

The technical expression of the design is based on the advent of robustness.

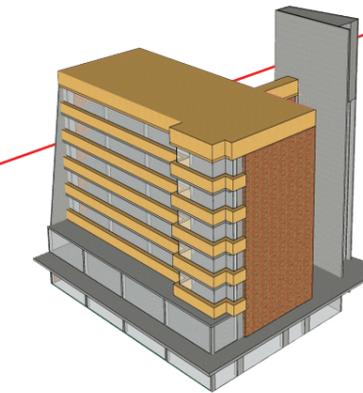
TECHNICAL INVESTIGATION

Introduction

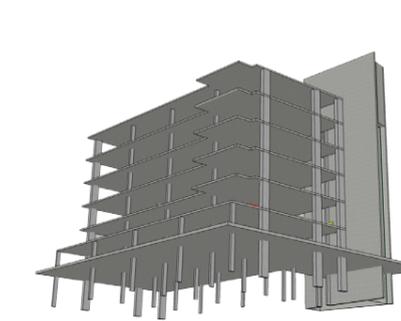
The architectural proposal is conducive to youth obstinacies in the sense that artistic content expressed around and within the building will not be considered as vandalism but as art. This manifested the robustness of the material choices for the design; the technical articulation of the design was to express a shed like structure within a predominantly masonry and concrete urban environment. The diverseness of the structure within the existing urban environment narrates with the distinctive expression of the design.

Structure of the Old Police building:

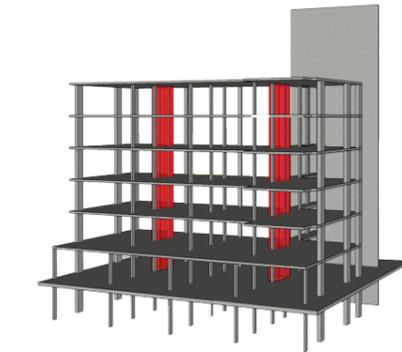
The centre for youth sub cultural expression is part of an existing intervention. The old police building consists of face brick external walls, it has a one way post tensioned structural system whereby the main structural columns are placed on the edge of the building in a west – east orientation. The building has two existing service ducts that extend from the sixth floor slab up to the first floor slab; this slab is a 300mm thick and carries the service pipes from the ducts.



Existing



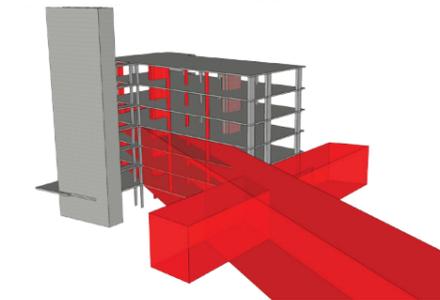
Slabs and columns



Ducts



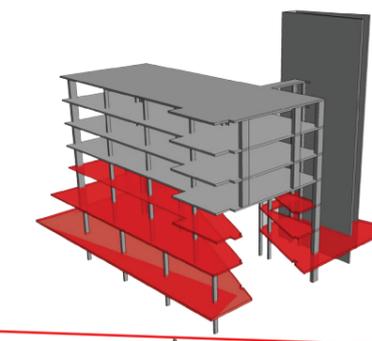
Perspective of intervention and elements to be demolished



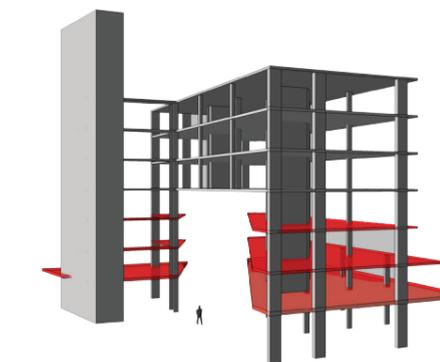
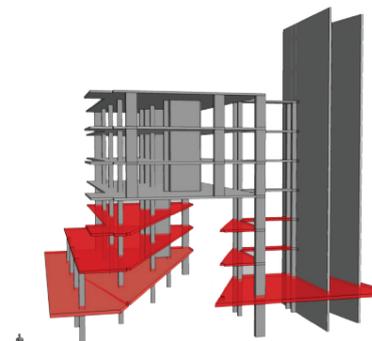
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The New Building:

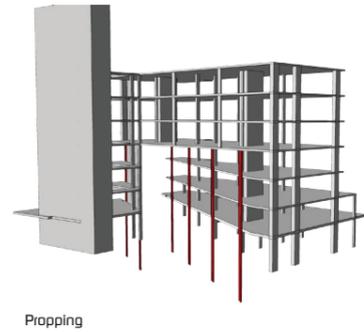
The intervention punctures through the first, second and third floor slabs of the existing building. The columns that run down from the bottom of the third floor slab to the column's foundation will be demolished. The process of this system is a complex procedure. Specialist engineers render the process viable, as long as the proposed intervention will support the existing structural system. The new structural system both supports the existing structure and facilitates the new functions proposed for the building.



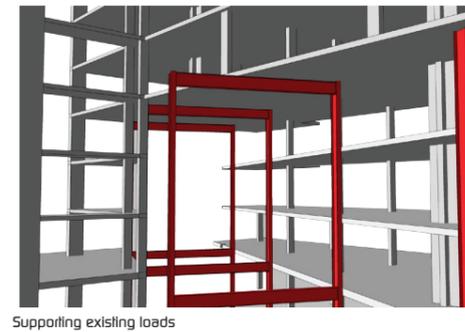
Proposed



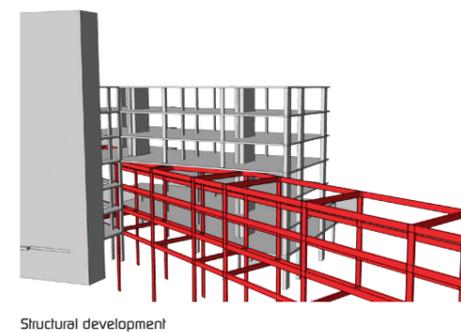
The structure for the new building effectively acts as a large girder truss or space frame. The new structure is three floors high and comprises of steel beams and columns that holistically acts as one major beam punctured through the existing building.



Propping



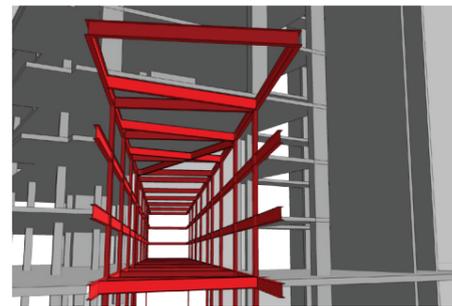
Supporting existing loads



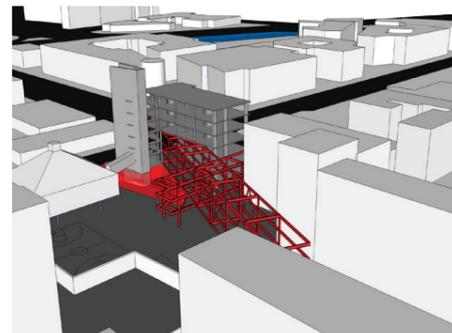
Structural development

Structural Articulation:

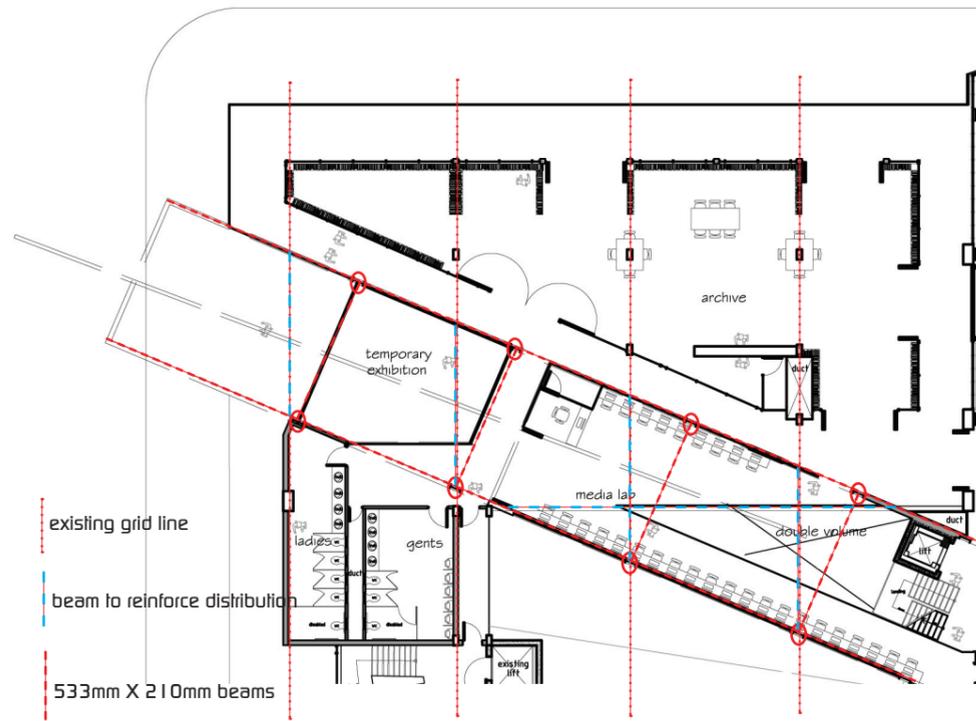
The new building's structure comprises of I – section steel beams and columns, the beams are 533mm deep and 210mm wide. The beams support the loads from the existing floor slab and columns that have been retained above the third floor. In order to achieve symmetry, the beams of the new building must cater for the load distribution along the grid lines of the existing building. The design of the structure, essentially provided a beam running in the direction of the initial space occupied by the demolished column. Therefore, the beam running underneath the retained column transfers the loads along the edge beams of the new structure and then into the foundation via the new columns. This load distribution via the new beam must be implemented at all areas within the existing structure whereby its initial load has been affected.



Perspective showing beams



Structure works as a holistic beam through the old building



- existing grid line
- beam to reinforce distribution
- 533mm X 210mm beams
- 533mm X 210mm columns

Fig.169 Structural system in plan

Steel:

Steel belongs to that group of metals containing iron, known as ferrous metals, which includes cast iron, wrought iron and steel, as well as alloys like stainless steel and weathering steel. Of the common building materials, steel is the strongest and toughest. It has high thermal conductivity and it is comparatively cheap to extract and shape. Steel is easy to recycle, and the energy to do so is small. Of the ferrous metals steel is the cheapest and by far the most used metals in the construction industry.

Design:

The steel structure's geometry and profiles should be inspected and certified by a professional engineer or other certified person according to SANS 10160 for loads, and according to SANS 10162 for the steel structure.

