Hybrid Territories

Towards a New Sublime and the Cybernetic Meadow

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Academic Year: 2019/2020

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CHALMERS
UNIVERSITY OF TECHNOLOGY

The Reels of Gutta-percha Covered Conducting Wire Conveyed into Tanks at the Works of the Telegraph Construction and Maintenance Company, at Greenwich (1865).

Architects have to stop thinking in terms of buildings only. [...] All are architects. Everything is architecture.
Hans Hollein, 1966

Table of Content

Abstract

Abstract

Every minute 574.500 pictures are shared, 4.000.000 videos shared, 16.000.000 text messages sent by more than 3.7 billion internet users which creates daily more than 2.5 quintillion bytes of data. Indeed, more than 90 per cent of the world's data was generated in the last two years which assigns the era we are living in the title of the information age.

Shaped constantly by our culture, data, algorithms and the "cloud" where everything is stored and kept safe, these are ubiquitous to a planetary scale regardless of geographies, political borders or cultural conditions of any kind. The virtual footprint of our culture is evident and unquestionable, but still invisible to the human eye, an abstract idea with no shape or presence and becomes inevitable to ask ourselves: what does it look like to give the virtual a physical form?

Every produced data is stored within giant slabs sitting in the remote territories of the countryside. Most of these are data centres and they are becoming the defining cultural constructions of our age when our collective history is digital, yet (almost) deprived of human presence. A type of building which sits at the core of what it does mean to exist today, but which excludes us.

This thesis aims to prototype an alternative form of server farm with the purpose to bridge the gap between human and machine component through the way it intervenes in the landscape.

The design is meant to celebrate the importance of these infrastructures as a highly symbolic component in the landscape and suggest an architecture which establishes a new relationship with the occasional visitor by delivering a human-based experience.

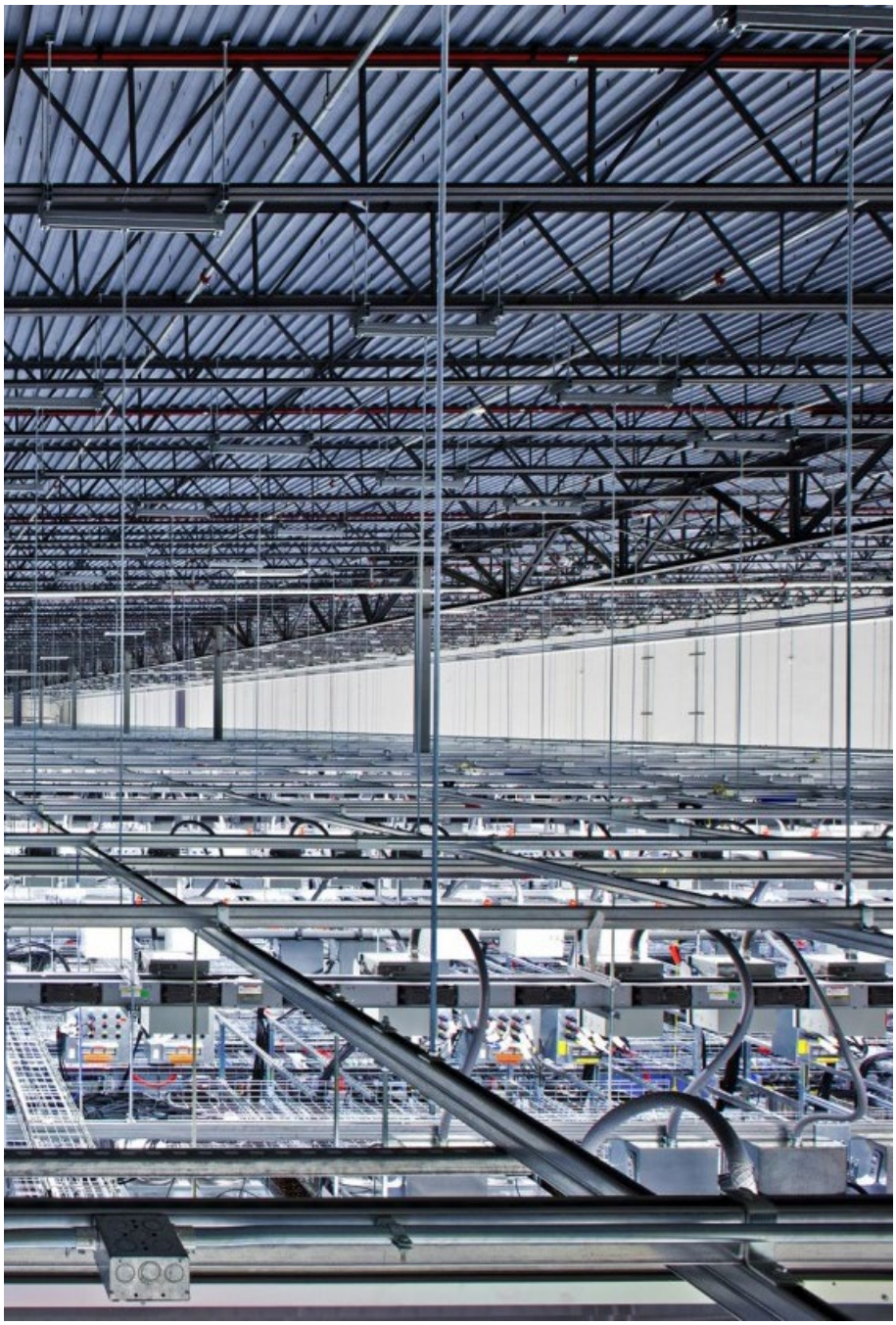

Image: GOOGLE Connie Zhou data center server / Source: Verge

Introduction

Student Background

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2013 -2016	Polytechnic University of Milan

Glossary

Machine landscapes	Refers to those remote areas which are highly populated by server farms , fulfilment centres and warehouses.
Post-human	Designating or relating to art, music, etc., in which humanity or human concerns are regarded as peripheral or absent; abstract, impersonal, mechanistic, dispassionate.
Data centre	A large group of networked computer servers typically used by organizations for the remote storage, processing, or distribution of large amounts of data.
Server rack	A computer or computer program which manages access to a centralized resource or service in a network.
Sublime	Producing an overwhelming sense of awe or other high emotion through being vast or grand
Human component	A constituent element of human species or pertaining to or having the nature of people.

All explanations are taken from Lexico (Oxford) dictionary - https://www.lexico.com/?search_filter=en_dictionary

Purpose of exploration

The purpose of this exploration is not to create a feasible project, but rather to stimulate thinking towards an emerging condition that deprive humans of agency in front of the ever-growing embodiment of the private sector but most importantly suggest alternative forms of interactions with those that are meant to be essential infrastructures of humanity, but which exclude us, and ultimately provide material for debate Which remains open to fruitful “contaminations”.

Main questions

What would the relationship between the building and the human component be?

How does this new form of architecture relate to human experience through the way it does sit in the landscape?

How can these relationships (building - landscape / building - human) be preserved or change over a period of time and what qualities do transcend it?

Method and Delimitations

Due to the nature of the topic and possible scenarios that can be envisioned from it, this thesis operates within the spectrum of research by design for speculative architecture. The design process is driven by a counter-factual narrative that attempts to answer “what might happen if” the server farm relates differently to the landscape and the human component, and the use of cognitive estrangement - a form of narrative characteristic of science fiction - to explore how this condition is preserved or changes in a fictional future scenario.

Despite the visionary approach to the thesis, the established fictional environment is encoded with existing theoretical sources that we know today, which help both to make more targeted assumptions and inform the design process in terms of scale and type of intervention in the landscape. Indeed, the features that are part of the automated infrastructures were investigated and explored at an early stage.

These include typology, scale and their relation with the vast landscape of the countryside and more specifically within the context of the Tahoe Reno Industrial Centre (TRIC) which shifts from the typical anthropocentric urban development and characterised by diversified typologies of automated infrastructure to be taken into analysis.

Later in the process, multiple iterations are tested to materialise at a conceptual level the prototype through several massing studies made possible with the use of a three-dimensional computer-aided design application.

Since the thesis has been focusing on how shaping an alternative form of post-human architecture and the experience which delivers to the human component through the way it does sit in the landscape and its architecture qualities, technical conditions has had a lower priority.

Background

A new (ordinary) presence

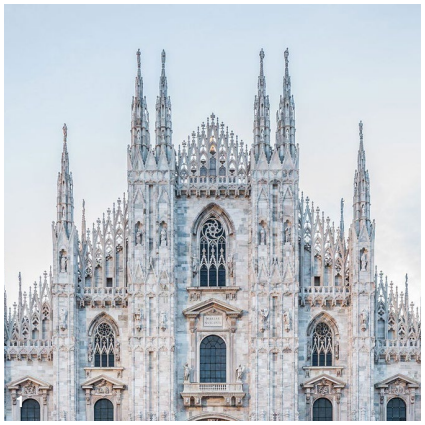
The time-line introduced in this section illustrates the architectural developments of the last centuries and how these are strictly correlated to the technological and cultural developments in history.

Indeed, since the Renaissance, specific architectural typologies have been imagined and built with the purpose to represent at best the cultural environment in which these have been placed and despite their symbolic diversity and functionality throughout history, one element places them under the same umbrella: the human presence. All, but one (pic. 6).

This building might be a server farm, autonomous factory or fulfilment centre (it is hard to tell due to their generality and opacity), unlike the architectural typologies mentioned before, are deprived of human presence and allocated in remote regions far from the urban context despite being the engine which keeps it running.

This put in discussion our current role as humans in front of these infrastructures and how the rural environment is affected by these entities.

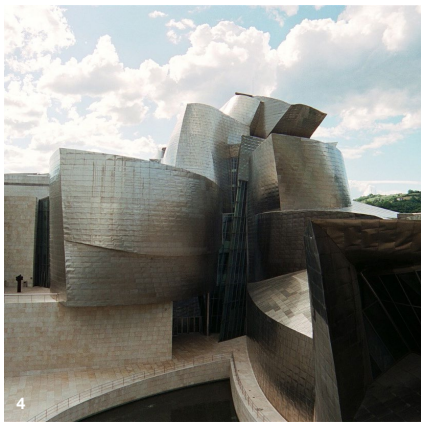
As Liam Young argues, “these infrastructures are a prime example of one of the new typologies of the post-human, a building of extraordinary meaning that sits at the core of what it does mean to exist today, but at the same time turns its back on any expression of that significance […] At a time when our collective history is digital, these blank forms are our generation’s great library, our cathedral, our cultural legacy. Every era had its iconic architectural typology […] now we have post-human architecture” (Young, 2019).



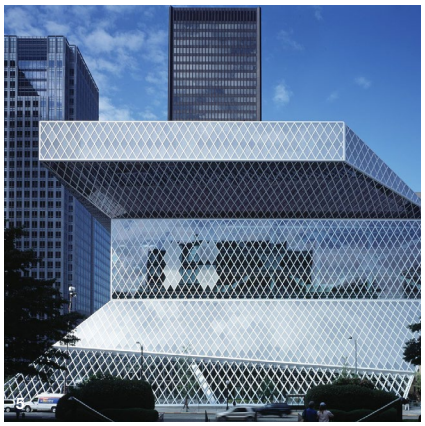
1393

1610

1952



1997



2004

2017

Milan Cathedral (1); San Giorgio Maggiore (2); Unité d'Habitation (3); Bilbao Museum (4); Seattle Library (5); Switch Supernap (6)

The above pictures illustrates those representative architectural typologies for a specific time in history up until now (pic.6), where our time and culture is represented by the architecture of server farms, fulfilment centres which, in spite of the other buildings are built to do not be accessible to humans marking the end of human centred design.

Post-human takeover

In June 2011, Steve Jobs introduced iCloud to the public, which by now might not appear extraordinary as it was back then, but what is worth to remind, is the core of that presentation. Indeed, to prove the company's commitment towards this new piece of technology, Jobs did not hesitate to bring to light one of the three data centres which had been just completed, by glorifying its scale, (not specified) sustainable features to respect the environment and on top of that the secrecy of its content and modes of operation.

This is the physical entity shaped by computation and the rise of internet consumption which virtual presence it is not weightless but has a footprint. This presents itself in the form of fibre optic cables and undersea cables which create a vast complex mesh that extends across geographies, national and legal jurisdictions just to deliver an ephemeral connection to the world.

The pivotal node of these infrastructures lead to those giant slabs sitting within the vast territories of the countryside, the same which once was synonymous of nature and spontaneity now is becoming increasingly designed and geometrical, setting in less than twenty years and the ever-growing proliferation of these infrastructures as much as their scale which is the main reason why these buildings cannot afford to find their place within a more urban and historical context.

Consequently, these are defining a new kind of urbanisation without people which raises questions and concerns on the future of the countryside and those remote areas around the globe where these buildings reside especially because up until now, urbanisation – as Rem Koolhaas states – has been always a result of human endeavour, wherein this case becomes underrated and obsolete enough to give room to a more machine-oriented presence from which, whether we like it or not, our existence depends on but we are not part of.

Koolhaas' thinking frames this "new architecture of featureless boxes as perhaps more exciting than anything we have seen since the birth of modernism in the early 20th century: a new sublime"(Koolhaas, 2019).

Undersea Cables, North pacific Ocean (1); Google Data Centre, Oregon (2);

From data, to cloud storage our virtual information travels across geographies, national and legal jurisdictions via fibre optic cables sunken under sea, invisible to the human eye, to find a pivotal node in giant slabs placed somewhere in the remote countryside.

Unmanned entities

Data centre

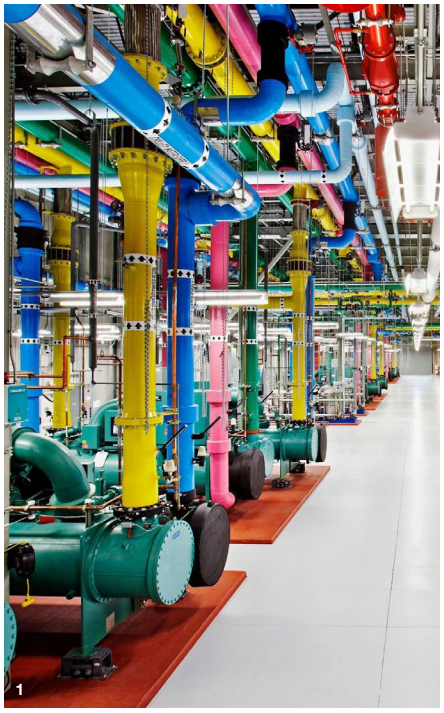
Hidden in plain sight, anonymous and generic, data centres are becoming an ever-expanding urban typology fed by our continuous increase in data consumption which makes of these architectural typologies, not just the infrastructure that stores our data but also a one that contributes to destroying the environment. Indeed, if data centres were a country, would be the eleventh most energy-consuming country in the world and equal pollution percentage as aviation. Mostly a machine-oriented environment, one engineer is enough to manage over a 1000 sqm of stacked servers and supervise temperature, lighting and cooling system which paradoxically are the few things left and designed on human dimensions and needs.

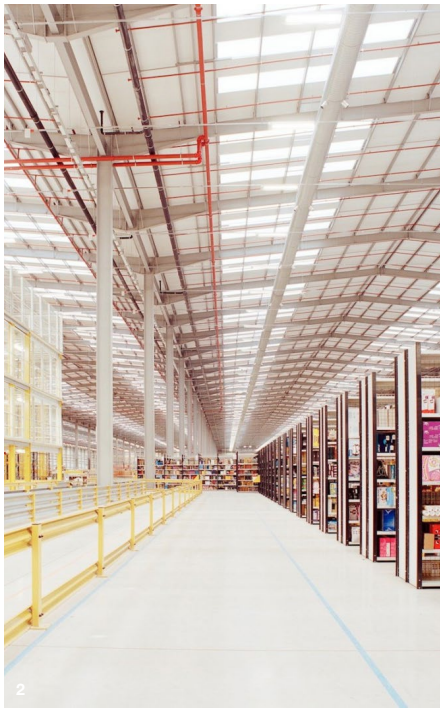
Fulfilment centre (Amazon)

A fulfilment centre is a horizontal grid-based surface with the size of nine soccer fields led primarily by robots which navigate around the immense space of the warehouse by scanning markers placed on the floor which allow them to navigate the gridded path until they reach the set destination where a whole rack of good is collected and delivered to the closest human component which “only” task left is to pack and dispatch the goods. The task of the robots to stock the racks placed around the warehouse in the most efficient way. After they have delivered the goods to the closest check-out point, the shelf is not destined to return to its original location, but rather is positioned in the closest open slot available, making of the whole fulfilment centre architecture in continuous reconfiguration.

Automated greenhouse

Can be a container or a vast transparent slab, this new form of greenhouses are a perfect alchemy of steel, glass, climate control, artificial lighting and meticulously regulated system of water distribution and nutrients which makes of these buildings a symbolic environment of equality where every single plant is monitored and treated according to its needs, making of the interior a safe landscape and all potential harms are locked out. Humans included, unless under special suits.





Inside Google Data Centre (1); Amazon Fulfilment Centre (2); Tesla Gigafactory (3); Automated Greenhouse (4)

The vast scale of these infrastructures in not the only feature that characterize them, indeed large scale factories have been conceived and part of the built environment since the industrial revolution, but what is particularly important is the shift within these buildings, from a human centred design attitude to a more robot-oriented environment.

The new sublime

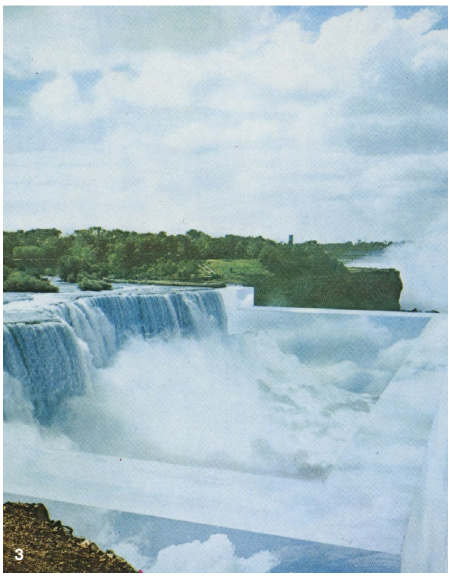
The more data we produce and consume, the bigger these buildings are going to be so these can be stored and protected accordingly. For the first time in architectural history, this phenomenon might mean the unique possibility for architects to engage with vast hybrid entities which have no dimension.

This new freedom of expansion has delivered server farms and fulfilment centres with plots half the size of Central Park, a scale which lacks sensitivity towards both the world and its inhabitants.

In front of this event and factual condition, we might just think of this infrastructures as a new form of sublime.

Unavoidably, the only way to look at this phenomenon in the countryside is to look at the history of Land art, which inevitably redirect us to structures which intervene in the landscape, such as Lighting Field installation by Walter De Maria or City by Michael Heizer, and let us wonder if these vast slabs could be redesigned as a new form of architecture which intervenes within the context of the countryside as a new form of Land Art. Moreover, these sublime forms, simply inhabiting the landscape reminds us of what some architects – almost prophetically – predicted already in the late 1960s such as Superstudio with their The Continuous Monument series of photo-montages, which represents a model of urbanization and architecture which creates a deliberate aesthetic based on the contrast between nature and the abstract forms of the objects which instils in the viewer a sense of wonder of the unknown and powerlessness that resembles the feeling we perceive once in front of these infrastructures.

Nonetheless, as Cristiano Toraldo di Francia argues in his blog, “the Continuous Monument takes the modern distinction between natural and artificial to the limit and opens the way to a new hybrid philosophy of reconstructing the relations between architecture and nature, in which the two terms blend in a single design by letting us wonder at this point what is natural and artificial anymore”(Toraldo di Francia, 2015).



TRIC or Tahoe Reno Industrial Centre located in the state of Nevada (1); An Avalanche in the Alps (2); Reflected Architecture by Superstudio (3);

These infrastructure, due to their scale and secrecy, become a new form of sublime as it was in romantic paintings where nature used to produce a sense of awe on the (represented) human component and the observer.

Nature / culture

Romantic painters used to illustrate nature as something inaccessible, an entity which possesses an aura of danger and detached from the people portrayed in the landscape by marking a clear distinction between nature and culture, natural and artificial.

In the Anthropocene, the line that separates the natural from artificial is gradually fading letting us wonder to what extent a natural condition has been affected by human activity and vice versa. Indeed, some artificial processes became so deeply embedded in our daily lives that we cannot see them as such anymore but rather a condition which has found its place within the sphere of the natural.

For the artist Koert Van Mensvoort the key issue lies in setting a new approach capable to distinguish nature from culture based on what is controllable (culture) and autonomous which makes of those things that fall outside the scope of human endeavour part of nature. For instance, a vegetable grown in an automated greenhouse is as much artificial as an item produced within a factory and a computer virus is natural as spread infection. As Koert Van Mensvoort writes in his essay, “real nature is not green, rather, what is beyond control from human power” (Van Mensvoort, 2006).

When we approach these computational geographies and we are confronted with the complexities of these machine landscapes, we start looking at them as forbidding, uncontrollable, and perhaps perilous entities sitting in the landscape from far away, most likely standing on top of a rocky peak like a Wanderer above the Sea of Fog, letting us wonder if these represent a new nature.

Artificially Grown Vegetables (1); Automated Milking Process (2); Antenna camouflaged as cactus (3); Wanderer above the Sea of Fog (4)

The line that distinguish nature from culture is increasingly blurring shifting the attitude of real nature as not “green”, but rather what is beyond control from human power. So are these infrastructures?

Experiencing the unknown

How is human perception and experience challenged in front of this new form of nature?

For centuries, science discoveries have stretched our cognitive system. When the American astronaut Harrison Schmitt pointed his camera box out of the window of Apollo 17 and took several images, among which one became the famously known Blue Marble he - or better the image - became a visual and symbolic identity of what is now called Overview Effect, or that feeling of profound awareness reported by those astronauts while viewing the Earth from outer space.

