7. Technical investigation

7.1 Structure

In the restaurants and offices where a larger span is ideal, a cast in-situ beam and slab system is used. The depth of the slab is 670mm at intervals of 2400mm and spans 12m. In the exhibition a ten meter span is required for ideal viewing of the art; therefore, a ribbed slab with a depth of 500mm at intervals of 600mm is employed. Underneath the overhead stairs a system of slab and beam is used. The columns are spaced at a distance of 7,2m throughout.

A steel frame with cantilevering beams is used on the roof of the building where a lighter structure is required (in order to reduce the concrete column sizes of the structure below) and a large span is not necessary. The steel members of the structure are hidden except for the bottom flange of the I-beams. The structure is clad on the outside with black powder-coated steel flat sheets with welted seams and on the inside with white painted and plastered gypsum board.

7.2 Surfaces

Reference to the industrial archaeological nature of the terrain is made by creating a vertical texture on the concrete façade with horizontal timber board shuttering. The texture refers to the metal sheeting used on the facades of the demolished workshops of the marshalling yard. The boards used to create the texture, are 150mm wide and 38mm thick with chamfered edges and tight butt joints that create the characteristic fins. The timber is unplanned resulting in a darker coloured concrete.

Public spaces are defined with precast- concrete pavement blocks with natural rounded cubicle exposed aggregate in a medium colour. The concrete blocks are placed on adjustable spacers to level the roof surfaces. 10mm open grooves are cast into the blocks to allow water drainage. Demolished buildings dating from the NZASM period are delineated with a difference in paving block sizes. On circulation routes a concrete block with a brush finish is used to allow easier movement for wheelchair users. Planters containing hardy plants interrupt the concrete surface. Surfaces around the soccer field are compacted soil and grass irrigated by collected and stored storm water.

The ceilings on the inside of the exhibition space are steel fabric that will partially hide the services.

7.3 Lighting

The routes are indicated with low-level lighting in the shape of a bollard. The height of the bollard is 350mm – a comfortable height to sit on. The lighting is only on one side of the route to avoid confusion when viewed from the side. In the public space, intermediate lighting is placed randomly, repeating the randomness of the floor pattern. Spread lighting is placed around the soccer field and public space. The public space's spread lighting will only be used during events - adequate intermediate lighting is placed in the space.

Fig. 112 Concrete texture created by rough sawn timber boards (Deplazes 2005: 57)

Fig. 113 Off shutter concrete wall patterned by the grain of timber shuttering planks. GPY Architectos. San Bernardo Assebly hall and workshop space, 1999-2001, Los Silos, Tenerife, Spain. (Hadid, Z. Forster, K. Sudjic, D. et al. 2005: 131)

Fig. 114 Cedar wood off shutter concrete and recycled cedar shuttering planks wall. Sambuichi Architects, Miwa Gama ceramic studios, 2001 -2002. Hagi, Japan.

Fig 115 Powder coated black intumescent paint on steel sheeting. Waro Kishi & K. Associates, Hu Tong Private residence, 2002, western Japan. (Hadid, Z. Forster, K. Sudjic, D. et al. 2005: 398 - 399)

Fig. 116 Pre-cast concrete block floor. Atelier Barani, Youth Studio at the concrete art centre, 1997-1998, Mouans-Sartoux, France. (Hadid, Z. Forster, K. Sudjic, D. et al. 2005: 46 – 47)

Fig. 117 Planter laid flush in concrete screed. J. Miguel Hernandes León, Muralles de Ceuta, 1992-1999, Ceuta Spanish enclave in Marocco (A. Aymonino, V. P. Mosco 2006: 48)

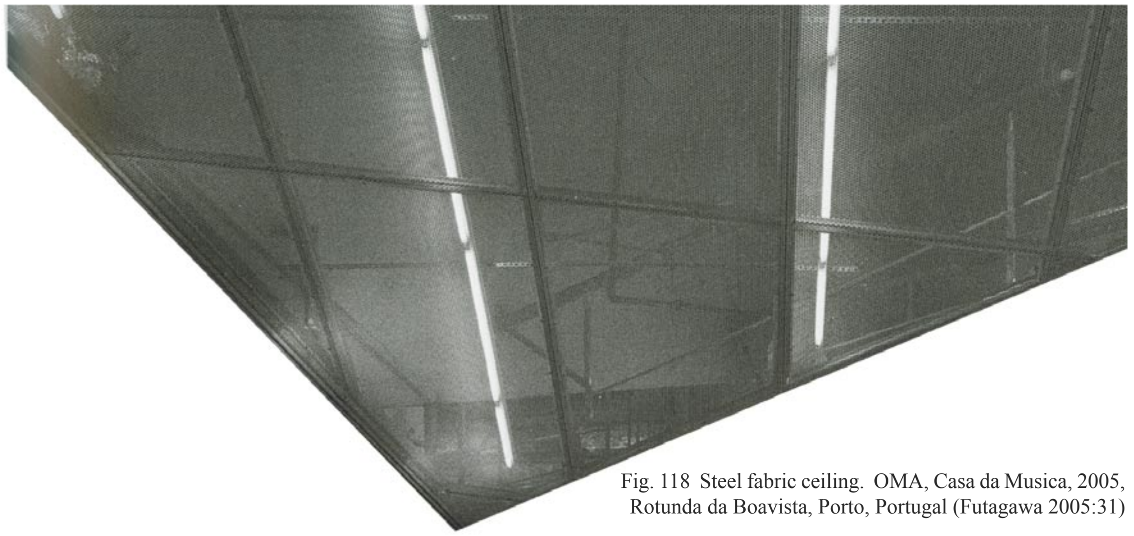


Fig. 118 Steel fabric ceiling. OMA, Casa da Musica, 2005, Rotunda da Boavista, Porto, Portugal (Futagawa 2005:31)

7.4 Stainless steel wire mesh ceiling

The advantage of stainless steel wire mesh ceilings is that it does not need to be replaced as often as conventional ceilings and it requires less maintenance. Stainless steel becomes resistant to corrosion by forming a passive layer. The layer is a result of the reaction between the chrome contents in the steel and the oxygen in the air. If the layer is damaged due to external penetration, it reproduces itself within seconds. The corrosion resistance can be increased by adding nickel, molybdenum or other alloys. No special maintenance is required – the wire mesh can be cleaned using brushes or high-pressure cleaning equipment and with alkaline non-abrasive cleaners.

The ceilings have good acoustic values – the sound is interrupted as a result of the structure of the wire mesh and is then transmitted to the layers located further back and absorbed by them. Stainless steel is 100% recyclable.

The wire mesh is inserted into a frame made out of galvanised steel angle profiles and is secured around its perimeter using a galvanised steel flat and hexagonal countersunk screws.

7.5 Soil contamination

The following information has been gathered from the web site: "Total – Corporate Social Responsibility" (www.total.com 2006). Soil pollution caused by industries are most likely to consist of heavy metals, hydrocarbons, acids, solvents, tar, radioactive substances or other more or less persistent compounds. The presence of contaminants in the soil is not a danger in itself. The contaminants become dangerous when it is absorbed into an edible plant or is absorbed into an aquifer that supplies a drinking water network. But because of the age of the marshalling yard, the pollution will not cause an immediate risk for the residents of Salvokop.

A thorough investigation of the degree of contamination of the site has not yet been done. Before remediation goals can be identified, a proper contamination analysis should be done. A contamination analysis consists of geological and hydrological studies, historical review of the industrial activities at the site, sample collection and analysis.

In order to determine the appropriate remediation technique the following factors need to be considered: type of contaminant, the site's profile and cost issues. Normally, a combination of remediation techniques is used on various parts of a site, over time.

A few of the remediation techniques, considered by the author to be appropriate for the site under investigation, is discussed.

Biological technologies:
Biodegradation: Microorganisms are used to break down organic contaminants, such as hydrocarbons. The bacteria transform the contaminants into water and carbon dioxide, through the digestive process.
Bioventing: This is a combination of soil venting and biological treatment. The air circulation through the soil stimulates biodegradation. Molecules, produced by the microorganisms, are extracted with vapors from the soil.
Natural attenuation: In this process the toxicity of certain contaminants are allowed to degrade naturally over time. The site needs to be monitored to ensure that proper conditions continue throughout the attenuation process.

Physicochemical technologies
Soil vapour extraction: Extraction wells pull volatile contaminants out of the ground, during which the vapours are condensed to liquids. The liquids are absorbed onto active charcoal or incinerated.
Thermal desorption: The soil contaminants are vaporized at a temperature of less than 500°C, without destroying the soil.
Solidification/stabilization: A binding agent, such as cement, is added to the soil to keep the contaminants from spread. The soil is then left on side, used as a material or landfilled.

