EMBRACE

Building Technology Report

Familiarizing the unknown
How to interact with a changing water environment and (re)imbrace its natural power

Building Technology Report

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Transitional Territories Studio 2018-2019
North Sea: Landscapes of Coexistence
Altered Natures and the Architecture of Extremes

Under supervision of

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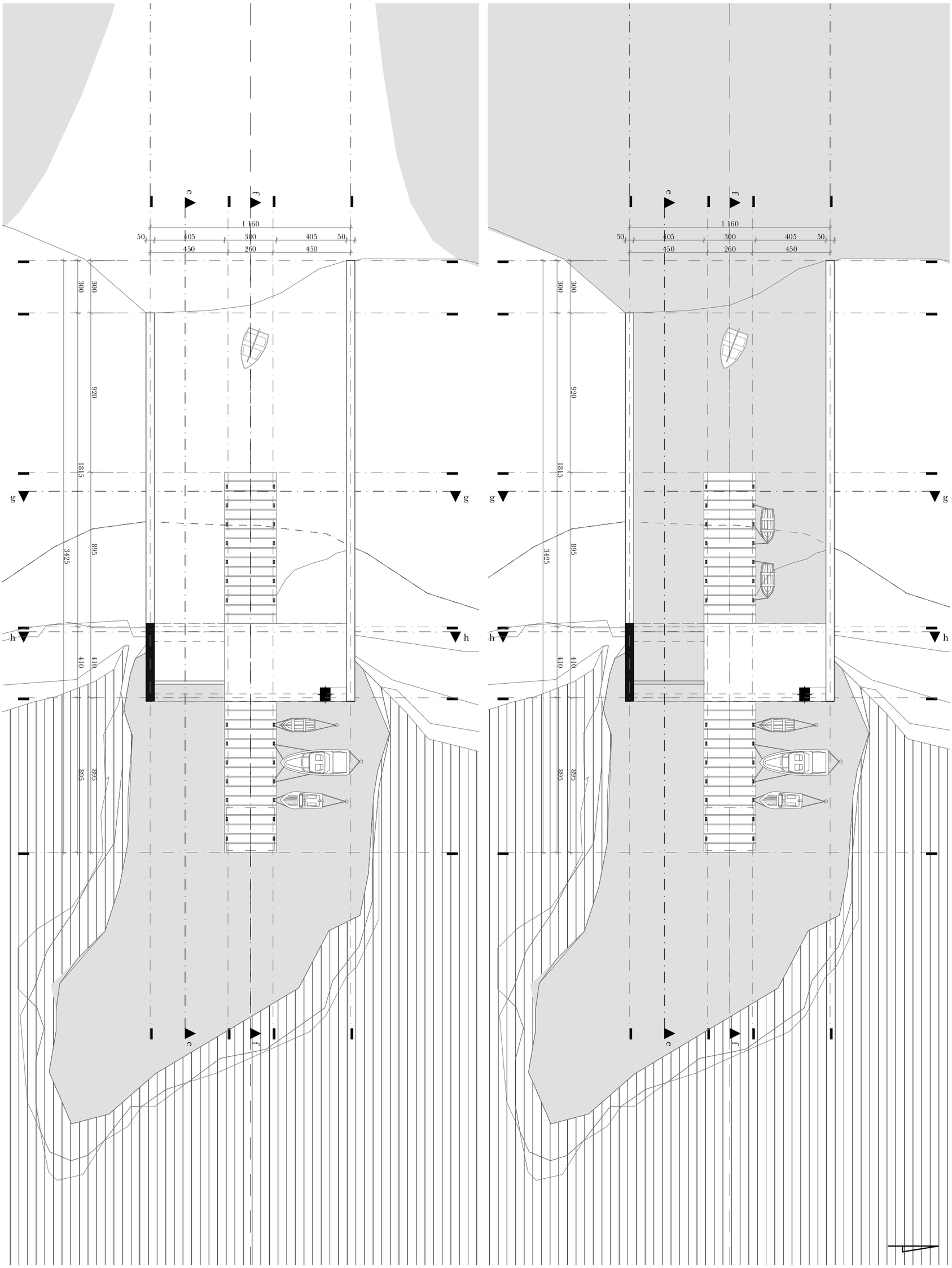
Building Technology tutor: ir. Sjap Holst

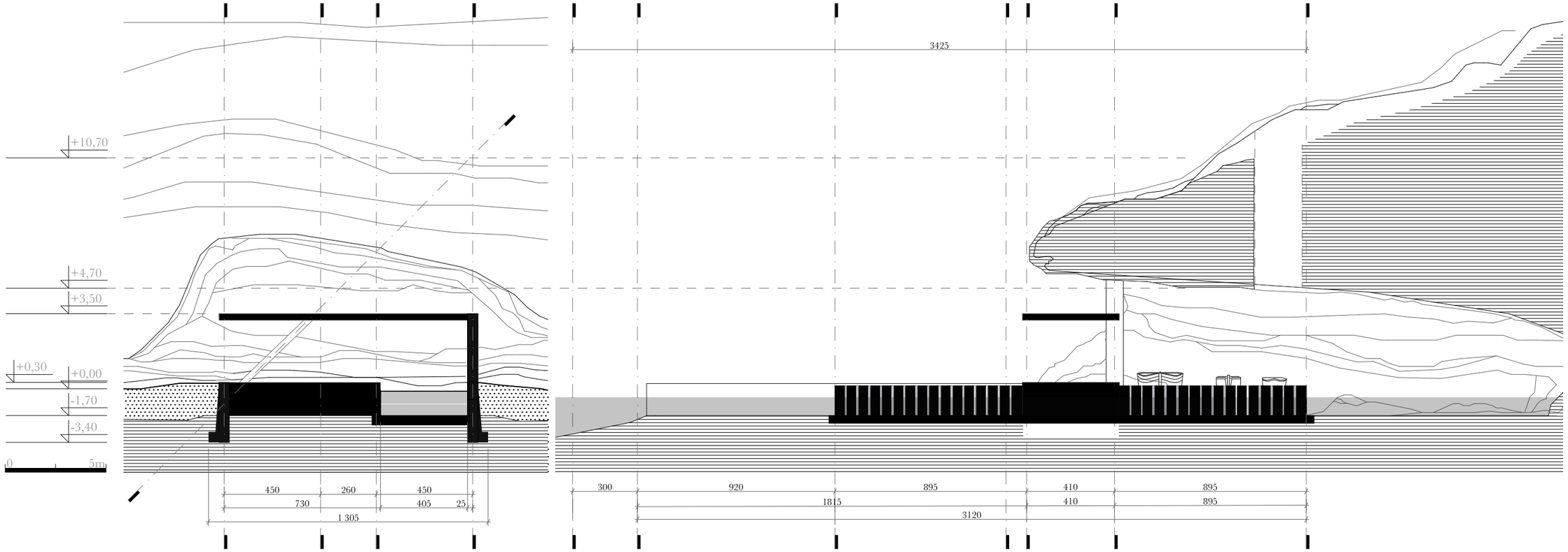
Research tutor: dr. ir. Nicola Marzot

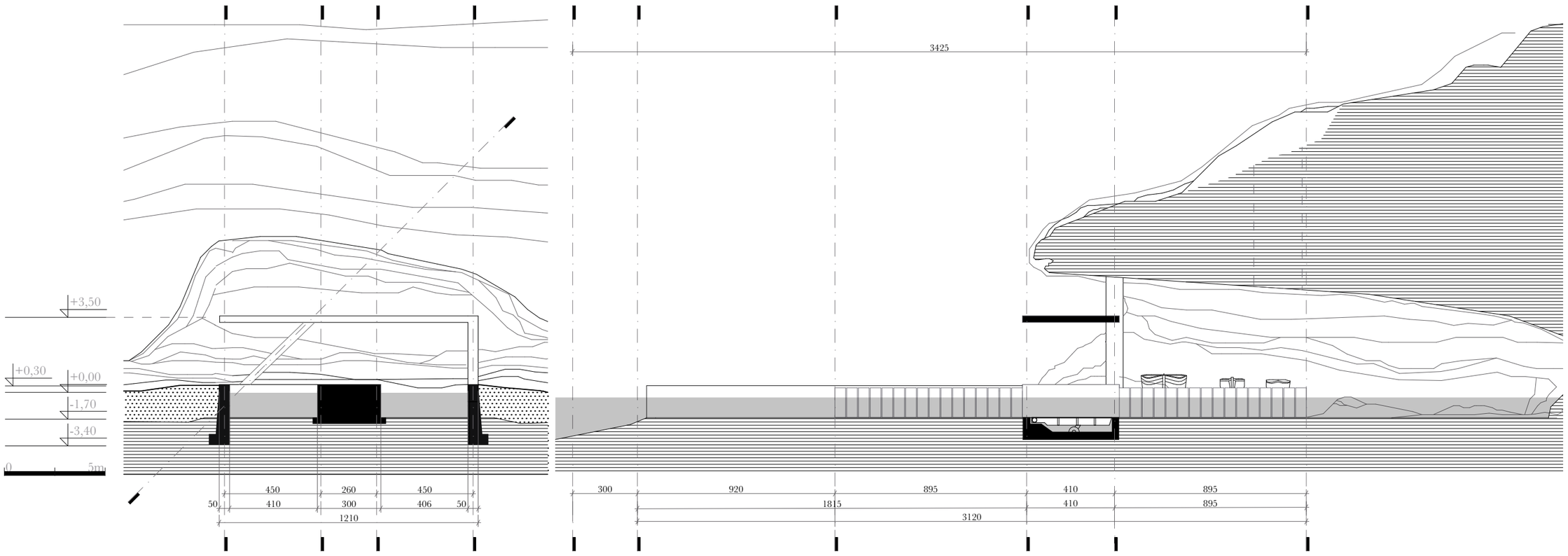
Studio Leader: dr. ir. Taneha K. Bacchin

TU DELFT
09-07-2019

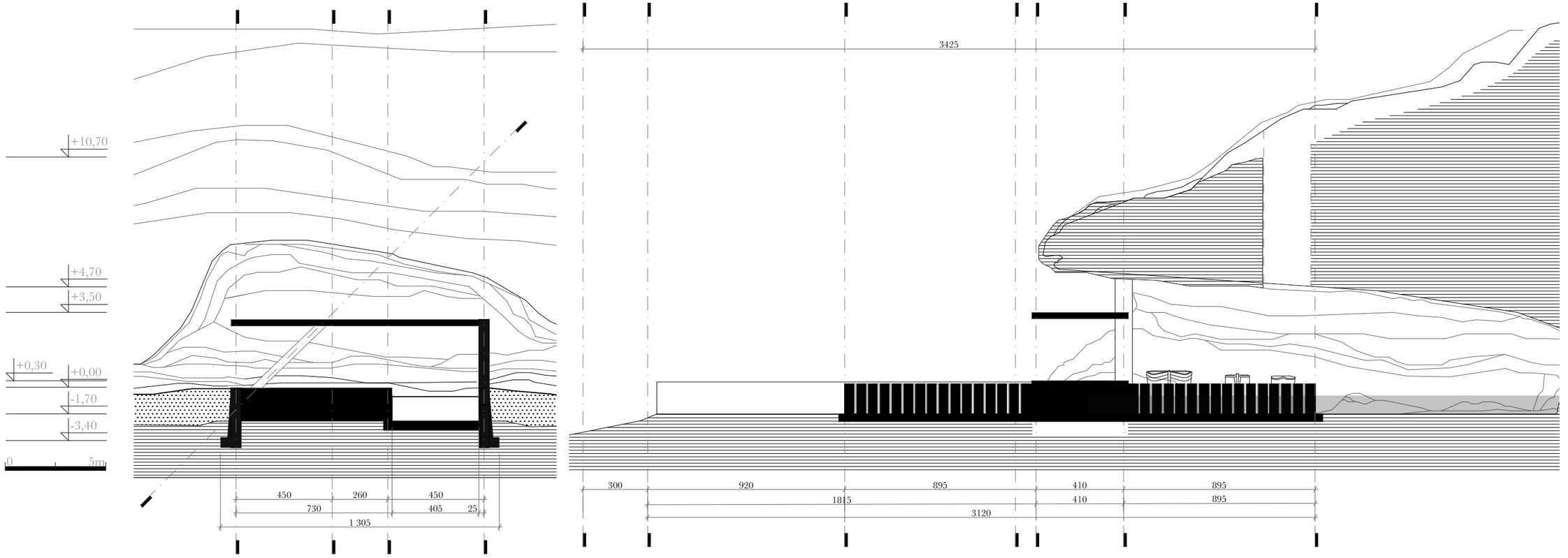


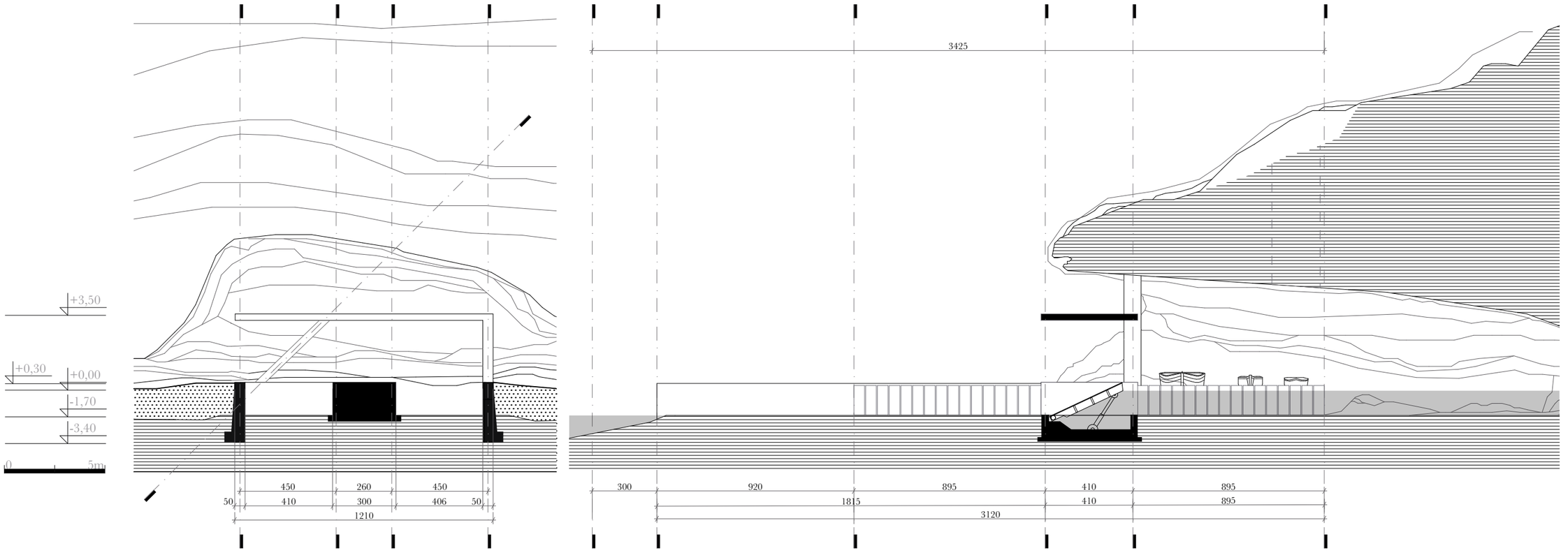
Harbour - Plan - 1:100 - Low tide/High tide





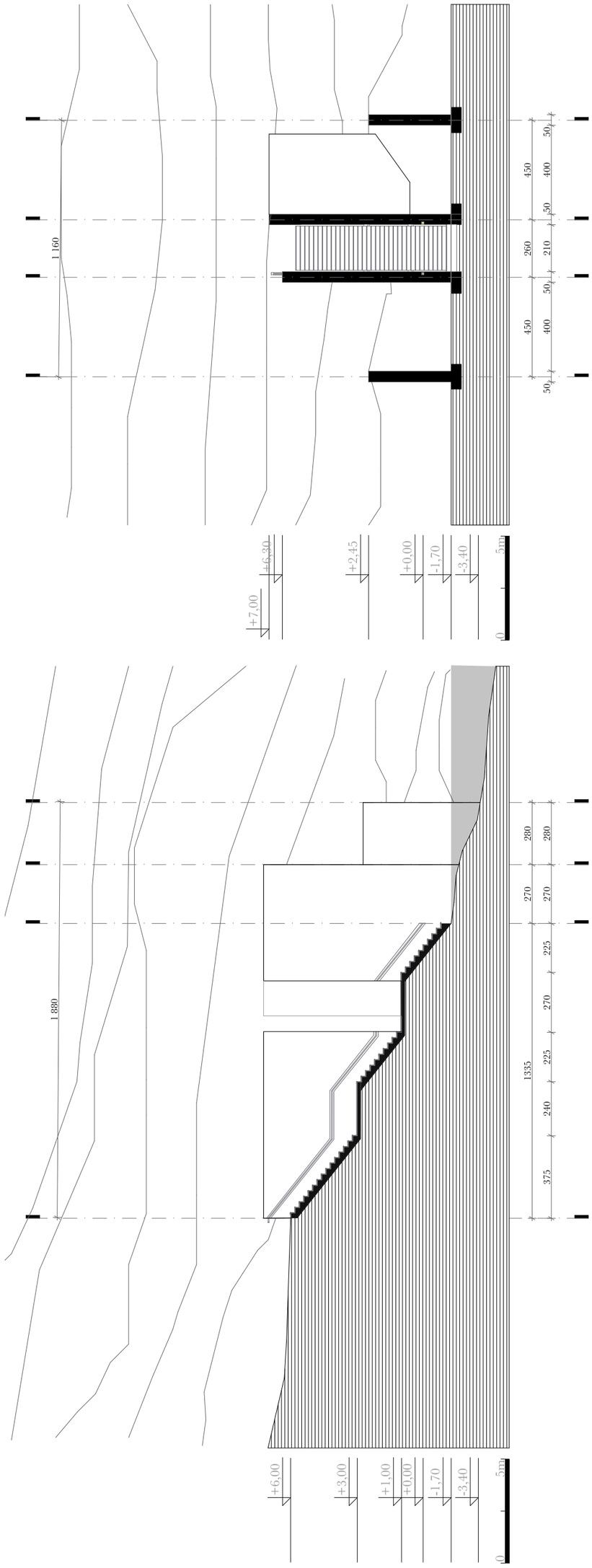
Harbour - Sections - 1:100 - High tide





Harbour - Sections - 1:100 - Low tide

Stairs - 1:100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50
400
450
50
210
260
50
400
450
50
+6,30
+7,00
+2,45
+0,00
-1,70
-3,40
5m
0