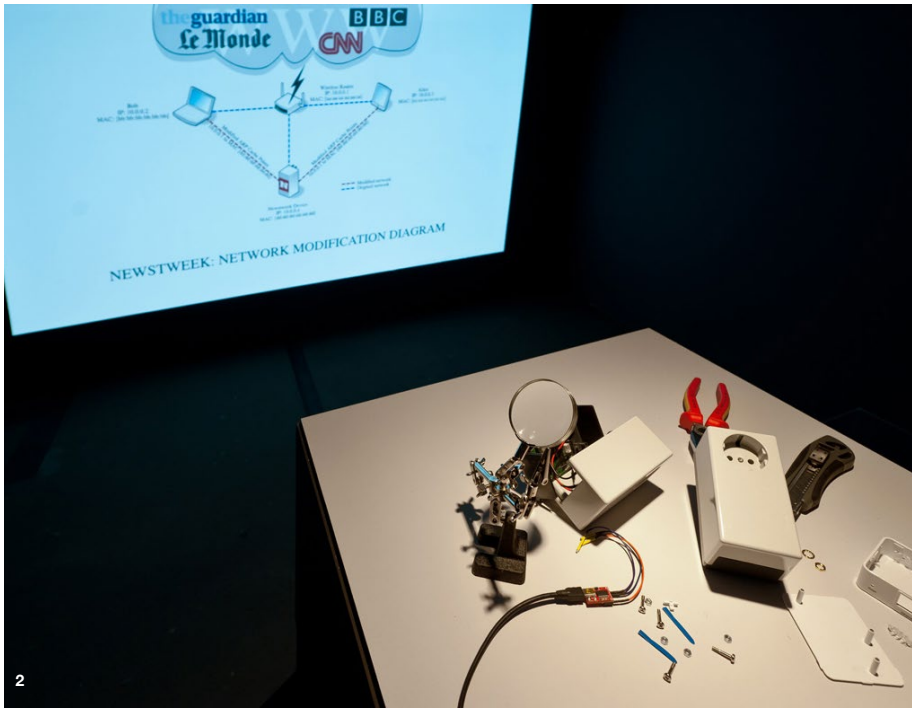
An exemplary cognitive shift and event which has challenged some individuals to experience and think differently. Has stressed the elasticity and challenged the human thought, but most importantly has recharged human perception making us understand how our daily scientific and phenomenal experiences shape our lives.

In 2011 the Berlin-based artists Julian Oliver and Danja Vasiliev designed a product and network system called Newstweek (Oliver, Vasiliev, 2011).

This appears as a normal electrical plug with an additional feature based on a tiny wireless device installed inside of it.

It might appear that its primary function is to connect you with the local wi-fi once you plug it in, but what the device does once you are connected is to change what other people can see on the network, for instance changing the content of a news website. Despite being criticised, what the artist brought to light is the vulnerability of the network, therefore make people aware of the flaws that the network carries with it and possibly being in control of the technology in itself.

Still, these autonomous infrastructures which has been discussed up until now seems to be the only scientific and technological discovery which remains invisible to the human eye either materially or spatially making it unimaginable any kind of engagement with the human component in contrary to what the aforementioned cases did, and therefore inspire any kind of way of thinking or interpret what we perceive because there is no room for experience in first place.



Earthrise photograph by William Anders and NASA (1); Newstweek electrical plug / device (2)

Two different mediums but with a shared message of revealing the hidden and challenging human perception through an alternative way of engaging the human component.

From “anti-” to unintentional monument

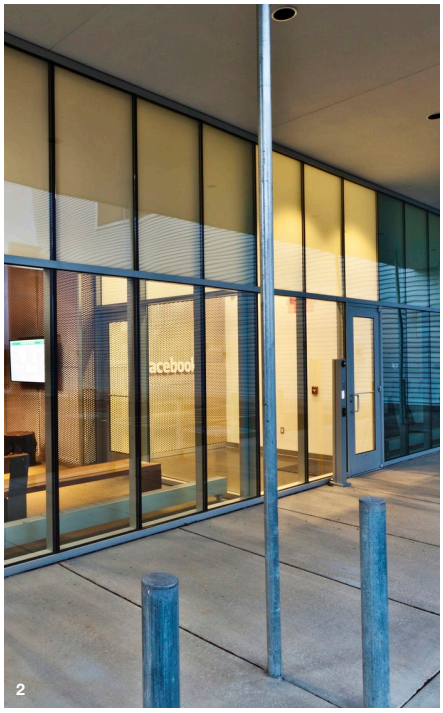
To make their architecture technologically efficient to the point that architecture assumes the role of machinery and vice-versa, data centres have been deliberately not designed.

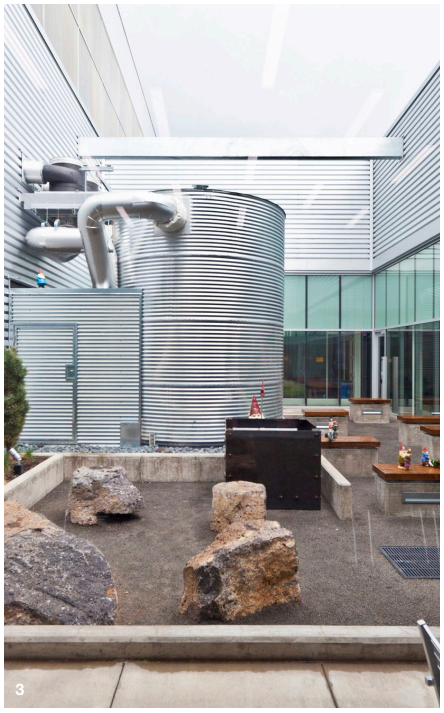
The American journalist Andrew Blum defines their intentional undesigned features as a broader denial about the complex systems which support our digital lives, nonetheless, their design explicitly says that they are meant to be “anti-monuments” which declare on purpose their unimportance if not an attempt to erase any trace of architecture, in favour of modular, low-cost and energy-efficient solutions (Blum, 2012).

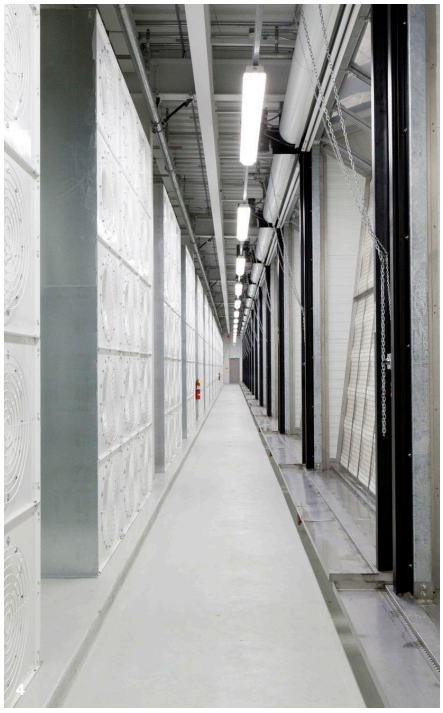
Just in the last years, some companies such as Facebook have started to think differently about the presence and physical presence that these infrastructures might have by meshing the typical ideals of a data centre with the company’s vision of making the world more open and connected by proposing a more approachable infrastructure characterised by more welcoming architectural elements such as large windows and the use of local materials. After all, data centres are stacks of hard drives which contain the most valuable archive of human culture and design should celebrate their content as has been done in the past with cathedrals or in the most recent history with libraries and museums which ultimately store extraordinary content part of human culture in the same way data centres store our data.

Maybe just then, by delivering a design which aims to celebrate and shield carefully, as something valuable and meant to last, the content of data centres, either through materiality or large windows as Facebook did in its complex in Oregon, we can aim to bridge the gap between man and machine by giving a peek of the physical form of our digital age.

Not necessarily conceived as immediate monuments to commemorate a specific person or event, but at least designed to transcend time so the age can be the sign that defines the building as a monument in their irreplaceable value for future civilisations. Or as Alois Riegl would define it, an intentional monument (Riegl, 1903).



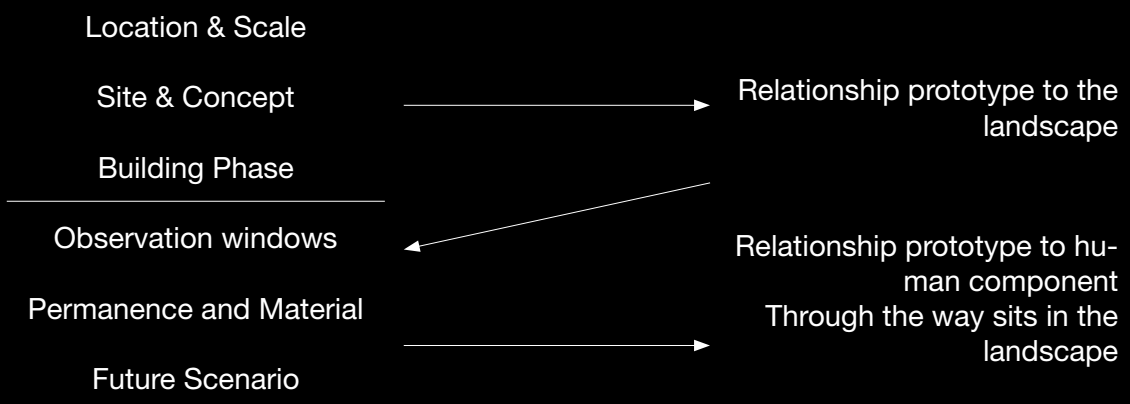




In a generic undesigned envelope the only sign of human presence is the glass box contrasting with the concrete prefabricated panels (1); Transparent envelope which gives a glimpse and of the content of the building but also attempts to materialise their vision of transparency and connection (2); Integrated of an unconventional human space within the data centre (3); Interior Facebook data centre (4)

Design

Strategy



Location

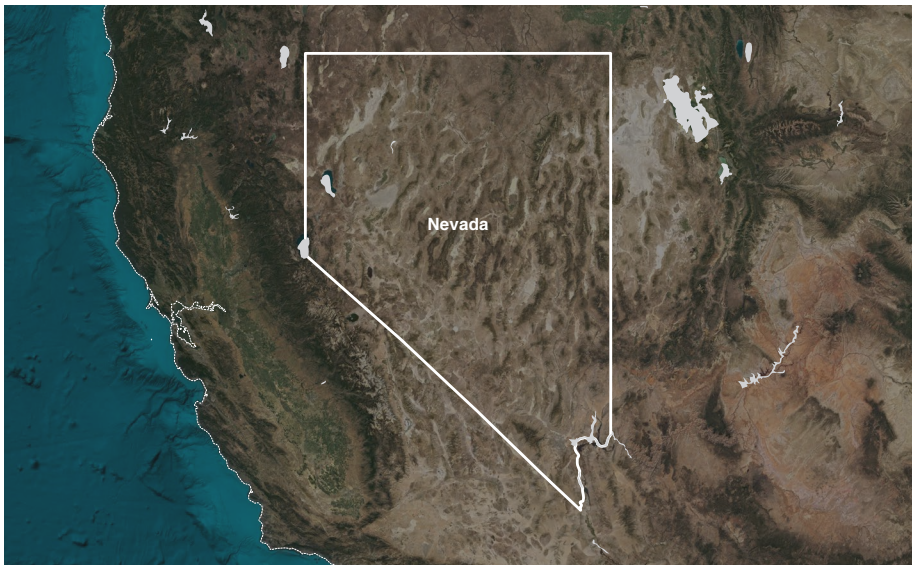
Nevada / Tahoe Reno Industrial Centre

State of Nevada

Due to its vast territory, most tech companies have decided to locate their server farms in the state of Nevada, also desired for its massive tax breaks and for subsidizing on regular basis infrastructures such as server farms and fulfilment centres and not collecting property taxes.

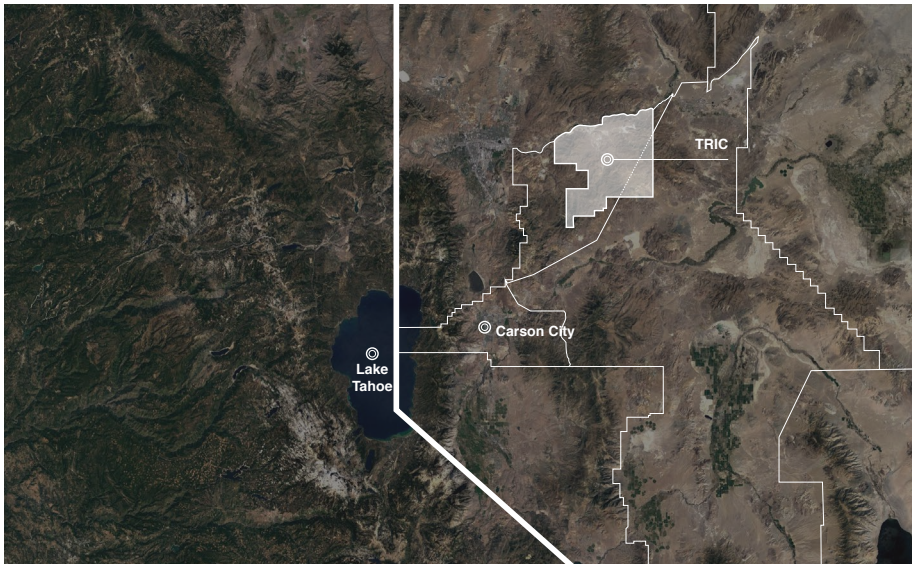
TRIC

In proximity to the state's border and close to Carson City, there is TRIC (Tahoe Reno Industrial Centre) which, as the name suggests, is an Industrial centre in itself big as Malta or Singapore and represents a territory where there is an enormous expanding assembly of infrastructures necessary to support the culture brought by the digital age under the shape of giant slabs.



Nevada

Nevada is a state located in the Western side of the USA bordered by Idaho, Oregon, Utah and most importantly California, headquarters of the most important tech companies such as Google, Apple and Facebook, but which relocate their server farms in Nevada to benefit from tax breaks and vast territories where to build them.



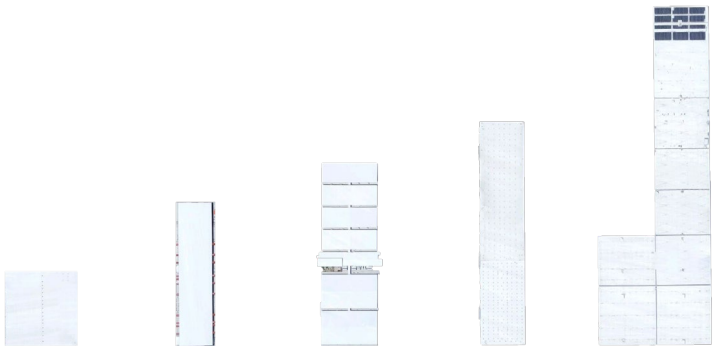
TRIC

75% of the population in the state of Nevada lives in Carson City which is the capital too. In the northeast side, 50 miles from the capital, the Tahoe Reno Industrial Centre found its place in the context of the countryside, already built available infrastructure, Interstate 80 and water source such as the Truckee River.

Location

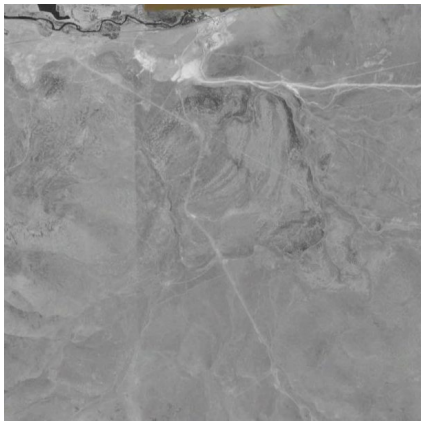
History & precondition

The actual Tahoe Reno Industrial Centre (TRIC) was nothing but a rocky expanse integrated in the vast landscape of the Nevada desert and it is just within the course of the last twenty-five years that a form of radical act of urbanisation took place. Not coincidentally this phenomenon find its place in a historical context marked by the inception and rise of the most important tech companies, but most importantly with increase in consumption of data since the introduction of the smart-phone and cloud storage which are the catalyst behind the rise of the physical infrastructure of the digital culture camouflaged as giant slabs with their own aesthetic. Urbanisation which has been historically a product of human endeavour, these infrastructure set their own urban condition based on logistic, efficiency and energy saving but most importantly to give room to a machine-oriented settlement.



Scale

90% of world's data was generated over last two years and as this figure grows so is the scale of the infrastructure that needs to support it. Indeed, over the last twenty years, these buildings did not grow just in terms of number but in scale as well.



1994

2004

2009

2012

2016

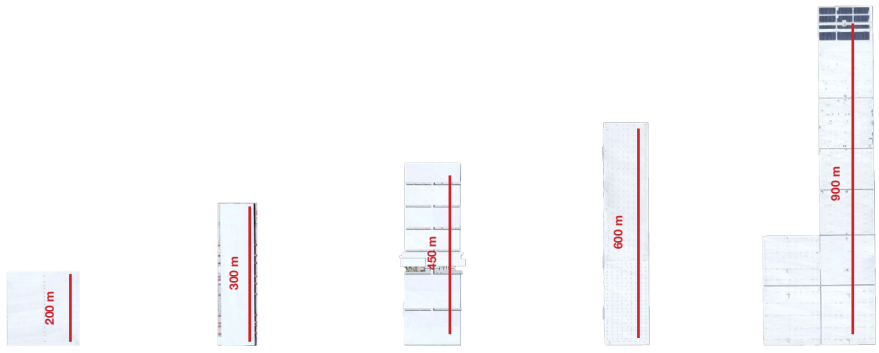
2019

Time-line

The above images illustrate the urban evolution of the actual TRIC with a initial settlement taking place already in 2004. The major one, though, is illustrated in 2009 which occurs at the same time of the rise of the smart-phone culture and what became the reason behind the rise of data consumption eventually translated in an increasing number of server farms and fulfilment centre in the years to come.

Scale

Scale comparison / Automated infrastructures



Automated infrastructures / Scale comparison

If this is the history of scale of server farms and warehouse, (the next page illustrates the history of scale of land art. Indeed, and almost inevitably, the only way to look at this phenomenon in the countryside is to look at the history of Land art as both contain similarities in the evolution of scale but also the context of intervention.

Scale

Scale comparison / Land-art

Spiral Jetty / Robert Smithson (1970)

Shift / Richard Serra (1970)

Roden Crater / James Turrell (ogoing)

City / Michael Heizer (ongoing)

Landart artworks / Scale comparison

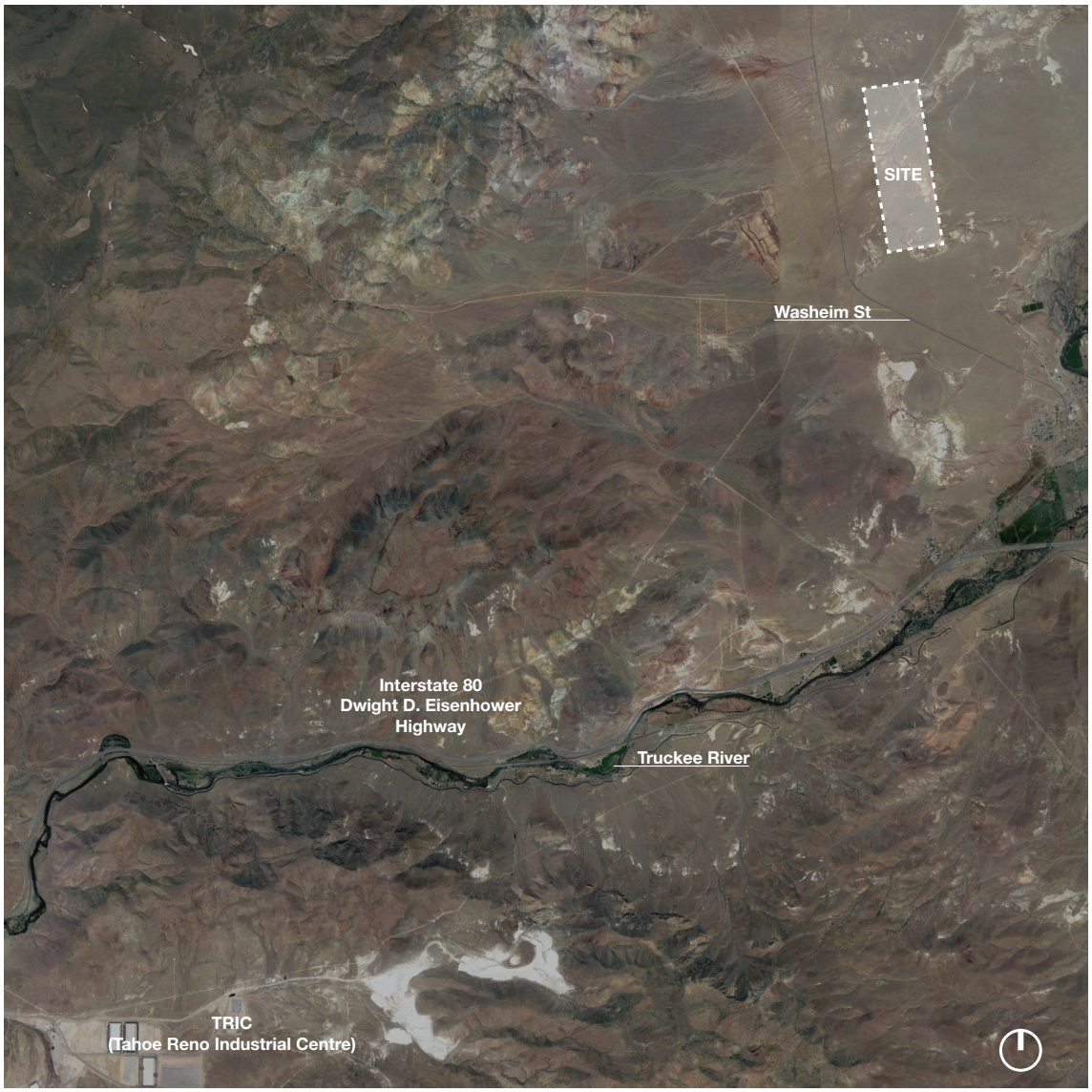
This study has not been informative just in terms of scale reference but also provides an interesting question for the design proposal. Given this similarity, can an alternative form of data centre intervene in the landscape as feature in the landscape as a landart does?

Site

39°40’20.6”N 119°19’55.0”W

Given the condition that these infrastructure increased in size as much as our data consumption over a span of almost twenty-five years , the assumption which has been made is that the next post-human building is going to be inevitably bigger.