7.6 Building cooling

The main characteristics of a warm temperate climate are the following:
- Low diurnal temperature range near coast to high diurnal range inland;
- Summer and winter can exceed human comfort range;
- Spring and autumn are ideal for human comfort;
- Mild to cool winters with low humidity;
- Hot to very hot summers with moderate humidity.

The following climate control systems can be used in a warm temperate climate (Green Building Council of Australia 2005:19):
- Natural ventilation;
- Thermal mass;
- Earth and geothermal conditioning;
- Labyrinth;
- Displacement ventilation;
- Chilled structure.

7.6.1 Natural ventilation

Natural ventilation includes single sided ventilation, cross ventilation and stack ventilation. It results in cheaper capital costs, lower operating costs, increased flexibility in workspaces and reduced environmental impact. Reliance on users for the effectiveness of this system often results in its failure. In circumstances where the effects of natural ventilation are not sufficient, a smaller plant can be used in a mixed mode operation (Green Building Council of Australia 2005:31). Natural ventilation can only be used in buildings that are aboveground and the depth of the building should be restricted.

7.6.2 Thermal mass

Thermal mass is the use of free cooling available when the outside air is cooler than that in the interior of the building. Concrete has excellent thermal mass properties and requires a minimum thickness of 50mm (Green Building Council of Australia 2005:40). In summer, the heat absorbed by the concrete during the day is radiated into the space at night; the concrete is cooled down by ventilating the space resulting in reduced temperatures in the daytime. In winter, the space is not ventilated during the night in order to retain the heat. Unfortunately this system relies on the user for its effectiveness.

7.6.3 Earth and geothermal conditioning

The earth below 500mm has a constant temperature and can be used to cool the air before it enters the building. Earth pipes are used for the heating/cooling effect. The amount of cooling depends on the moisture content and soil type and varies throughout the year. Rock fill can be used to surround the pipe to increase the thermal capacity (Green Building Council of Australia 2005:41). Unfortunately geothermal conditioning is only feasible in exceptionally large buildings or in areas with high electricity costs (reference).

7.6.4 Labyrinth

Air is pumped into an artificial tunnel underneath the building. A labyrinth is constructed inside the tunnel to maximise the surface for heat transfer. The cooled air is returned to the interior of the building. This option should only be used if the labyrinth serves other engineering/structural purposes due to the amount of embodied energy contained in constructing this structure (Green Building Council of Australia 2005:41).

7.6.5 Displacement ventilation (UAD)

Ventilation is supplied at the bottom of the space and the natural convective movement pick up the pollutants and it is extracted at a high level. In conventional overhead ventilation systems, fresh air is introduced at ceiling height and results in a mixture of fresh and used air. A displacement ventilation systems supply air at 18°C and return it at 26°C; an overhead systems supplies air at 12°C and return it at 24°C (Green Building Council of Australia 2005:46).

The displacement ventilation system is only effective in tall spaces as the temperature gradient is crucial in order to reduce the cooling loads. The floor vents can be controlled by individual users to supply air towards or away from the occupant (Green Building Council of Australia 2005:47). With this system the total cooling requirement to achieve comfort is greatly reduced as well as the plant size and running costs (Mansel-Thomas 34).

7.6.6 Chilled structure

Exposed concrete is already able to absorb heat and consequently reduce internal temperature. By passing temperature–controlled water through the concrete the cooling capacity is increased. The water is passed through unseen pipe work 50mm below the surface and does not need to be exceptionally cold (around 13ºC) (Green Building Council of Australia 2005:50). Individual control, zone control, north and south orientation or overall building control is possible with a building management system (Tarmac p. 5). Chilled technologies are ideal in areas where large amounts of groundwater sources are available and require little maintenance. Chilled technologies can also be used for space-heating and will require a larger plantroom.

In order to control the environment in the exhibition, the stable thermal conditions of the earth are employed. To ensure that the exhibition is in the human comfort zone, water pipes are laced throughout the roof structure for space heating and cooling purposes. A mechanical system provides fresh air to the space, using displacement ventilation. The offices will be cooled using passive systems such as thermal massing and natural ventilation. Because of the heat storing capacity of concrete roofs, the interior temperature is likely to rise to an uncomfortable level in summer – chilled technologies is applied to reduce the temperature. The restaurant and the entrance to the exhibition do not require any mechanical systems because it is located on the southern side; natural ventilation and thermal massing will be adequate.

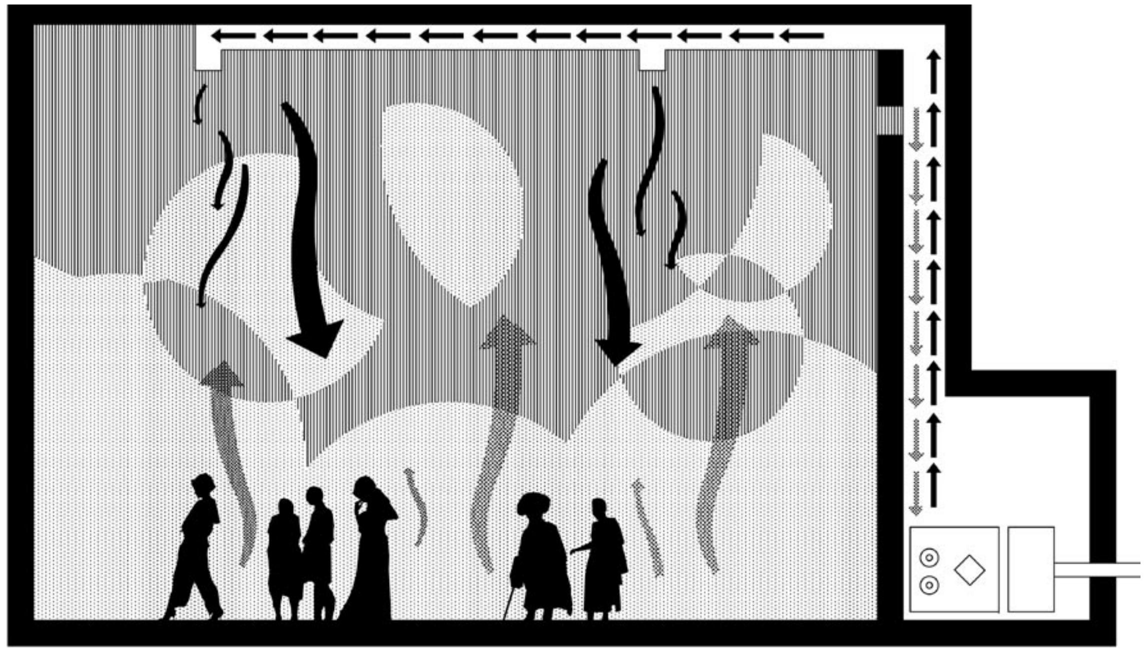


Fig.119 Conventional overhead ventilation (Author 2006)

