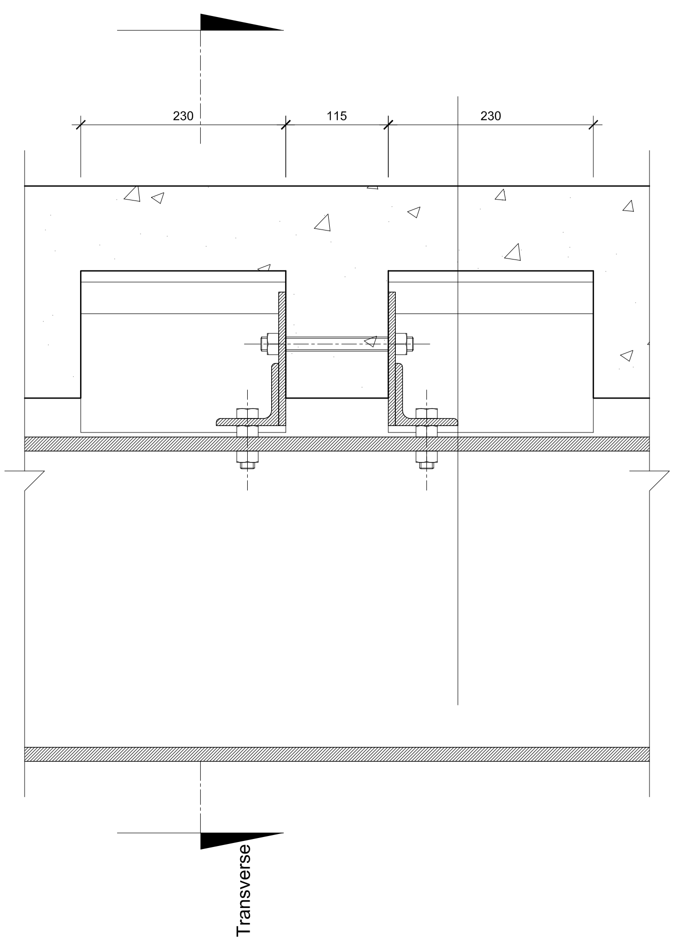
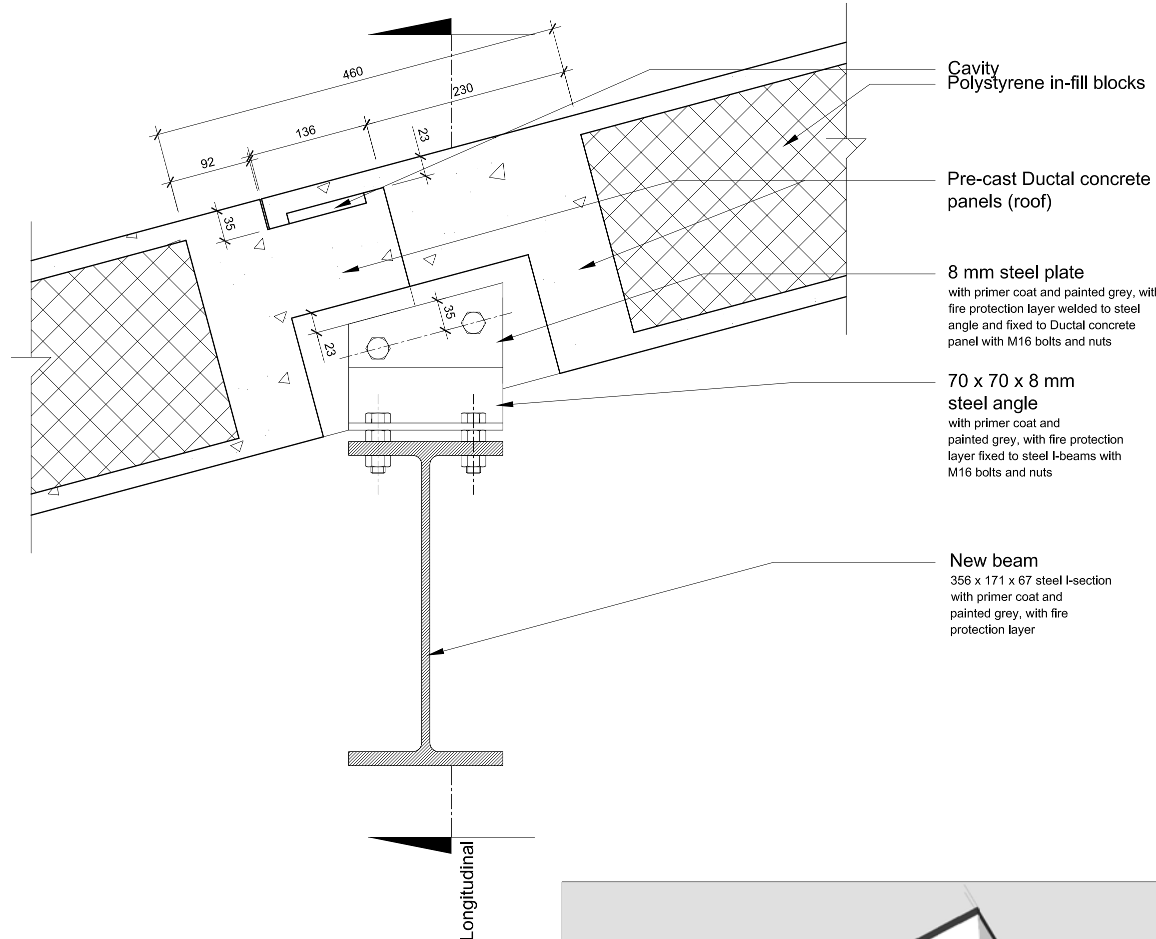
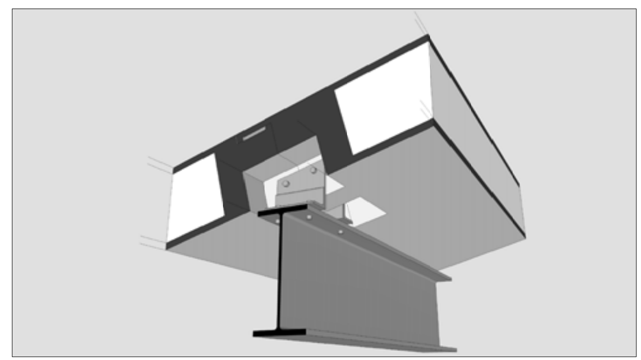


Section (longitudinal)



Section (transverse)



Perspective section from below

Site development

Detail 2 (façade roof)