Therefore an urban or historical context cannot welcome an entity of this scale, and the vast territories offered by the countryside of Nevada create a perfect condition to prototype a new kind of non-anthropocentric architecture. Hence, the site finds its place in the northern side of the Tahoe Reno Industrial in proximity of Washeim street and Truckee River.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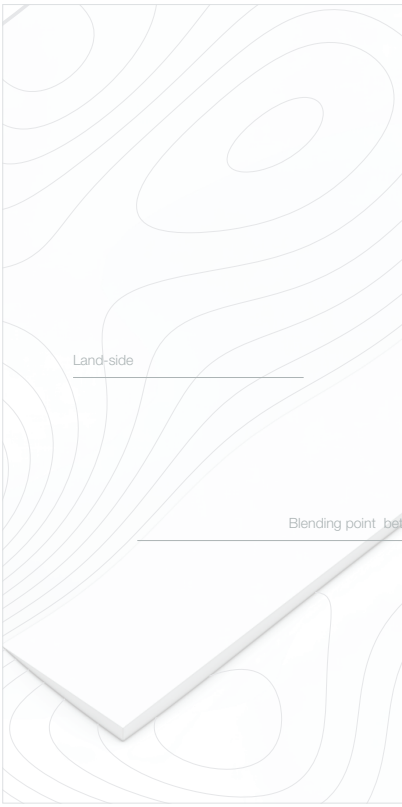
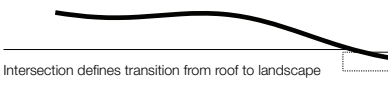
Washeim St
Interstate 80
Dwight D. Eisenhower
Highway
Truckee River
TRIC
(Tahoe Reno Industrial Centre)

Concept

Massing development



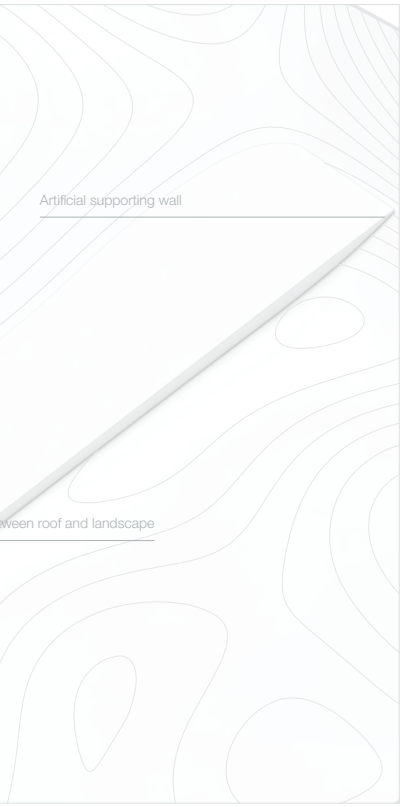
Existing depression in the landscape

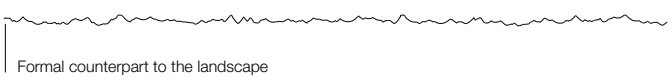


Intersection defines transition from roof to landscape

To accommodate a prototype of that scale the context of the countryside was the most appropriate one and the choice landed in a desert area in the northern side of TRIC district in proximity of Washeim street.

The existing depression in the ground sugg
scape does not impose itself but rather bec
wall at the extreme edges of the dip.



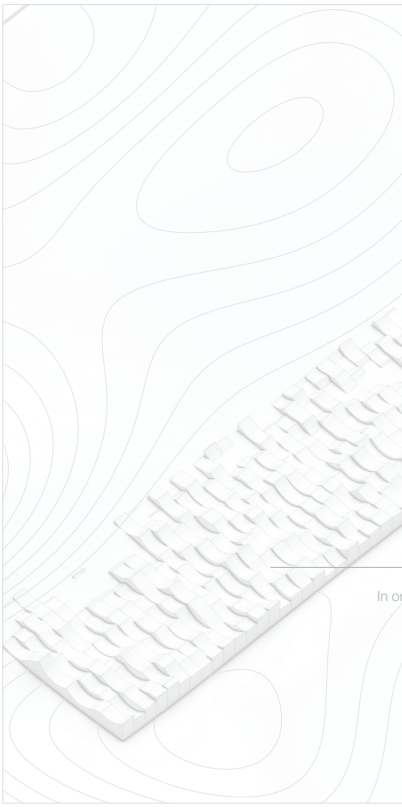


gests a building which presence in the land-comes a feature in it by acting as an artificial

With these concept baselines the design process progressed through a series of massing proposals which landed on the final design operation of manipulating the roof to create a formal counterpart to the landscape and seamless transition from the land side to the roof of the prototype.

Concept

Massing development

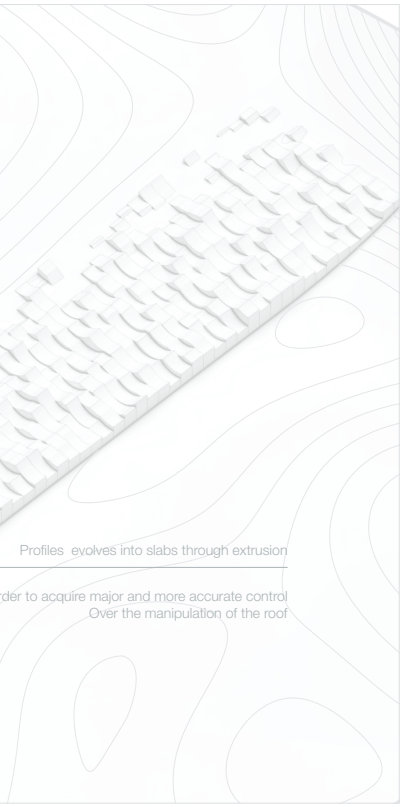


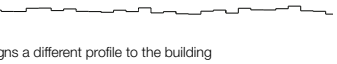
Span / 30m

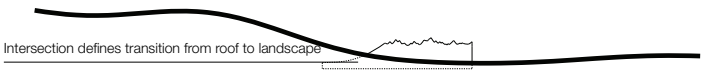
The following operation assig

The previous operation advanced by contouring the initial iteration in order to create singular profiles.

These, have been turned into slabs in order tion over the roof.





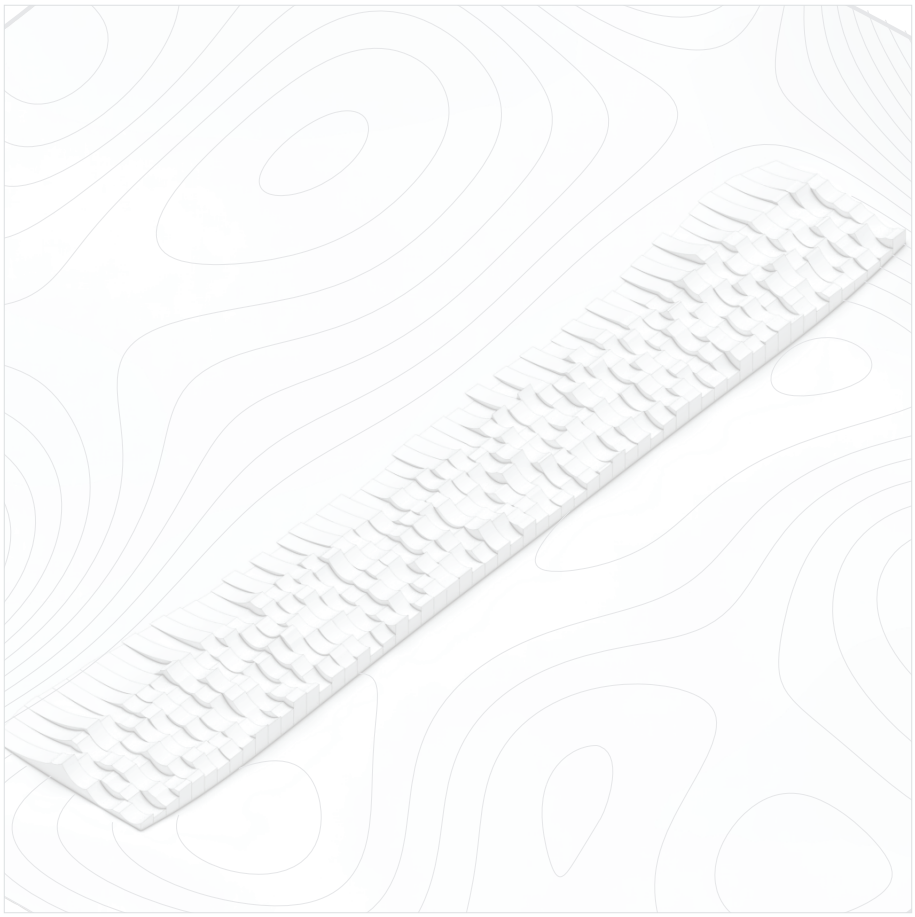


to acquire major control over the manipula-

Ultimately results in blending each roof's closest edge to the land-side in direction to the landscape establishing consequently a new relationship with it.

Concept

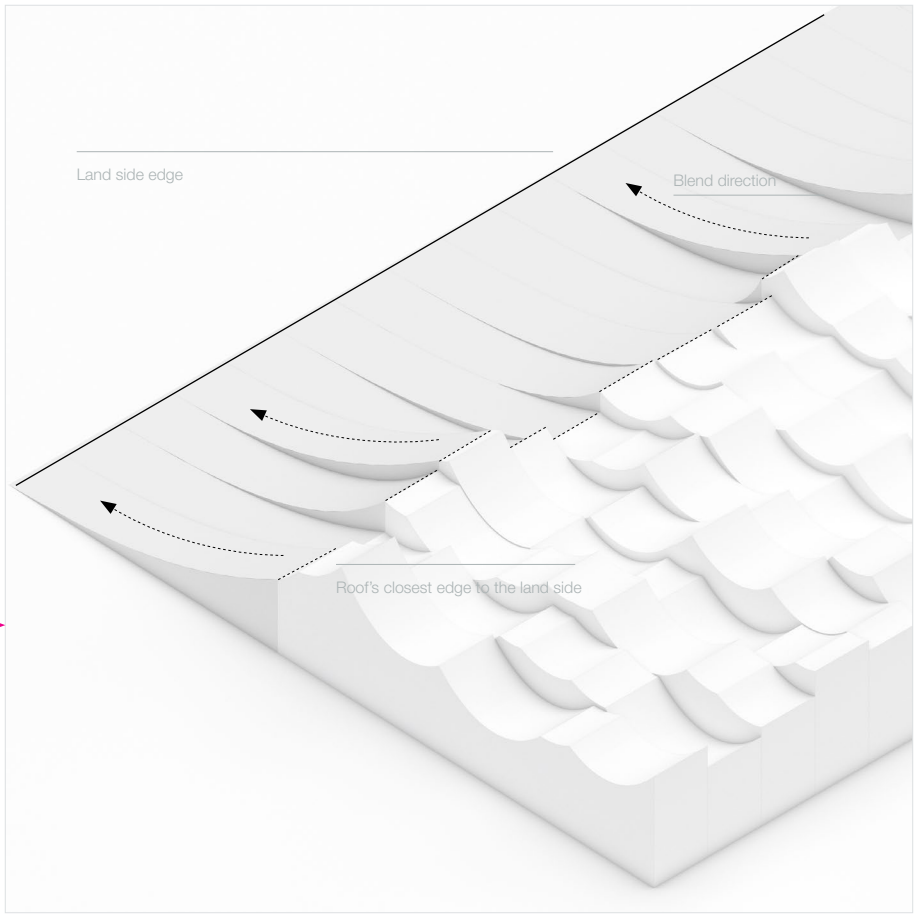
Roof landscape



Overall prototype

Conclusion

The existing depression in the ground suggests a building which exteriority does not superimpose itself in the landscape but rather becomes a feature in it, acting as an artificial support wall and which roof blends into the landscape. In the next phase, the roof landscape assumes the role of the actant which bridges the gap between man and machine by giving a peek of the physical form of our virtual world through the way the prototype sits in the landscape.



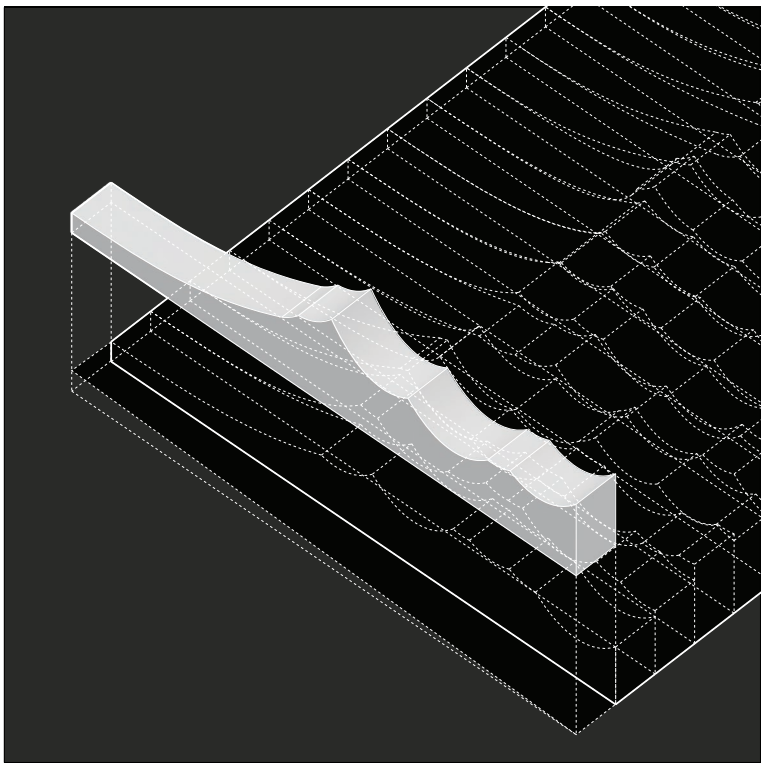
Roof landscape extraction / Close up

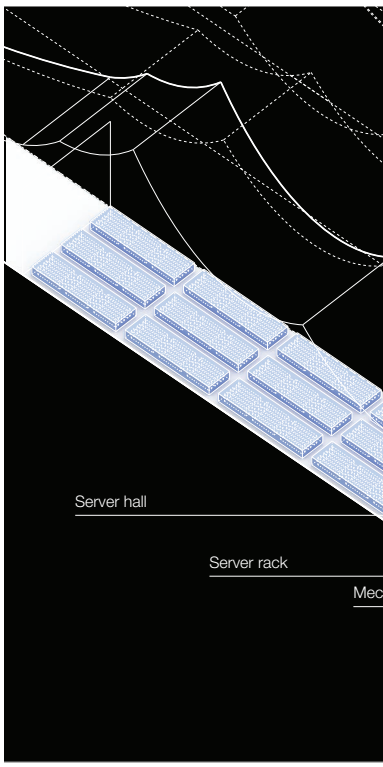
Examined chunk

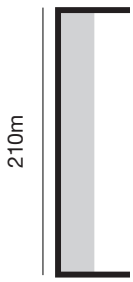
Concept

Building phase

01 Preparation







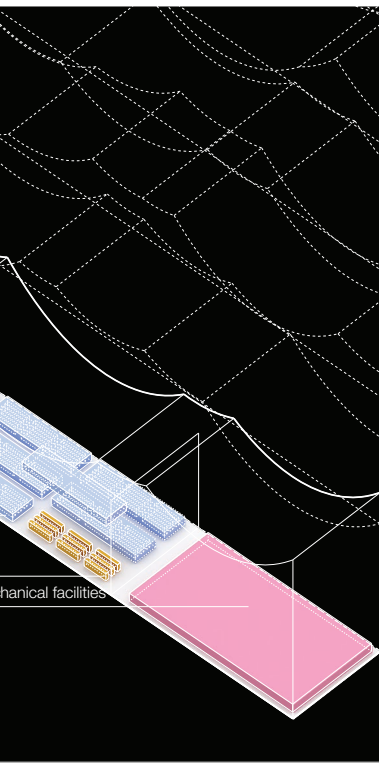
Incremental concept

The obtained prototype is an incremental concept which takes shape through three main phase and is based on independent slab units which size 210m x 30m each.

Grid activation

Each slab unit operates on the purest fo grid which imposition helps to define thos es used to allocate server hall modules necessary mechanical facilities to support

02 Infill



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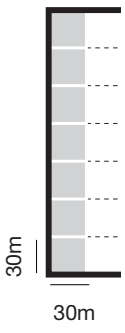
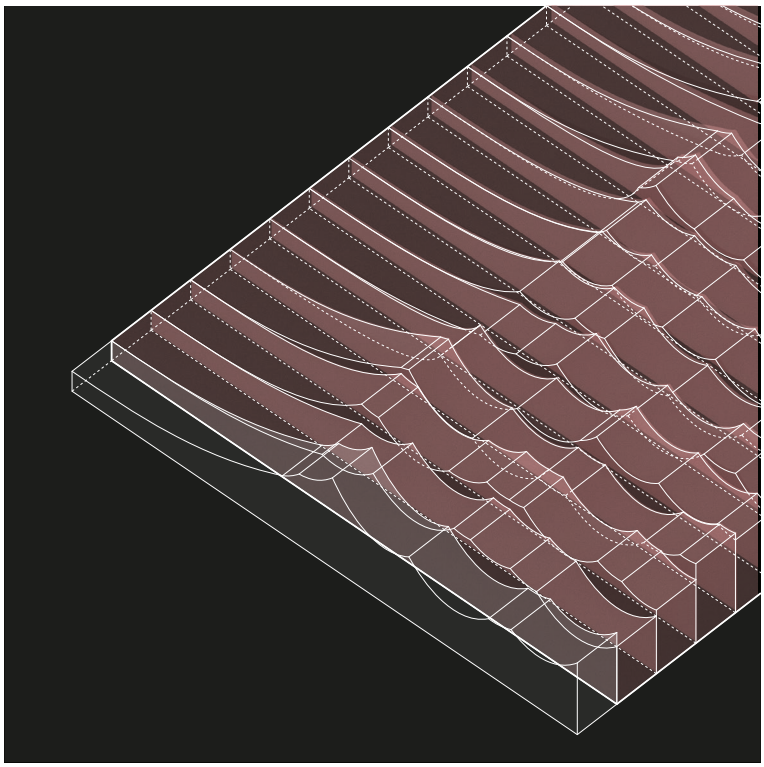
t them.

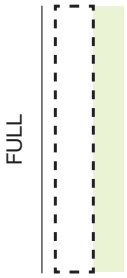


03 Expansion



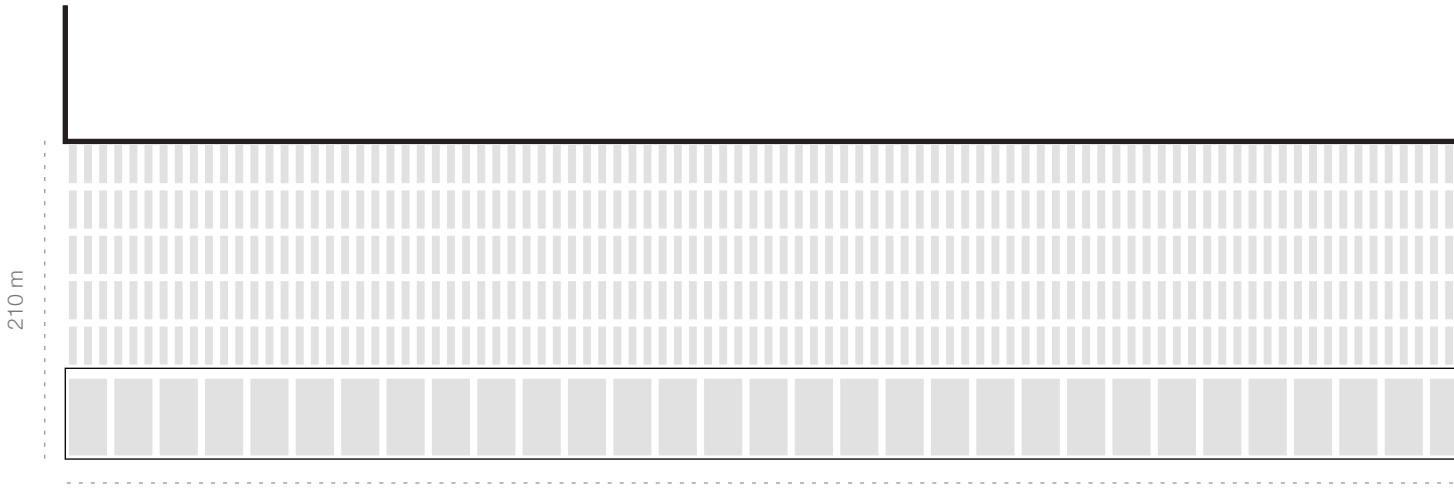
Bar code

Once the slab unit reaches full capacity the others which compose the overall prototype are added at need without a specific order of juxtaposition.