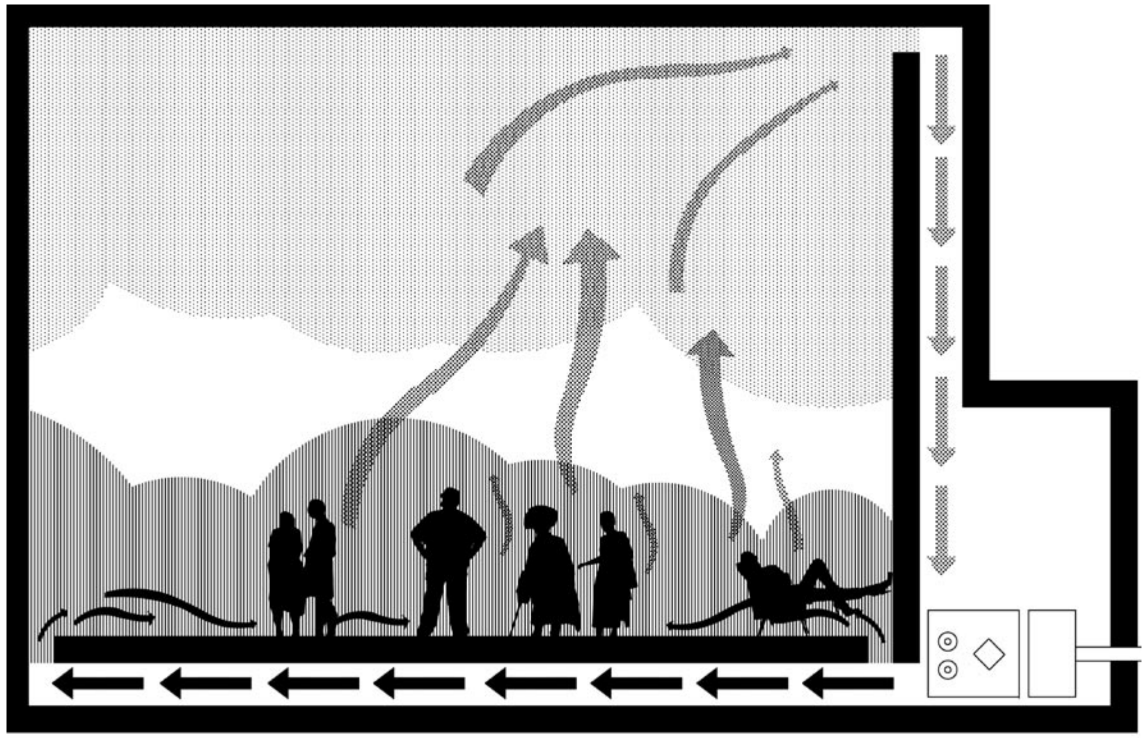
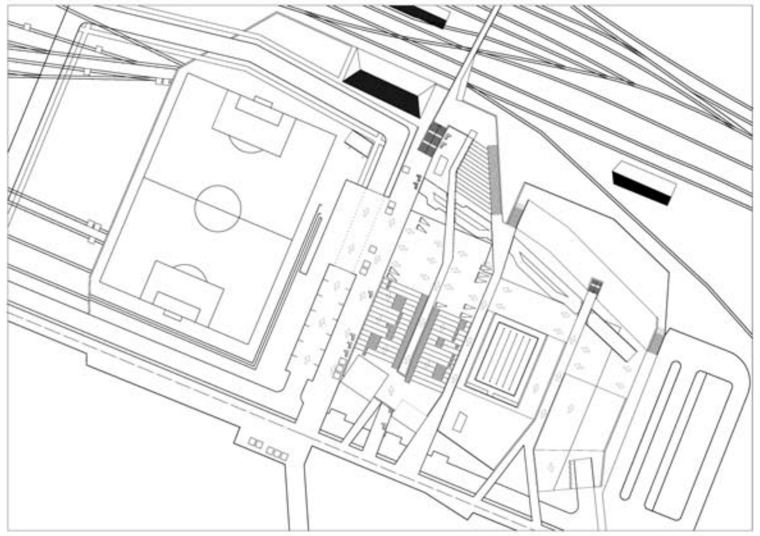


Fig. 120 Displacement ventilation (Author 2006)