Scale as shown

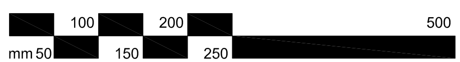


Figure 8.48

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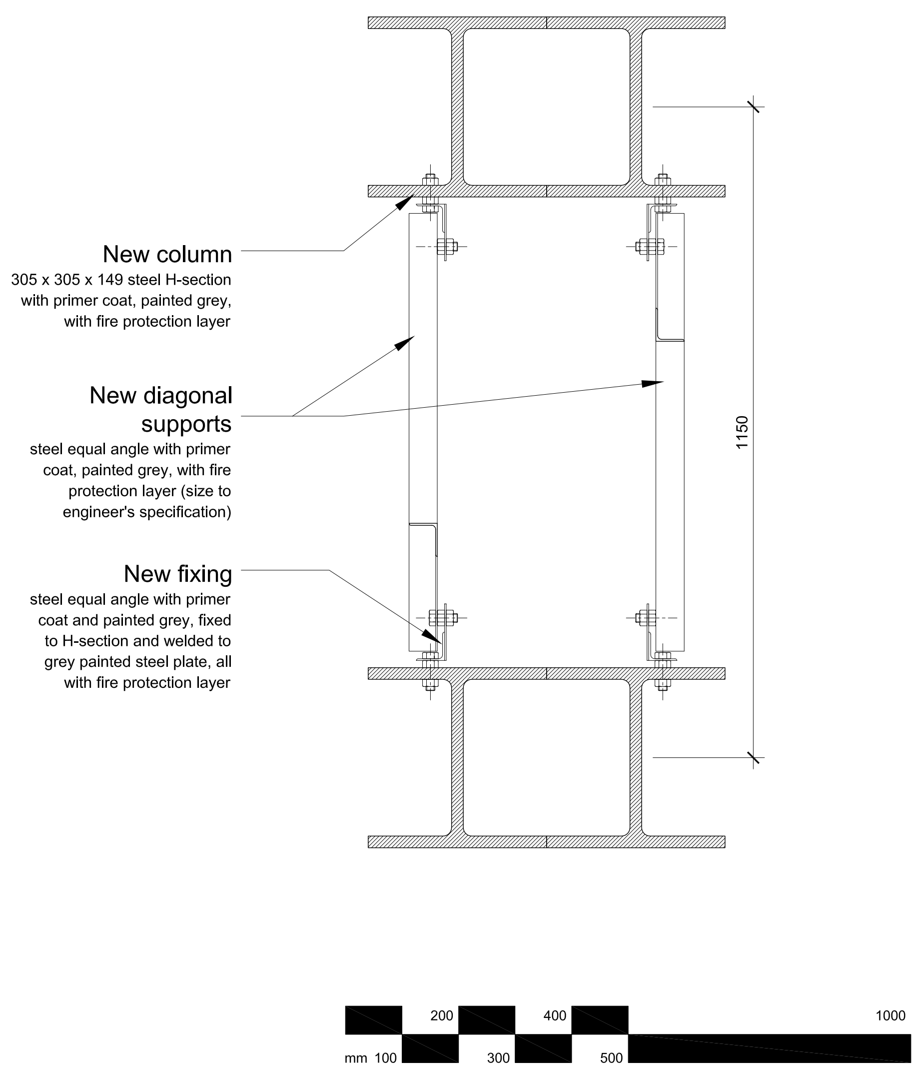
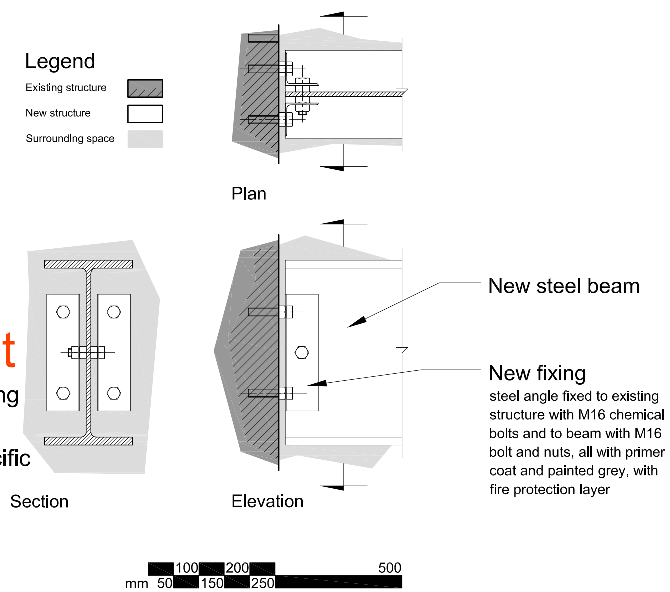


Site development

Detail 3 (steel lattice column)

Scale as shown

Figure 8.51

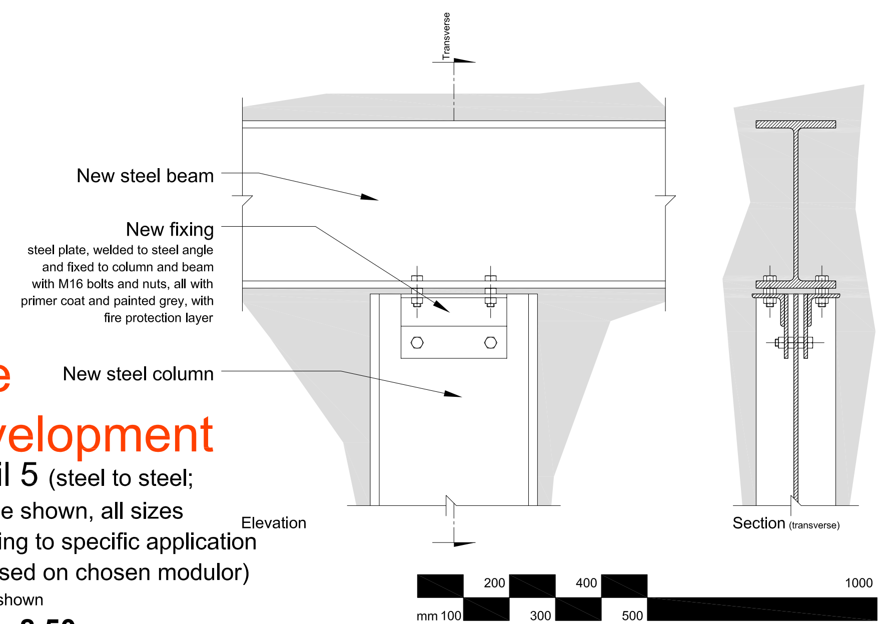


Site development

Detail 4 (steel to existing structure; principle shown, all sizes according to specific application and based on chosen modulor)

Scale as shown

Figure 8.49



Site development

Detail 5 (steel to steel; principle shown, all sizes according to specific application and based on chosen modulor)

Scale as shown

Figure 8.50

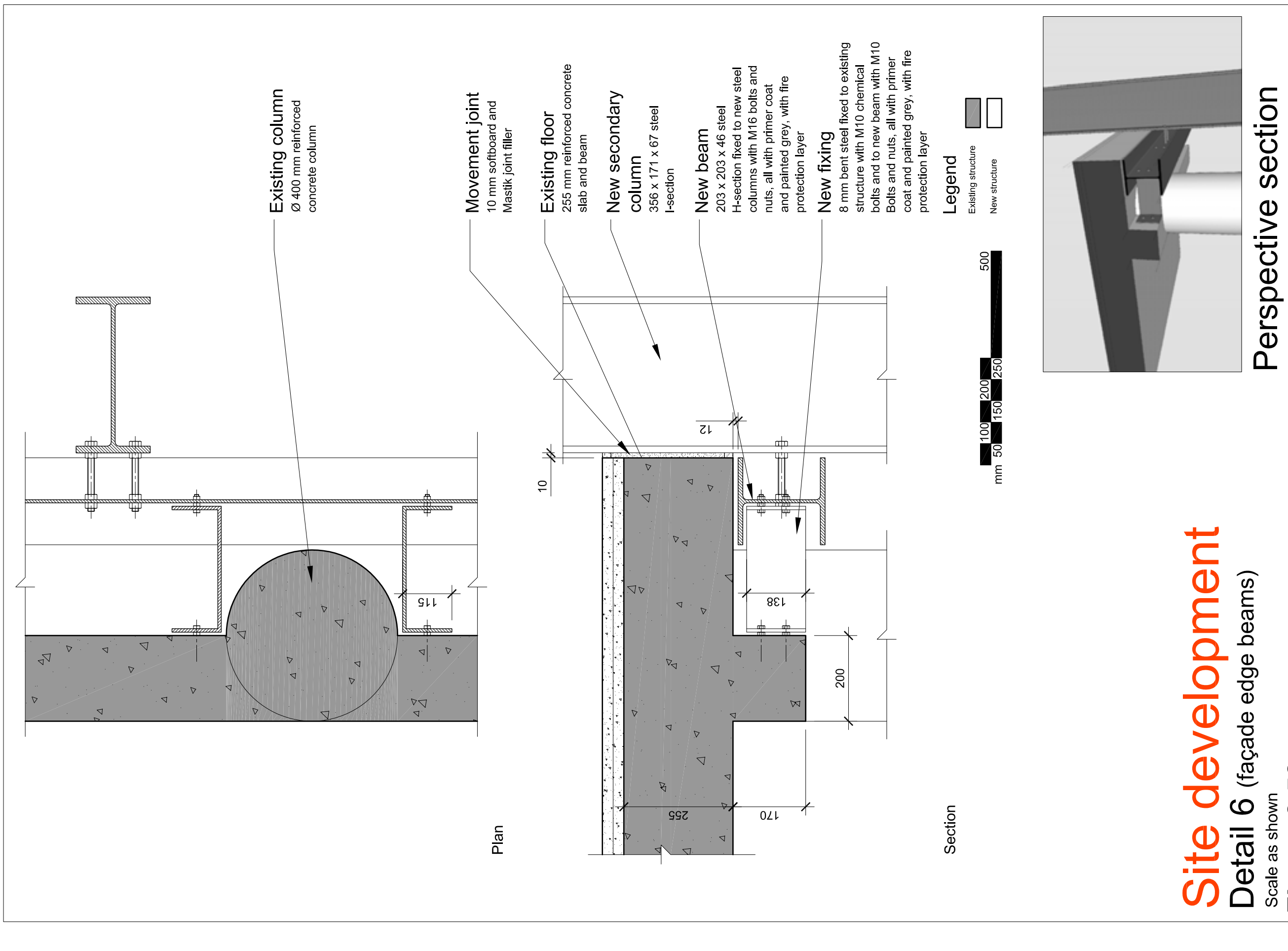
8.3.1. Site development function/programme

Reinforced concrete is used in most cases to illustrate the function/programme. This corresponds to the bulk mass of the function/programme in the parti-diagram and fits easily with the cantilevering landings of the escalator spaces and beam-and-slab structure of the parking levels.

