STRUCTURE

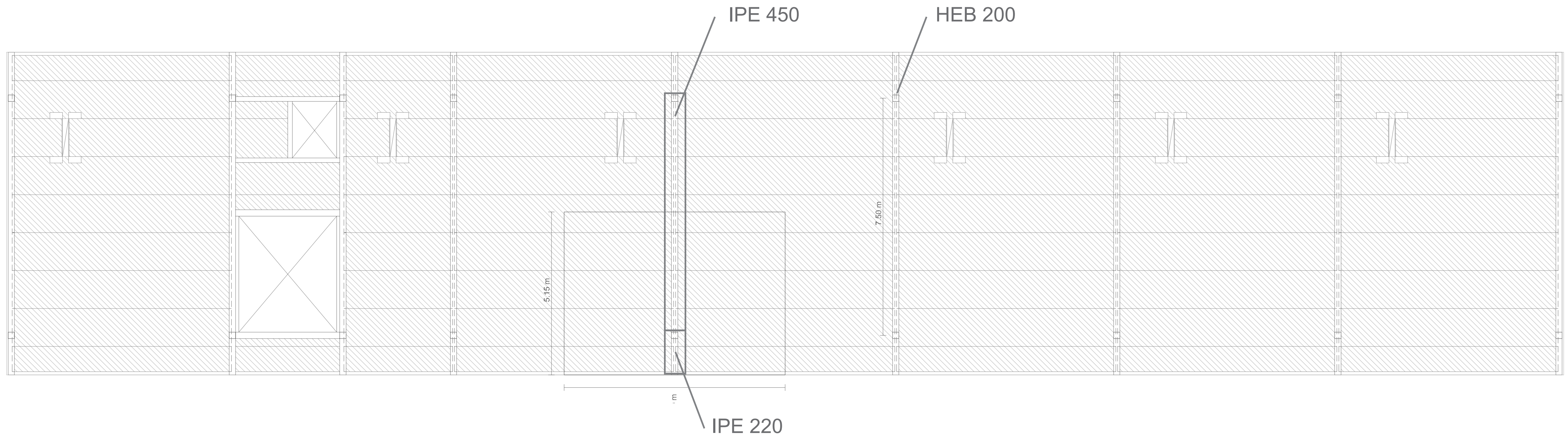
BLOCK A

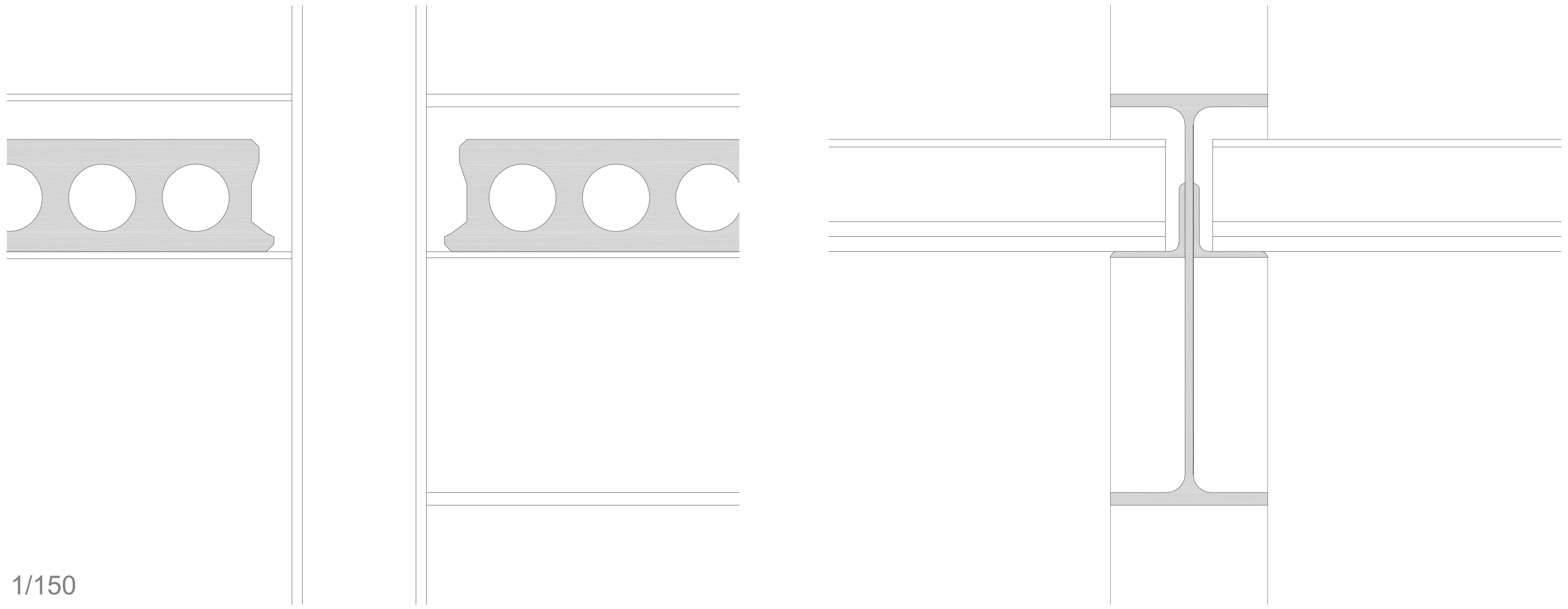
For the structure of the blocks the system used is parallel metal frames with hollow-core slabs.

La razón es una mayor facilidad y rapidez constructiva dado que la mayoria de los elementos son prefabricados, solo teniendo que aplicar una capa de compresión sobre las losas alveolares.

The reason is a faster and easier contruction since most of the elements are prefabricated, only having to apply a compression layer over the hollow-core planks.

The gaps in it are made by placing a special metal piece.





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CÁLCULO DE PESOS PROPIOS Y SOBRECARGAS

Forjado Cubierta Block A

Peso Propio

Forjado de losa alveolar con capa de compresión de 5 cm	3.51 KN/m2
Cubierta plana invertida con rava	2.50 KN/m2
Falso techo	0.30 KN/m2
TOTAL	**6.31 KN/m2**

Sobrecargas

Uso de mantenimiento	**1.00 KN/m2**
Nieve (Szczecin)	**2.50 KN/m2**

Forjado Medio Block A

Peso Propio

Forjado de losa alveolar con capa de compresión de 5 cm	3.51 KN/m2
Parqué sobre rastreles	0.40 KN/m2
Falso techo	0.30 KN/m2
TOTAL	**4.21 KN/m2**

Sobrecargas

Uso zona residencial	2.00 KN/m2
Tabiquería	1.00 KN/m2
TOTAL	**3.00 KN/m2**

Forjado Inferior Block A

Peso Propio

Forjado de losa alveolar con capa de compresiónde 5cm	3.51 KN/m2
Parqué sobre rastreles	0.40 KN/m2
Lana de vidrio	0.12 KN/m2
Falso techo	0.30 KN/m2
TOTAL	**4.33 KN/m2**

Sobrecargas

Uso zona residencial	2.00 KN/m2
Tabiquería	1.00 KN/m2
TOTAL	**3.00 KN/m2**

DETERMINACIÓN DE CARGAS PARA ESTADOS LÍMITE

Forjado Cubierta Block A

E.L.U. q = 1.35•6.31•7•5.15 + 1.5•1•7•5.15 + 0.5•2.5•7•5.15 = 406.23 KN

E.L.S. q = 6.31•7•5.15 + 1•7•5.15 + 2.5•7•5.15 = 353.65 KN

Forjado Medio Block A

E.L.U. q = 1.35•4.21•7•5.15 + 1.5•3•7•5.15 = 367.11 KN

E.L.S. q = 4.21•7•5.15 + 3•7•5.15 = 259.92 KN

Forjado Inferior Block A

E.L.U. q = 1.35•4.33•7•5.15 + 1.5•3•7•5.15 = 372.95 KN

E.L.S. q = 4.33•7•5.15 + 3•7•5.15 = 264.24 KN

CÁLCULO DEL PILAR MÁS DESFAVORABLE

Comprobación de pilares metálicos sometidos a compresión de pilar. Por tanto, calculamos la resistencia de la barra a compresión del pilar de planta baja, por ser el de mayor longitud y el que está sometido a mayores esfuerzos.

