

Chapter 7

TECHNOLOGY

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7.1 TECHNICAL CONCEPT

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The tectonic concept is a development of the design concept as an attempt to bring the conceptual intentions to a technical resolution. The architecture aims to articulate the edge condition, both inside and outside, to give expression to the movement of people, their interaction between programs and the physical context.

The horizontal plane is explored as a series of stereotomic elements that form an extension of the ground plane. This element becomes multifunctional at times to allow for movement above and define space below. The separation and overlapping of the floor planes allows for the interaction between spaces. This is expressed with tectonic elements to allow for visual or physical connections between people and the context. The transition of stereotomic and tectonic is also explored vertically to give expression to the program of the building - The public and the ground, towards more private connecting with the sky.

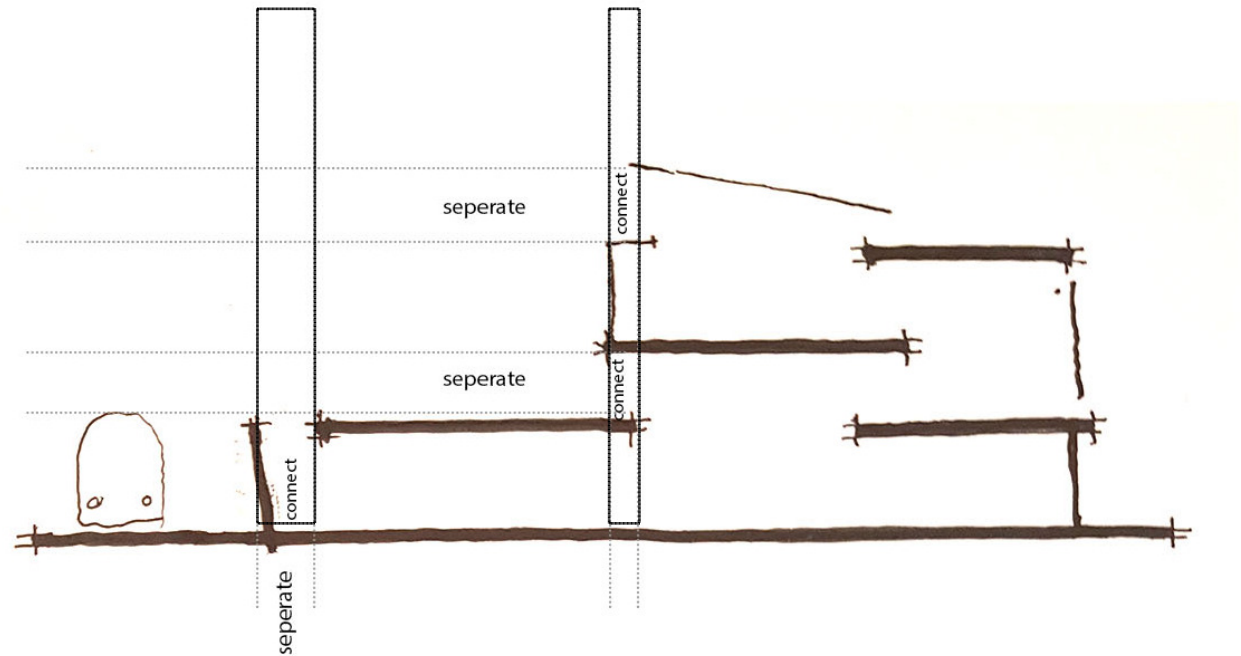


Figure 7-01: Tectonic Concept (Author, 2019)

7.2 STRUCTURAL SYSTEM

7.2.1 PRIMARY STRUCTURE:

The primary structure of the building is the concrete skeleton made up of rectangular and circular columns. Concrete beams span between the columns and support the concrete floors spanning between them. At points, the floor slab is pulled away from the columns to give expression to these connections. The columns define the movement/circulation paths in the building while establishing vertical connections between floors. The overlapping floor plates creates a series of edge conditions that become thresholds/in-between spaces within the building's interior and exterior. The scale of these spaces adds spatial variety within the building and allow for visual interaction between floors and programs.

7.2.2 SECONDARY STRUCTURE:

The secondary structure is made of rectangular steel sections that support the roof and cladding of the building. The form of the roof allows for ample south light to enter the building while allowing for views towards the sky through glass frames inserted between the structure.