1 880
280
280
270
270
225
270
225
240
1335
375
+6,00
+3,00
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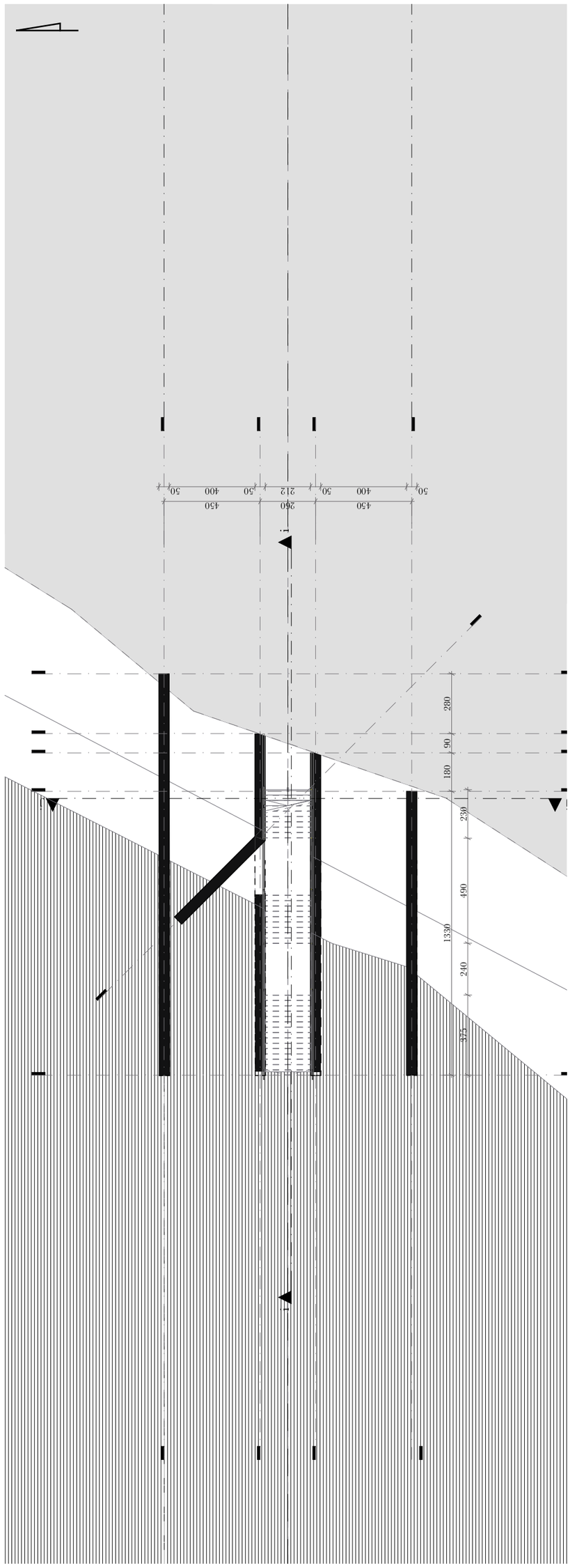
+0,00
-1,70
-3,40
5m
0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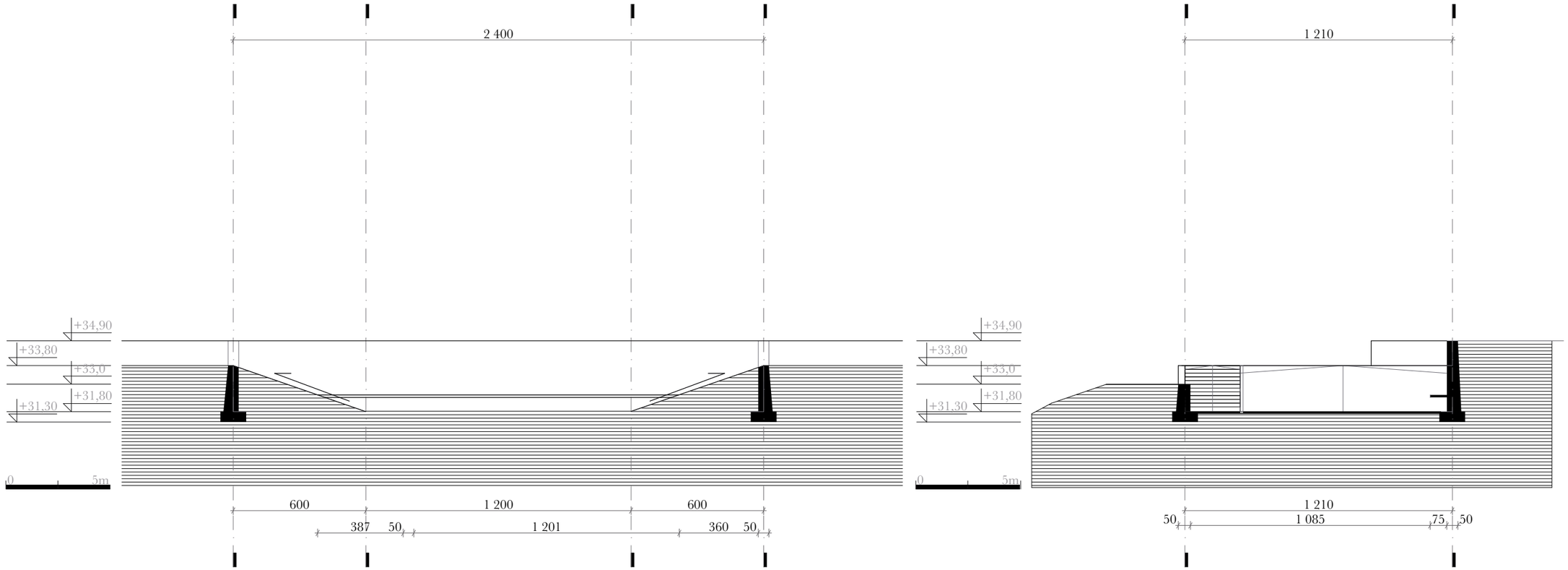
400
50
212
50
400
50
450
260
450
280
90
180
230
490
240
1330
375


2 400
+34,90
+33,80
+33,0
+31,80
+31,30
0
5m
600
1 200
600
387
50
1 201
360
50
1 210
1 210
50
1 085
75
50
1:100
Basin - 1
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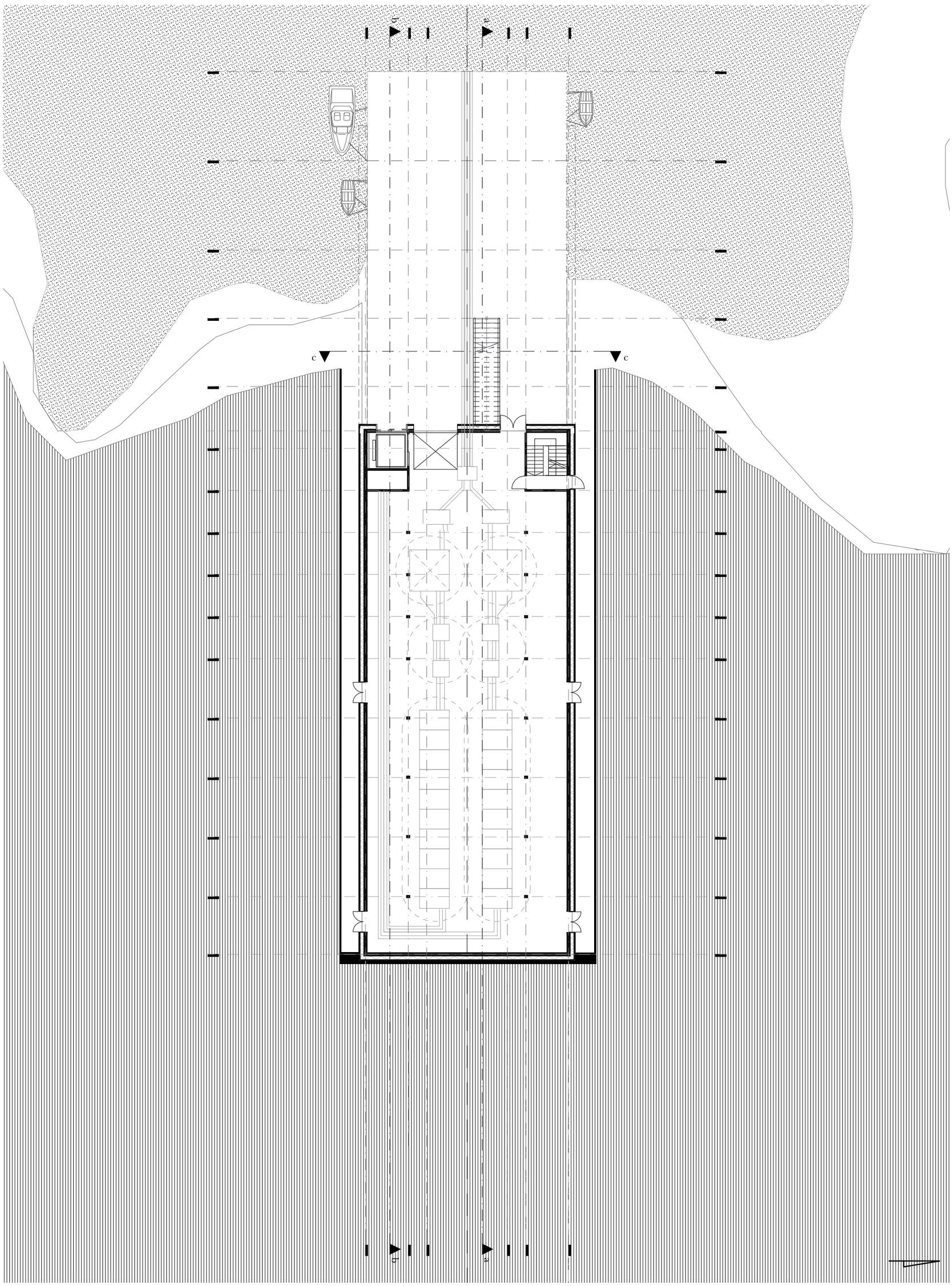
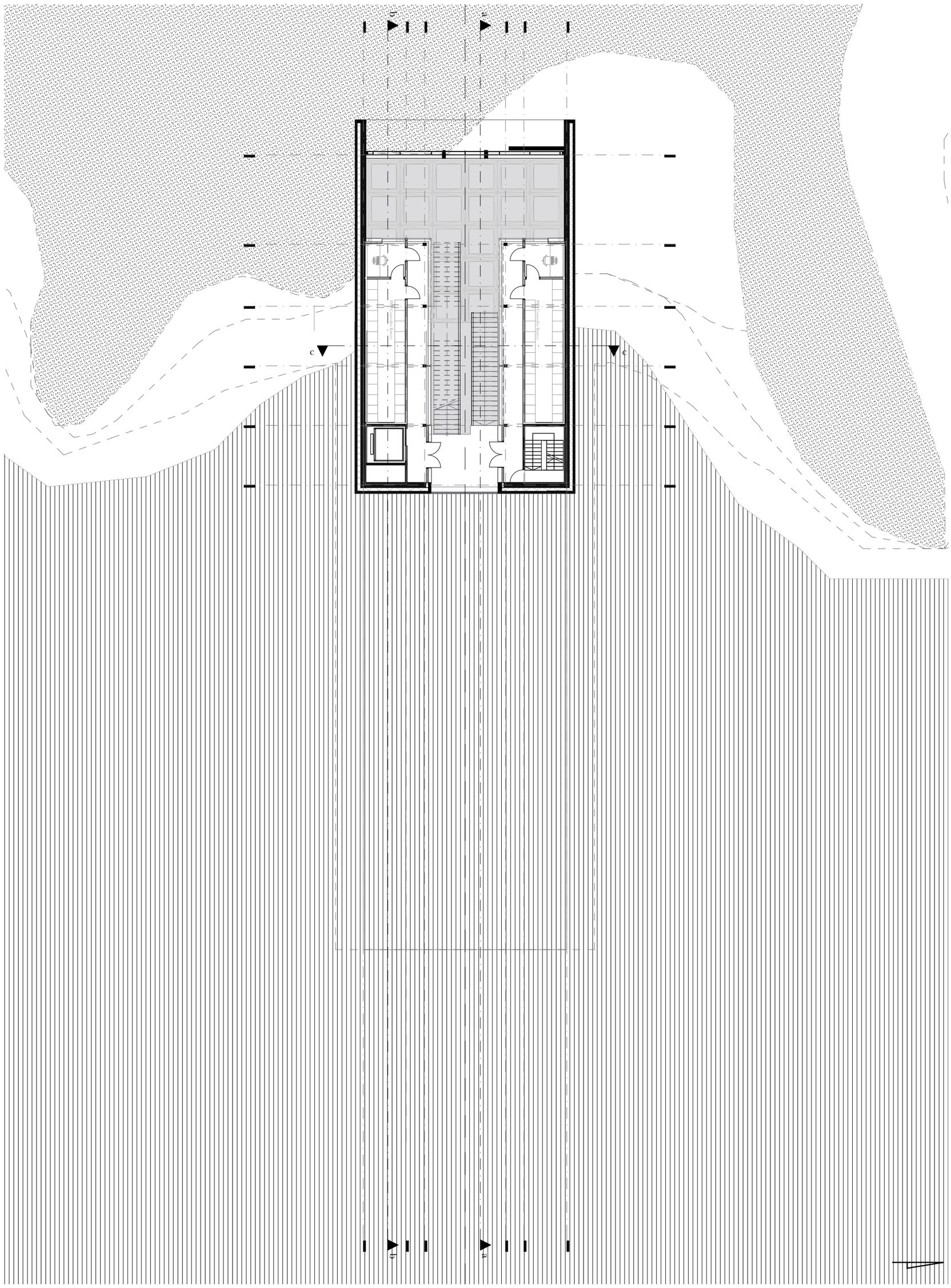
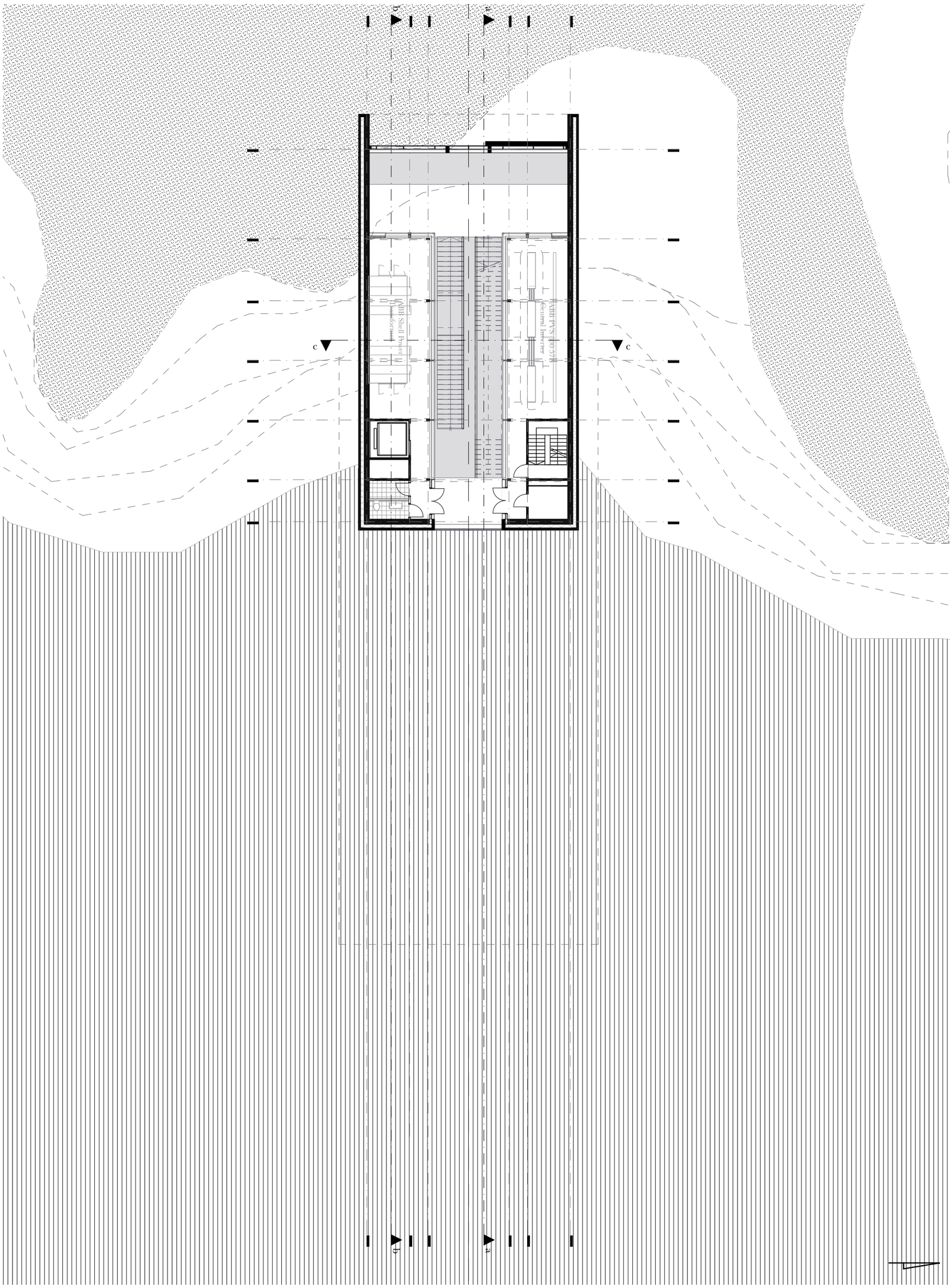
k