The section of the steel structure for the new building that penetrates the old police building does not have to be braced because it is automatically a stiffened system due to the connections with the existing slabs as well as the loads implemented on it by the retained columns and slabs. The southern part of the structure is braced on the sides and the bottom with equal steel channels. This system is enough, according to specialist engineers to keep the structure in equilibrium.

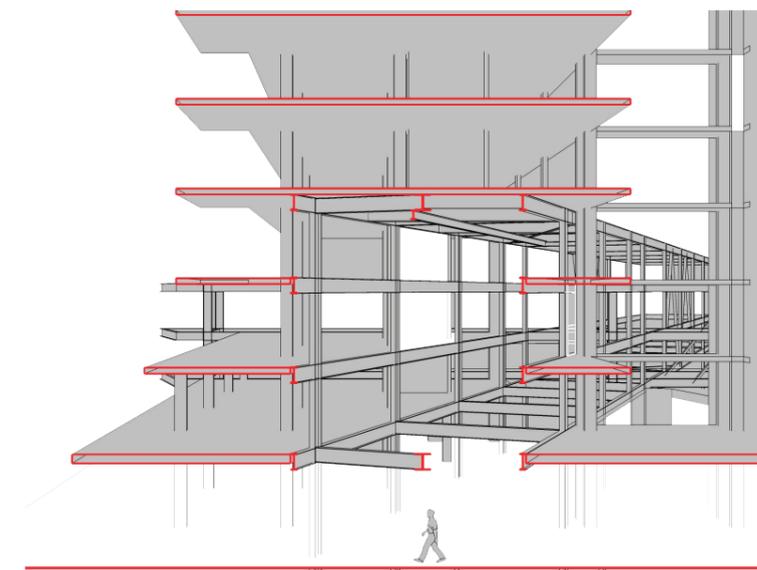
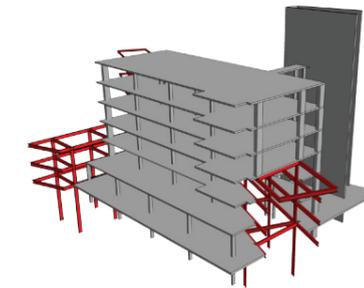
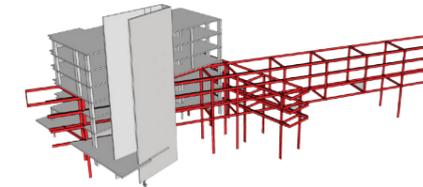


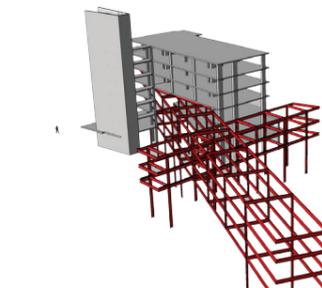
Fig.170 Sectional perspective of structure through the building



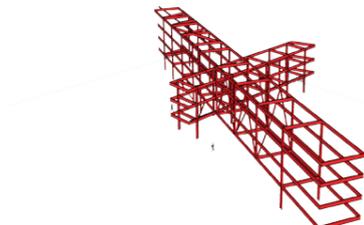
Northwest perspective of fused structural system



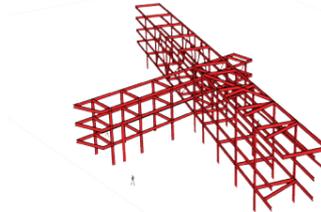
Southwest perspective of fused structural system



Southeast perspective of fused structural system



Southeast perspective of structure



Northwest perspective of structure



Northeast perspective of structure



Southwest perspective of structure

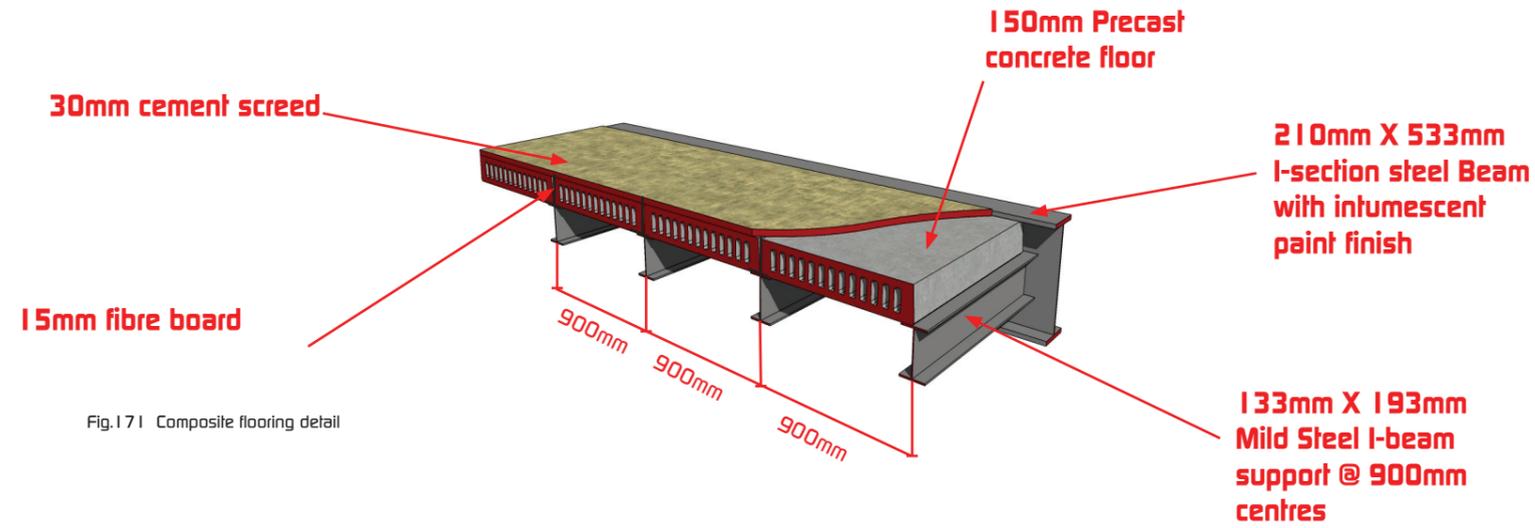


Fig.171 Composite flooring detail

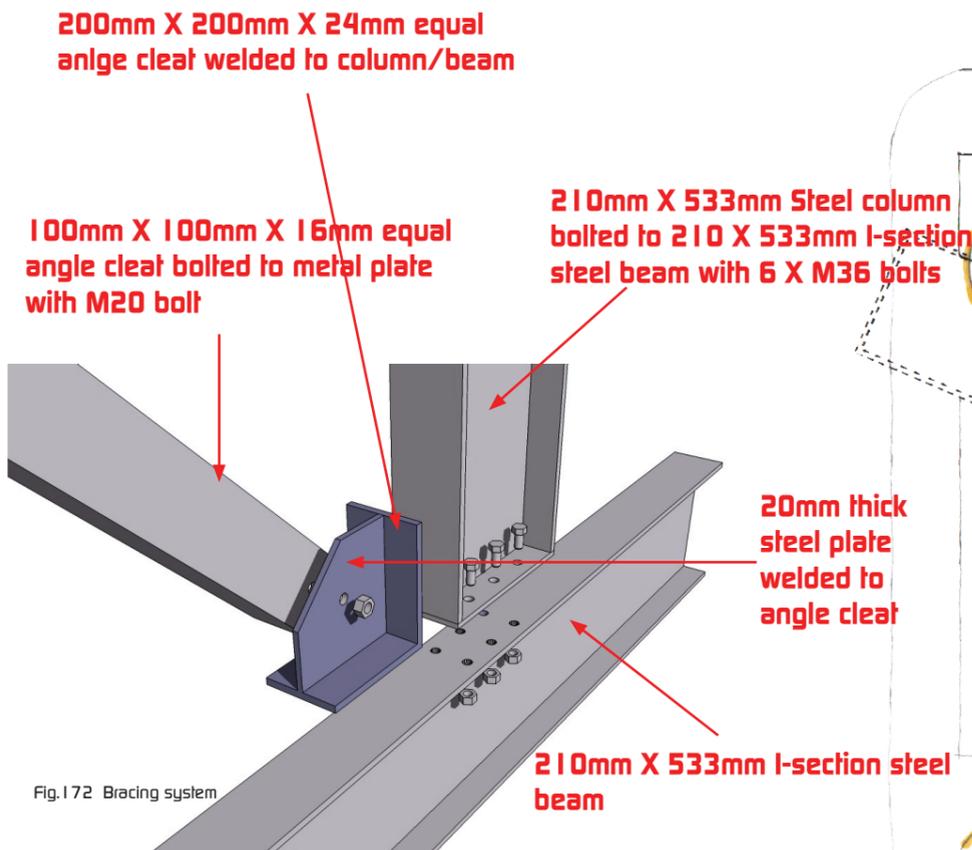


Fig.172 Bracing system

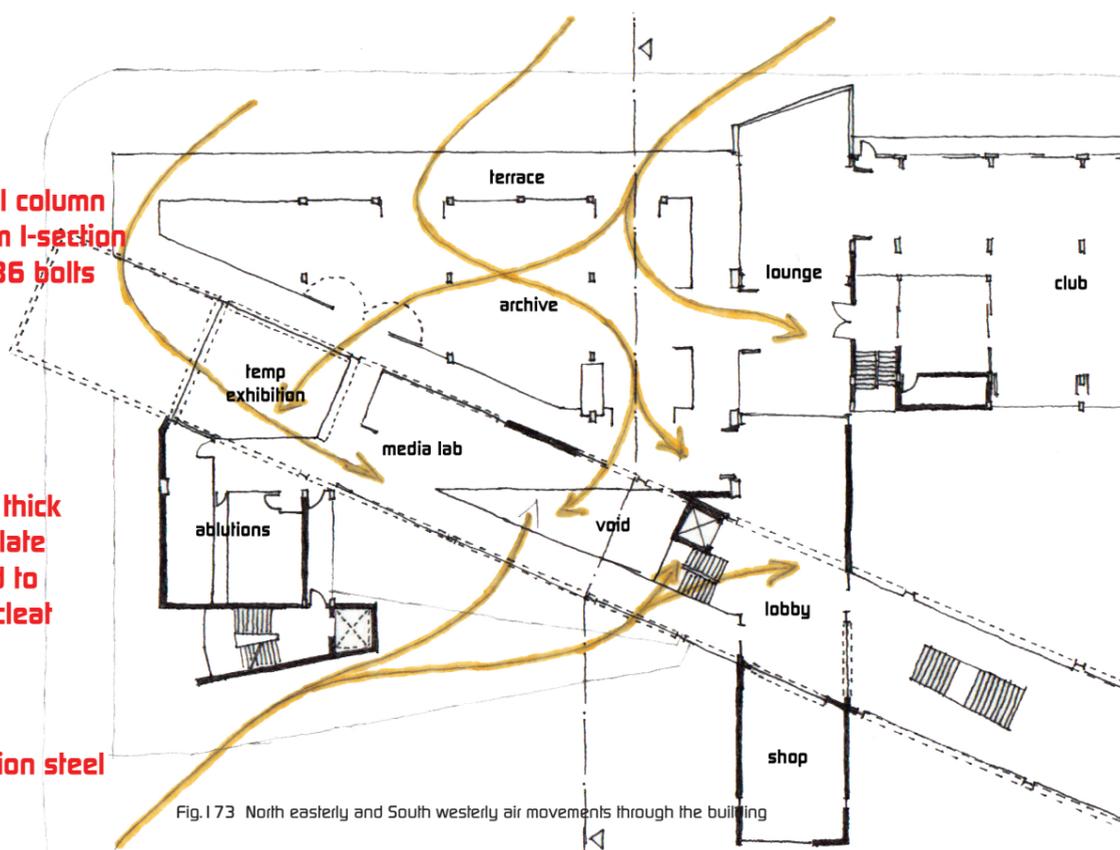


Fig.173 North easterly and South westerly air movements through the building

The stack principle:

Under calm conditions, warmed air within a space moves upward to the ceiling, leaving the cooler air below. This movement is enhanced firstly if the temperature differential between warm and cool air is greater and secondly, if there is greater height in the space in which the air moves. Air is warmed by humans, by lighting, by office machinery or cooking equipment and most often by radiant sunshine passing through a window. [Napier, 2000: 5.2]

Ventilation:

The centre for youth sub cultural expression employs a lot of openable sections within the building. Natural ventilation is achieved through these openings since the building articulates a permeable envelope. The structure employs passive design principles; air flows due to the stack effect, and wind on the surfaces. The provision of a void compliments the stack effect; since hot air rises, it is extracted upwards and the sinking nature of cold air cools areas such as the music studio.

Pressure differentials at openings cause air flow through rooms. Openings at angles greater than 60 degrees relative to the wind will promote good cross ventilation. The efficiency of cross-ventilation depends on the shape and orientation of openings. The leeward openings within the building are larger than the windward openings hence optimal ventilation is achieved. [AAL 210 notes, 2003 - Pieter Joubert]

The building's width is 8.5m, which is optimal to achieve cross ventilation since ventilation rate drops with distance between openings. A shallow room with small openings will be better cross-ventilated than a deeper space [AAL 210 notes, 2003 - Pieter Joubert]. Joubert states that it is recommended that room depth not exceed 5x the room height ($d < 5H$), the distance that the air has to flow in the building is minimized.

Most part of the building employs passive ventilation, areas such as the radio station and the music studio will employ HVAC system for ventilation.

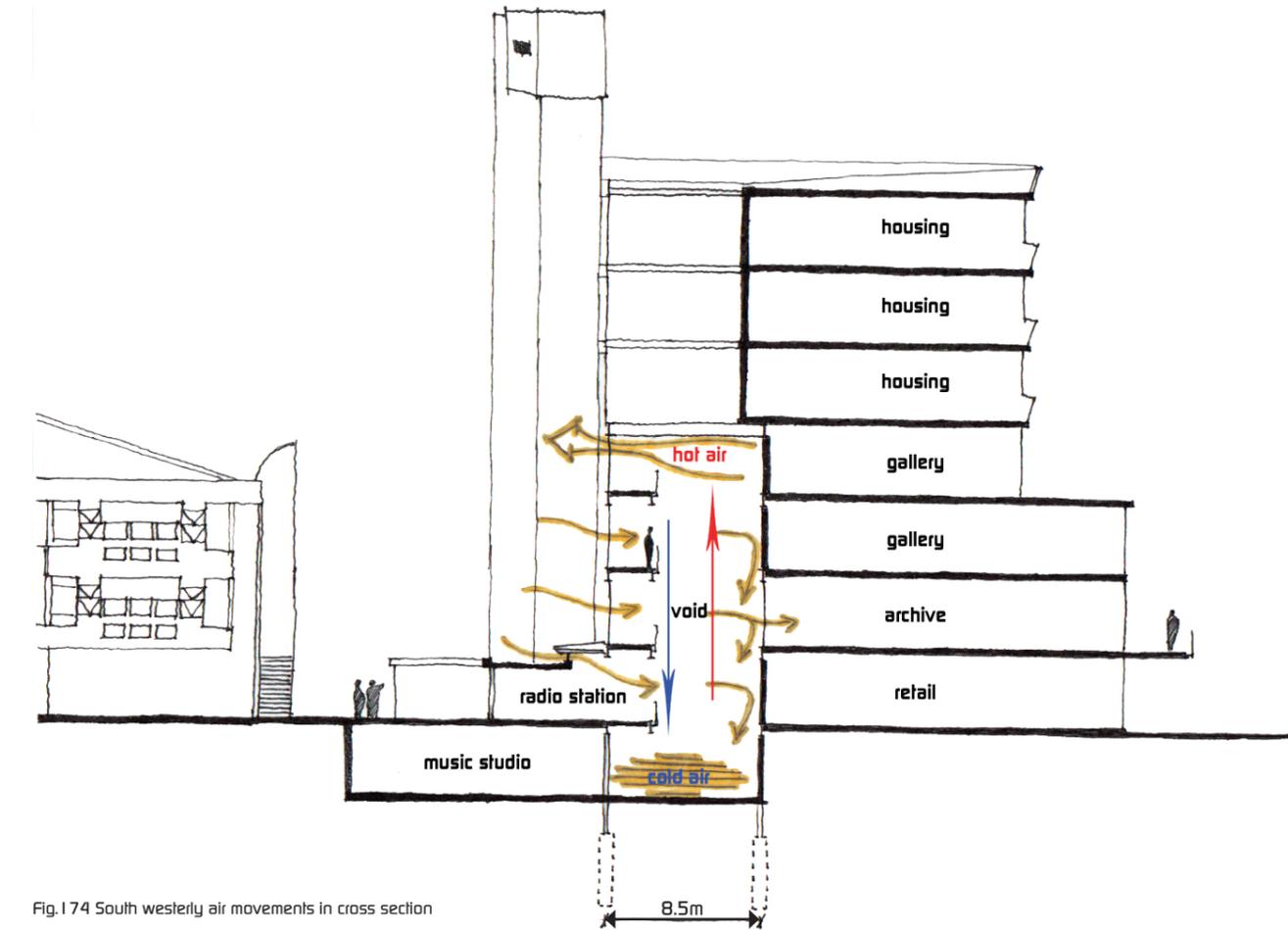


Fig.174 South westerly air movements in cross section

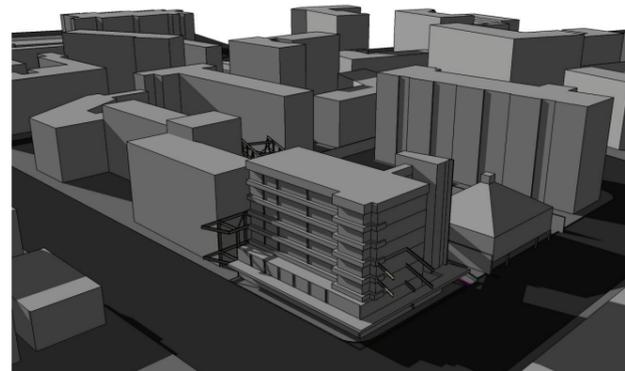
Northern Sun:

The northern façade of the old police building is well design for shading; the existing slabs extend out enough for the building to be shaded against the sun. By referring to the sketches, one can notice how the façade is shaded for summer sun in December but allows sun penetration during winter. For the equinoxes, (March and September), the vertical shadow angle remains constant.

The fused intervention's northern façade needs to be shaded in areas such as the lounge and archive spaces on the first floor. The gallery on the second floor also needs to be shaded; resolving this will be a technical as well as a design feat, since the building expresses itself on the urban realm – a visual statement should therefore be articulated.

The red lines indicate the façade of the fused intervention; the fact that the design extends from the existing building denotes that the extended area does not form part of the shading system that the old police building employs. The northern façade of the new building will be bi functional; technically, it will serve as a sun protection device and aesthetically it will form part of the visual statement that the design conveys unto the urban realm.

An analysis of the existing sun penetration onto the northern façade of the old police building was done in order to gain insight into the specific design of sun control.



21 March / September @ 08H00



21 March / September @ 10H00



21 March / September @ 12H00



21 March / September @ 14H00

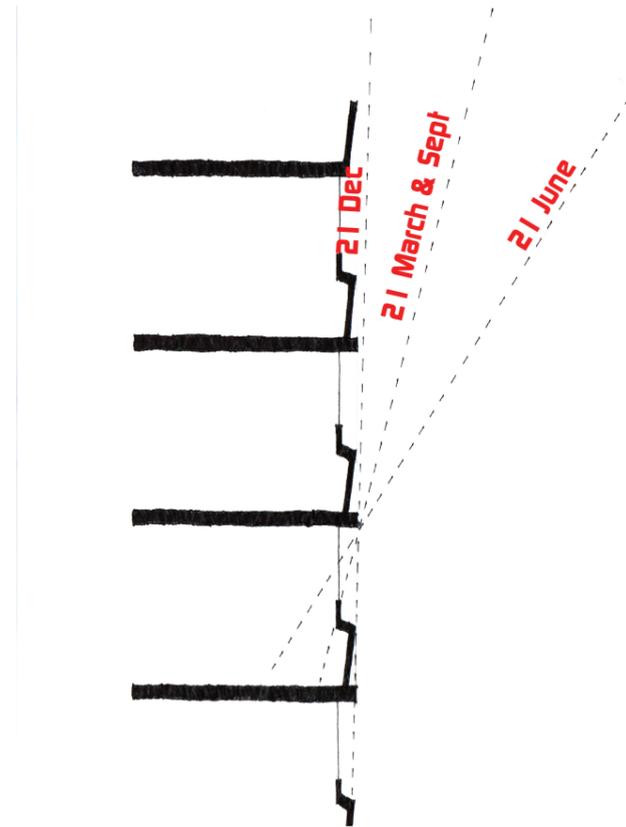
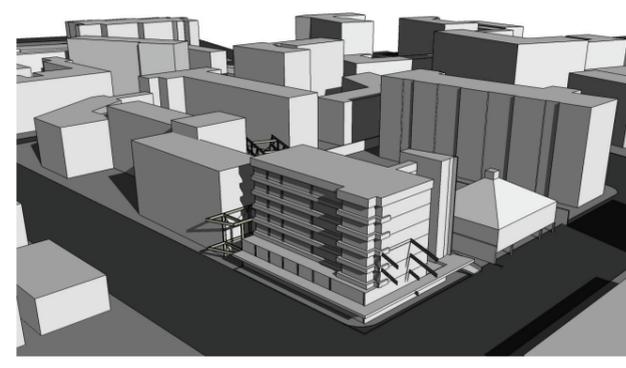


Fig.175 External window and wall of Old Police building



21 March / September @ 16H00

The Design:

The concept of the sun shading device persists with the concept of resistance; the idea is to generate a skin that expresses against the linearity of the existing façade of the old police building. The material composition of the shading device will be composed entirely of steel; again an advent against the masonry composition of the existing building. The spaces that will be shaded by the sun device have glazed facades; hence the shading device should provide shade for summer sun but allow light for winter sun.

