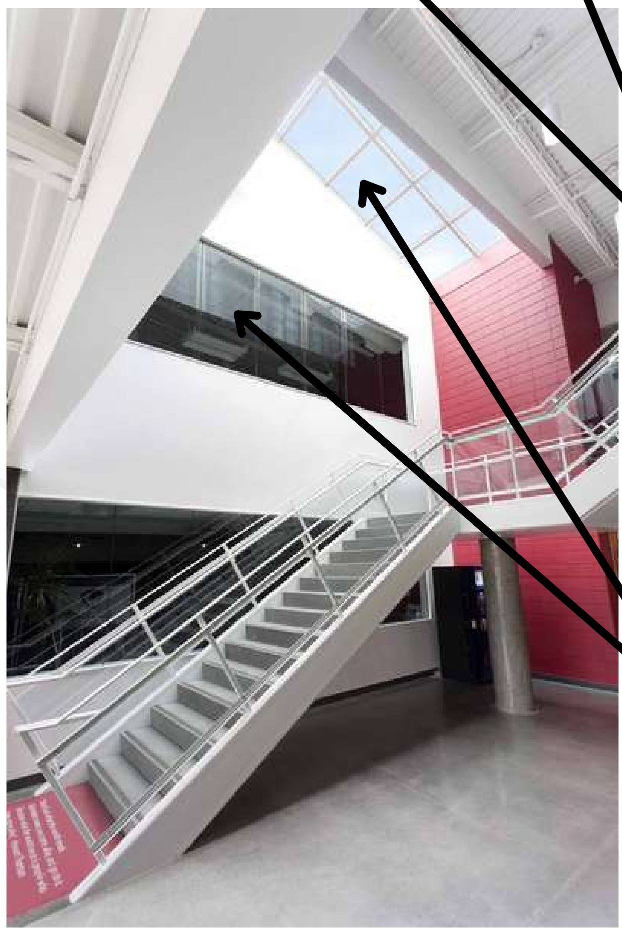
ARCHITECTS' DESCRIPTION

"Located amidst the Ozark Mountains in the small agricultural community of Green Forest, Arkansas this two-story middle school roots itself in the heart of the existing public school campus. We recognized the importance of the existing central greenspace as a common area, used throughout the day as a gathering place for middle school and high school students during lunch and before and after school. Furthermore, it is a transitional space consistently traversed by all students and members of the community to access the community stadium. The space acts as a plaza between the old CWA gymnasium, art + music, cafeteria, and agricultural buildings on the campus."

2.4.2 Green Forest Middle School

Precedent Studies 8

As a building located in the geographic center of the campus, all elevations are carefully composed with the play of concrete block and metal panel to dynamically address each approach. These durable, low-maintenance materials are common to economical school construction, but are creatively used to provide a unique design aesthetic.



MATERIALITY

1 Standing Seam Metal Roof

The standing seam shed roof of the building channels all water to the east side in continuation with the natural hydrology of the site while also providing a compositional shell embracing the main volume of the new structure.

2 Timber Cladding

Timber cladding provides a warm and natural aesthetic, contributing to a visually pleasing and welcoming environment. The use of wood can create a connection with nature, fostering a positive atmosphere conducive to learning.

Timber is a renewable resource, and when sourced responsibly, it can contribute to the overall sustainability of the building. The use of timber cladding aligns with the school's commitment to eco-friendly construction practices and a reduced environmental impact.

3 Stack-bond Concrete Block

As a base material, the standard-sized, sand-blasted, is used instead of split-face block, which is the most typical material for school construction.

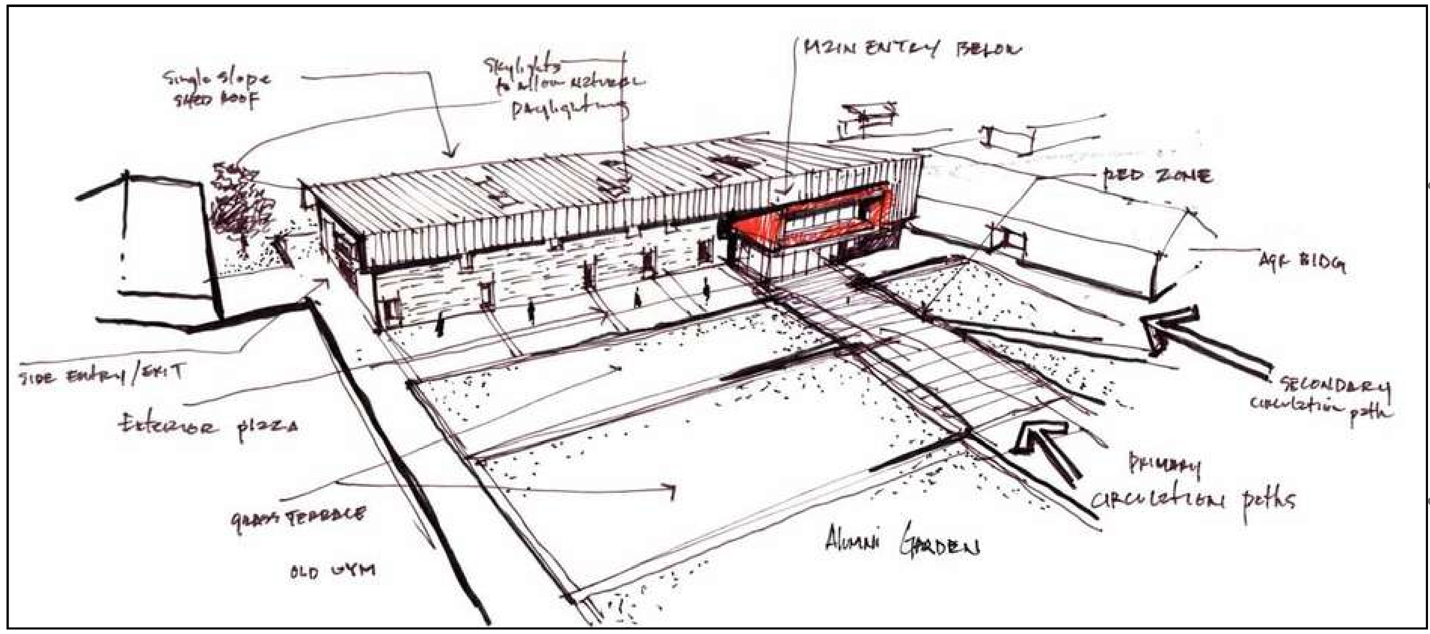
This smooth block keeps the building friendly to students and other users occupying the landscaped gathering spaces around the building.

4 Glass Panels

Glass panels are employed to maximize the entry of natural light into the building's interior spaces. This helps reduce the reliance on artificial lighting, creating a well-lit and energy-efficient environment. Additionally, glass provides visibility, allowing occupants to connect with the outdoors and fostering a sense of openness.