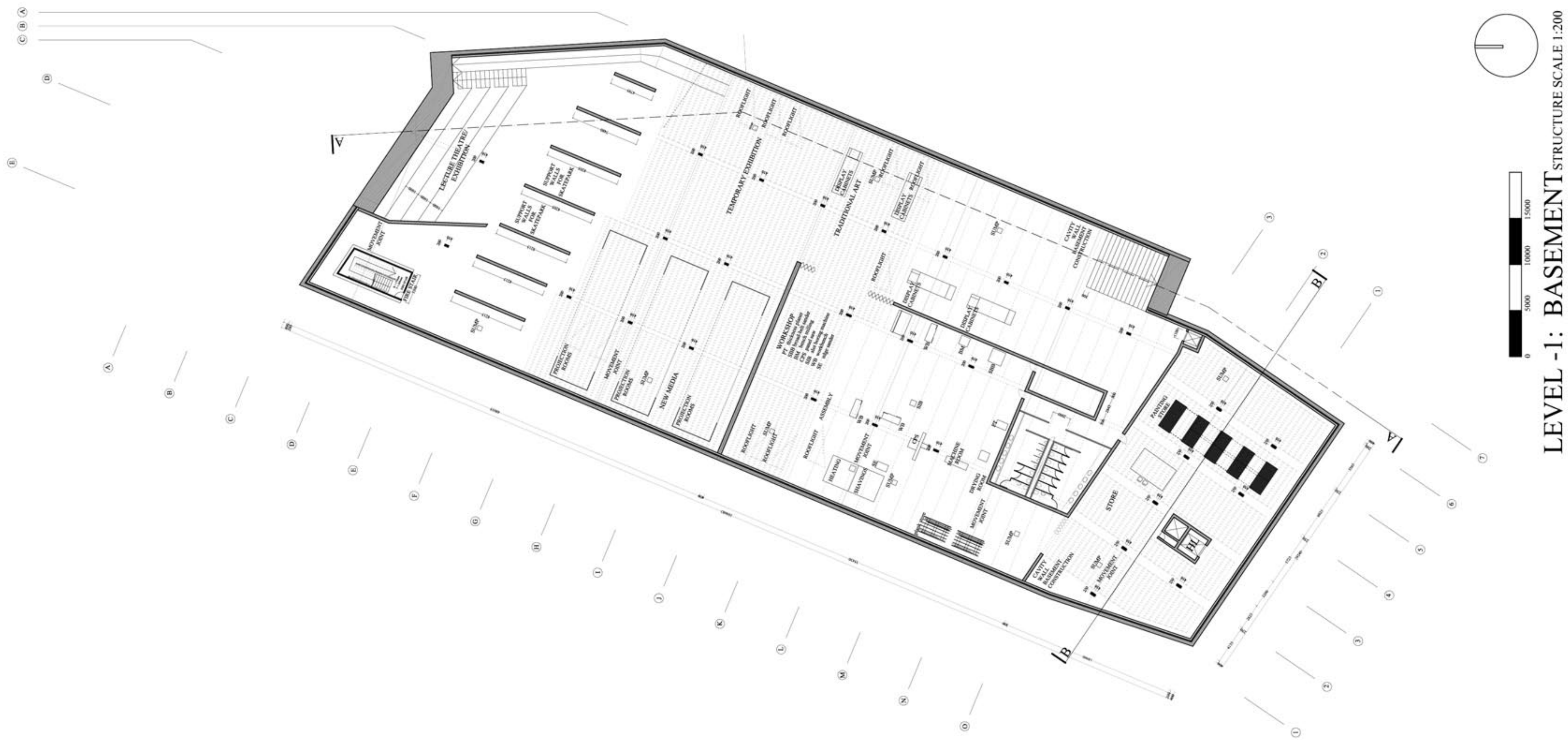
NEW INTERVENTION SURROUNDED BY FUTURE DEVELOPMENTS



DRAINAGE

CUT AND FILL

SITE PLAN SCALE 1:250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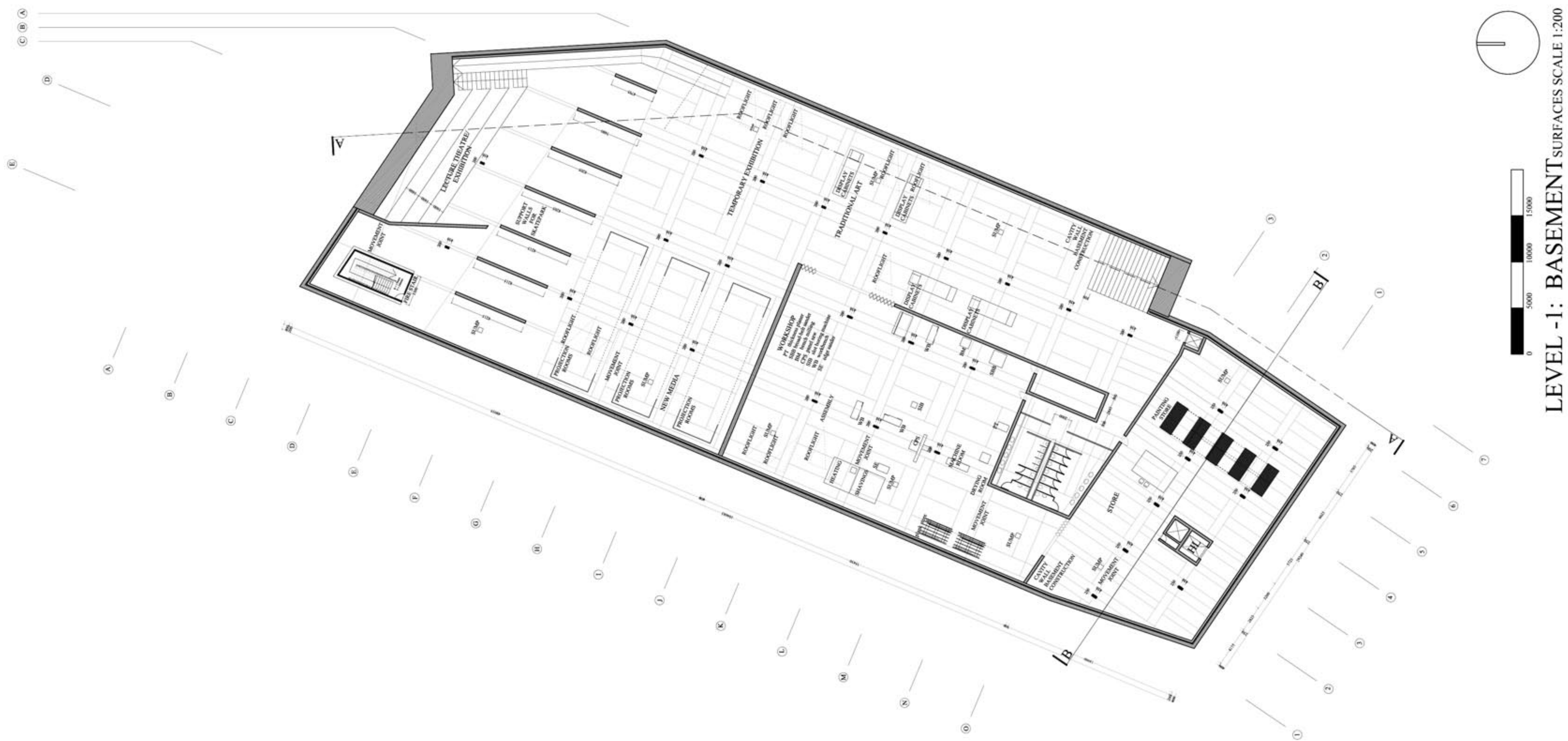
10000
15000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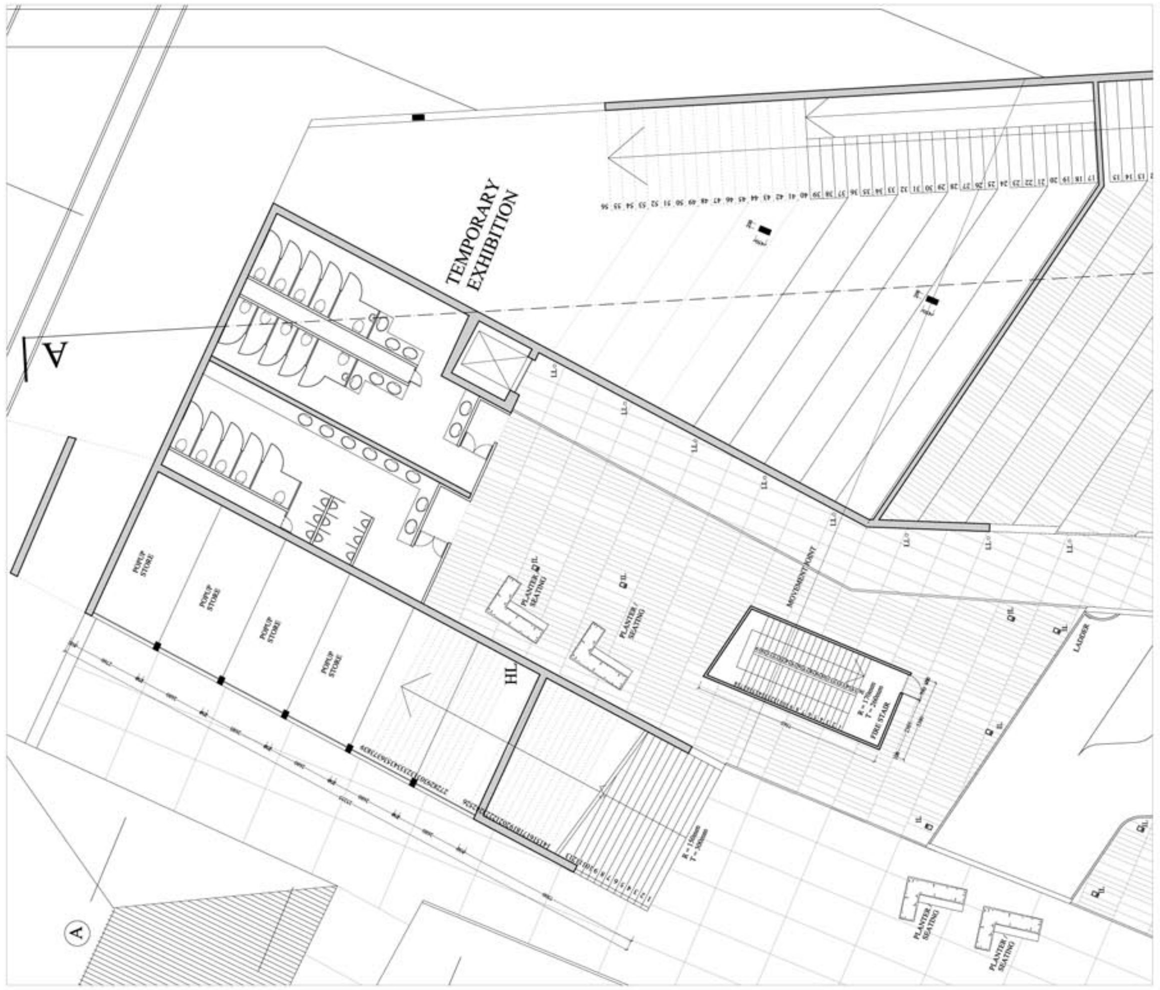