The initial bi functional nature of the shading device perseveres yet again, the design of the device for the new building works as a balustrade as well as a shading device. The device is constituted of red Cor – ten steel mesh, the motive is for the mesh to stain the existing building which will signify the building as an invaded space by the subculture.

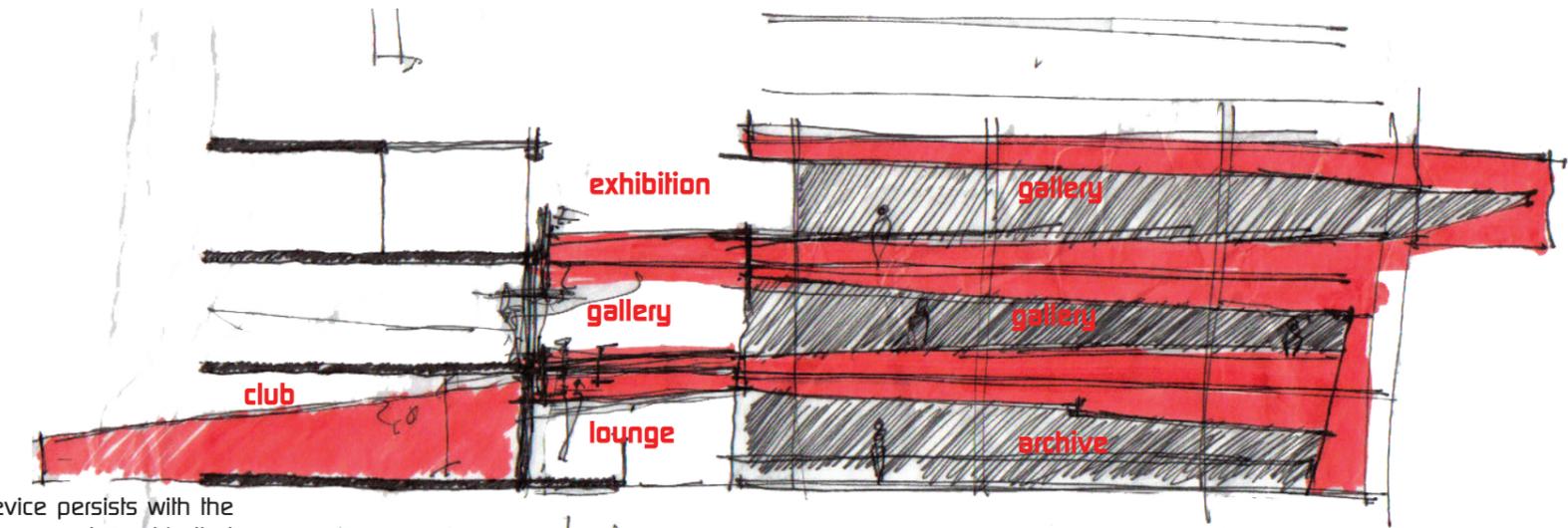
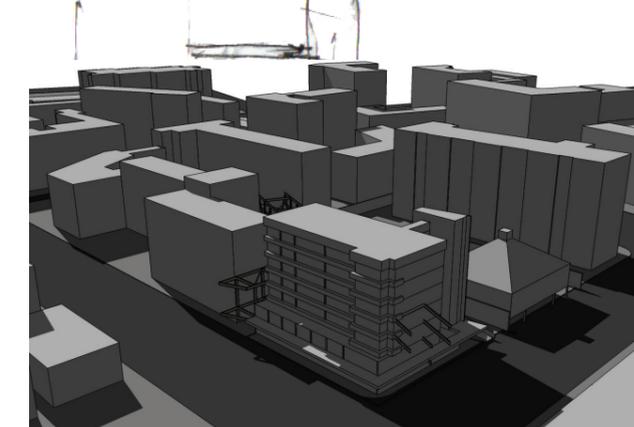
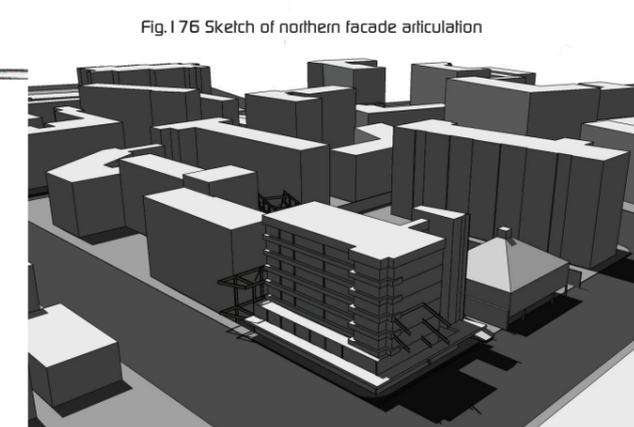


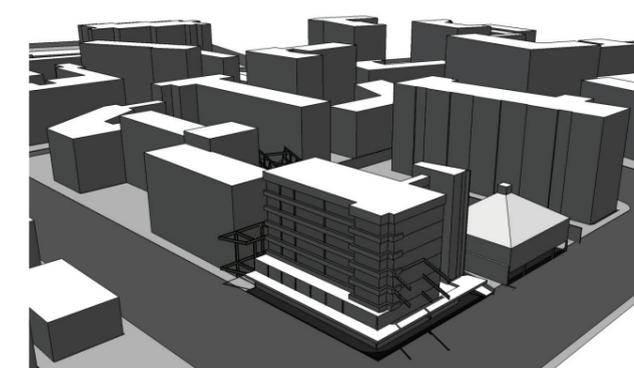
Fig.176 Sketch of northern facade articulation