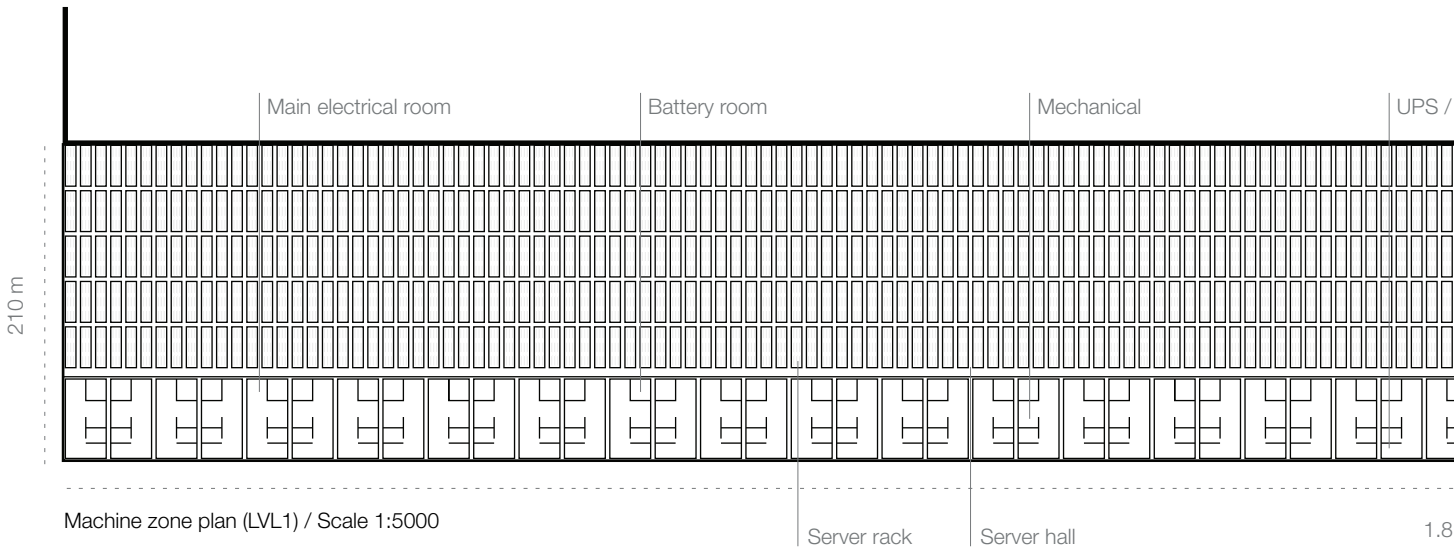
Plan

Server farm layout



Human zone plan (LVL1) / Scale 1:5000

1.8

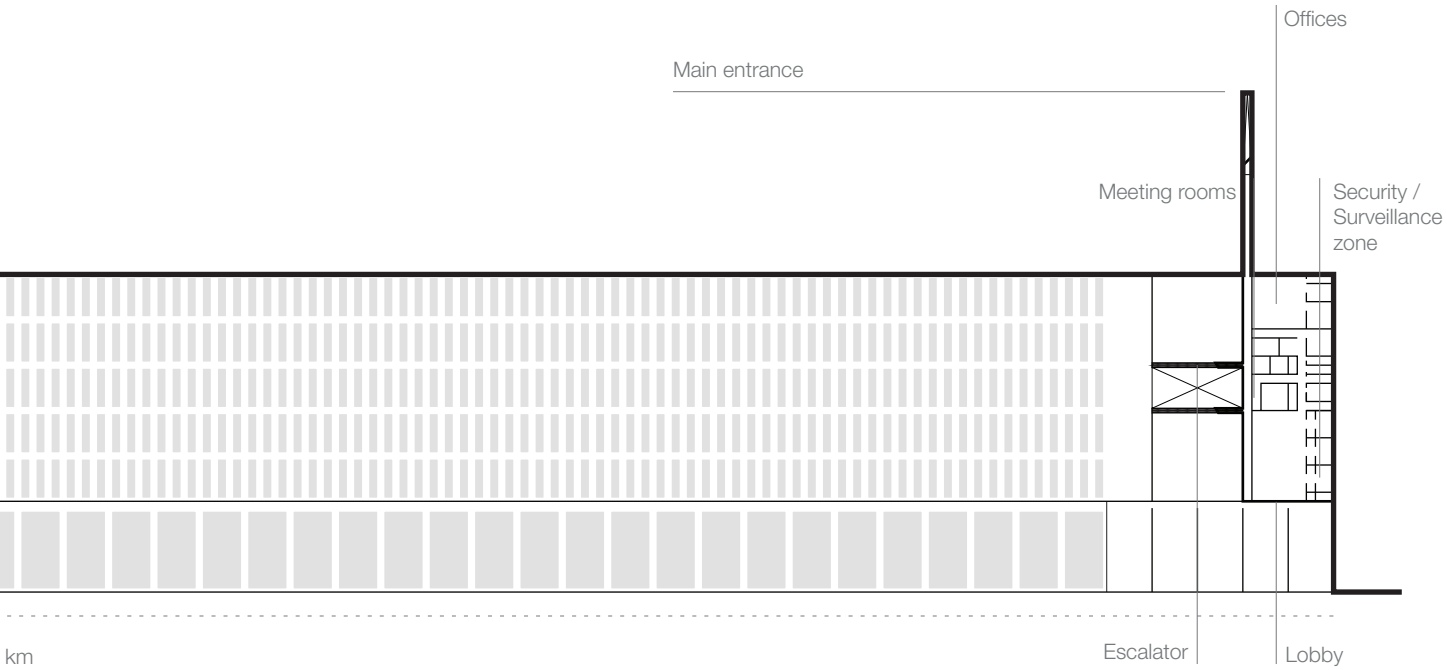


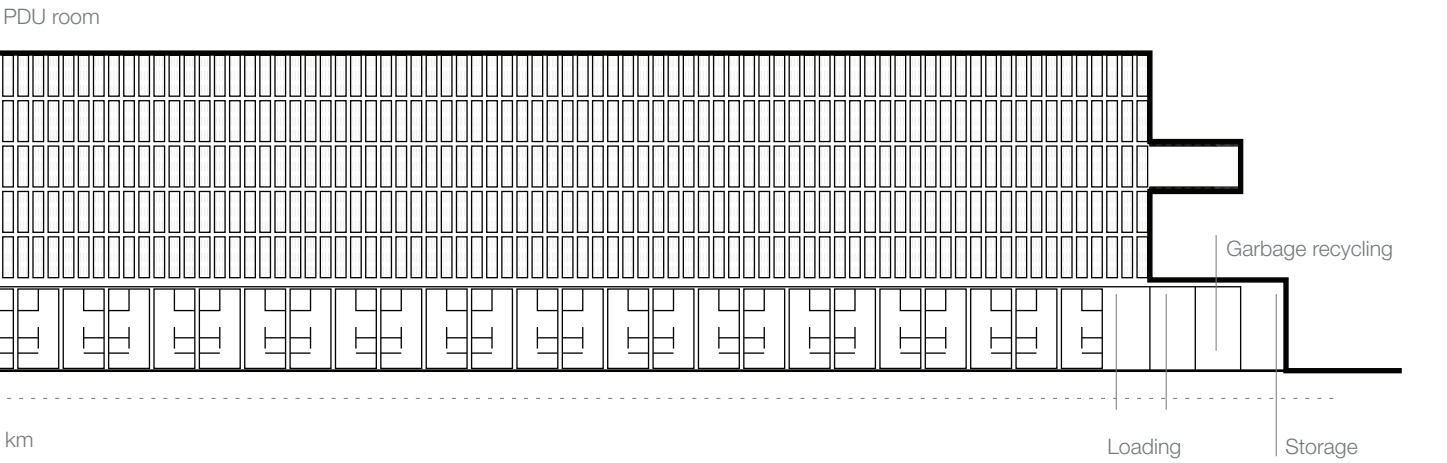
Machine zone plan (LVL1) / Scale 1:5000

1.8

Server farm / Plan

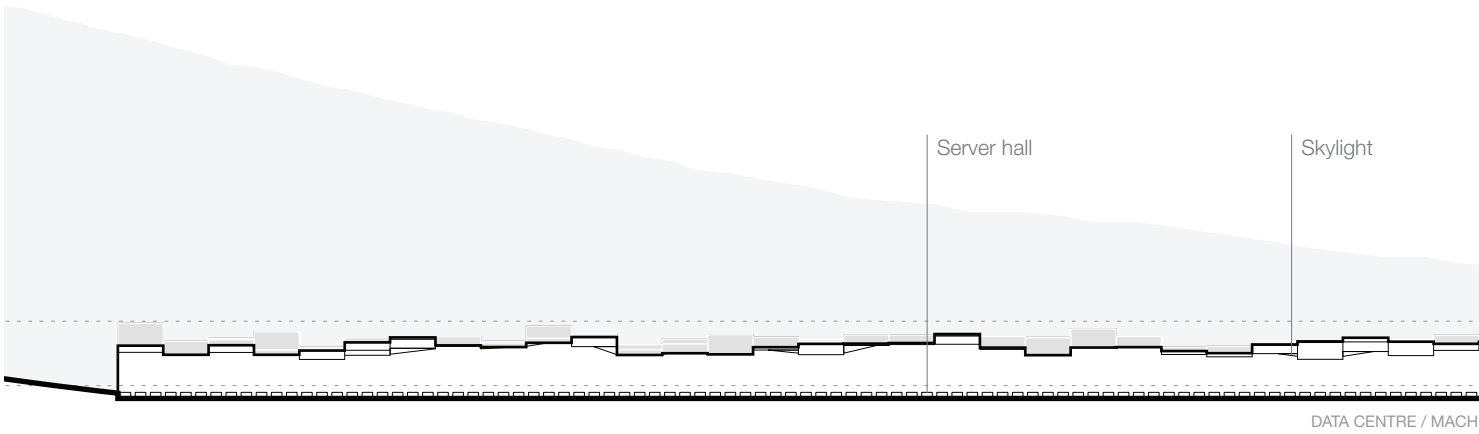
The full completion of the prototype suggest a layout where human spaces are pushed to occupy a small portion of the building's overall size – yet when looking at the spaces entirely dedicated to machines, becomes evident that humans are not entirely out of the picture as still based on human's body dimensions for occasional maintenance.


Offices
Main entrance
Meeting rooms
Security /
Surveillance
zone
km
Escalator
Lobby

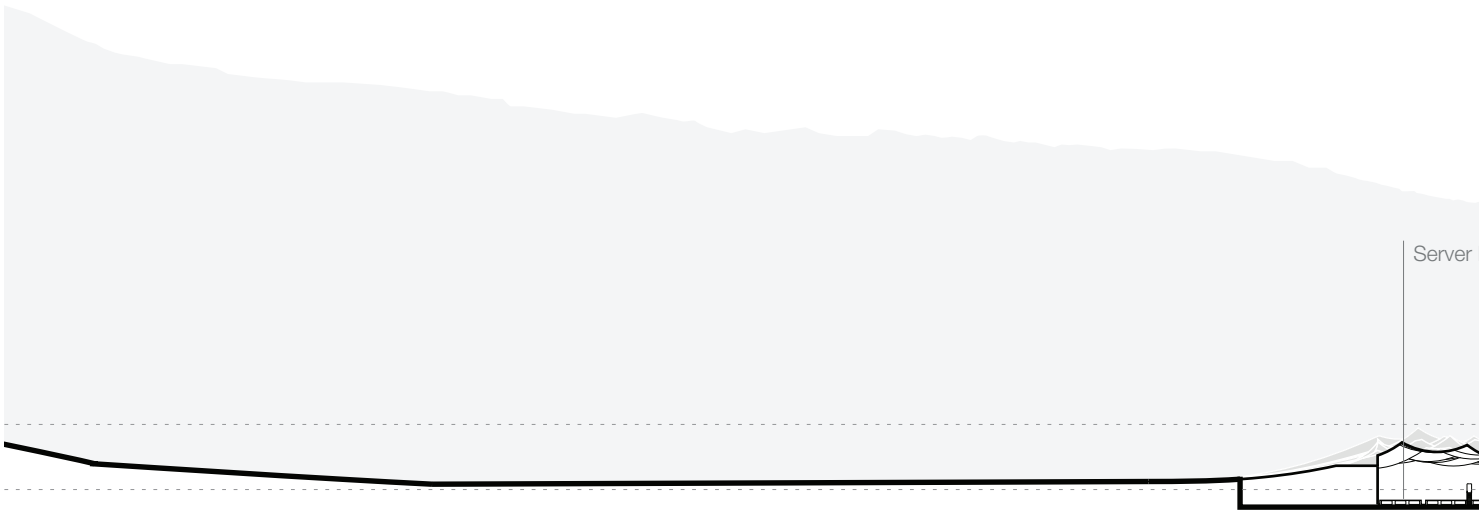

PDU room
Garbage recycling
km
Loading
Storage

Elevations

Server farm layout



Longitudinal section / Scale 1:5000



Cross section / Scale 1:5000

Server farm / Elevation

The section instead, aim to showcase not only the relationship of the server farm with the landscape but also the architecture qualities which emerge from previous operations such as the vaults and the relationship between machinery and architecture.

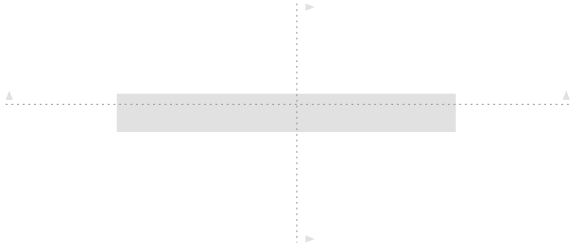
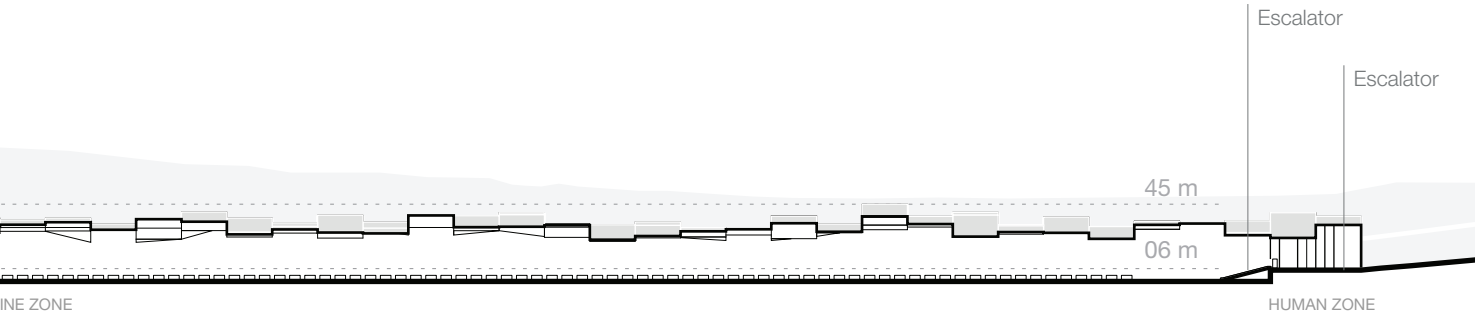
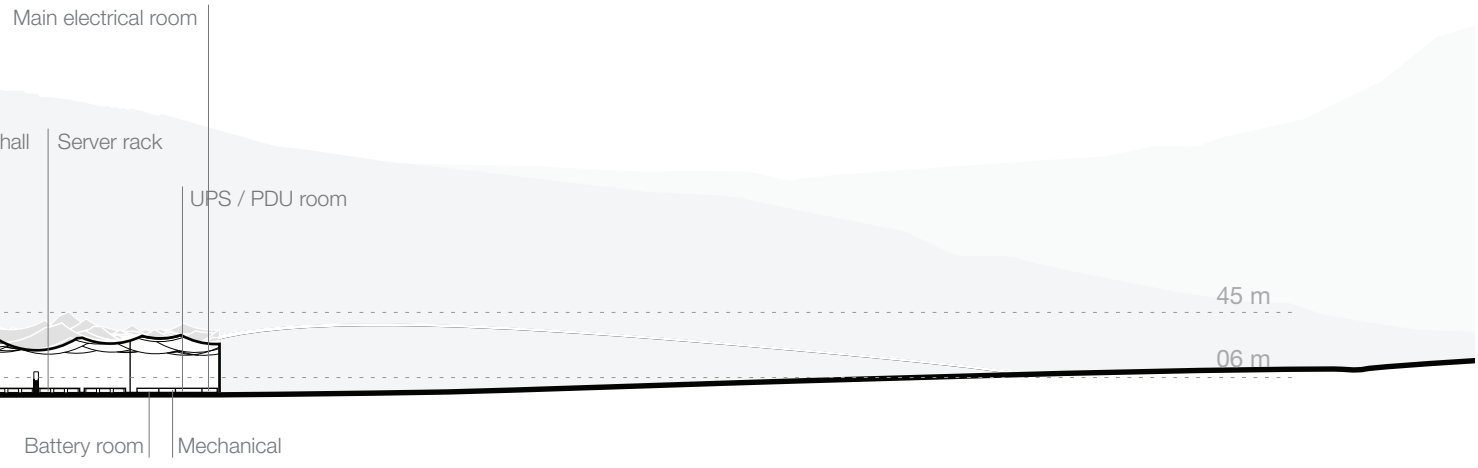


Diagram section location





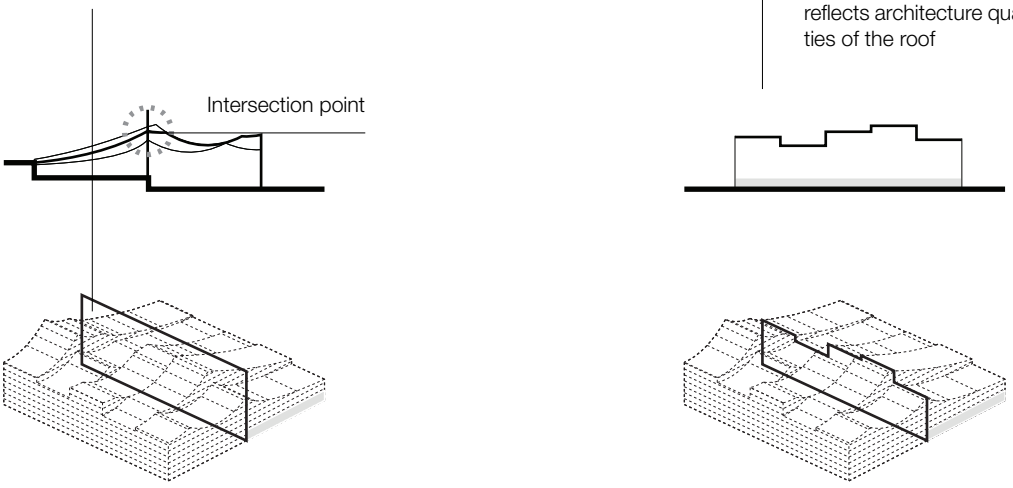
Observation windows

Extraction process

The boundary of the building is extruded in height to meet the roof

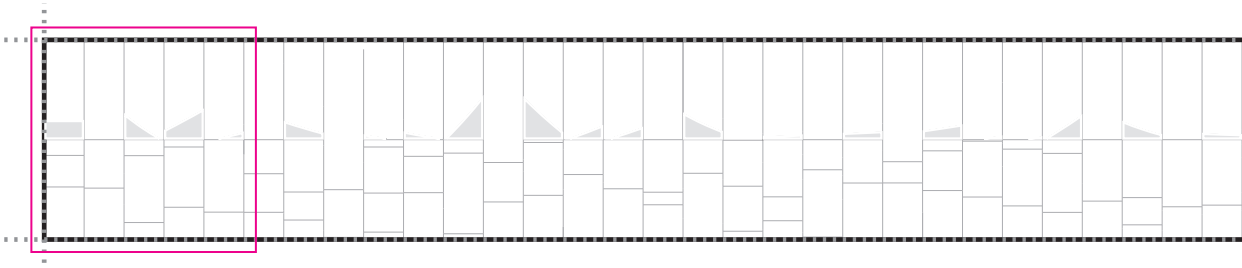
Intersection point

The meeting point defines a specific profile which reflects architecture qualities of the roof



Examined chunk

The observation windows take shape at the intersection between the wall – which marks the boundary of the data centre – and the landscape roof. Through an operation of double intersection, the spaces generated come as a cavity in the roof landscape as a result of the already existing architecture qualities rather than an arbitrary imposition.



Building plan - observation windows location / Scale 1:5000

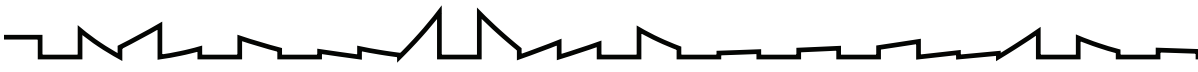
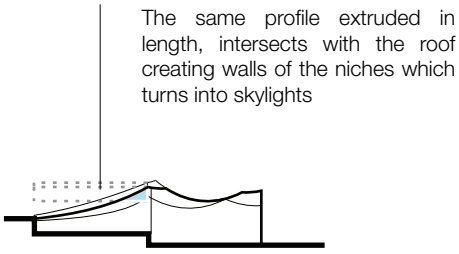
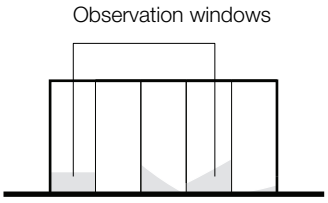
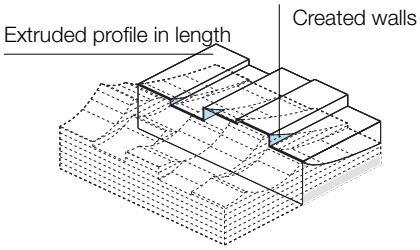


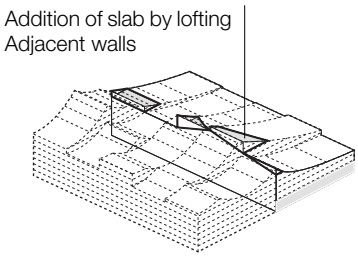
Diagram observation windows' arrangement / Scale 1:5000

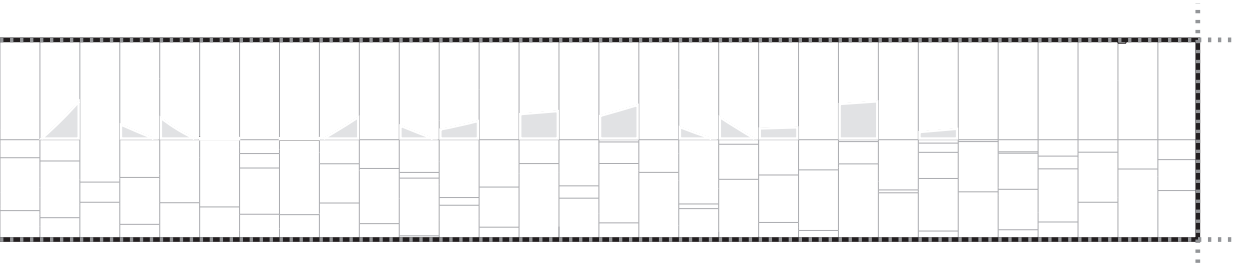
The observation windows are distributed along the entire building but the human zone, allowing the occasional visitor not only to get the view of the interior of the server farm but also to experience the "horizontalness" of the building. The niche created through extraction, provides a sheltered space for the occasional visitor, protected from atmospheric agents can experience the complex systems which support the virtual world.