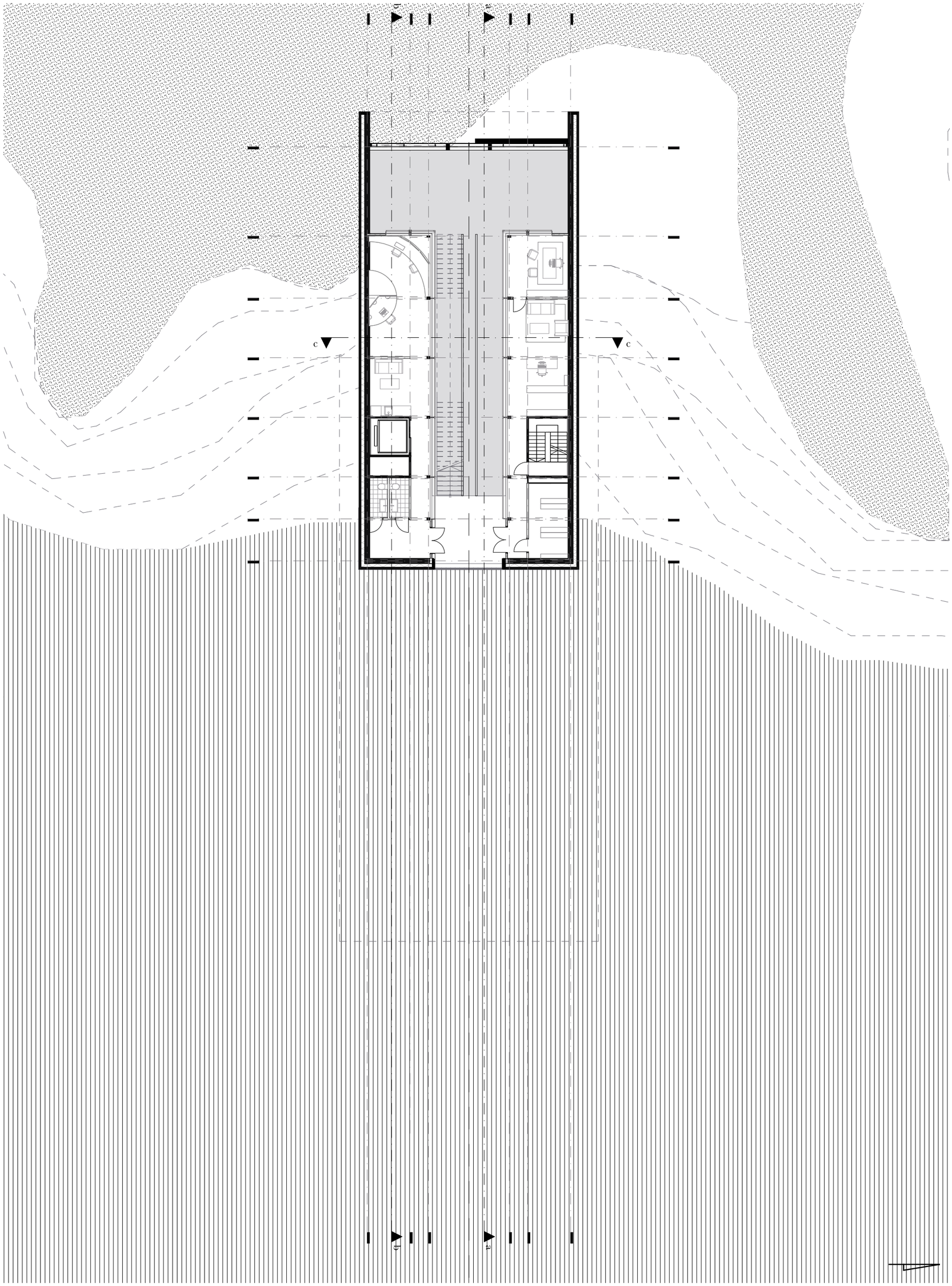
Tidal Power Plant - Plan - 1:200 - Level 0 - Electric Generator / Rectifier / Voltage Regulator



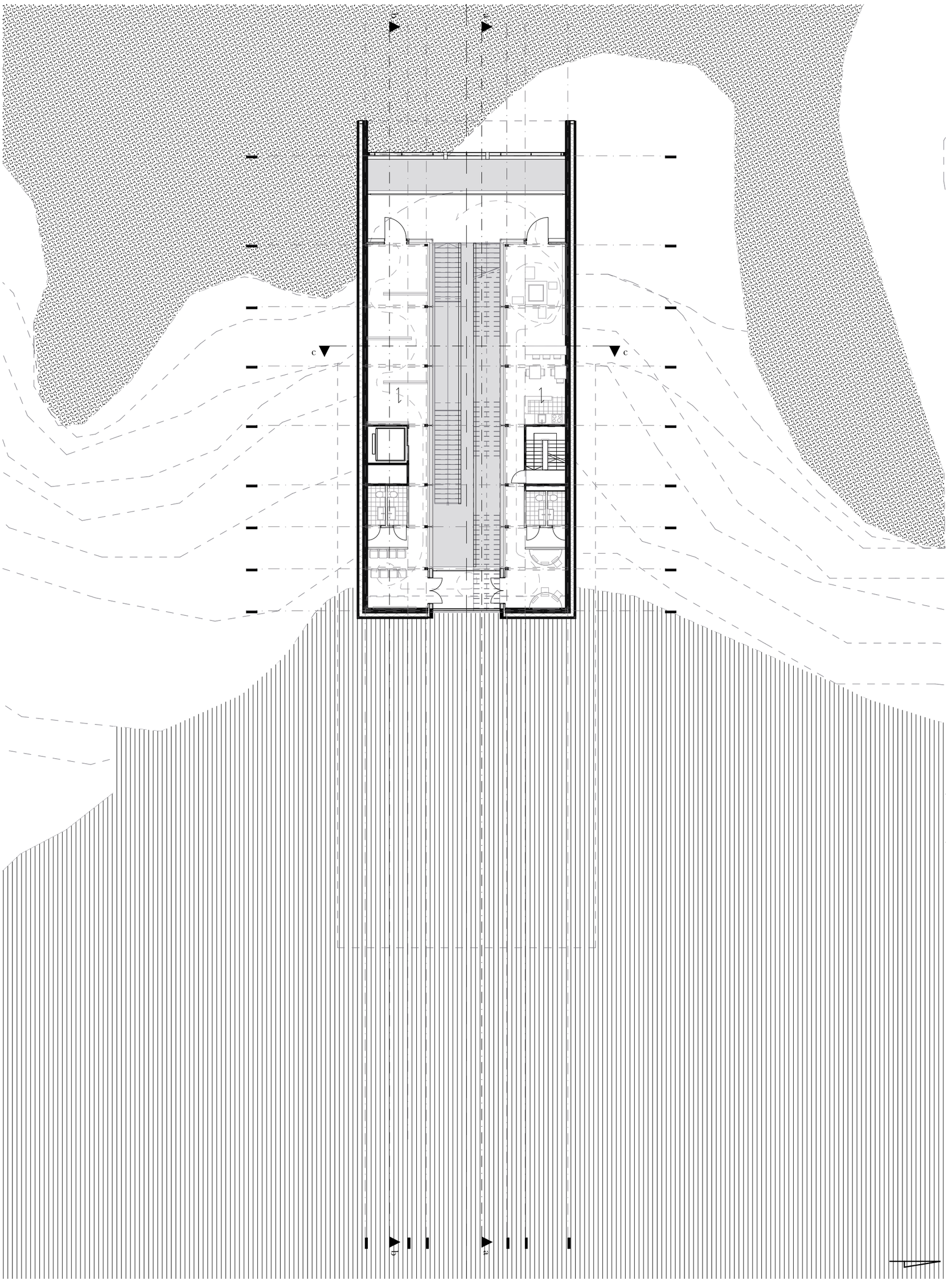
Tidal Power Plant - Plan - 1:200 - Level 1 - Hybrid Battery Storgae



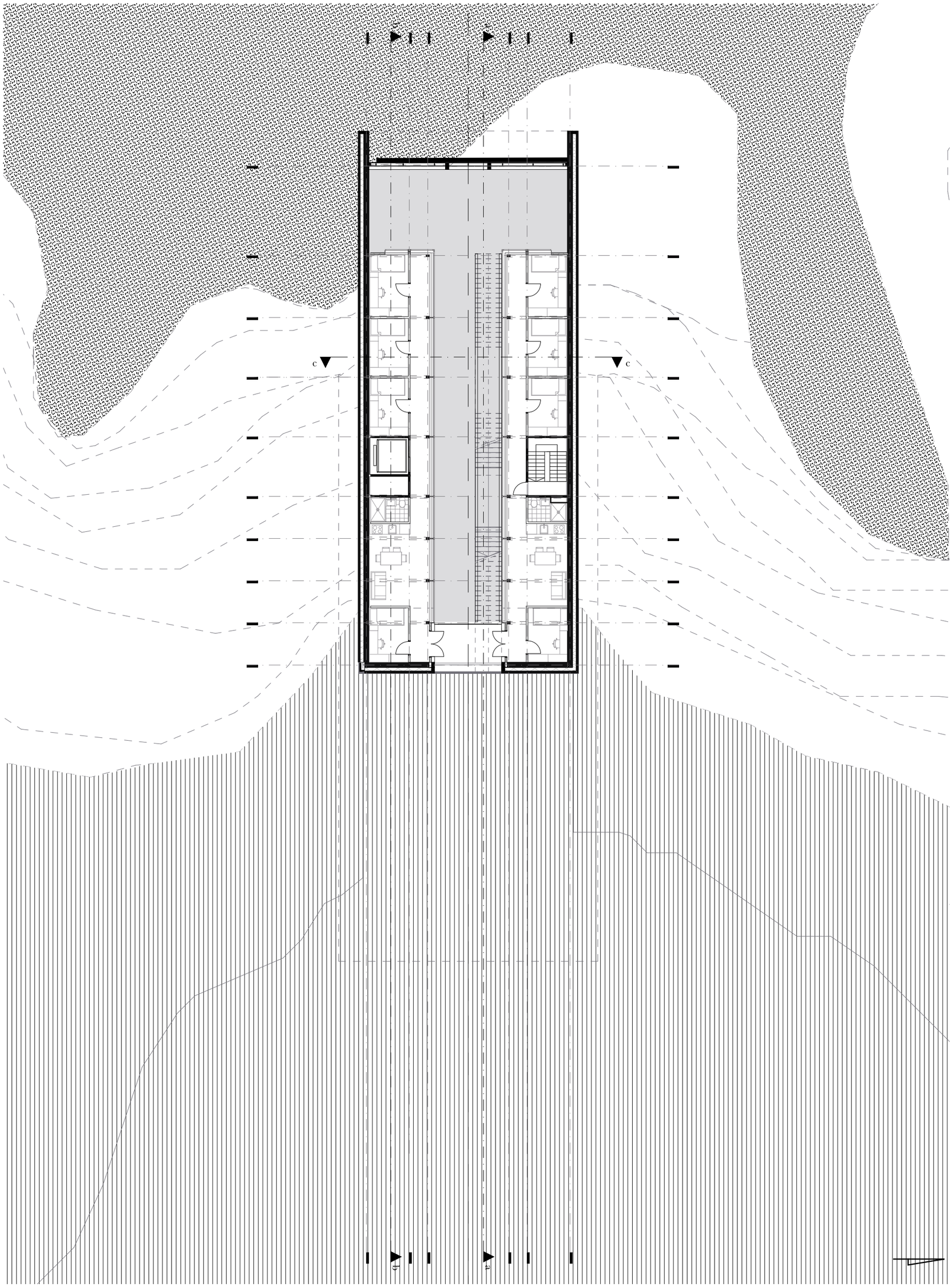
Tidal Power Plant - Plan - 1:200 - Level 2 - Inverter / Power Transformer



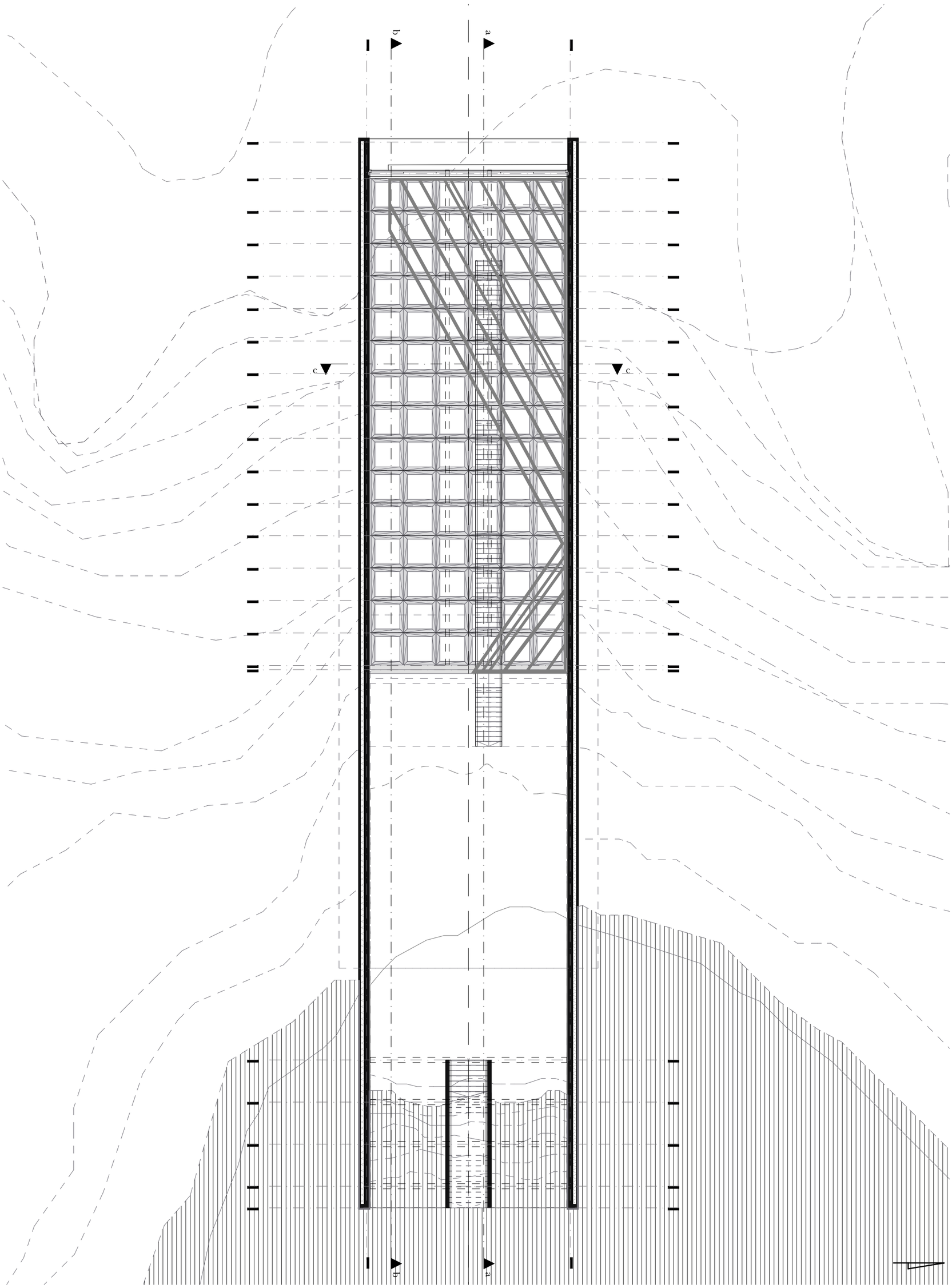
Tidal Power Plant - Plan - 1:200 - Level 3 - Control Rooms



