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Introduction

The project presented is a two-story children's library located in Cambridge, Ontario. The building will house different activities and functions ranging from book shelves and study areas to a cafeteria and multiple workshops. The building program is arranged around a main courtyard and a sunken plaza. A buffer space around the courtyard contains the more flexible functions, such as the kids meeting spaces, the art, photography, and group study areas. The library's play area and cafeteria are located adjacent to the sunken plaza where their functions are extended to the outside. The other building functions, such as the offices, washrooms, book shelves, digital space, and nursing room are arranged away from the courtyard and adjacent to the exterior wall of the building.

The main issue in the design process was to create a building that would fit within its surroundings by capturing the essence of the city while still holding a distinct architectural image. The library was to be designed as very well-insulated and well-lit building; thereby, the detailed design of the building envelop was very critical. Another critical aspect was the design of the courtyard envelop within the main building; this was to be a glass box penetrating the rammed earth main mass.

The creation of multiple interesting spaces that have good interior environments, suited for children's play and use, was the main motivation behind the design strategies of the project. In this technical report the main focus will be on the use of the rammed earth material for the building envelop; the characteristics, details, and design of this material will be discussed. Also, the design decisions made for the courtyard and the sunken plaza will be covered in this report. Highlighting those aspects of the design will explain how the building functions within its environment, as well as how the library creates excellent spaces for children and parents in the city of Cambridge.

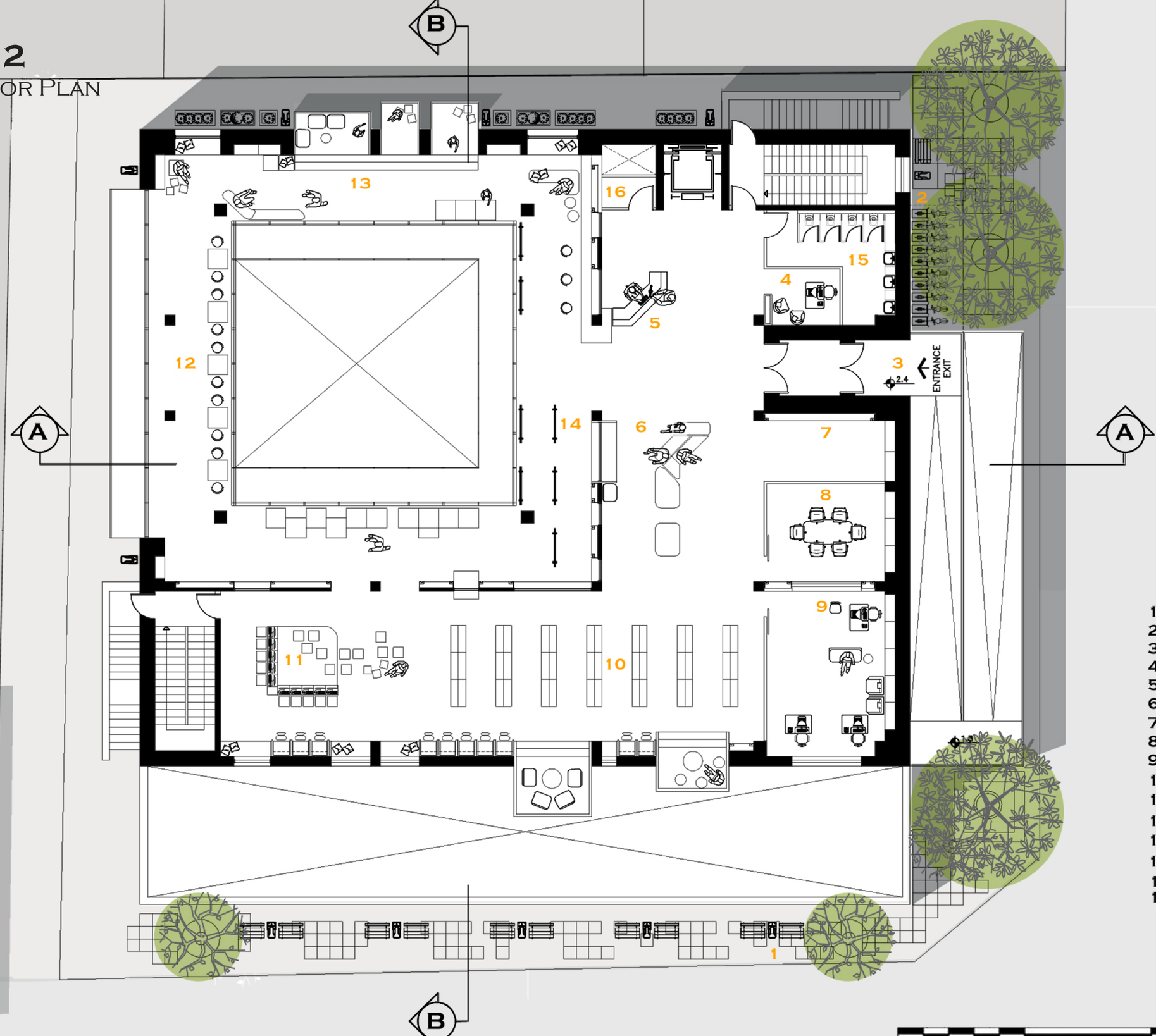
The following diagrams [1-5] show the main drawings for the design: A 3D exterior shot, ground floor plan, basement floor plan, and sections A-A, and B-B.

Diagram 1

Exterior Shot of the Library

Diagram 2

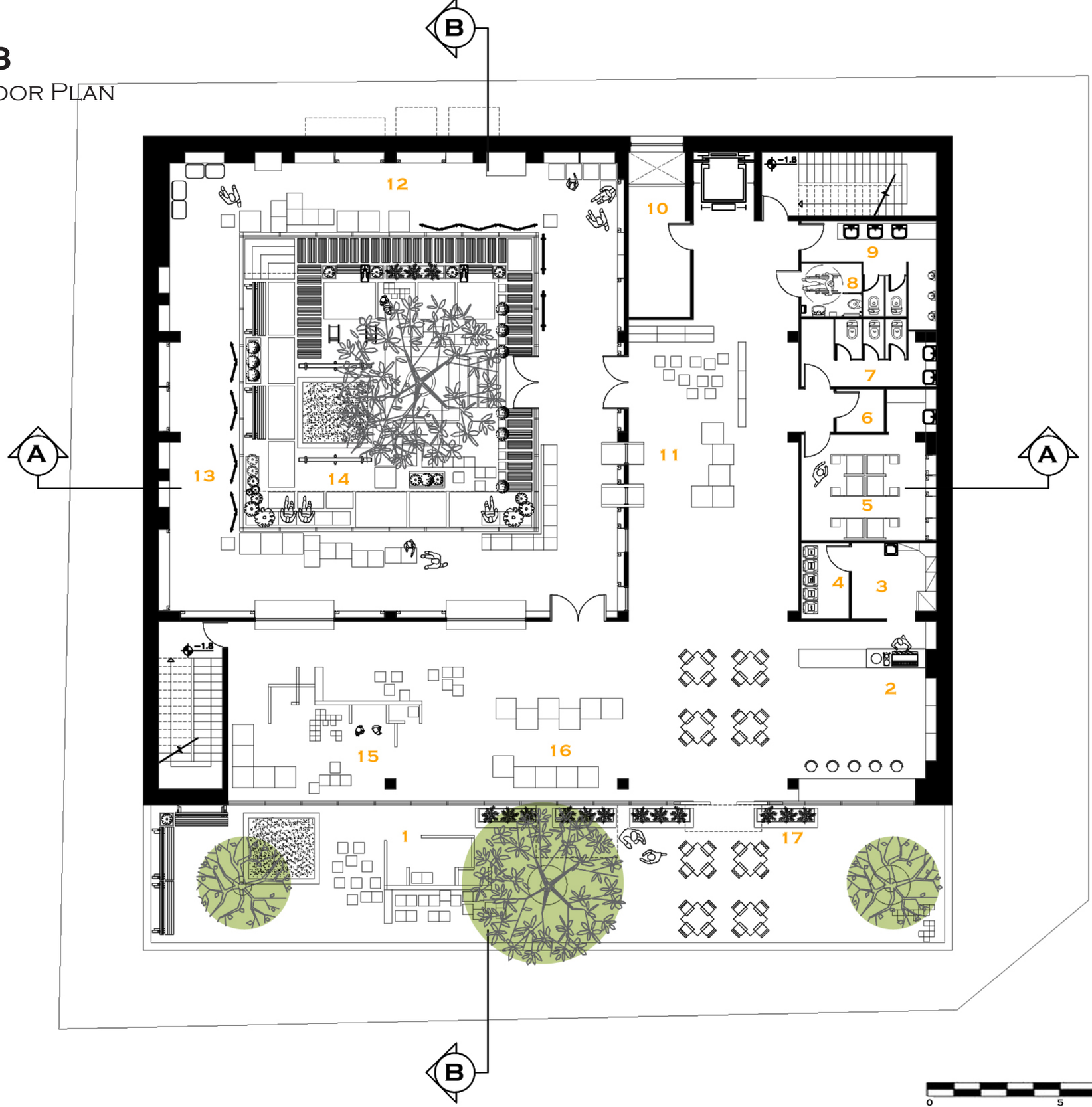
Ground Floor Plan



1 Public Seating Area
2 Bike Parking Area
3 Entrance
4 Security
5 Reception/Information Desk
6 Lobby
7 Strollers Area
8 Staff Meeting Space
9 Staff Offices
10 Books and Reading Area
11 Digital Space
12 Study Space
13 Kids Meeting Spaces
14 Exhibition
15 Kids W.C.
16 Mechanical Room

Diagram 3

Basement Floor Plan



1 Sunken Plaza
2 Cafeteria
3 Cafeteria Kitchen
4 Recycling Room
5 Nursing Room
6 Cleaning Room
7 W. W.C.
8 Accessible W.C.
9 M. W.C.
10 Mechanical Room
11 Story Space
12 ArtWorkshop
13 Photography Workshop
14 Courtyard
15 Play Area
16 Kids Kitchen
17 Kids Garden

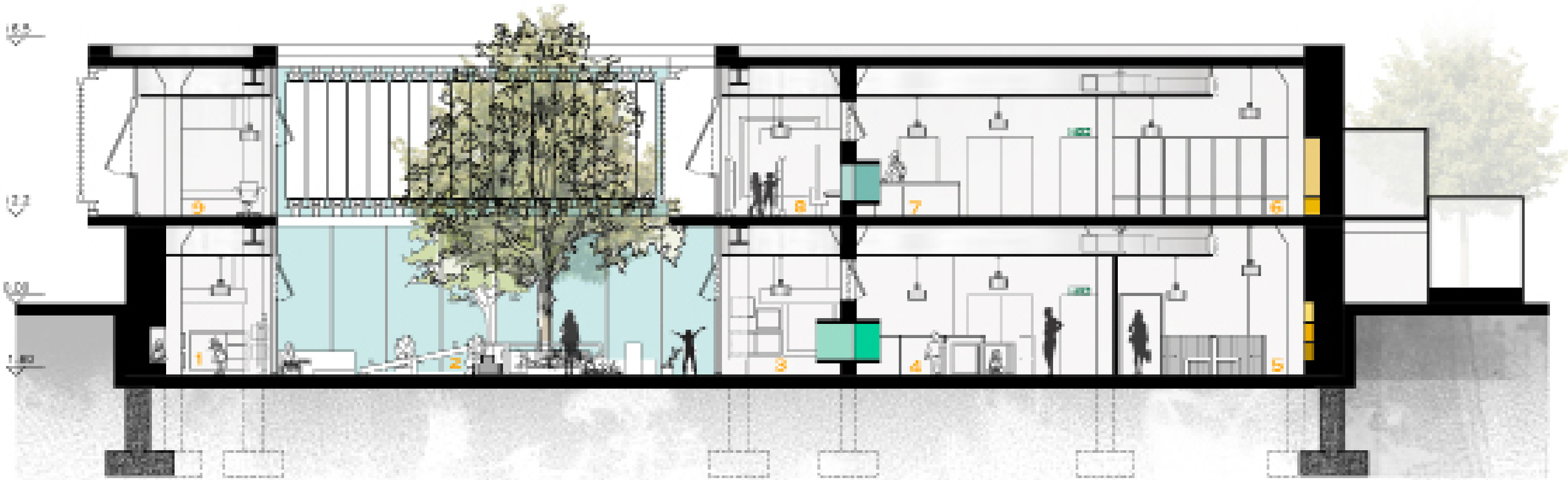
N

Scale Bar [M]

0 5 10 15 20

Diagram 4

Section A-A



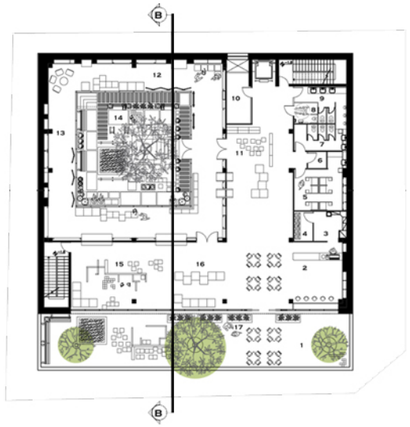
1 Photography Space
2 Courtyard
3 Workshops
4 Story Space
5 Nursing Room
6 Stroller Area
7 Lobby
8 Exhibition Space
9 Study Space

Scale Bar (M)

0 5 10 15 20

Diagram 5

Section B-B



1 Public Seating Area
2 Sunken Plaza
3 Play Area
4 Workshop
5 Courtyard
6 Art Workshop
7 Kids Meeting Spaces
8 Books and Reading Area
9 Individual Study Space

Scale Bar [m]

0 5 10 15 20

Structure

The structural system of the building is based on a grid system of reinforced concrete columns [400mm * 400mm] supporting two-way reinforced concrete slabs; also, the system includes two reinforced concrete bearing walls surrounding each of the fire exit stairs. Around the courtyard, four main reinforced concrete columns [500mm * 500mm] joined by four main steel I-beams support the reinforced concrete slab above; diagram 6. The I-beams were used to span the long distance around the courtyard without using too many columns. The courtyard itself is enclosed within a curtain wall structure giving it the aesthetic of a glass box within the building. Reinforced concrete was used as the major structural material due to its high compressive strength, adequate tensile strength, and adequate stiffness preventing deflections in the structural components, i.e. slabs. Also, the material is resistant to fire, it's very durable, and it performs well within many environmental conditions. Reinforced concrete is a readily available material and an economically efficient structural solution. [1]

The structural system works by transferring the roof load to the columns of the ground floor. In turn, the ground floor columns transfer their loads to the basement floor columns. The basement floor columns support and transfer the loads of the above columns and slabs. The load of the entire structure is then transferred to the foundations.

The structural system makes the building more excellent by the flexibility given to the arrangement of columns. This characteristic of the structure provides the desired areas without many interruptions of spatial continuity. The structural system also allows for the desired floor height without any interruption by beams. With the absence of structural beams it becomes easier to install an HVAC system with minimal floor height, thereby, using less materials. The materials used for the structure require very minimal maintenance and provide a long service life, allowing the building to last longer and to stay in a good shape.