The same profile extruded in length, intersects with the roof creating walls of the niches which turns into skylights


Observation windows

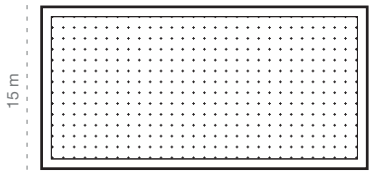

Extruded profile in length
Created walls


Addition of slab by lofting
Adjacent walls

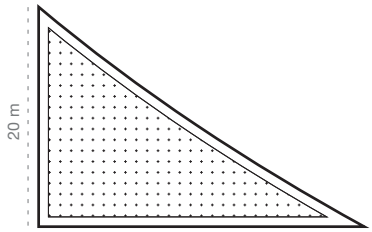


Observation windows

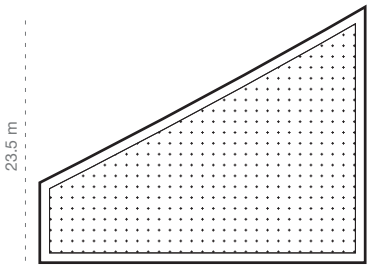
Catalogue 1



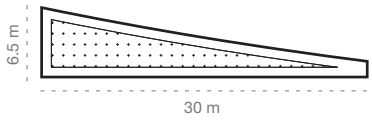
OW 01



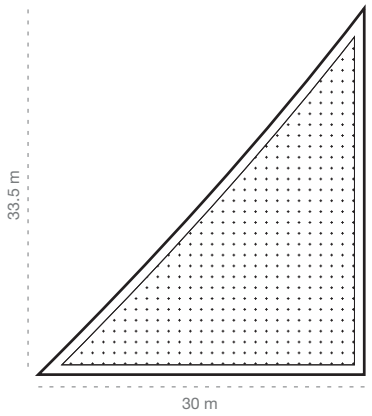
OW 02



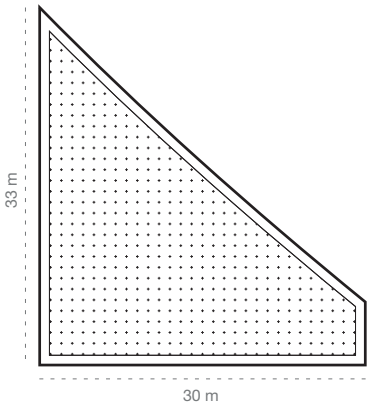
OW 03



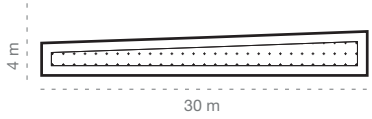
OW 07



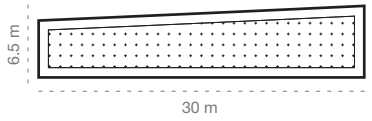
OW 08



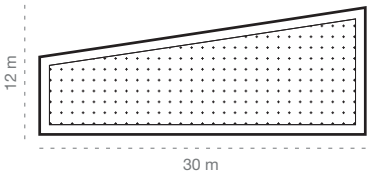
OW 09



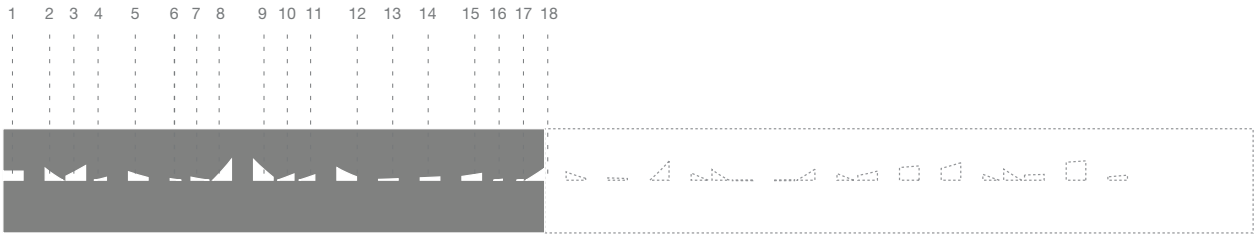
OW 13



OW 14

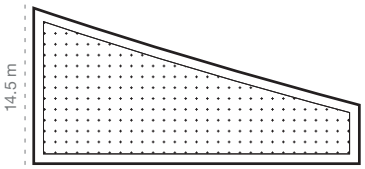


OW 15

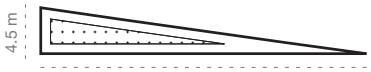


Plan diagram / Observation windows location

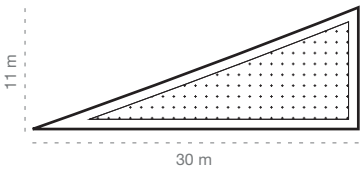
OW 04



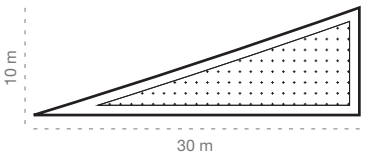
OW 05



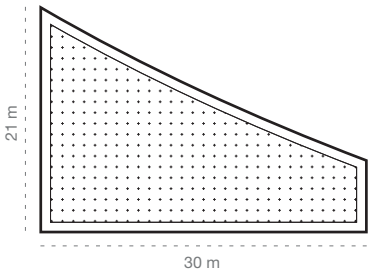
OW 06



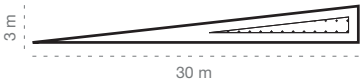
OW 10



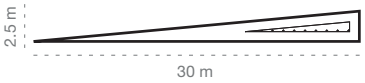
OW 11



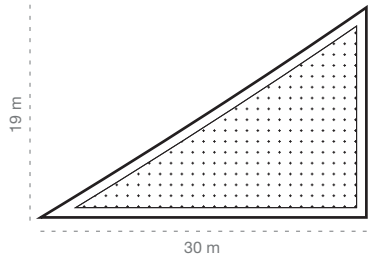
OW 12



OW 16



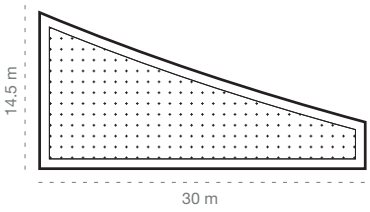
OW 17



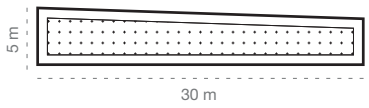
OW 18

Observation windows

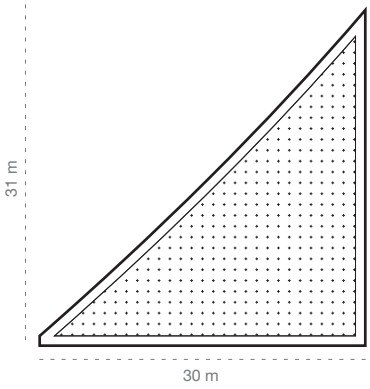
Catalogue 2



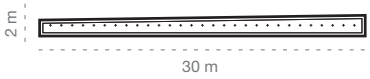
OW 19



OW 20



OW 21



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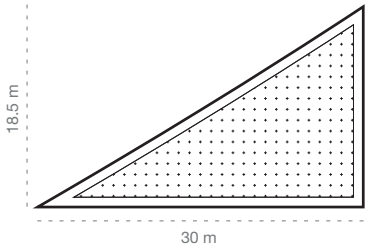

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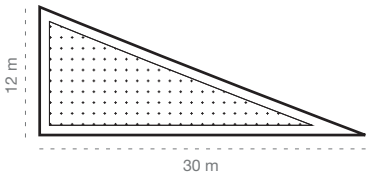

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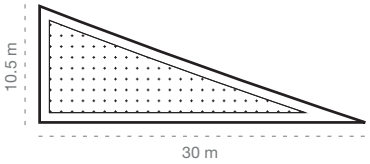

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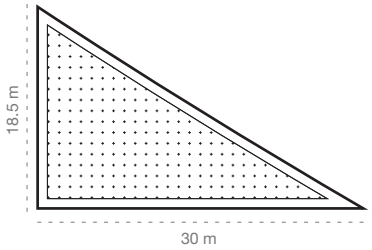

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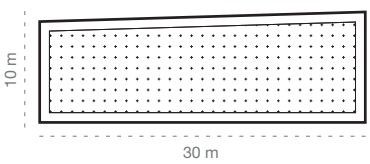

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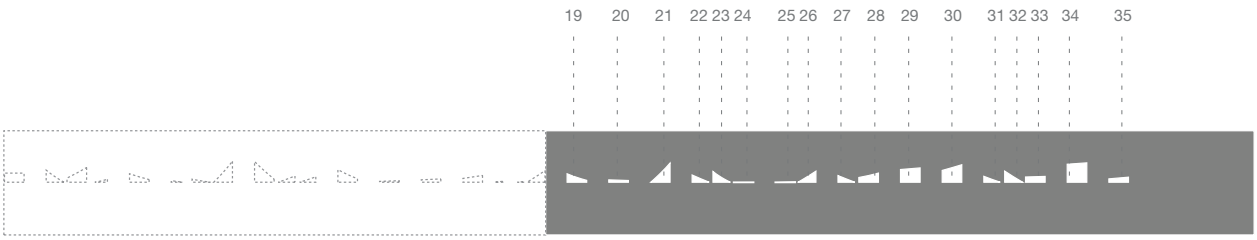
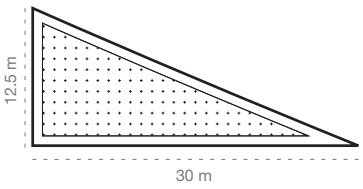


Plan diagram / Observation windows location



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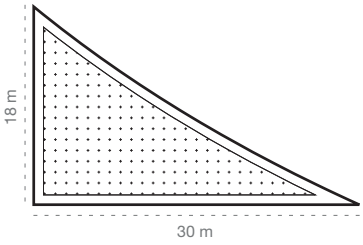

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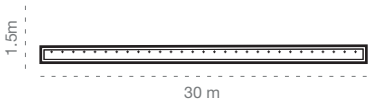

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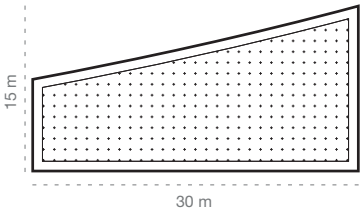

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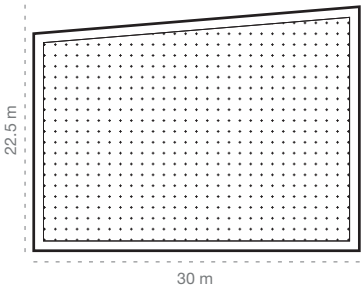

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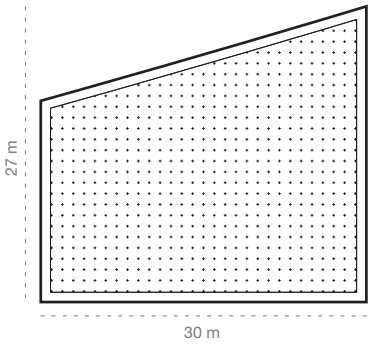

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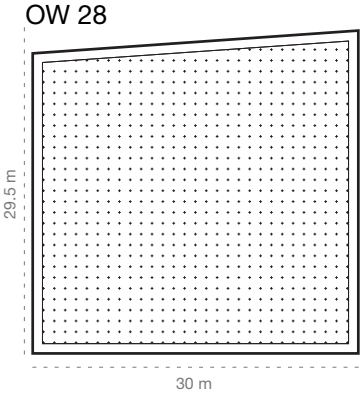

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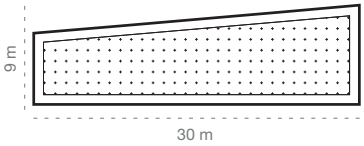
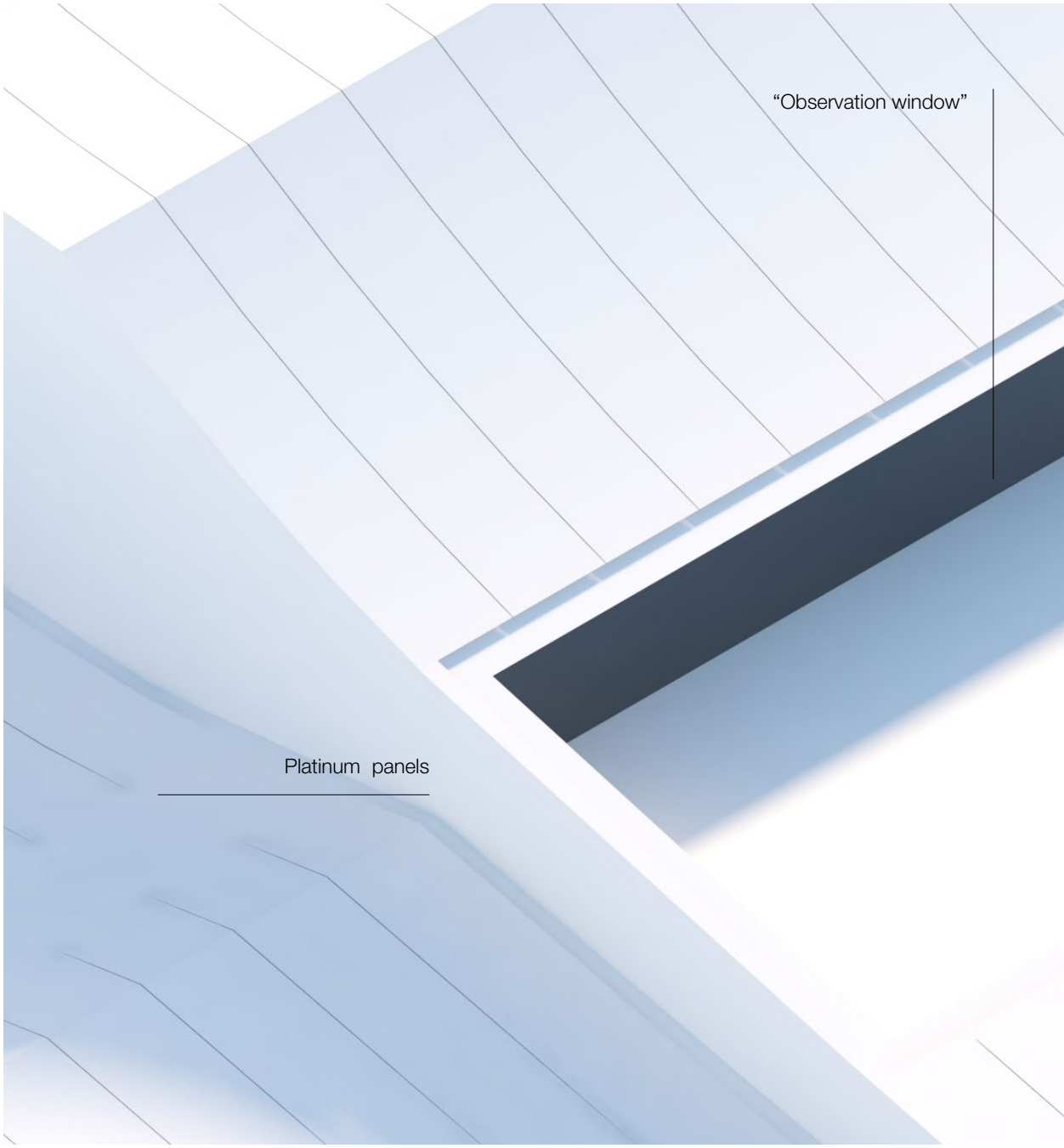


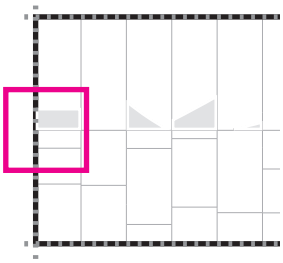
OW 35

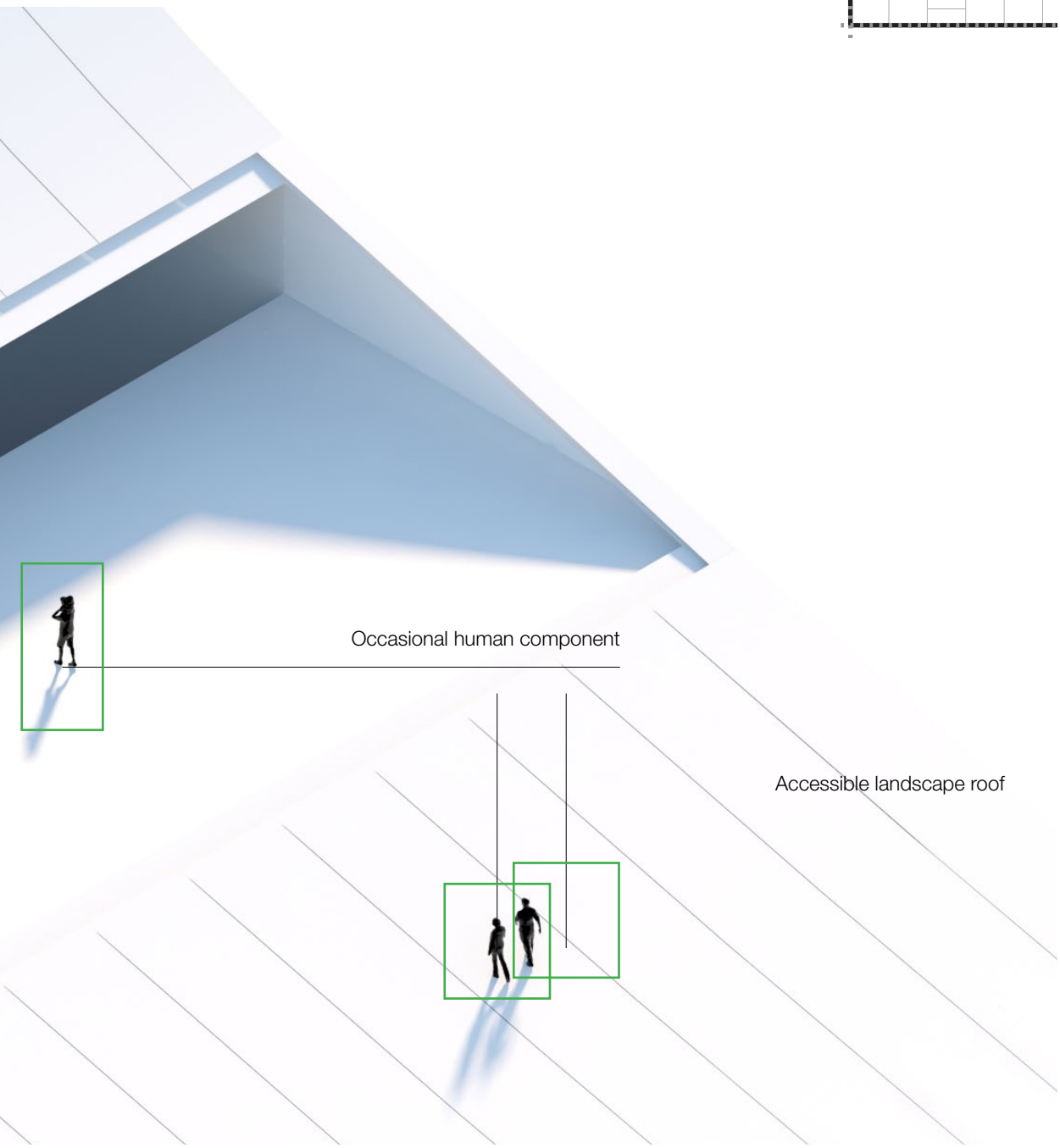
Observation windows

Close up / Observation window 1



The sense of curiosity the observation windows elicit in the occasional visitor, through the way they are caved in the building, induces it to undertake a journey towards the closest observation window bridged by the landscape roof which retreats there where the cavity starts, as it opens as a sheltered free space. A cavity which accommodates the occasional visitor and allows the view of the interior through the transparent glass...




Occasional human component
Accessible landscape roof

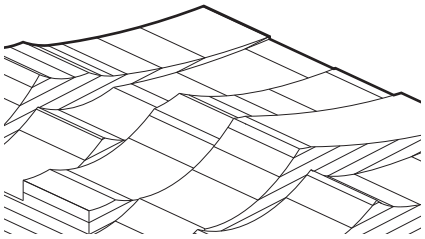
Observation windows

Perspective view / Observation window 1

...Which ultimately delivers to the human component the experience of getting a peek of the components within the server farm. An operation which bridges, even if visually, the gap between man and machine.

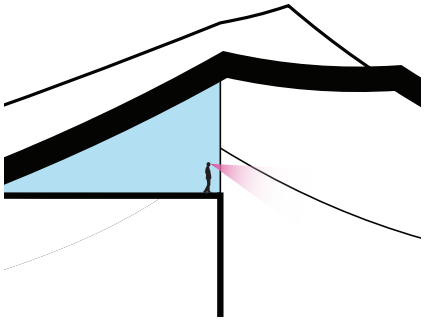
Permanence and materiality

Prototype architecture qualities

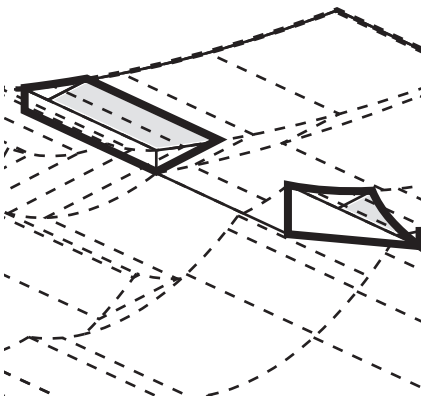


Landscape roof

Vault system



Visual connection



Observation windows

Permanence and materiality
Featureless architecture

E-shelter data centre, Frankfurt

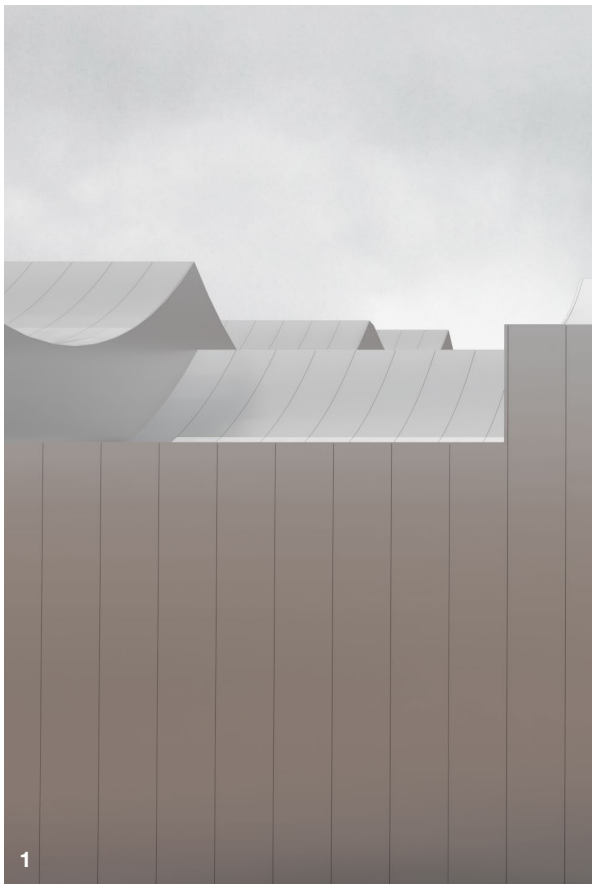
RIIG data centre, China

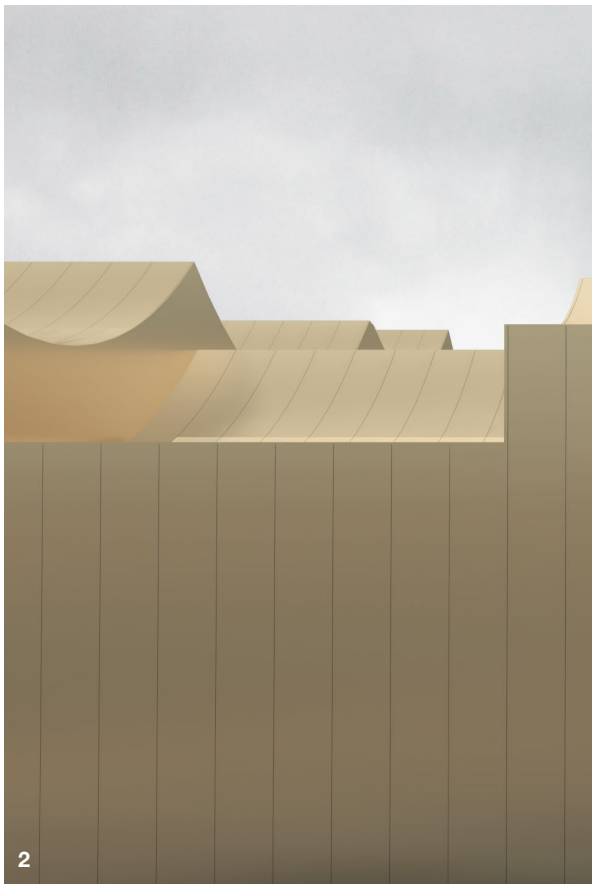
Permanence over temporality

This ultimate act of design (visual link between human and machine component) is part of those architecture qualities (Landscpe roof, Vault system, Observation windows, Visual link) that emerged throughout the design process which are meant to transcend the condition exposed by the already existing server farms: Declare their unimportance by being deliberately undesigned, to look less provocative in their appearance which is strictly related to their temporality as most of times servers can be relocated and the data centre disassembled and forgotten. In contrary the prototype deliberately suggests qualities of an architecture which celebrates its presence in the landscape and the value of its content by embracing instead permanence over temporality, referred to the ability of a building to endure based on its material strength, defying time's events and deteriorating effects.