2.4.2 Green Forest Middle School

Precedent Studies 8



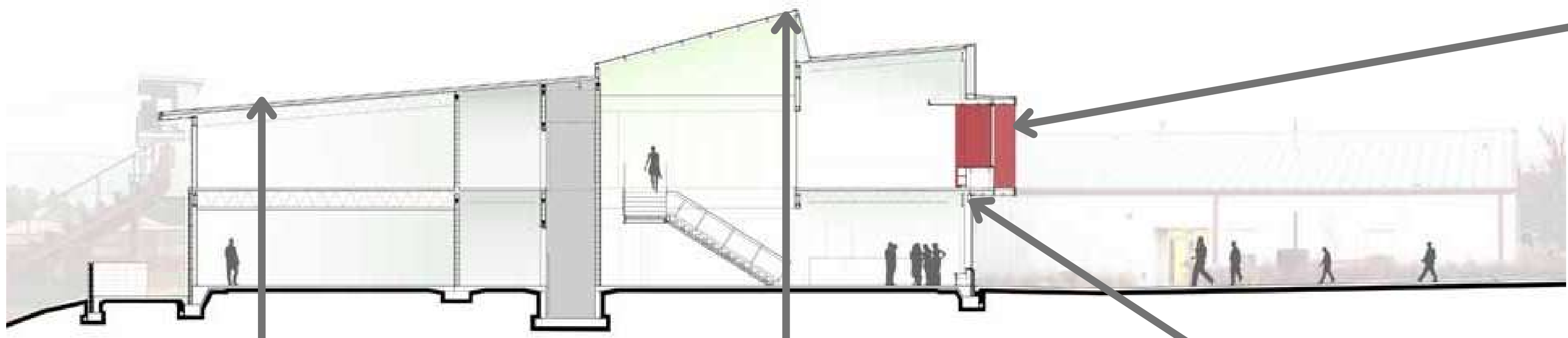
DESIGN & TECTONICS

1 Flexible Learning Spaces

Designing adaptable spaces that facilitate various teaching methods and accommodate evolving educational needs. Incorporating collaborative spaces and technology integration for modern teaching methods.

2 Community Intergration

Designing spaces that can be used by the community beyond regular school hours. The design also aims to create welcoming and engaging environments for students, staff, and visitors.



3 Building Envelope

Tectonic considerations involve selecting materials for the exterior that provide weather resistance and insulation. On top of that, incorporating energy-efficient glazing systems and insulation to optimize thermal performance.

4 Structural Systems & Foundation Design

The design tectonics employ robust structural systems that meet safety standards by using materials that provide the necessary strength and stability. As for foundation design, the design considers site-specific soil conditions to design appropriate foundations, as well as ensuring stability and load distribution for the entire structure.

Some tectonic considerations also include employing construction methods that are efficient, cost-effective, and safe. Besides that, considering the availability of local materials and construction practices.

5 Standing Seam Metallic Roof

Standing seam roofs feature raised seams that interlock to create a continuous vertical line. The profile of the seams can vary, with some roofs having a more pronounced seam for a distinct architectural look.

The roof's structural system must be capable of supporting the weight of the standing seam metal panels. This involves considering the spacing and size of purlins or other support structures.

2.4.3 Summary & Comparison

KEY TAKEAWAYS

1 Weather Resistance

The standing seam design, with raised seams that interlock, provides excellent resistance to water infiltration. This weather-resistant feature helps prevent leaks and water damage to the structure.

2 Lightweight Construction

Metal roofing is relatively lightweight compared to some other roofing materials. This can simplify the construction process, reduce structural load, and may allow for retrofitting onto existing structures.

3 Adaptability to Sloped Roofs

The standing seam design is well-suited for sloped roofs. It efficiently sheds water and snow, preventing water accumulation and potential damage.

TABULATED SUMMARY

ADVANTAGES	DISADVANTAGES
1 Durability Metal roofing, particularly standing seam systems, is known for its durability and longevity. It can withstand harsh weather conditions, including wind, rain, and hail.	**1 Installation Complexity** Proper installation of standing seam metal roofing requires skill and expertise. Improper installation can lead to issues such as leaks or reduced wind resistance.
2 Fire Resistance Metal roofing is non-combustible and provides a high level of fire resistance. This can be especially important in regions prone to wildfires or areas with strict fire safety regulations.	**2 Denting** Depending on the gauge and type of metal, standing seam roofs can be susceptible to denting, particularly from large hail or falling debris.
3 Recyclability Metal roofing is highly recyclable. At the end of its life cycle, the material can be recycled, contributing to sustainability and reducing environmental impact.	**3 Scratching and Abrasion** Some metal roofing materials are prone to scratching and abrasion during installation or maintenance activities.

3

FACADE DESIGN PROPOSAL

3.1 CONCEPT OF FACADE DESIGN
3.2 DEVELOPMENT OF FACADE
3.3 VISUALIZATION OF FACADE DESIGN SCHEMES
3.3.1 DESIGN FACADE SCHEME 1 : PLASTIC AND GLASS PANELS WITH STEEL MULLIONS
3.3.2 DESIGN FACADE SCHEME 2 : STAINLESS STEEL LOUVRES WITH STEEL FRAMES
3.4 COMPARISON OF FACADE DESIGN SCHEMES
3.5 FACADE DESIGN SCHEME DETAILING
3.6 FINAL DEVELOPED FACADE DESIGN

3.1 CONCEPT OF FACADE DESIGN

STEEL FRAMES + CLADDING/LOUVRES




Each case studies above exhibits common characteristics of how:
Frame structures articulates and shape the form of the building - Frames can be designed in various magnitudes to express different patterns, 1-way, 2-way, 3-way etc.

Using Cladding as a Facade Design:
Cladding enhances the functionality of entirely open frame structures by striking a balance between the benefits of natural lighting and protection against external elements. While the frames provide an open and airy architectural environment, the strategic application of cladding serves the essential purpose of mitigating the direct impact of rain, ensuring the well-being and comfort of the occupants within the internal spaces.

Using Frames as a Facade Design:
Frames contribute to the overall reduction of the structural load borne by the building. The use of such materials not only ensures structural integrity but also minimizes the burden on the underlying support system.

Creative applications of braced and structural elements, such as columns, within frame structures, serve a dual purpose by seamlessly blending functionality with aesthetics. These designs go beyond mere structural support, becoming integral components that enhance the visual appeal of the building.

In addition to that, the transformation and careful articulation of frames provide a pathway to achieve organic forms in architectural design.

3.2 DEVELOPMENT OF FACADE

STEP-BY-STEP INSTALLATION OF FACADE PROCESS

1 DEFINING SPACE

The building's façade plays a pivotal role in delineating and defining the internal spaces, acting as a distinctive boundary that separates the interior from the exterior environment.

2 STRUCTURAL COLUMNS

Steel and timber columns provide structural support to the framework, effectively distributing and transmitting the imposed loads to the foundation.