8.3.2. Site development form/beauty

For the form/beauty elements, a light, yet strong material was needed. Although a composite structure, consisting of a steel frame and cladding, was considered, the construction and waterproofing joints proved too complex. Therefore Ductal Concrete was chosen, “a cementitious material consisting of cement, sand, silica fume, silica flour, superplastisizer and water” (Cavill and Chirgwin). The product is manufactured by Lafarge and thus available in Gauteng (www.lafarge.co.za). Steel fibres are added to the mixture to create a material, which is six to eight times stronger in compression and has ten times more flexural strength than conventional concrete (Lamarre 2009:3). It is also waterproof (Vosloo 2009), nullifying the need for an additional layer. The span:depth ratio (s/d) was determined by looking at two built examples:

- Road bridge (fig.8.54), Shepherd’s Gully Creek, designer unknown, consists of



Site development
Detail 6 (façade edge beams)
Scale as shown
Figure 8.52

Fig.8.53 - Sketch of the Site Development balustrade detail.
Fig.8.54 - Partial section of the road bridge at Shepherd's Gully.
Fig.8.55 - Photograph of Villa Navarra.

a single 15 m spanning structure with pretensioned beams of 600 mm depth (Cavill and Chirgwin), thus:
15000 / 600 = 25 s/d
and formwork panels with a depth of 25 mm and a span of 1100 mm, carrying a 170mm thick reinforced concrete slab, thus:
1100 / 25 = 44 s/d;
- Villa Navarra (fig.8.55), Provence, by Rudy Ricciotti, which has a roof that cantilevers for 7390 mm with ribs having a depth of 515 mm (Lamarre), thus:
7390 / 515 = 14,3
14,3 x 3 (for cantilever to span) = 42,9 s/d;

Therefore, the average s/d is:
(25 + 44 + 42,9) / 3 = 37,3 s/d

The longest span for the roof over the escalators is 9582 mm, thus:
9582 / 37,3 = 256,9 mm

rounded up to 276 mm thick ribs according to the chosen module (230 + 46). A 23 mm thick skin is structurally sufficient (based on the thickness of the formwork panels used for the above mentioned bridge) and corresponds to the module. Precast panels were consequently designed for assembly with the steel supports on site (fig.8.48). All other applications of Ductal concrete were designed using the same principles.

8.3.3. Site development tectonics/structure

Steel is used throughout the project, as the tectonics/structure component, because of the slenderness ratio and ease of connection to an existing structure. Most of these are mechanically fixed, increasing the robustness of the components to be re-used on other structures if the need arises in the future. All steel is painted grey, including a

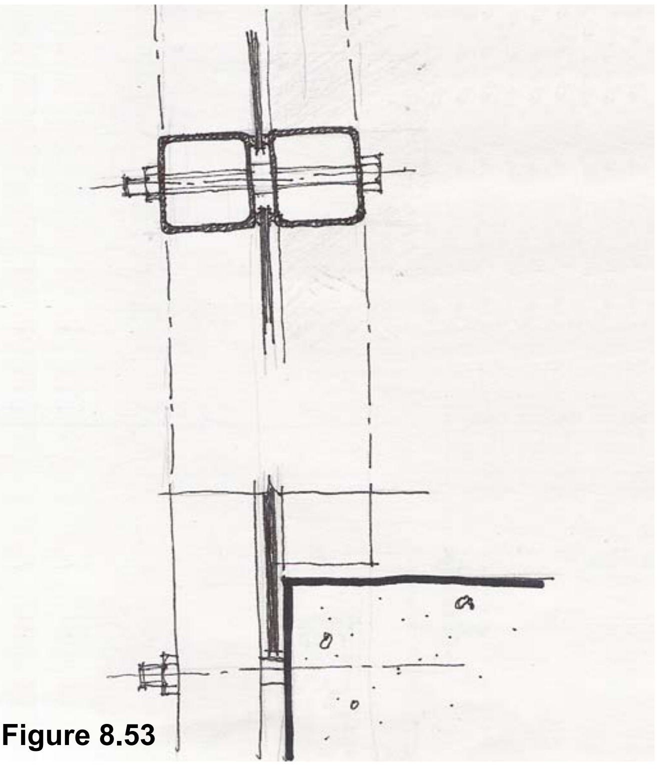


Figure 8.53

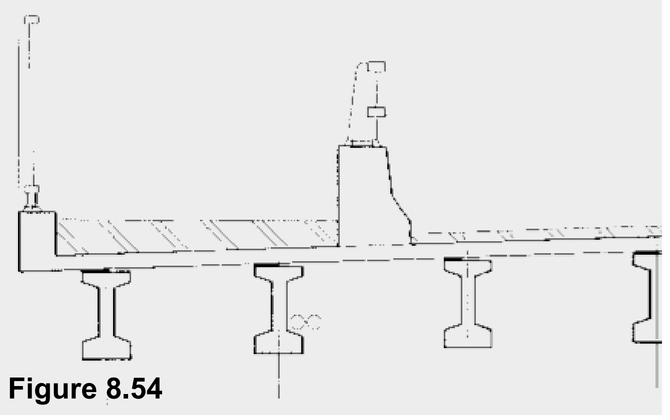


Figure 8.54

fire protection layer. Iscor distributes the steel, being sourced from their production facility in Vanderbijlpark (www.iscor.co.za).

8.3.4. Circulation elements

The escalators are 35˚ Schindler units with 800 mm wide steps. Details are provided by the manufacturing company (www.schindlerdraw.com).

The vehicular elevator's size is based on those available from Wöhr, a German company that specializes in parking solutions (www.woehr.de).

8.3.5. Service ducts

The services ducts (fig.8.47; also see section 6.3.6) contain all necessary piping and ventilation ducts. They are composed of steel angle frames fixed to the existing structure with chemical bolts and clad with 1 mm thick galvanized steel sheets. Most are located on the northern façades of the building.

The ventilation system was designed after consultation with Vosloo (2009), Scheepers (2009) and Vos (2009). It works on the following mechanisms (fig.8.55):

- air in the warm-air duct moves upward to pull stale air out of the interior spaces at ceiling level;
- cool air is then pulled into these spaces, because of negative pressure;
- this air is pulled through a cool-air duct before entering the space;
- air in the cool-air duct moves downward, to push fresh air into the space.

Upwards movement of the air in the warm-air ducts is achieved by applying the following

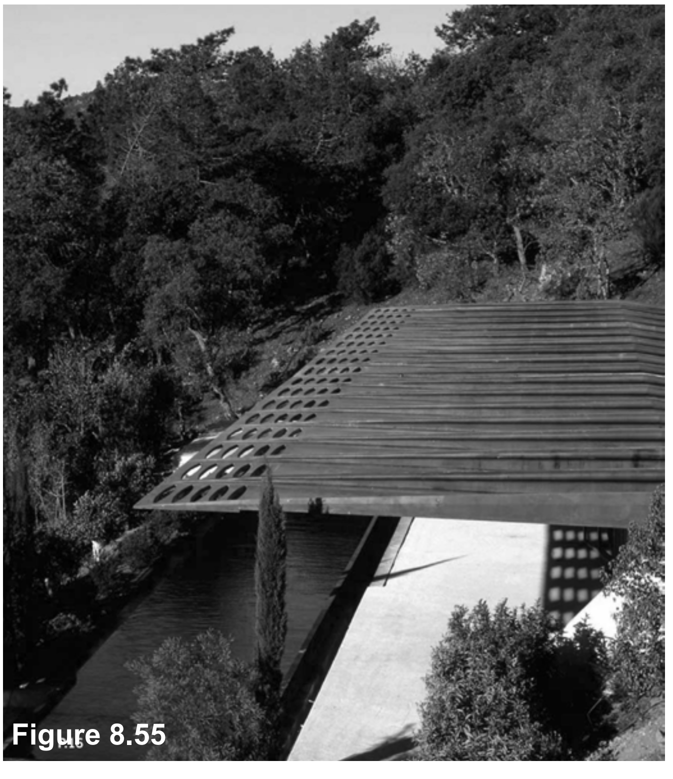


Figure 8.55

Fig.8.56 - Diagram illustrating the ventilation system in 'sites' in the City Centre building.
Fig.8.57 - Photograph of modular turf.
Fig.8.58 - Diagram of a modular turf installation.
Fig.8.59 - Photograph of an *Acacia sieberiana var. woodii* tree.

measures:

- these ducts are positioned in the northern part of the service ducts, so as to be heated by the sun;
- the galvanized steel sheet cladding is painted matt black on the exterior surfaces where it covers these shafts to increase heat absorption;
- the ducts taper towards the top to increase the upward air speed (based on the Venturi-effect; www.spiritus-temporis.com);
- precast Ductal concrete panels on top of the outlets are aligned to the main wind directions for summer to create negative pressure beneath them, thus pulling the warm air out.