Materiality

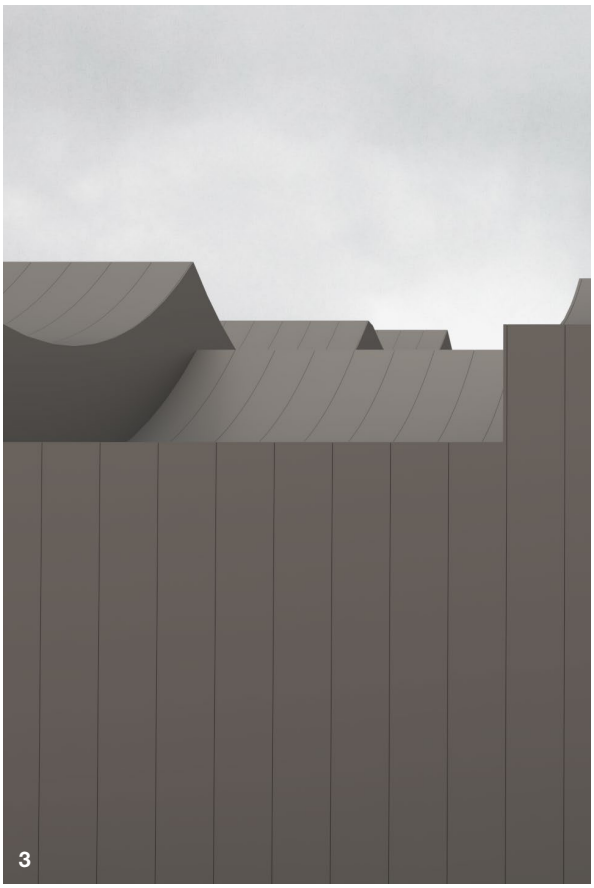
Material studies

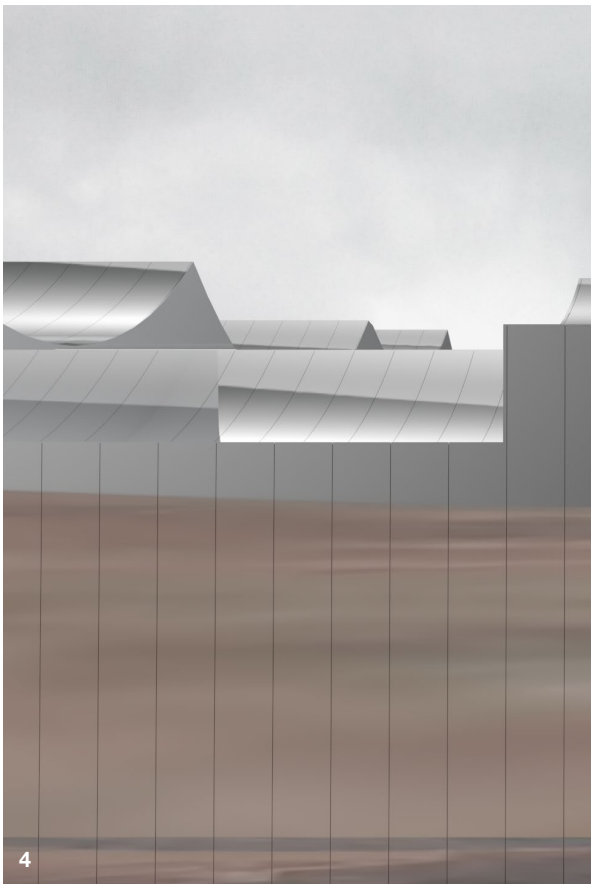

1


2

Material

This assumption makes it easier the choice in terms of materiality which represents at best the qualities of the prototype. In contrary to the cheap prefabricated concrete panels and several studies, is suggested to use a brushed platinum cladding system (1) for its ductility (ideal due the curved roof) and the effect which creates by reflecting a blurred image of the surrounding landscape which can change depending on the available source of light during the day.

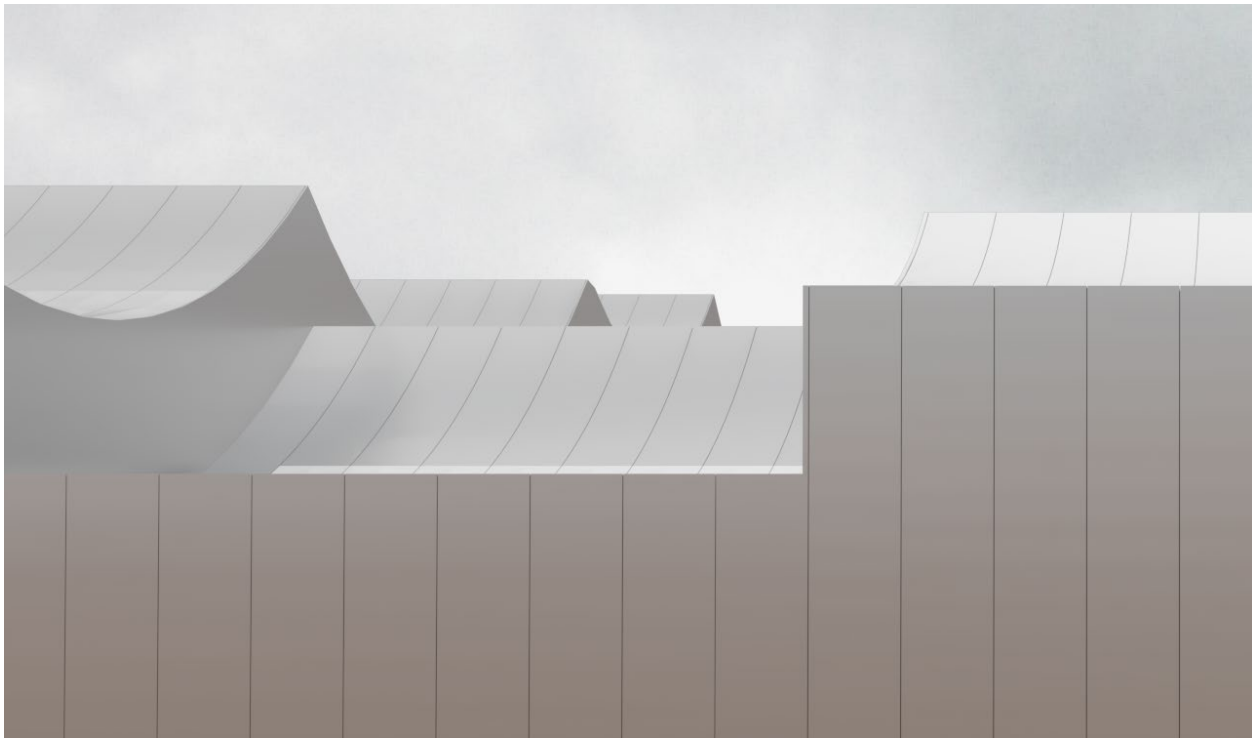


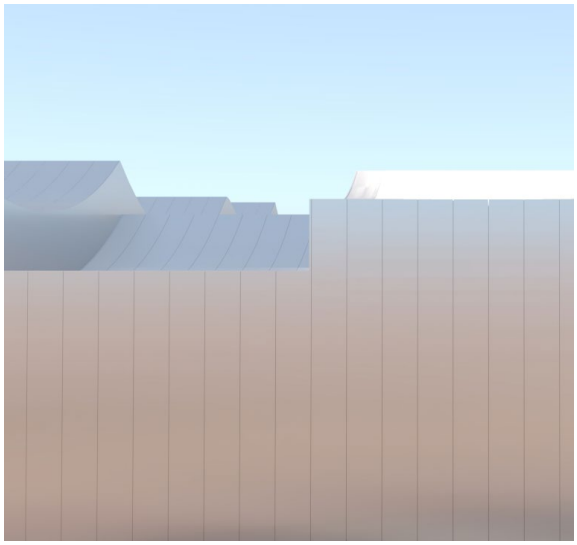


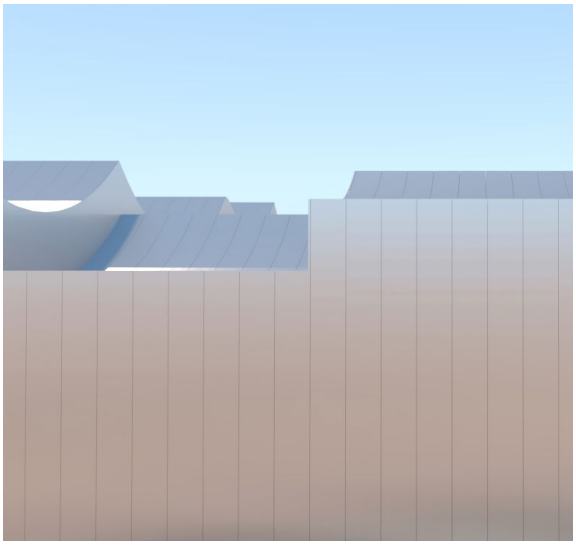
Brushed platinum 5cm (1); Gold brushed platinum (2);
Black matte platinum (3); Polished platinum (4)

Material

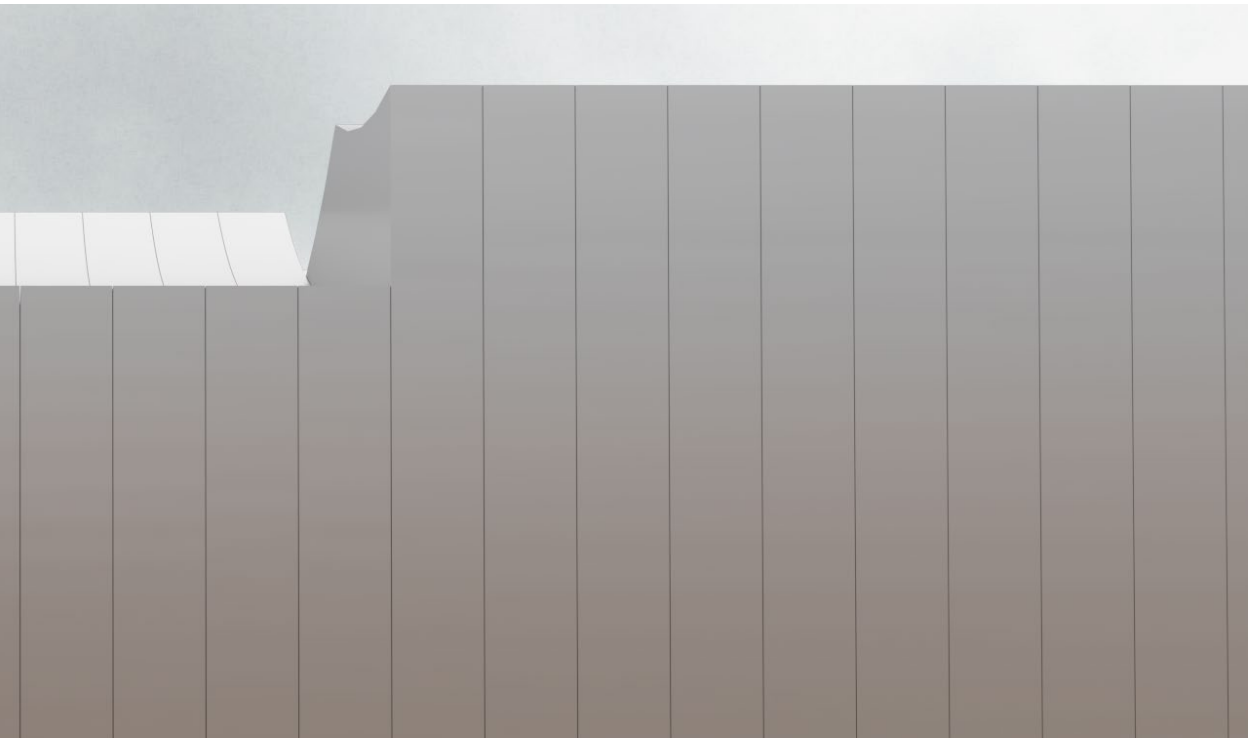
Daylight effect study

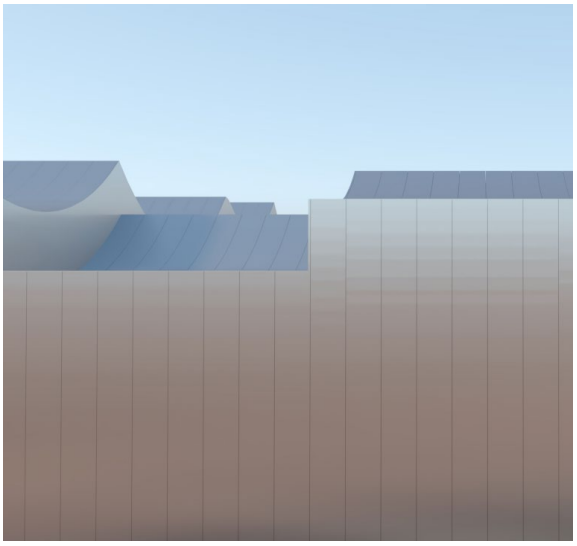


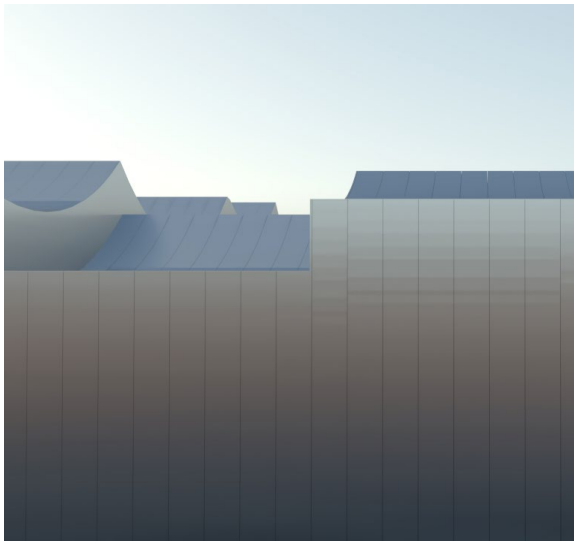




Views illustrating the change of appearance of the building throughout the day and the responsiveness of the material according to the available light.

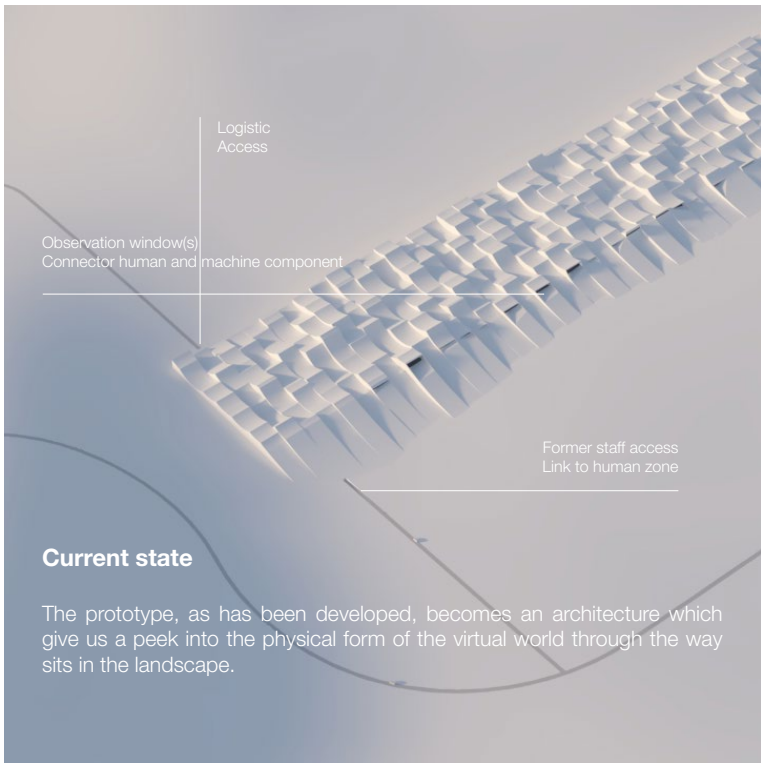


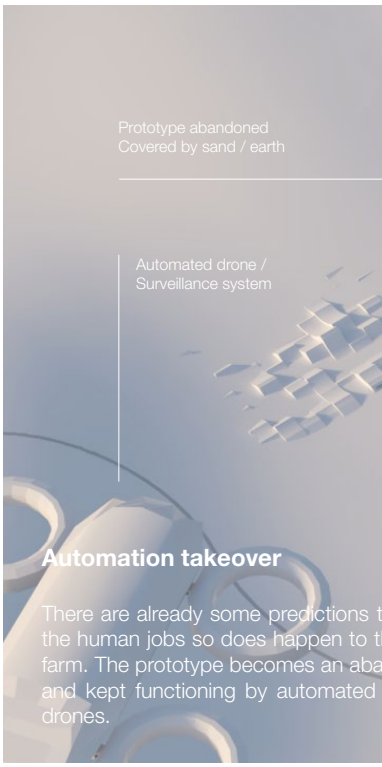




Permanence
Time-line

(Alternative) Present **203**





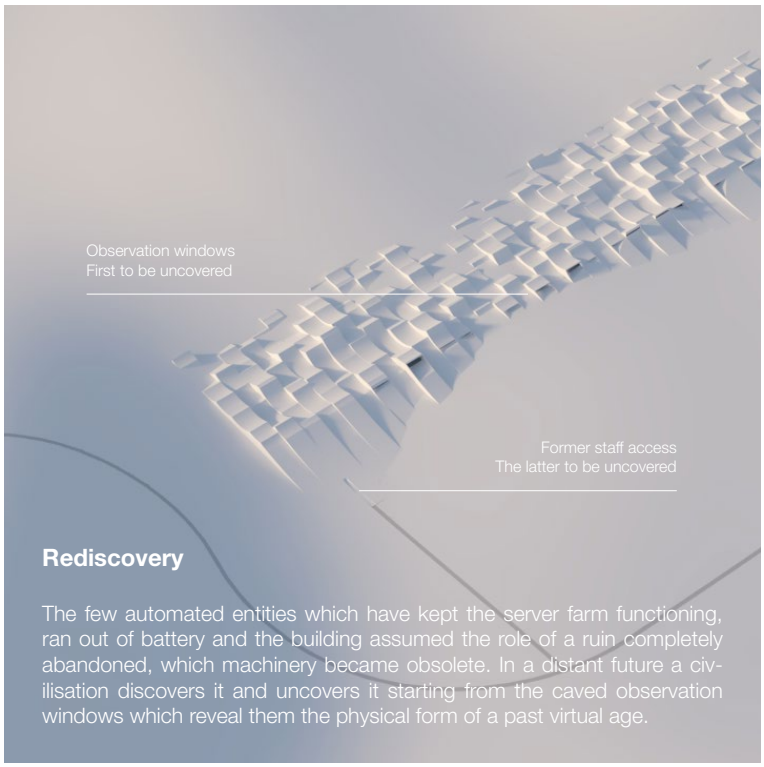
Permanence, defied events and time

The events that the proposed prototype defies, are strictly linked to the topic and are projection into the future. These fictional scenarios are meant to demonstrate, not only the building's ability to endure time's deteriorating effects, but also how time preserves if not strengthens its position as an integrated feature in the landscape due to its geological scale. Scale is not flaw anymore but rather an asset.

30 / Automation takeover

hat automation will takeover most of
hose few ones available at the server
ndoned artefact in the landscape run
entities and constantly surveilled by

Far future / Rediscovery



Rediscovery

The few automated entities which have kept the server farm functioning, ran out of battery and the building assumed the role of a ruin completely abandoned, which machinery became obsolete. In a distant future a civilisation discovers it and uncovers it starting from the caved observation windows which reveal them the physical form of a past virtual age.