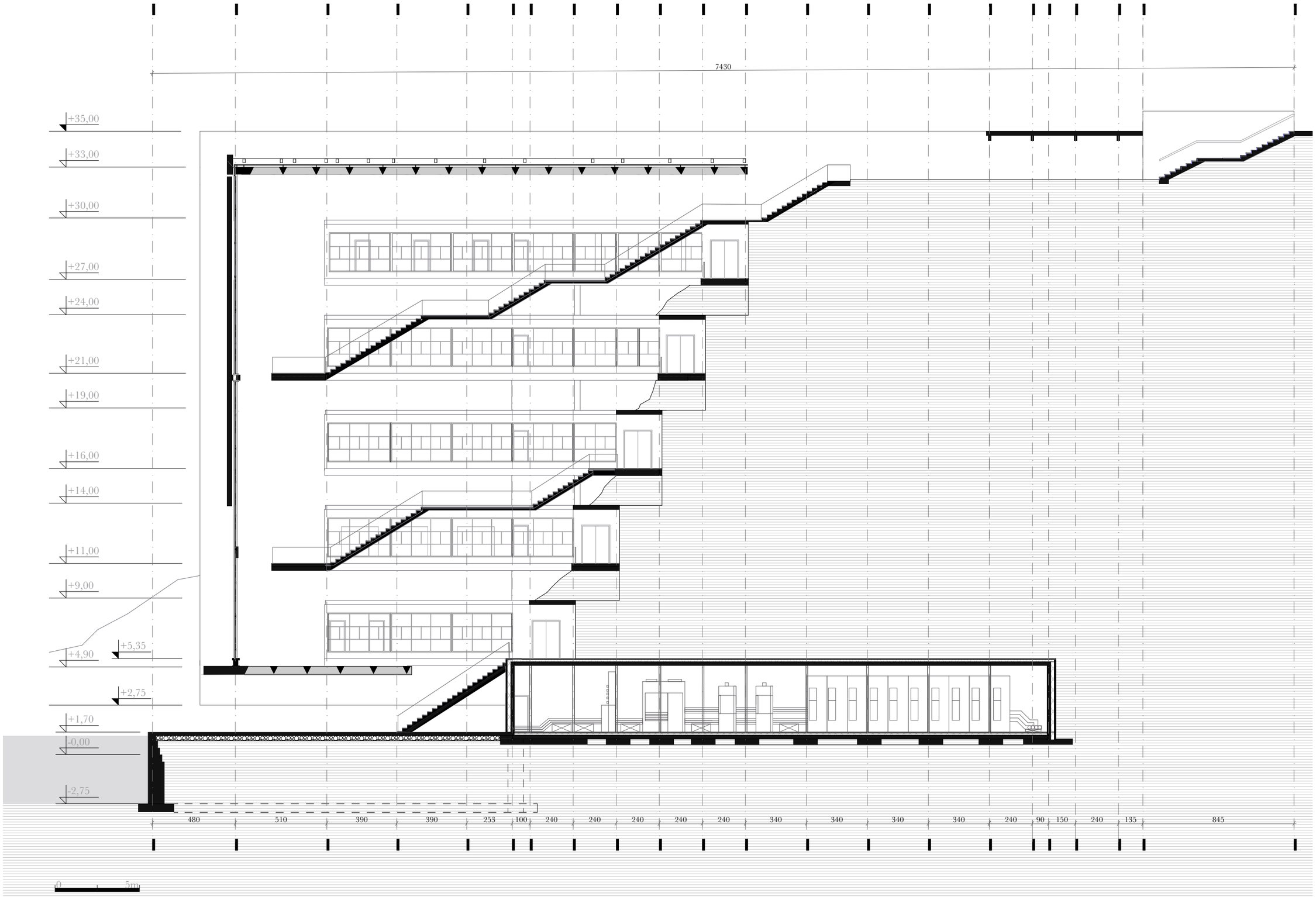
Tidal Power Plant - Plan - 1:200 - Level 4 - Visitors Center



Tidal Power Plant - Plan - 1:200 - Level 5 - Shelters for workers

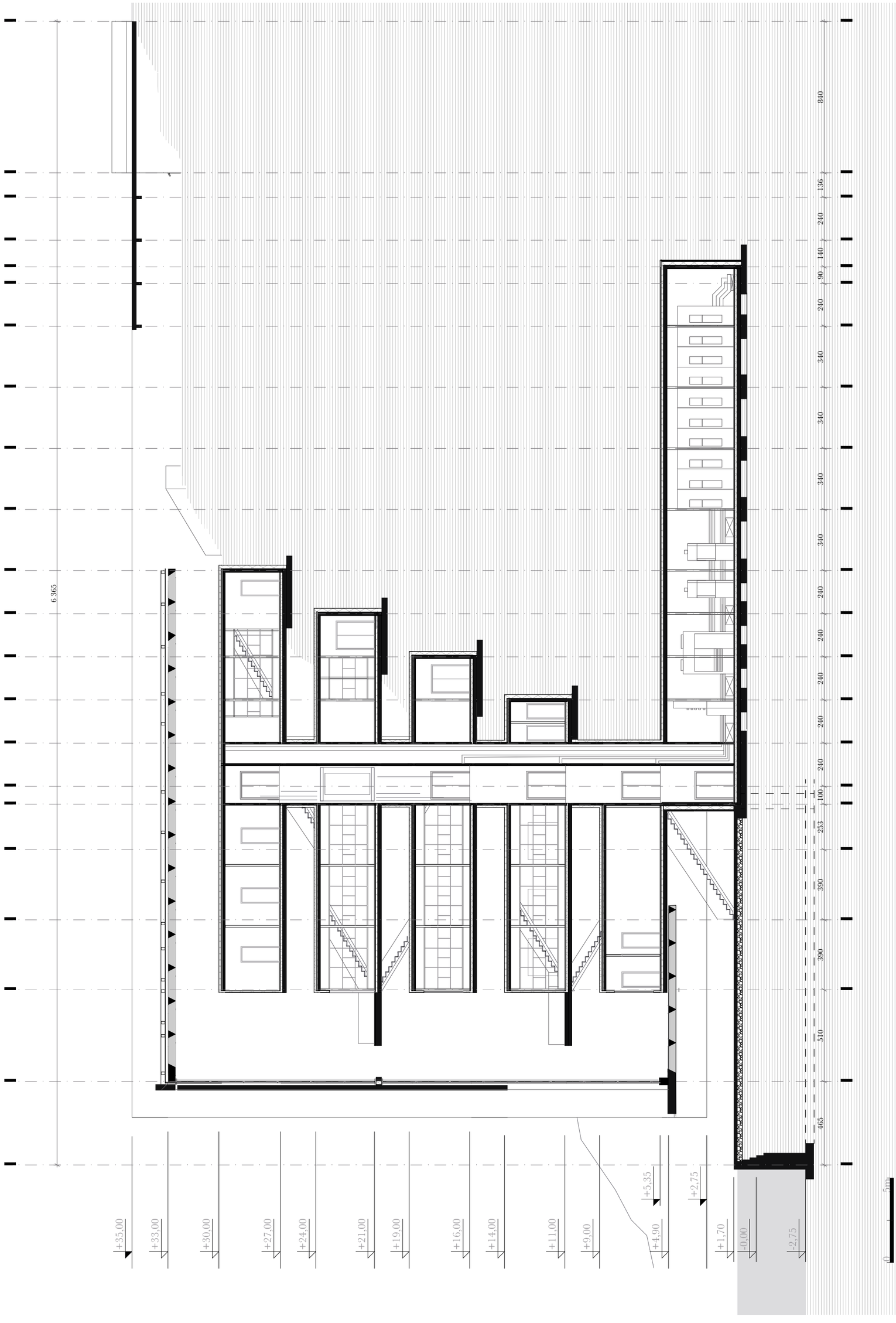


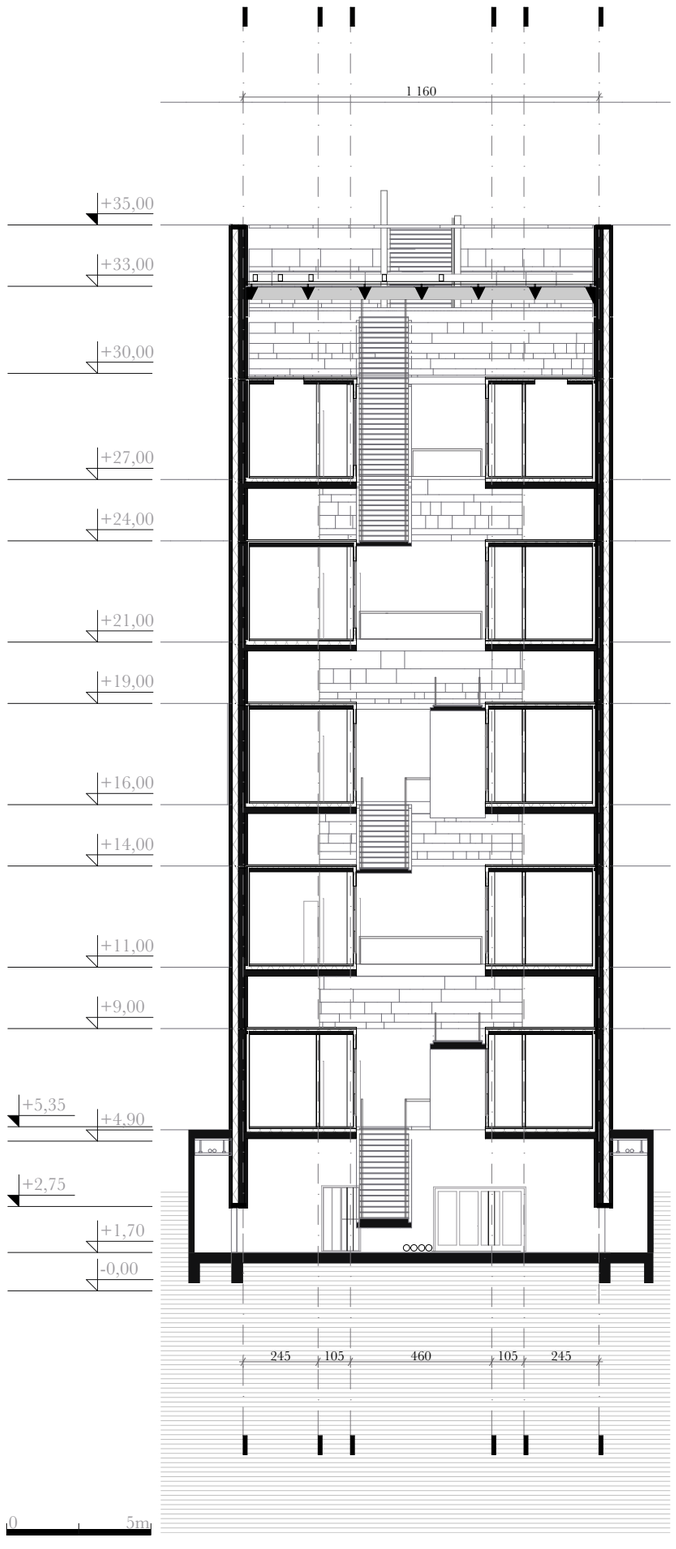
Tidal Power Plant - Plan - 1:200 - Level 6 - Roof - Main entrance