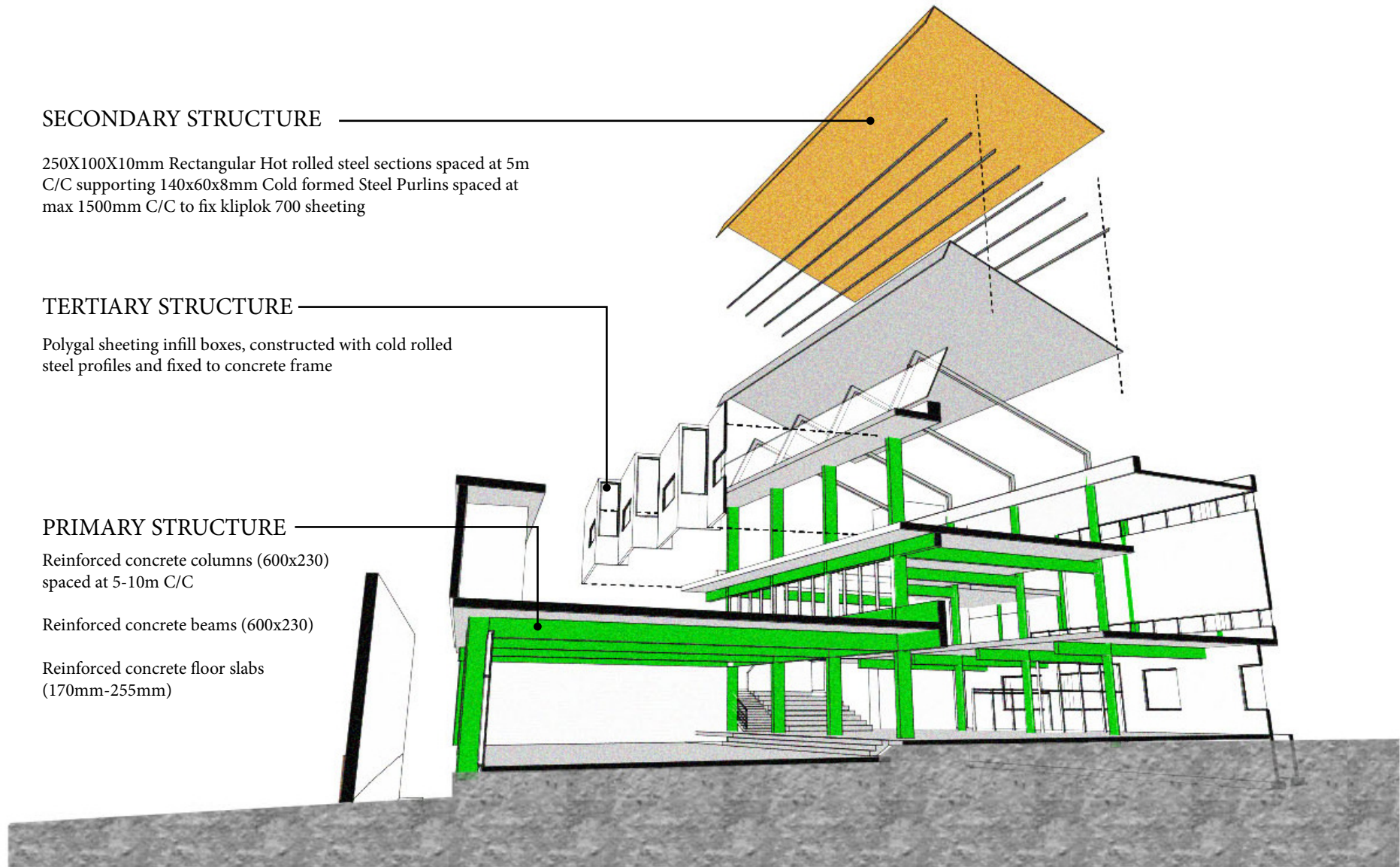
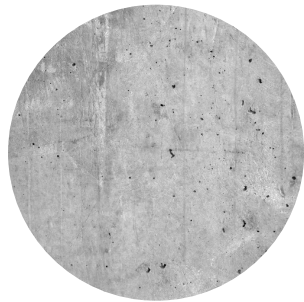


Figure 7-02: Structural system (Author, 2019)

7.3 MATERIALS



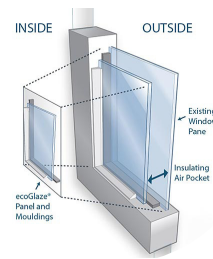
Concrete

The main representative structural elements consist of reinforced concrete columns at 5 to 10 meter intervals. The columns give expression to the vertical connection between spaces.



Structural Steel

The main roof structure is constructed with (size)mm Hot rolled rectangular steel portal frames. The structure supports the roof assembly and becomes a lightweight element that contrast the heavy concrete form.



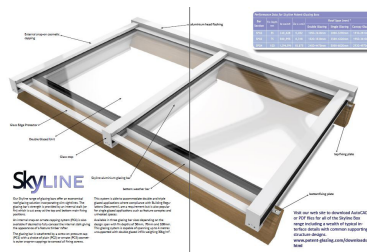
Single and Double glazing

Double glazing is used at ground floor level to reduce the noise generated from the trains while allowing natural light to enter the space/s. The insulating air pocket also reduces heat loss within rooms.



32mm Thermogal - Isolation sheeting

Durable, translucent and lightweight material to be used as wall cladding on the southern edge to allow for daylight and to permit light towards the exterior at night. The sheeting provides good thermal insulation with a U-value of 1.3 w/m2 and a light transmittance of 15%.

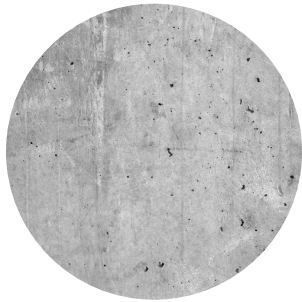


Patent Glazing

Double glazed patent glazing system consisting of glazing bars and cover panels.

Figure 7-03: Material palette Author, 2019)

horizontal



Concrete floor

170 and 255mm Cast-in-situ reinforced concrete according to required span are used as floors (inside and outside) and flat roof structures.



Kliplok 700 sheeting

Kliplok roofsheeting will enclose the main roof structure and give tightness of the steel portal frame.



Veneered wood grill ceiling panels (Hunter Douglas)

The veneered wooden grill system consists of wooden slats that are secured to each other with an aluminium dowel to form a grill panel. The system is demountable to provide easy access to service plenums mounted to concrete surfaces. The wood finish adds a warm feel to the spaces and has good acoustic qualities ideal for the library and lecture hall.



ceilings (flush plaster)



210x210x60mm Pavers

Paving bricks are used on the exterior movement paths and public gathering spaces. It's low on maintenance and durable to withstand the harsh conditions of the context.

7.4 ENVIRONMENTAL CONSIDERATIONS

7.4.1_DISPLACEMENT VENTILATION

Displacement Ventilation is an air distribution technology that introduce cool air into a zone at low velocity, usually at a low level. Buoyancy forces ensure that the supply air pools near the oor level, allowing it to be carried up into the thermal plumes that are formed by heat sources. Heat is extracted at higher levels. This makes the system more efficient that traditional air conditions technology and is effective at delivering fresh air to occupants while removing many of the contaminants associated with heat sources. There are however some limitationsc/consideration to the application of the system, this includes the size and placement of diffusers, especially where there is limited wall area to position diffusers. Various types of diffusers are available to solve these issues. They can either be wall mounted, free standing or encased in the floor. Within the design of the library, care should taken to position these elements so they do not obstruct or limited the spatial organization of furniture etc.

The design of the section considers various strategies to integrate the ventilation system. Wall mounted diffusers are used where wall spaces are available, where as encased floor units are used on the upper floor where the supply air plenum can be located in the ceiling below. The duct allows for the system to be integrated vertically. From there, it can branch out horizontally within the ceiling spaces or selected wall surfaces.

7.2.1_EARTH TUBES

The cooling process of the air conditioning unit are optimised by integrating a earth tubes system to the process. The earth tubes run 3m under the ground, where the soil is at a stable temperature of 18 °C during the year. This allows cool air to enter the HVAC system.