LEVEL 0: GROUND SCALE 1:100

LEVEL 0: GROUND SCALE 1:200

LEVEL 1: OFFICES SCALE 1:100

0 2500 5000 7500

LEVEL 1: OFFICES SCALE 1:200

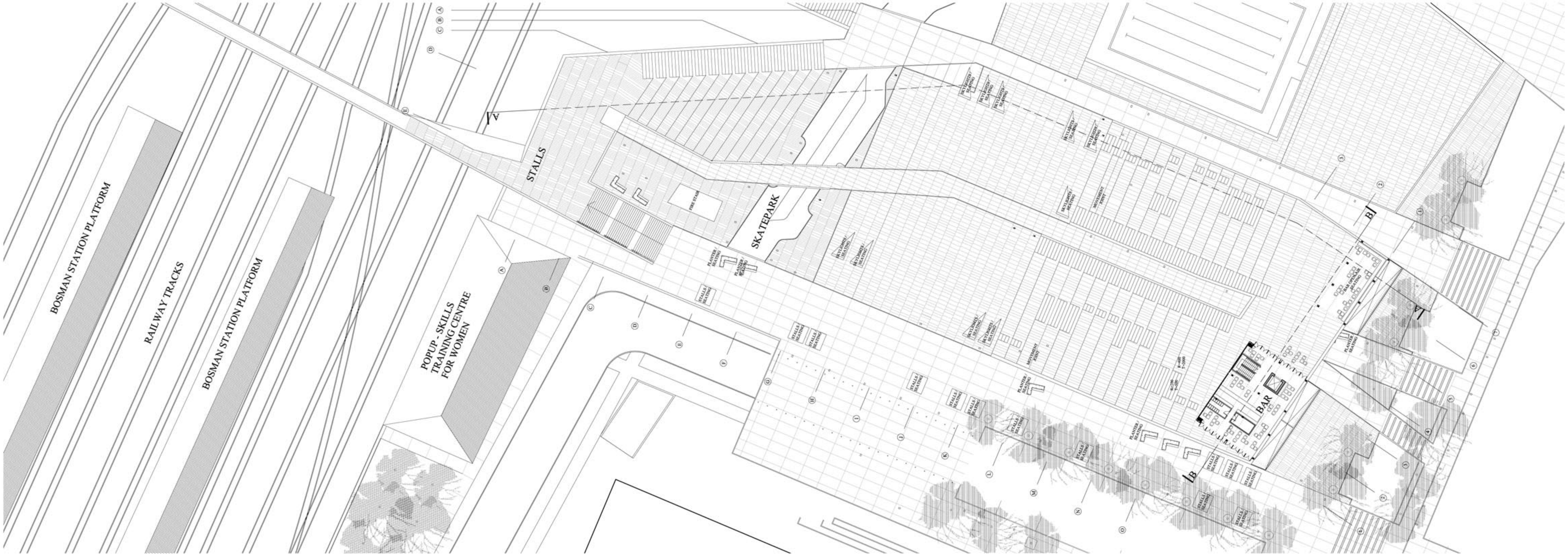
0 5000 10000 15000

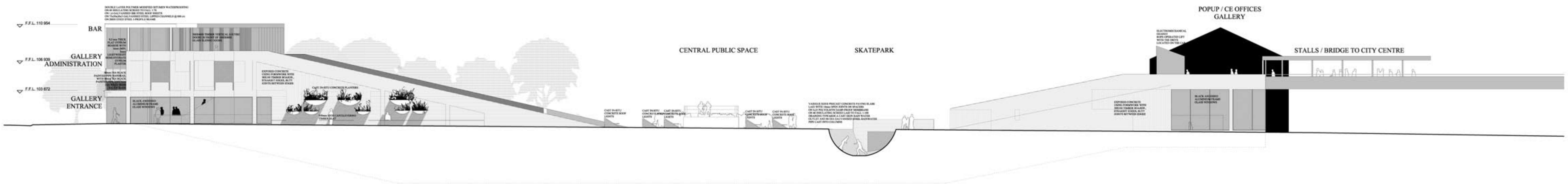
LEVEL 2: BAR SCALE 1:100

0 2500 5000 7500

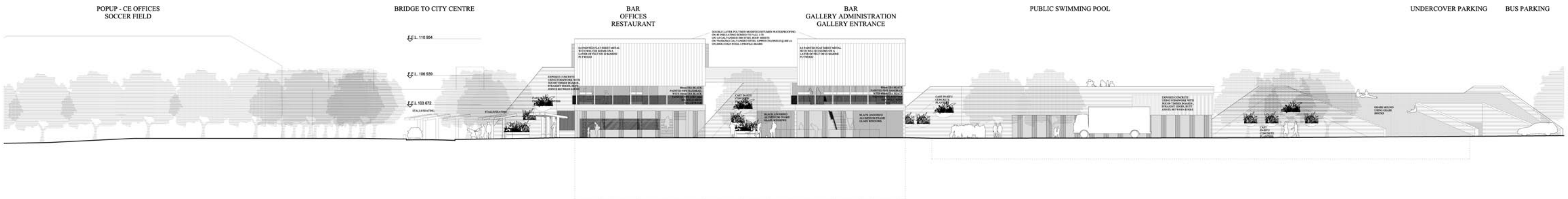
LEVEL 2: BAR SCALE 1:200