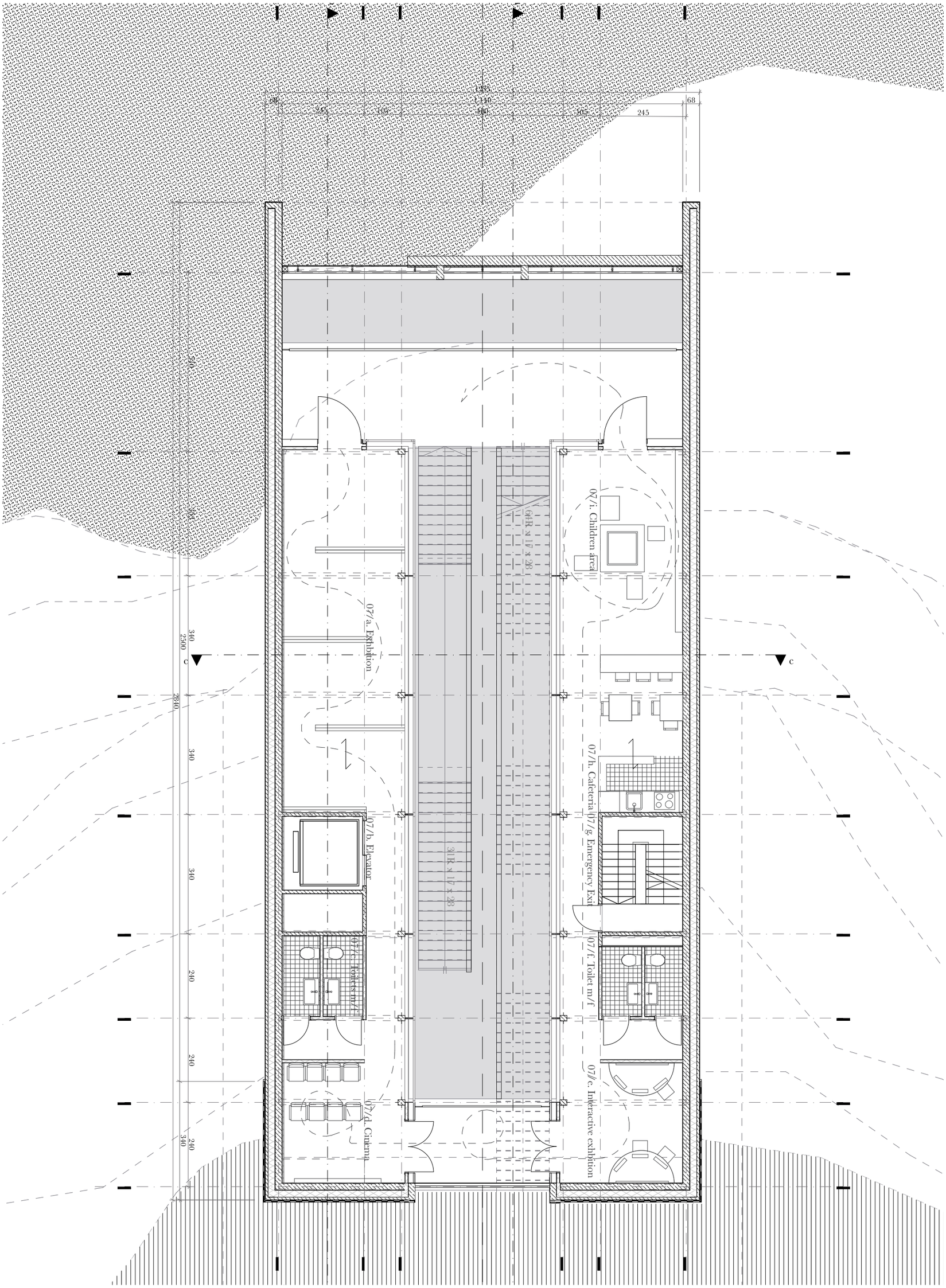
Tidal Power Plant - section A - 1:200

Tidal Power Plant - section B - 1:200





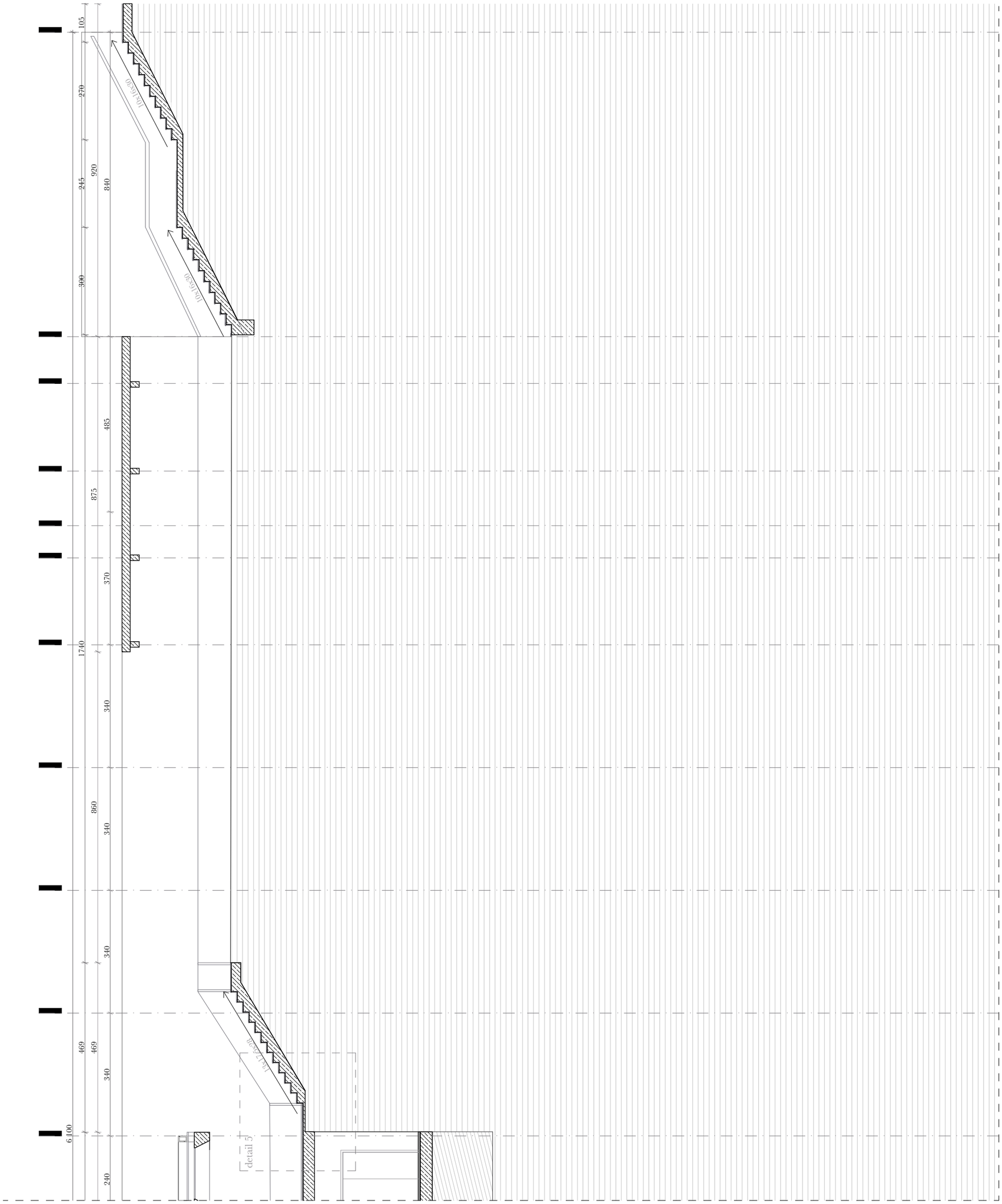
Tidal Power Plant - section C - 1:200

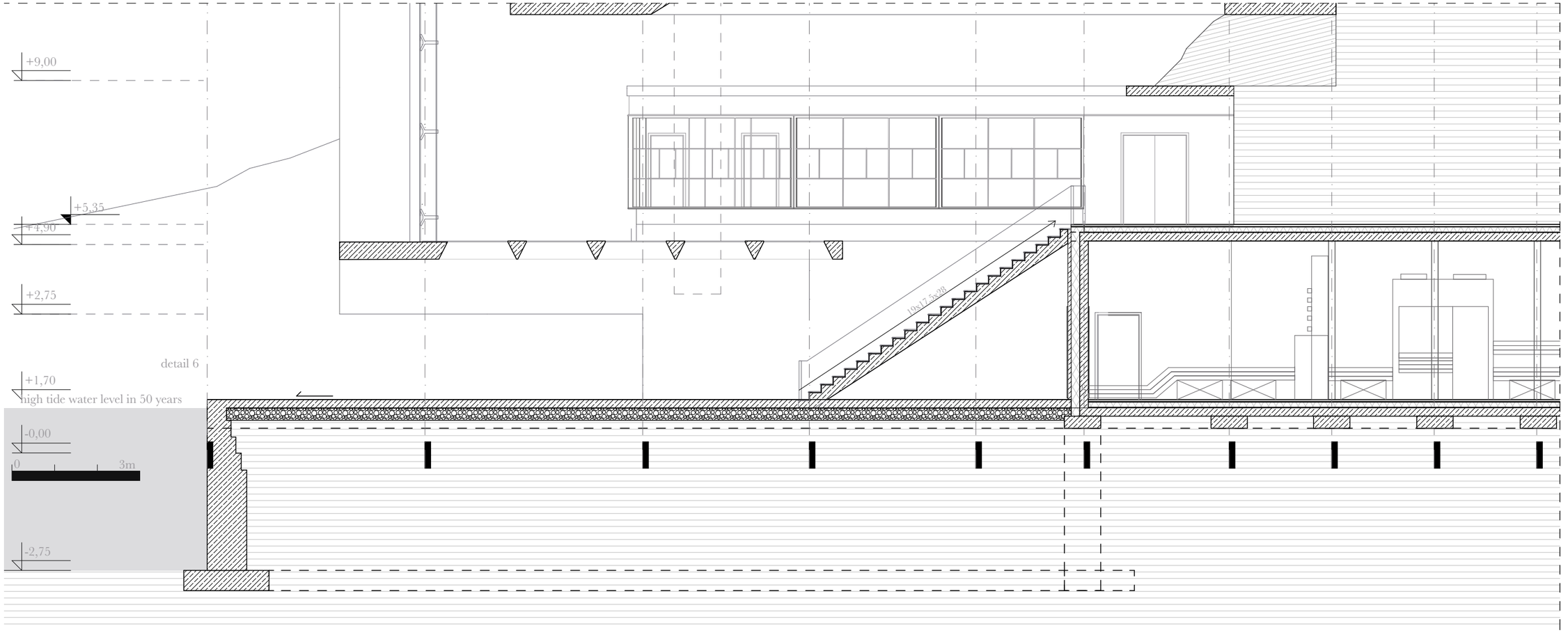


Tidal Power Plant - Plan - 1:100 - Level 4

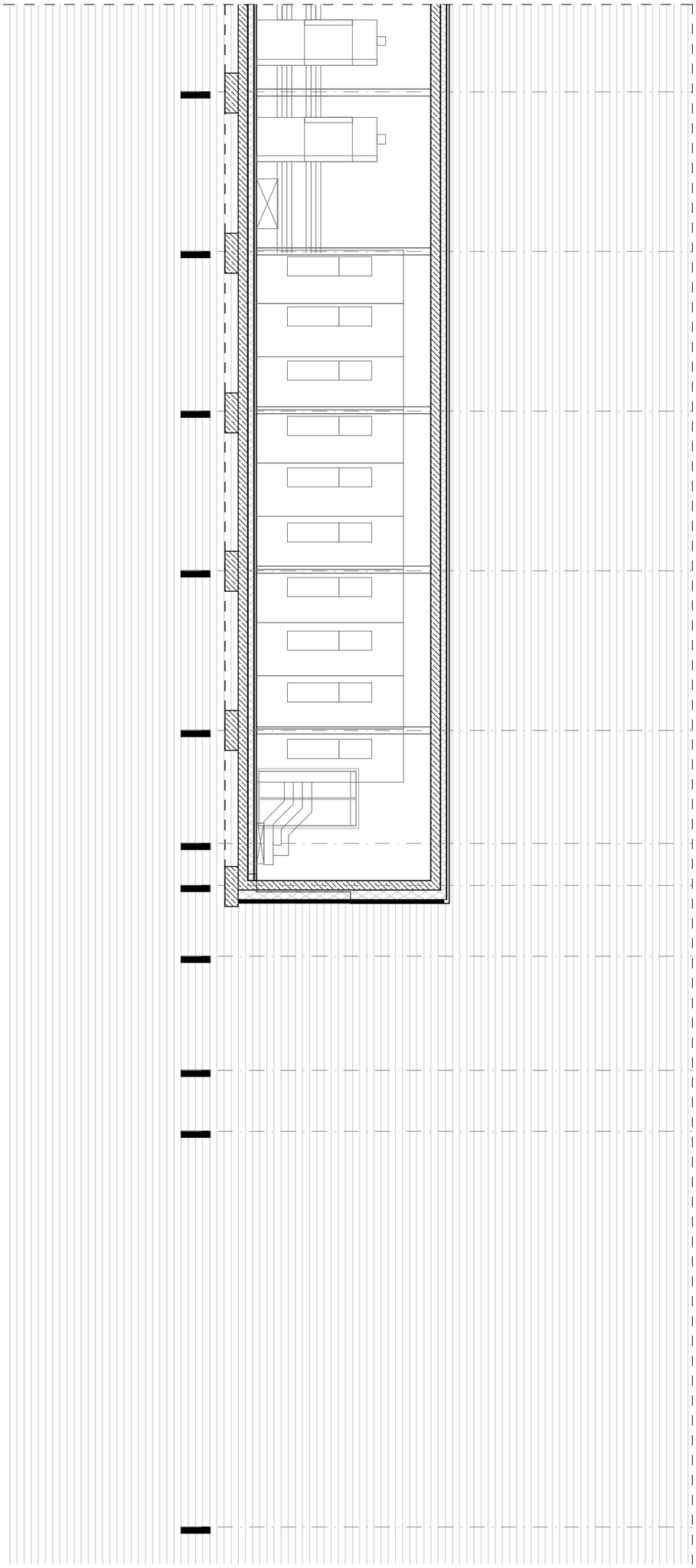
310
30 50 62
280
2 774
1 480
511
43 142
599
510 510 390 390 253 340 240 240 240
+35,00
+33,00
+30,00
+27,00
+24,00
+21,00
+19,00
+16,00
+14,00
+11,00
detail 1/2/3/4
1:20
13x17,5=228
13x17,5=228
13x17,5=228
13x17,5=228
Tidal Power Plant - section A - 1:100 - part A

Tidal Power Plant - section A - 1:100 - part B

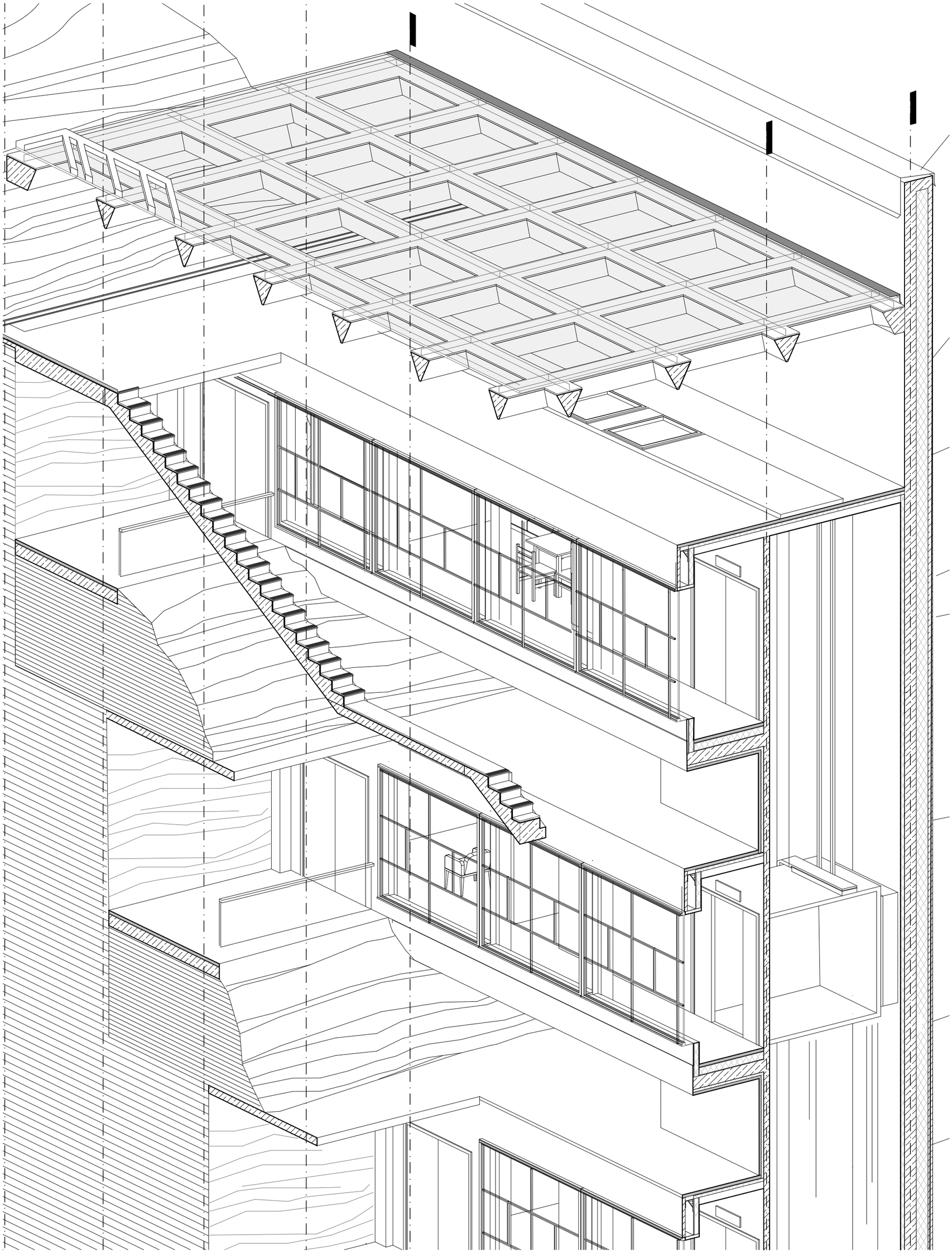




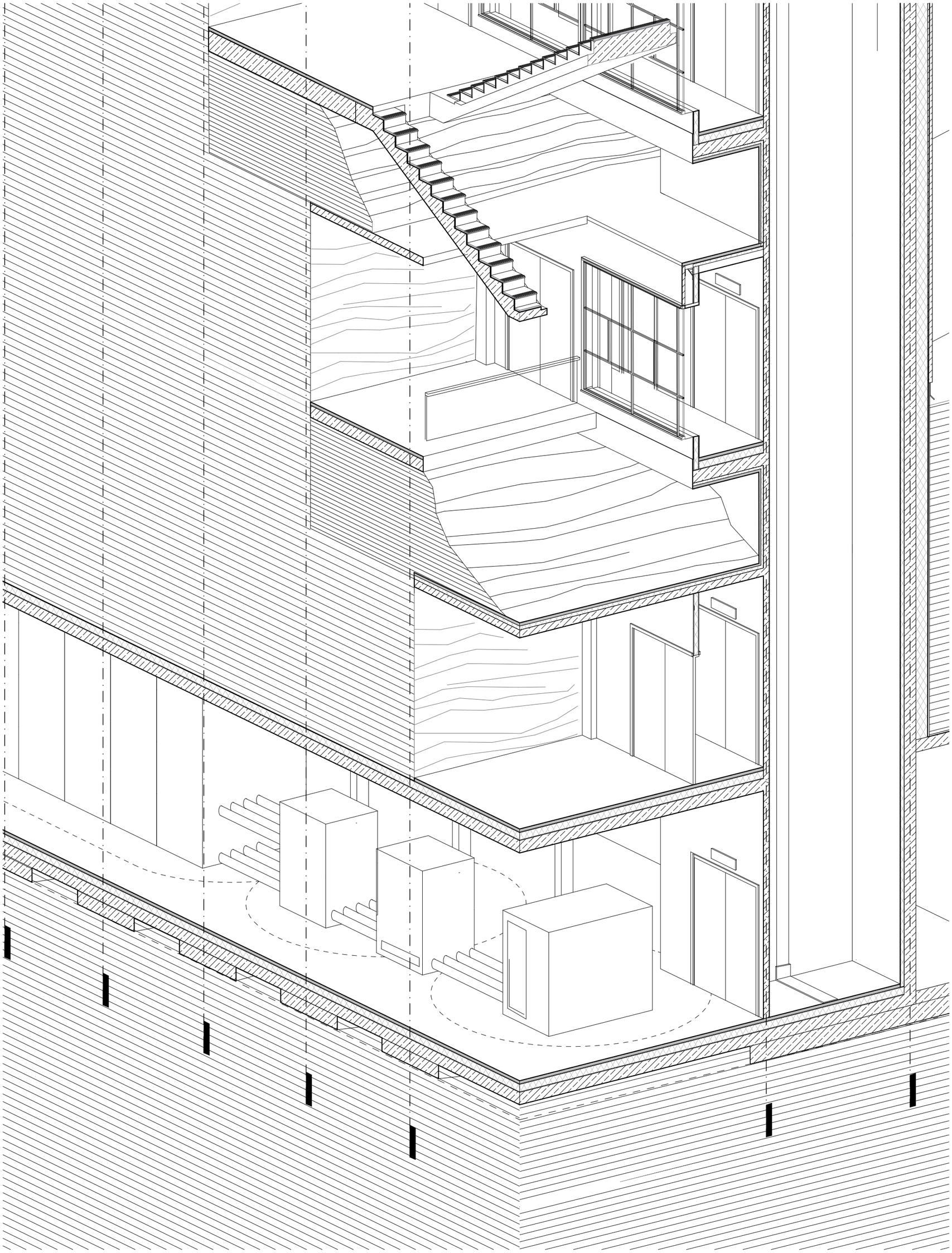
Tidal Power Plant - section A - 1:100 - part C