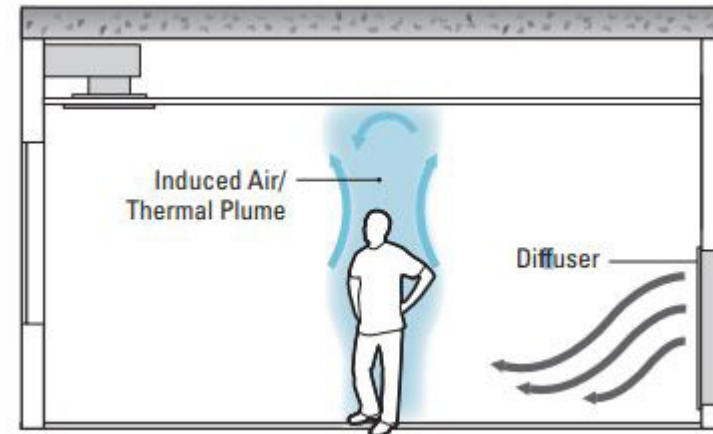


Figure 7-04: Principle of displacement ventiliation (<https://www.priceindustries.com/content/uploads/assets/literature/engineering-guides/displacement-ventilation-engineering-guide.pdf>)



Figure 7-05: Wall mounted/recessed wall diffuser(<https://www.priceindustries.com/content/uploads/assets/literature/engineering-guides/displacement-ventilation-engineering-guide.pdf>)

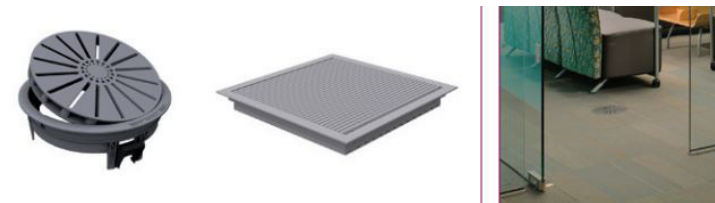


Figure 7-06: Displacement floor diffuser (<https://www.priceindustries.com/content/uploads/assets/literature/engineering-guides/displacement-ventilation-engineering-guide.pdf>)

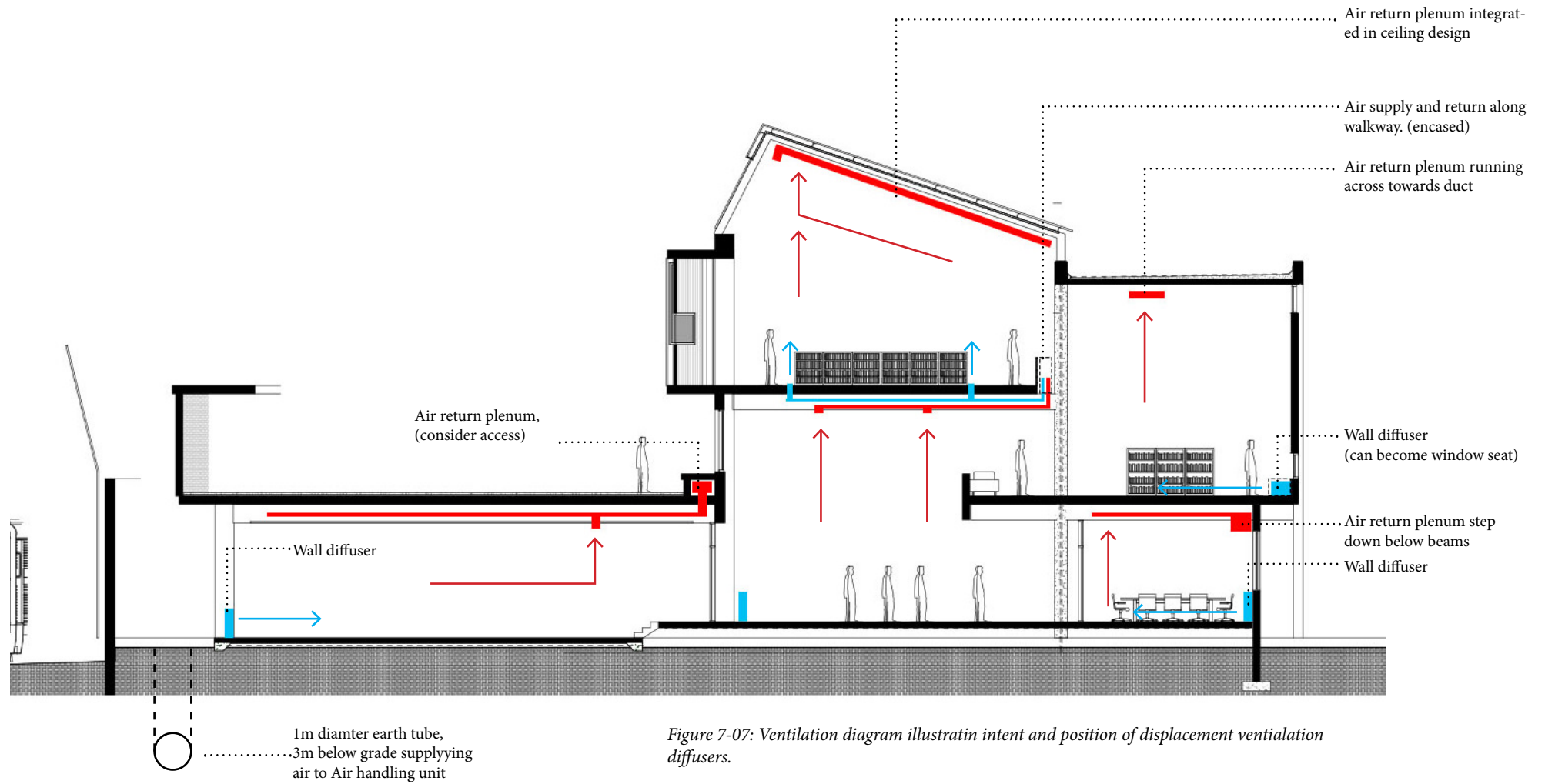


Figure 7-07: Ventilation diagram illustrating intent and position of displacement ventilation diffusers.

