portfolio.

.redait tsegaye legesse.
architectural engineer | 2024

Redait Tsegaye Legesse

Building and Architectural Engineer

Italy +393280686284 redaittsegaye.legesse@mail.polimi.it

WORK EXPERIENCE

BIM Consultant
iDEAS Engineering and Architecture Studio Srl.
11/2023- Present *Naples, Italy*

Major Projects
- Shusha Mosque in Shusha, Azerbaijan- BIM modeling, Content Creation and Coordination (collaboration with Simmetrico)
- Memorial Complex Park of the Patriotic War, Azerbaijan - BIM modeling, Content Creation and Coordination (collaboration with Simmetrico)

Junior BIM Consultant and Computational Designer
3-im SRL Virtual Projects Consulting Company
01/2023- 11/2023 *Cinisello Balsamo, italy*

Major Projects
- ZNM- Zayad National Museum Design by Norman Foster Facade Modeling and Automation for CAM Technology.
- SNAM- Digital Twin Modeling for Gas pipelines with limited data that have been installed significant years ago

Junior Tutor in Urban Design and related Studio Courses
Politecnico di Milano
01/2022- 07/2022 *Lecco, Italy*

Major Projects
- LeccoLAB didactical path at Department of Architecture, Construction Engineering and Built Environment - ABC

Junior Architect and Internship
MH Engineering PLC.
09/2016- 04/2020 *Addis Ababa, Ethiopia*

Major Tasks
- 3D renderings, Drafting Drawings, Panel Illustrations, Detail Drawings and Facade Designs.

EDUCATION

Msc in Building and Architectural Engineering
Politecnico di Milano
10/2020 - 05/2023 *Lecco, Italy*

Courses
- Thesis Title - From Prediction to Construction: A Parametric Workflow for Volumetric Facade Panels
Integrating Artificial Neural Networks and Smart Details to Optimize Building Solutions
- Energy Efficient Office Building Design in Milan_ Sustainable Building Technology (SBT)
- Reinventing Cities_ Sustainable Multidisciplinary Design Process (SMDP)

Bsc in Architecture (with Distinction)
EiABC, Ethiopian Institute of Architecture, Building Construction and city Development
02/2012- 01/2017 *Addis Ababa, Ethiopia*

Thesis Title
- Youth Rehabilitation Center- Inclusive Design

BIM: From sketch to Digital Twin
Coursera Online Course
02/2022- 03/2022 *Online*
Peter the Great St. Petersburg Polytechnic University

Design Computing: 3D Modeling in Rhinoceros with Python/Rhinoscript
Coursera Online Course
02/2022- 03/2022 *Online*
University of Michigan

SKILLS

3D/2D Design and Drawing

- Revit - Revit.Inside.Rhino (Parametric 3D modeling on Revit with native Revit functions as well as Dynamo and GH script)
- Rhinoceros 3D (Modeling with GH Script)
- AutoCAD (mainly used for 2D Drawings)

BIM & CAM Modeling

- Autodesk Revit
- Autodesk BIM 360
- Autodesk Naviswork

Algorithmic Design

- Grasshopper (+plugins)
- Rhino- inside
- Dynamo

Visualization and Data Processing

- Adobe InDesign
- Adobe Photoshop
- Adobe Illustrator

INTERESTS

Computational Design| Parametric Design | Generative Design | Design Optimization | Sustainable Architecture| Digital Twin| BIM

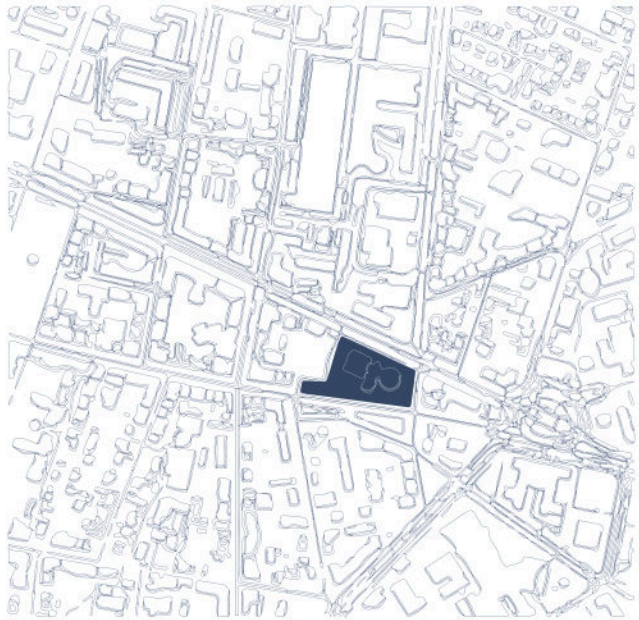
content.

This portfolio showcases a selection of the author's academic and professional accomplishments spanning from 2022 to 2024. To demonstrate author's capacity to work on both large-scale and small-scale projects within BIM framework, Deep passion about the evolving landscape of architectural technology, particularly the strides made in computational and algorithmic design. Eagerly anticipate the fusion of computational analysis with sustainable and energy-efficient principles in BIM workflows to address real architectural challenges throughout the design and construction phases.

Redait Tsegaye Legesse

architectural portfolio | 2023

Computational design | Parametric Design | BIM | Generative Design
Sustainable Architecture | Energy Efficient Building | Design Optimization



01. TOUR GUILLIOUT

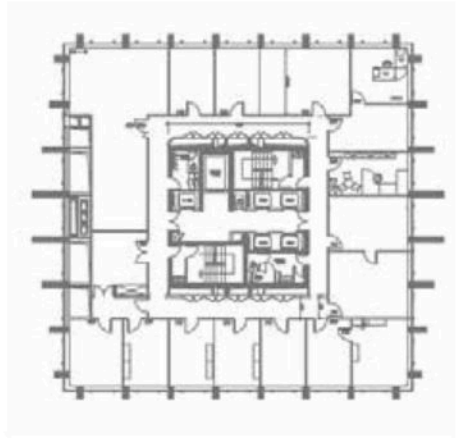
Thesis - Facade Renovation

Location - 150, cours Albert Thomas, Lyon, France
Client - Tour Guillot et auditorium Bourdeix (ex-CIRC)
Status - Reinventing Cities Competition - Under construction
Thesis Project by - Giandomenico Azzone, Konstantin Loshkov and Redait Tsegaye Legesse
(as completion paper to MSc degree in Building and Architectural Engineering from Politecnico de Milano)
Thesis Advisor - Professor Masera Gabriele

The proposed project entails a renovation and functional reconfiguration of a 1972 office tower's envelope. The existing flat and monotonous facade will be replaced with twisting rows of bays that respond to environmental conditions. These alterations in the envelope of the building will necessitate corresponding changes to the interior layout and programming. The thesis proposes a parametric workflow that aims to mitigate the environmental impact of buildings by intervening in the early stages of design, demonstrating its functionality through the refurbishment of an existing building. The proposed approach aims to enhance the existing state-of-the-art practices by providing a real-time overview of a building's performance during the early design phases.