Axil de agotamiento $N_u \geq N_d$

Por lo que, partiendo de los datos obtenidos anteriormente

$N_d = F_{cubierta} + F_{medio} + F_{inferior} = 406.23 + 367.11 + 372.95 = 1146.29$ KN

Necesitamos un área para el perfil de: $\Omega_n = N_d/f_{yd}$

$f_{yd} = f_y/1.05 = 275/1.05 = 261.9$ /Nmm2

$$\Omega_n \geq \frac{1146{,}29 \cdot 1000 \text{ KN}}{261.9 \text{ N/mm2}} = 4376 \text{ mm2} = 43.76 \text{ cm2}$$

El perfil HEB 160 $\Omega = 54.4$ cm2 > 43.76 cm2

Pandeo

$$\lambda = \frac{\beta \cdot L}{i_{min}}$$

β para barra empotrada-articulada 0.7

L longitud de la barra 420 cm

i_{min} es el radio de giro mínimo del perfil, que para HEB 160 es 4.05 cm

$$\lambda = \frac{0.7 \cdot 420}{4.05} = 72.6$$

El coeficiente se estima a partir de la esbeltez λ sabiendo que para el acero A42b es ω = 1.445

$$N_u = \frac{\sigma \cdot A}{\omega} \cdot x \frac{1}{1000}$$

σ es 2600 para el acero A42b

A es el área del perfil HEB 160 es 54.3 cm2

$$N_u = \frac{2600 \cdot 54.3 \text{ cm2}}{1.445} \cdot x \frac{1}{1000} = 97.7 \text{ T} = 977\text{KN}$$

$N_u = 977$ KN ≤ 1146.29 KN

Por lo que HEB 160 no cumple y habrá que aumentar el perfil

Comprobación de HEB 180

β = 0.7

L = 420 cm

imin = 4.57

A = 65.5 cm2

$$\lambda = \frac{0.7 \cdot 420}{4.57} = 64.33$$

El coeficiente se estima a partir de la esbeltez λ sabiendo que para el acero A42b es ω = 1.43

$$N_u = \frac{2600 \cdot 65.5 \text{ cm2}}{1.445} \cdot x \frac{1}{1000} = 119\text{T} = 1990 \text{ KN}$$

$N_u = 1990$ KN ≤ 1196.29 KN

Por tanto CUMPLE

CÁLCULO DE LA VIGA MÁS DESFAVORABLE

Cálculo de módulo resistente y la inercia necesaria en las vigas de un vano. Para el cálculo asimilamos nuestro caso al de la viga isostática y varga uniforme, que dando del lado de la seguridad, ya que cualquier condición de enlace que se introduzca a la estructura hará que esta funciones más solidariamente, reduciendo las solicitones en el centro de vano, que coincide con la sección más desfavorable.

Viga intermedia

Momento de cálculo $M_{rd} \geq M_d$

$M_d = q \cdot L_2 / 12$

q = 1.35•6.31•7 + 1.5•1•7 + 0.5•2.5•7 = 78.88 KN/m

$$M_d = \frac{78.88 \cdot (7.5)_2}{12} = 369.75 \text{ KNm}$$

Módulo resistente (W_{nec})

$W_{nec} = M_d / f_{yd}$

Dada la resistencia del acero minorada

$f_{yd} = f_y / 1.05 = 275/1.05 = 262$ N/mm2 = 26.2 N/mm2

$$W_{nec} = \frac{369.75 \cdot 100}{26.2} = 1411.26 \text{ cm3}$$

El perfil IPE 450 tiene W = 1500.26 cm3 ≥ 1411.26 cm3

$$I_{nec} = \frac{5 \cdot q \cdot (L)_4}{384 \cdot E \cdot L/\psi}$$

q es la carga de E.L.S = 6.31•7 + 1•7 + 2.5•7 = 68.67 KN/m

L es la luz = 750 cm

E = 2100000 kg/cm2

ψ es la relación luz/flecha = 300

$$\text{Inec} = \frac{5 \cdot 68.67 \cdot (750)_4}{384 \cdot 2100000 \cdot 750/300} = 53887.94 \text{ cm4}$$

IPE 550 tiene una I = 67120 cm4 ≥ 53887.94 cm4

Por tanto CUMPLE

Viga en voladizo

Momento de cálculo $M_{rd} \geq M_d$

$M_d = q \cdot L_2 / 2$

q = 1.35•6.31•7 + 1.5•1•7 + 0.5•2.5•7 = 78.88 KN/m

$$M_d = \frac{78.88 \cdot (1.2)_2}{2} = 56.79 \text{ KNm}$$

Módulo resistente (W_{nec})

$W_{nec} = M_d / f_{yd}$

Dada la resistencia del acero minorada

$f_{yd} = f_y / 1.05 = 275/1.05 = 262$ N/mm2 = 26.2 N/mm2

$$W_{nec} = \frac{56.79 \cdot 100}{26.2} = 216.75 \text{ cm3}$$

El perfil IPE 220 tiene W = 252 cm3 ≥ 216.75 cm3

$$I_{nec} = \frac{5 \cdot q \cdot (L)_4}{384 \cdot E \cdot L/\psi}$$

q es la carga de E.L.S = 6.31•7 + 1•7 + 2.5•7 = 68.67 KN/m

L es la luz = 750 cm

E = 2100000 kg/cm2

ψ es la relación luz/flecha = 300

$$\text{Inec} = \frac{5 \cdot 68.67 \cdot (120)_4}{384 \cdot 2100000 \cdot 120/300} = 35.31 \text{ cm4}$$

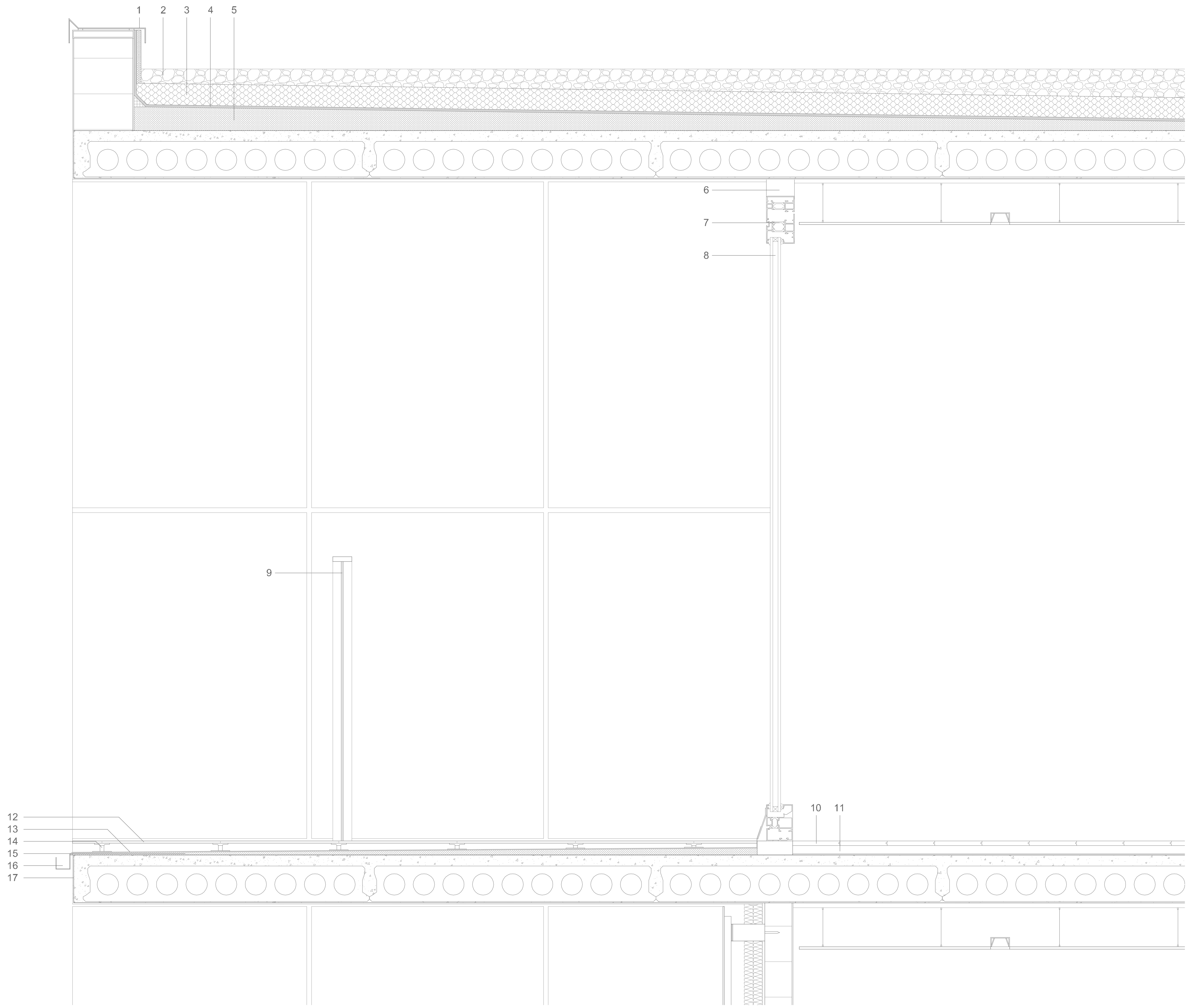
IPE 220 tiene una I = 143 cm4 ≥ 35.31 cm4