Diagram 6
Structural Plan

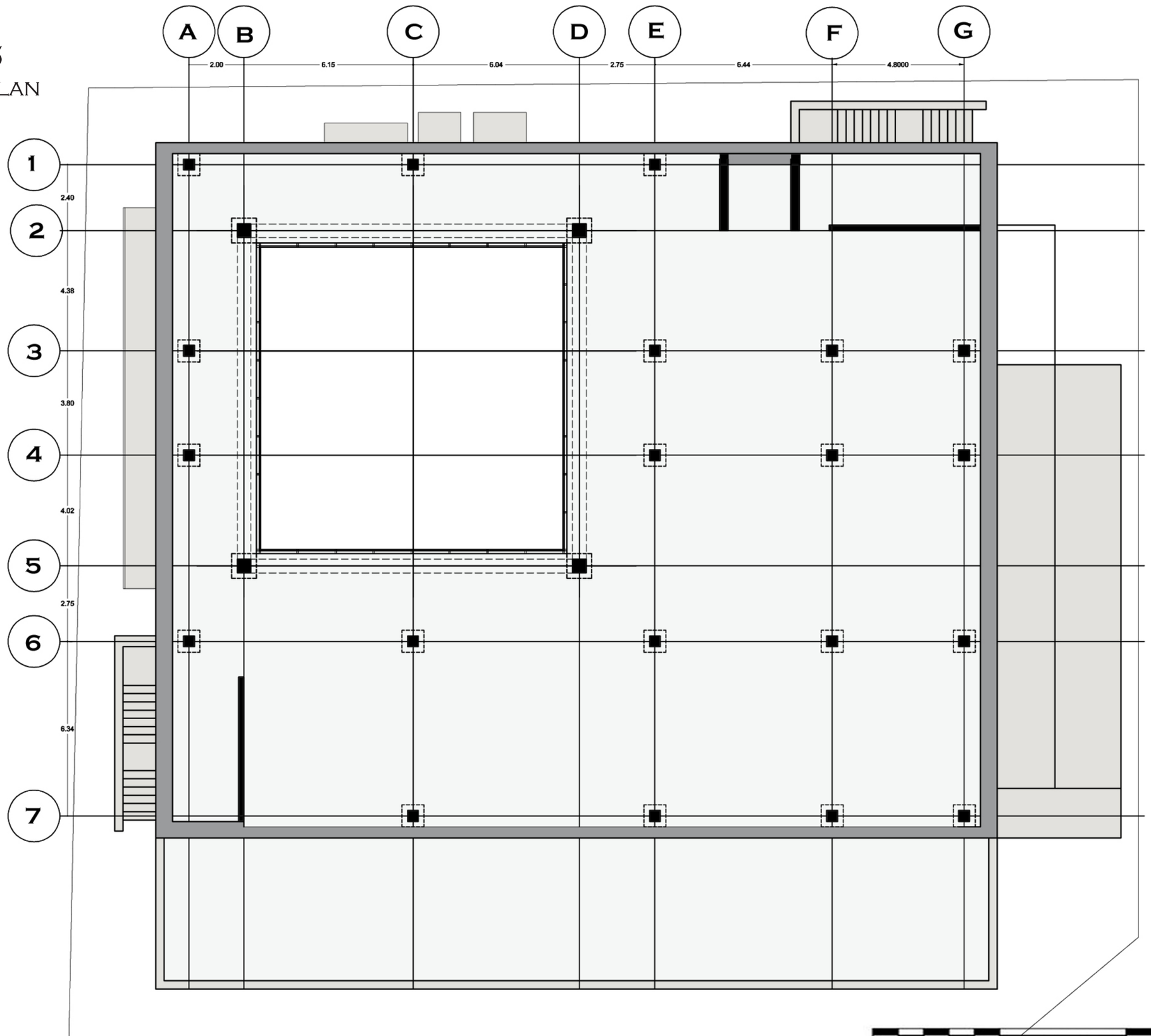
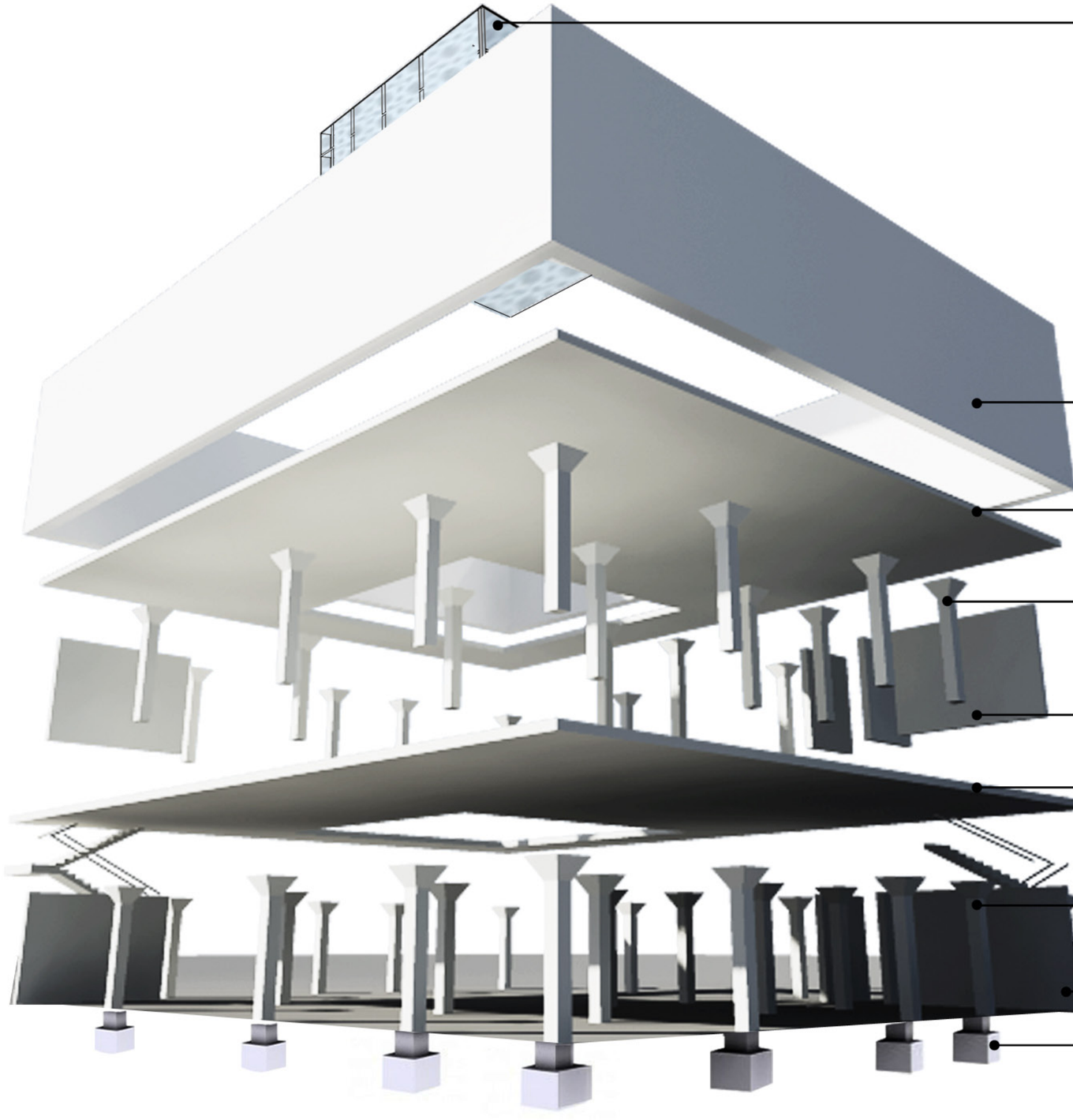


Diagram 7

Structural Axonometric



Curtain Wall/
Courtyard Glass Box

Rammed Earth Exterior
Wall Building Envelope

Two Way Reinforced Concrete
Slab

Reinforced Concrete Columns

Fire Resistant/ Reinforced
ConcreteLoad-Bearing Wall

Two Way Reinforced Concrete
Slab

Reinforced Concrete Columns

Fire Resistant/ Reinforced
ConcreteLoad-Bearing Wall

Foundation

Skin and Envelope Design and Strategies

The skin of the library building is mainly created from insulated and reinforced rammed earth walls penetrated by double-glazed glass windows and curtain walls. The walls are created from an assembly of two layers of rammed earth, 250mm each, with a 100mm Polyisocyanurate rigid insulation in the middle.[2] The rammed earth wall itself is formed on a 600mm foundation wall to support its load. The three main layers of the wall are held together by rebars in order to resist tensile stresses. [detail 1].

The rammed earth wall was the most suitable choice for this building design due to its many unique characteristics. This material is a very sustainable source, it's widely available, and it has a low cost compared to other building materials. In addition, rammed earth is a strong and durable material that requires very low maintenance; it also does not contain any harmful toxins, making it an excellent choice for a kids' library. The thick layers of rammed earth provide a high thermal mass, thereby reducing the need for air conditioning and heating in the building. The skin performs as a great protector of the interior environment from extreme weather conditions; the spaces within the building remain at stable and comfortable temperatures throughout the year. Another characteristic of rammed earth walls is its great sound-insulating ability; this quality creates quiet library spaces which are protected from any outside traffic noises. The construction process of rammed earth is simple; it also has very minimal environmental and manufacturing impacts. The insulated rammed earth wall has an R-value of 33 $K \cdot m^2/W$.[3]

The skin was designed as an air tight and well insulated envelop. The following wall section and its details further explain the strategies in which the rammed earth skin was designed. [Details 1 to 1.4]

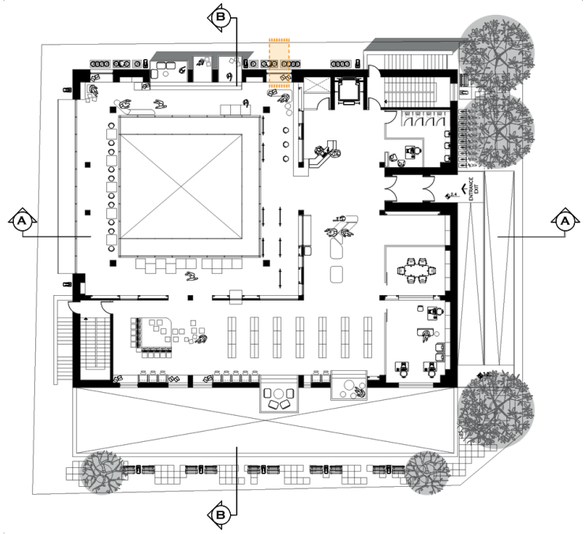
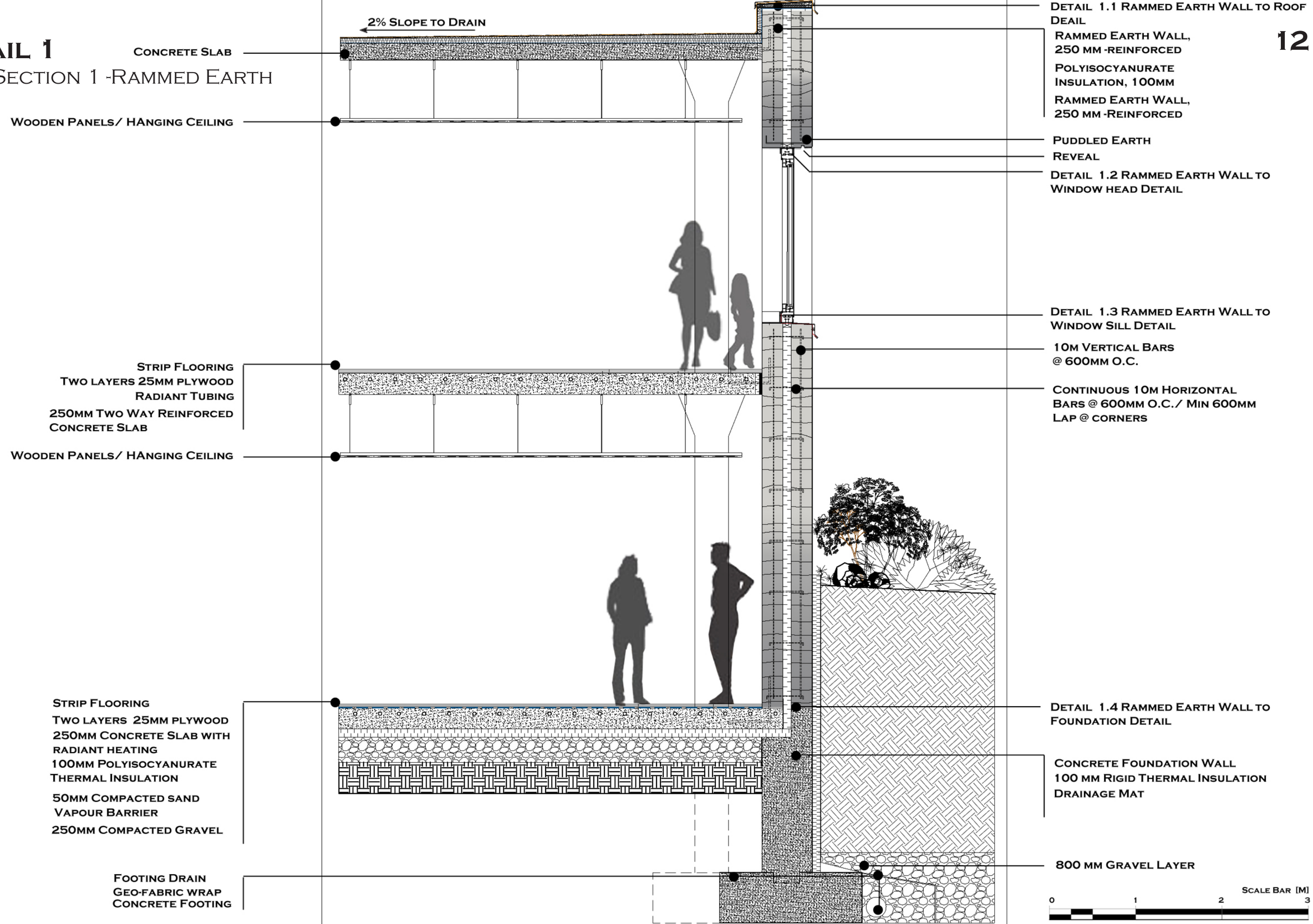