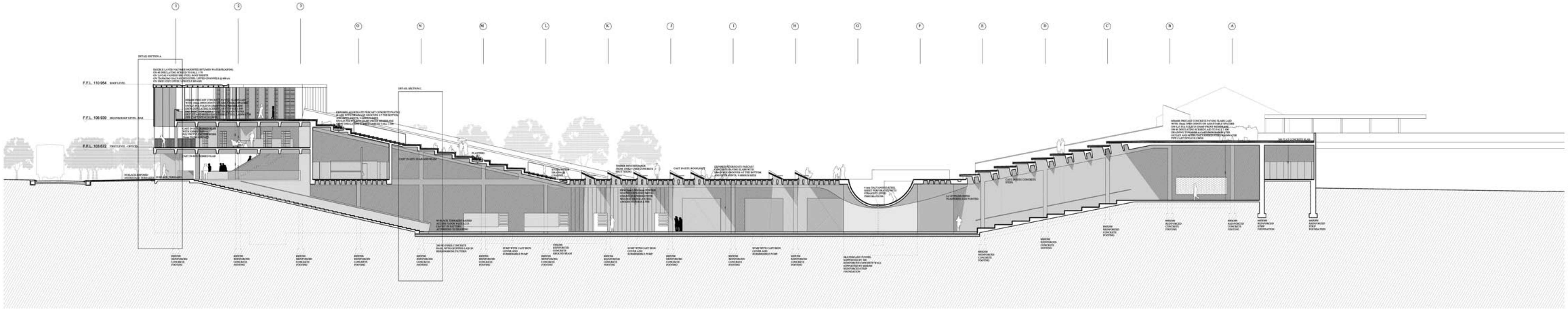
0 5000 10000 15000

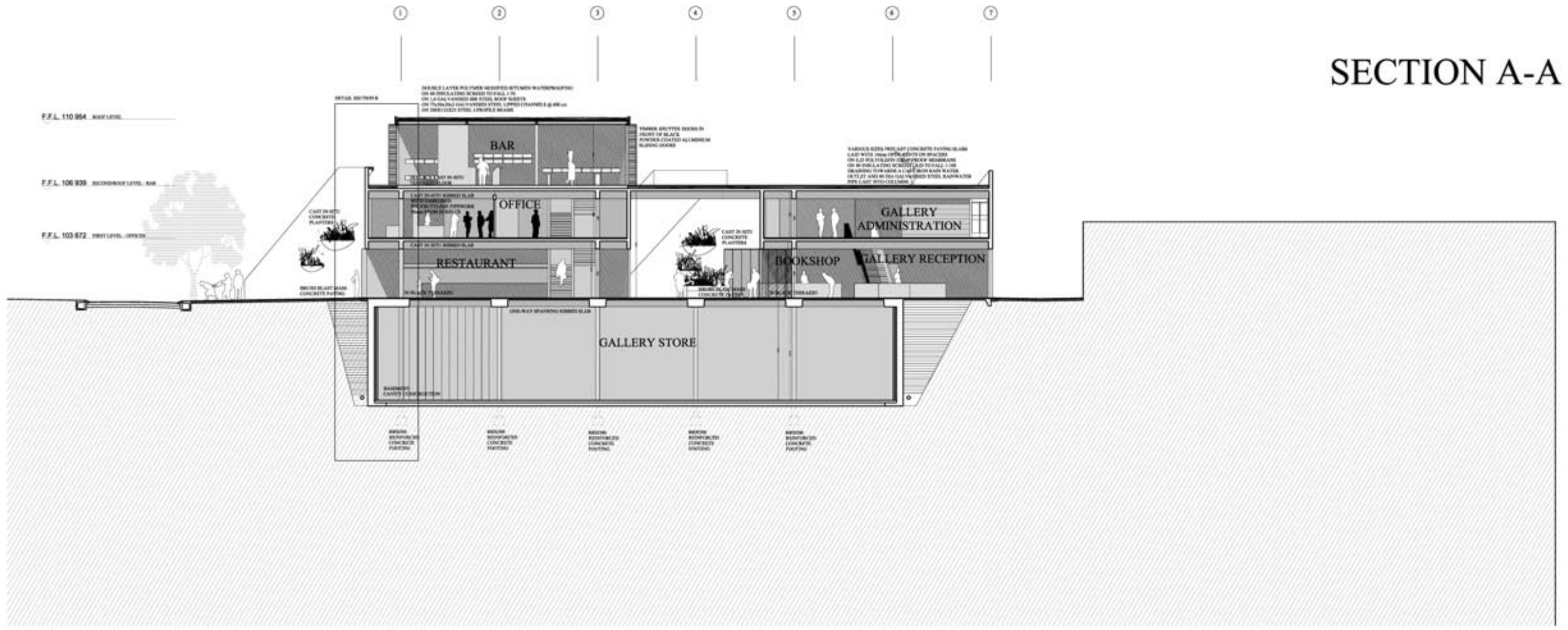




EAST ELEVATION
SCALE 1:100

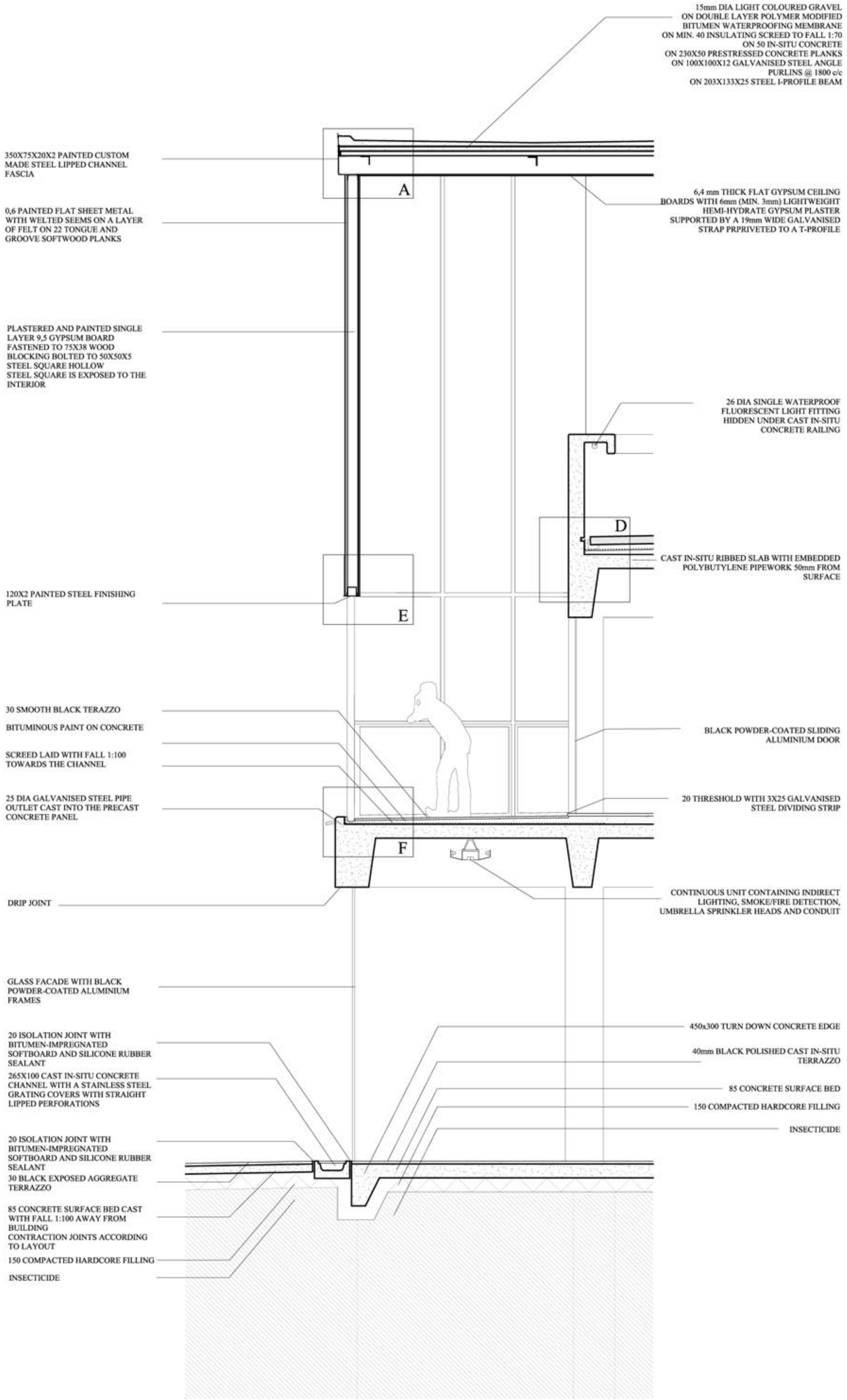




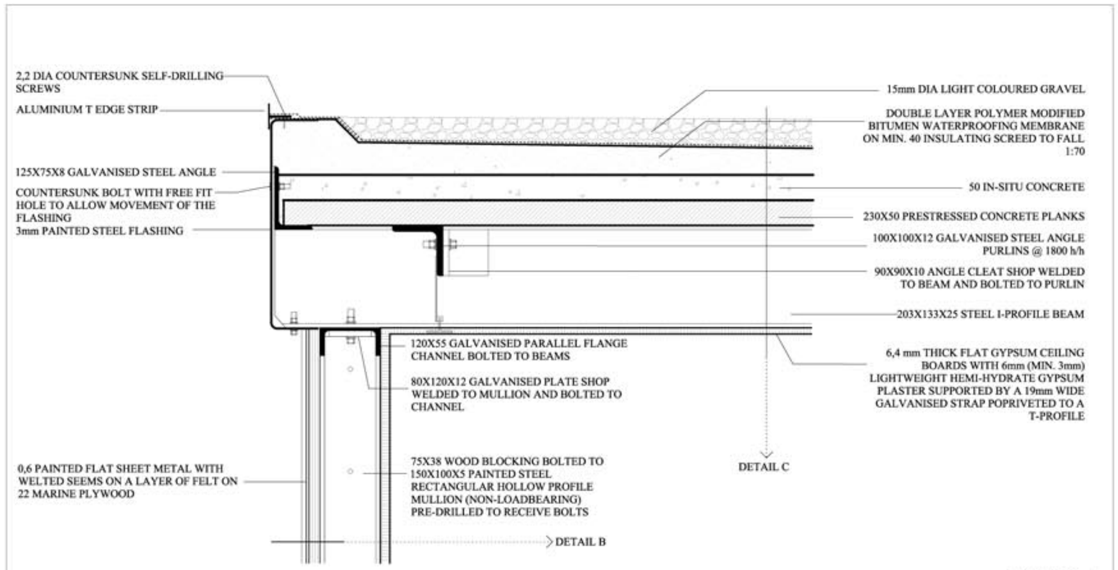


SECTION A-A

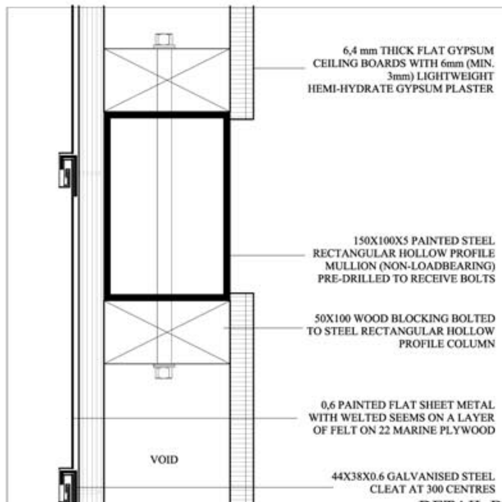
5000



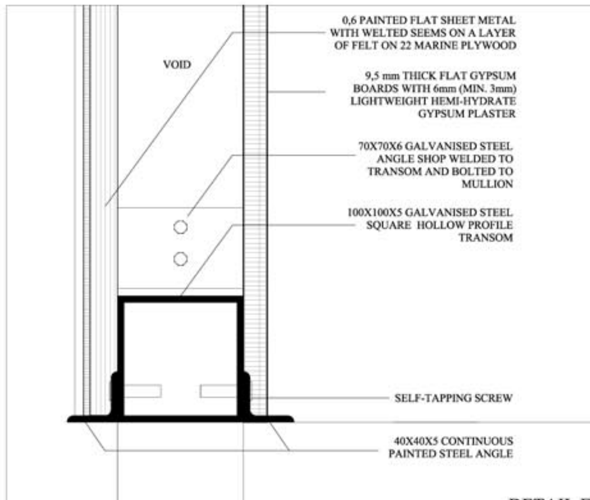
DETAIL SECTION A
SCALE 1:25