Por tanto CUMPLE

CONSTRUCTION

BLOCK DETAIL

1 Metallic coping
2 Gravel filling
3 Fiberglass insulation
4 Roofing felt
5 Slope of lightweight concrete
6 Metallic lintel
7 Aluminium carpentry
8 Doble glazed window
9 Glass railing
10 Wooden flooring
11 Batten
12 Exterior wood pavement
13 Geotextile waterproof sheet
14 Pedestal
15 Slope of mortar
16 Gutter
17 Water proofed cement plaster
18 Air gap
19 Fibberglass insulation
20 Water proofed cement
21 Solid brick
22 Laminated gypsum board
23 Tinted metallic wall panel
24 Aluminium support structure
25 Anchored extruded aluminium profile
26 Skirting board
27 Reinforced concrete
28 Steel profile edge beam
29 Hollow-core plank
30 Fibberglass insulation
31 Hanger wire
32 Suspended ceiling



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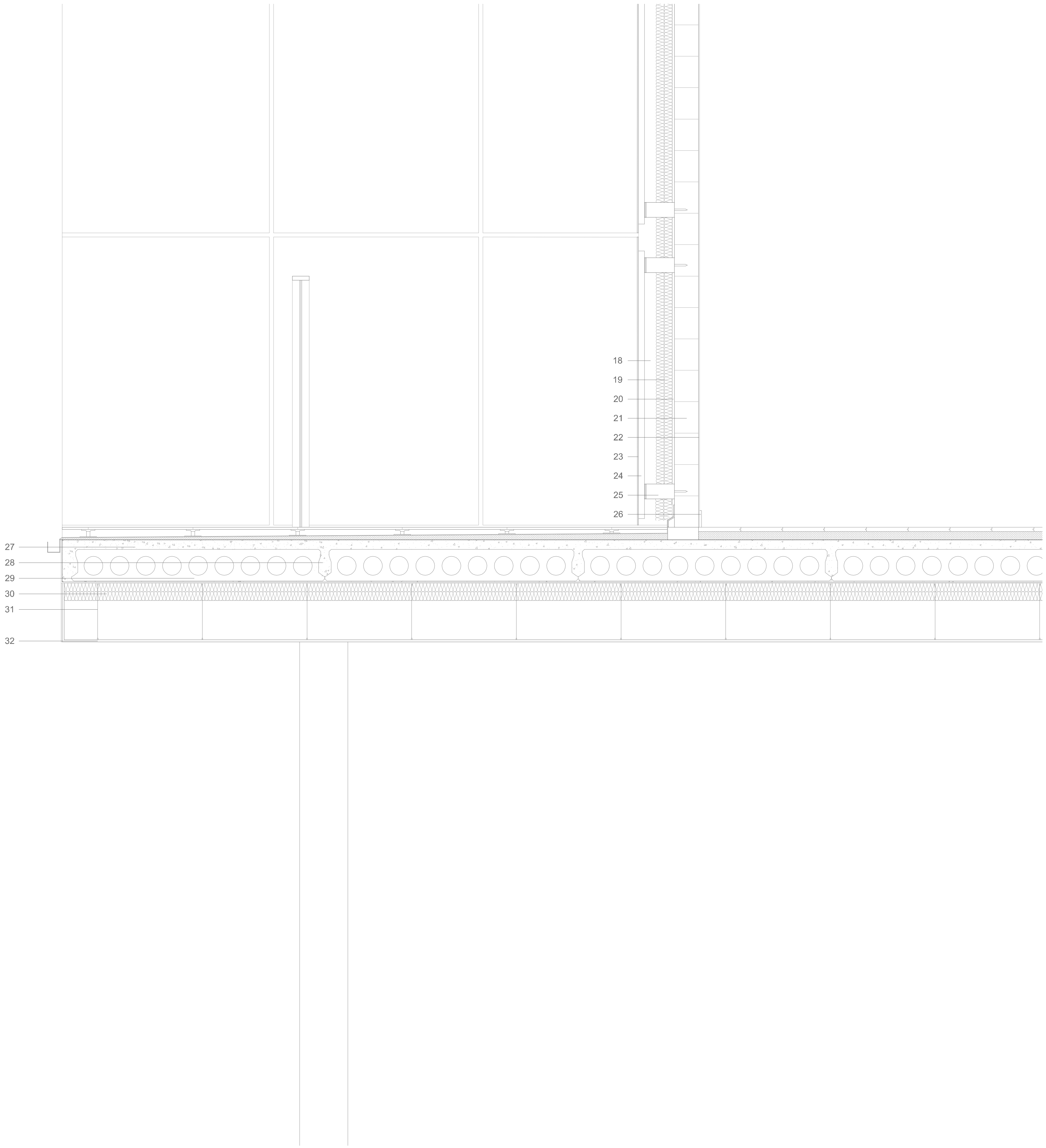