01. TOUR GUILLIOUT

Thesis - Facade Renovation



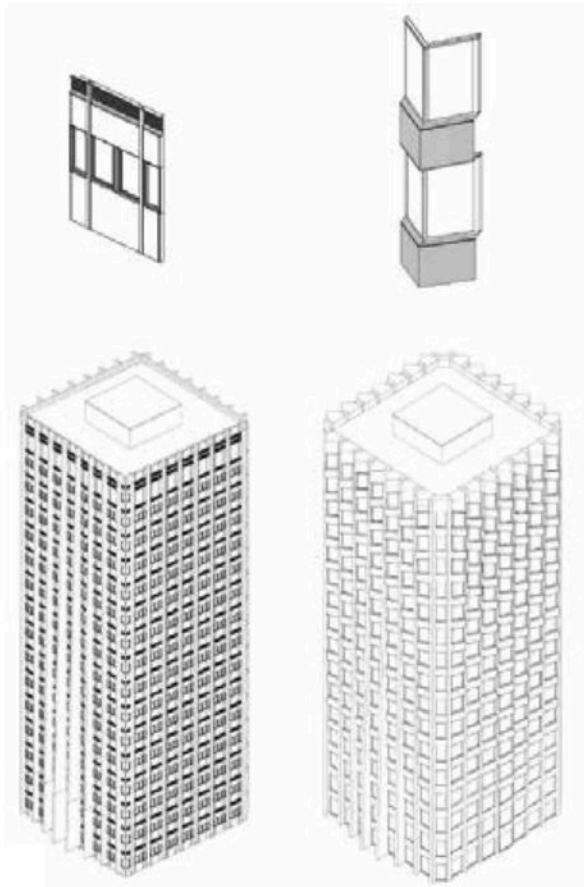
Top - Original Fourth Floor Plan
Bottom- Proposed Floor Plan

The "Tour Gulliout" is a building constructed in 1972 in Lyon, intended to house The International Agency for Research on Cancer (CIRC). It's known for its innovative lightweight prefabricated facade and a core made of reinforced concrete that contains service areas. Initially, the design emphasized showcasing the building's structure and layout, but a revised approach took contextual factors into account, resulting in modifications to the facade.

The new facade design features fully glazed lower sections, taking advantage of shading effects, while gradually reducing glazing as it moves upwards. Additionally, modules protrude from the facade and align themselves towards favorable directions such as east and west.

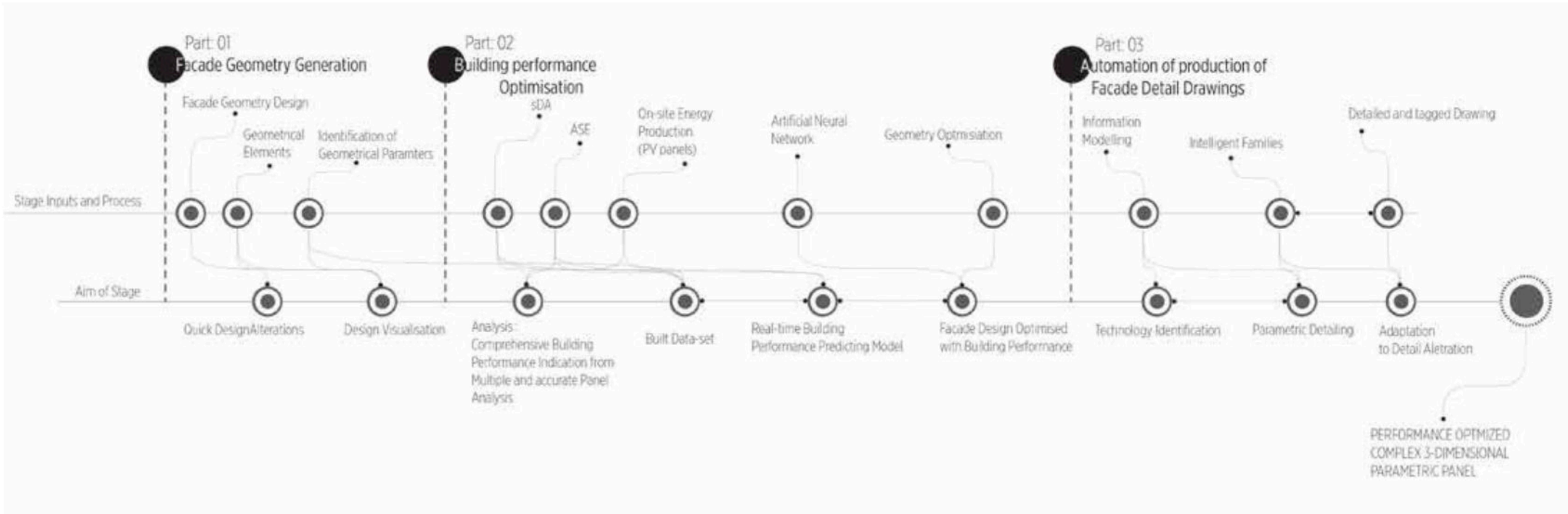
The original floor plan prioritized functionality but lacked consideration for cardinal orientations or external structural elements. In response, the new floor plan aims to enhance flexibility and adaptability to external changes.

The lower part of the building is designated for office spaces and features a nearly fully glazed facade with a slightly distorted grid. This allows for a free plan layout organized mainly through furnishing. Conversely, the upper part of the building is reserved for residential units, with reduced glazing to create a more intimate atmosphere. The plan for the residential section follows the rotation of the facade units while maintaining rectangular main spaces.