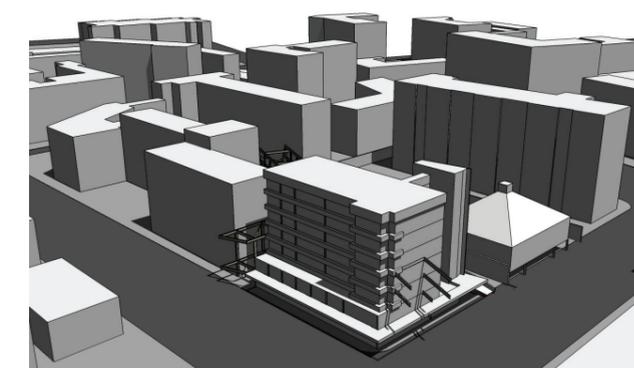
21 December @ 08H00



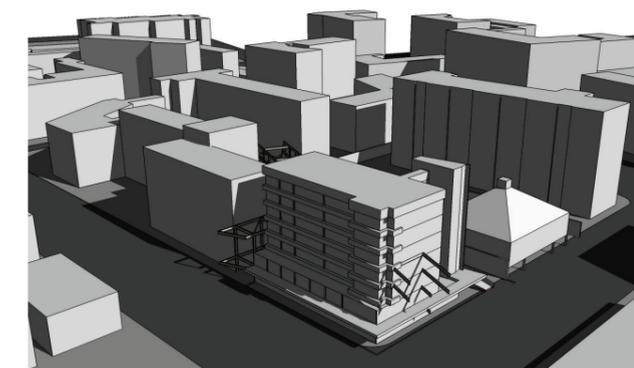
21 December @ 10H00



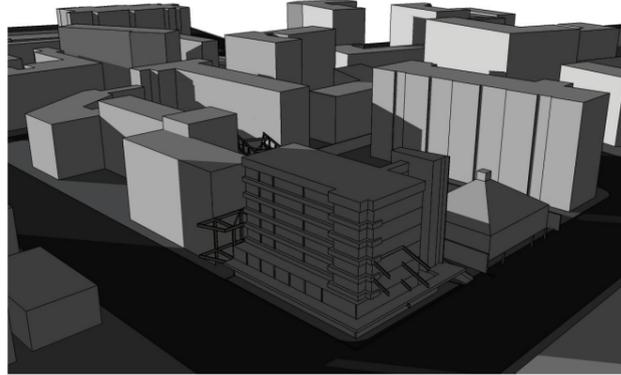
21 December @ 12H00



21 December @ 14H00



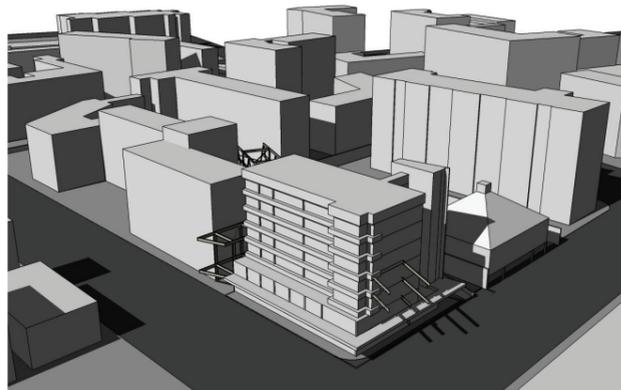
21 December @ 16H00



21 June @ 08H00



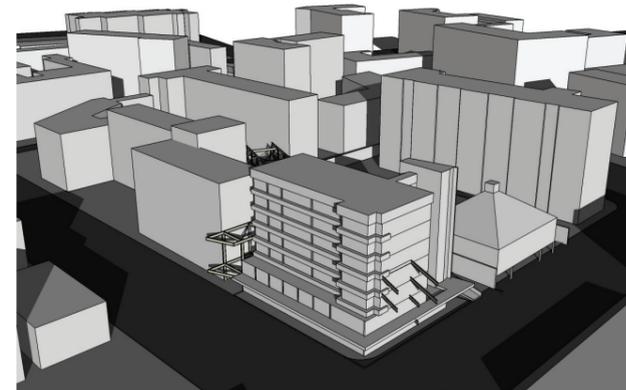
21 June @ 10H00



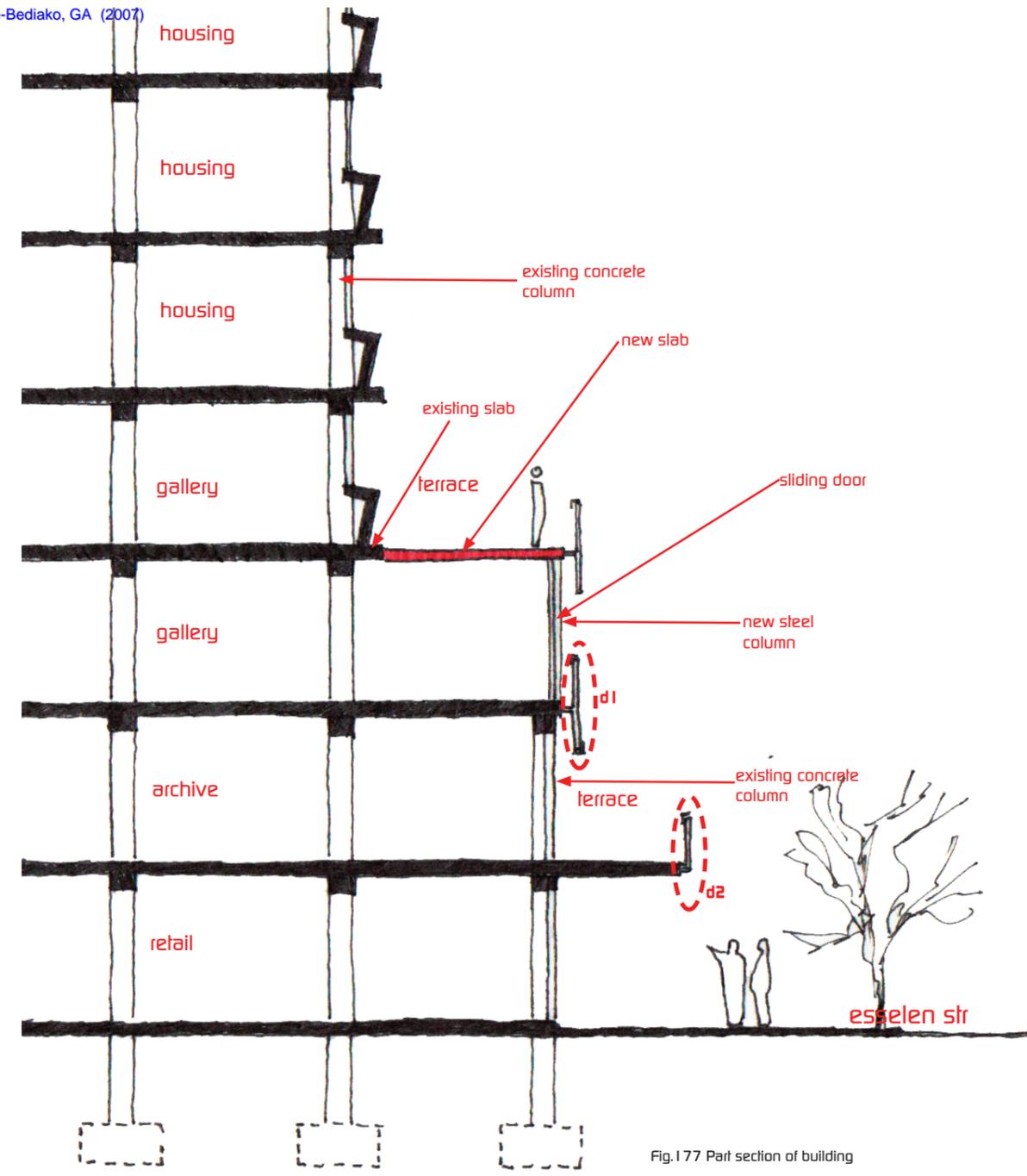
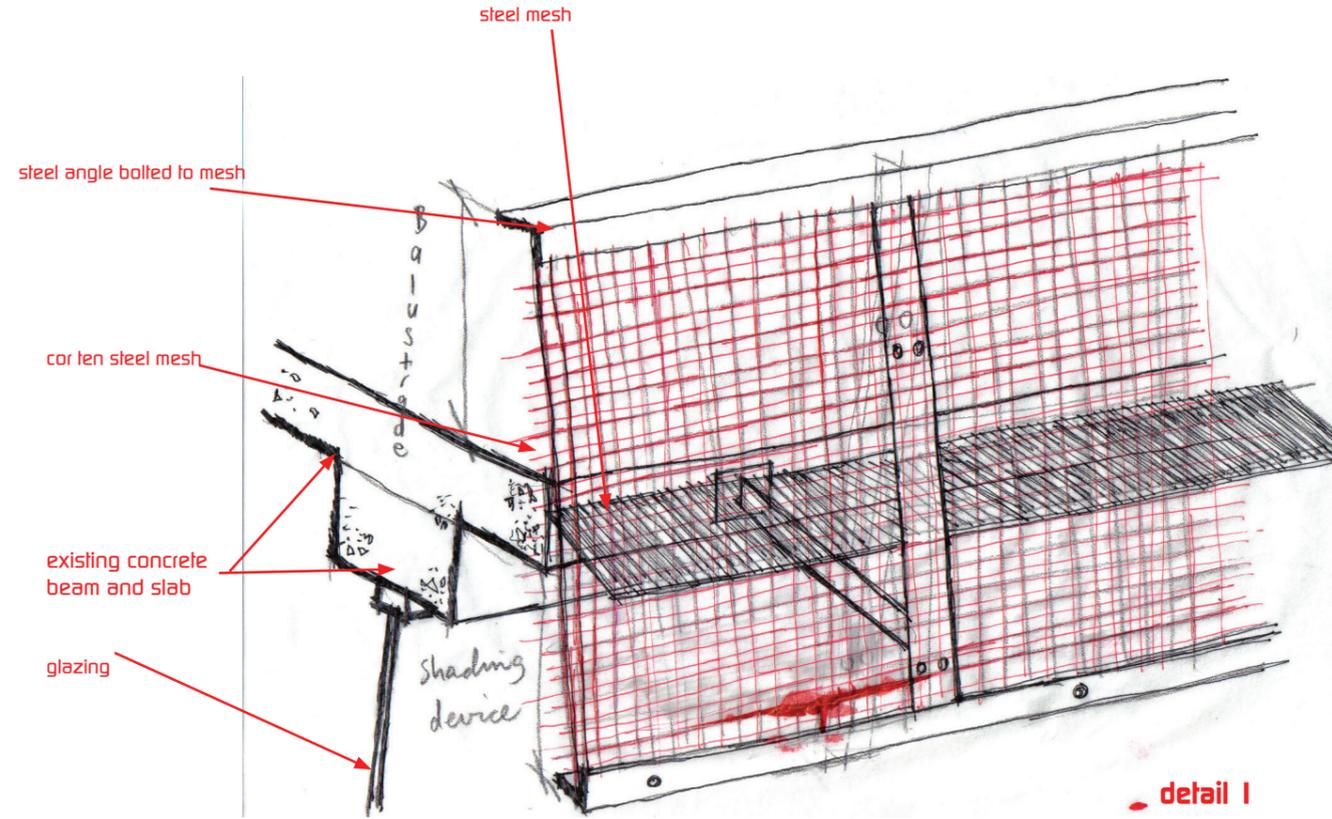
21 June @ 12H00



21 June @ 14H00



21 June @ 16H00



Cor-Ten Steel:

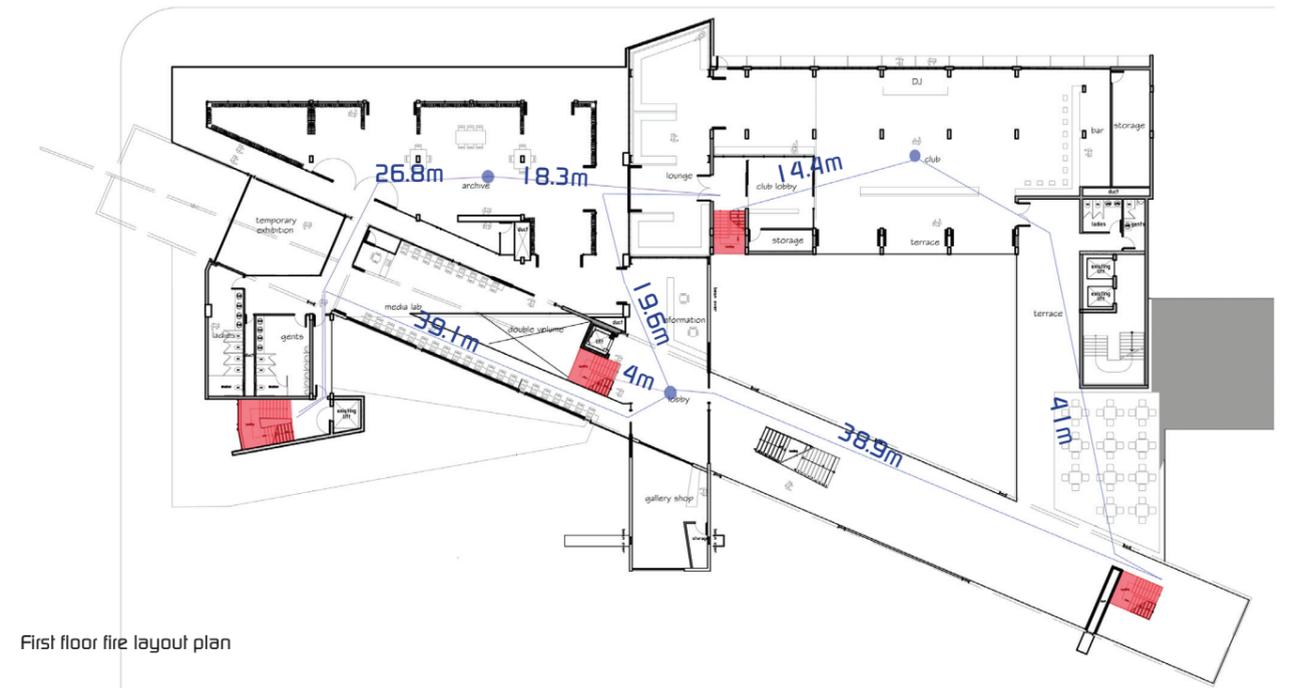
This weathering steel is copper bearing and fully weldable as long as the correct electrodes are used. This steel corrodes to a dark brown colour, then stabilizes, and never needs to be painted. The motive for the choice of this steel is due to the fact that it stains the environment during the early stages of 'rusting', hence the idea is for parts of the cladding system for the building to stain the existing buildings as well as the environment. This stained environment would demarcate the space that the building occupies as an invaded space by the subculture and classify it diverse to the other public spaces within its context. The stained environment adds to the robust feel that the building visually communicates.

The club is fully glazed from slab to slab; the shading device shades the club as well as contributing to the robust aesthetic of the building. The light connections give the club a vibrant and funky expression on the building's façade at night. The sliding door allows for cross ventilation and transpires the club's feel out onto the Esselen Street.

The strength of steel drops at temperatures of about 500 degrees celsius hence the steel structure must be protected from fire. The structure of the building will be finished with clear intumescent paint; which produces an insulating foam during a fire, delaying flame spread and improving fire resistance without affecting the appearance of steel the structure. Coating thickness of 1mm gives a fire protection of 60 minutes. The fire protection rate occupancy B2 according to SABS 0400-1900 is 30 minutes, therefore the intumescent paint will provide ample time for evacuation in the case of fire.