The downward movement of the air in the cool-air ducts is attained by implementing the following measures:

- the ducts are positioned in the southern part of the service ducts to be shielded from the sun;
- the ducts taper towards the bottom to increase the downward air speed (based on the Venturi-effect; *ibid.*);
- water mist is sprayed into the ducts at the top to decrease the temperature;
- precast Ductal concrete units are positioned at the top facing east (according to the main wind direction during summer), 'scooping' air into the cool-air ducts and forcing it down.

The cool-air duct is insulated from the city climate by means of:

- a 100 mm polystyrene insulation layer which is inserted between the warm-air and cool-air duct;
- the area dedicated to piping serves as a second insulation layer on the southern side

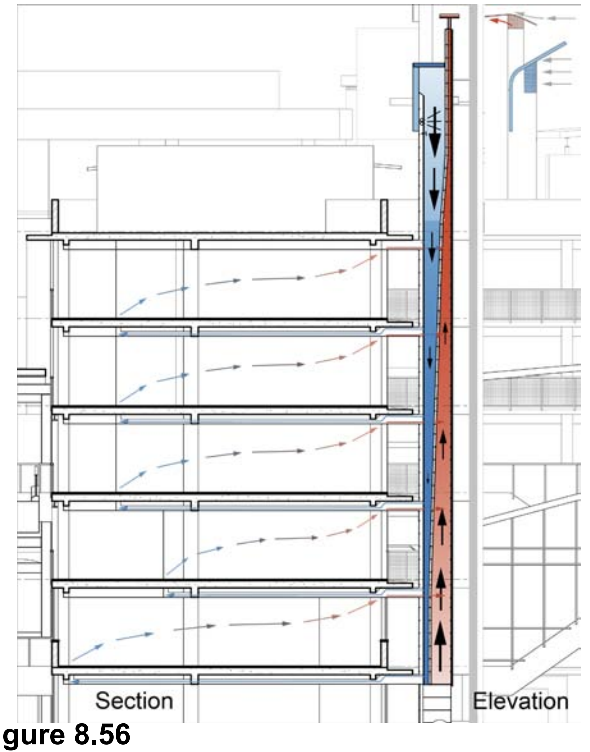


Figure 8.56


Figure 8.57

of the cool-air duct;
- the side has a double layer of galvanized steel cladding, with a 50 mm polystyrene layer in-between.

An ultraviolet lighting unit is installed just beneath the water mist sprayer to prevent any bacteria from entering the new 'sites'.

8.3.6. Vegetation

Modular turf (fig.8.57) is used for the main open spaces' grassed areas, a lightweight growing medium manufactured by Fytogreen, an Australian company (www.fytogreen.com.au). It consists of an aminoplast resin foam, laid on top of geo-fabric, a Fytonop drainage cell layer and a Low Density Plastic liner (fig.8.58; *ibid.*). Irrigation pipes are placed between the panels and an LM-lawn layer is added onto this.

Paper bark thorn trees (*Acacia sieberiana var. woodii*, fig.8.59) were chosen for the main open spaces for their wide canopies, providing shade for the users of the existing and new spaces. Their placement coincides with existing column positions on the floor below, negating the addition of structural supports. Each is planted within a Ductal concrete planter box, since the material strength creates less loading than conventional structures.

8.4. Second phase: the MINI Space Gallery

Figs.8.60-8.75 show all plans, elevations, sections and details for this phase of the project.

Again, the parti-diagram was used as the guiding principle for solving the design and final details.

Structural sizes are all based on calculations from Orton (1988:22-54; see Appendix B), as with the previous phase.

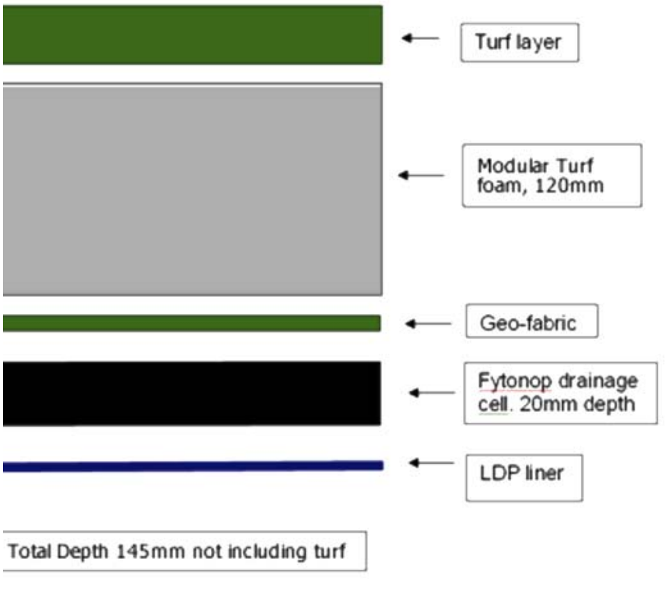
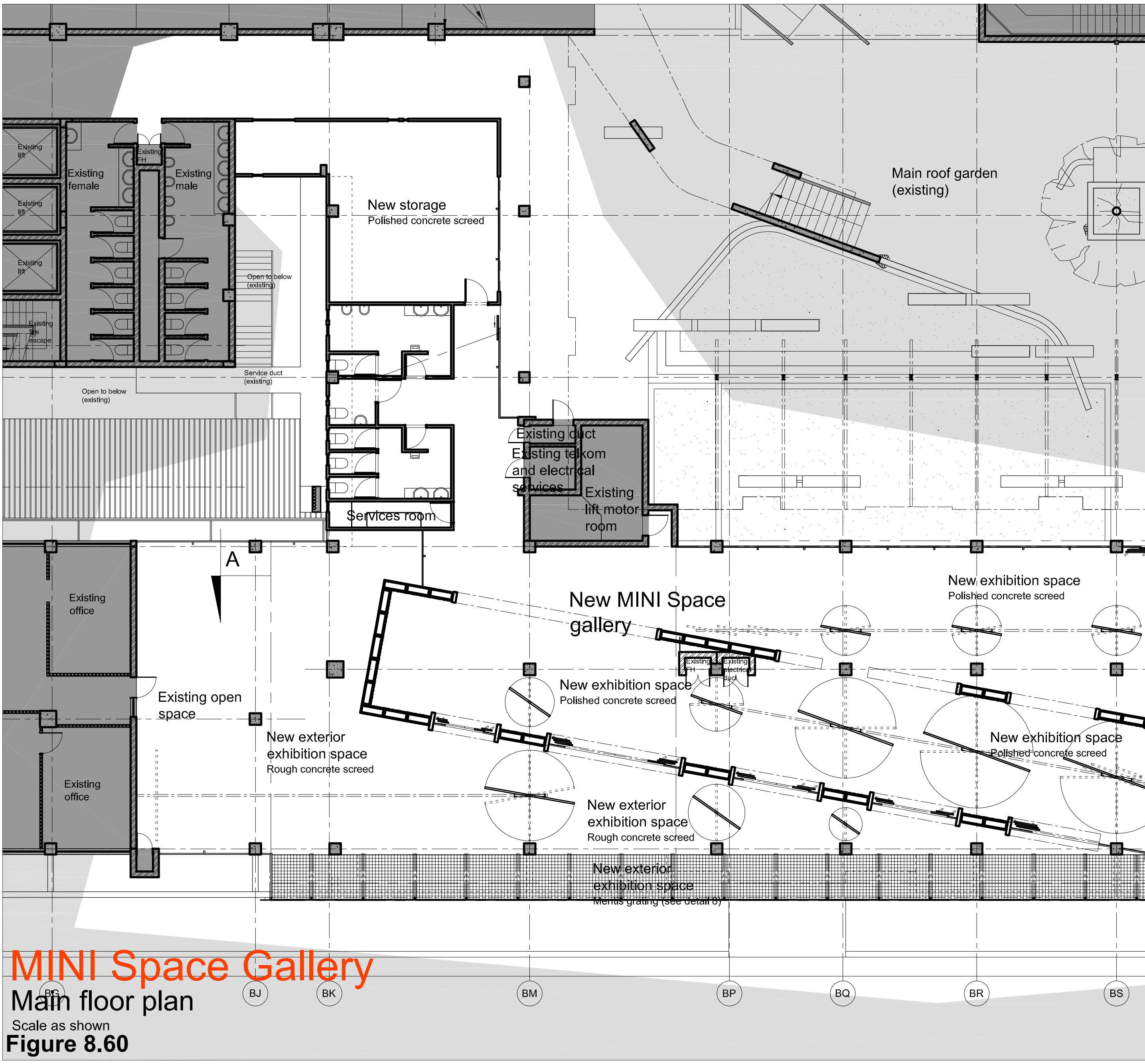