Left- Original Tour Gulliout Facade Unit and Whole Geometry
Right - Proposed Tour Gulliout Facade Unit and Whole Geometry

Thesis Title: From Prediction To Construction : A Parametric Workflow For Volumetric Facade Panels Integrating Artificial Neural Networks And Smart Details To Optimize Building Solutions



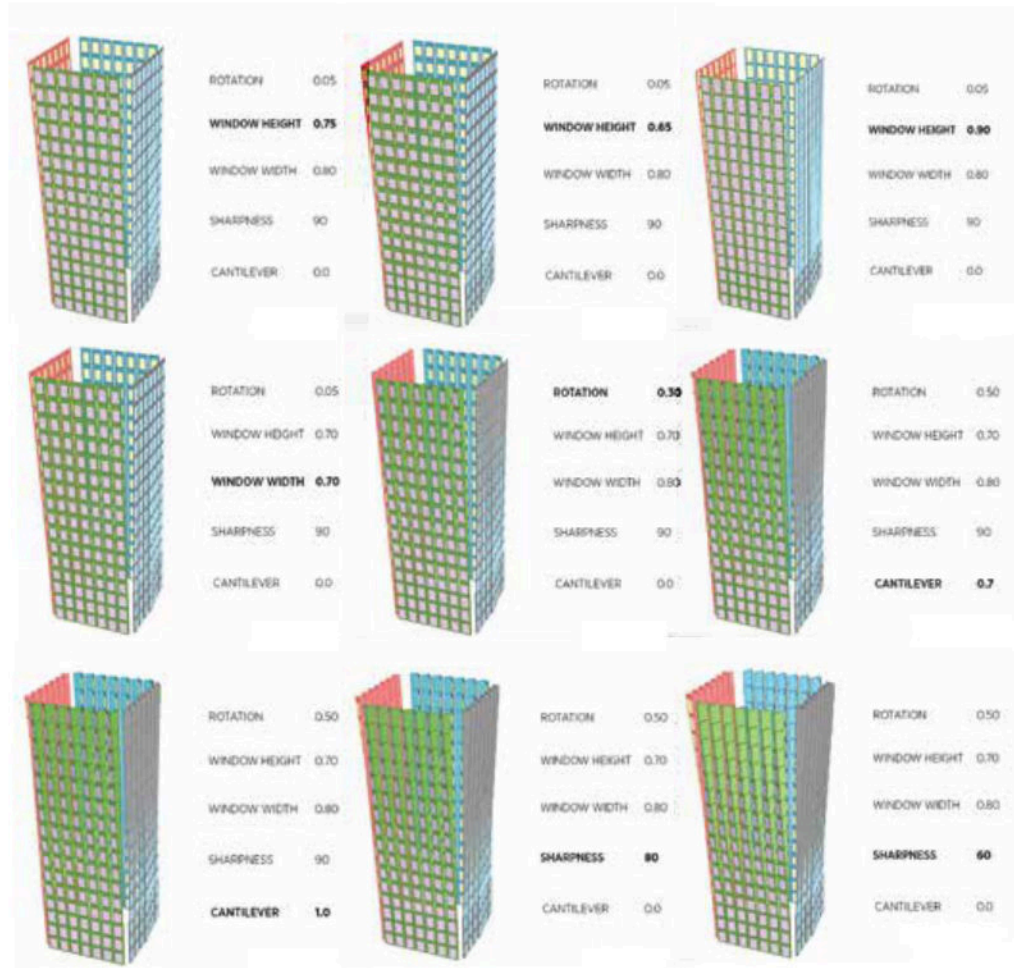
Thesis Workflow

A. Facade Geometry Generation

We have opted to utilize a parametric approach for the creation of the building facade geometry, with the entire process being carried out within the Grasshopper environment. Designing using a parametric approach offers several advantages over traditional design methods, as it allows for the creation of a highly responsive geometry, which can be modified and manipulated with ease. This flexibility allows for the exploration of a wide range of design options in a short amount of time, enabling architects to quickly iterate and refine their designs.

This approach not only improve the efficiency of this stage, but also facilitates the real-time extraction of geometric properties for each façade panel, a crucial aspect for subsequent steps in the workflow we have developed.

We identified six key parameters that were deemed essential for the success of this endeavor. These parameters are as follows:
A. Height:
B. Distance from the edge:
C. Window to wall ratio (WWR)
D. Façade rotation angle;
E. Façade position relative to the entire façade;
F. Main façade orientation.



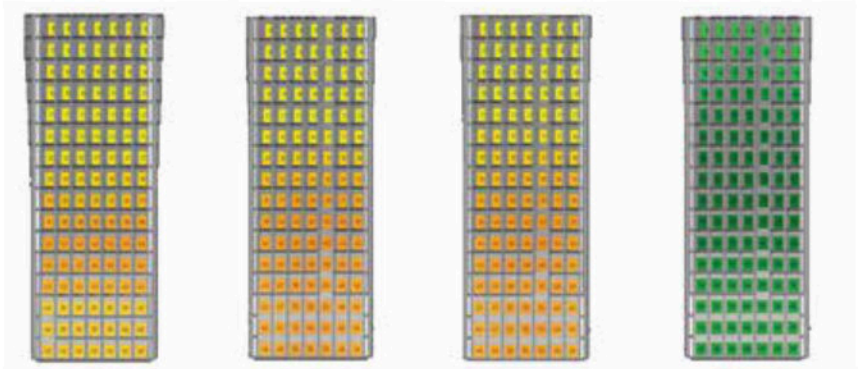
The Six Key Parameters and how they impact the tectonics of the facade of the building

B. Building Performance Optimization

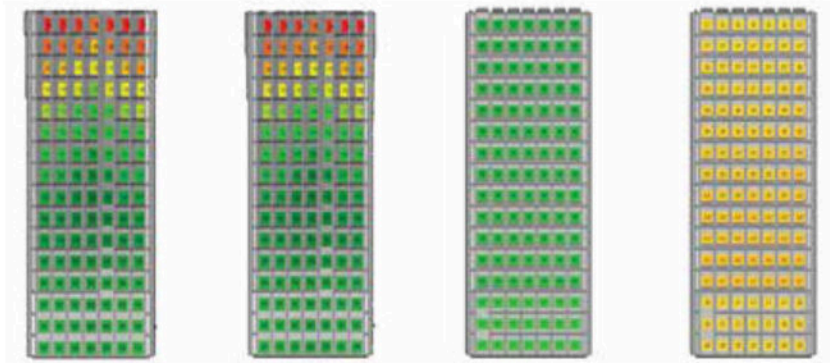
The central idea of the daylight metric analysis tool developed in the course of this project is to provide the possibility to have a real-time overview of a building's performance, in order to guide designers in making informed decisions during the early design phases and to provide useful information that can improve the efficiency and environmental impact of the building through passive strategies.