7.4.1_SOUND AND ACOUSTICS

The existing noise of the trains are addressed by using the following strategies to mitigate the noise levels.

Layer 1: 150mm thick Mineral fibre wool are used as part of the railway barrier in order to absorb the low frequency ranges emitted by the trains.

Layer 2: Sound that passes through the mineral fibre wool is reflected by density in the form of the concrete wall. The sound is reflected back towards the absorption panel.

Layer 3: Double glazing is used to allow for daylight to enter the building as well as to further reduce the sound levels at this point.

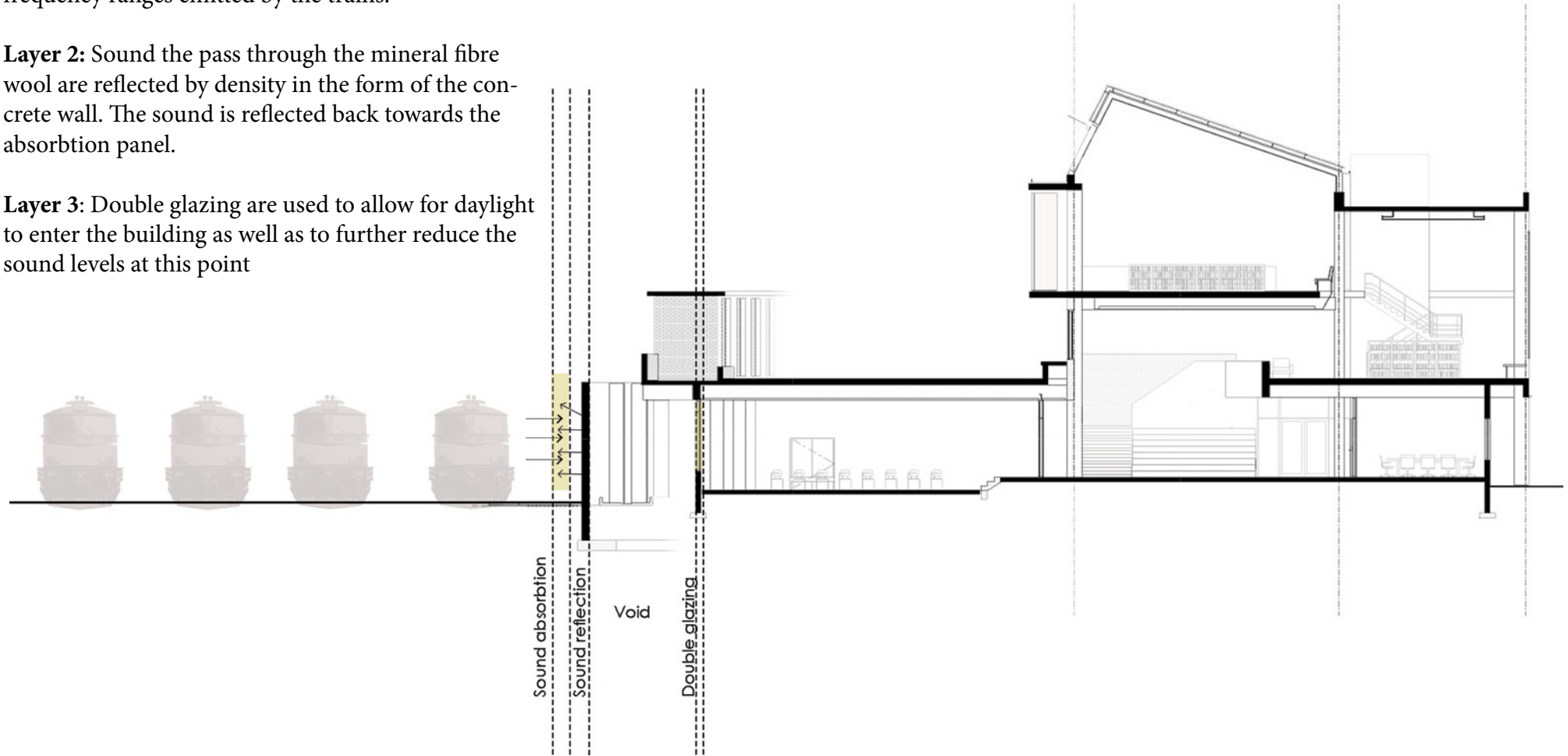


Figure 7-08: Sound reflection, absorption and isolation diagram (Author, 2019).