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BOX DETAIL

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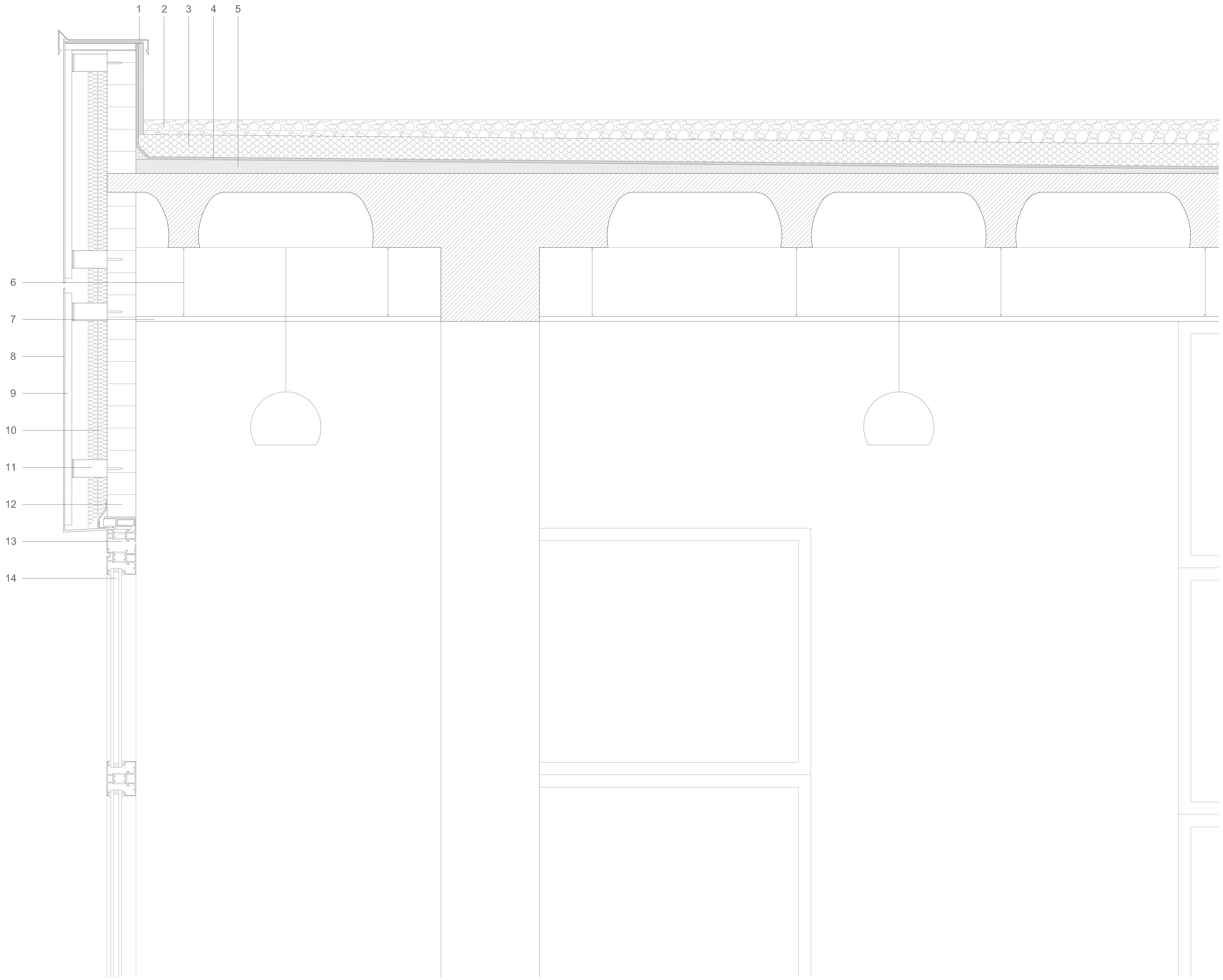
2 Gravel filling
3 Fiberglass insulation
4 Roofing felt
5 Slope of lightweight concrete
6 Hanger wires
7 Suspended ceiling
8 Tinted metallic wall panel
9 Aluminium support structure
10 Fibberglass insulation
11 Anchored extruded aluminium profile
12 Solid brick
13 Aluminium carpentry
14 Doble glazed window
15 Gutter
16 Flasing
17 Pedestal
18 Removable floor panel
19 Reinforced concrete
20 Electrowelded wire mesh
21 Waffle filler



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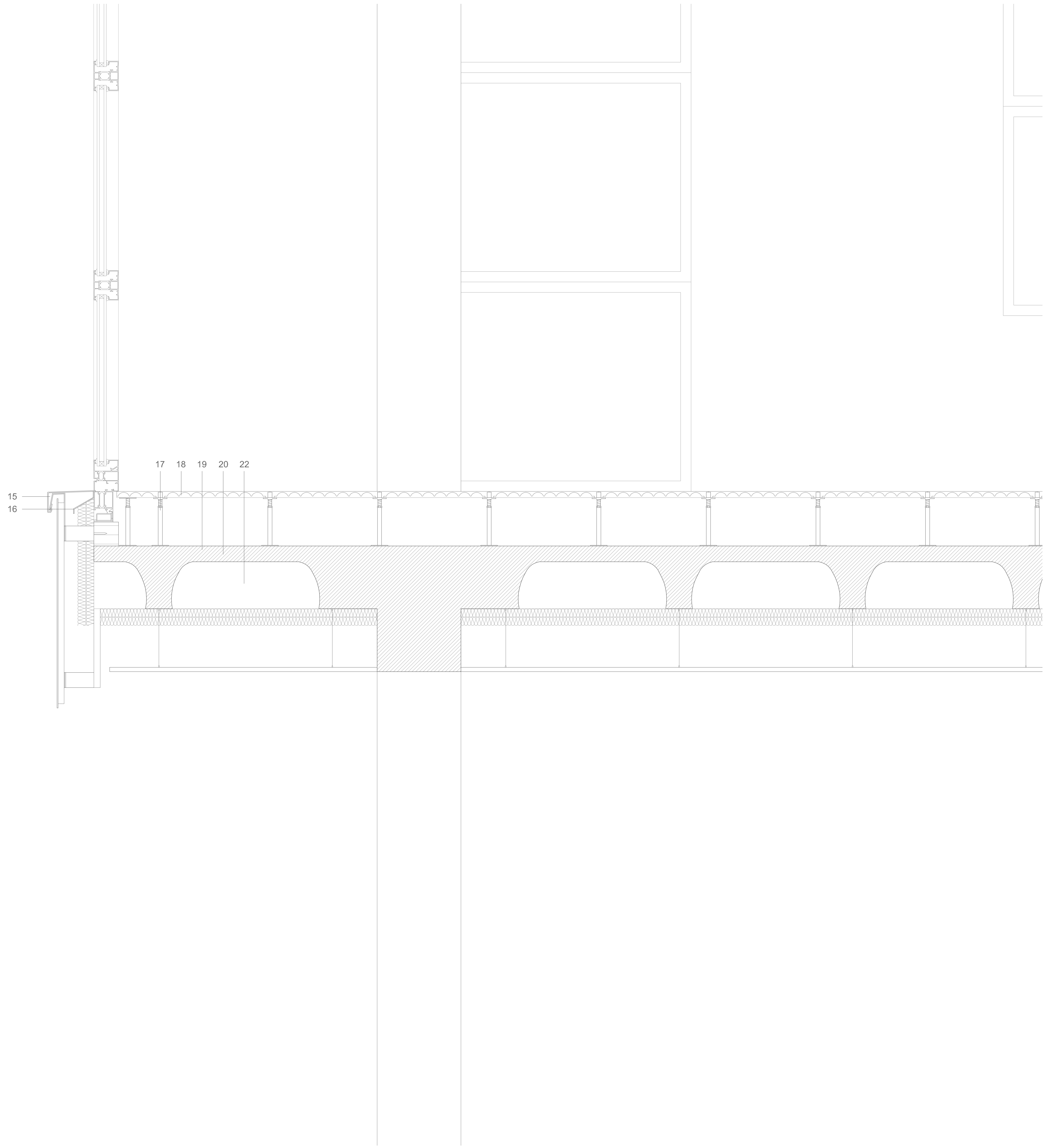

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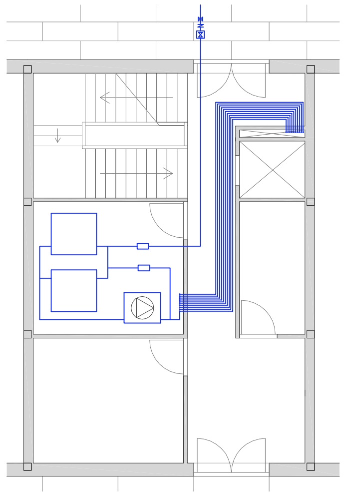
SYSTEMS