Figure 1. Location of Wall Section1 on Ground Floor Plan

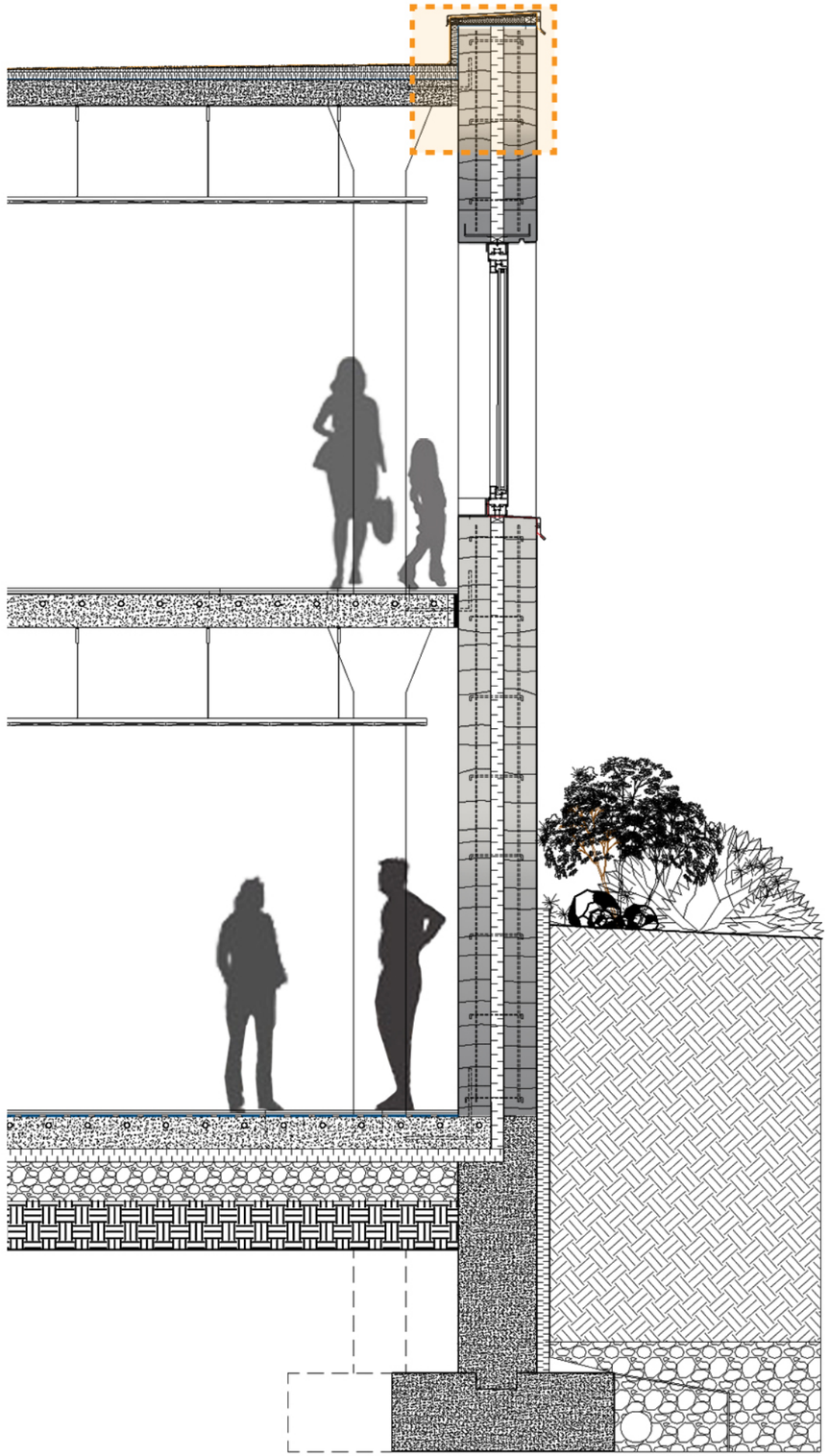
DEtail 1

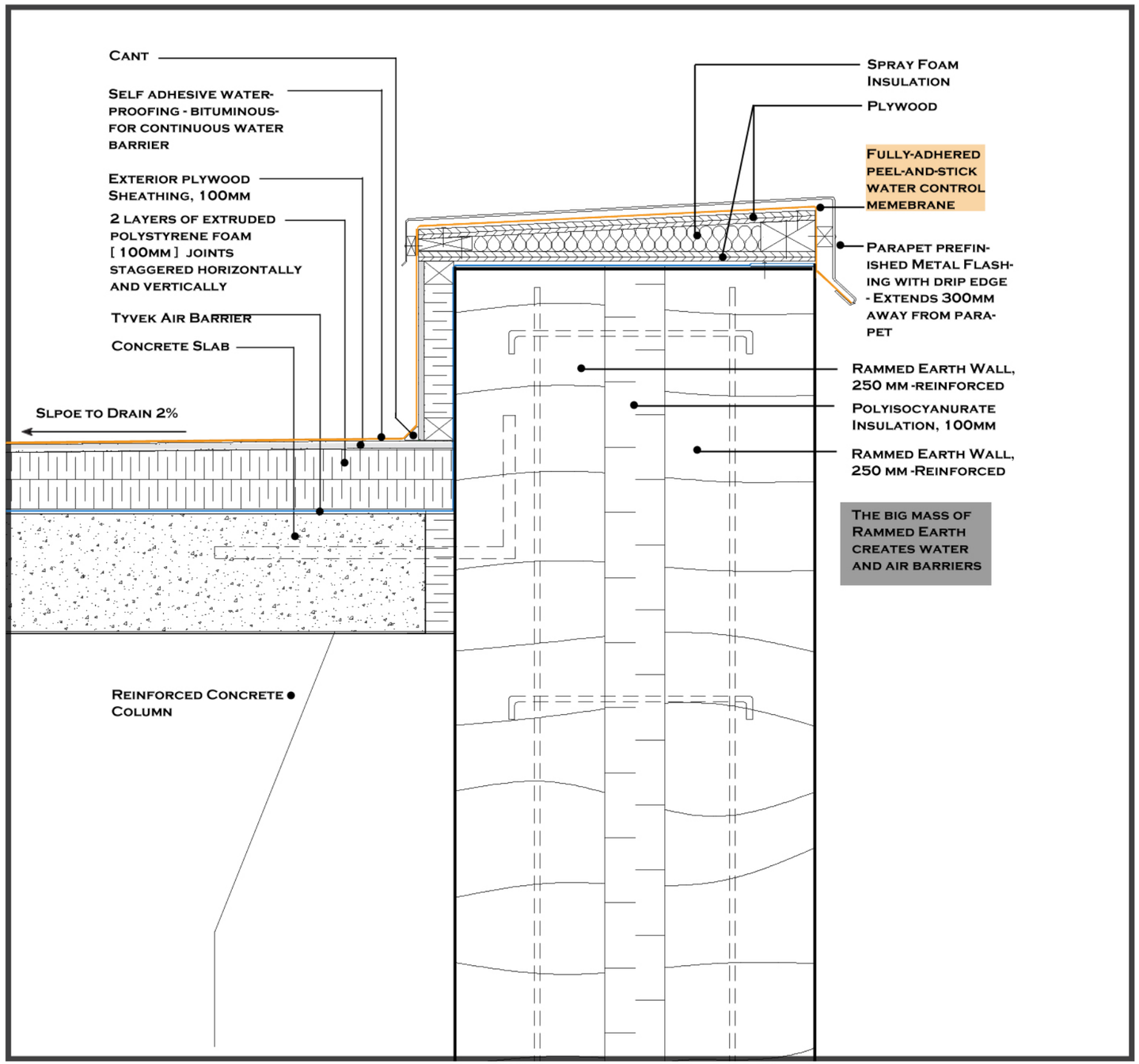
Wall Section 1 -Rammed Earth



DEtail 1.1

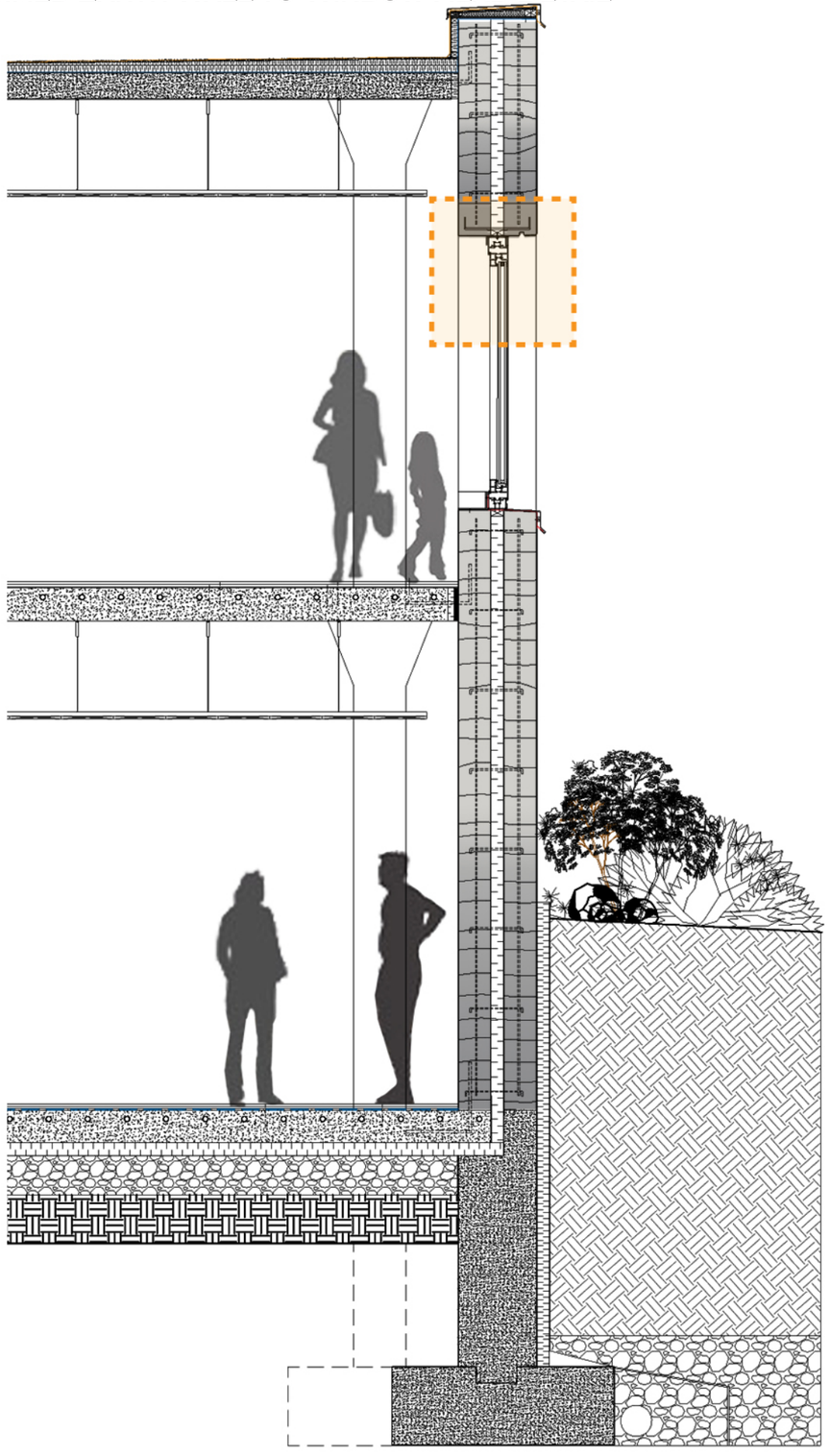
Rammed Earth Wall to Roof Detail

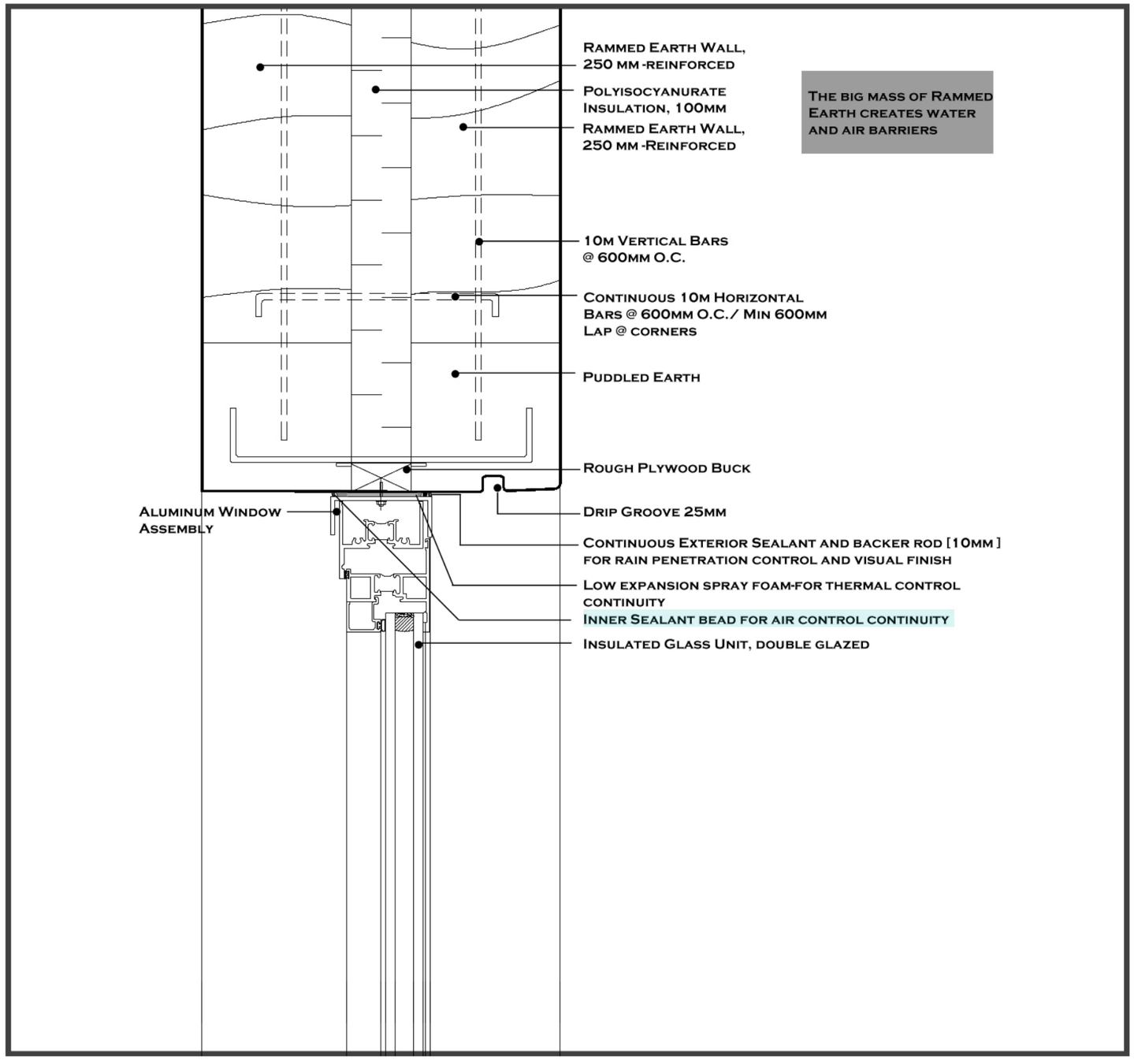




Detail 1.2

Rammed Earth Wall to Window Head Detail



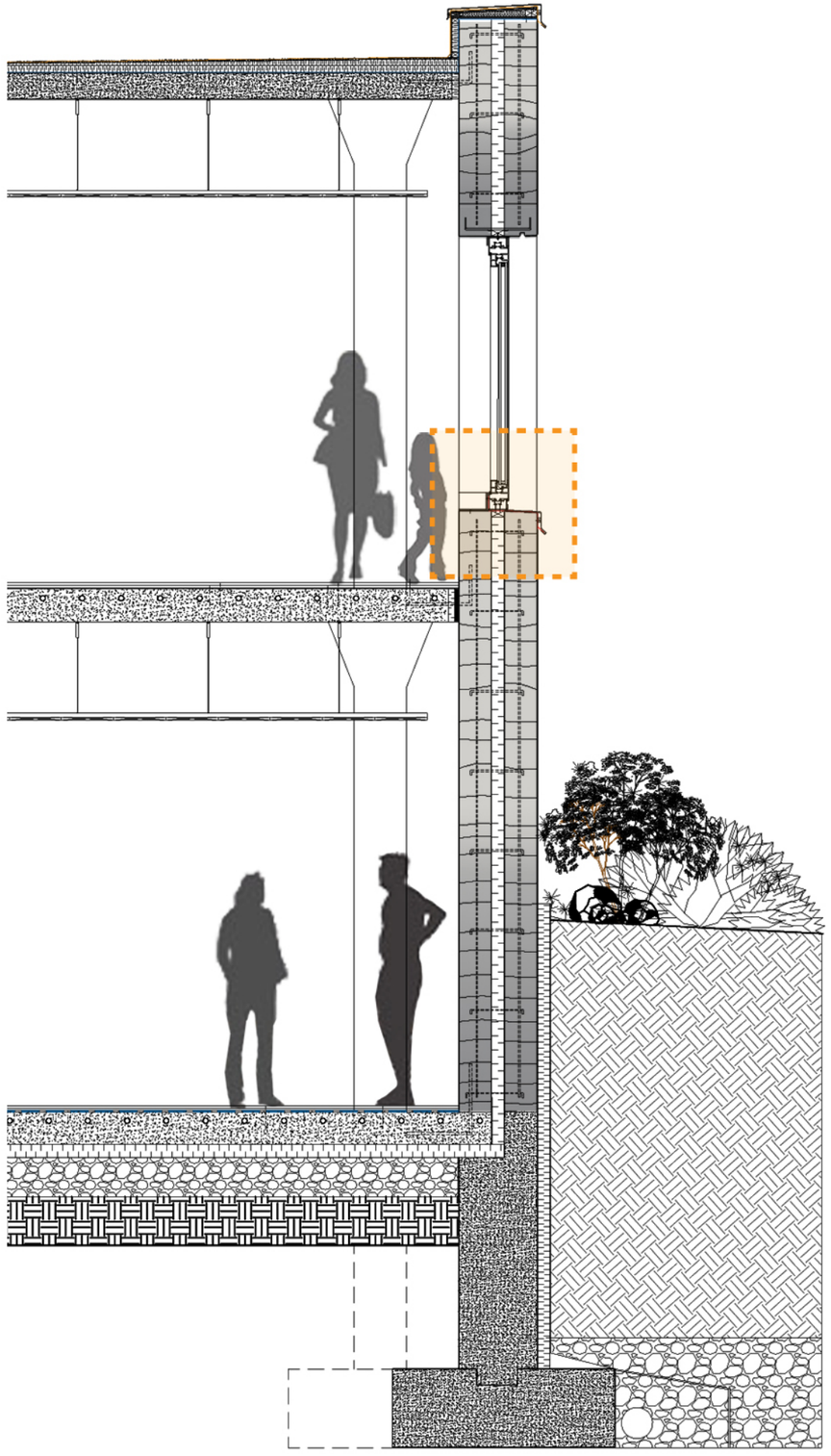


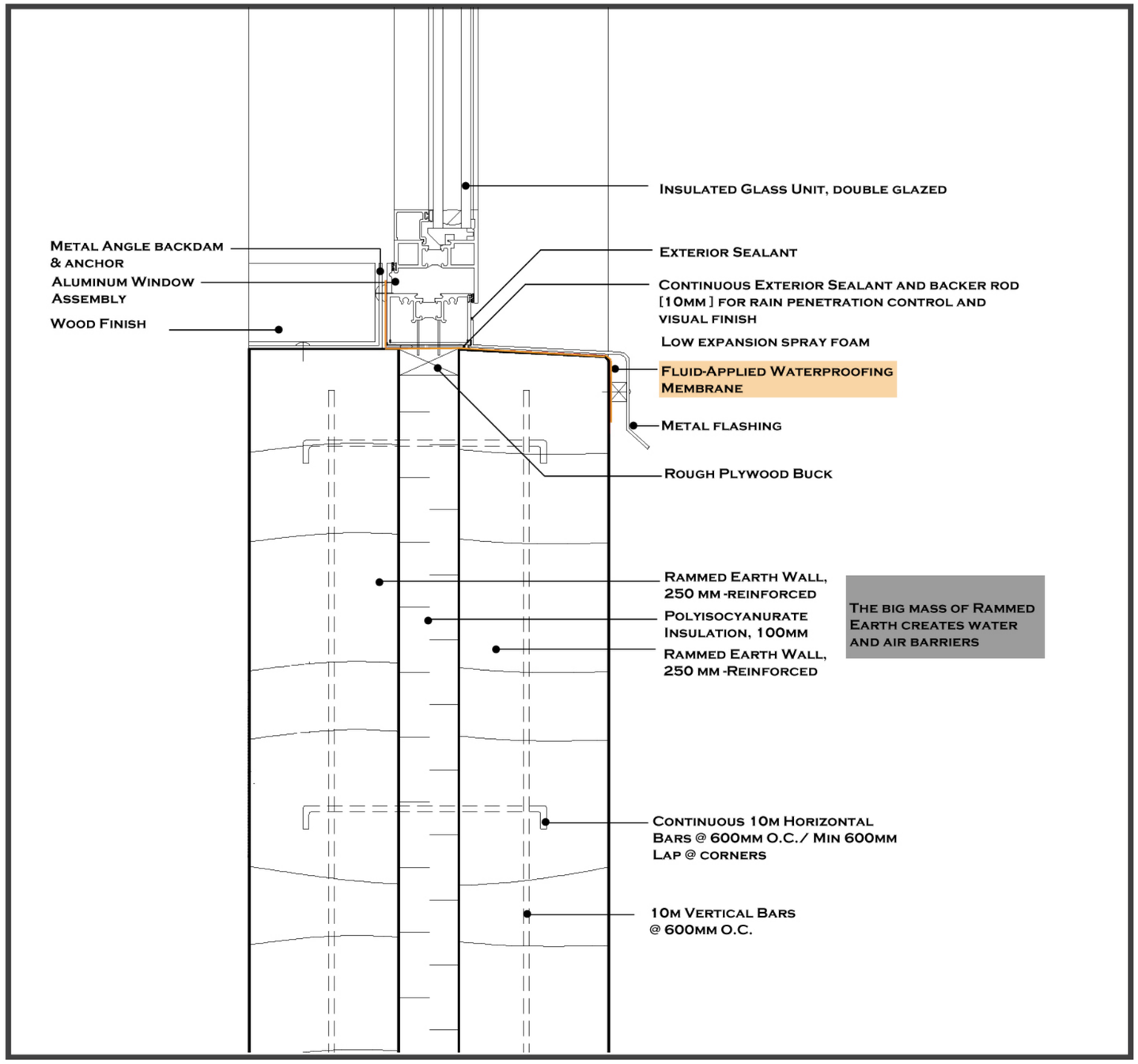
Scale Bar [mm]