3 SUPPORTING MEMBERS

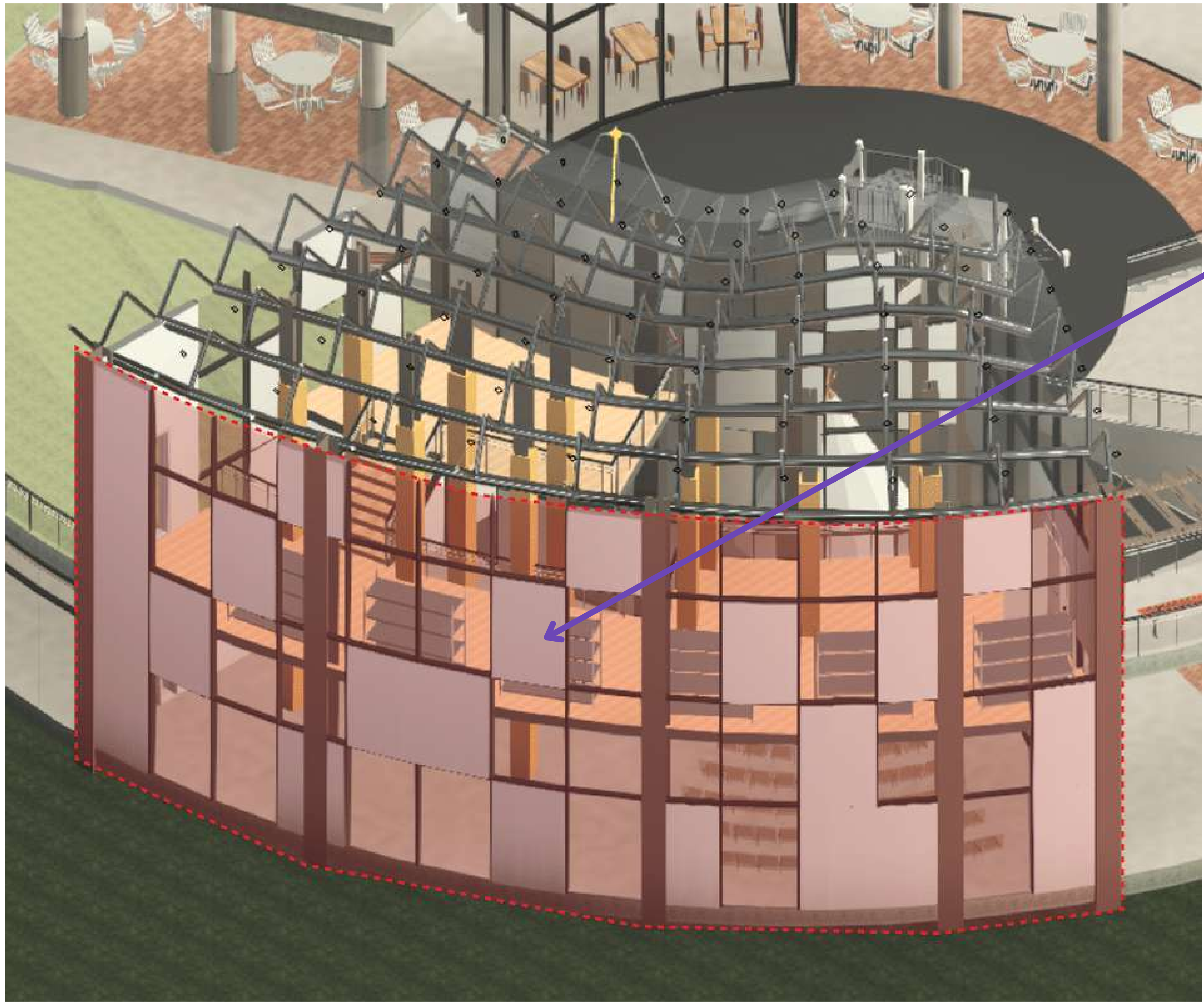
Mullions with greater profile in width and depth are stiffened, acting as a secondary supporting member.

4 BRACING FOR ADDED SUPPORT

Braces are installed and affixed to the primary ring beam to provide robust support and secure anchoring for the facade.

3.3 VISUALIZATION OF FACADE DESIGN SCHEMES

3.3.1 DESIGN FACADE SCHEME 1: PLASTIC AND GLASS PANELS WITH STEEL MULLIONS



Isometric Drawing 1 - Scale 1:200

PLASTIC AND GLASS PANELS WITH STEEL MULLIONS

Application of: Precedent Study 2 - Lewis Arts Complex (Princeton University)

Polycarbonate panels are securely positioned between mullions within a timber frame, employing slot-in techniques facilitated by C-brackets and a sealing agent for a robust and weather-resistant assembly. This method ensures a snug fit and effective sealing, contributing to the overall durability and performance of the facade.