Tidal Power Plant - section A - 1:100 - part D



Tidal Power Plant - Section in Axonomentry - 1:50 - Part A



Tidal Power Plant - Section in Axonomentry - 1:50 - Part B

dditional structure for insulation

oof opening window

0 mm exposed concrete
0 mm sheep wool insulation
30 mm reinforced concrete floor

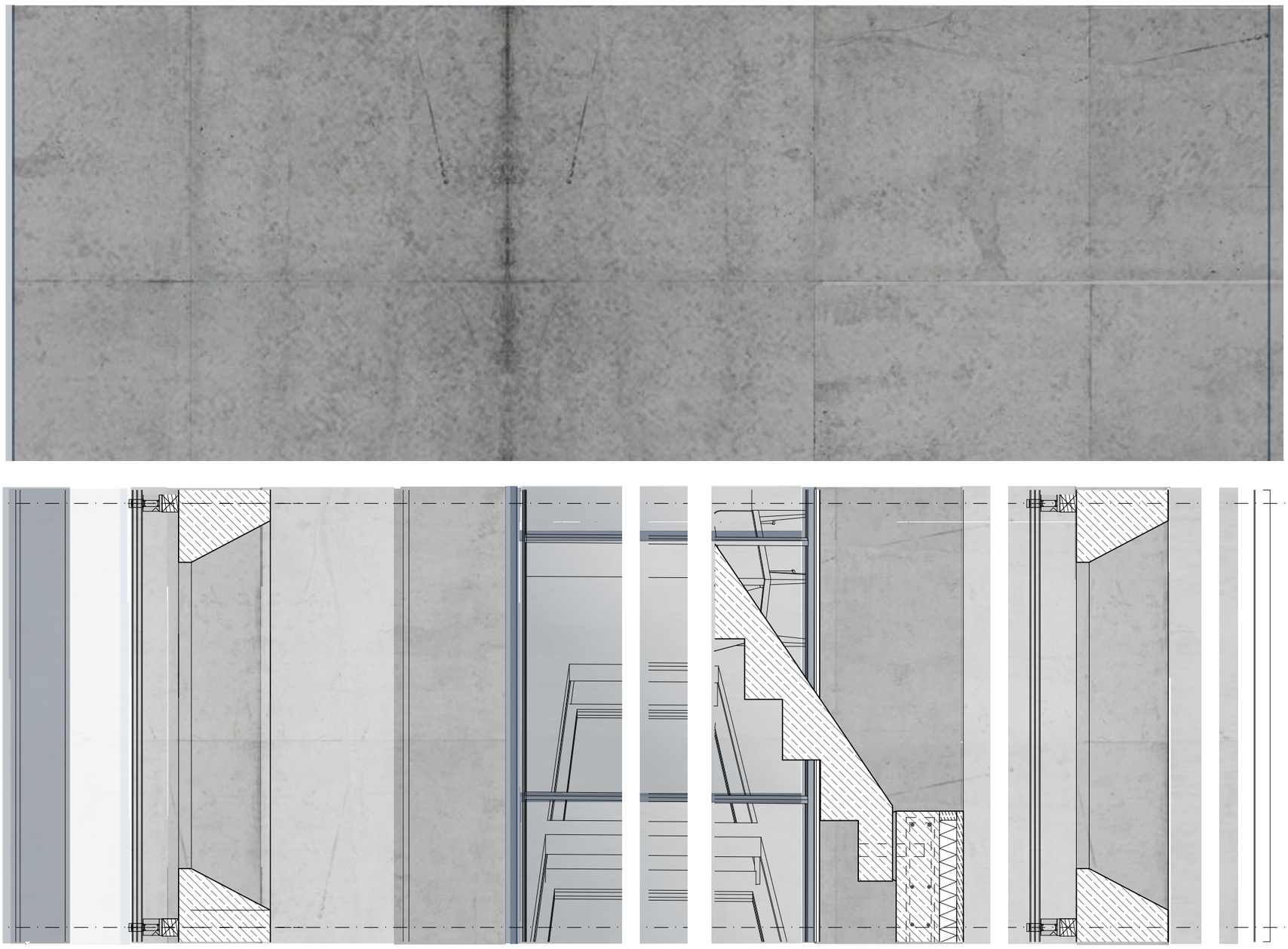
0 mm exposed concrete panels
ir void
20mm sheep wool insulation
0mm exposed concrete

0 mm reinforced concrete
0 mm sheep wool thermal insulation
mm exposed insulating - concrete wall

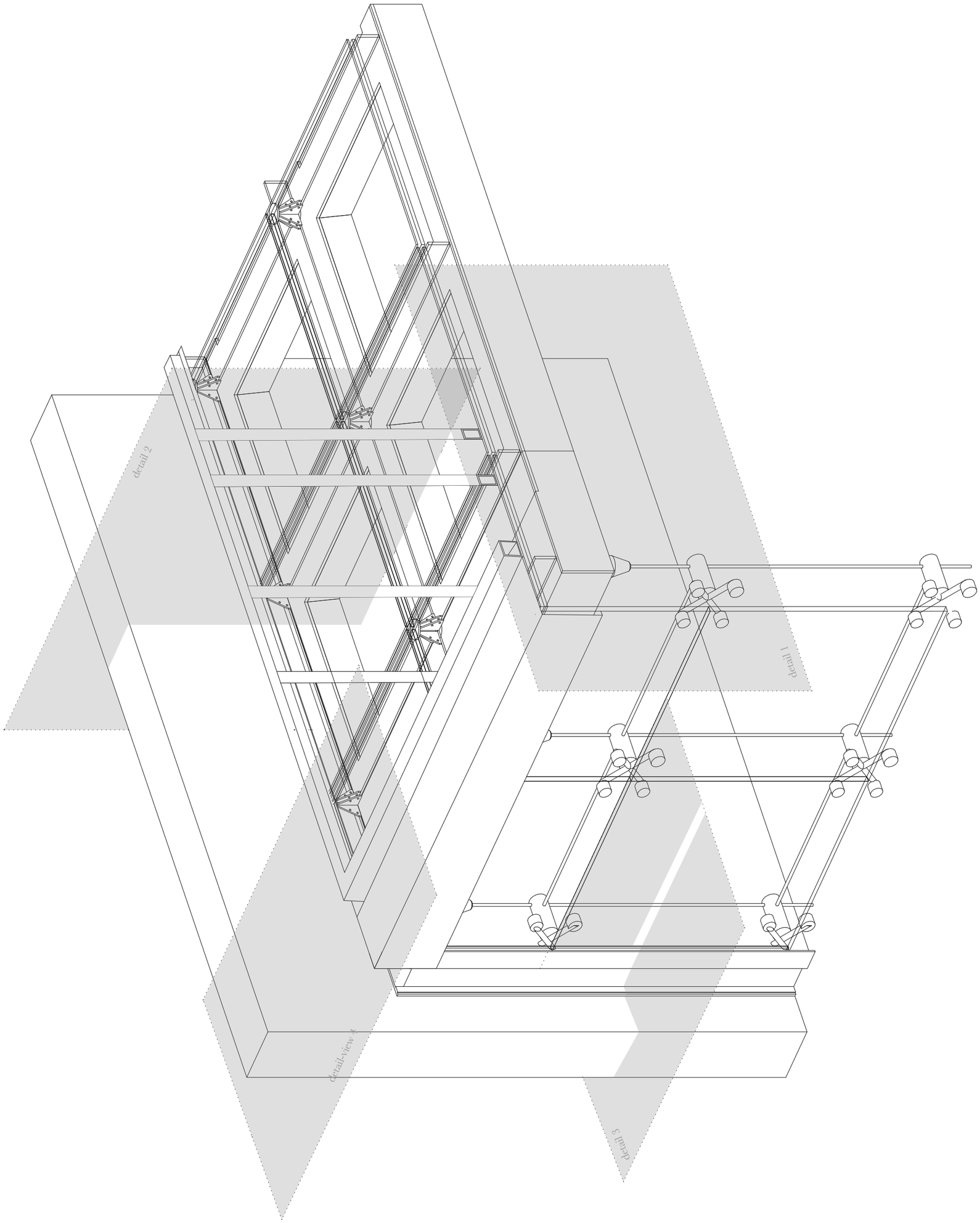
mm oak strip parquet laid on edge
mm screed with underfloor heating
lythene layer
mm impact-sound insulation
mm additional insulation for media
0 mm reinforced concrete floor
mm sheep wool insulation
mm exposed concrete

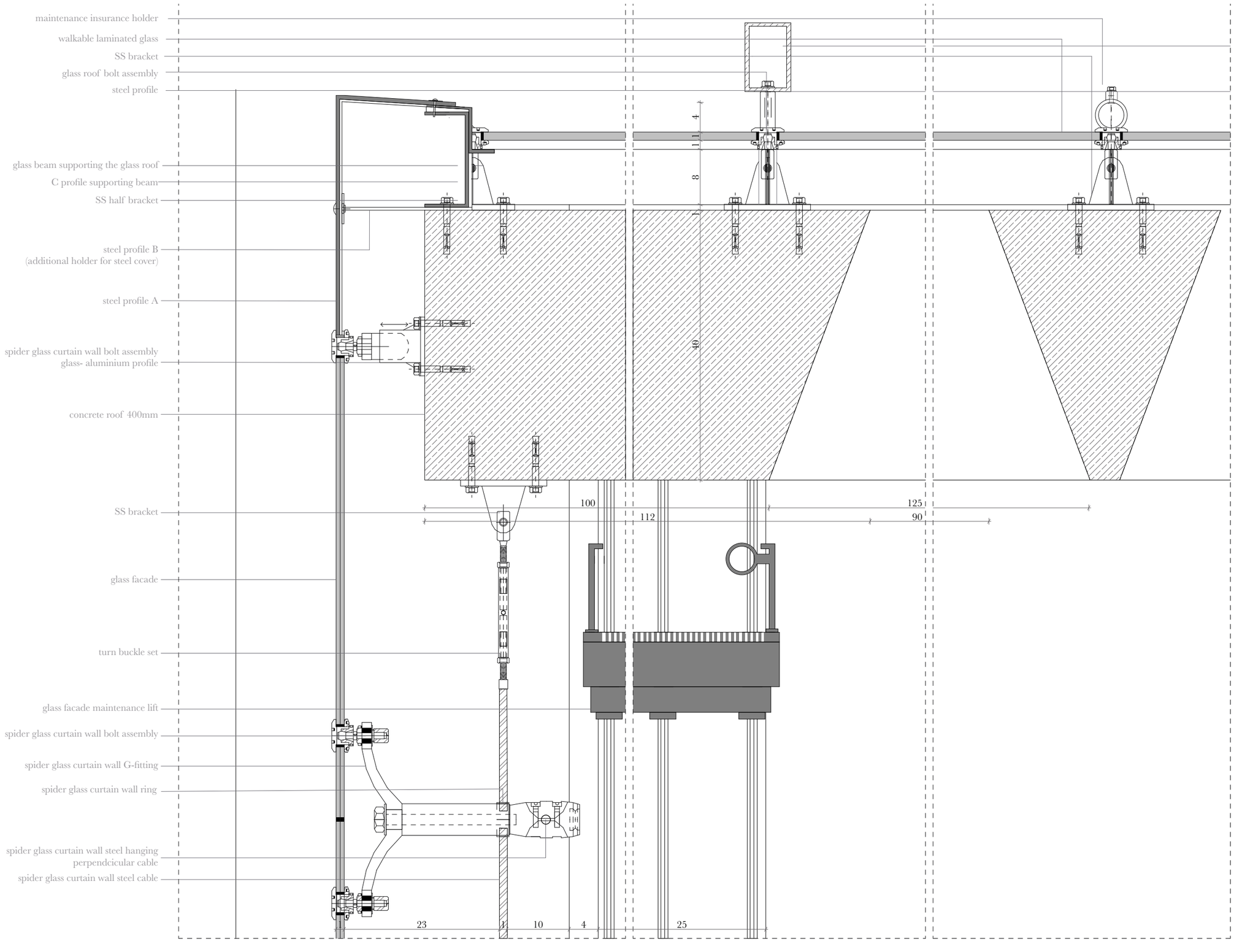
Tidal Power Plant - Section - Interior - 1:20 - Part A