0 500 1000

Detail 1.3

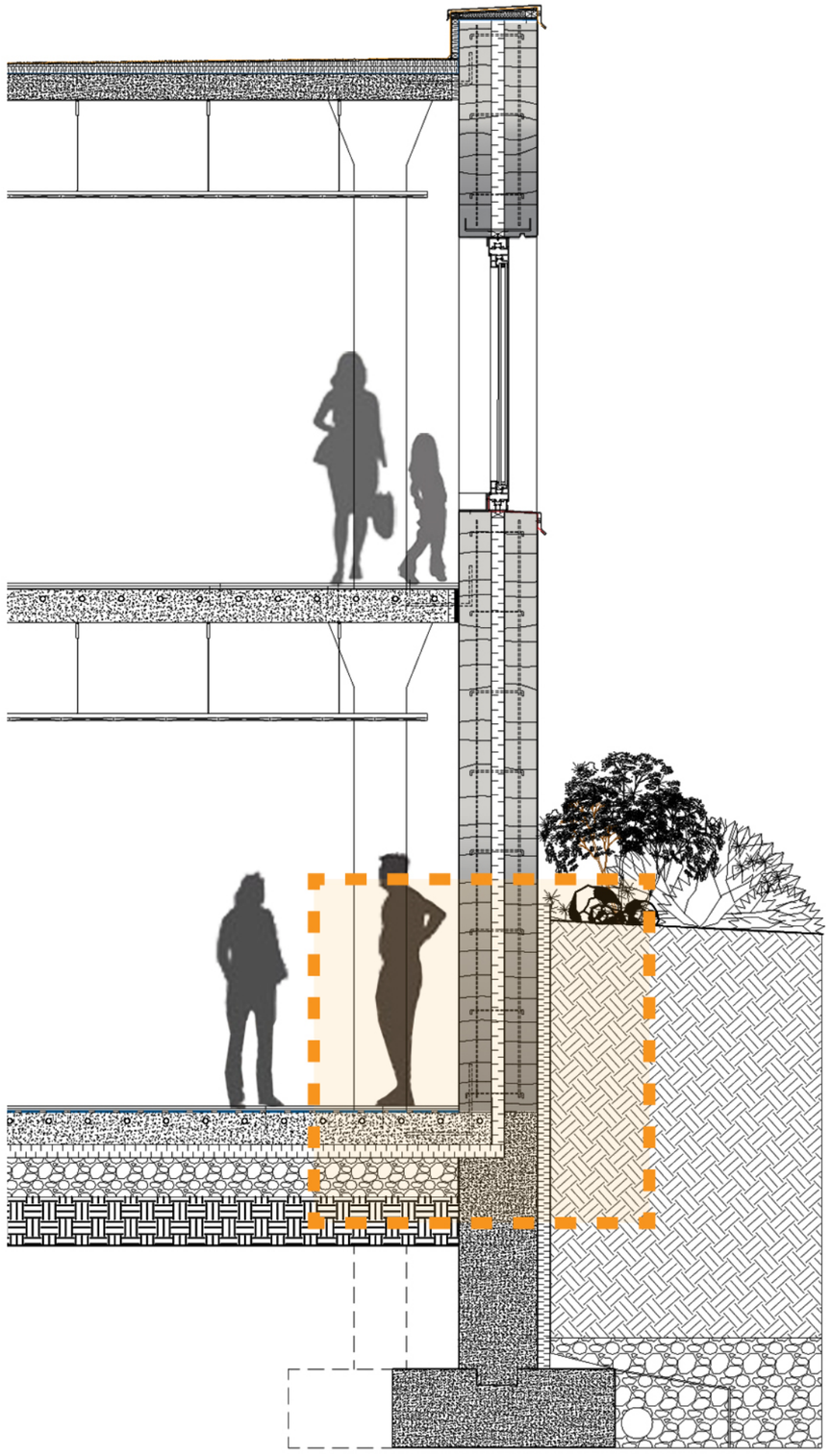
Rammed Earth Wall to Window Sill Detail

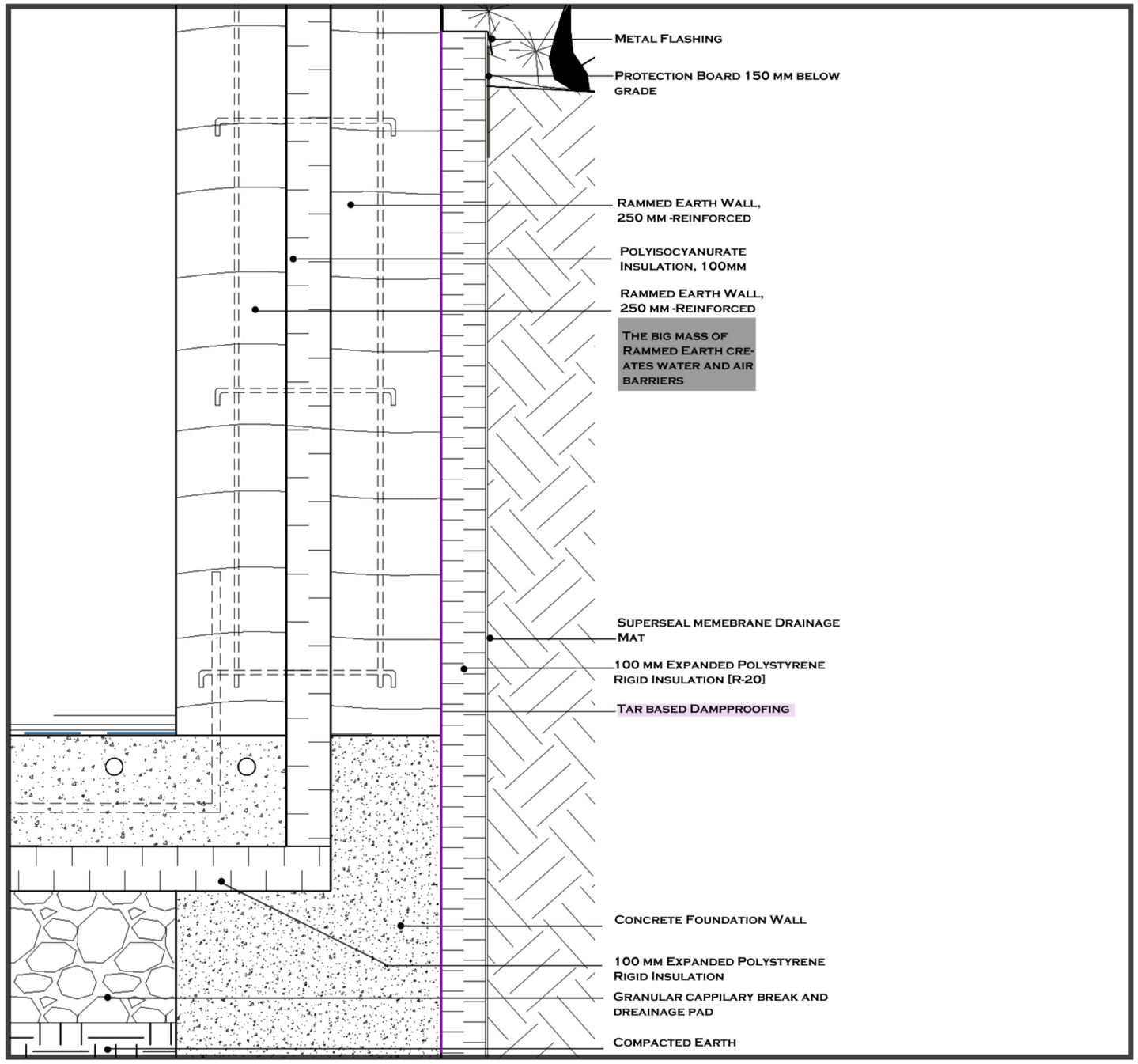




Detail 1.4

Rammed Earth Wall to Foundation Detail





Scale Bar [mm]

0 500 1000

Skin and Envelope Design and Strategies

Transparent Elements

The glass elements in the building, the windows, curtain walls, and glass boxes are all double glazed, one Low-E coating, with Argon. These elements have an R-value of 3.846 K·m²/W and a U-value of 1.476 W/m2 °C. [4]

The building's glass elements are protected by a double skin made from wooden louvers. The glass elements facing south are shaded by horizontal wooden louvers while the ones facing East and West are shaded by vertical ones. In the courtyard the ground floor curtain walls are protected by the wooden louvers; however, the curtain walls of the basement floor are shaded by the horizontal extrusion of the ground floor's double skin as shown in diagram 8. Solar gain in the building, caused by glass elements, is also reduced by planting trees around the building windows as well as within the courtyard and sunken plaza.

The entire reinforced concrete building structure is contained within the rammed earth envelop, thereby, protecting it from various climate conditions. The building envelop is attached through connection joints to the reinforced concrete slabs [Details 1, 2]. Those joints hold the building envelop rigidly and relief the stress caused by structural movements [thermal, seismic].

On Grand Avenue façade corten metal panels become part of the building envelop; diagram 9. They are attached to the roof and floor slabs, as shown in details 3 to 3.2.[5] [6] Those panels were used in order to create a lighter weight opaque skin [lighter than the rammed earth wall] on top of the large glazing area below. This allows for a better envelop solution while still carrying the overall aesthetic of the building. The curtain walls in the building are also attached to the floor slabs by their vertical structural components (mullions). The glass boxes extruding from the building are attached by a steel structure to the building's slabs as shown in detail 3 [wall section] and detail 3.2 [glass box connection detail][7]

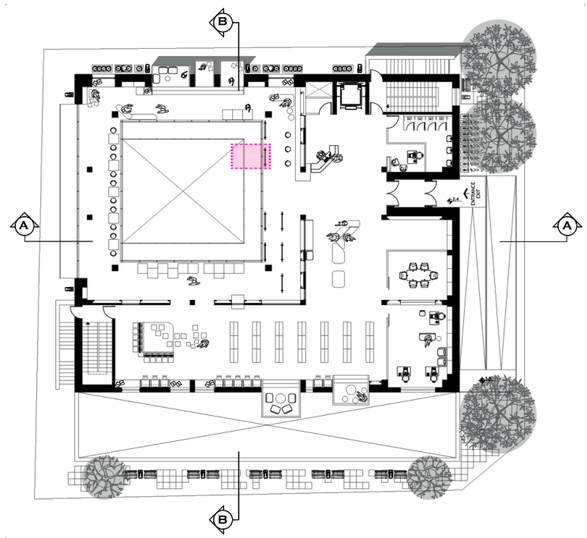


Figure 2. Location of Wall Section 2 on Ground Floor Plan

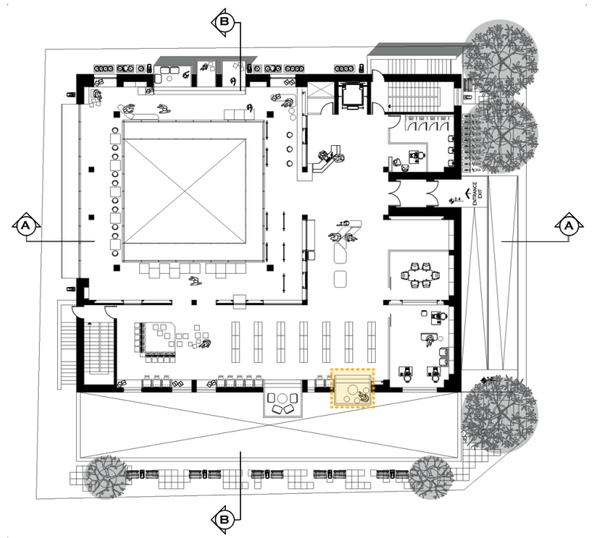
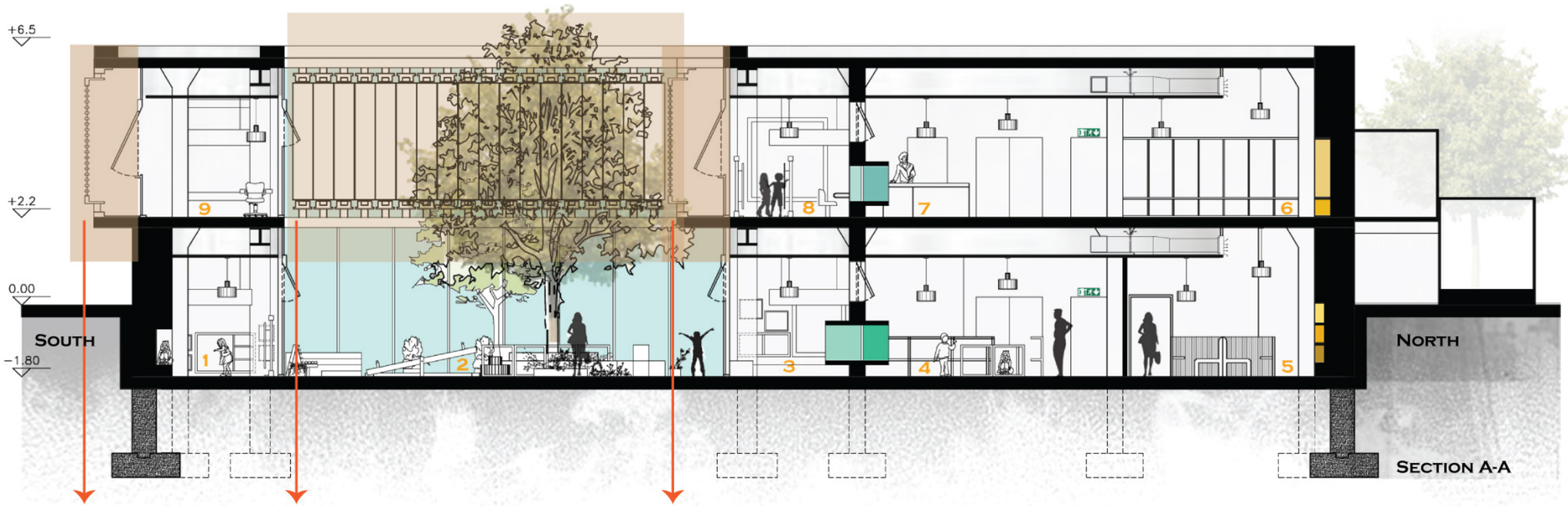


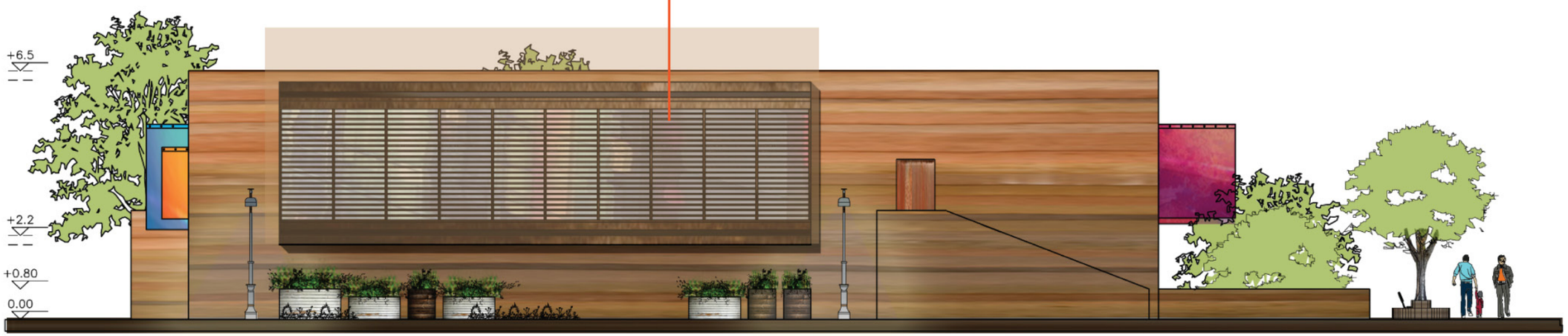
Figure 3. Location of Wall Section 3 on Ground Floor Plan

Diagram 8

Design Strategies for Glass Elements -Orientation and Double Skin



Section A-A



South Elevation

Diagram 9

Design Strategies - Corten Metal Skin

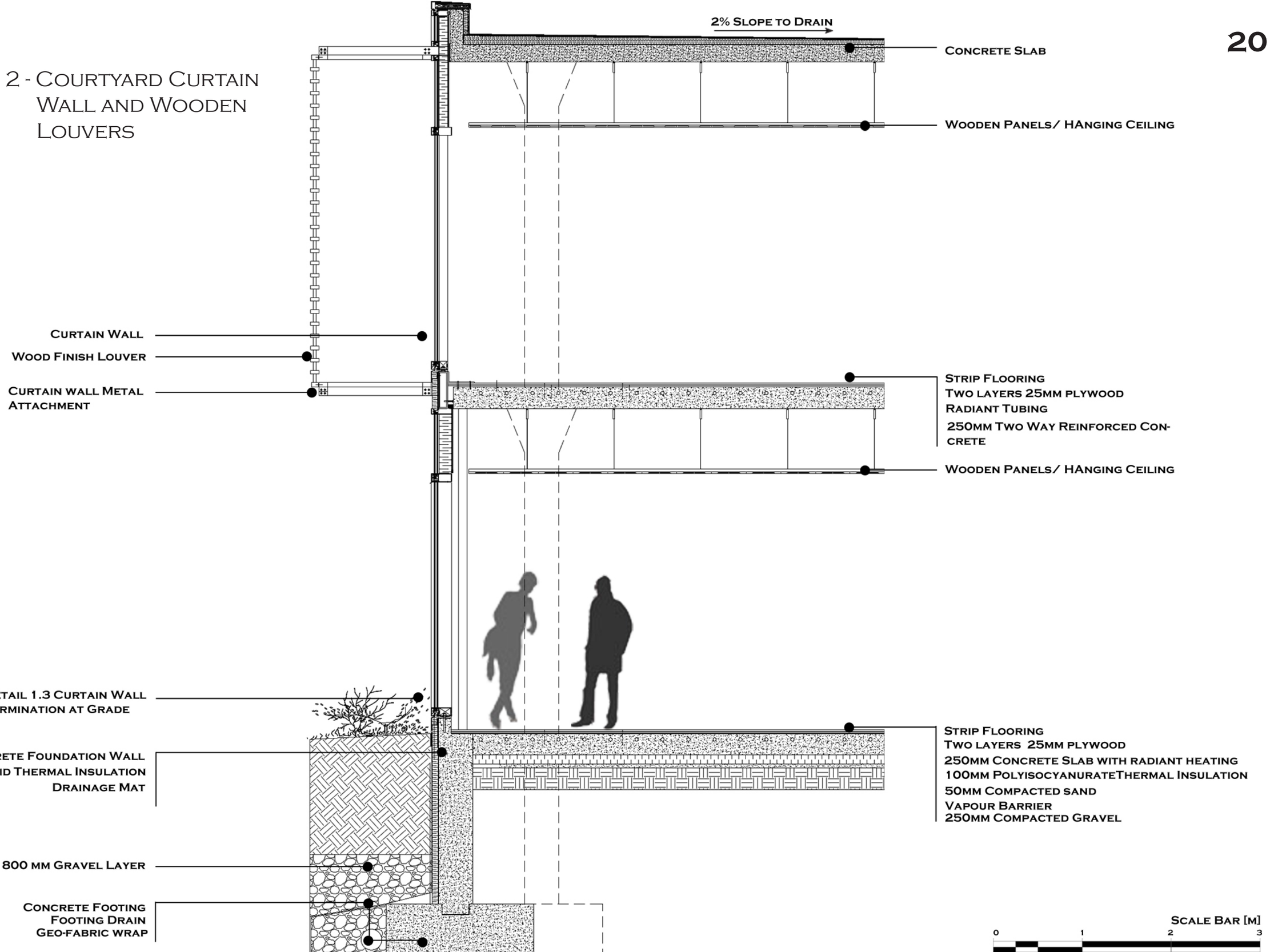
Grand Ave. Elevation

Scale Bar [m]