WATER SYSTEM SUPPLY



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EVACUATION PLANS

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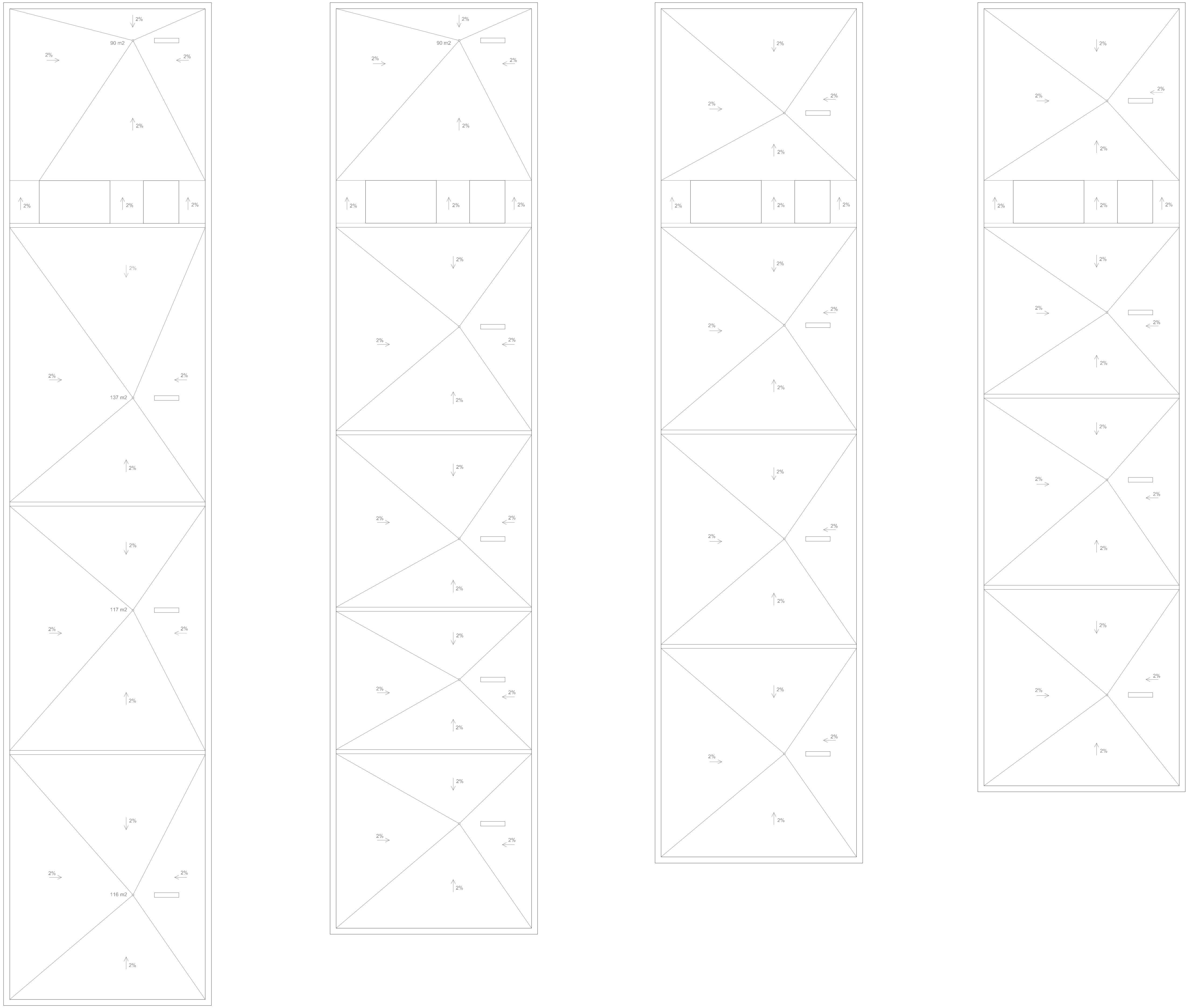
ROOFS



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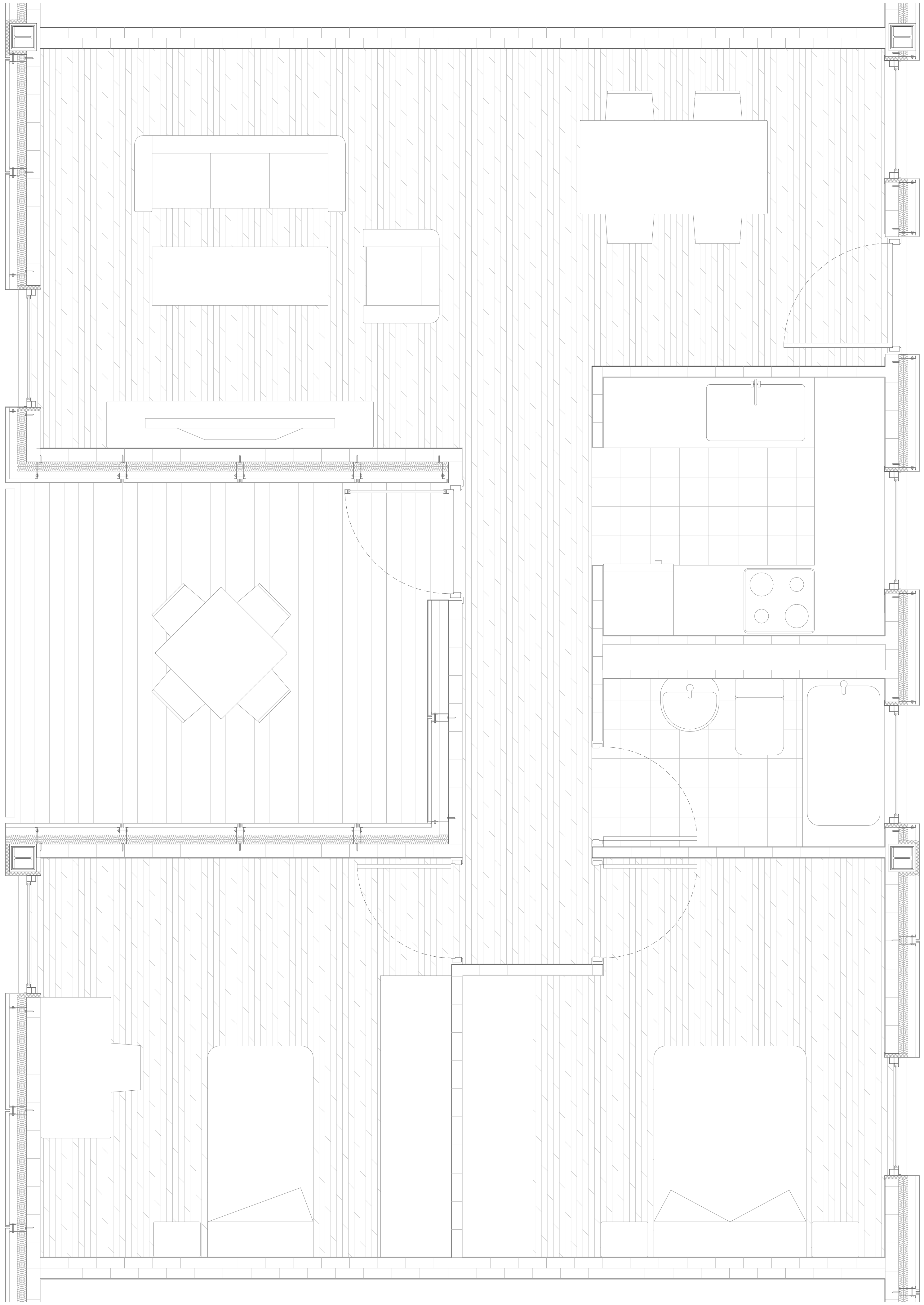
HOUSING

In order to resolve the development of the various systems that make up the housing, a 3 room flat have been chosen. Part of the modules that integrate one of the blocks.

It has a north-south orientation and has two facades facing to the outside. On the north side is the kitchen, the bathroom and a bedroom. While in the south, a second bedroom and the living room.