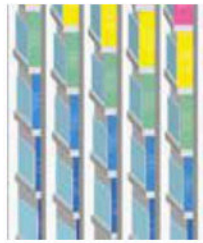
The parameters we have focused on are Spatial Daylight Autonomy (sDA), Annual Sunlight Exposure (ASE) and photo voltaic panel (PV) energy production. The need to develop this tool emerged from an examination of the current products available on the market and their associated shortcomings. A primary limitation we identified corresponds to the time that simulation programs, such as Honeybee, Ladybug, and DIVA, utilize for conducting analyses of spatial daylight autonomy, annual sunlight exposure, and solar radiation.

Properties Visualization

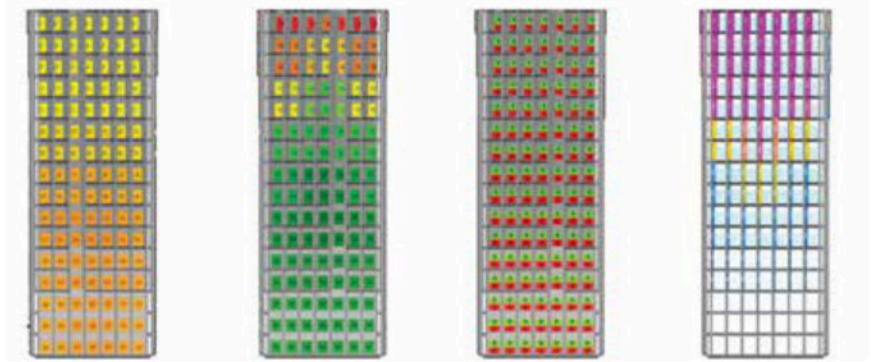


ASE/sDA Visualization





PV Visualization

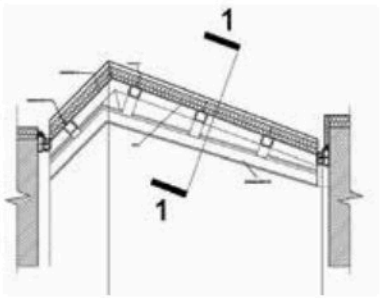


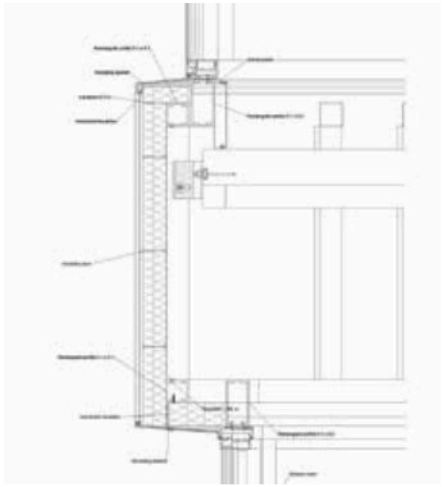
The Three Building Performance Parameters and how these parameters analyses the specific facade geometry under study. Each Cell Represents a Laboratory Space where the three parameters are separately computed.

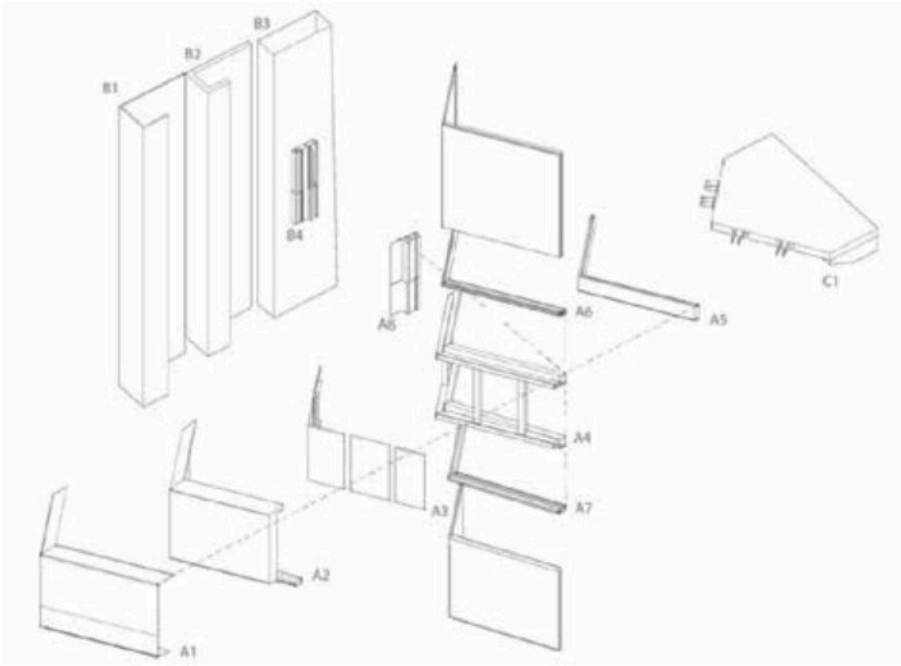
C. Automation of Production of Facade Details

The technological solution for the project involves the use of four independent components in the façade unit: prefabricated reinforced concrete slab extension (C), vertical structure insulation unit (B), spandrel bay (A), and visual/opaque units.