Tidal Power Plant - Section - Interior - 1:20 - Part B - Materials

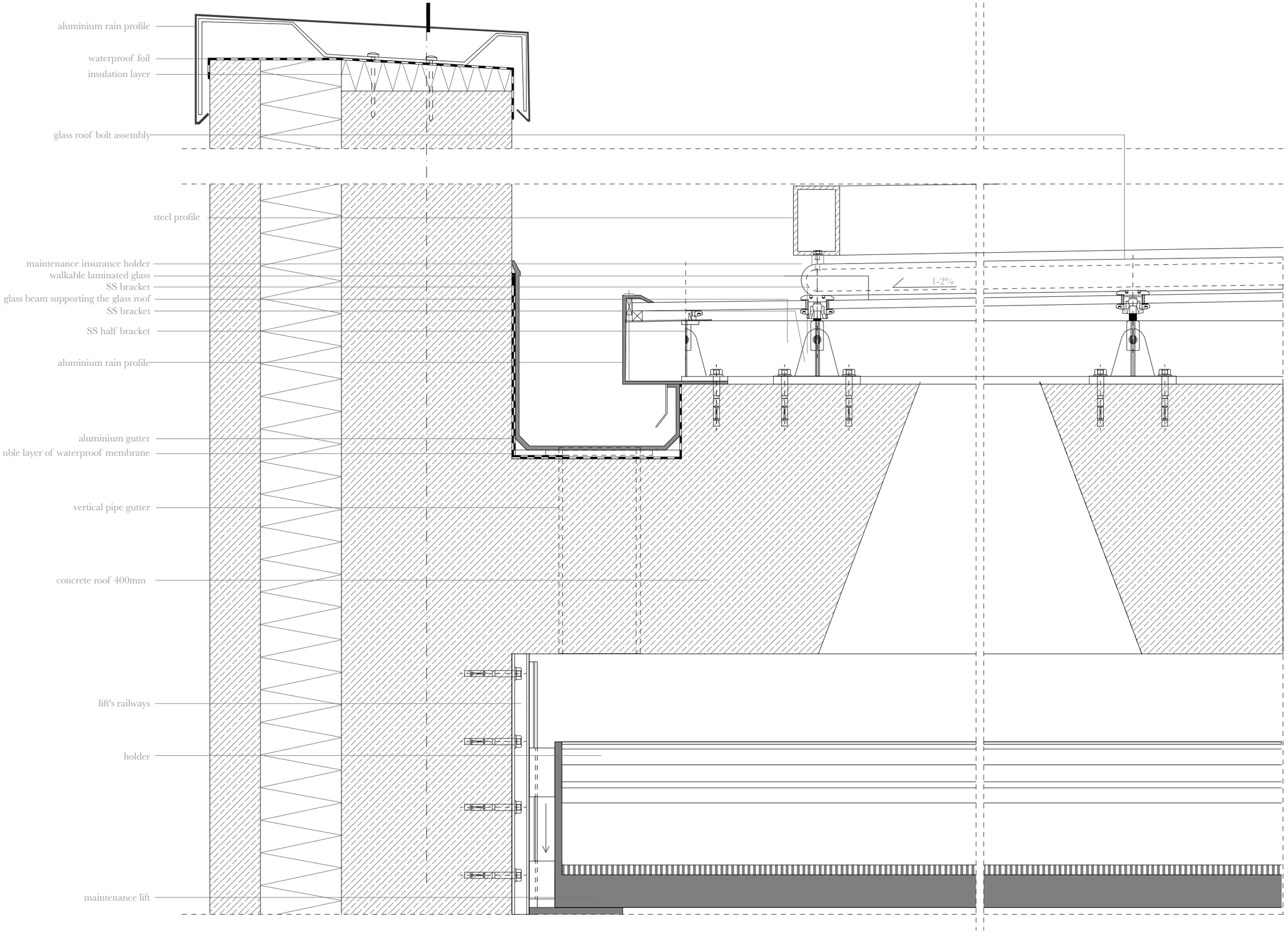


Tidal Power Plant - Section - 1:5 - Detail Axo

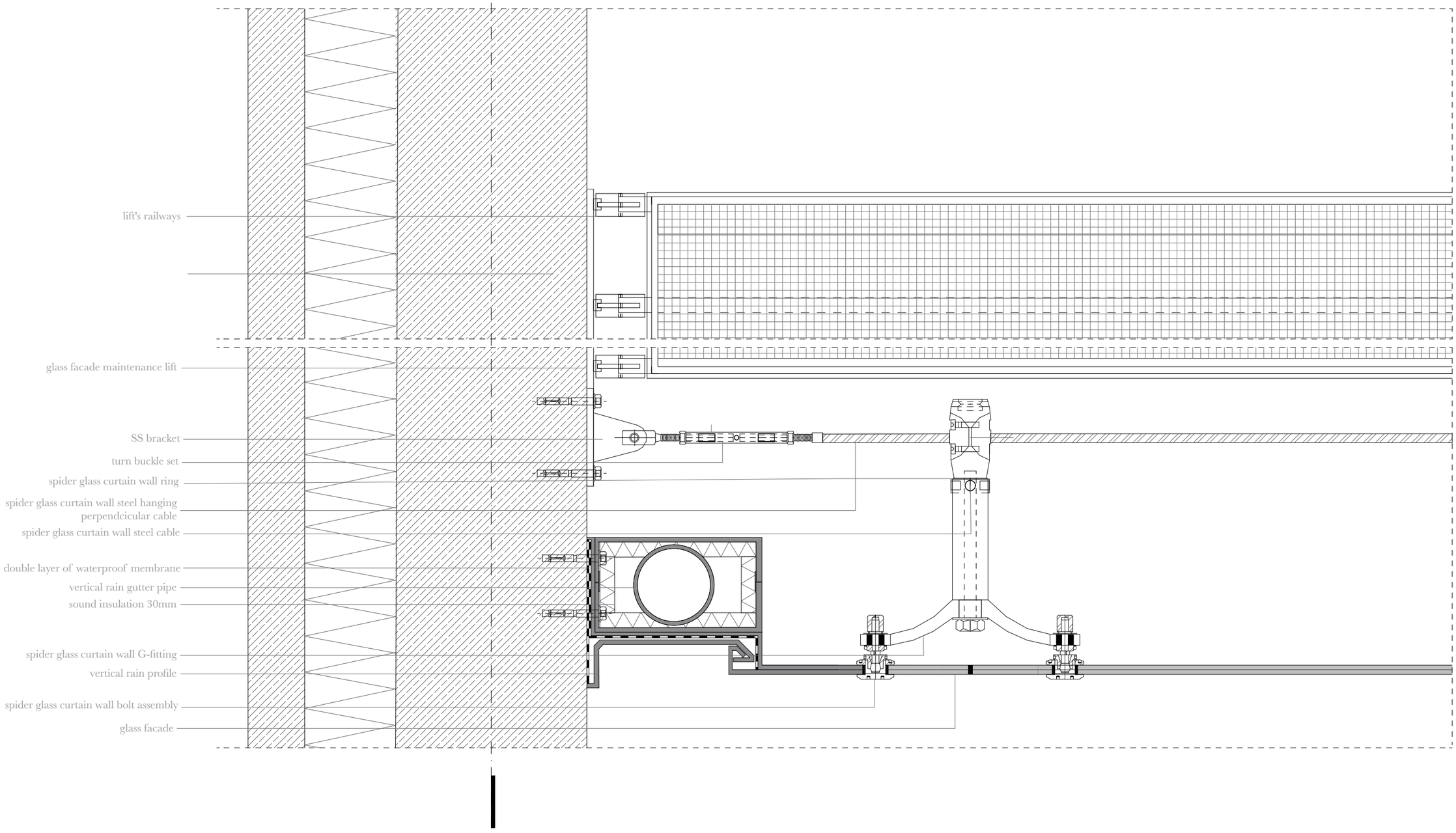




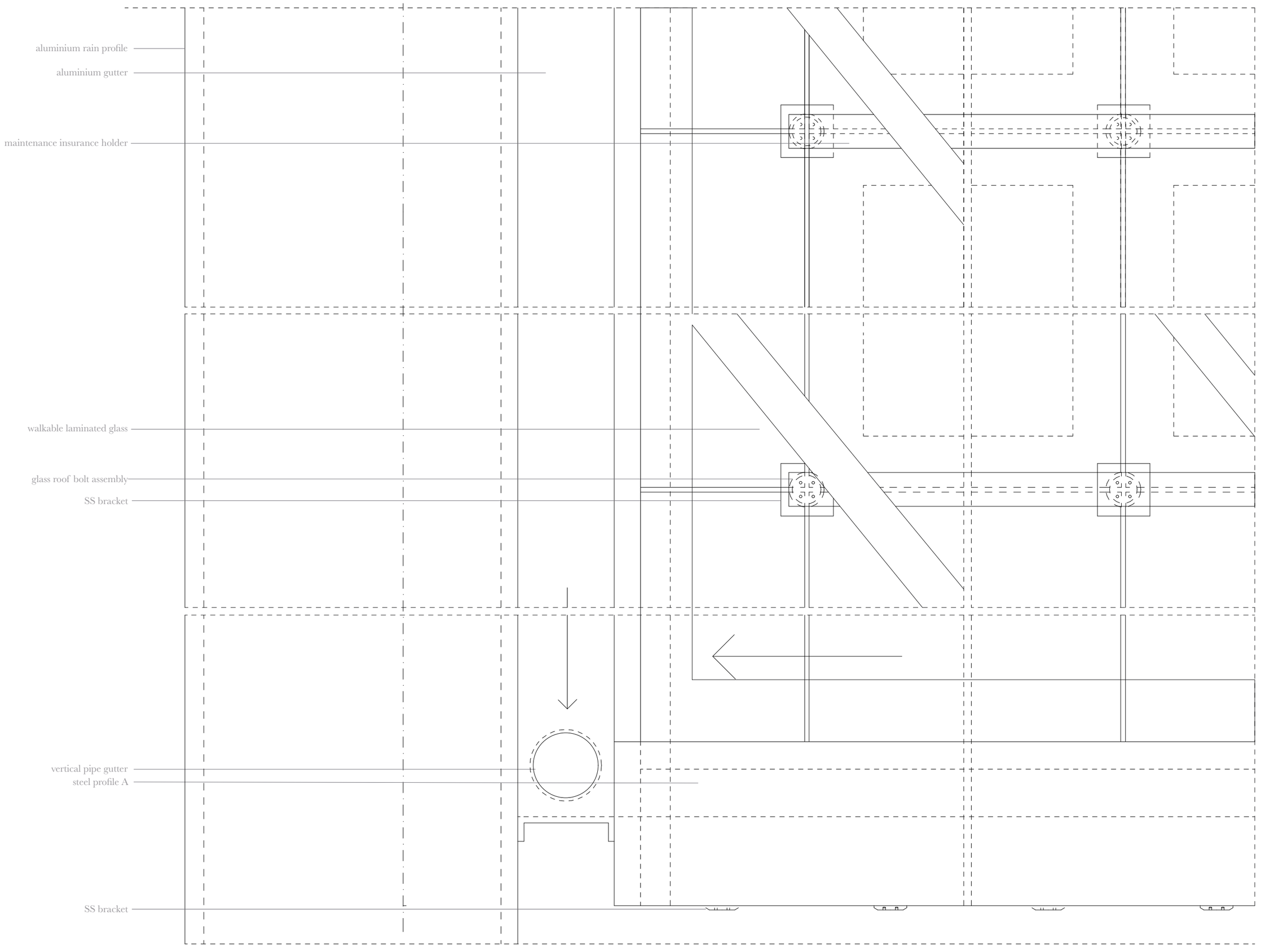
Tidal Power Plant - Section - 1:5 - Detail 1



Tidal Power Plant - Section - 1:5 - Detail 2



Tidal Power Plant - Section - 1:5 - Detail 3



Tidal Power Plant - Section - 1:5 - Detail 4

stairs' railing

prefabricated concrete stairs

screw M5 x 25mm AISI 304

stairs' railing concrete anchor
concrete screw M7 AS 30

emergency grey water reservoir entrance

horizontal gutter - Vessel K11

sand
drainage mat

light concrete C12

concrete C15
waterproof layer x2

polystyren

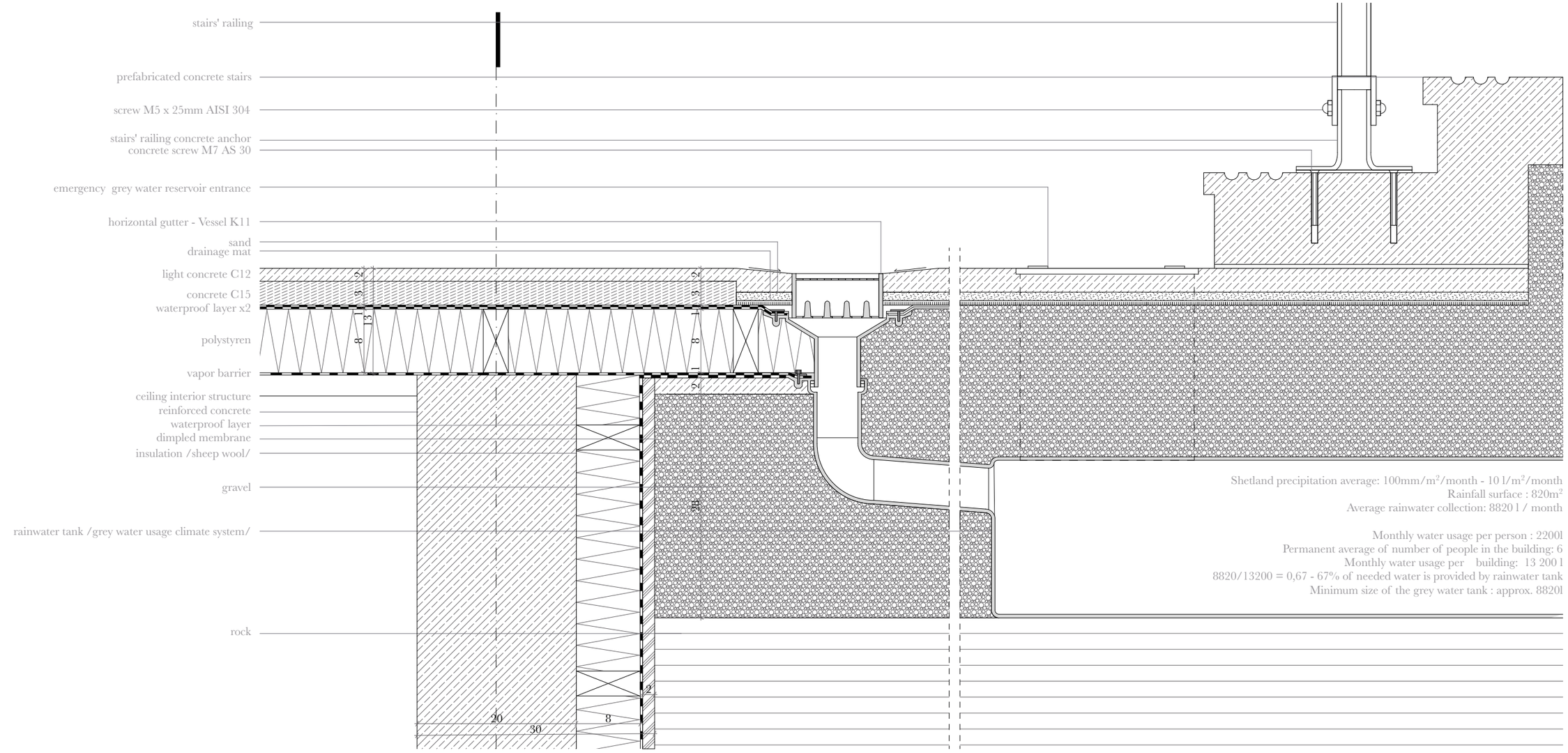
vapor barrier

ceiling interior structure
reinforced concrete
waterproof layer
dimpled membrane
insulation /sheep wool/

gravel

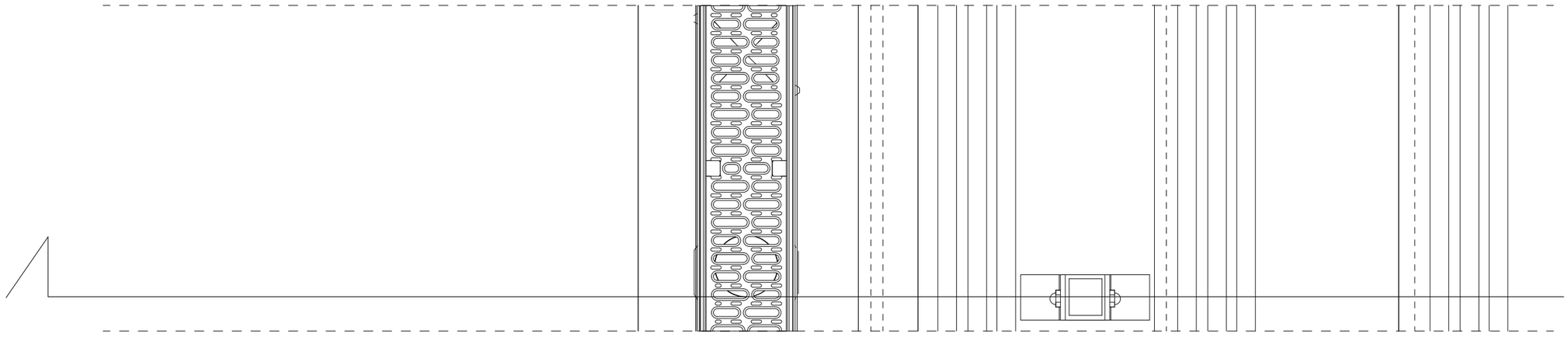
rainwater tank /grey water usage climate system/

rock

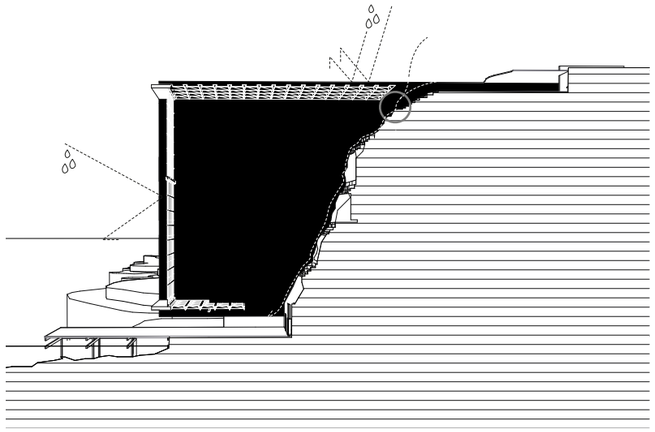


Shetland precipitation average: 100mm/m²/month - 10 l/m²/month
Rainfall surface : 820m²
Average rainwater collection: 8820 l / month

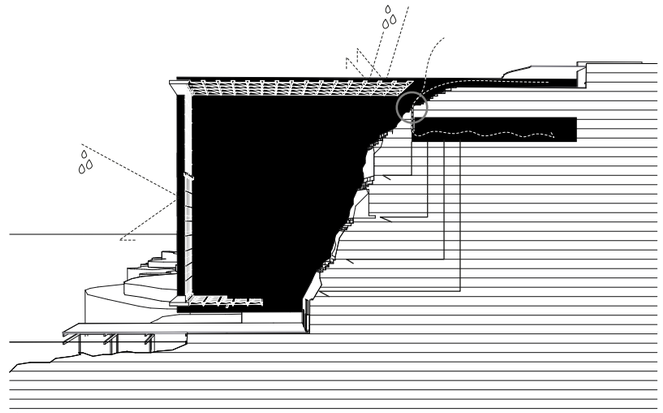
Monthly water usage per person : 2200l
Permanent average of number of people in the building: 6
Monthly water usage per building: 13 200 l
8820/13200 = 0,67 - 67% of needed water is provided by rainwater tank
Minimum size of the grey water tank : approx. 8820l



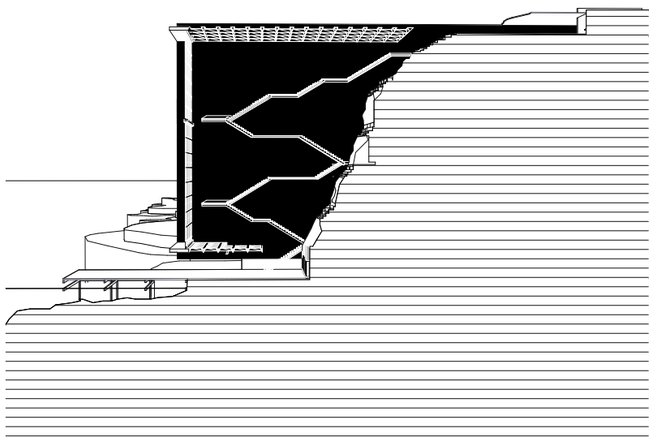
Tidal Power Plant - Section - 1:5 - Detail 5



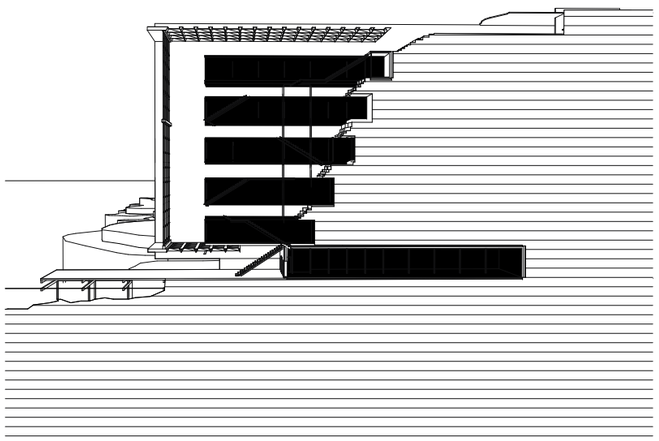
Facade and the roof protects the builidng from wind, rain and overheating by sun radiation.