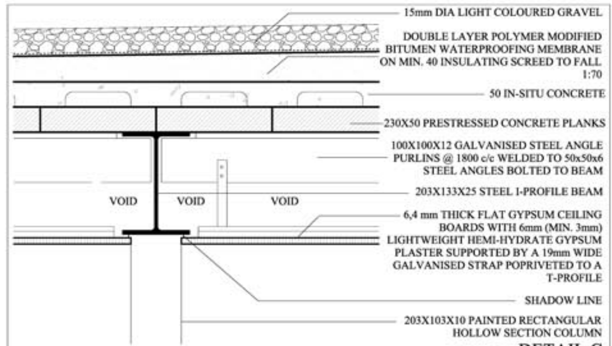
DETAIL A
SCALE 1:5



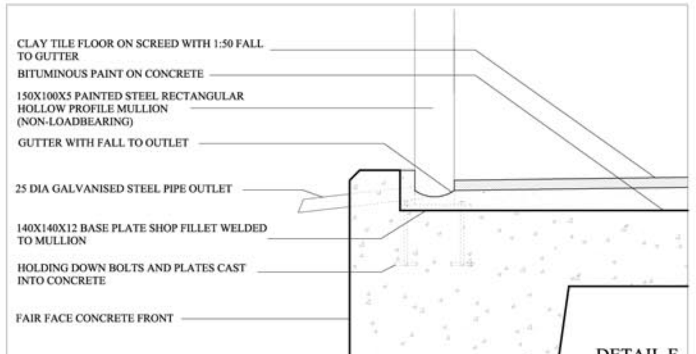
DETAIL B
SCALE 1:2



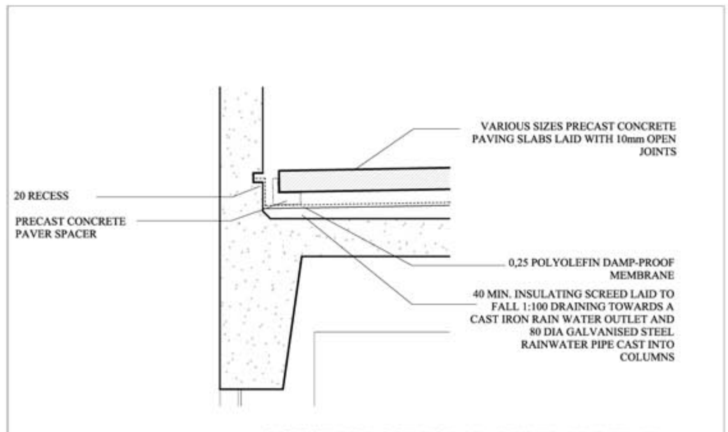
DETAIL E
SCALE 1:2



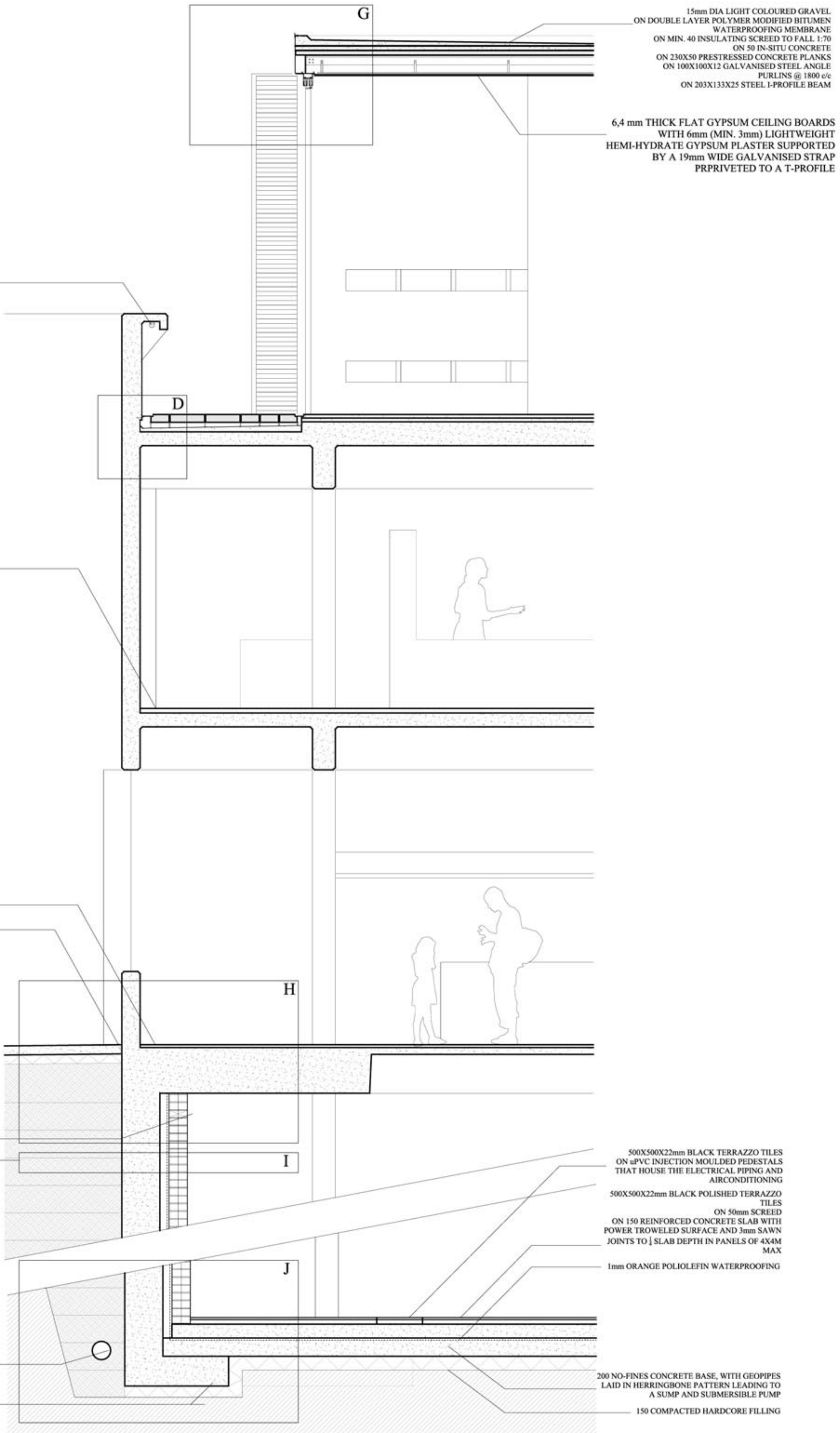
DETAIL C
SCALE 1:5



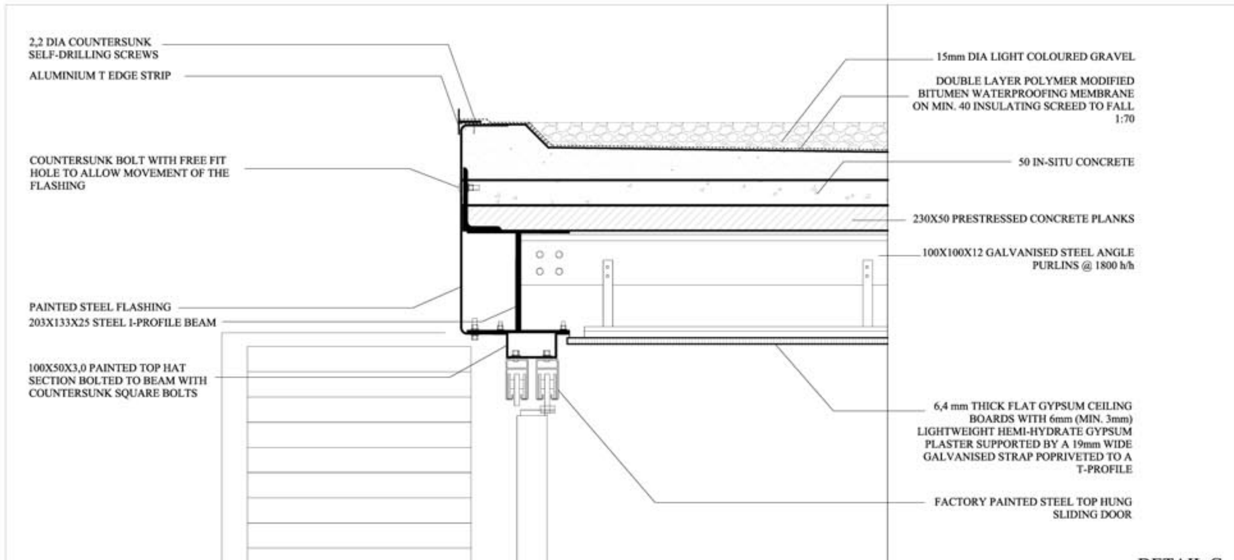
DETAIL F
SCALE 1:5



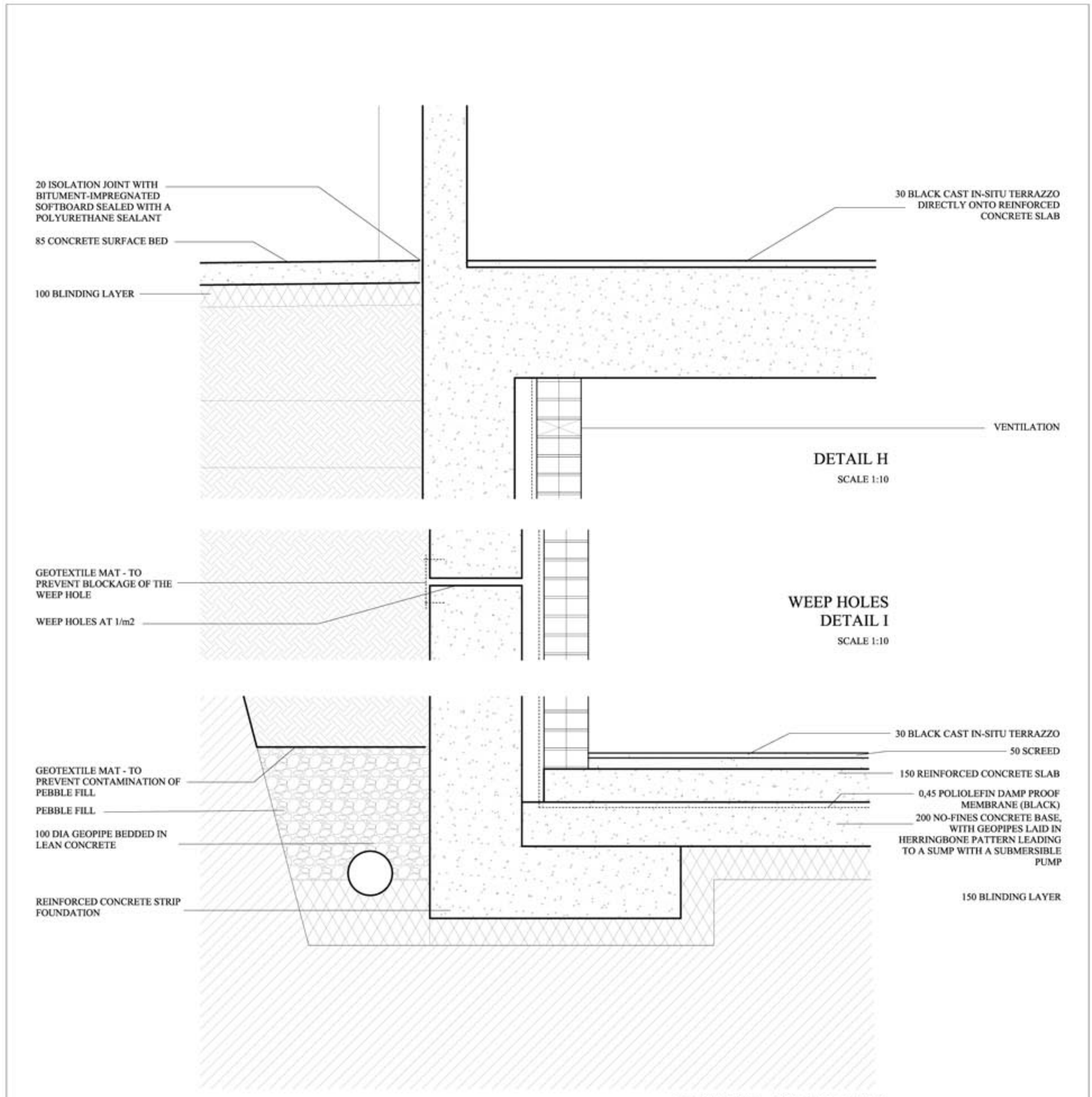