Once the assembly is installed on two consecutive floors, the visual and opaque units can be easily installed from the interior. This approach minimizes the need for scaffolding and reduces the time and labor required for installation





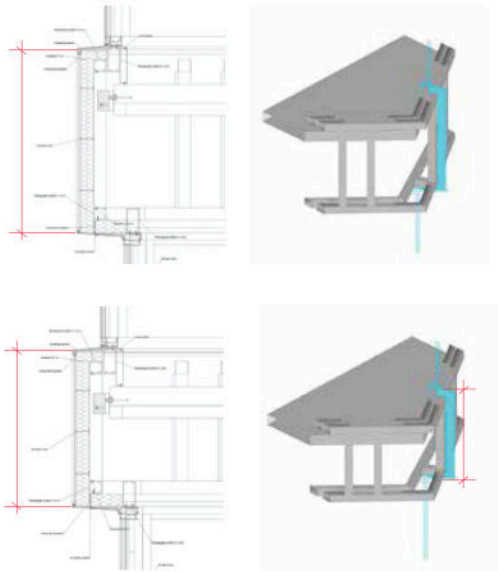


Plan, Section and Exploded 3D of the technological solution employed

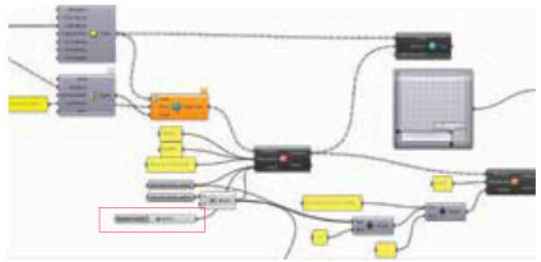
LEGEND
A - BAY MODULE
A1- folded aluminium finishing; A2 - mineral wool insulation; A3 - vapour barrier; A4 - structural frame; A5 - interior panel cover; A6 - window sill receptor; A7 - window head receptor; A8 - female mullion
B - STRUCTURE UNIT INSULATION UNIT
B1 - folded aluminium finishing; B2 - mineral wool insulation; B3 - vertical structure; B4 - male mullion
C - SLAB EXTENSION

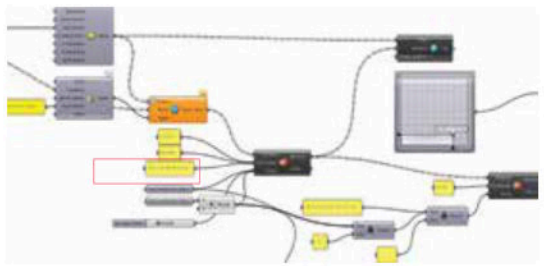
C. Automation of Production of Facade Details

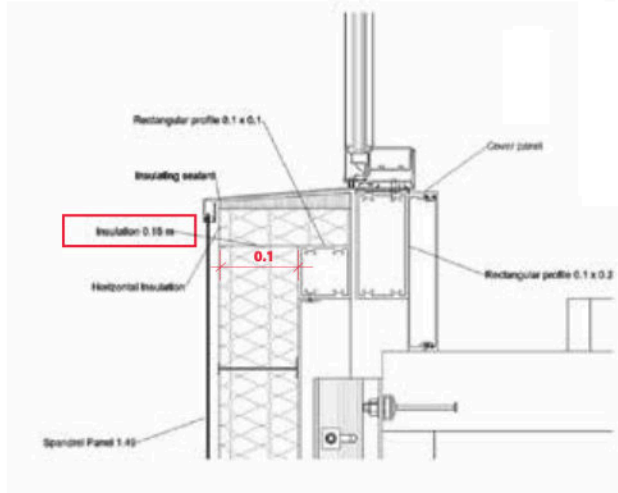
Conventional tools such as AutoCAD are used to manually draw line-based details. Any further adjustments to the project require case-by-case revisions. To integrate this step into the overall coherent workflow, we utilized Rhino.Inside®.Revit. We developed a set of parametric line-based families that are placed over the 3D host geometries. The parameters are linked to the actual geometry data, so they are automatically adjusted to any changes in the host geometry.

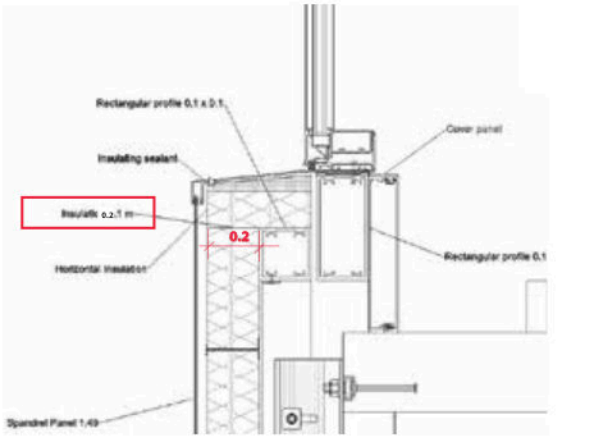


An example of a change brought on the structural frame length using the adapted automated parametric workflow









An example of a script illustrating the change of insulation thickness brought on the automatically generated parametric detail drawing through manipulation of a number slider.

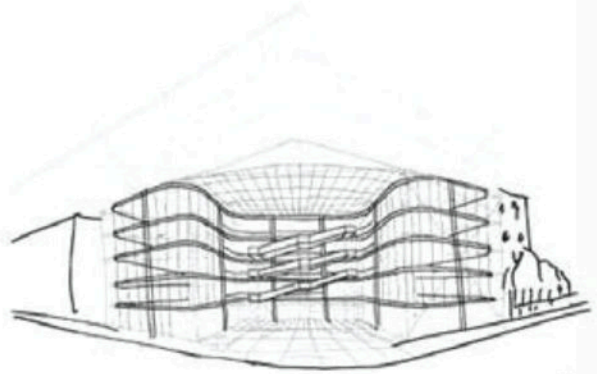
02. OFF/ice
(Off Conventions, Off Consumption)
Office Building Design