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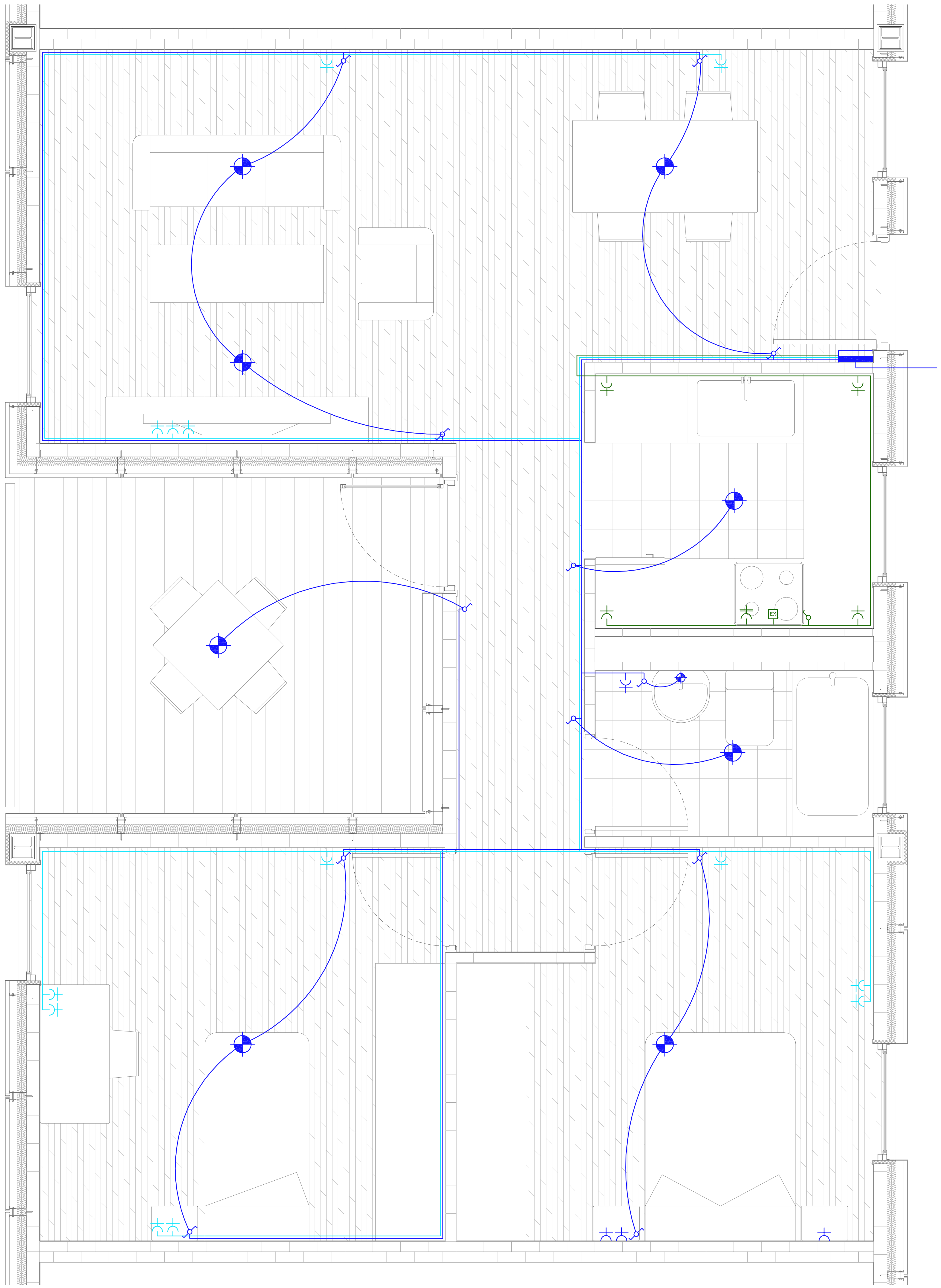
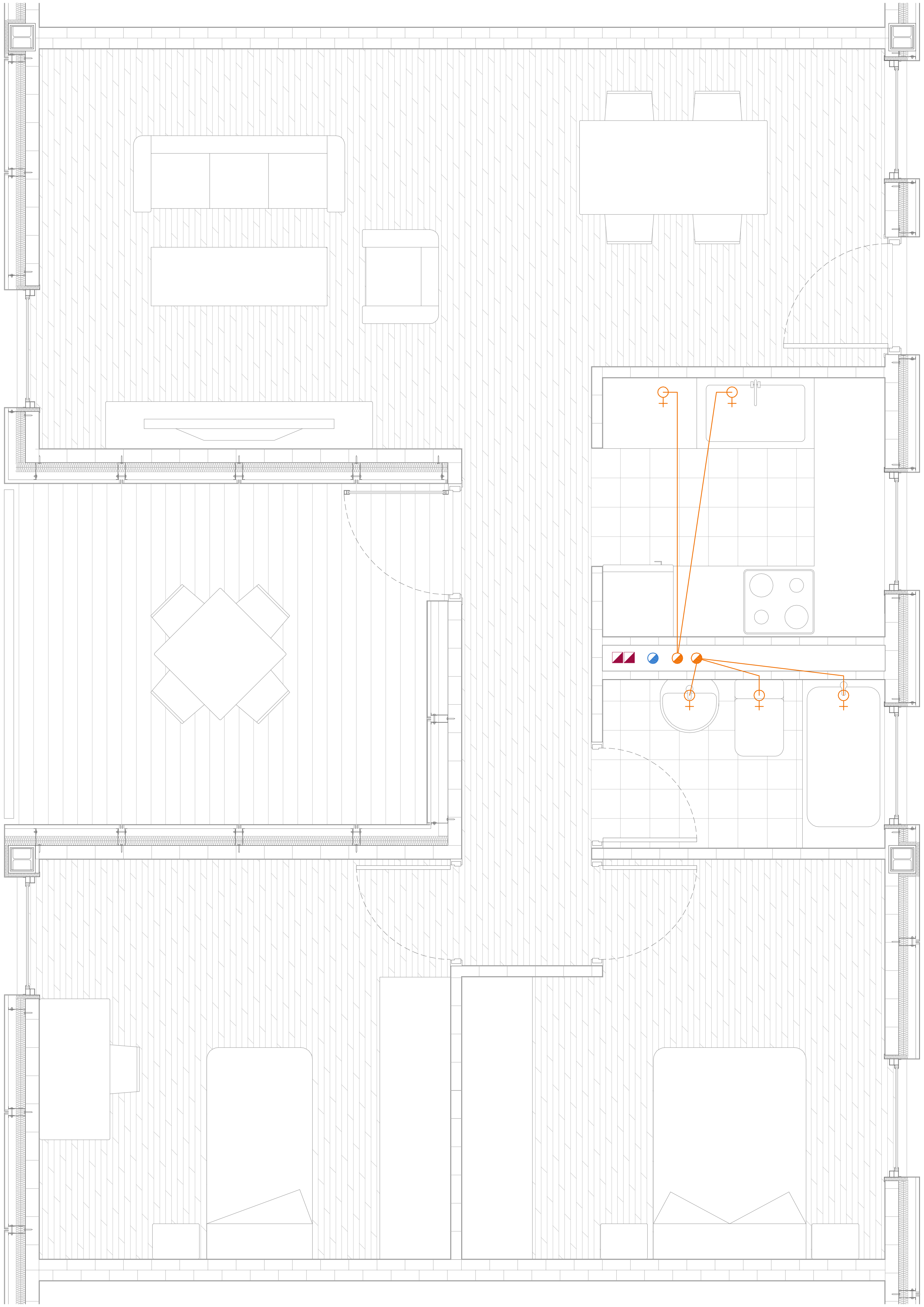
ELECTRICAL WIRING