0 5 10 15 20

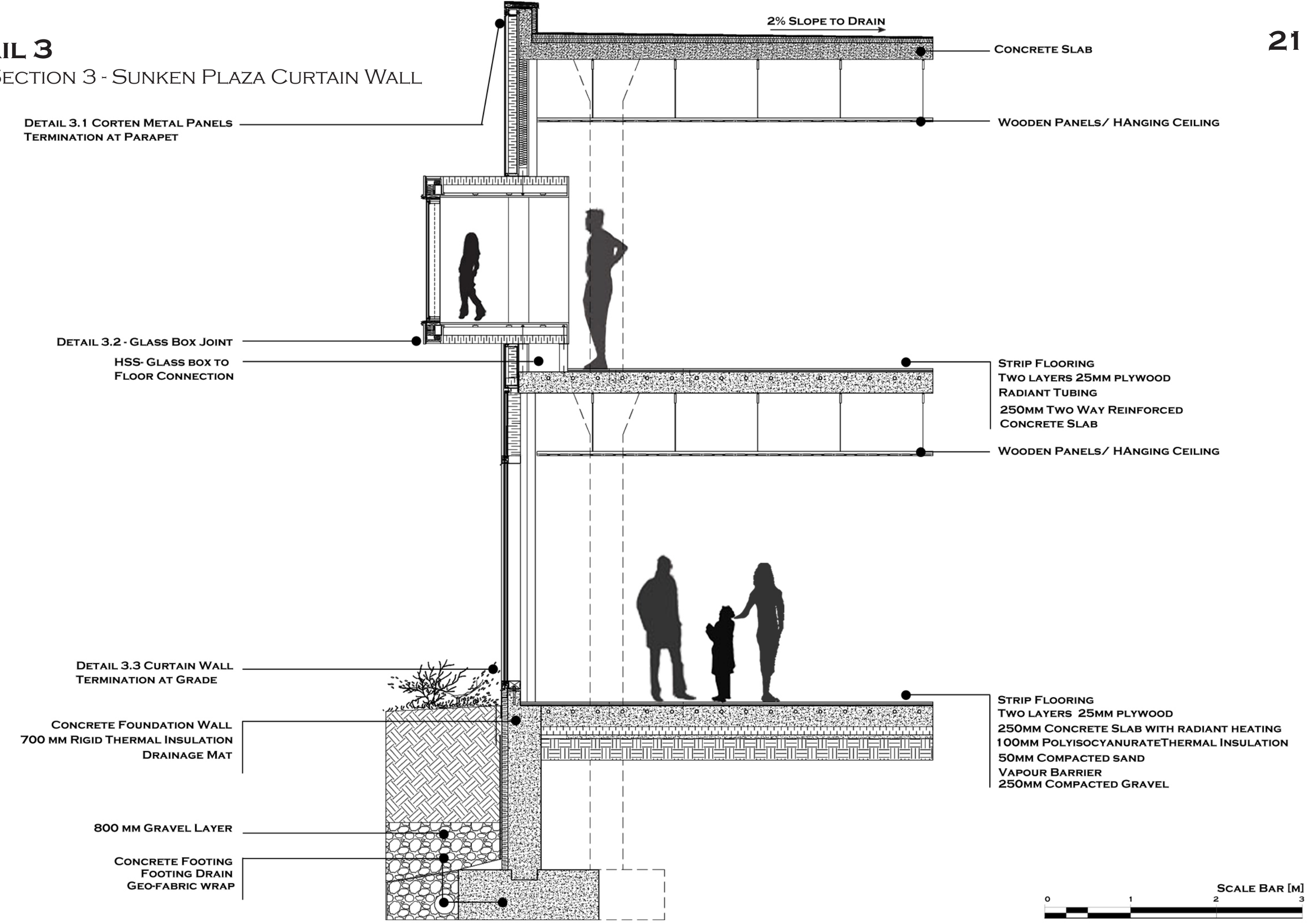
Detail 2

Wall Section 2 - Courtyard Curtain Wall and Wooden Louvers



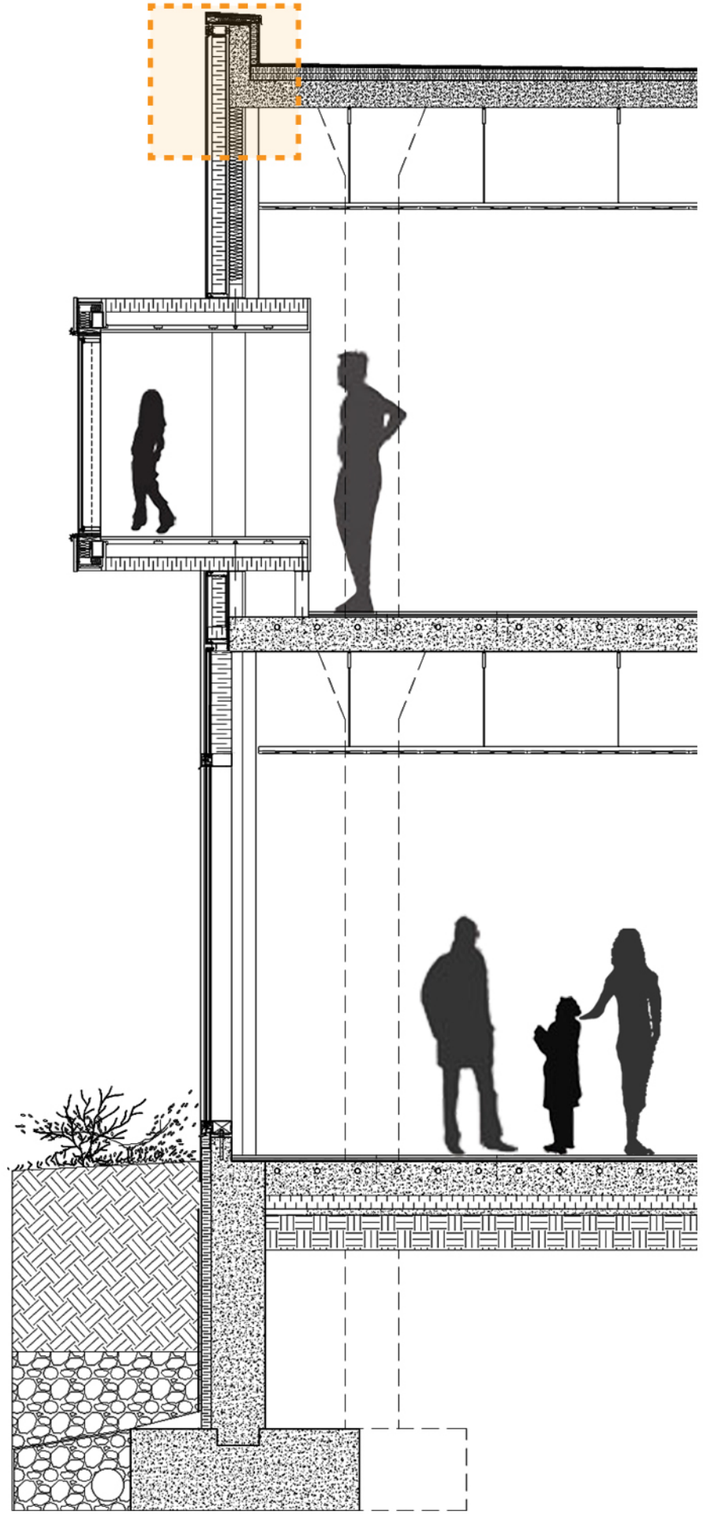
DEtail 3

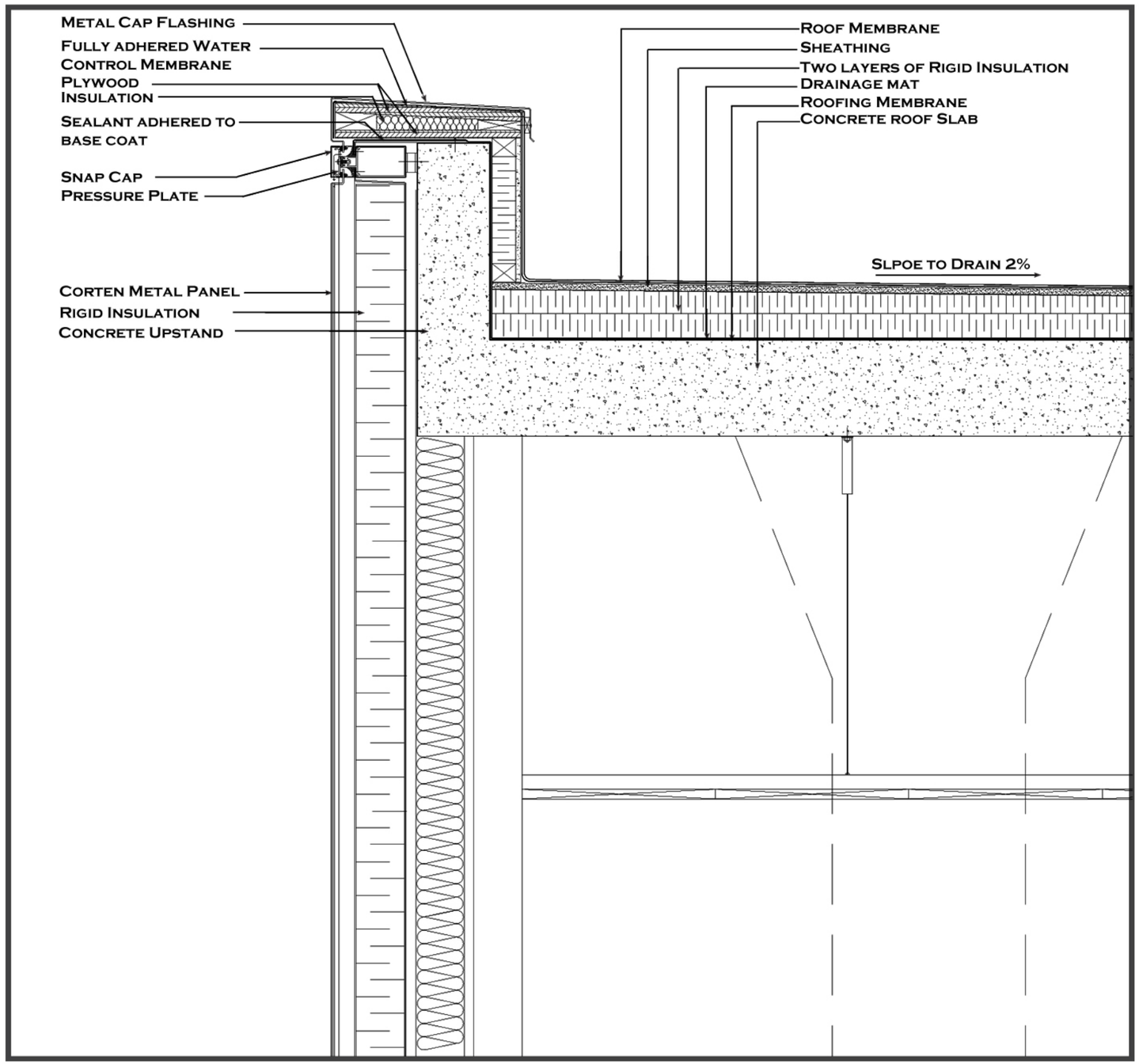
Wall Section 3 - Sunken Plaza Curtain Wall



Detail 3.1

Corten Steel Panel Termination At Parapet



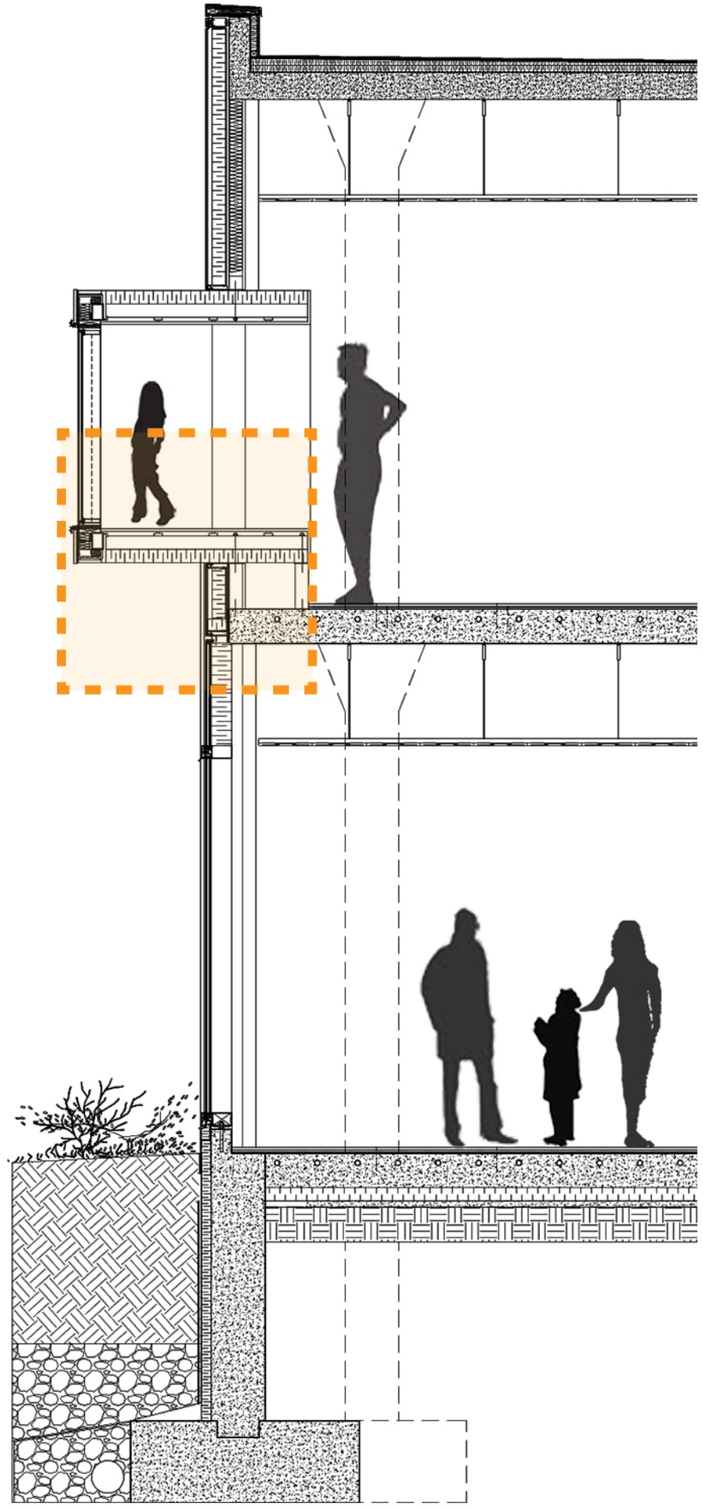


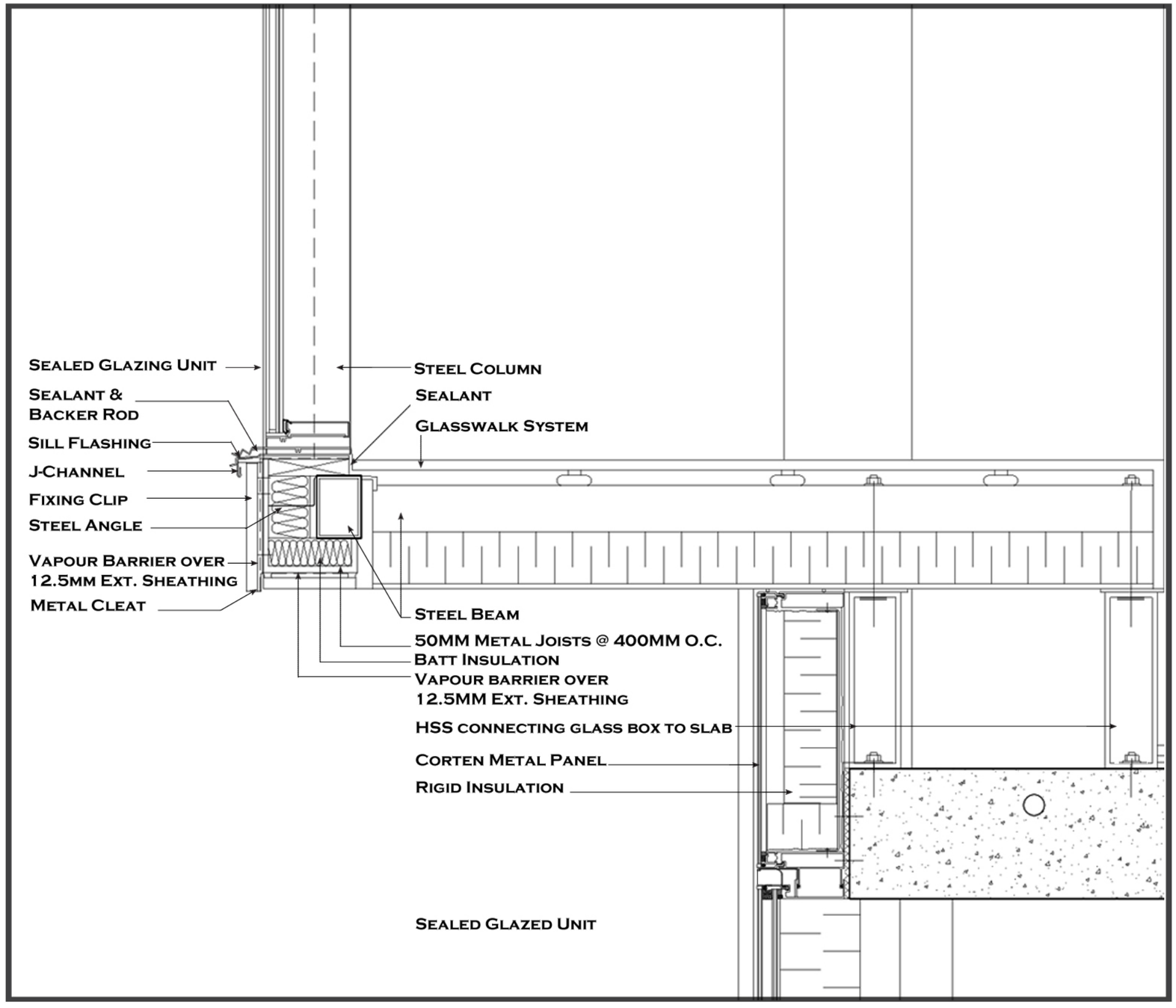
Scale Bar [mm]