7.6 FINAL DESIGN

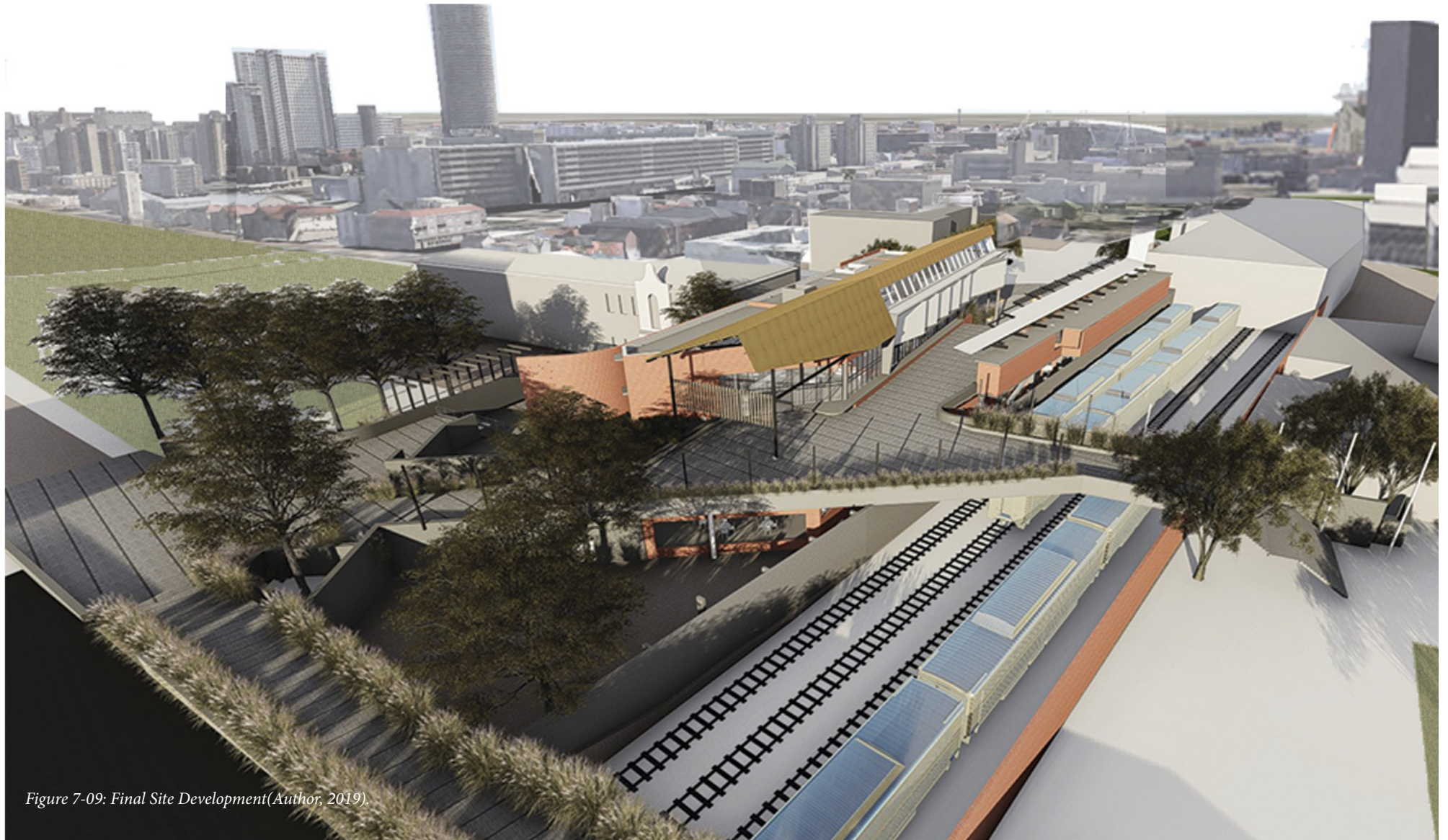


Figure 7-09: Final Site Development (Author, 2019).



FLOOR PLAN LEVEL 0

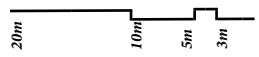


Figure 7-10: Ground Floor plan (Author, 2019).



FLOOR PLAN LEVEL 2

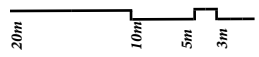


Figure 7-12: Second Floor plan (Author, 2019).

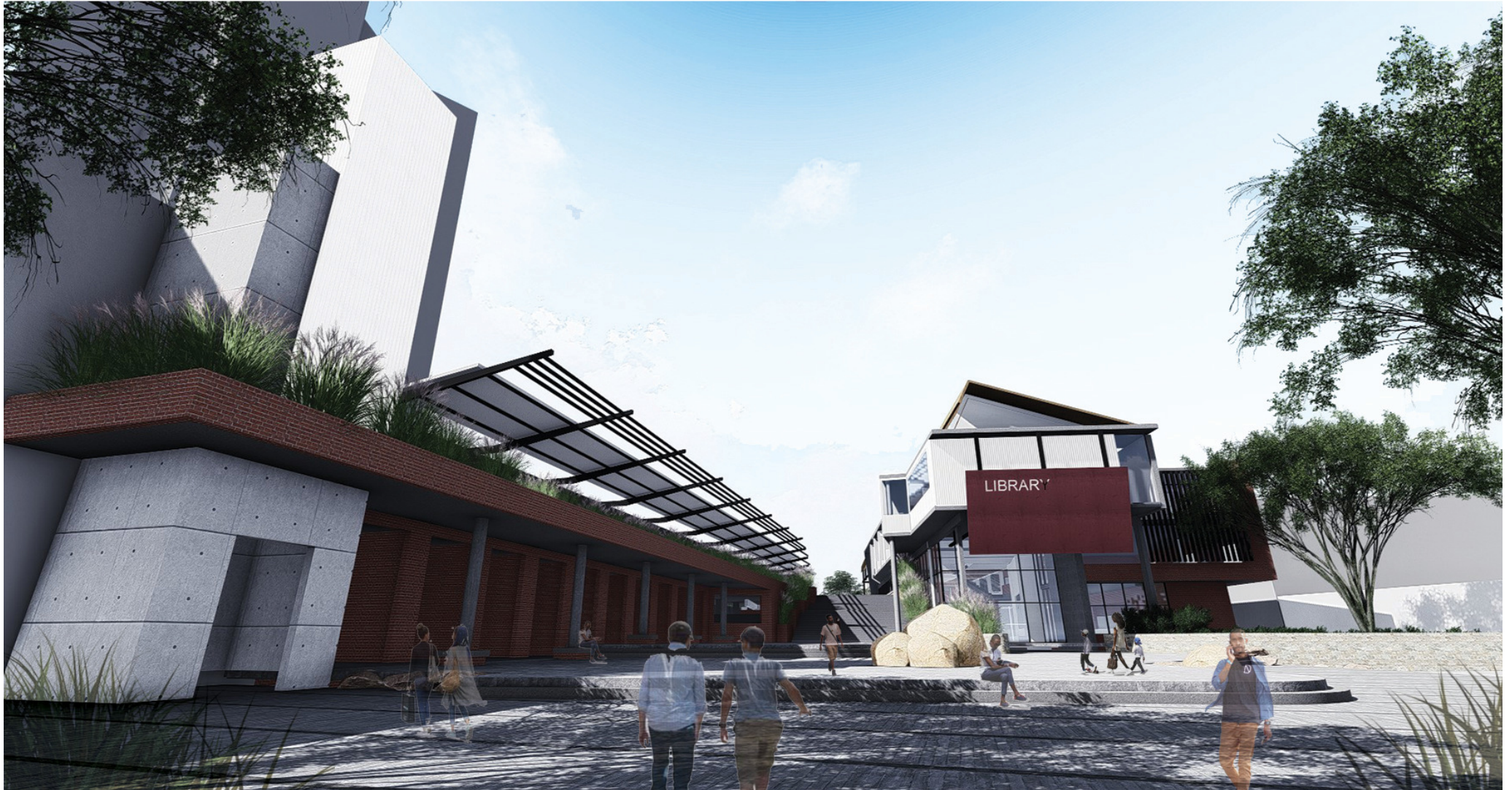


Figure 7-13: Perspective from station towards new public plaza and library (Author, 2019).