3.3 VISUALIZATION OF FACADE DESIGN SCHEMES

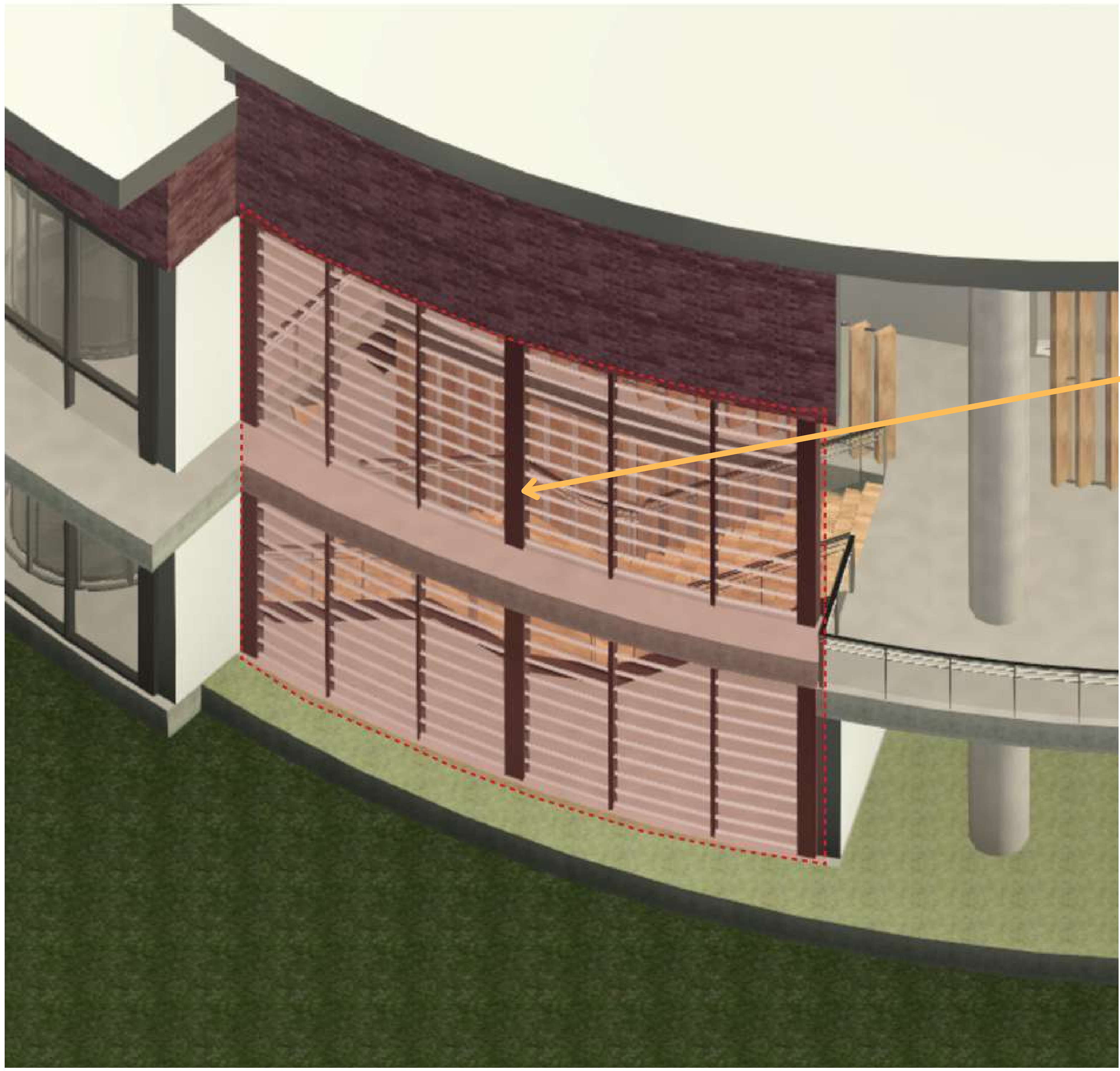
3.3.1 DESIGN FACADE SCHEME 1: PLASTIC AND GLASS PANELS WITH STEEL MULLIONS

Elevation 1 (North) - Scale 1:150

Elevation 2 (East) - Scale 1:150

3.3 VISUALIZATION OF FACADE DESIGN SCHEMES

3.3.2 DESIGN FACADE SCHEME 2: STAINLESS STEEL LOUVRES WITH STEEL FRAMES



Isometric Drawing 2 - Scale 1:250

STAINLESS STEEL LOUVRES WITH STEEL FRAMES

Application of: Precedent Study 4 - AC House

Stainless steel louvres are affixed to sub-frames, which are subsequently mounted onto the steel framework as panels. This design promotes the infiltration of wind and sunlight into the building, fostering a space that is both well-ventilated and naturally illuminated.