ACCESSIBLE ROOF TO PARAPET WALL DETAIL
DETAIL D
SCALE 1:10



DETAIL SECTION B
SCALE 1:20



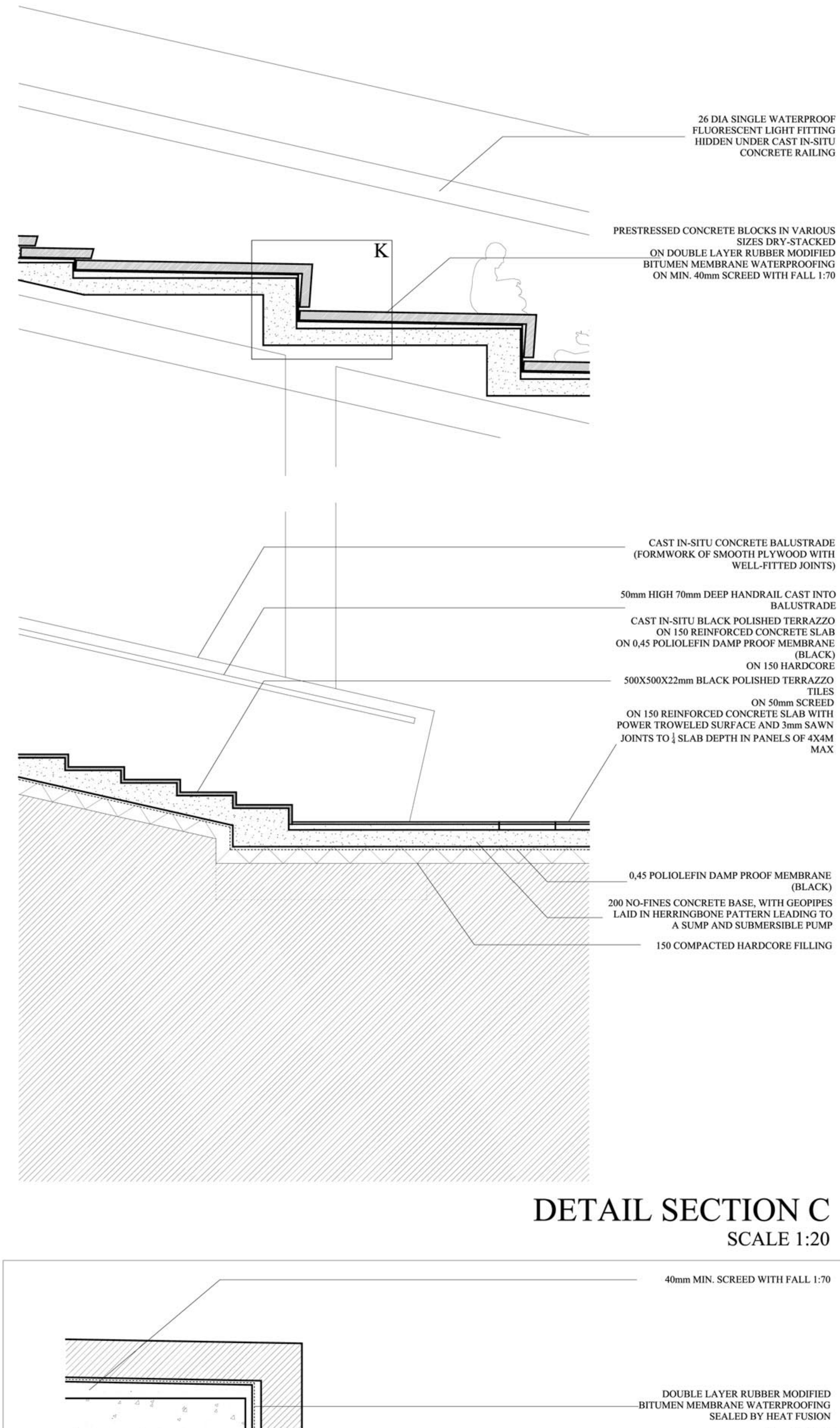
DETAIL G
SCALE 1:5



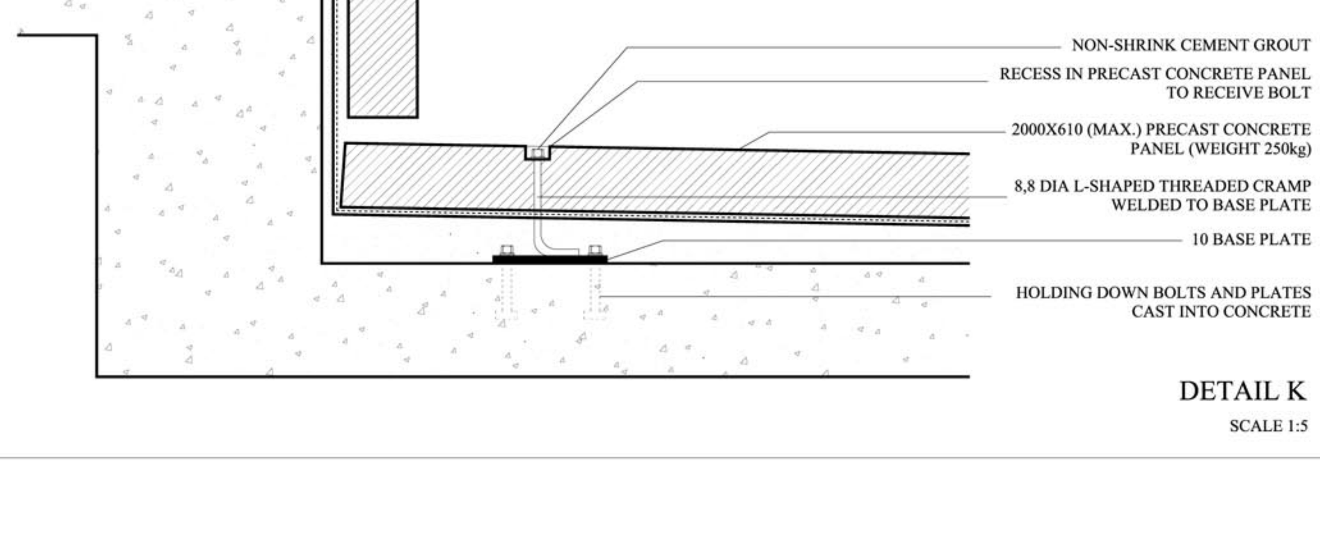
DETAIL H
SCALE 1:10

WEEP HOLES
DETAIL I
SCALE 1:10

BASEMENT - CAVITY WALL
DETAIL J
SCALE 1:10



DETAIL SECTION C
SCALE 1:20



DETAIL K
SCALE 1:5