0 500 1000

Detail 3.2

Glass Box Connection Detail



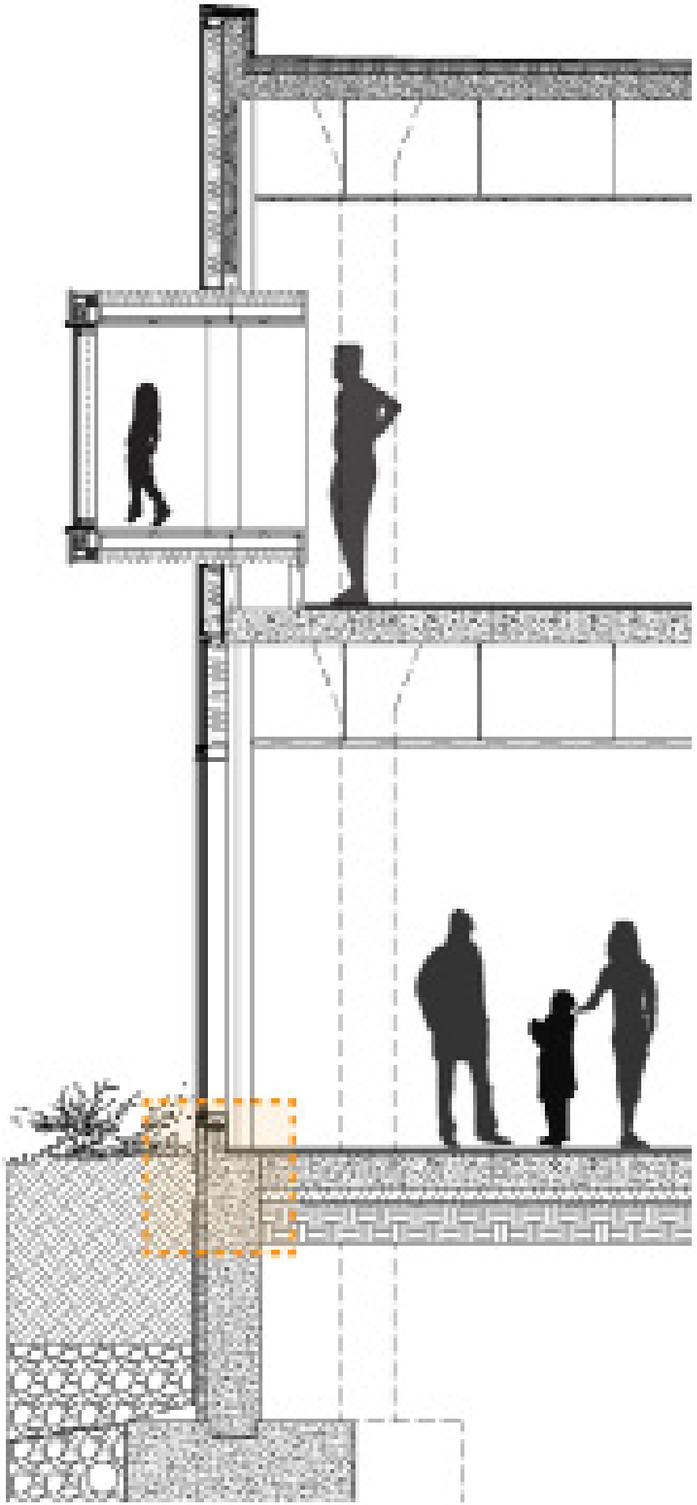


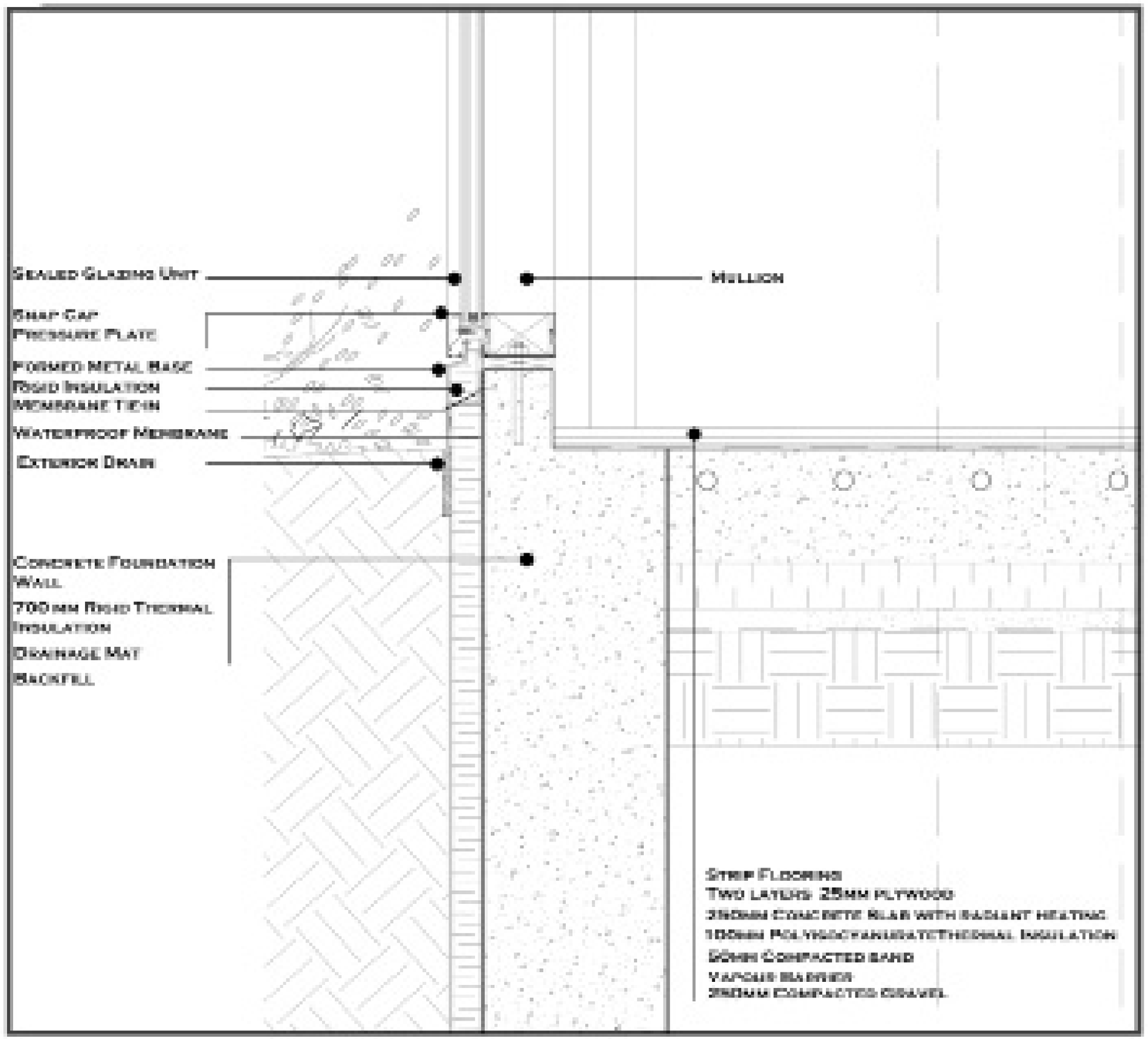
Scale Bar [mm]

0 500 1000

Detail 3.3

Curtain Wall Termination At Grade Detail





Efficient Design Strategies

This library design follows a set of sustainable strategies that affect its overall performance. Initially, the building was designed as a rammed earth box that is sunk 1.8 meters underground. Naturally, this underground space is kept warmer in the winter and cooler in the summer. This design strategy reduces the need for air conditioning and heating in the space. In addition, the rammed earth building material has a high thermal mass which also contributes to less energy use in the building. Also, by using this material no toxins nor off-gassing are emitted during preparation or construction which makes it more environmentally friendly.

The design and orientation of the library allows for natural ventilation throughout its spaces. In good weather days, operable windows in the building envelop, around the courtyard, and near the sunken plaza allow for natural air to flow within the building by stack ventilation; diagram 10. The building is oriented in a way where functions that require more light are arranged around the courtyard, thereby occupying the southern and western sides of the building. Also, the main individual study spaces are arranged on the eastern side of the building where light penetrates through the glass openings. The building is designed as a very flexible and open plan; this allows for light, as well as natural air to flow throughout the entire structure. Openings in the secondary surrounding the courtyard allow for indirect light to be reflected into the interior spaces; diagram 11.

The site of the building was developed in order to enhance the library's energy performance; the approach taken was to plant many local trees, shrubs, and flowers around the site. The trees were mainly planted in the courtyard, in the sunken plaza, as well as on the sidewalks of Grand Avenue and Blair Rd. The trees used are deciduous trees such as red and white maples; they provide shade in the hot summer days and lose their leaves in the winter allowing for deeper penetration of light into the building. Only local plants are used in the project in order to reduce transportation costs and to allow for their natural growth within their environment; diagram 12.

Rain water is directed to multiple roof drains and then collected in water storage tanks. The stored water is then used to water plants in the courtyard and the sunken plaza; diagrams 13,14. In those areas a drip irrigation system is used in order to use less water, thereby, making the building more efficient. Within the building, low-flow sensor faucets are used in washrooms and in the cafeteria kitchen in order to lessen the amount of water used.

Efficient Design Strategies
Continued

The roof of the building is a low-sloped roof with high reflectance in order to reduce heat gain by the building in the hot summer days. Also, to insure that the building is air tight and protected from all climate conditions, thermal insulations and air barriers are made continuous around the entire building, its windows, and curtain walls; refer back to details 1-3.

Diagram 10

Efficient Design Strategies - Natural Ventilation

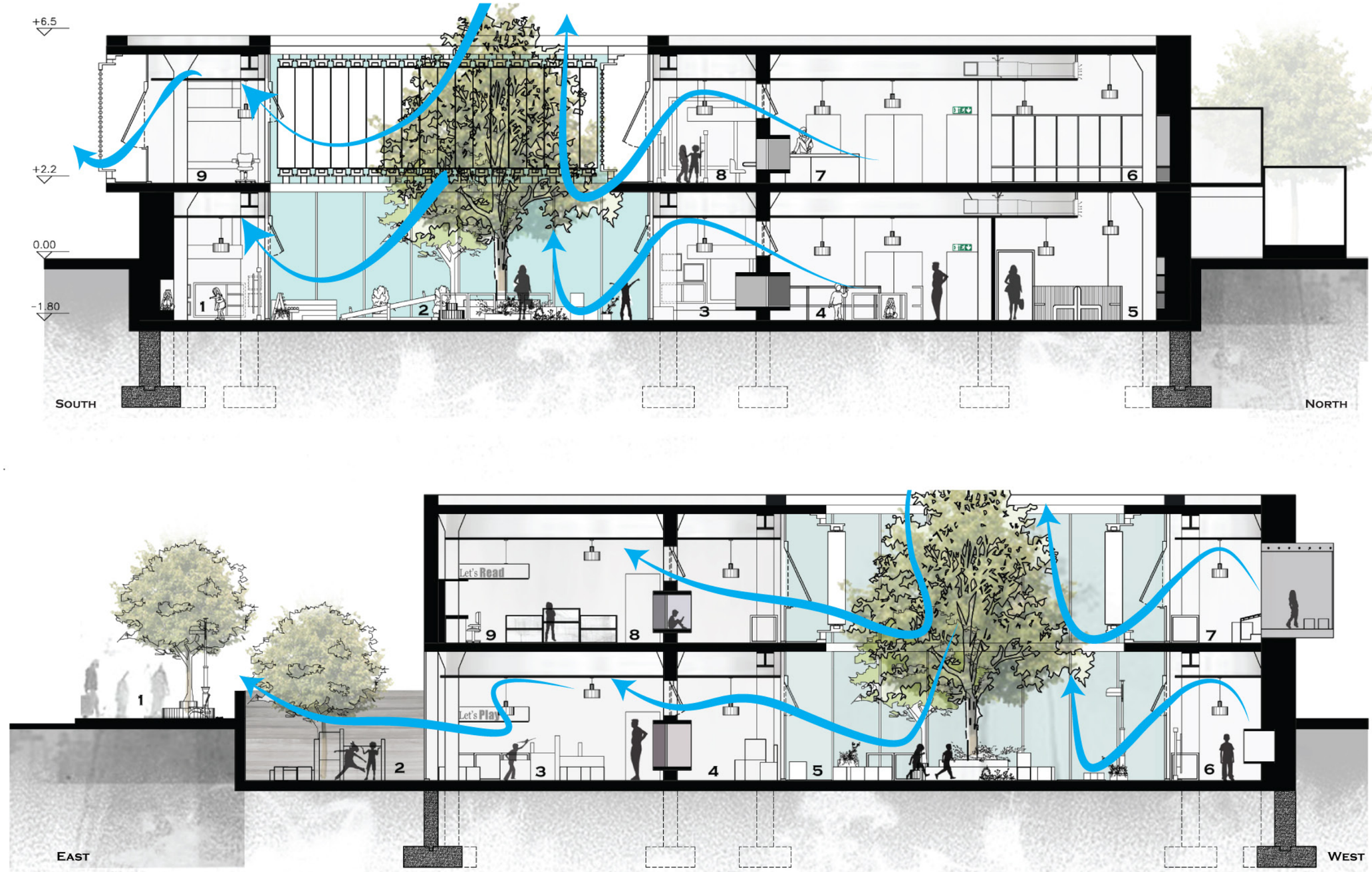


Diagram 11

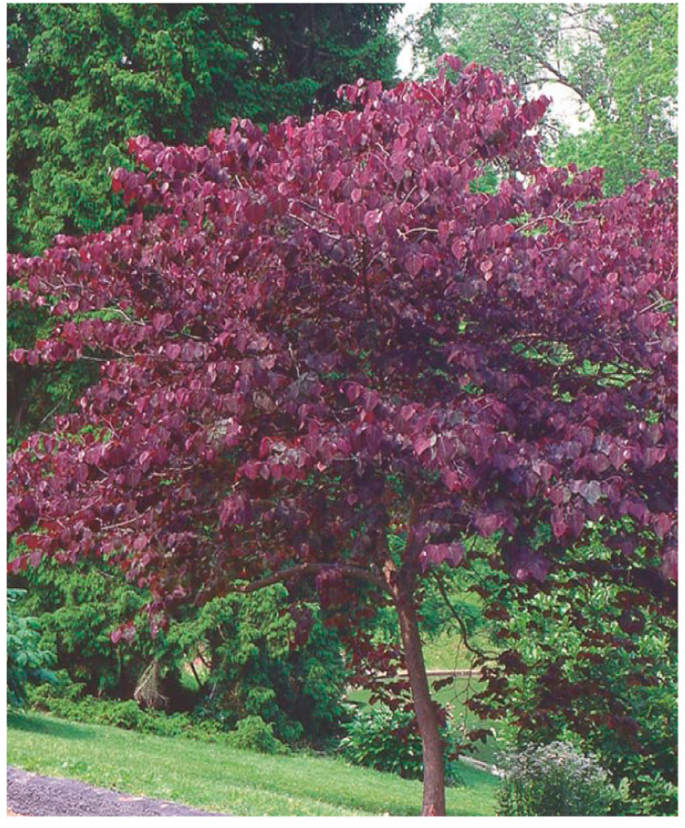
Efficient Design Strategies - Day Lighting