3.3 VISUALIZATION OF FACADE DESIGN SCHEMES

3.3.2 DESIGN FACADE SCHEME 2: STAINLESS STEEL LOUVRES WITH STEEL FRAMES

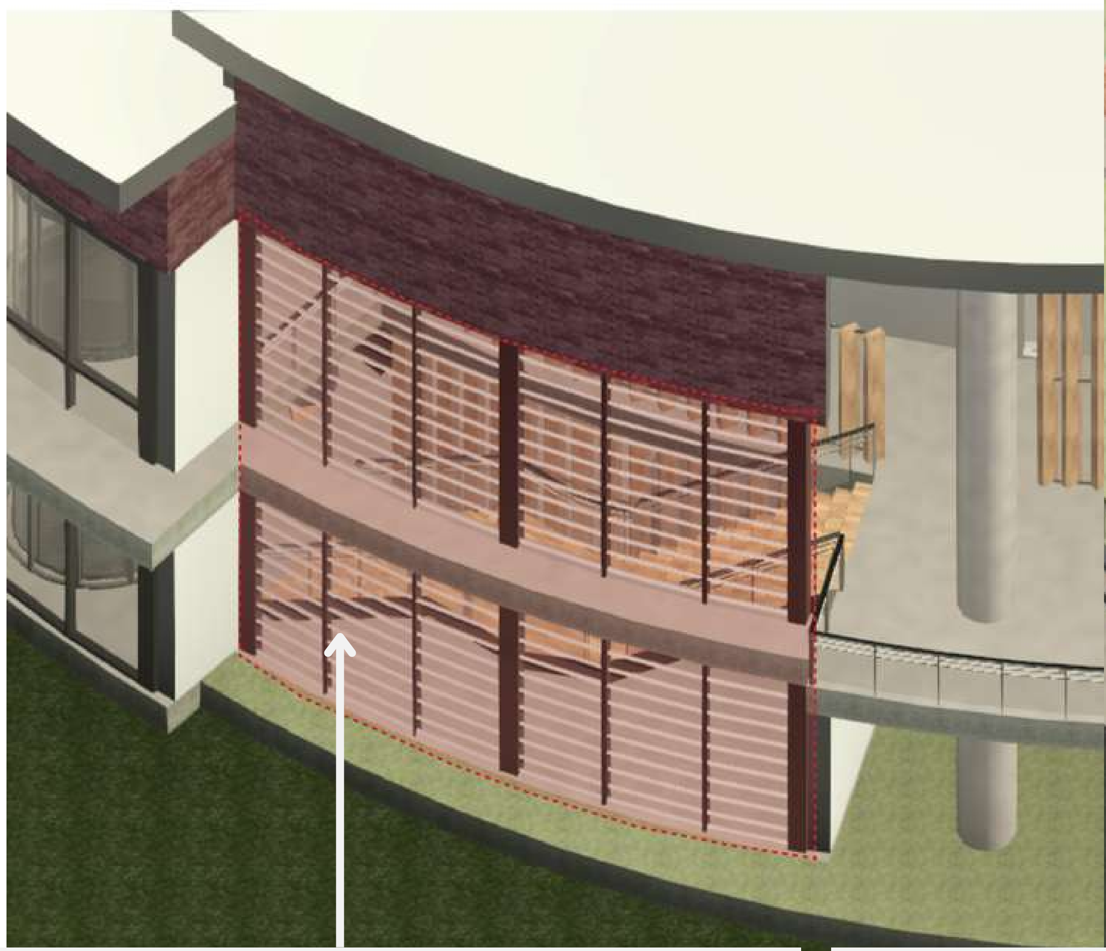
Elevation 1 (East) - Scale 1:150

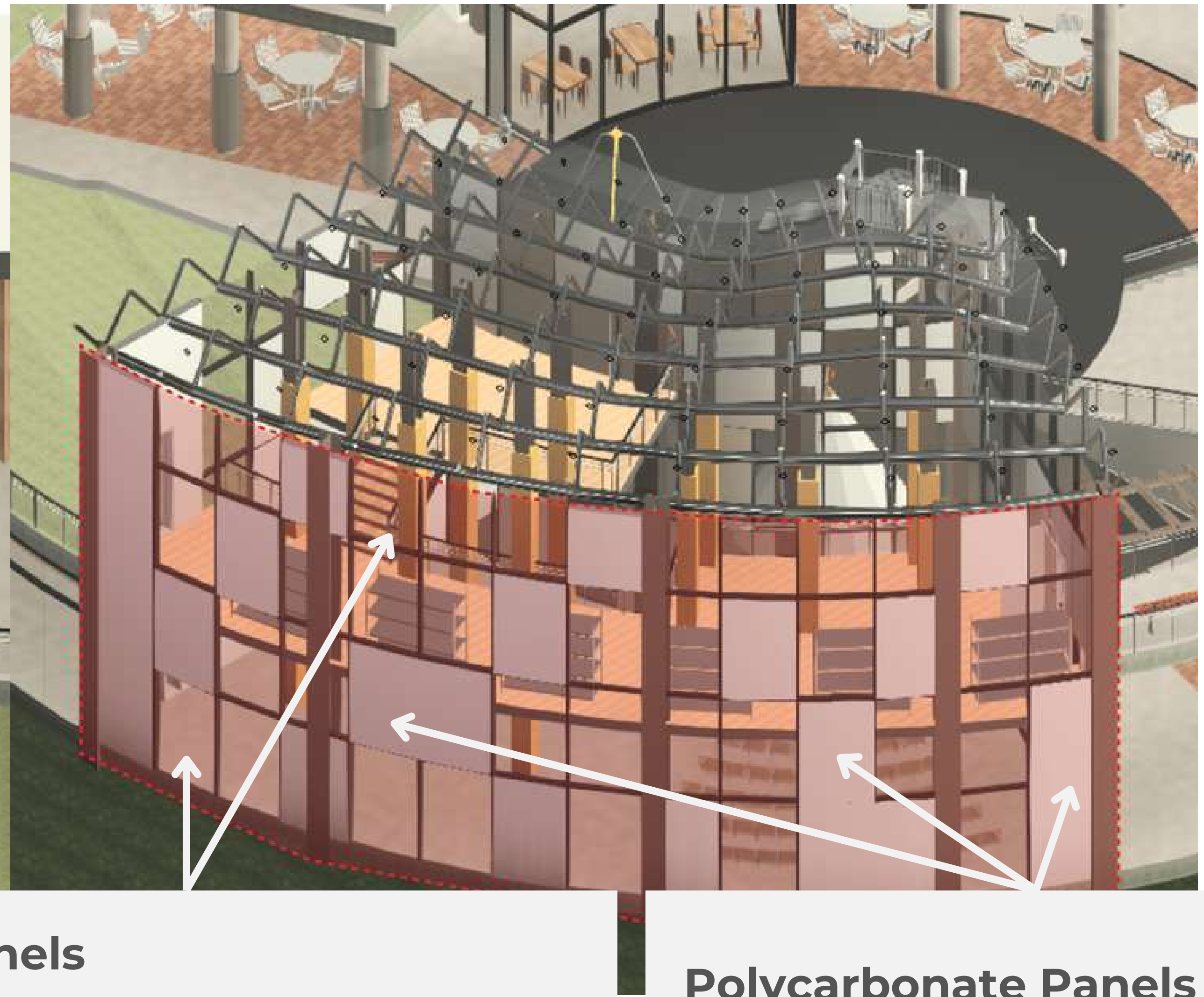
3.4 COMPARISON OF FACADE DESIGN SCHEMES

	DESIGN FACADE SCHEME 1: PLASTIC AND GLASS PANELS WITH STEEL MULLIONS	DESIGN FACADE SCHEME 2: STAINLESS STEEL LOUVRES WITH STEEL FRAMES
INSTALLATION	Polycarbonate panels are securely positioned between mullions within a timber frame, employing slot-in techniques facilitated by C-brackets and a sealing agent for a robust and weather-resistant assembly.	Stainless steel louvres are affixed to sub-frames, which are subsequently mounted onto the steel framework as panels. This design promotes the infiltration of wind and sunlight into the building, fostering a space that is both well-ventilated and naturally illuminated.
AESTHETICS	The combination of plastic and glass panels with steel mullions offers a contemporary aesthetic characterized by transparency, sleek lines, and a harmonious blend of materials. Together, these materials contribute to a polished, light-filled, and stylish architectural expression.	Stainless steel louvres with steel frames convey a modern and industrial aesthetic. The sleek, metallic finish of stainless steel exudes sophistication, while the use of louvres adds a sense of contemporary design. The combination of these materials creates a visually striking facade with clean lines.
PASSIVE DESIGN	Emphasizes energy efficiency and natural elements. The glass allows for abundant natural light, reducing the need for artificial lighting, while the steel mullions provide structural support.	Prioritizes natural ventilation and solar control. The louvres facilitate airflow for passive cooling, reducing reliance on mechanical systems. The stainless steel material provides durability and solar reflectance, contributing to energy efficiency.
MAINTENANCE	Regular cleaning of the glass surfaces to remove dirt and grime. Inspection of steel mullions for signs of corrosion or wear is essential. Checking and replacing any damaged or degraded sealing elements, such as gaskets or weather-stripping, ensures the continued weather resistance of the facade.	Periodic cleaning to prevent corrosion and maintain the aesthetic appeal. Inspecting stainless steel components for signs of rust or wear is crucial, and any identified issues should be addressed promptly. Lubricating movable parts, such as hinges, ensures smooth operation.

3.5 FACADE DESIGN SCHEME DETAILING

TOWARDS THE FINAL FACADE DESIGN





Steel Louvres
Steel louvres excel in providing effective solar control and shading. Their adjustable slats or blades allow for precise modulation of sunlight entering the building, helping regulate interior temperatures and reducing the reliance on artificial cooling systems. This not only enhances energy efficiency but also creates a comfortable and well-tempered indoor environment.

Glass Panels
Glass panels have become a popular and aesthetically pleasing choice for facade walls in modern construction due to a combination of functional, aesthetic, and environmental benefits. The use of glass as a primary material for building exteriors has transformed architectural design and has become synonymous with contemporary structures.

Polycarbonate Panels
The primary elements of the building's exterior are polycarbonate panels, which permit the entry of natural light. These panels, designed with partial enclosure, mitigate heat retention and offer flexibility in shaping, forming a dynamic and flowing exterior "envelope" for the building.

3.6 FINAL DEVELOPED FACADE DESIGN

Elevation 1 (South) - Scale 1:150

Elevation 2 (West) - Scale 1:150

4

CONSTRUCTION DETAILS

4.1 PROJECT SPECIFICATIONS

STRUCTURAL SYSTEM

Main structures : Steel post and beam system
Secondary structures : Timber post and steel beam system
Structural Column

1. Glulam Timber Columns
2. Steel rectangular hollow section (RHS) columns
3. Steel circular hollow section (CHS) columns

Beam : Steel I-beam
Flooring : Reinforced Concrete Floors

FACADE SYSTEM

- Polycarbonate panels and glass panels braced to steel frame mullions, structural columns and beam components. Sub-frames are utilized to install glass panels to structural columns, while slotting-in methods area applied for polycarbonate panels with C-shape brackets.