Figure 8.58

Figure 8.59

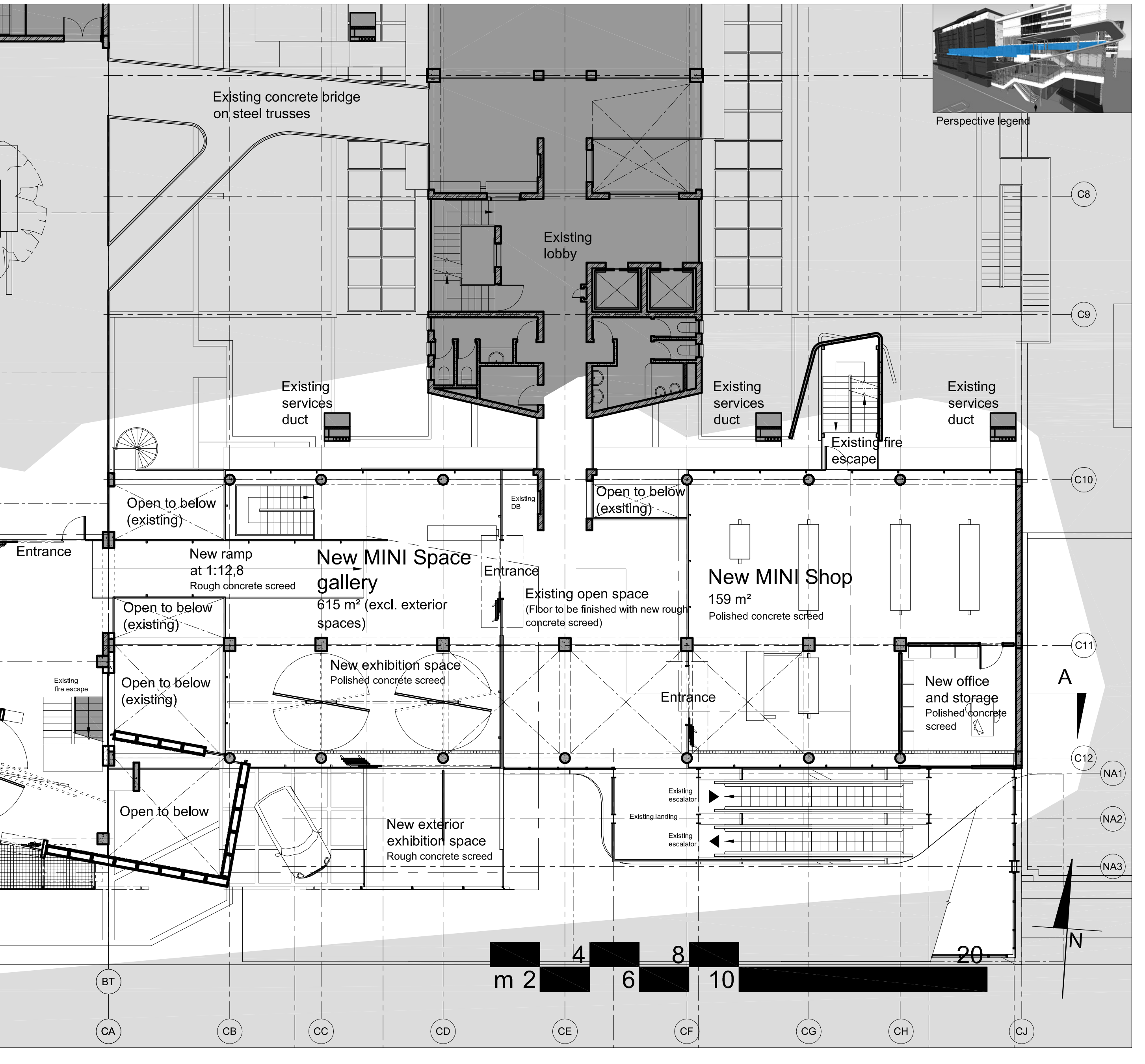


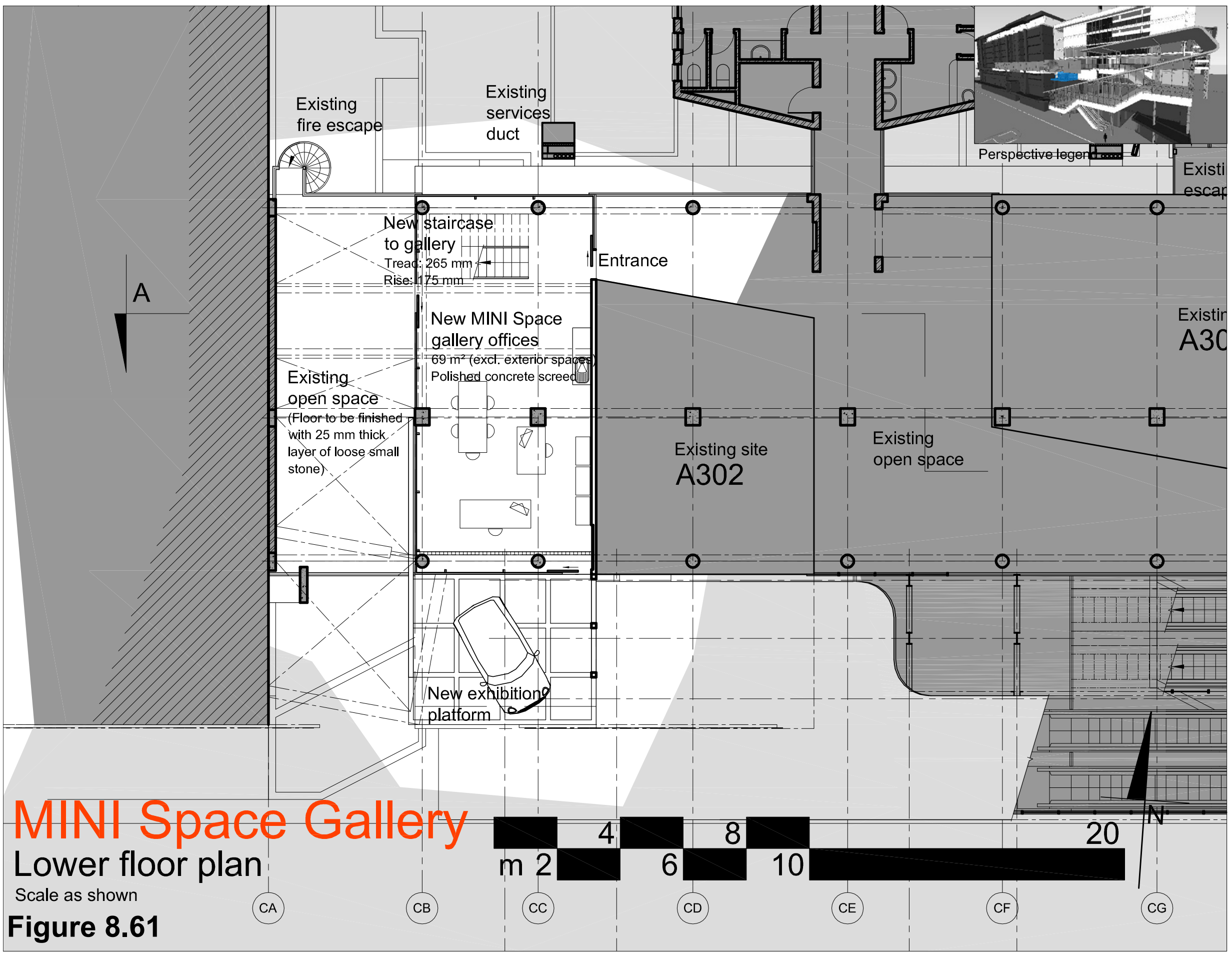
MINI Space Gallery

Main floor plan

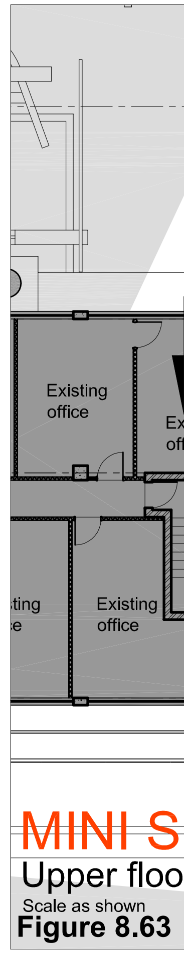
Scale as shown

Figure 8.60

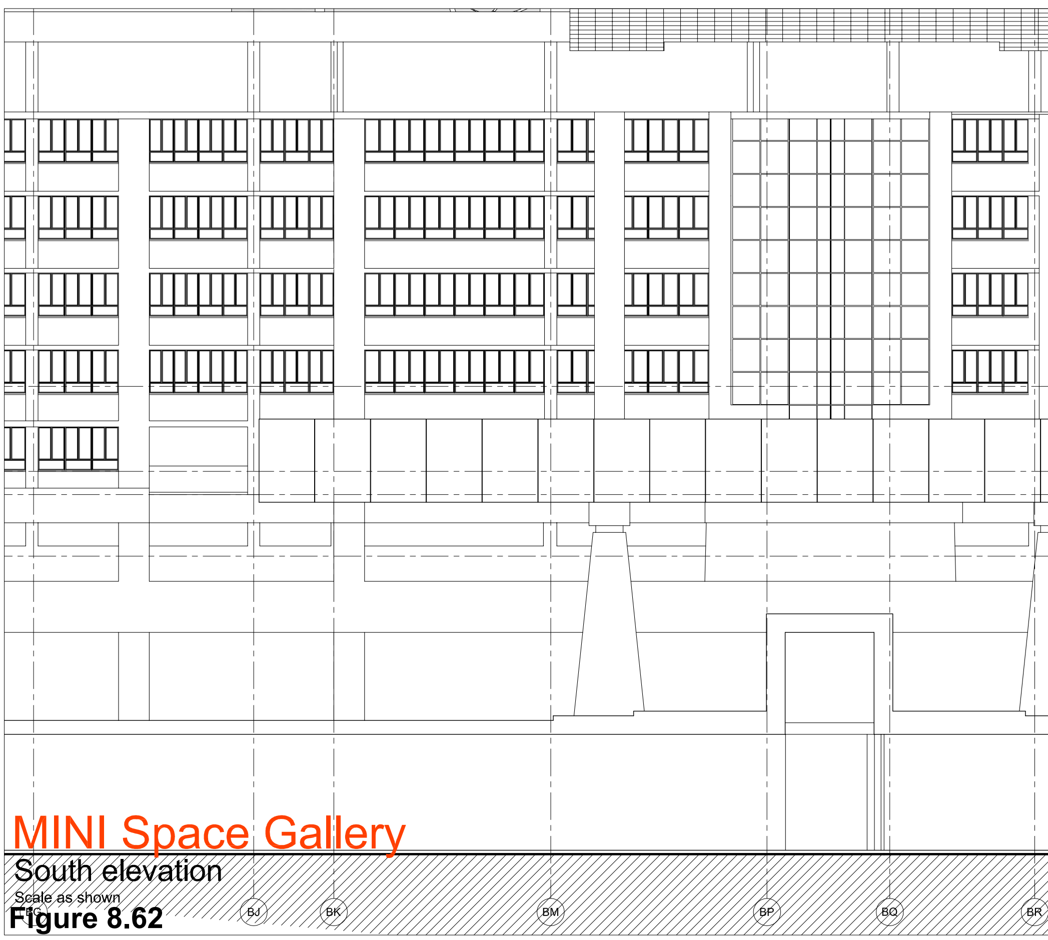

Existing concrete bridge on steel trusses
Perspective legend
Existing lobby
Existing services duct
Existing services duct
Existing services duct
Existing fire escape
Open to below (existing)
Entrance
New ramp at 1:12,8
Rough concrete screed
New MINI Space gallery
615 m² (excl. exterior spaces)
Existing DB
Entrance
Open to below (exsiting)
Existing open space
(Floor to be finished with new rough concrete screed)
New MINI Shop
159 m²
Polished concrete screed
Open to below (existing)
Open to below (existing)
Existing fire escape
New exhibition space
Polished concrete screed
Entrance
New office and storage
Polished concrete screed
A
Open to below
New exterior exhibition space
Rough concrete screed
Existing escalator
Existing landing
Existing escalator
N
m 2 4 6 8 10 20
C8
C9
C10
C11
C12
NA1
NA2
NA3
BT
CA
CB
CC
CD
CE
CF
CG
CH
CJ