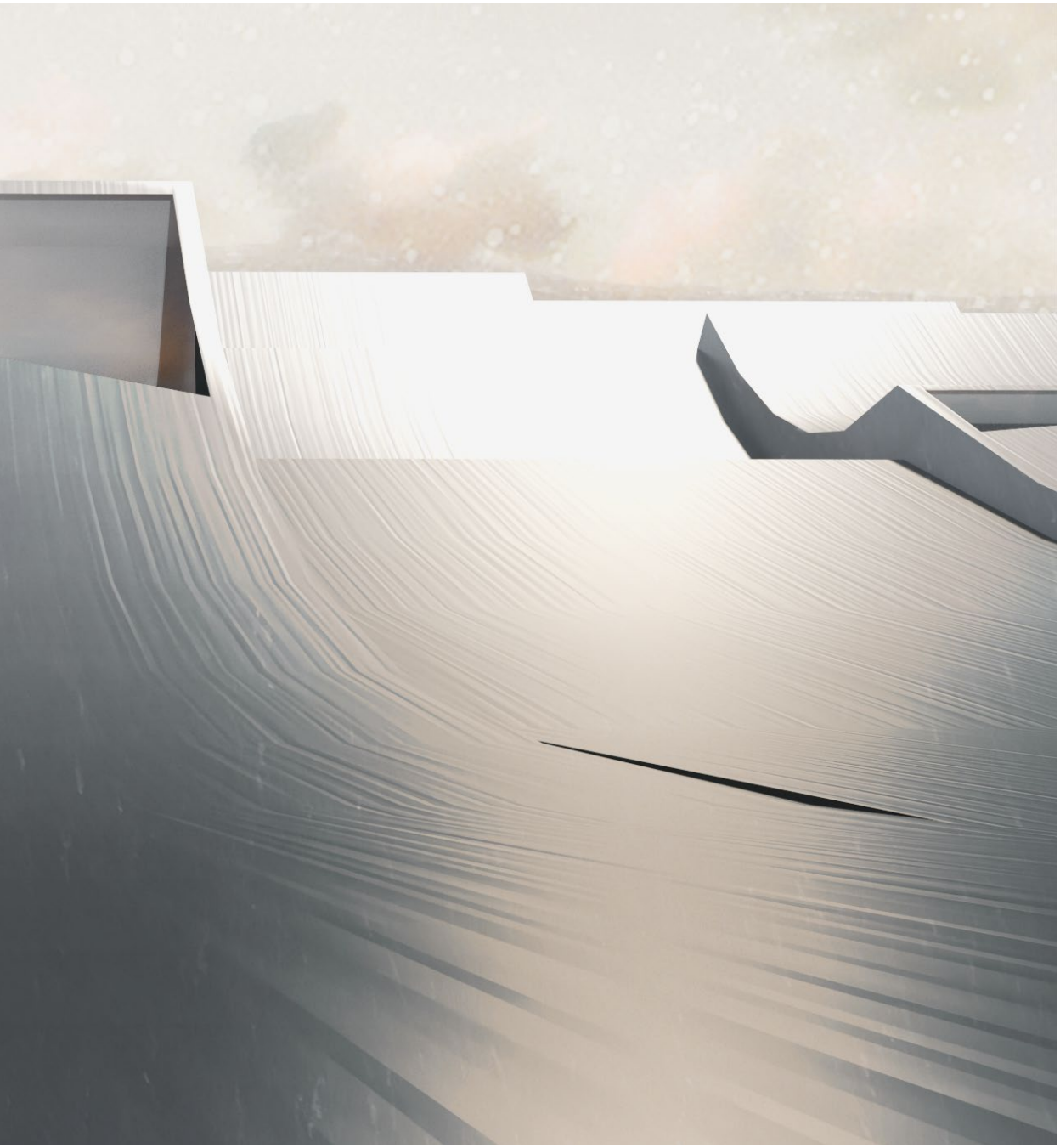
Permanence
Rediscovery / exterior

Unintentional monument

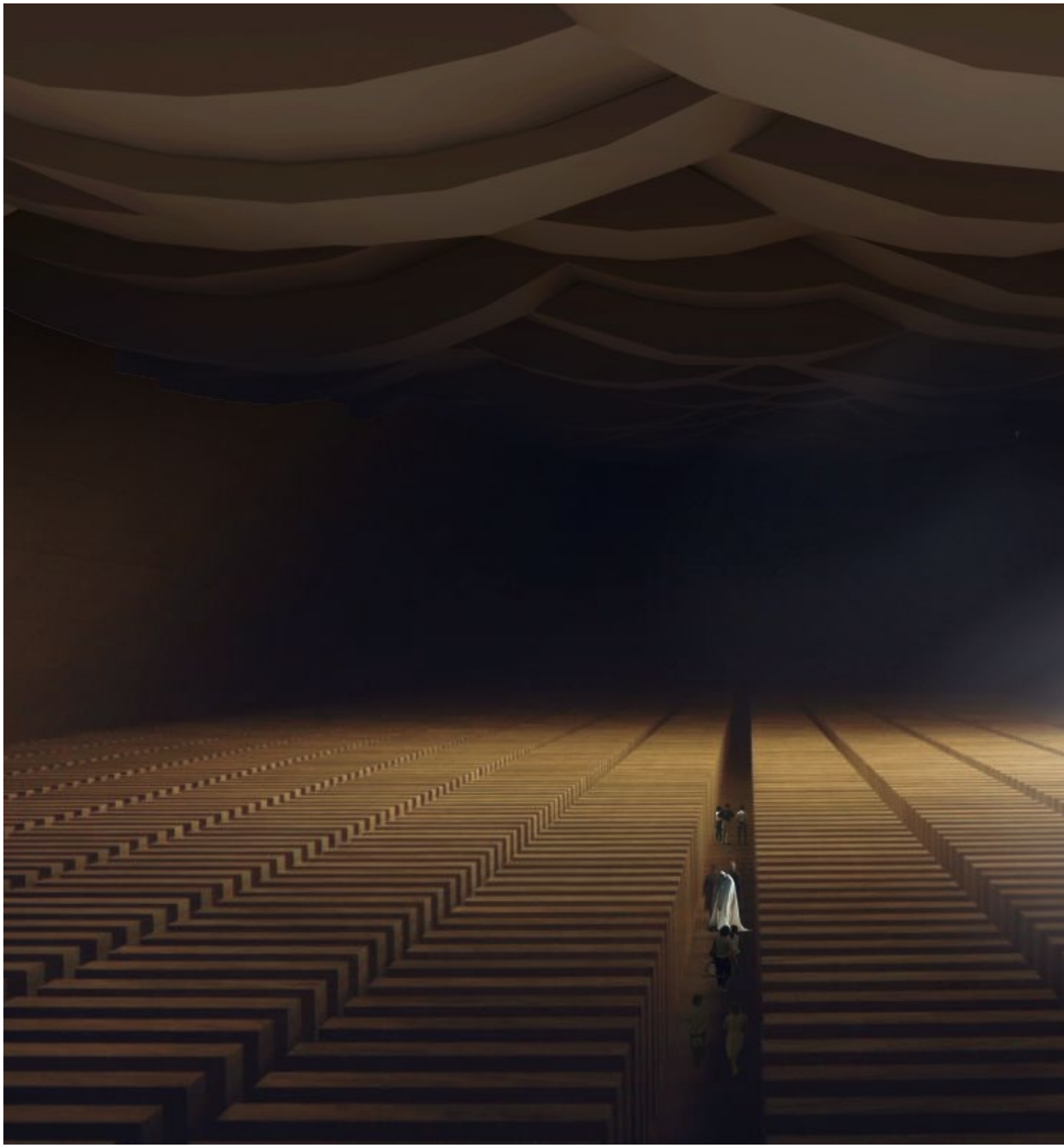
To borrow from Riegl, age and the course of events become the sign which define the object as a monument for assuming an irreplaceable value for future civilisations, not only for being this highly symbolic component in the landscape but also for the different kind of experience that the building delivers to the human component...

Permanence

Rediscovery / exterior



Permanence
Accessibility (visit)



Unintentional monument

... Indeed, the only thing to do not defy time is its inaccessibility, becoming a site of pilgrimage and a public territory that just then owe us access.

Case Studies

Deliberate aesthetic

Continuous Monument

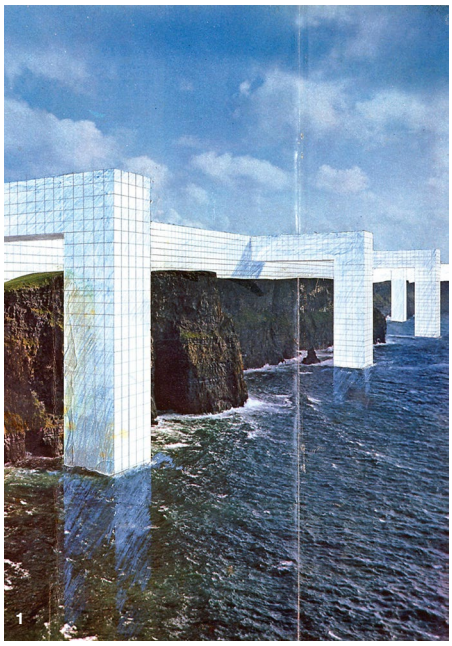
Continuous Monument is photo-collages series imagined by the radical collective Superstudio in the late 60s and conceived as a form of total urbanisation shaped like a three-dimensional white grid expanding across the Earth's surface by reducing it to a singular and infrastructural landscape. Continuous Monument is also a form of criticism towards the scientific method conceived within the realm of architecture which aims to deliver a standardised model suitable to every context and reducible to an entity of absolute neutrality.

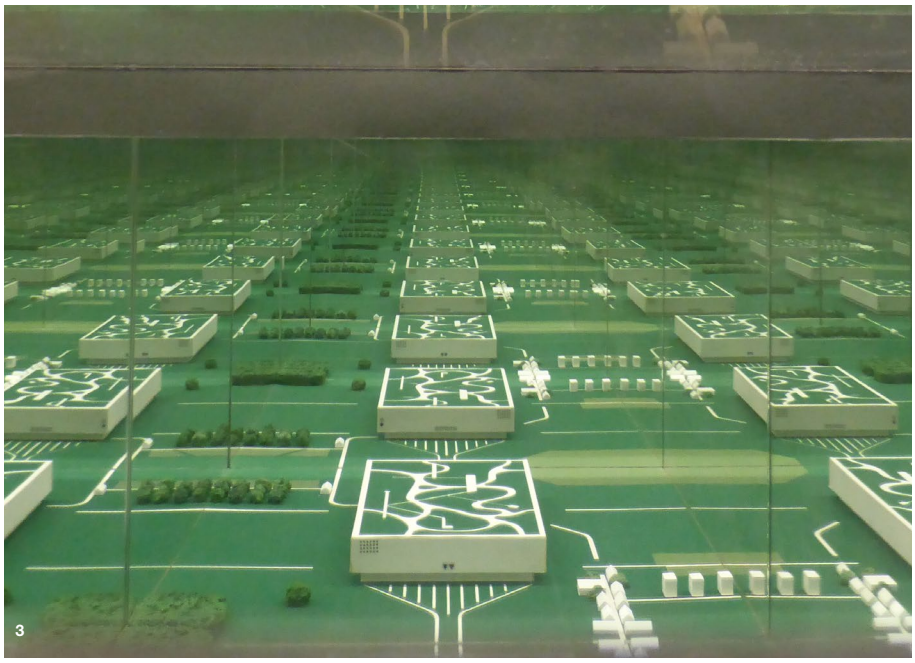
Despite the similarities with the contemporary data centres, with their efficiency-driven aesthetic, neutral and anonymous to the point to estrange themselves from the context they inhabit, the anonymous mega structures imagined by Superstudio creates their relation with the landscape depending on where they manifest their presence by obtaining their own aesthetic (indeed the white three-dimensional grid is never the same) based on the contrast between nature and the abstract forms of the objects.

No-Stop City

Archizoom was one of those experimental and counter-cultural collectives raised in Florence towards the end of the 60s with the advent of neoliberalism which career had a major turning point with the release of one of their most debated speculative project No-Stop City.

Inspired by pop-art and its deep criticism towards a consumer society, the project is a city without architecture within an infinitely expandable grid which presents the same organisation that you might find within a warehouse or supermarket (symbolic entities behind consumerism then and now) where humans, objects, architecture and nature exist within a non-hierarchical system and open landscape as a new model of urbanisation against the modernist credo, without architecture and infinite resources available to humankind which paradoxically today is real but translated in the architecture of fulfilment centres such as Amazon.





Continuous Monument, Superstudio (1); Continuous Monument, Superstudio (2); No-stop City, Archizoom / Andrea Branzi (3);

In the late 60s early 70s, almost prophetically the architects of that time envisioned similar entities to those giant slabs in the countryside, with their own aesthetic, estranges themselves from the landscape of the countryside.

Feature in the landscape

Land art

One way to look at this phenomenon of hyper-rational organisation in the countryside is to look at land art. An art movement which places itself in the same period of Superstudio, between 1967 and 1968, was represented by a small group of artists, such as Michael Heizer, Robert Smithson, Walter De Maria, Robert Morris, Christo, Richard Serra, and lately James Turrell, which used to work in close contact with the landscape by sculpting it with the use of available natural resources or installing directly elements in the landscape such as The Lightning Field (Walter De Maria).

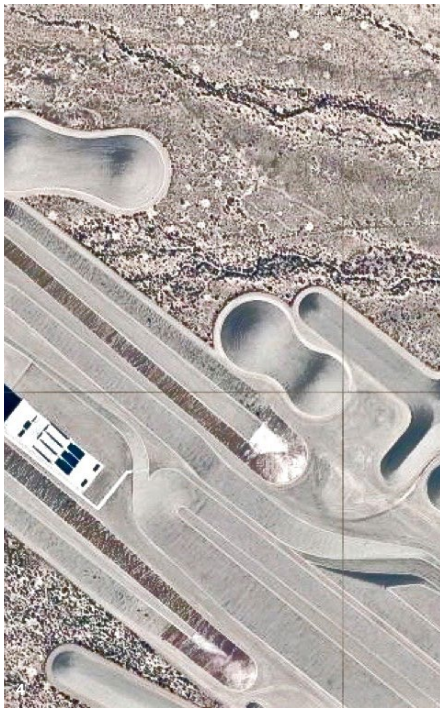
Both approaches ended up by making of the installation an integrated feature in the landscape eventually exhibited in galleries in form of photographs (due to the vast scale of the installations) and rare cases by bringing material directly from the landscape.

Roden Crater

Roden Crater is a large-scale artwork (800 m diameter) placed within a geological formation of a bowl-shaped extinct volcano in the Painted Desert region of Northern Arizona. In construction since 1974 and estimated to be concluded within the next five years after Kanye West's donation, Roden Crater has been conceived as light observatory connected to a series of spaces, through human-scaled tunnels, which open onto the landscape to capture the light from the sun and the stars at night by creating a celestial vaulting effect which places the viewer in close relation with the sky.

City

Began in 1972, City is probably the biggest artwork ever conceived which could find a place just in a vast territory such as the Nevada desert. Almost 2 km long and 0.4 km wide, a scale comparable to landscapes intervention like the National Mall or Central Park, City is situated in a flat basin which makes of the parts that compose relatively big in terms of size but *modestly* large if compared with the scale of the surrounding basins and ranges.



The Lightning Field, Walter De Maria (1); Roden Crater, James Turrell (2); Spiral Jetty, Robert Smithson (3); City, Michael Heizer (4)

Can we imagine these new form of architecture intervene within the context of the countryside as a new form of land art?

Landscape roof

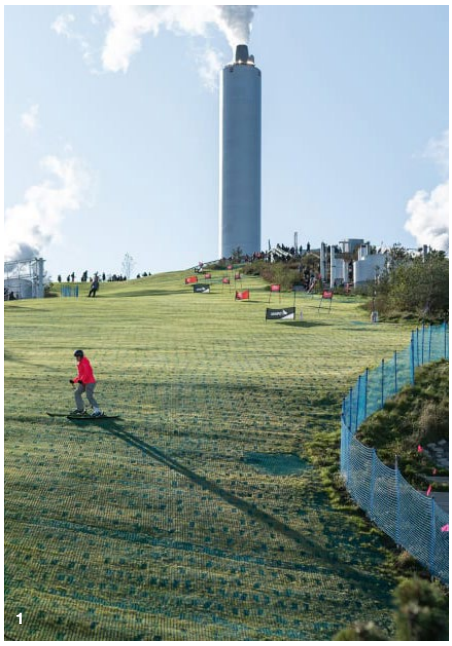
Amager Bakke

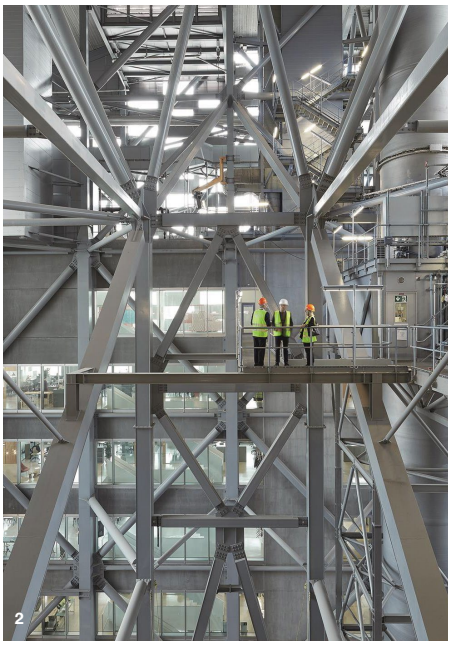
Also known as CopenHill, is the closest example of an architecture which is meant by nature to serve exclusively as functional machinery (architecture as machinery and machinery as architecture) which has been turned into social infrastructure.

Designed by BIG, the strategic and simple gesture of turning the roof into a landscape has turned what would have been otherwise inaccessible - a power plant - into a social infrastructure which preserves the anonymity and opacity of the highly functional machine and its main functions, combined with the experience of the human component that approaches occasionally the building.

This opens a discourse on how the fundamental components of a building can establish a new relationship with the human component which would be otherwise impossible.

Therefore, by stressing the architecture qualities which are already included in the repertoire of the realm of architecture, this examples shows how a possible solution on how design can bridge the gap between man and machine by preserving full autonomy of each component.





View from the landscape roof and the activities host on it (1); Interior of the power plant (2); Aerial view of the building illustrating its relationship with the surrounding landscape (3);

Unintentional monument

Göreme Cave Dwellings

Thousands of years ago, volcanic eruptions covered the region of Göreme with thick ash which eventually thickened into a soft rock which ancient civilisations began carving creating a network of human-shaped chambers linked by a designated tunnel complex which defined an urbanised sunken cultural landscape.

After being used until the first half of the twentieth century, nowadays most of the chambers have been turned into a museum while others still function as dwellings even though are addressed to visitors and tourists which makes of the valley of Goreme and its carved chambers a landscape to visit and discover for our modern civilisation.

The aforementioned case study is a perfect example of what Riegl would define unintentional monument. At first conceived for the basic human need to dwell, or celebrate the act of dwelling through the carved chambers, this was not erected to commemorate any specific event or person and the passage of time defined it as a monument due to its irreplaceable value for the modern civilisation by delivering a unique experience to the occasional visitors, completely different from what its original purpose was.

One of too many carved chambers into the soft rock created by thickened ash (1); Bikers riding the rugged landscape of Cappadocia

Design studies

Midterm proposal

Promenade strategy

Plan / First floor

Plan / Second floor

Plan / Third floor

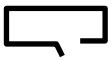
Plan / Fourth floor

Plan / Fifth floor

Plan / Sixth floor

Plan / Seventh floor

Plan / Eight floor

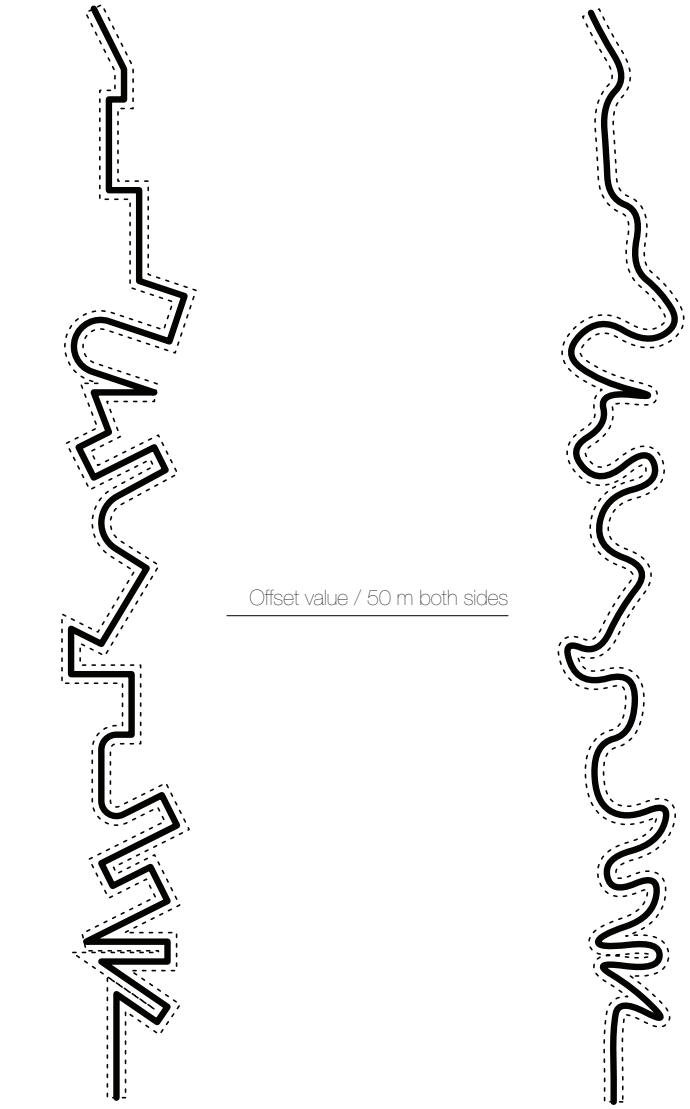


Plan / Ninth floor

The midterm proposal focused on defining the prototype through the use of the promenade architecturale and its relationship with the human component via movement. The promenade has been extracted from an existing building (Netherlands embassy / OMA) and layered in length rather than height and which profile became the element that generated the mass of the prototype. The volume was still quite abstract and mainly form-based and some architecture qualities have just started to take a form such as the relationship of the roof with the landscape and through it, the possibility of the occasional visitor to engage with the machine component ((building). The decision made from the midterm proposal has been to define and design further the landscaped roof to activate additional architectural qualities as an antithesis of how a conventional server farm presents itself. After the mid-term, the idea of the movement to experience the horizontalness of the building became specific by introducing the “observation windows”, nonetheless to create the so craved relationship between human and machine component.

Midterm proposal

Rebuilt promenade

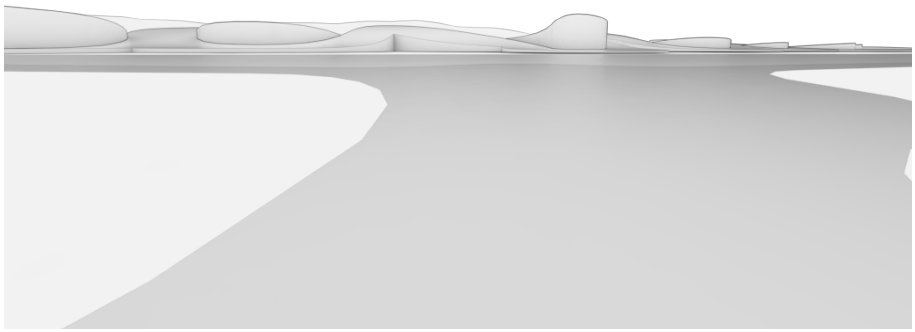


The above illustrated paths are the re-layered (in length rather than height) promenade extracted from The Netherlands embassy / OMA.

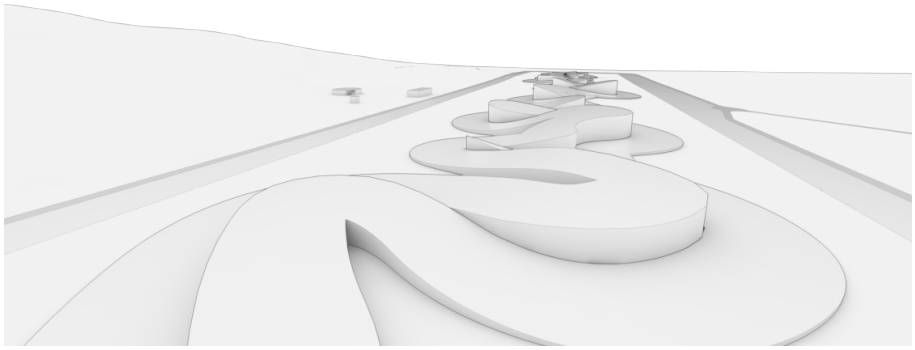
Path (A) has been kept with its original features without any additional manipulation. The Path (A') instead presents an alternative iteration made possible by rebuilding the curve (A) by reducing the amount of points which constructs it. This approach, assigns to the curves a more topographic profile, still preserving its main connotations and was the one examined further as a proposal for the mid-term seminar.