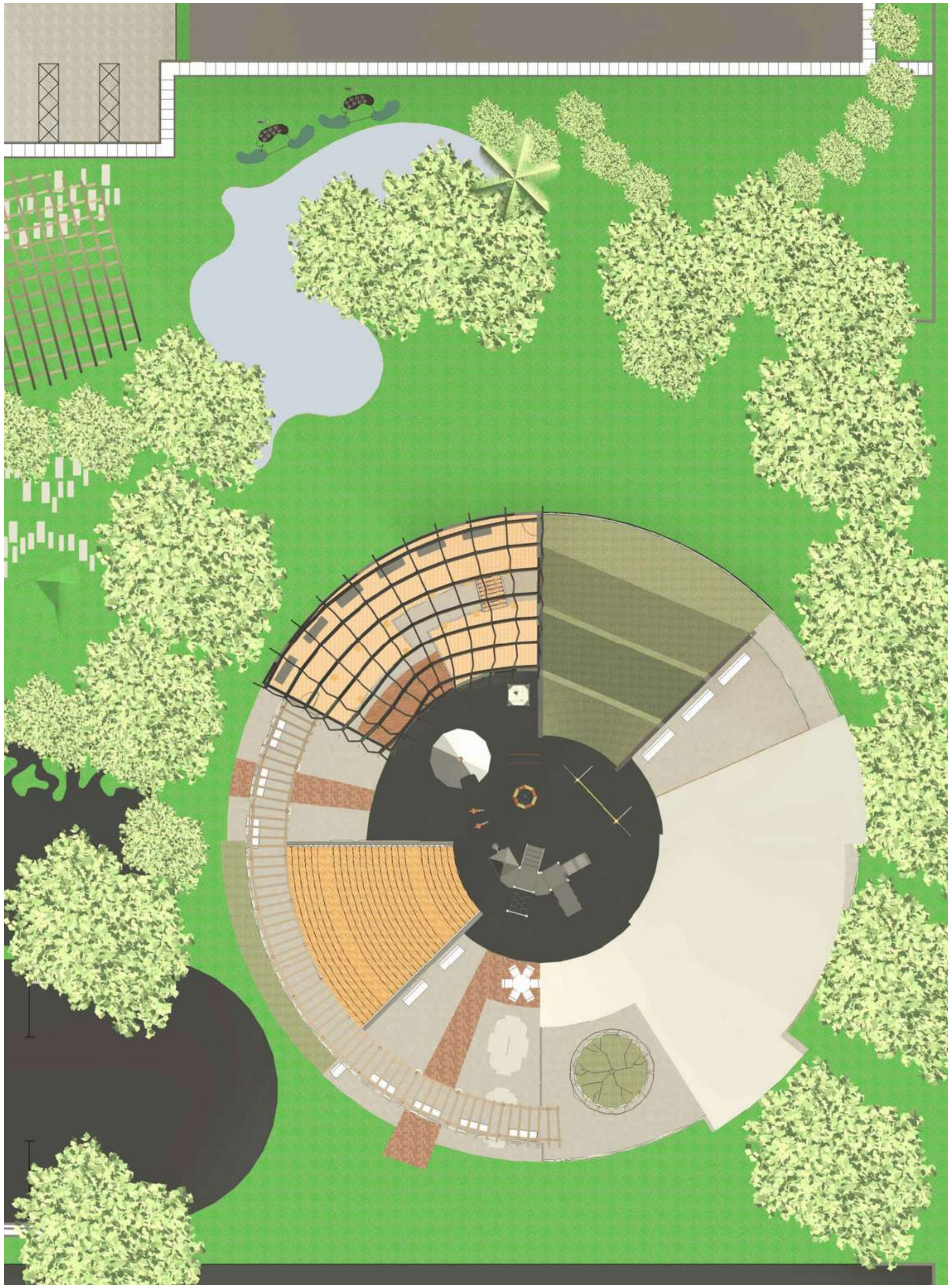
POLYCARBONATE PANEL + GLASS PANELS + STEEL FRAME MULLIONS

- Steel Louvres braced to steel frame mullions, structural columns and beams components

STEEL LOUVRES + STEEL FRAMES

ROOF SYSTEM

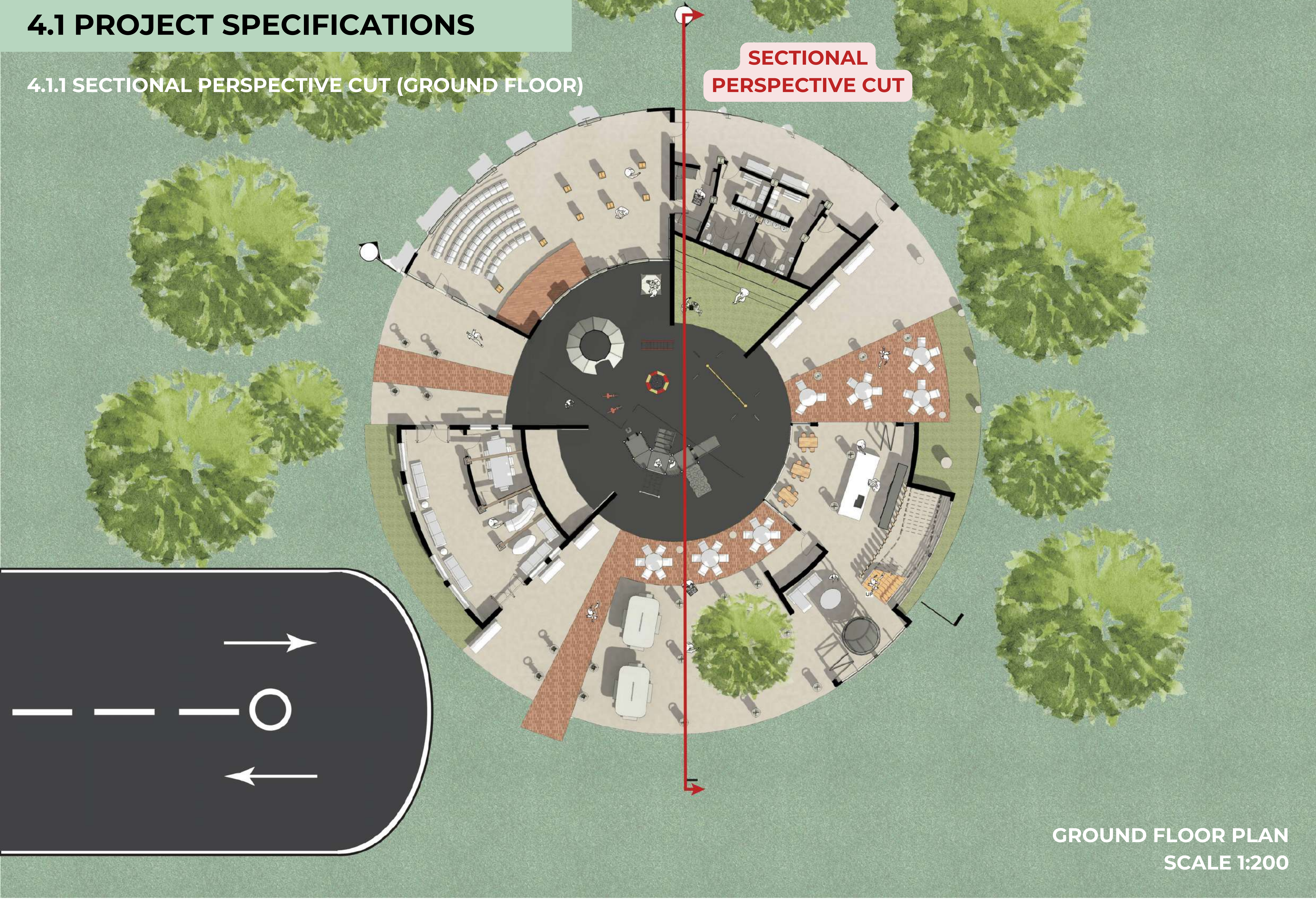
1. **Standing seam galvanized zinc roof installed with pitch** for main community building.
2. **Parametric Polycarbonate Roof** for main planting greenhouse.