Diagram 12

Efficient Design Strategies - Local Plants used on Site

Red Maple

Silver Maple



Redbud Tree

Diagram 13

Efficient Design Strategies
Roof Drain Plan

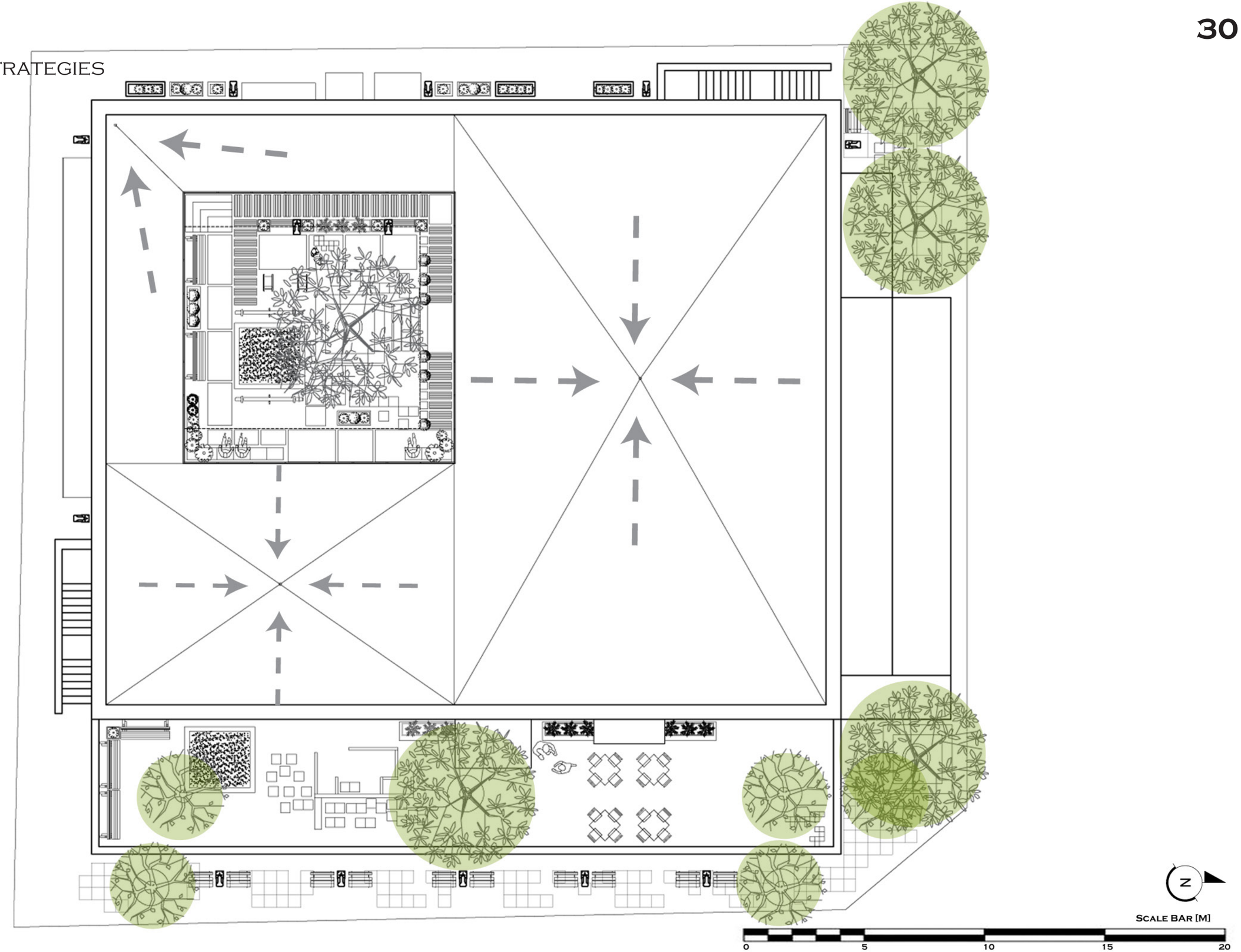
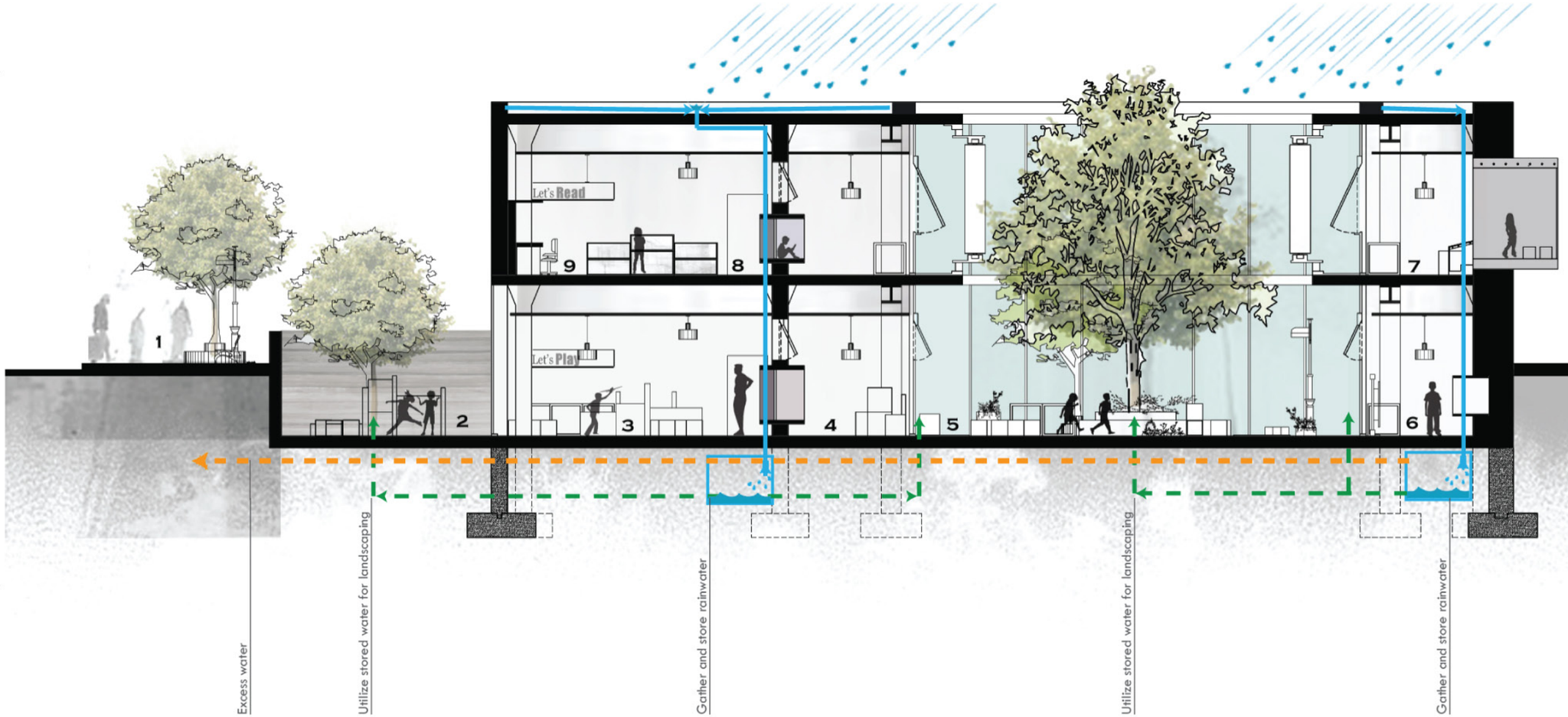


Diagram 14

Efficient Design Strategies - Use of Water on Site



Environmental Systems and Services

The HVAC system used in this library design is a combination of a radiant floor heating system supported by ceiling ducts systems for air conditioning and ventilation. The radiant floor heating is arranged throughout the library depending on its different zones and functions; for instance, the space directly around the courtyard has a separate HVAC system due to its naturally different climatic conditions. The ceiling ducts system is also distributed based on the different building zones and their varying environmental conditions. This HVAC system is concealed by the hanging wooden ceiling in the library; diagrams 15,16. All mechanical systems are located in the main mechanical room on the basement floor level; they are connected through a shaft to the secondary mechanical room on the ground floor level.

The thermal mass of the rammed earth walls is characterized by its ability to store heat; however, this does not lead to overheating in the interior spaces. The thermal mass of rammed earth causes it to slowly gain solar heat during the day and to radiate it back at night. This characteristic of the building envelop allows it to provide stabilized internal environments; therefore, the building requires minimum mechanical cooling during the summer. [8]

Due to Canadian winter conditions, it is essential to have a heat generating source. Therefore, the building is designed to generate heat by a radiant floor heating system. Due to the characteristics of rammed earth and its ability to store heat, less energy would be needed in order to heat the building. However, in order to maintain a comfortable interior environment, heat sources are increased around the perimeter of the courtyard and the sunken plaza; this is due to the large glazing areas around those spaces. A separate radiant floor heating system is designed in the courtyard and sunken plaza in order to prevent snow piling within those outdoor spaces.

Condensation would not be a problem in the building as the entire envelop is air-tight and perfectly sealed by the mass of the rammed earth walls, and all other interior finishes, windows, and curtain walls are sealed with air and vapour barriers to prevent any air leaks. By preventing air leak, it is ensured that condensation within building envelope - escape of warm air - is prevented. However condensation could occur within building on the interior surfaces and windows; therefore, the presence of the mechanical ventilation system is important in further preventing condensation.

Environmental Systems and Services

Continued

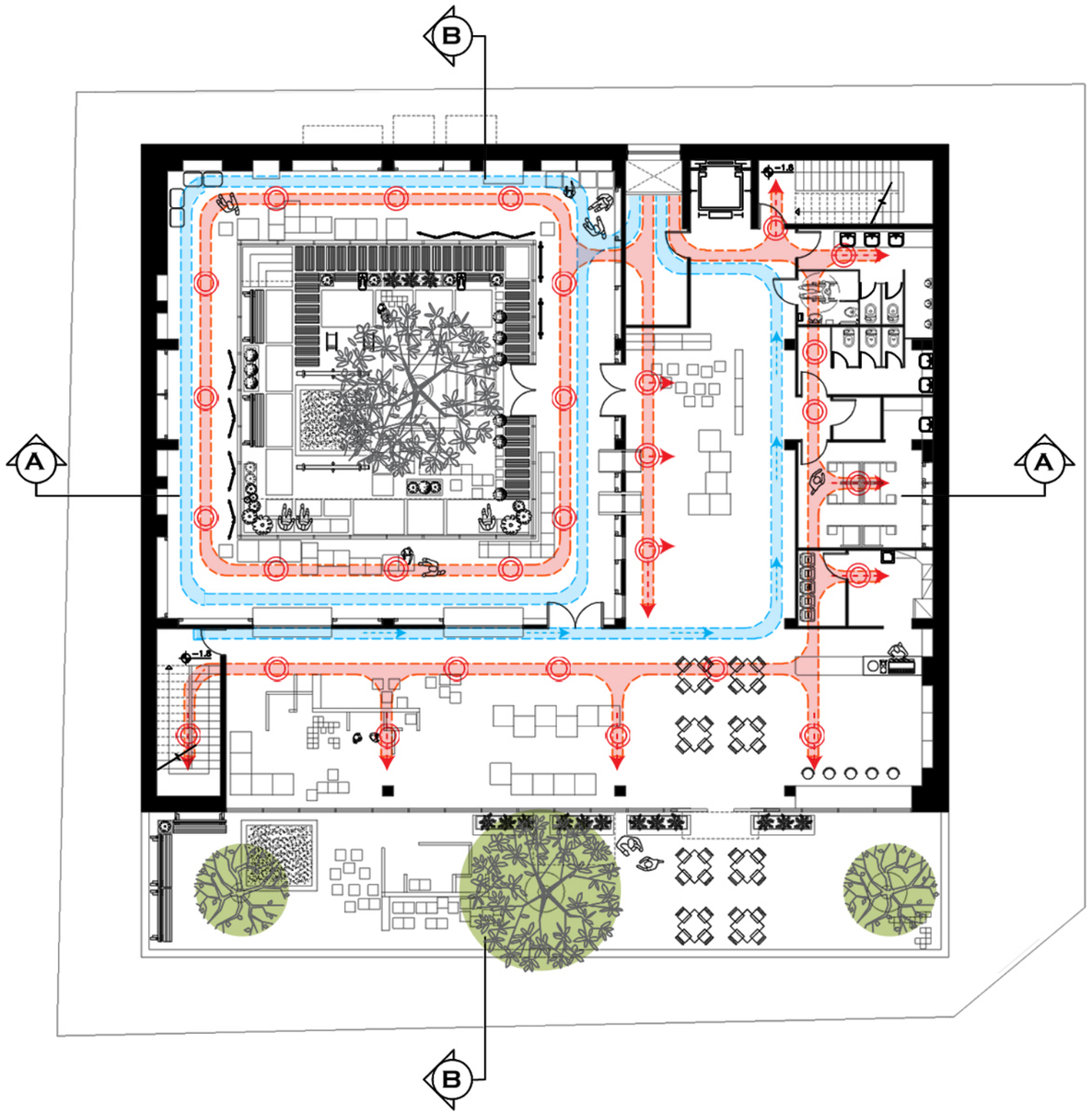
Acoustics in the building are controlled by the layout of the plan [arrangement of functions related to the courtyard and sunken plaza] as well as by the choice of materials and design strategies used. Rammed earth has a great noise reduction ability which protects the building from outside noises as well as absorbing some of the interior noises generated. The floor slabs, made out of concrete, also aid in reducing noises from penetrating form one floor to another. To further insulate sound between the two floors, as well as sound generated by the HVAC system, a layer of db-Block sound barrier is added to the hanging ceiling.

The artificial lighting strategy for indoor and outdoor spaces is the utilization of LED lights. In the courtyard and sunken plaza down-lights are used in order to maximize the use of light without scattering it into space [e.g. up-lights]. The amount of light in a space is distributed based on its area and function in order to minimize energy consumption. Multi-zone control systems are provided within the design to allow for multiple light controls within the different library spaces. Other lighting, such as that of projectors, is separately controlled. [9]

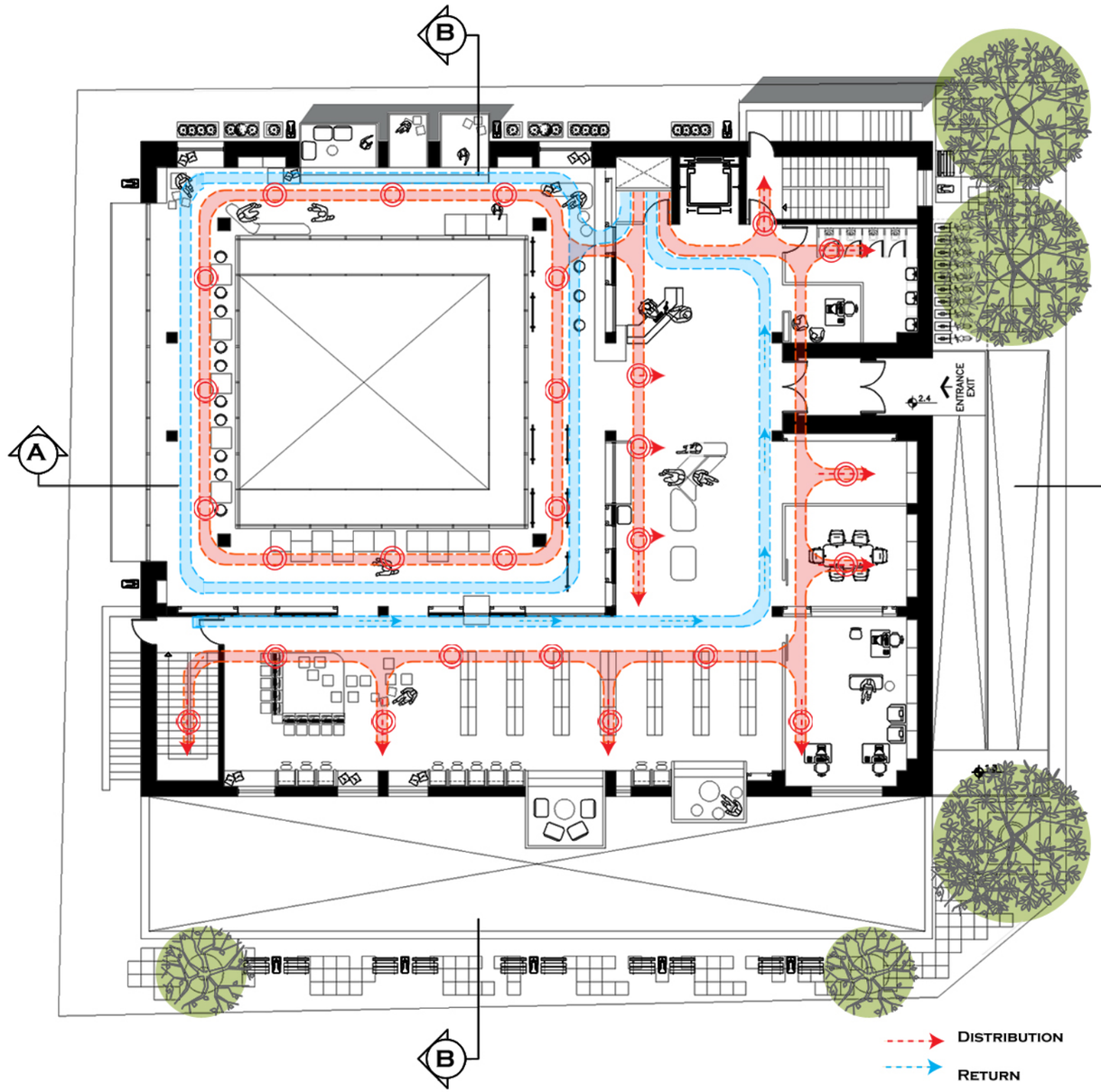
The library building is located within a serviced area. The building is serviced with a main cable wire for all of the data uses. A service supplier would be assigned to provide data services to the building. The cable wire is connected to a main box within the building where multiple cables are then distributed throughout the interior spaces for internet, phone, and other devices usage. A wireless internet service is provided within the library, by an internet router connected to the main line, for occupants' use. The building allows for data transmission for the use of mobile devices. The library floors are connected via two stair cases as well as a main elevator; diagram 18.

Diagram 15

Environmental systems and Services-HVAC Ducts Distribution



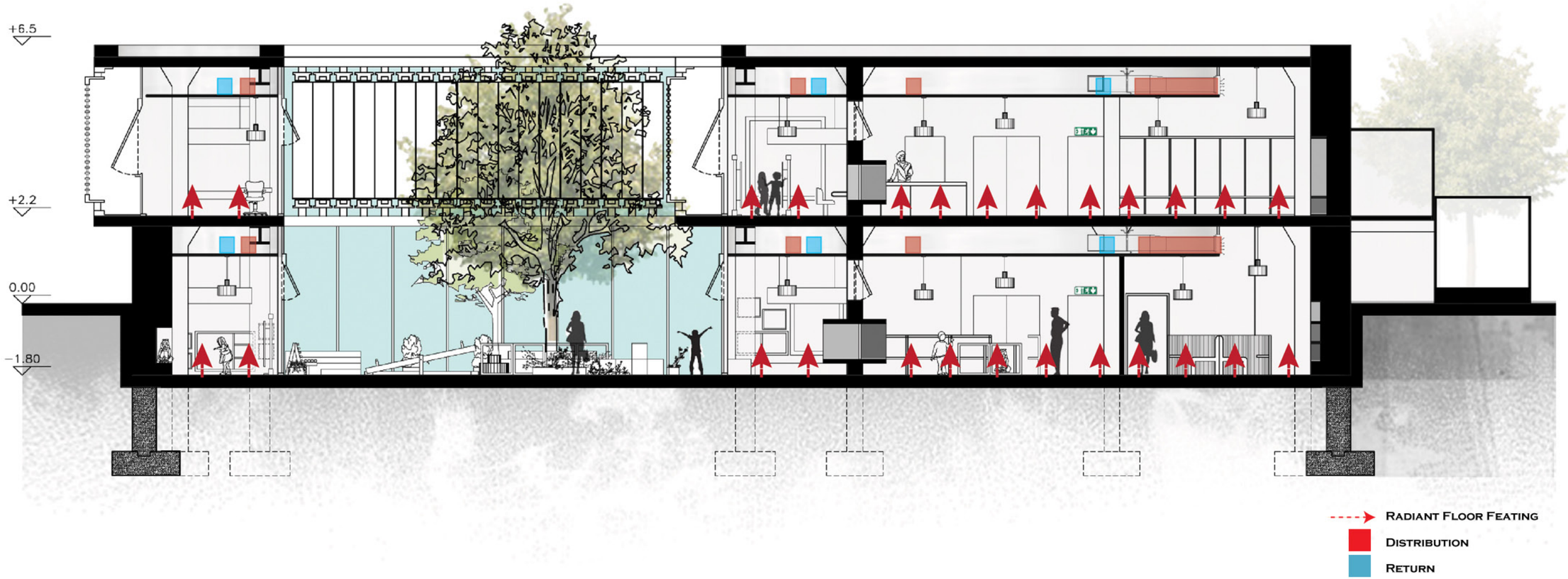
Distribution of HVAC on the Basement Floor Plan



Distribution of HVAC on the Ground Floor Plan

Diagram 16

Environmental systems and Services-HVAC Ducts concealed by hanging ceiling - Secction A-A



Scale Bar [M]

0 5 10 15 20

Life Safety

Occupants' life safety was very critical in the design process. The interior environment is kept healthy and clean from any toxins or off-gases due to the use of rammed earth material. All main exits of the building have doors with a minimum width of 1 meter; all of those exits open outwards and are equipped with panic bars making the exiting easier in case of an emergency. Two main fire exit stairs are placed on both ends of the building as shown in diagram 17. Both stairs cases have a width of 2.4m [1.1m stair flight width]. The evacuation route is direct, clear, and the exit routes are indicated by signs throughout the building. The fire exit stair cases are made from concrete and surrounded by 300mm thick concrete walls in order to protect them in case of a fire.