MINI Space Gallery
Lower floor plan
Scale as shown
Figure 8.61



MINI S
Upper floo
Scale as shown
Figure 8.63



MINI Space Gallery
South elevation
Scale as shown
Figure 8.62

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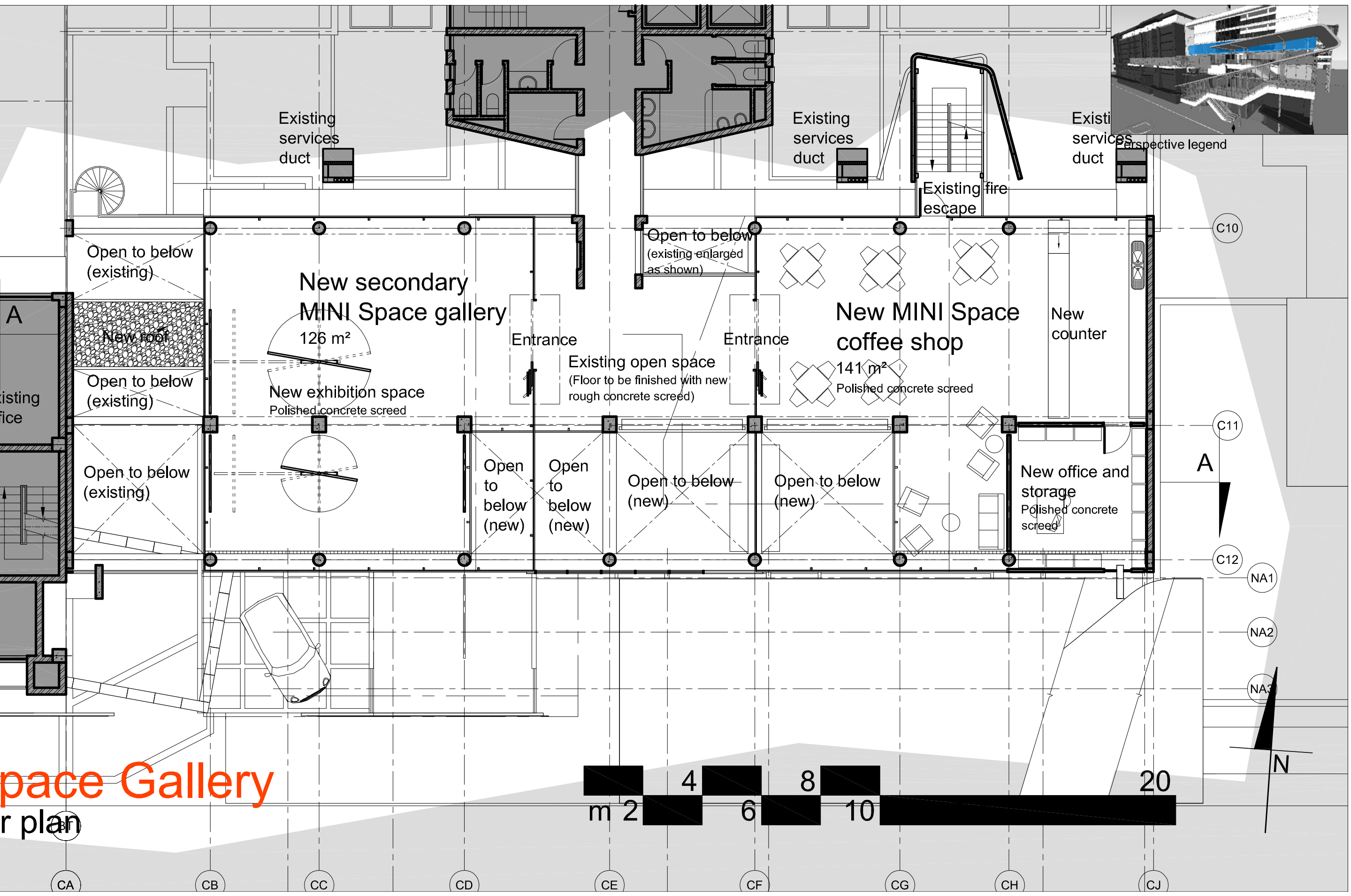
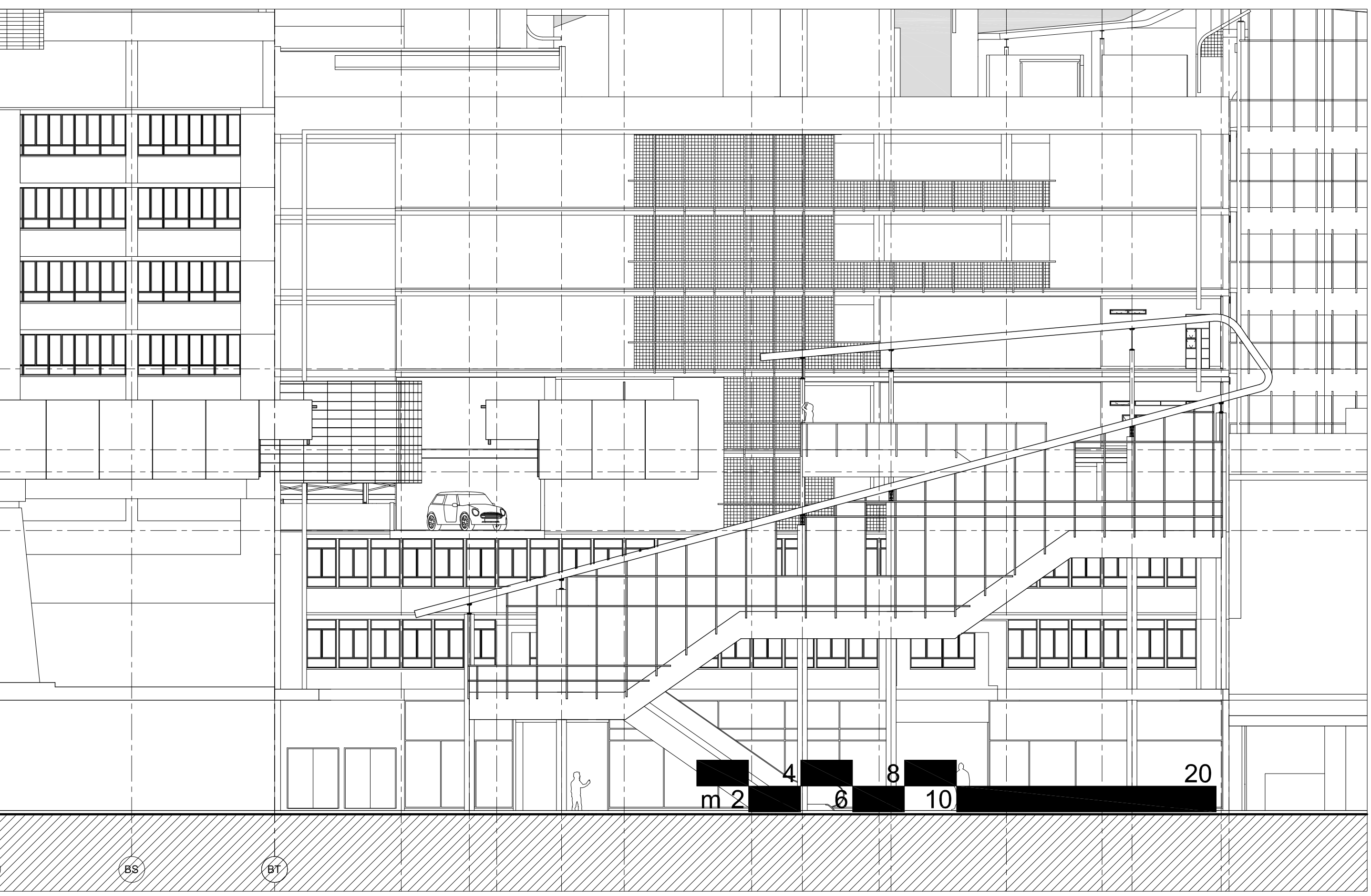
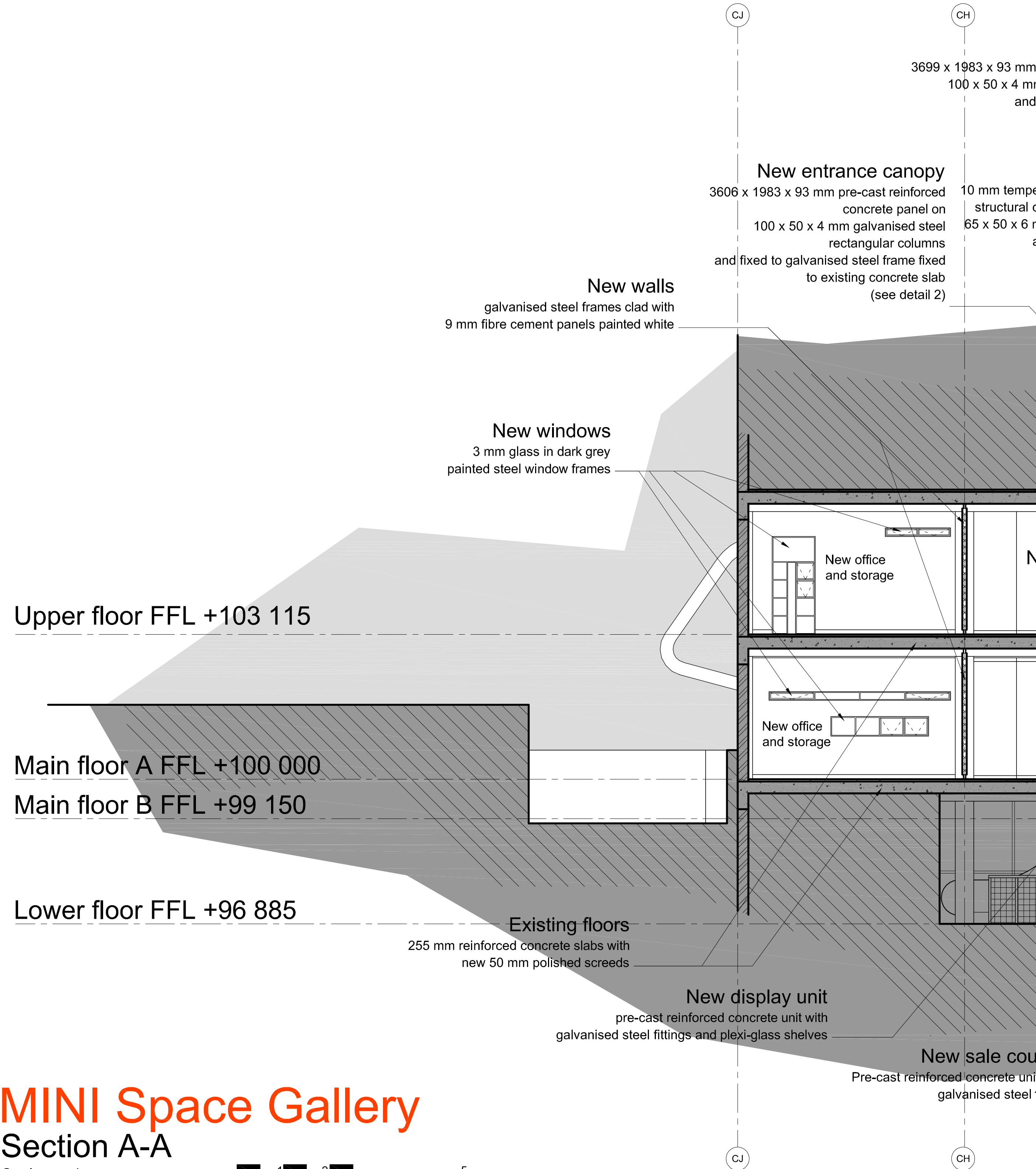