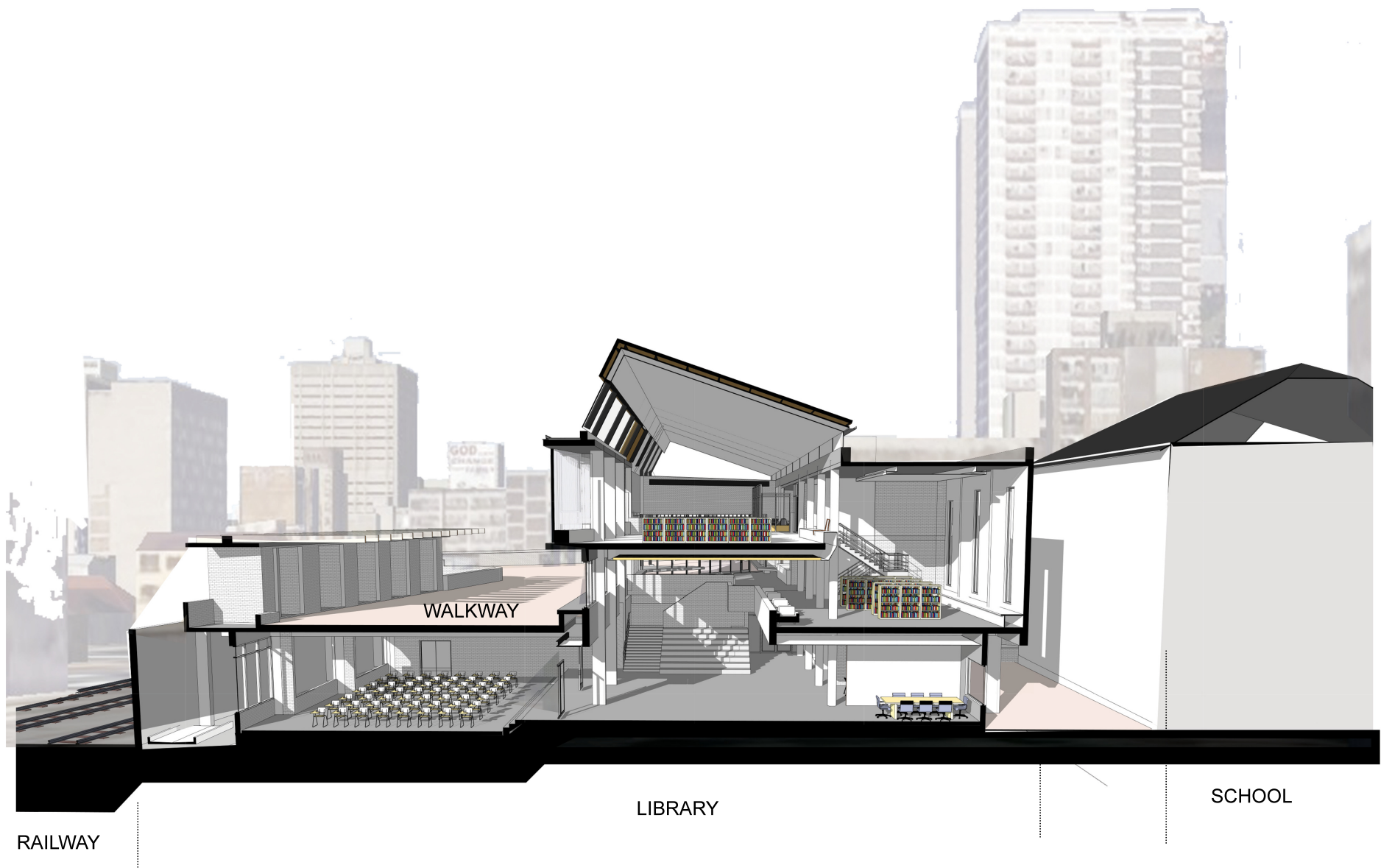


Figure 7-14: Cross section through library and public walkway (Author, 2019).