Midterm proposal

Path (A') / Relationship to the landscape



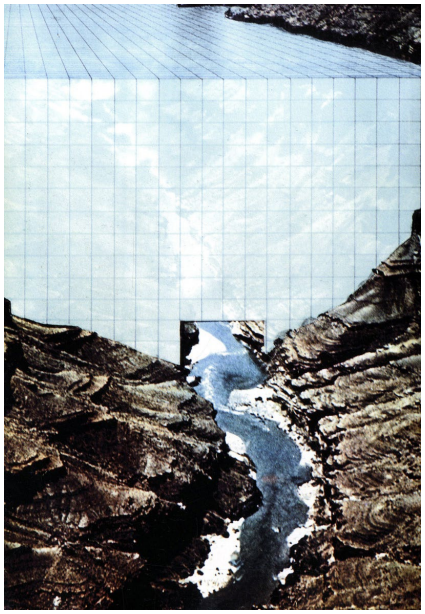
View from the main road reveals the building as a formal counterpart to the landscape

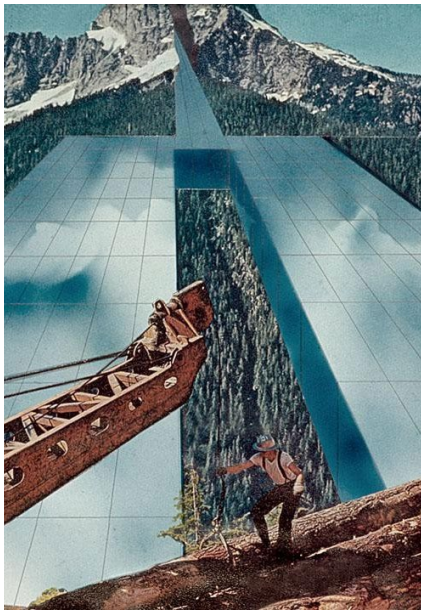


Aerial view highlights the relationship of the landscape roof with the land-side

Midterm proposal

Path (A')/Relationship to human component

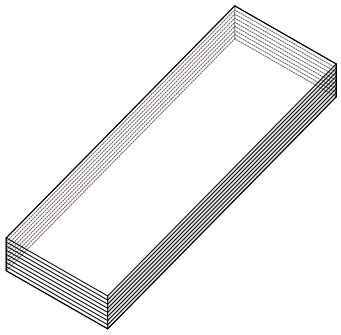




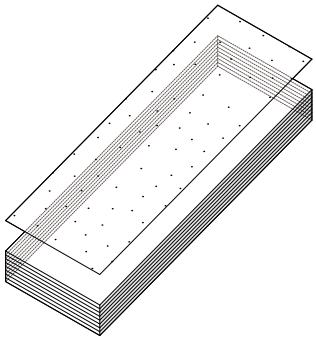
Reference / Continuous Monument collage series, Superstudio

Interaction human with machine component through accessible landscape roof

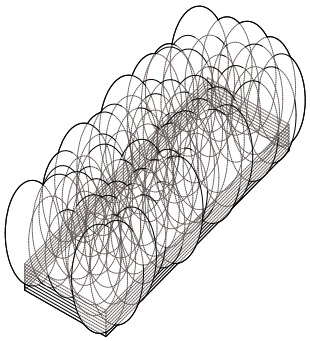
Interim 2
Roof design development



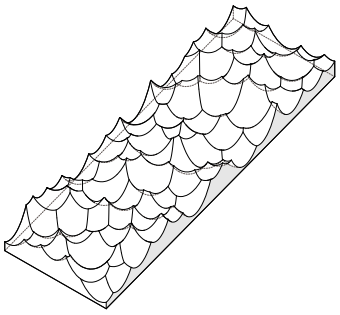
Base mass / slab



Points cluster projection



Cluster ellipsoids

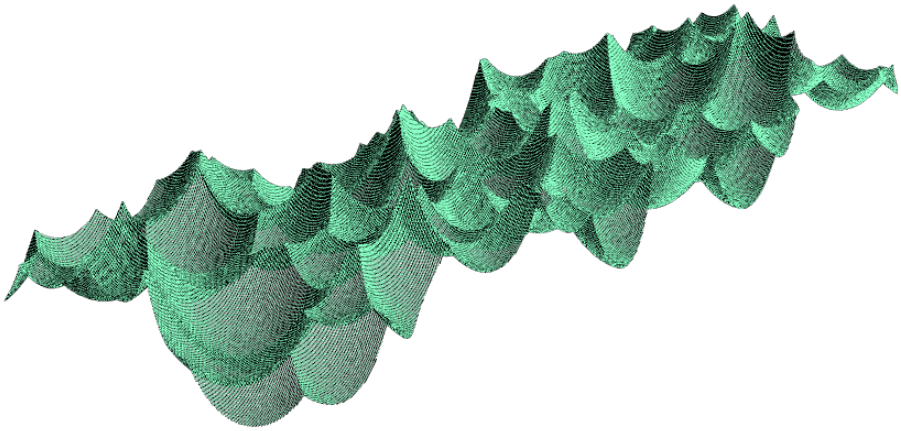


Subtraction between base mass and ellipsoids

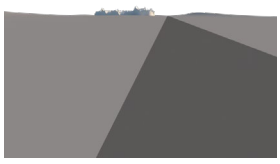
As mentioned earlier, the obtained prototype for the midterm seminar needed to be developed and designed further in order to extract additional architectural qualities unique to contrast the current state of the existing server farms and move from the condition of being deliberately undesigned to a state where they assume importance for including designed features. Hence the need to start from the base mass of the slab and operate of the roof which trough an operation of subtraction between the base volume and a cluster of ellipsoids, the end result included major qualities for both the interior and exterior of the prototype and became the base which has been elaborated further for the final design in order to define a specific relationship between the landscape and the prototype through the landscape roof and ultimately, based on the way it does sit in the landscape, define a relationship between human and machine component.

Interim 2

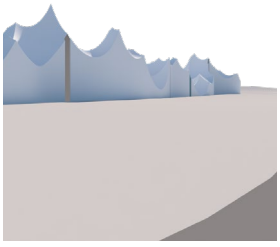
Roof design development



Edited roof through subtractions



View from the main street



Close up view of the building

Close up main entrance building

Summary

Conclusion

Although appealing, the condition of no scale is an articulated concept to put in practice within the realm of architecture.

It does not come as a surprise that the only way those masterminds behind those infrastructures have been dealing with it is through an extreme degree of approximation which led to a seamlessly a combination between architecture and machinery, which has left behind all those architecture qualities – which relates to the human component – to make space to the efficiency of the machine component and this is what stands between the so craved relationship between human and machine and the series of difficulties to erase that gap.

During the design process it has been noticed that one way to deal with this issue is by separating the content from the container and let their singularities define a hybrid architecture which sees architecture and machinery operating autonomously, yet collectively within the same realm.

This opened up the possibility to apply a certain degree of design which through a series of massing proposals which aimed to bridge the aforementioned gap between human and machine by proposing ultimately one way on how to give a peek into the physical form of our digital actions by delivering ultimately a human-based experience through the way the machine sits in the landscape.

Nonetheless, this process delivered additional architecture qualities which suggest an architecture that celebrates the value of its content worth to preserve and shield against nature and time deteriorating effects, defining ultimately the survivor of our generation's cultural legacy when our collective history is exclusively digital.

Despite not being erected to commemorate a specific event or person, its endurance over time let age becomes the sign which defines the architecture as a monument in its irreplaceable value for (future) modern civilisation becoming a highly symbolic component in the landscape.

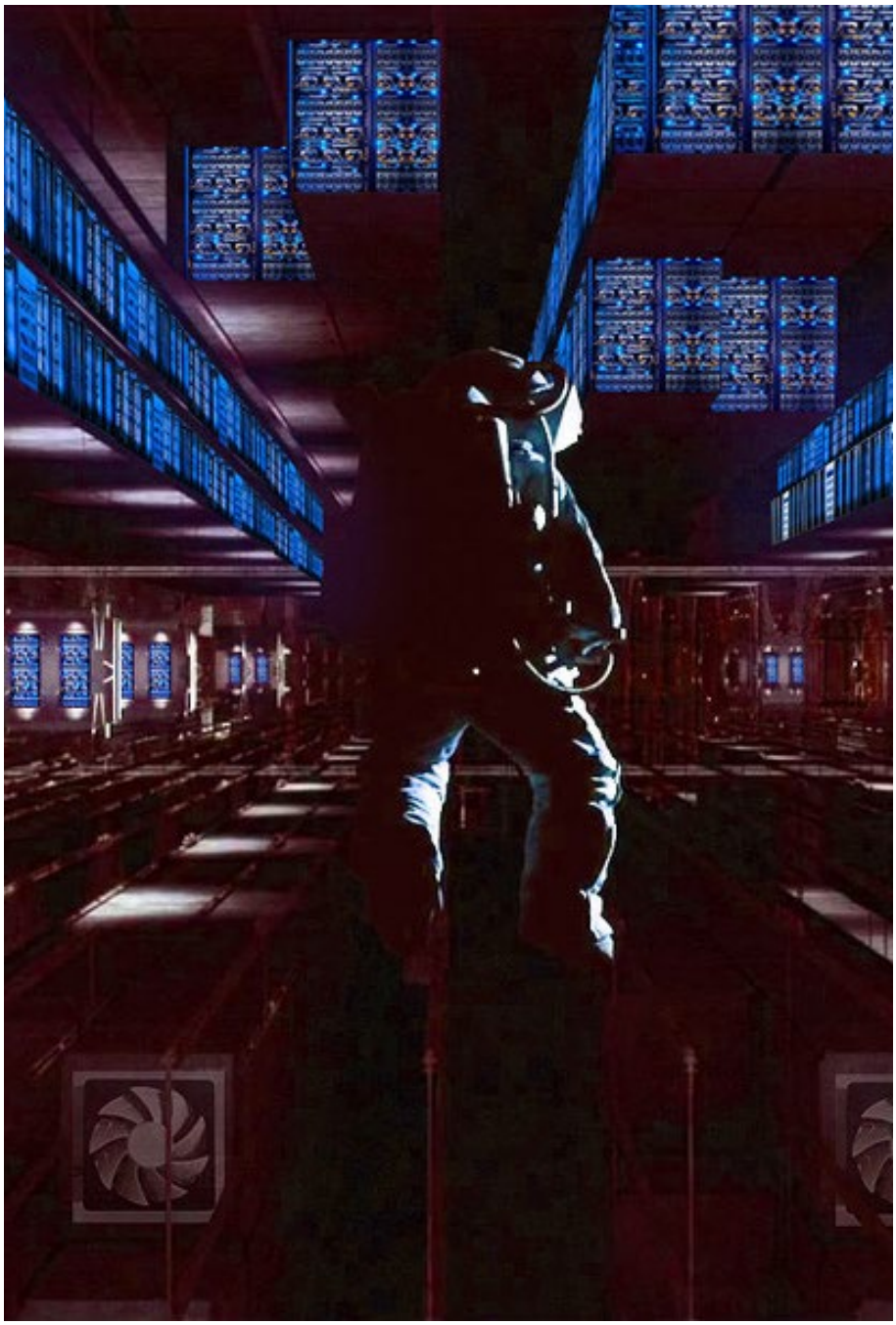


Image: OMA, Lights Out, 2019, Simulation of Unmanned Data Center. © OMA. / Source: e-flux

Bibliography

Bibliography
Literature

Aranda, J. (2015). *E-flux journal: The Internet Does Not Exist*

Blum, A. (2011). *Tubes: Behind the Scenes at the Internet*

Bratton, B. (2015). *The Stack: On Software and Sovereignty*

Bridle, J. (2018). *New Dark Age: Technology and the End of the Future*

Castillo, G. and Choi, E. (2015). *Hippie Modernism: The Struggle for Utopia*

Colakides, Y. Garrett, M. Gloerich, I. (2019). *State Machines: Reflections and Actions at the Edge of Digital Citizenship, Finance, and Art*

Coupland, D. (2015). *The Age of Earthquakes: A Guide to the Extreme Present*

Easterling, K. (2014). *Extrastatecraft: The Power of Infrastructure Space*

Flash Art (2019). *Volume 326*

Frankl, V. (1946). *Man's Search for Meaning*

Holl, S. (1997). *Parallax*

Koolhaas, R. (2006). *Junkspace*

May, J. (2019). *Signal. Image. Architecture*

Otero Verzier, M. (2018). *Work, Body, Leisure*

Stoppani, T. (2018). *Unorthodox Ways to Think the City: Representations, Constructions, Dynamics*

Williams, A. Srnicek, N. (2015). *Inventing the Future: Postcapitalism and a World Without Work*

Young, L. (2019). *Machine Landscapes: Architectures of the Post Anthropocene*

Zuboff, S.(2018). *The Age of Surveillance Capitalism*

Bibliography
Web

Dragland, A. (2013). *Big Data, for better or worse: 90% of world's data generated over last two years.* Retrieved from https://www.sciencedaily.com/releases/2013/05/130522085217.htm

Glancey, J. (2003). *Anti-Matter*. Retrieved from https://www.theguardian.com/artanddesign/2003/mar/31/architecture.artsfeatures

Goodyear, D. (2016). *A Monument to Outlast Humanity*. Retrieved from https://www.newyorker.com/magazine/2016/08/29/michael-heizers-city?verso=true

Harrison, A. (2017). *Posthuman Architecture*. Retrieved from https://www.pca-stream.com/en/articles/ariane-lourie-harrison-posthuman-architecture-119

Ivanišin, K. (2016). *On the Sublime*. Retrieved from https://www.transfer-arch.com/monograph/on-the-sublime/

Koolhaas, R. (2019). *Rem Koolhaas on the New Rural Sublime*. Retrieved from https://frieze.com/article/rem-koolhaas-new-rural-sublime

Lucarelli, F. (2013). *Architecture without humans*. Retrieved from http://socks-studio.com/2013/04/01/architecture-without-humans/?fbclid=IwAR3MC3H37niWyDGuNS1uV1-KsSsmhdS7UuCNDDJfEA0deWgVBeLB4kl9OKY

Marr, B. (2018). *How Much Data Do We Create Every Day?* Retrieved from https://www.forbes.com/sites/bernardmarr/2018/05/21/how-much-data-do-we-create-every-day-the-mind-blowing-stats-everyone-should-read/#601a918460ba

Peluso, S. (2019). *Portfolio: the physicality of digital infrastructures*. Retrieved from https://www.domusweb.it/en/art/gallery/2019/03/13/portfolio-the-physicality-of-digital-infrastructures.html

Pestellini, I. (2020). *Data Architectures*. Retrieved from https://www.e-flux.com/architecture/intelligence/310404/data-architectures/

Stone, M. (2019). *The Planet Needs a New Internet*. Retrieved from https://earther.gizmodo.com/the-planet-needs-a-new-internet-1837101745

Tonka, H. (1988). *Bernard tschumi, cinegram folie, le parc la villette*. Retrieved from https://issuu.com/echeverriapatricio/docs/bernard_tschumi__cinegram_folie__le

Van Mensvoort, K. (2006). *Real nature is not Green*. Retrieved from https://nextnature.net/2006/11/real-nature-isnt-green

Volner, I. (????). *OMA's big adventure in the desert and how it gloriously failed*. Retrieved from https://pinupmagazine.org/articles/article-oma-desert-hotel-art-museum-data-storage-ian-volner
Wigley, M. (2018). New Babylon: Radical Hospitality in a World Beyond Labor. Retrieved from https://strelkamag.com/en/article/mark-wigley-new-babylon

Zolotoev, T. (2019). *Landscapes of the Post-Anthropocene: Liam Young on architecture without people*. Retrieved from https://strelkamag.com

Zolotoev, T. (2017). *Posthuman Architecture: Rem Koolhaas, Benjamin Bratton, and Janna Bystrykh on Scale and System*. Retrieved from https://strelkamag.com/en/article/koolhaas-and-bratton

Video

Koolhaas, R. (2015). *On the Coutryside.* Retrieved from https://www.youtube.com/watch?v=shVxB6wRHo0

LeCavalier, J. (2019). *Landscapes of Fulfillment.* Retrieved from https://www.youtube.com/watch?v=mPSSfXWi5l4

Bibliography

Image credit

Apollo 8 (1968). *Blue Marble*. Retrieved from https://www.extremetech.com/extreme/210519-humanity-gets-a-new-blue-marble-photo-of-earth-and-its-stunning

Archizoom, Branzi A. (1969). *No-stop City*. Retrieved from http://www.frac-centre.fr/collection-art-architecture/archizoom-associati/no-stop-city-64.html?authID=11&ensembleID=42

De Loutherbourg, J. (1803). *An Avalanche in the Alps*. Retrieved from https://www.tate.org.uk/art/research-publications/the-sublime/project-overview-r1117556

De Maria, W. (1977). *The Lightning Field*. Retrieved from https://publicdelivery.org/walter-de-maria-lightning-field/

Ehrhorn Hummerston (2019) *In Copenhagen, they've combined energy production with recreation*. Retrieved from https://edition.cnn.com/travel/article/ski-slope-powerplant-copenhagen-denmark/index.html

Evans R. Gao, J. (2016). *DeepMind AI Reduces Google Data Centre Cooling Bill by 40%*. Retrieved from https://medium.com/the-fourth-wave/deepmind-ai-reduces-google-data-centre-cooling-bill-by-40-bd3ef8cfe36e

Friedrich, C. (1818). *Wanderer above the Sea of Fog*. Retrieved from https://en.wikipedia.org/wiki/Wanderer_above_the_Sea_of_Fog

GEA (2018). *Fully robotic rotary parlors gain U.S. momentum*. Retrieved from https://www.gea.com/en/news/trade-press/2018/robotic-rotary-parlors-gain-us-momentum.jsp

Gehry, F. (1997) / Photograph Flickr User: cincinnato (2013). *The Guggenheim Museum Bilbao*. Retrieved from https://www.archdaily.com/422470/ad-classics-the-guggenheim-museum-bilbao-frank-gehry

Gordon, R. (2013). *Greenhouse Production Tips From The Netherlands*. Retrieved from https://www.growingproduce.com/vegetables/

greenhouse-production-tips-from-the-netherlands/

Heizer, M. (1972-ongoing). *City*. Retrieved from https://www.idistura-to.com/blog/2016/04/10/heizerov-grad-the-city/

Jonnu Singleton (2012) *Facebook Prineville Data Center / Sheehan Partners (Archdaily)*. Retrieved from https://www.archdaily.com/285237/facebook-prineville-data-center-sheehan-partners

Le Corbusier (1952) / Photograph De Vriendt, S (2010). *Cité radieuse de Marseille*. Retrieved from https://www.archdaily.com/85971/ad-classics-unite-d-habitation-le-corbusier

Logiqs (2019). *Rolling Bench Systems*. Retrieved from https://www.logiqs.nl/en/greenhouse-automation/rolling-benches/

Lund, K. (2016). *Tahoe Reno Industrial Center, Nevad*a. Retrieved from https://www.flickr.com/photos/kenlund/28143437835

Norbert Eisele-Hein (unknown). *Capadoccia by bike*. Retrieved from https://www.nationalgeographic.com/travel/world-heritage/cappadocia/

OMA+LMN (2004) / Photograph Ruault, P. (2009). *Seattle Central Library*. Retrieved from https://www.archdaily.com/11651/seattle-central-library-oma-lmn

Oliver, J. Vasiliev, D. (2011) *Newstweek*. Retrieved from https://www.antiatlas.net/julian-oliver-and-danja-vasiliev-newstweek-en/

Plagen, T. (2016). *NSA-Tapped Undersea Cables, North Pacific Ocean*. Retrieved from https://www.tba21.org/journals/article/trevorpaglen

Rasmus Hjortshoj and Søren Aagaard (2019). Retrieved from https://www.dezeen.com/2019/10/08/big-copenhill-power-plant-ski-slope-copenhagen/

Bibliography
Image credit

Roberts, B. (2013). *Amazon Unpacked*. Retrieved from http://www.defringe.com/article/amazon-unpacked

Sakuma, P. (2012). *Skilled Work, Without the Worker, The New York Times*. Retrieved from https://www.nytimes.com/2012/08/19/business/new-wave-of-adept-robots-is-changing-global-industry.html

Shutterstock (2019). *Does AI Hold the Key to a New and Improved "Green Revolution" in Agriculture?* Retrieved from https://www.pbs.org/wgbh/nova/article/does-ai-hold-key-to-new-green-revolution-in-agriculture/

Smithson, R. (1970). *Spiral Jetty*. Retrieved from https://www.deseret.com/2017/10/5/20620927/the-great-salt-lake-s-spiral-jetty-is-a-symbol-of-utah-s-magnificent-history#aerial-photo-showing-robert-smithsons-spiral-jetty-on-the-northern-banks-of-the-great-salt-lake-and-the-rozel-point-landscape-to-which-it-is-attached-aug-26-2009

Solari, G. (1481 / Photograph Simone, S.(2015). *Milan Cathedral*. Retrieved from https://www.architecturaldigest.com/gallery/best-gothic-cathedrals

Superstudio / Archive Cristiano Toraldo di Francia (1969). *The Continuous Monument. The Mad Genius of Superstudio*. Retrieved from https://www.nytimes.com/slideshow/2016/04/15/t-magazine/the-mad-genius-of-superstudio/s/superstudio-slide-8SFG.html?smid=pin-share

Superstudio, (1970). *Reflected Architecture*. Retrieved from https://www.e-flux.com/announcements/168183/superstudio-50/

Turrell, J. (1972-ongoing). Roden Crater. Retrieved from https://tlmagazine.com/james-turrell-gives-us-an-insight-into-his-roden-crater/
Unknown (2017). Switch Supernap. Retrieved from https://www.lineaedp.it/news/32196/siziano-the-most-advanced-data-center-europe-is-also-the-greenest/#.XnCDcahKhPY

Unknown (1865). *The Reels of Gutta-percha Covered Conducting Wire Conveyed into Tanks at the Works of the Telegraph Construction and Maintenance Company, at Greenwich*. Retrieved from https://pt.m.wikipedia.org/wiki/Ficheiro:The_Reels_of_Gutta-percha_Covered_Conducting_Wire_Conveyed_into_Tanks_at_the_Works_of_the_Telegraph_Construction_and_Maintenance_Company,_at_Greenwich_MET_DP801249.jpg

Voit, R. (2013). *These are the coolest cell phone towers you will ever see*. Retrieved from https://www.michiganradio.org/post/these-are-coolest-cell-phone-towers-you-will-ever-see

Webster, T. (2015). *Google Data Center, The Dalles, Oregon*. Retrieved from https://www.e-flux.com/architecture/intelligence/310404/data-architectures/