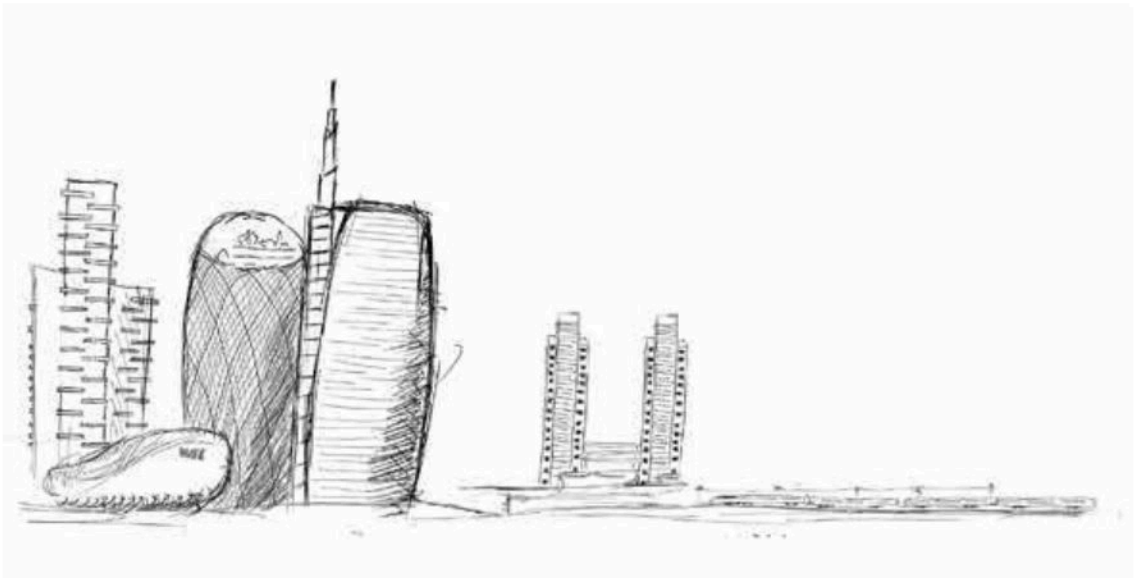
Location - 29 Via Federico Confalonieri, Milano
Client - Tour Guillot et auditorium Bourdeix (ex-CIRC)
Status - Reinventing Cities Competition - Under construction

A 5000 sq.m office building located at the verge of a grand urban redevelopment in Milan, Italy. The main function is complemented by a set of public/semi-public spaces which aim to enhance the social aspect of the work life. The main design feature is an environmentally responsible curvilinear facade. The building envelope was designed to specifically address environmental factors. Its configuration allows for the most efficient protection from the low morning and evening sun, as well as the high noon sun, ultimately promoting energy efficiency and occupant comfort within the building

Urban Context

In the process of designing a building situated at a crossroad it is typical for architects to consider how to accentuate the significance of this juncture by utilizing distinct building typologies. These usually includes the tower typology, which utilizes height to visually emphasize the crossroad, or the plaza typology, which reinforces the urban importance of the crossroad and serves as an additional point of attraction for the populace. In our design, we aim to merge these two typologies in order to create a building that effectively highlights the urban node while also serving as a gathering space for the community

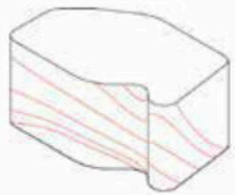




02. OFF/ice
(Off Conventions, Off Consumption)
Office Building Design- Facade Concept

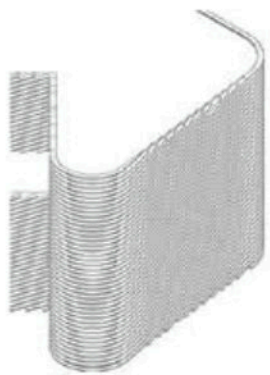
Environmental Factors

The building envelope was designed to specifically address environmental factors. To accomplish this, continuous exterior shadings, which gradually change their inclination angle from vertical at the west and east facades to horizontal at the south facade were integrated into the building's design.



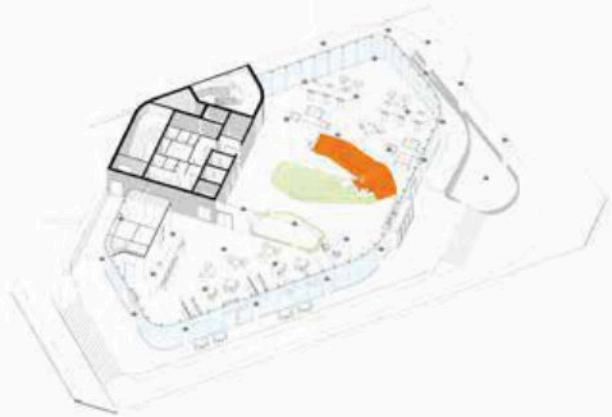
The position of shadings on different facades of a building is affected by the movement of the sun during the day.

The shading devices feature a curved shape, which allows them to effectively block direct sunlight at various angles throughout the day. This configuration allows for the most efficient protection from the low morning and evening sun, as well as the high noon sun, ultimately promoting energy efficiency and occupant comfort within the building

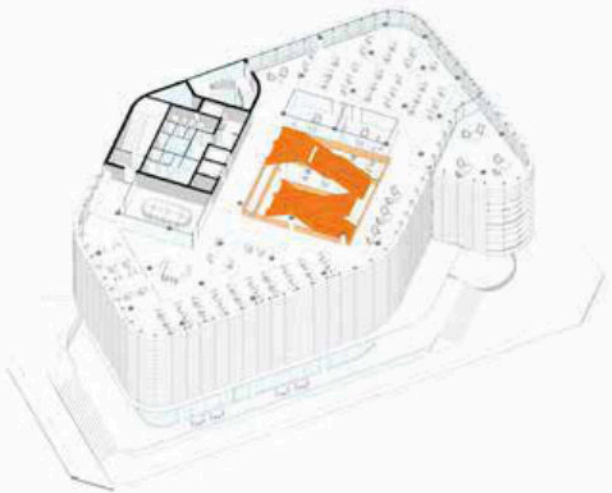


The design is optimized using computational tools to achieve the desired performance characteristics while maintaining the desired aesthetic appeal.