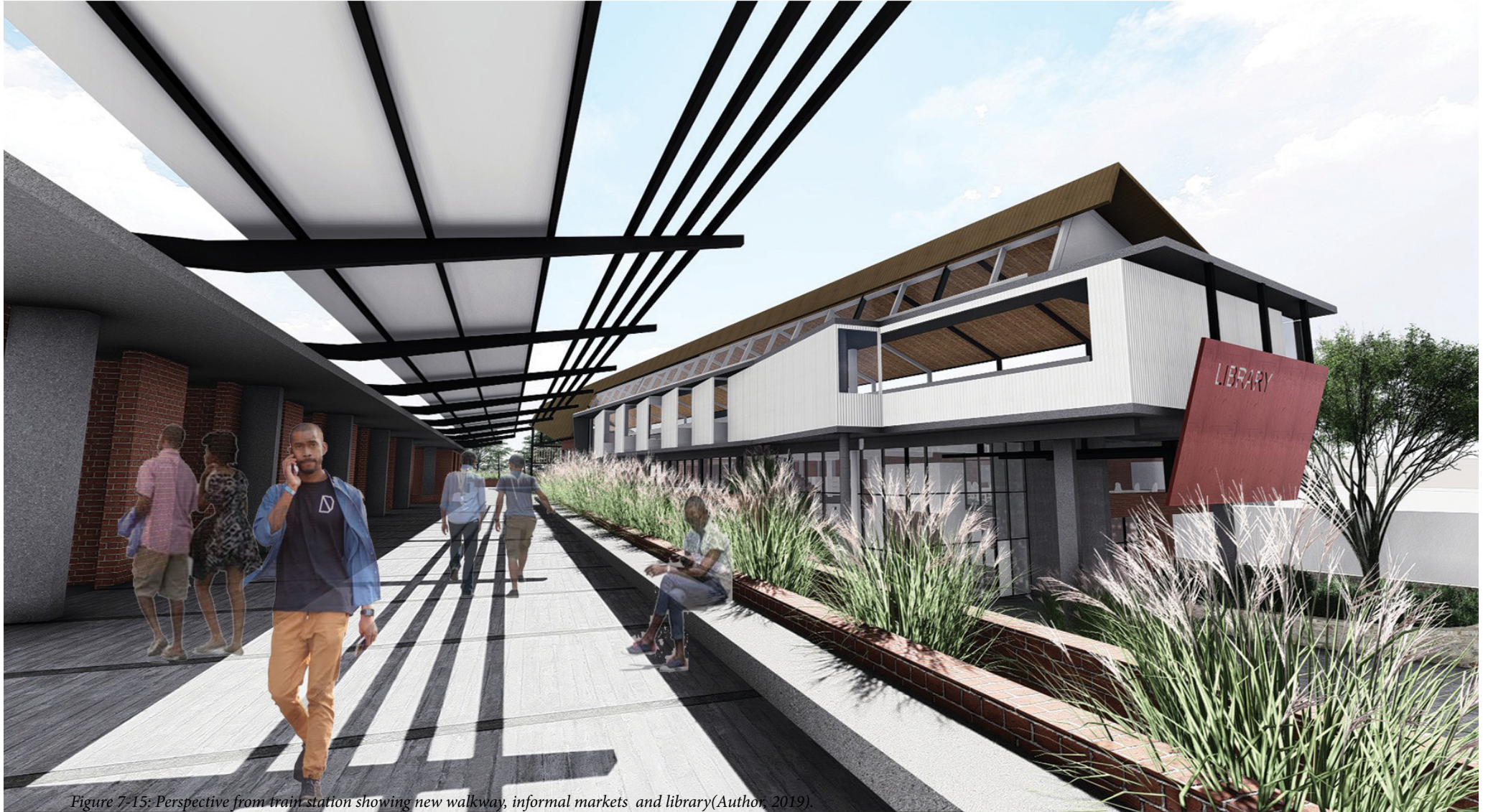


Figure 7-15: Perspective from train station showing new walkway, informal markets and library (Author, 2019)

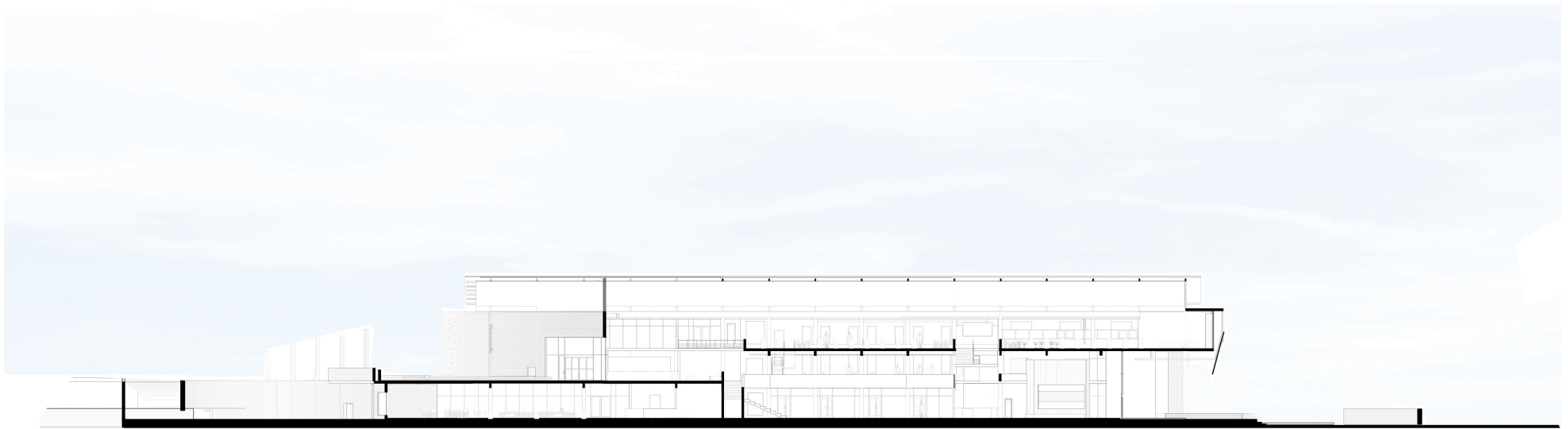


Figure 7-16: Longitudinal Section through library (Author, 2019).



Figure 7-17: Perspective view showing approach to library and school (Author, 2019).