SITE PLAN

4.1 PROJECT SPECIFICATIONS

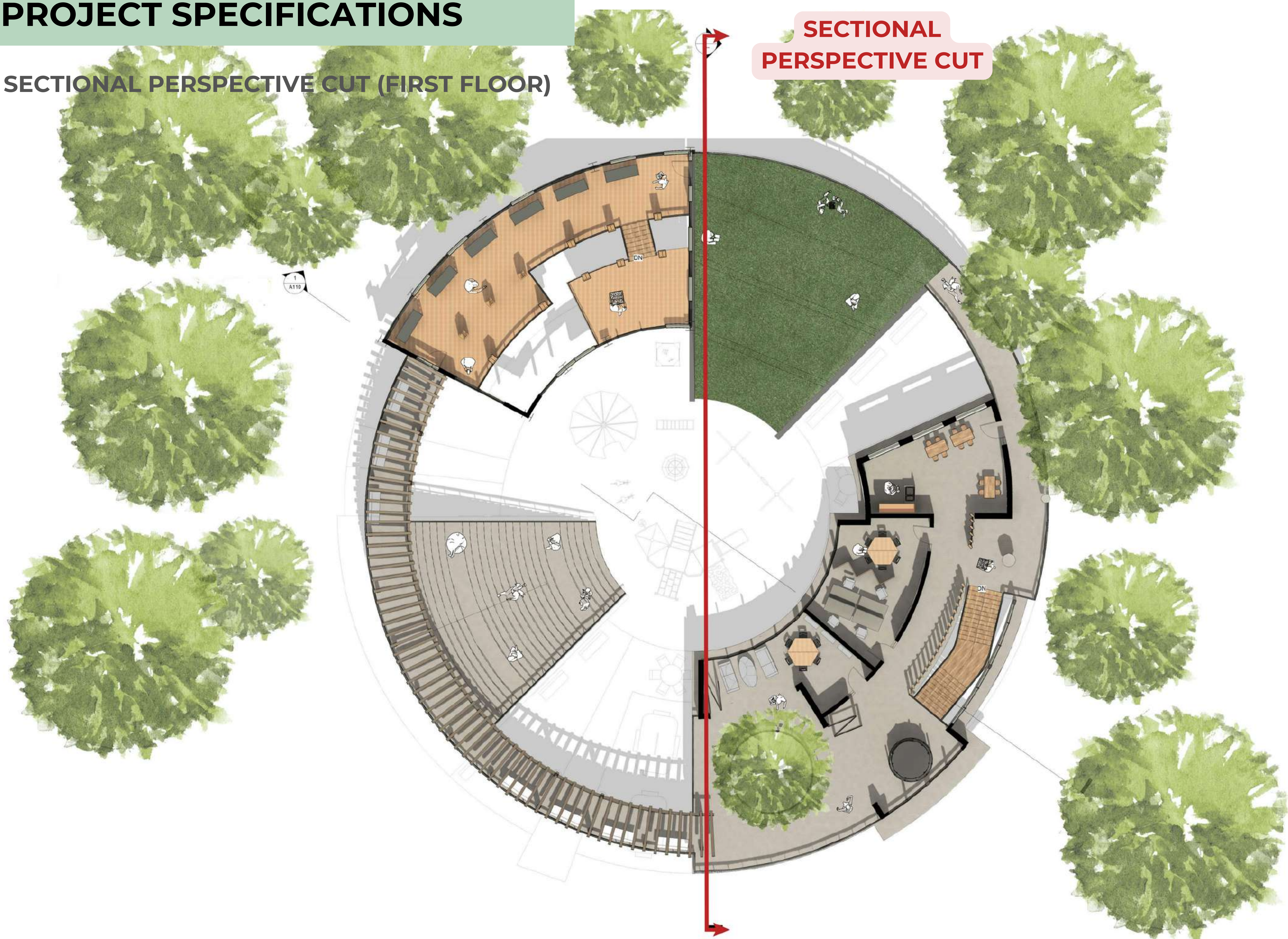
4.1.1 SECTIONAL PERSPECTIVE CUT (GROUND FLOOR)