- Light system and wiring
- General wiring
- Kitchen wiring



PIPERWORK AND VENTILATION

- Water pipe network
- Drain pipe
- Shunts



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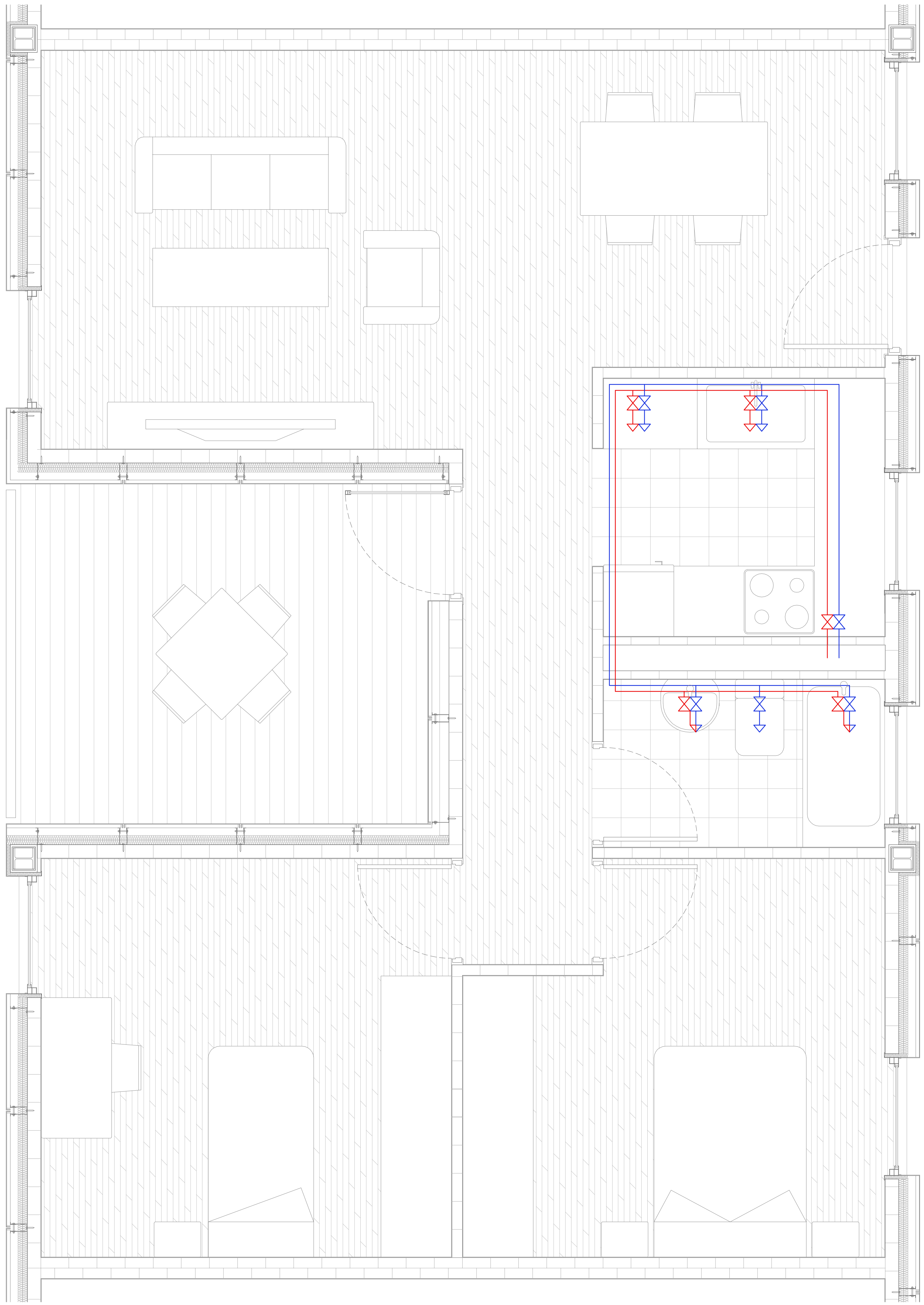
WATER SYSTEM