The building has four emergency fire escape stairways that comply with SABS 0400 - 1900 section T. The stairway on the ground floor that opens out onto the public space has a roller shutter door system, according to SABS 0400-1900 Section TT22, any revolving or sliding door or automatically operated door shutter may form part of an emergency route where such door or shutter is positioned at the end of such route discharging to a safe area. This roller shutter door will be opened during most part of the day; therefore the stairway will discharge people out of the building onto the public space.

The emergency stairways exposed outside must all have railings on both sides, the exposed stairway that discharges the club and lounge space are subject to SABS 0400-1900 rule TT2.4.



First floor fire layout plan

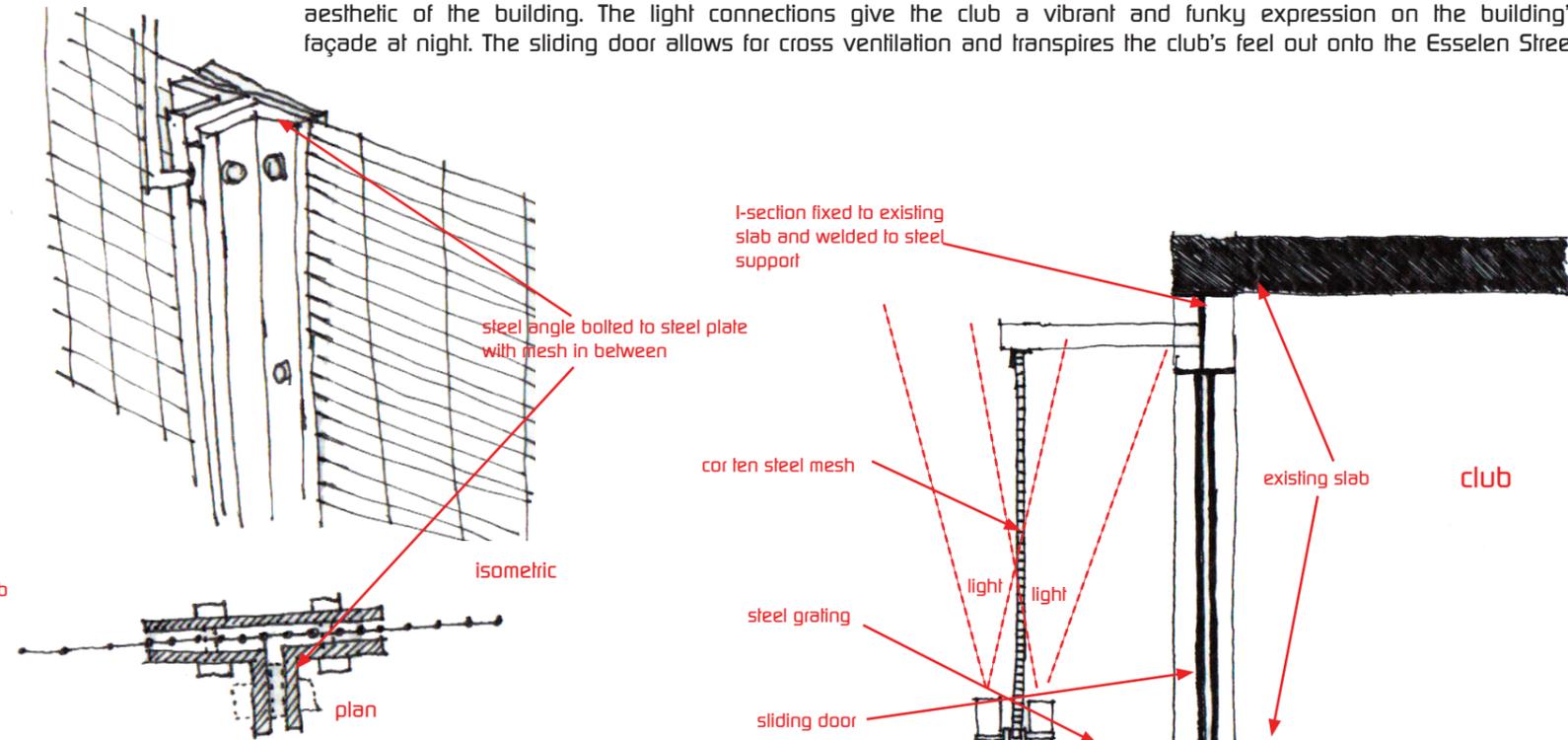


Fig. 1 78 Section of Club facade

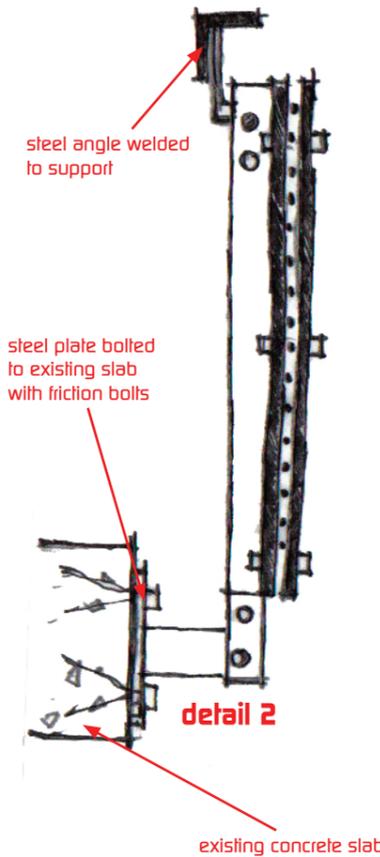
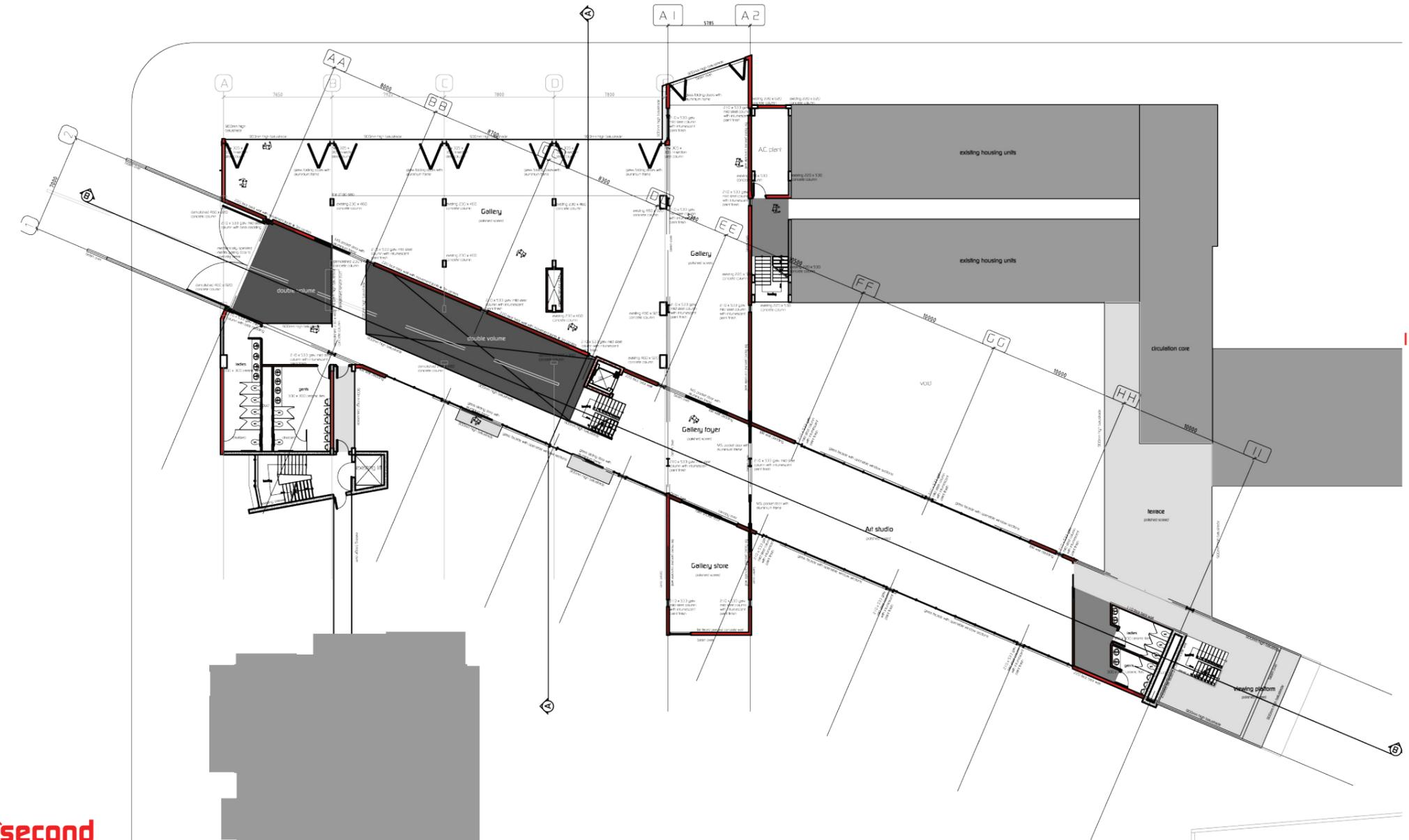
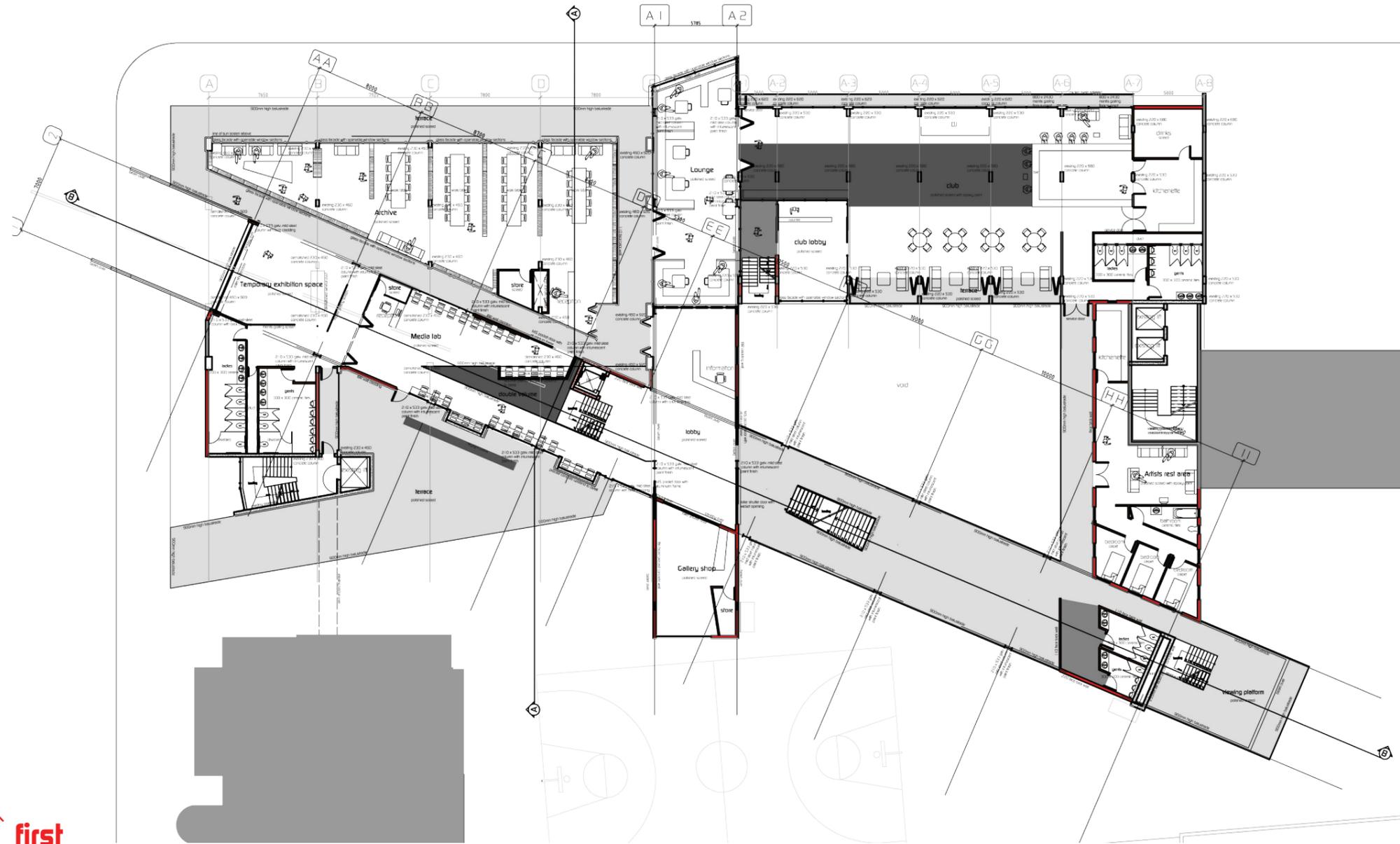
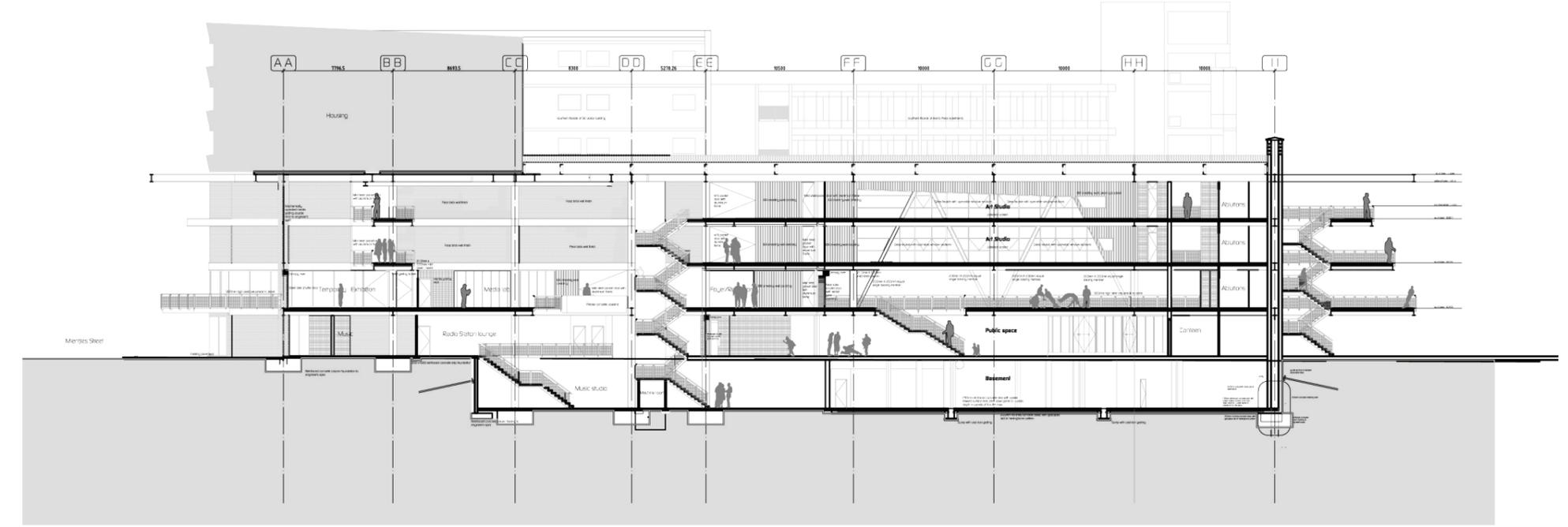
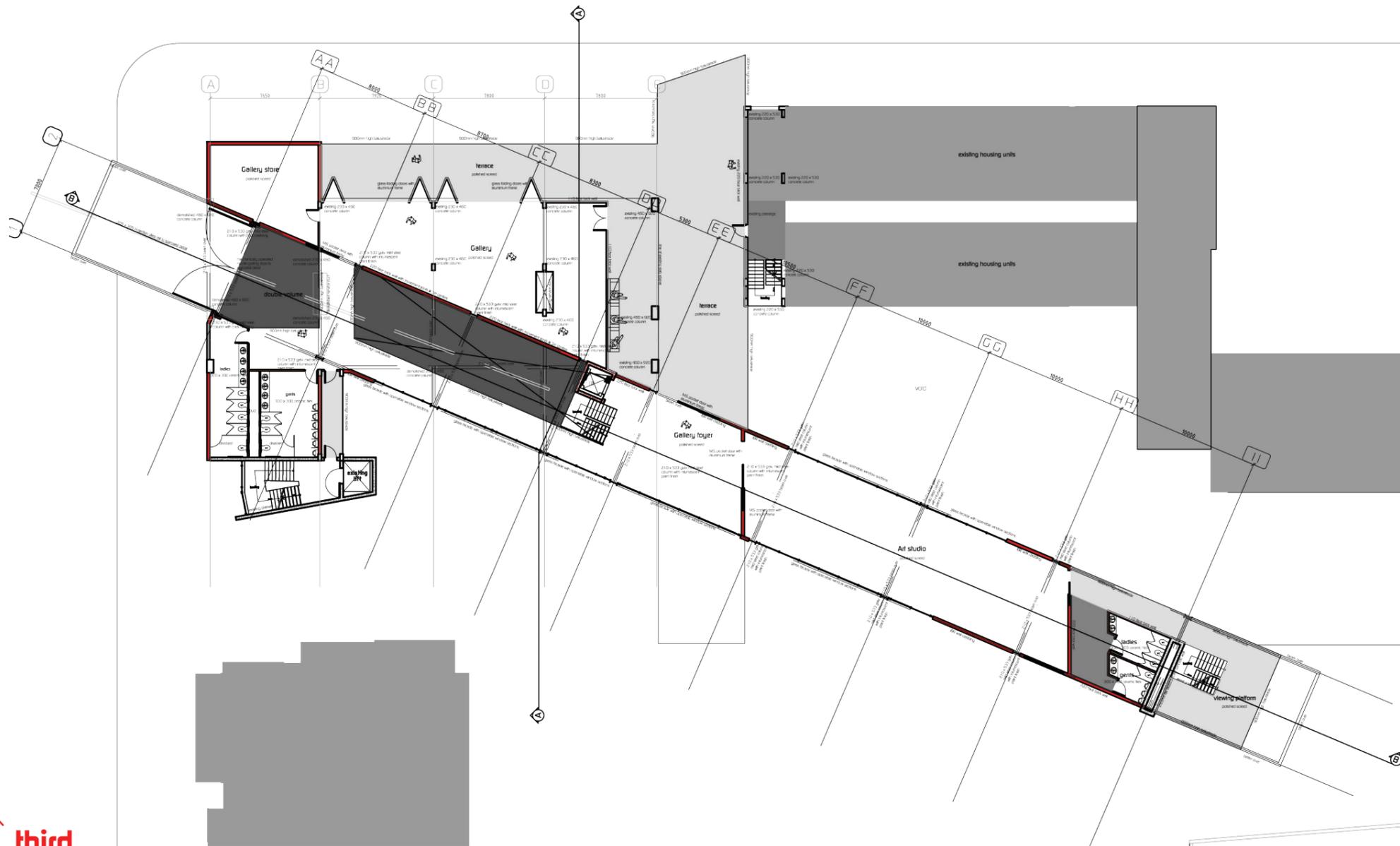