02. OFF/ice
(Off Conventions, Off Consumption)
Office Building Design - Plan Layout



Ground floor belongs to the city as much as it does to the building itself. Co-working, cafe and spacious lobby create perfect environment for informal meetings and serves as a building's "hall". Separated entrances and elevators allow to the building's part operate independently and secure quite environment of the working spaces even when the roof garden or ground floor cafe are hosting events



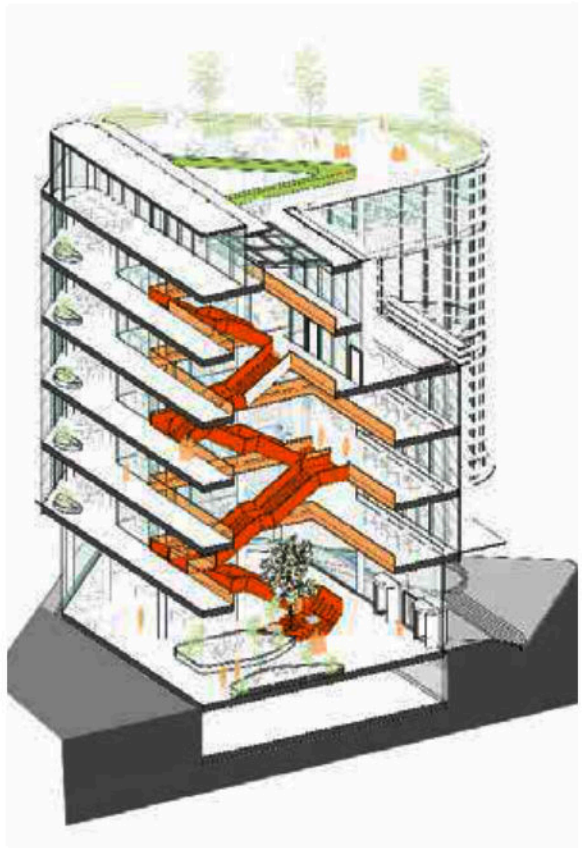
The rest of the floors demonstrate the office floors layout. The eastern side is organized in the form of free plan while western one is subdivided on smaller rooms. Each floor has resting zones with greenery and wide city panorama.

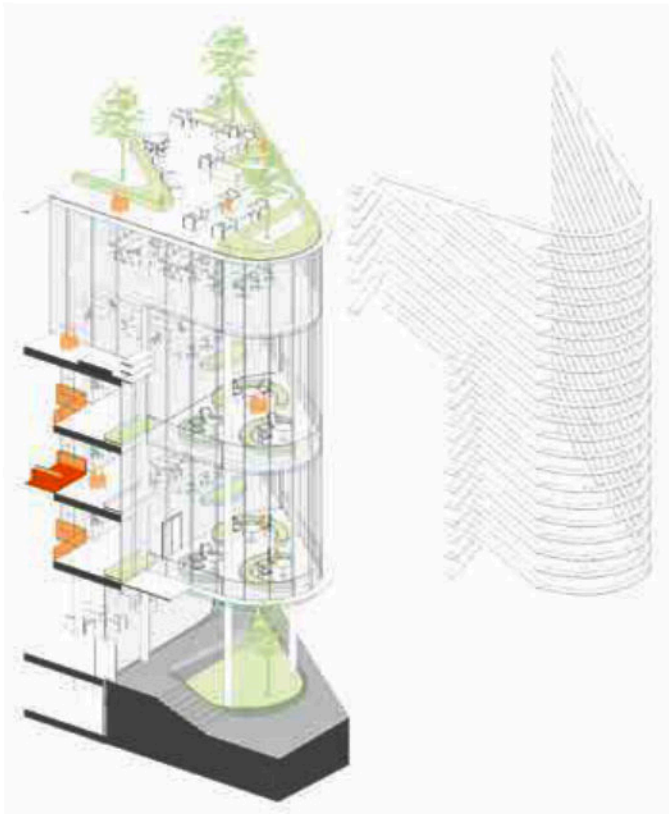
Plaza

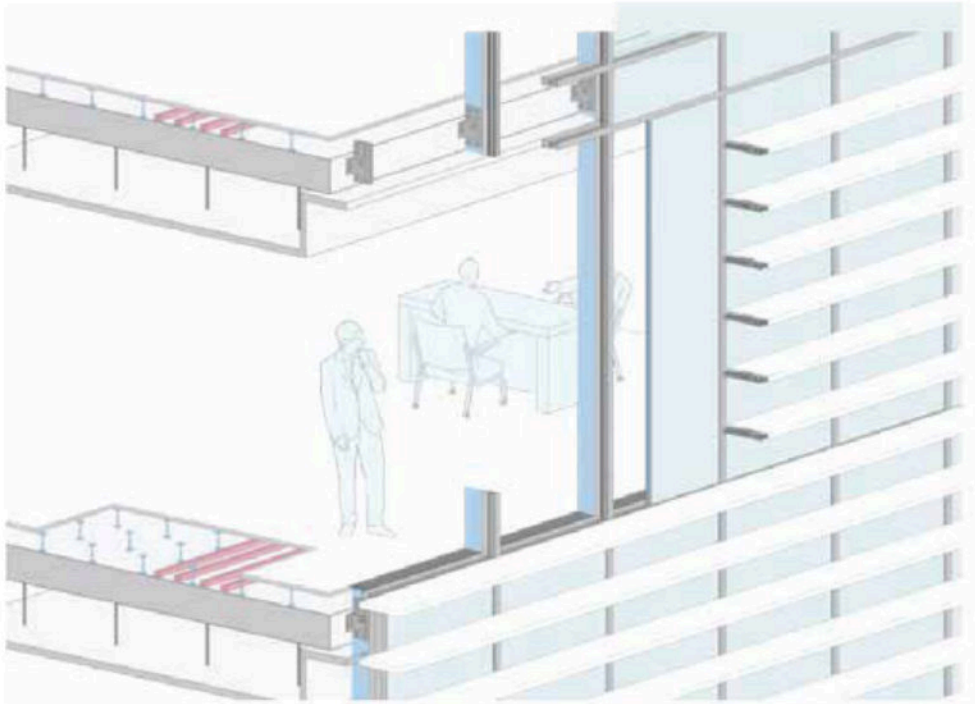
In our project, we have integrated the function of a traditional plaza into the building's internal design by incorporating an atrium. This atrium serves as a centralized gathering space for occupants and visitors, providing natural light and ventilation, and promoting social interaction and community building within the Building.