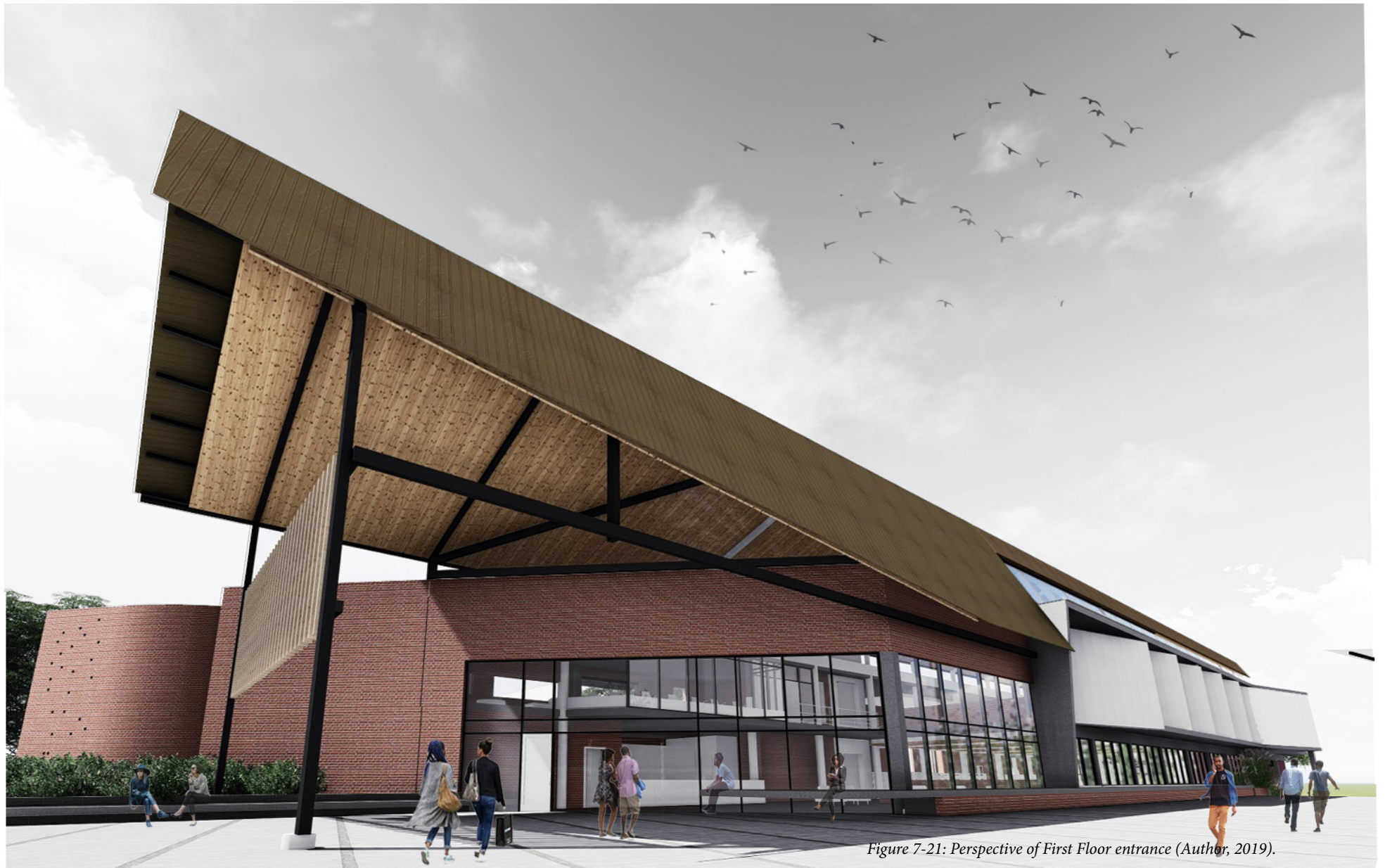


Figure 7-21: Perspective of First Floor entrance (Author, 2019).

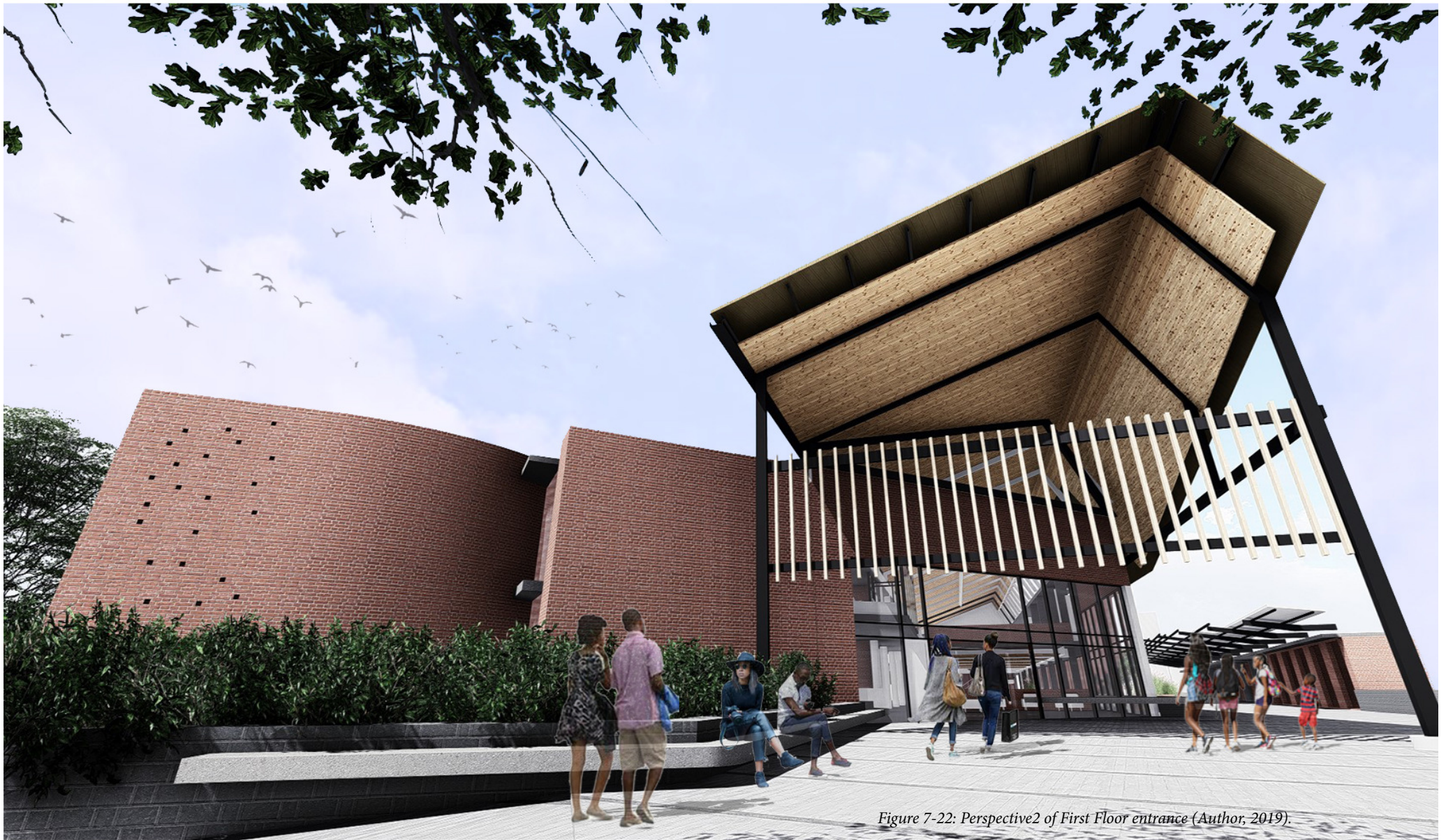


Figure 7-22: Perspective2 of First Floor entrance (Author, 2019).