Hot water circuit

Cold water circuit

Hot water valve

Cold water valve



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RADIATORS NETWORK

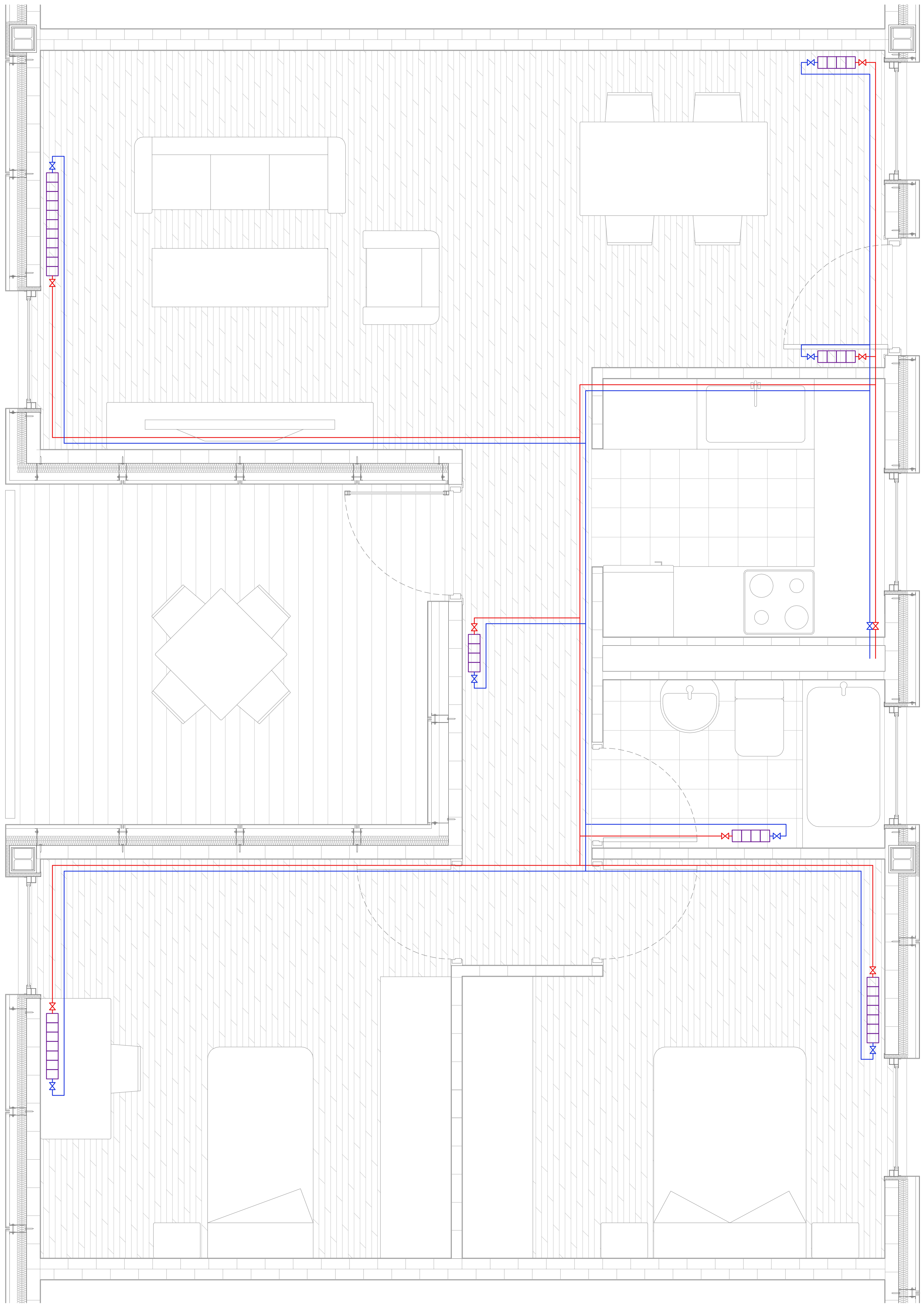
Hot water circuit

Cold water circuit

Hot water valve

Cold water valve

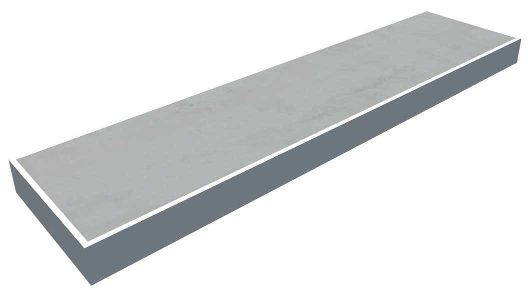
Radiators



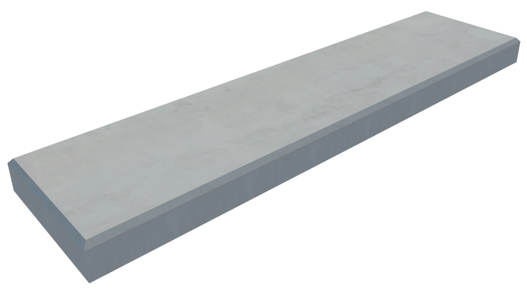
MATERIALIZATION

URBAN FURNITURE

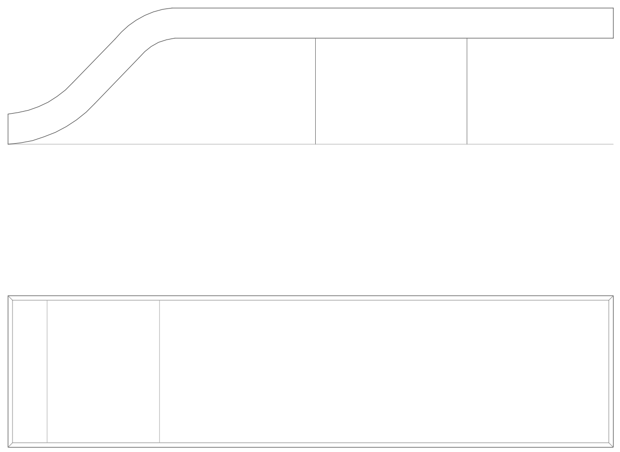
Floor Light



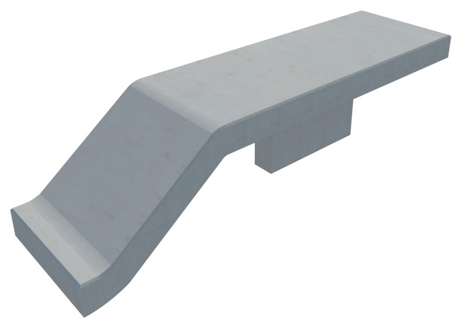
Concrete Pavement



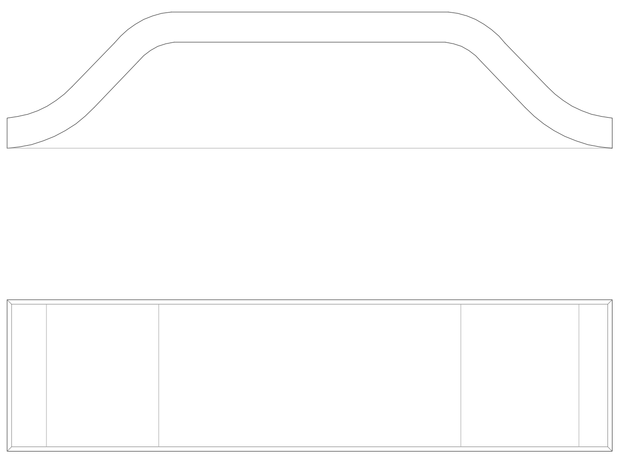
Wood Pavement



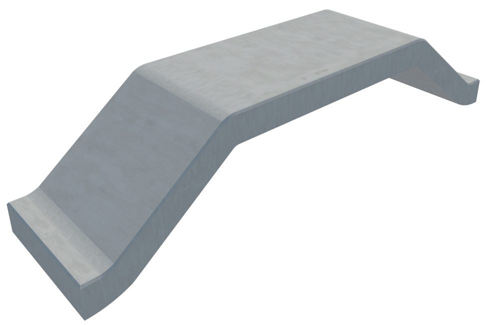
Concrete Bench

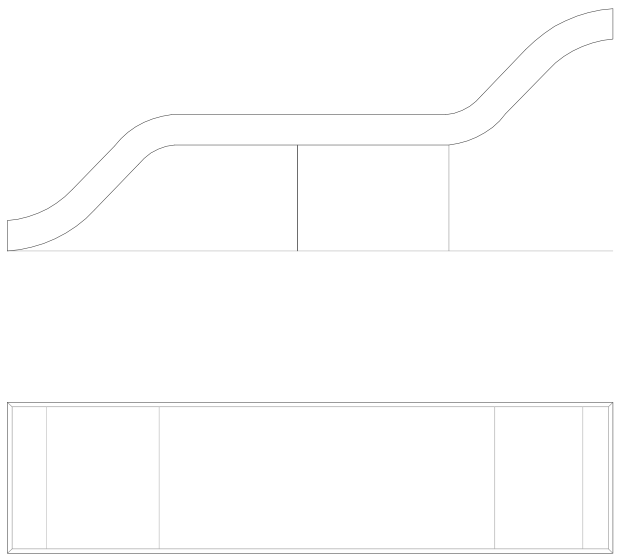


URBAN FURNITURE



Concrete Bench





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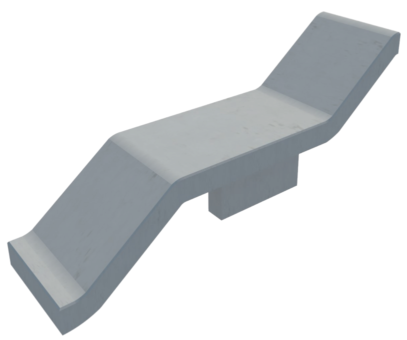
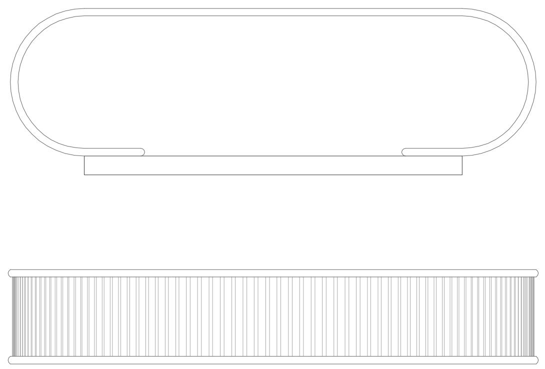
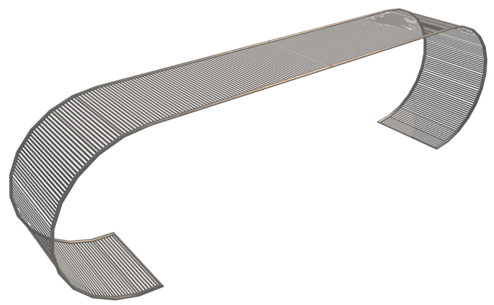
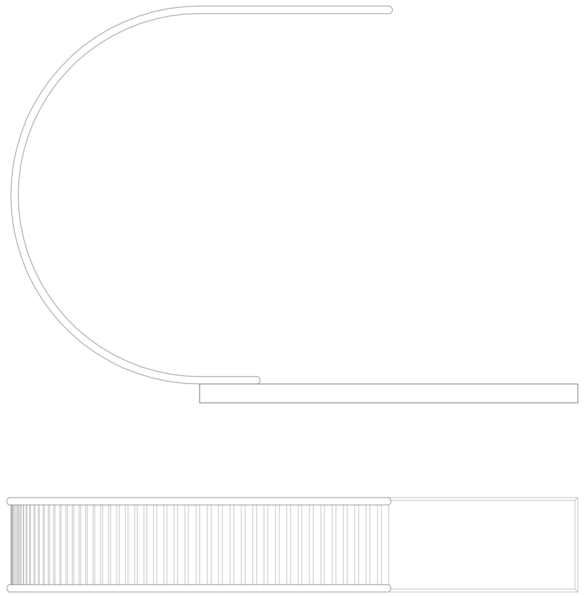




Metallic Table





Metallic Shadow