GROUND FLOOR PLAN
SCALE 1:200

4.1 PROJECT SPECIFICATIONS

4.1.2 SECTIONAL PERSPECTIVE CUT (FIRST FLOOR)

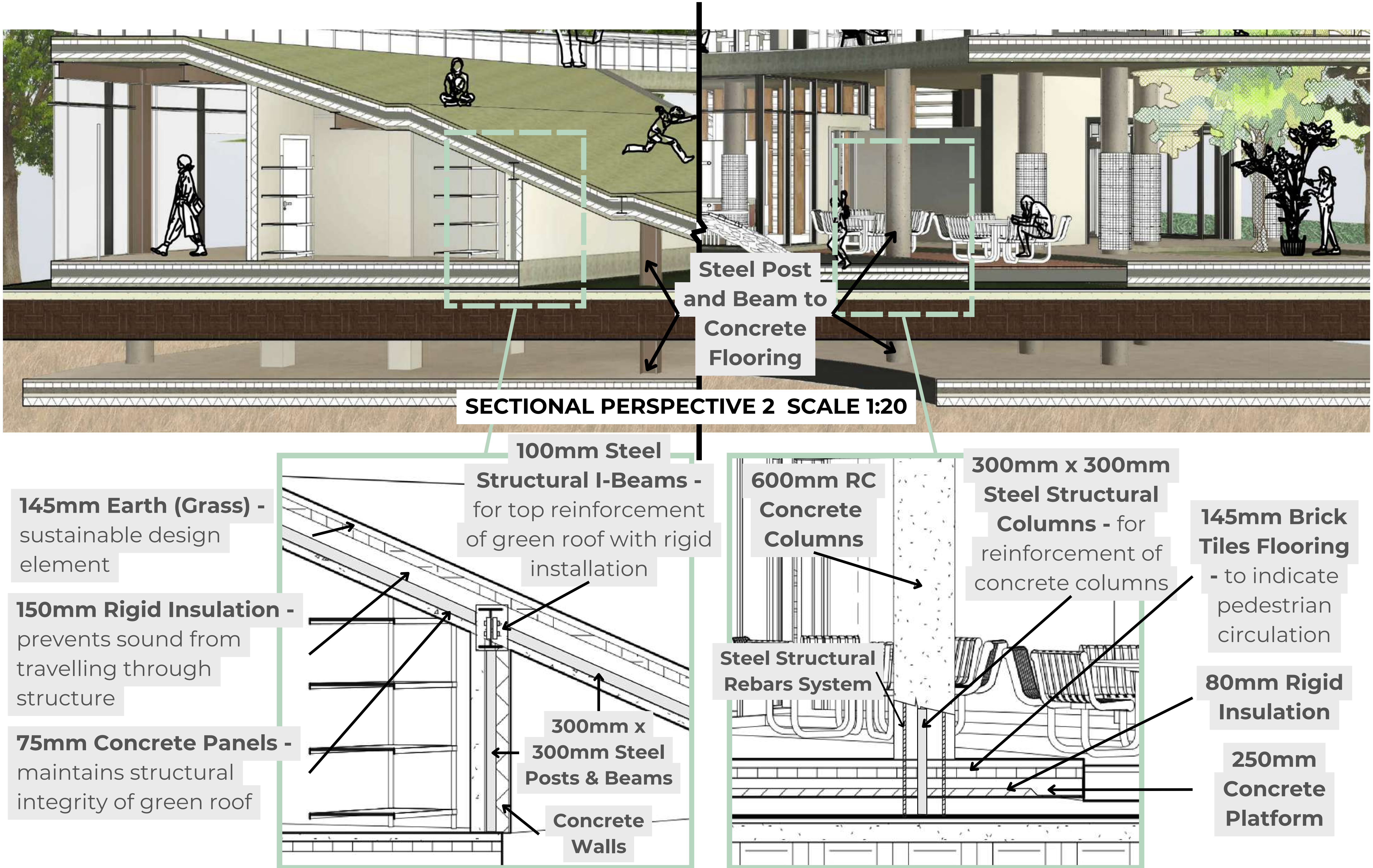


FIRST FLOOR PLAN
SCALE 1:200

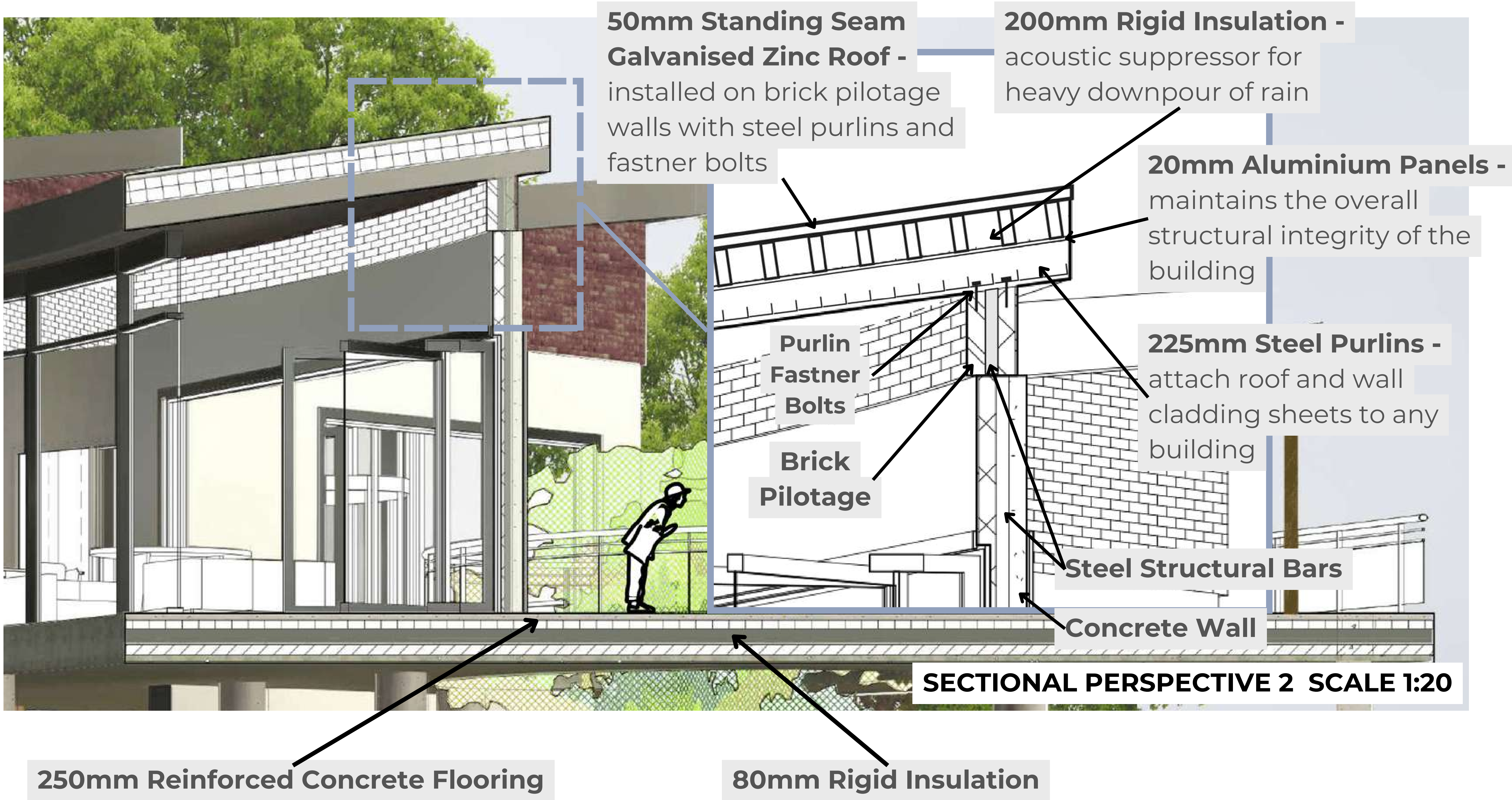
4.2. INTERGRATED SECTIONAL PERSPECTIVE

COMBINED SECTIONAL PERSPECTIVE
SCALE 1:100

4.2.1 SECTIONAL PERSPECTIVE 1 (GROUND FLOOR)



4.2.2 SECTIONAL PERSPECTIVE 2 (FIRST FLOOR)



5
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THANK YOU