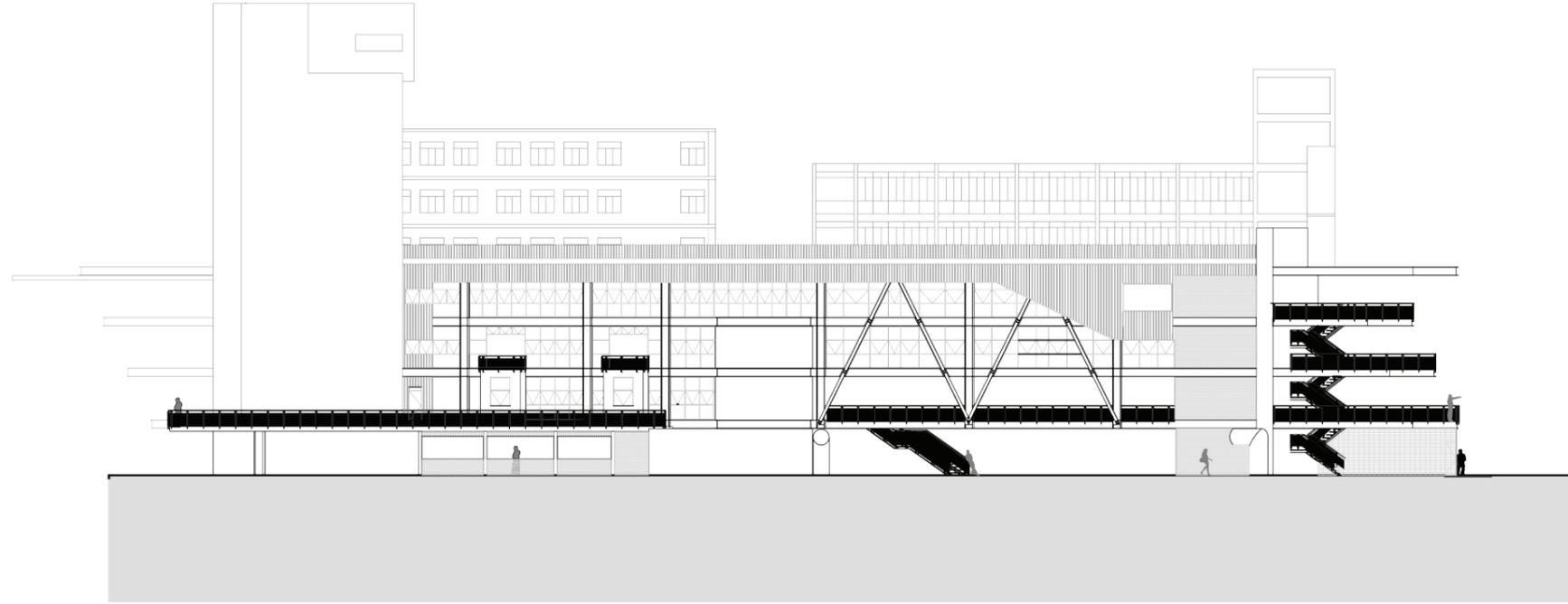
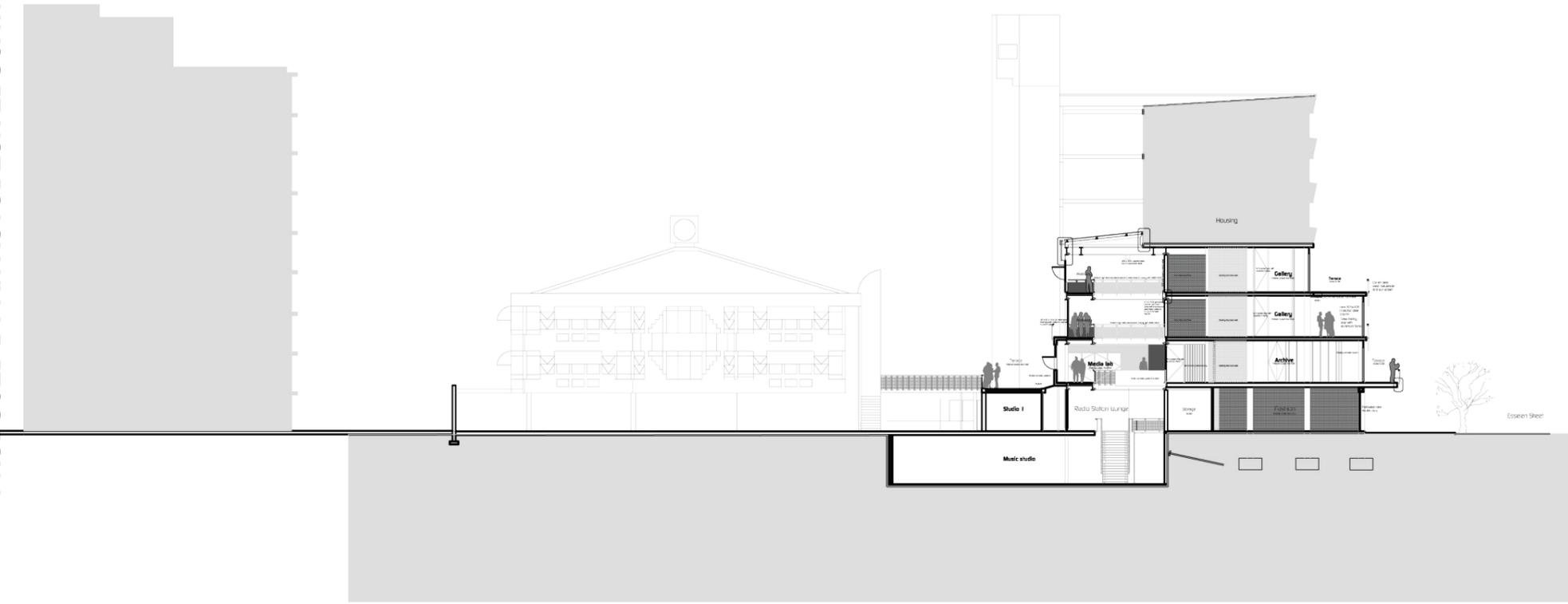
Fig. 1 79 Facade assimilate (Author, 2006)

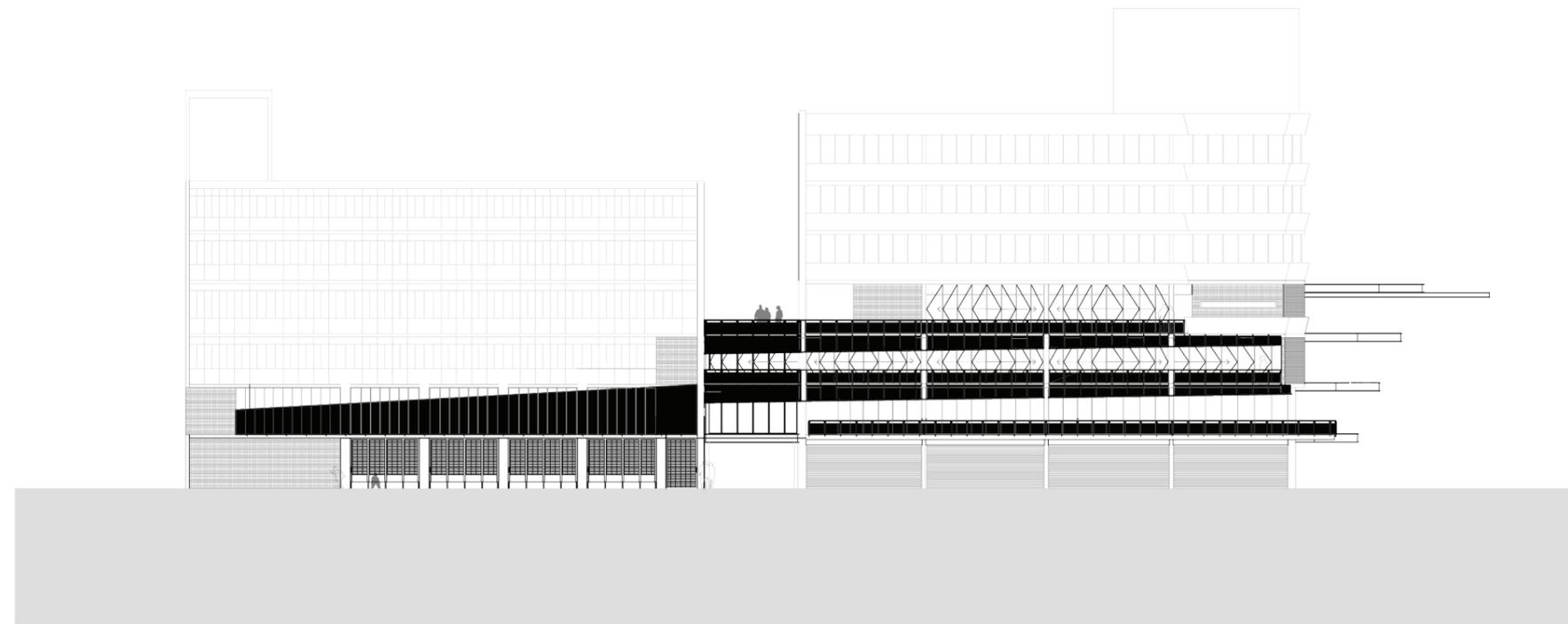




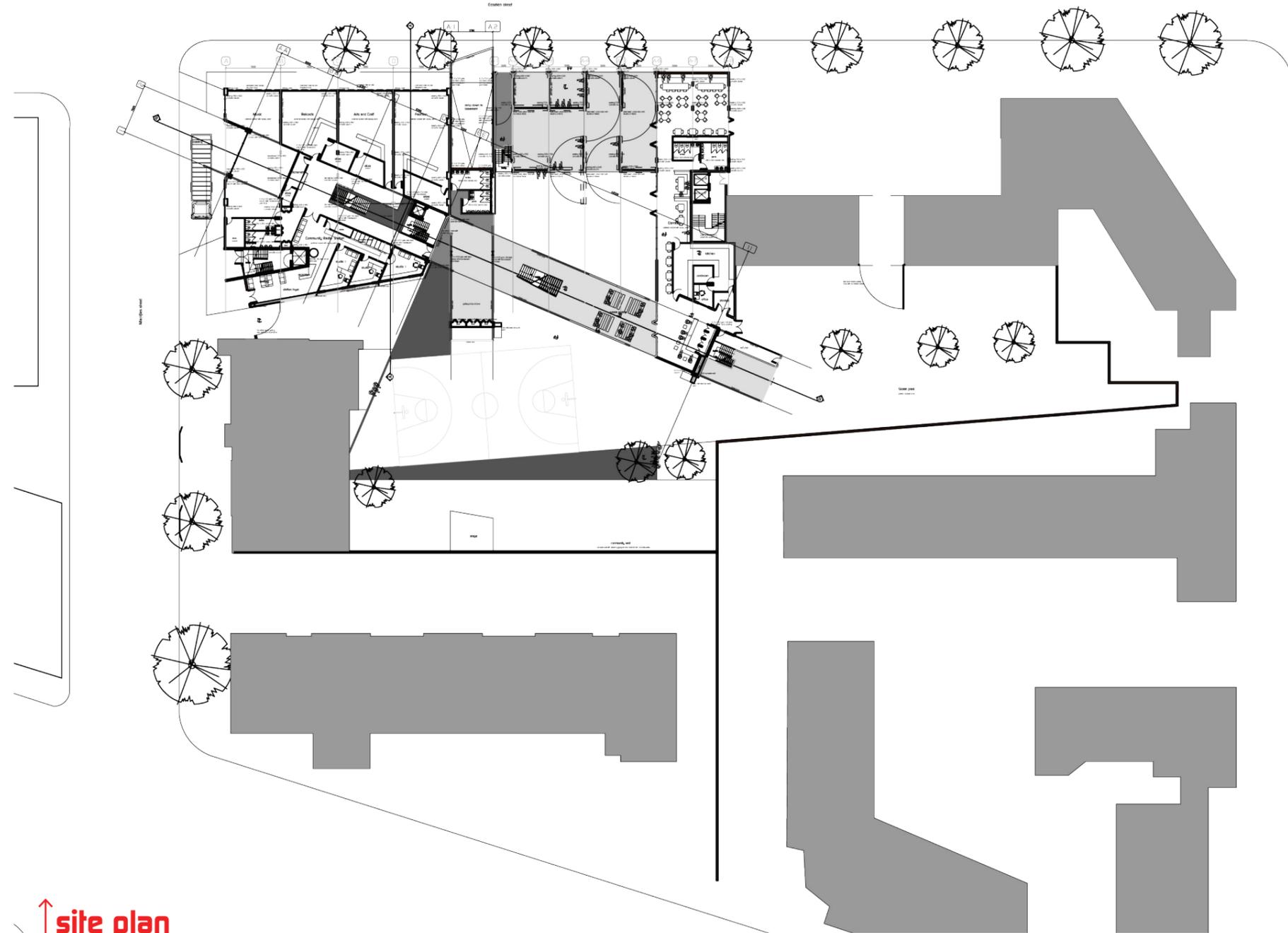
sections

section b-b





north



↑ site plan