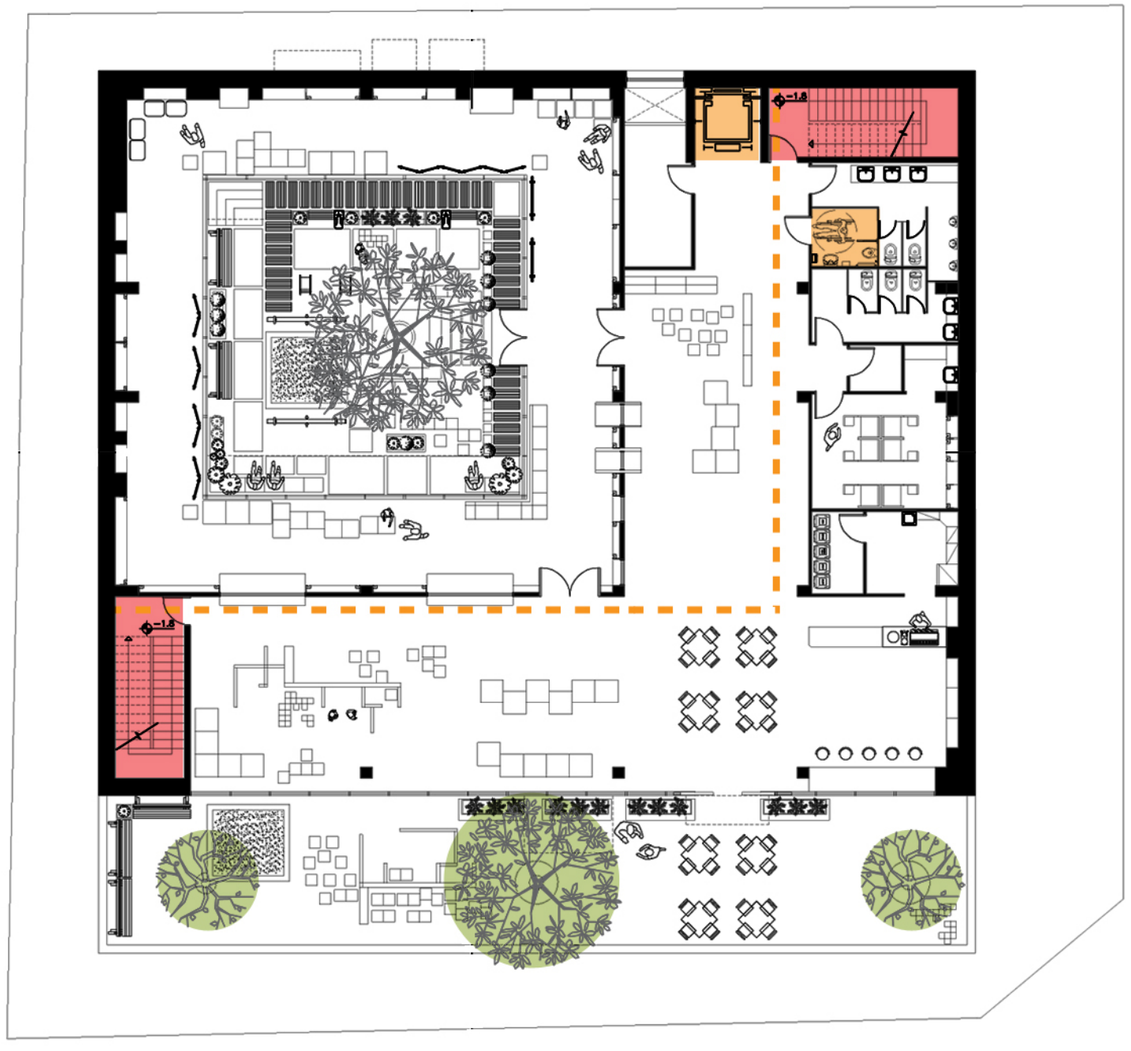
The whole building is equipped with a fire detection and alarm system with an automatic sprinkler system. The sprinklers are distributed on the surface of the wooden hanging ceiling on the two main floors. Those sprinklers are connected back to the main pipes which run above the hanging ceiling. The fire detector is also placed on the suspended ceiling; it is connected to electric wires which run above the wooden hanging ceiling.

Barrier Free Design

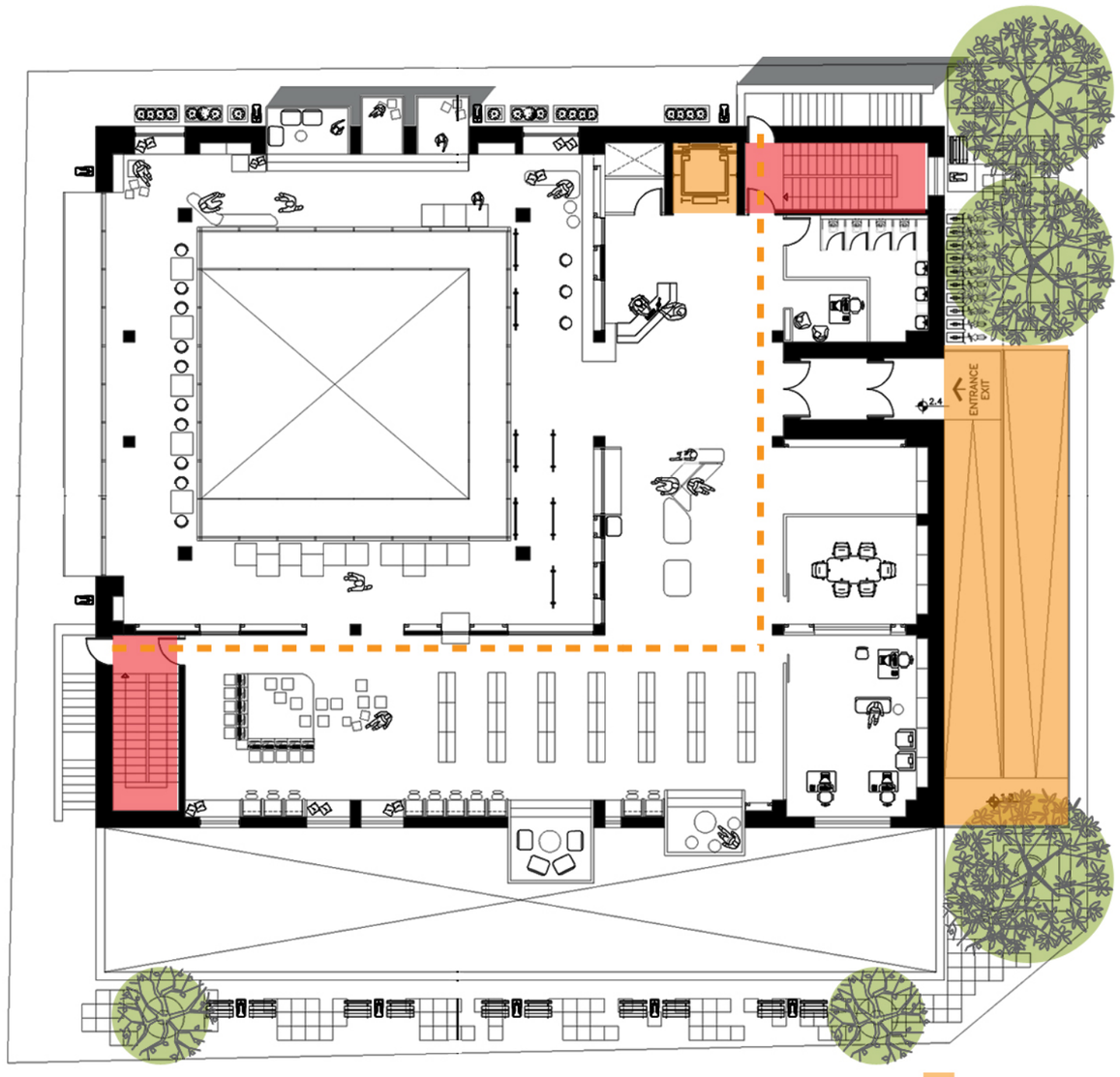
The library is designed as a barrier free space. The main entrance and exit is via a ramp that connects the ground floor level to that of the main street [the ramp is sloped at a ratio of 1:12]. The building has an open plan where all the spaces are located on one level, i.e. not separated by stairs. This allows children and occupants with special needs to move freely without any barriers. In addition, a barrier free washroom is located at the basement floor level. The two library floors are connected via a main elevator, in addition to the two main stair cases, thereby allowing easier movement within the building.

Diagram 17

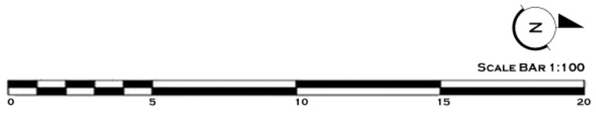
Life Safety and Barrier Free Aspects of the Design



Basement Floor Plan



Ground Floor Plan



Environmental Site Strategies

The building does not cover the whole site area, thereby, leaving outdoor green spaces. Trees are planted within the courtyard, the sunken plaza, and around the building. The various outdoor spaces provide for different and more interesting views from the inside to the outside. The design provides an area for bike parking as well as an outdoor seating area in order to connect the public to the building as well as to provide a richer experience of the site. All plants used are local; they grow within their natural environment.

Around the building, on the outside perimeter, natural grass is grown. However, within the landscape of the courtyard and sunken plaza is artificial turf is used. This material is not environmentally harmful, and it easier to maintain for the purpose of this building. Other parts of the landscape are made from outdoor playground rubber mat which is non-toxic and environmentally friendly material. This material sits on a layer of compacted sand; it is a safer outdoor finish for children's play than any other outdoor finishes.[10]

Roofs are sloped to roof drains in order to allow rain water to drain through pipes connected to storage tanks. Excess water runs to the road service pipe: the storm water pipe; refer back to diagram 9. The perimeter around the building is sloped outwards, towards the streets, where all the water is drained and directed to catch basins. Within the courtyard and the sunken plaza, water is drained to main floor drains which are also connected to the storm water pipe.

Advanced energy metering is incorporated into the design to control and monitor usage of water. Water meters are installed separately for each usage such as irrigation and indoor usage [washrooms, kitchen].

Recycling containers are also important aspects integrated in the design. Within the building, as well as outside of it, spaces are provided for recycling containers in order to encourage users to properly recycle used materials.

Environmental Design: LEED Criteria and My Building

This library was designed to meet the LEED requirements for New Construction. Considerations of the site, the building, its materials and its relationship to the surrounding urban context were critical parts of the design process. The comments made on the attached LEED spreadsheet are based on the LEED requirements for New Construction. [9] Based on the assesment of the project, a Gold LEED certification was achieved with 76 points. The design satisfies most of the LEED criteria which indicates a good, environmentally friendly, sustainable, and efficient project.

Note: Attached is the LEED Spreadsheet for this library design:
The design's LEED assesment [LEED v4 for BD+C: New Construction and Major Renovation]

Concluding Comments

Structural, environmental, and efficient design strategies were incorporated into the design of the library. Children need safe and flexible environments in order to play, learn, study, and grow. The structure used allowed for the flexibility required in the spatial arrangement. The materials chosen for the design, the skin, the floor finishes, the ceilings, and the outdoor landscape allow for an overall comfortable design for children. The materials are also environmentally friendly, sustainable, and suitable for children's use due to their good health and safety aspects.

Efficient design strategies were taken in order to decrease the overall energy consumption in the building. The design is barrier free, it has all aspects of protecting the life of its occupants, and it allows for a safe and interesting learning environment.

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

The Library - Children's Library in Cambridge, ON.

Date

Y	?	N					Comments
1			Credi 1	Integrative Process		1	The building was designed to be a high-performane and cost-effective project
			Location and Transportation		Possible Points:	16	
			Credit 1	LEED for Neighborhood Development Location		16	
1			Credit 2	Sensitive Land Protection		1	The site is not a farmland, nor is it a floodplain. It is not a habitat for any endangered species nor does it contain any water bodies or wetlands.
		2	Credit 3	High Priority Site		2	
2			Credit 4	Surrounding Density and Diverse Uses		5	The combined surrounding existing density of the site within 400m radius is 5050
		5	Credit 5	Access to Quality Transit		5	Bus transit trips does not meet the minimum of 72 trips on weekdays and 40 on the weekens
1			Credit 6	Bicycle Facilities		1	Bike storage is provided on site near the main entrance to the building
1			Credit 7	Reduced Parking Footprint		1	No parking is on the site
		1	Credit 8	Green Vehicles		1	
			Sustainable Sites		Possible Points:	10	
Y			Prereq 1	Construction Activity Pollution Prevention		Required	
1			Credit 1	Site Assessment		1	The site assesment: environmental and soil report was completd and the results affected the design process of the library building.
2			Credit 2	Site Development--Protect or Restore Habitat		2	Native and adapted vegetation are used on the site, restored and compacted soils meet the requirements
1			Credit 3	Open Space		1	In the design, a courtyard and a sunken plaza form the outdoor spaces, they are planted with a diversity of vegetation types. Different outdoor areas are also provided for seating and playing in order to incourage social interactions.
		3	Credit 4	Rainwater Management		3	
2			Credit 5	Heat Island Reduction		2	Plants are used to provide shade, a high reflectance low-sloped roof
1			Credit 6	Light Pollution Reduction		1	In the outdoor areas lights pointing downward are used to reduce light pollution
			Water Efficiency		Possible Points:	11	
Y			Prereq 1	Outdoor Water Use Reduction		Required	
Y			Prereq 2	Indoor Water Use Reduction		Required	
Y			Prereq 3	Building-Level Water Metering		Required	
2			Credit 1	Outdoor Water Use Reduction		2	The use of a drip irrigation system which depends on collected rain water reduces outdoor water use to 100%
3			Credit 2	Indoor Water Use Reduction		6	Water reducing fixtures are used such as low-flow sensor faucets, urinals, and toilets
		2	Credit 3	Cooling Tower Water Use		2	
1			Credit 4	Water Metering		1	Water meters are installed for 80% of the irrigated landscape area, another is installed for the indoor plumbing fixtures

			Energy and Atmosphere		**Possible Points:**	33	
Y			Prereq 1	Fundamental Commissioning and Verification		Required	
Y			Prereq 2	Minimum Energy Performance		Required	
Y			Prereq 3	Building-Level Energy Metering		Required	
Y			Prereq 4	Fundamental Refrigerant Management		Required	
6			Credit 1	Enhanced Commissioning		6	The commissioning authority follows the mechanical, electrical, and plumbing activities, and the building's thermal envelop in accordance to ASHRAE Guideline.
18			Credit 2	Optimize Energy Performance		18	Passive design strategies are used, in combination with the rammed earth material envelop, and a good insulation system to reduce the energy load by 50%
1			Credit 3	Advanced Energy Metering		1	Advanced energy metering is incorporated into the design
		2	Credit 4	Demand Response		2	
		3	Credit 5	Renewable Energy Production		3	The project doesn't depend any renewable energy source, such as solar or geothermal
1			Credit 6	Enhanced Refrigerant Management		1	There is no use of any refrigerants in the project in order to aid in reducing ozon depletion
		2	Credit 7	Green Power and Carbon Offsets		2	

			Materials and Resources		**Possible Points:**	13	
Y			Prereq 1	Storage and Collection of Recyclables		Required	
Y			Prereq 2	Construction and Demolition Waste Management Planning		Required	
3			Credit 1	Building Life-Cycle Impact Reduction		5	Reduction of green house gases due to the use of rammed earth, use of natural light and ventilation in order to reduce the amount of non-renewable energy resources used,
2			Credit 2	Building Product Disclosure and Optimization - Environmental Product Declarations		2	Environmental product decleration and review of lifecycle confirmed to ISO
2			Credit 3	Building Product Disclosure and Optimization - Sourcing of Raw Materials		2	raw material source and extraction committed to reducing environmental harms
2			Credit 4	Building Product Disclosure and Optimization - Material Ingredients		2	Materials used have a Health Product Declaration [e.g. drywall], building products are sourced from product manufacturers that are in place to optimize health and safety [concrete which is used for more than 25% of the building materials]
2			Credit 5	Construction and Demolition Waste Management		2	Waste during construction will be limited to 2.5 pounds per swuare foot or less

			Indoor Environmental Quality		**Possible Points:**	16	
Y			Prereq 1	Minimum Indoor Air Quality Performance		Required	
Y			Prereq 2	Environmental Tobacco Smoke Control		Required	
2			Credit 1	Enhanced Indoor Air Quality Strategies		2	Have Co2 dedictors, natural and good mechanical ventilation system
3			Credit 2	Low-Emitting Materials		3	Low emittion materials, concrete, rammed earth
1			Credit 3	Construction Indoor Air Quality Management Plan		1	Good control of air during construction
1			Credit 4	Indoor Air Quality Assessment		2	The building will undergo a flush-out with required air volume
1			Credit 5	Thermal Comfort		1	Thermal mass of rammed earth, a good radiant floor heating, and a goor HVAC system
1			Credit 6	Interior Lighting		2	The spaces have multizone control systems, lighting is controlled for presentations, available switches
3			Credit 7	Daylight		3	75% of the requlary occupied spaces is naturally lit
1			Credit 8	Quality Views		1	Multiple different views achieved through the presence of curtain walls and windows looking onto the courtyard and sunken plaza as well as viewing the area around the building and the neighbourhood.
1			Credit 9	Acoustic Performance		1	The use of rammed earth as well as different interior finishes provides a good acoustic environment for the library

			Innovation		Possible Points:	6	
2			Credit 1	Innovation	5		Performance achieved in an existin LEED V4 prerequisite
1			Credit 2	LEED Accredited Professional	1		Supervised by Terri Boake

			Regional Priority		Possible Points:	4	
1			Credit 1	Regional Priority: Specific Credit	1		Construction wase management provided
1			Credit 2	Regional Priority: Specific Credit	1		Regional materials, rammed earth, concrete, and local plants
1			Credit 3	Regional Priority: Specific Credit	1		Storm water management plan
1			Credit 4	Regional Priority: Specific Credit	1		Water use reduction in toilets, urinals, faucets

76			**Total**	Possible Points:	110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

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