Existing services duct
Existing services duct
Existing services duct
Perspective legend
Existing fire escape
Open to below (existing)
New roof
Open to below (existing)
Open to below (existing)
A
Existing office
New secondary MINI Space gallery
126 m²
New exhibition space
Polished concrete screed
Entrance
Existing open space
(Floor to be finished with new rough concrete screed)
Entrance
Open to below
(existing enlarged as shown)
New MINI Space coffee shop
141 m²
Polished concrete screed
New counter
New office and storage
Polished concrete screed
Open to below (new)
Open to below (new)
Open to below (new)
Open to below (new)
A
N
C10
C11
C12
NA1
NA2
NA3
pace Gallery
r plan
m 2 4 6 8 10 20
CA
CB
CC
CD
CE
CF
CG
CH
CJ


m 2 4 6 8 10 20
BS
BT

Legend



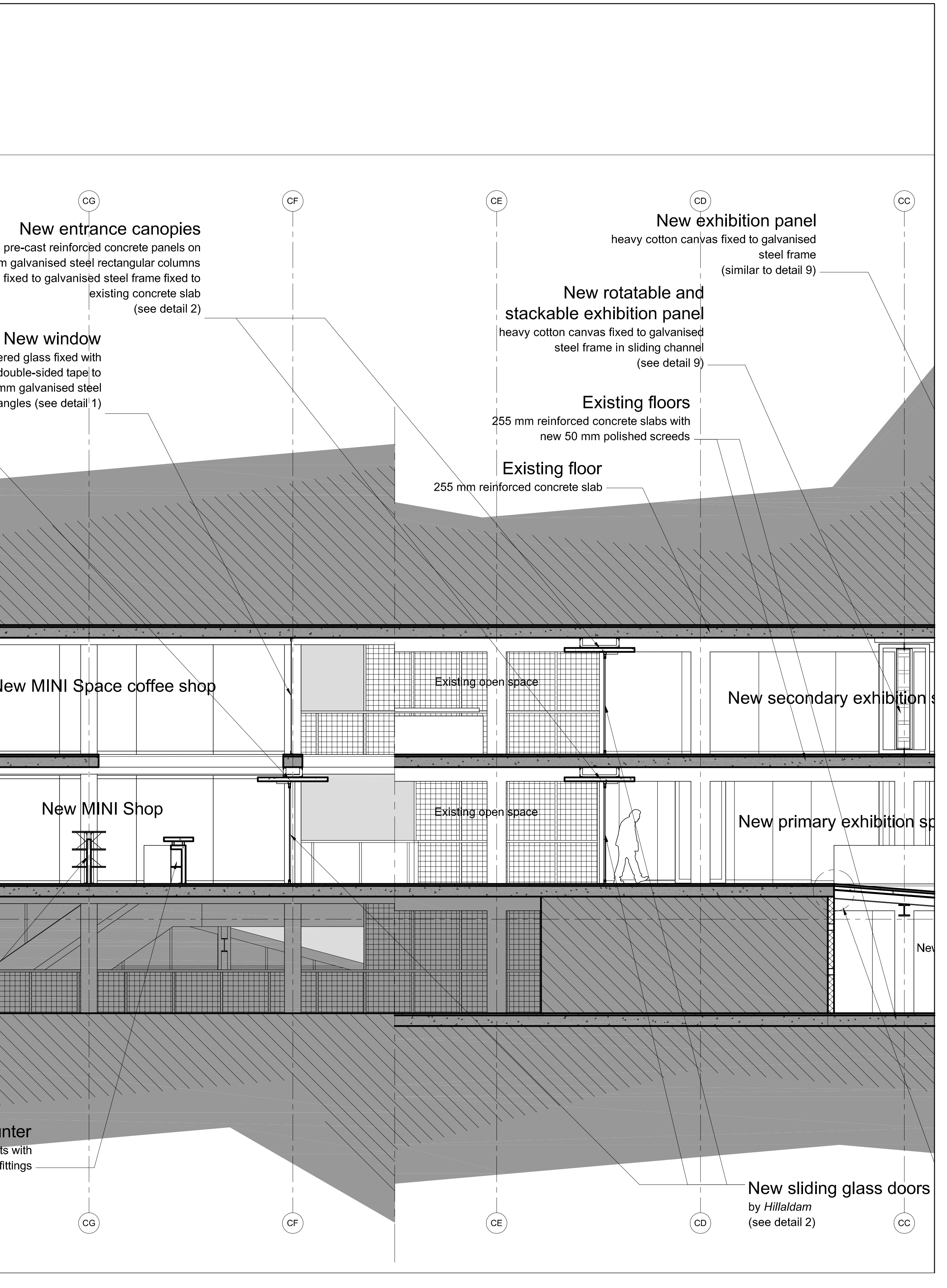
MINI Space Gallery

Section A-A

Scale as shown

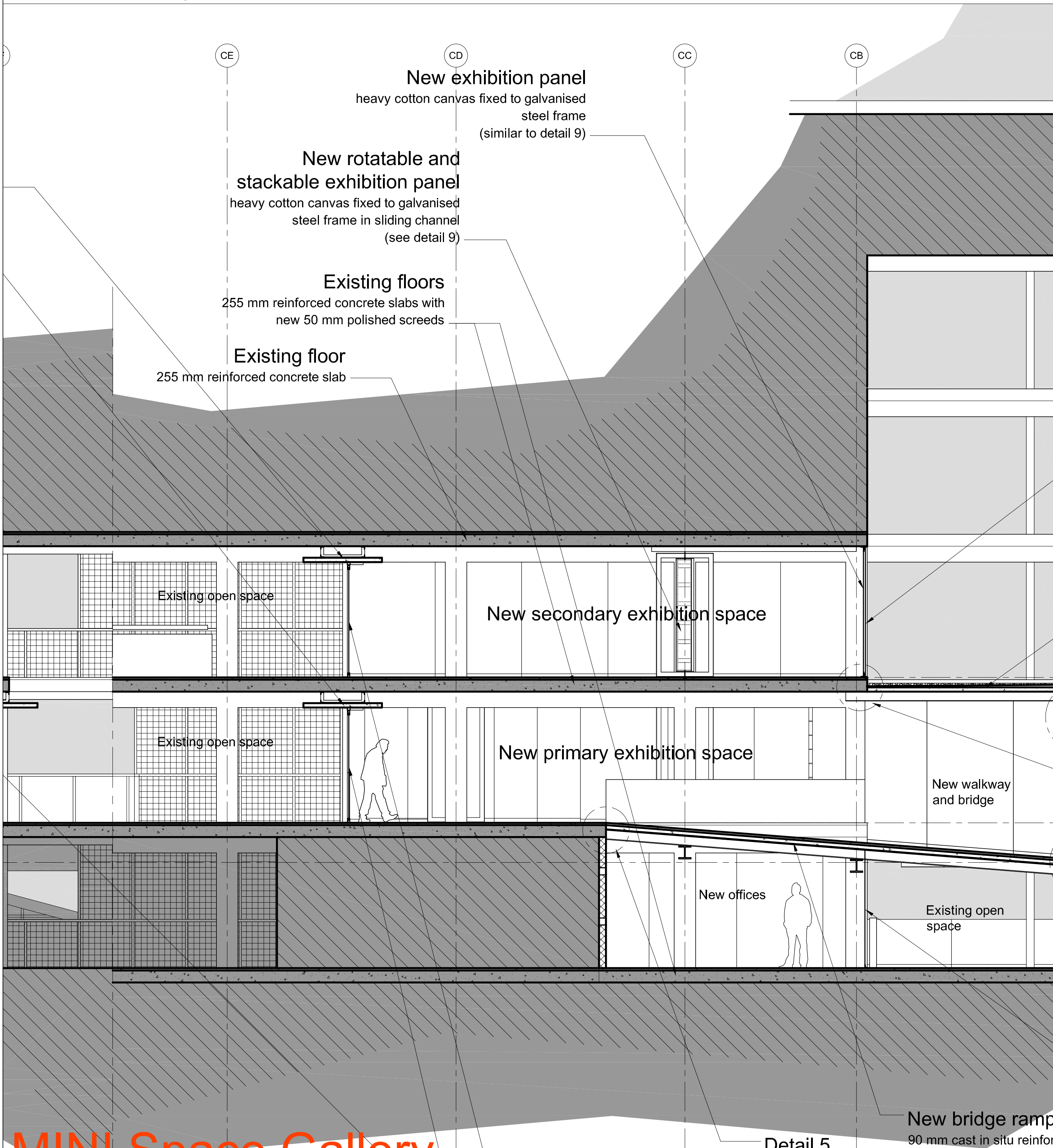
m 1 2 5

Figure 8.64



CG
CF
CE
CD
CC
New entrance canopies
pre-cast reinforced concrete panels on
m galvanised steel rectangular columns
fixed to galvanised steel frame fixed to
existing concrete slab
(see detail 2)
New window
ered glass fixed with
double-sided tape to
mm galvanised steel
angles (see detail 1)
New exhibition panel
heavy cotton canvas fixed to galvanised
steel frame
(similar to detail 9)
New rotatable and
stackable exhibition panel
heavy cotton canvas fixed to galvanised
steel frame in sliding channel
(see detail 9)
Existing floors
255 mm reinforced concrete slabs with
new 50 mm polished screeds
Existing floor
255 mm reinforced concrete slab
New MINI Space coffee shop
Existing open space
New secondary exhibition s
New MINI Shop
Existing open space
New primary exhibition sp
New
nter
ts with
fittings
New sliding glass doors
by Hillaldam
(see detail 2)
CG
CF
CE
CD
CC

Legend



MINI Space Gallery

Section A-A

Scale as shown

Figure 8.65