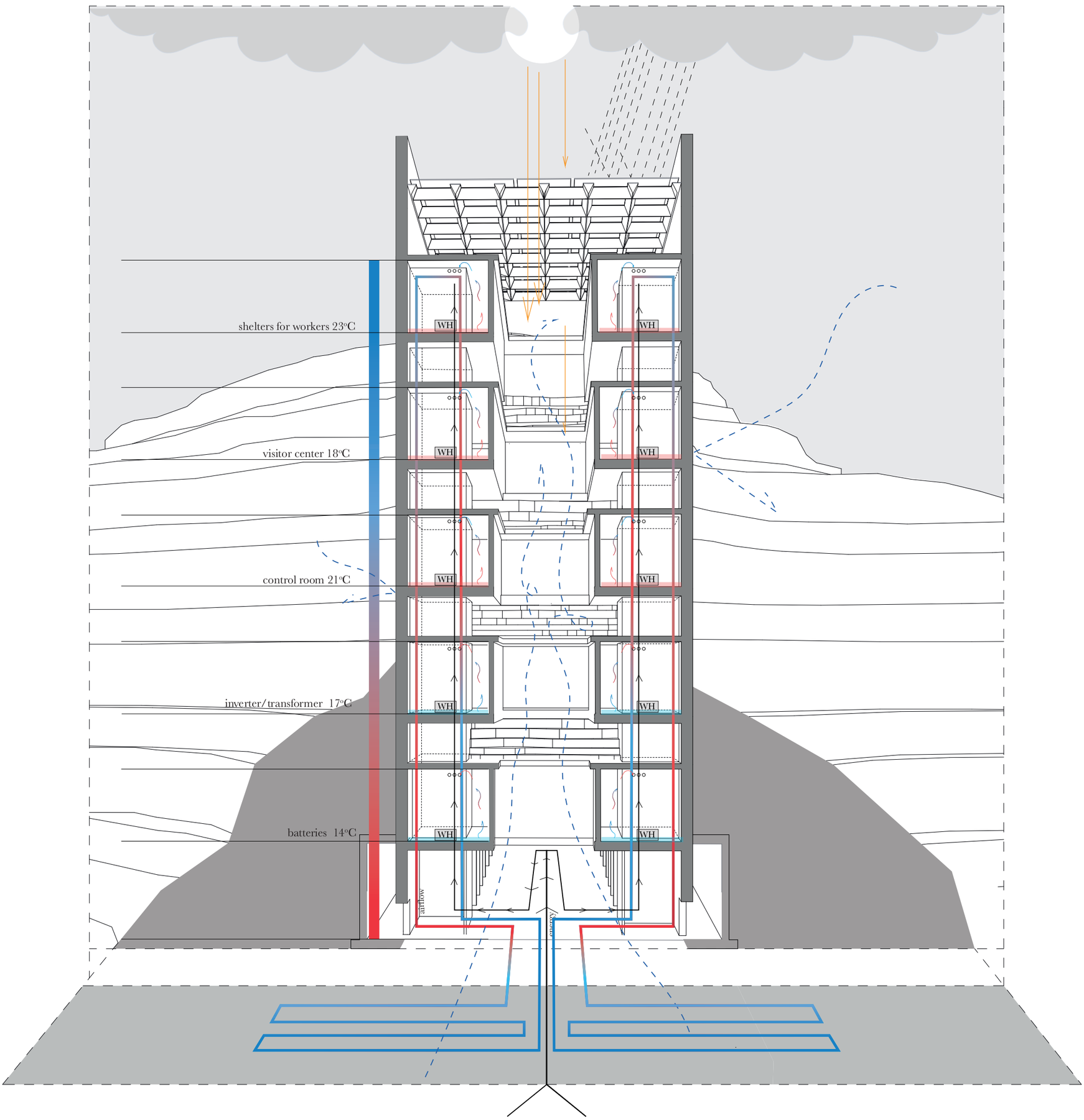
Rainwater collected at the main entrance to the building is being kept in water reservoir and used in the building as grey water.



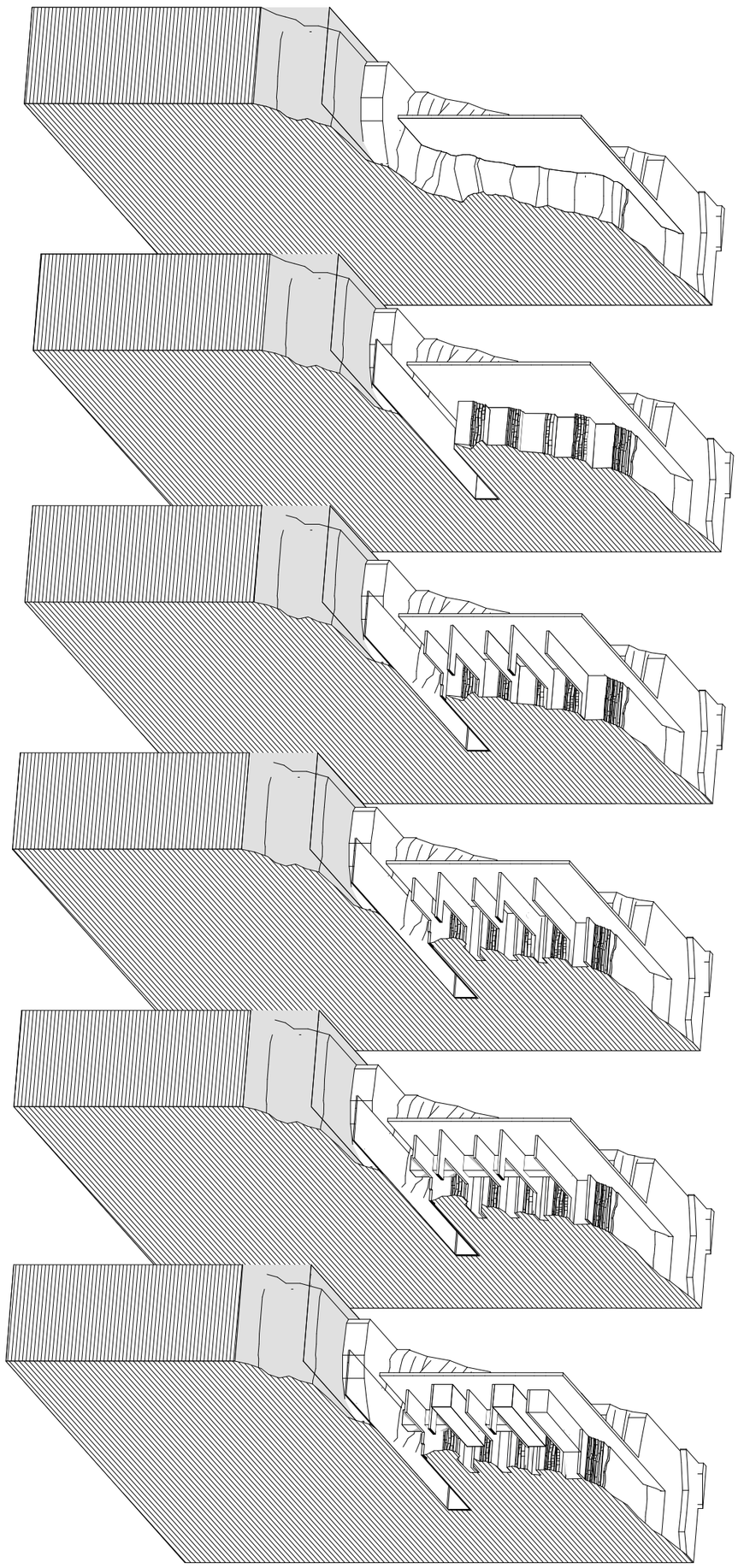
Tempreature in the core of the building is the same as outdoor because of lack of entrance and exit doors. Air can float through the whole builiding.



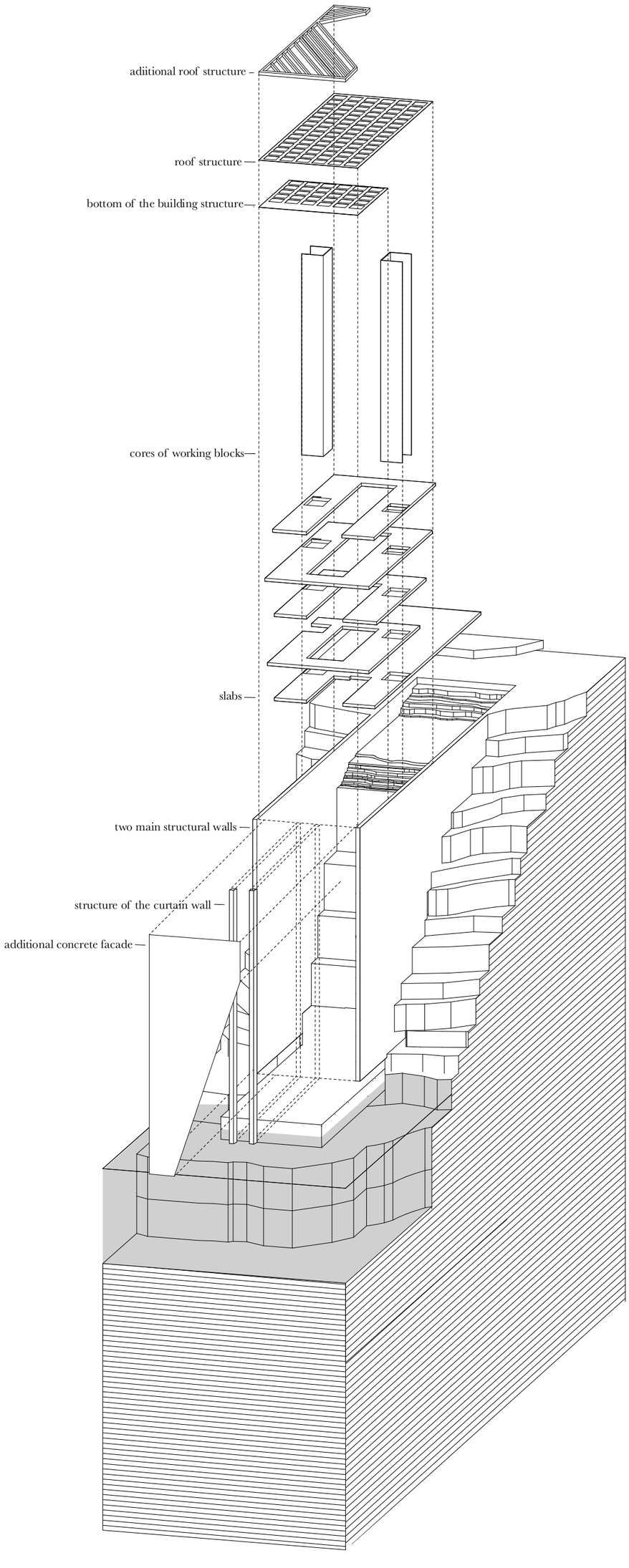
Tidal Power Plant functional boxes have indoor conditions. Thanks to the charactetistic structure, each of them has its own controlled temperature.



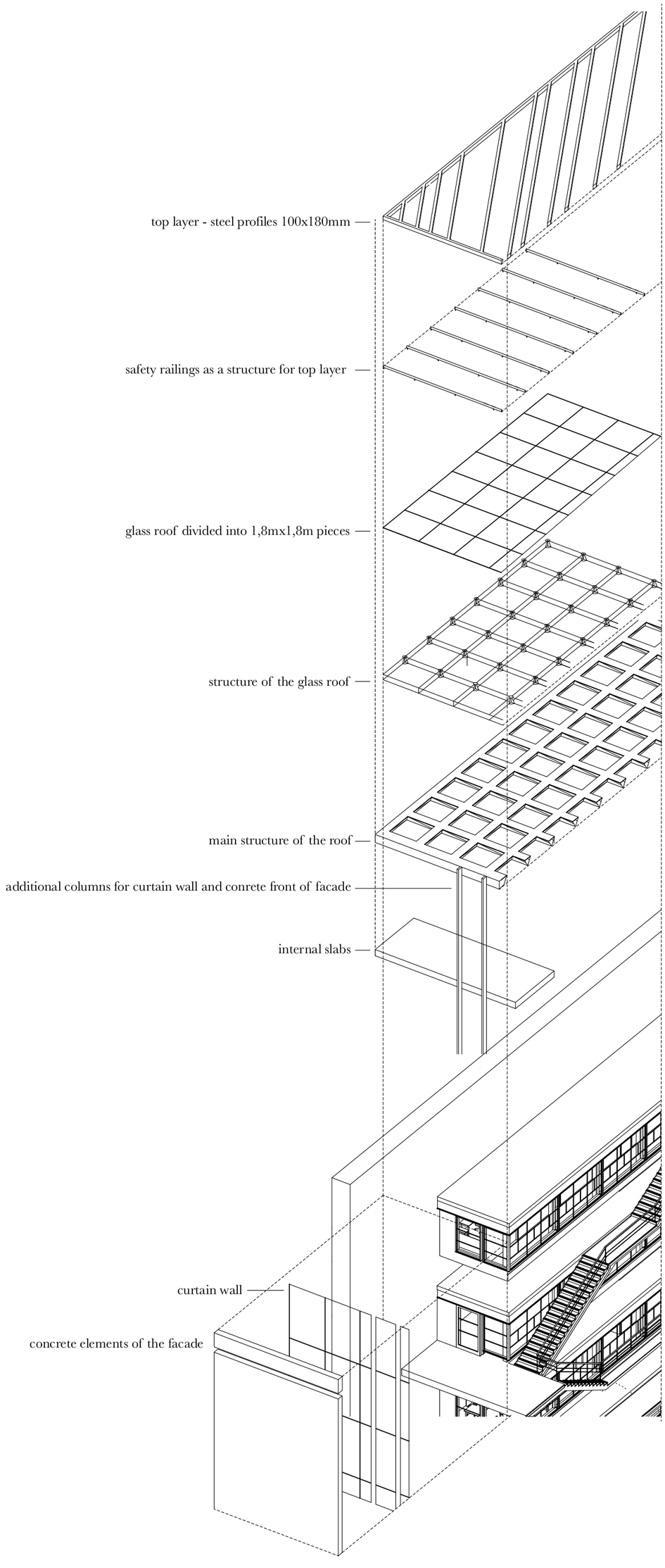
Tidal Power Plant - Climate Scheme



Tidal Power Plant - Structural Scheme

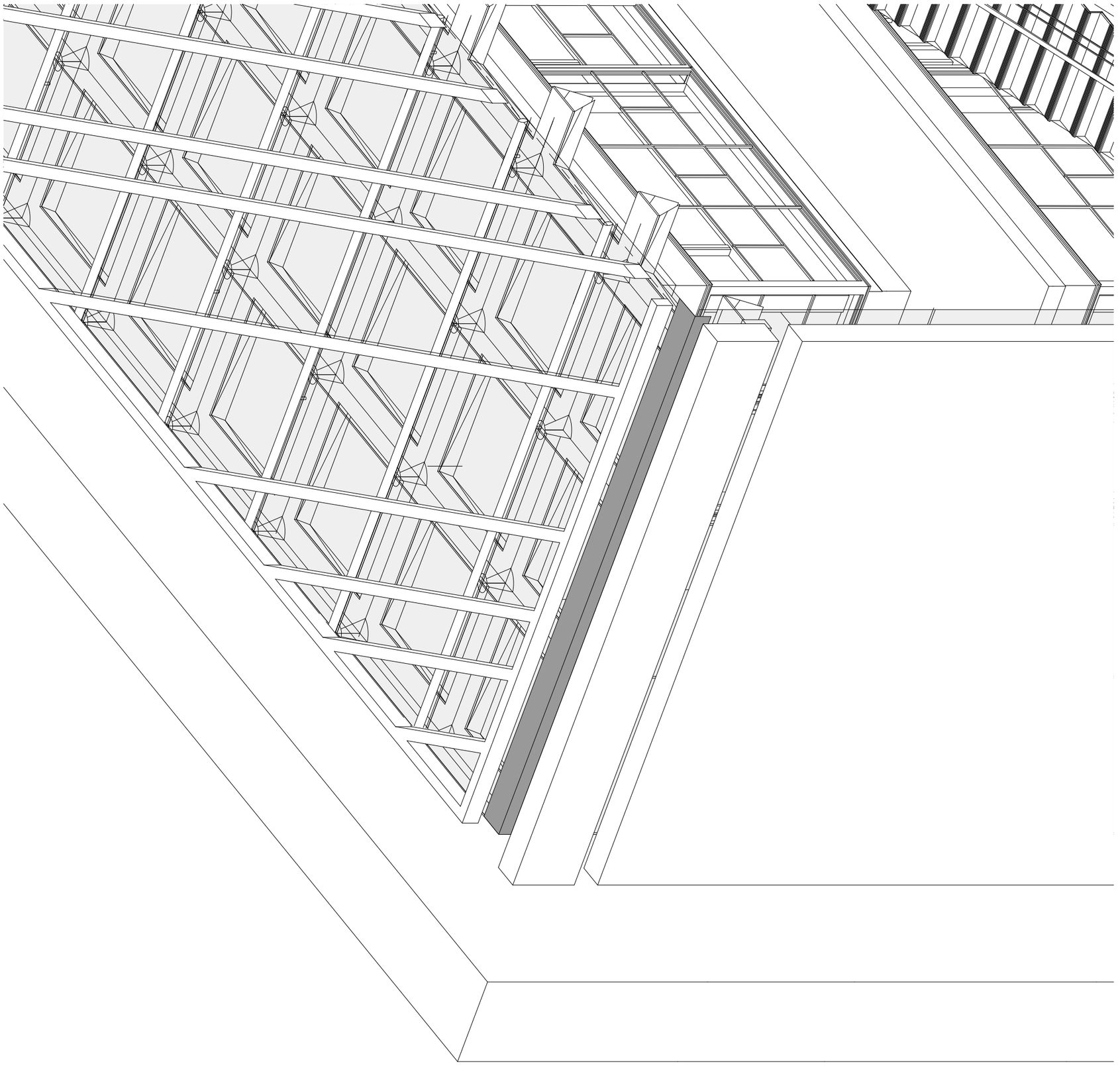


Tidal Power Plant - Structural Scheme



Tidal Power Plant - Axonometry - Structure of the roof - 1:200

Tidal Power Plant - Axonometry - Structure of the roof



10 Tidal Turbines - 15 MW/h - 225MW/24h - 110 MW low tide - high tide - 90 MW high tide - low tide - 24MW in breaks

Shelters for workers

Visitors' Center - 2pp

Control Rooms - 2+2pp

Inverter/Power Transformer - 1

Hybrid Battery Storage - 1

Elec. Generator/Rectifier/Voltage Regulator

4 people for 8 hours/day _____ 4 people for 12hours/ day in 2 shifts_____ 8 shelter rooms for workers - 4 regular/4 emergency

Tidal Power Plant - Axonometry - Circulation Scheme