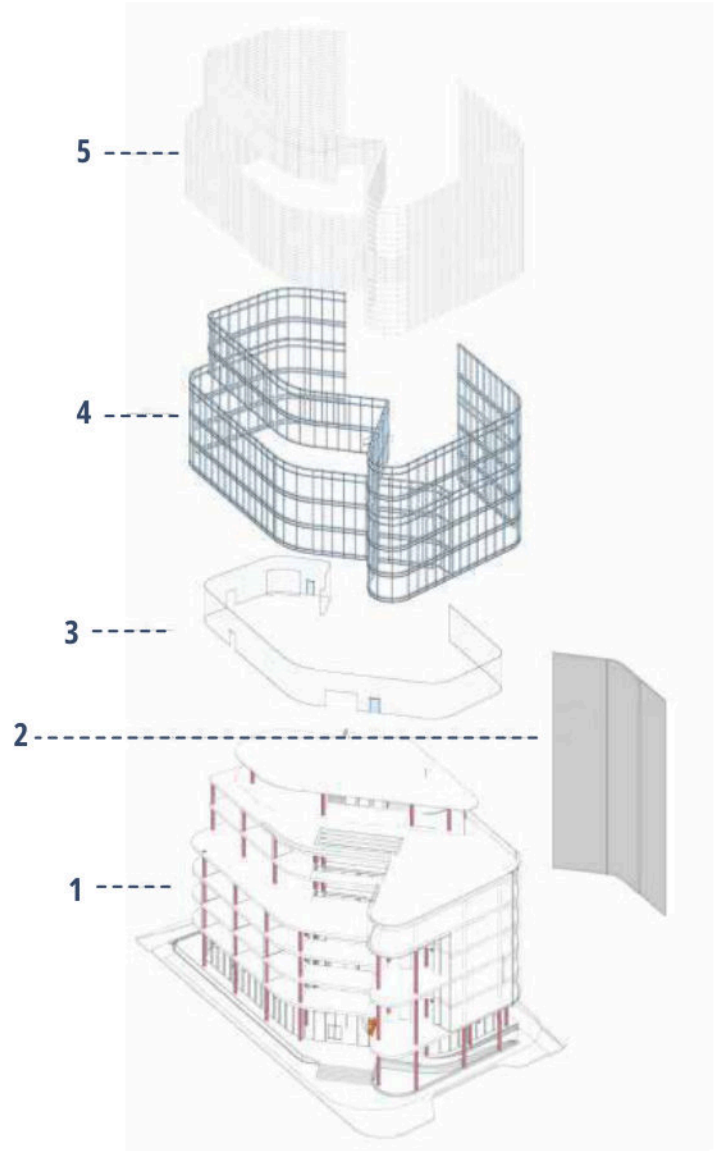
Tower

On the other hand, we have incorporated the tower typology through the use of a protruding cantilever that extends over the crossroad, thereby creating a striking visual presence that draws attention to the building and its location.









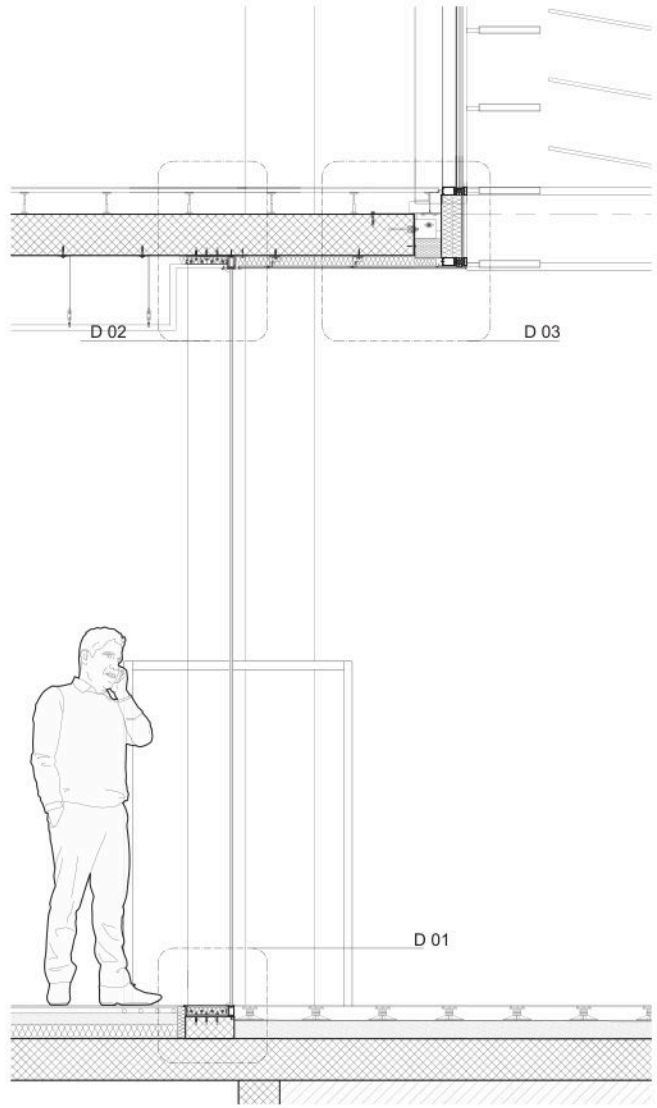
BUILDING COMPONENT

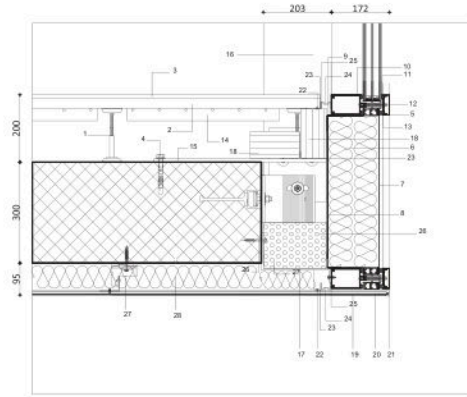
1. Building Structure- Post Tensioned Flat Slab to Column Structure
2. Opaque Facade- Aluminum Rain screen Cladding
3. Transparent Facade- Ground and Sixth Floor - Double Glazed Curtain Panel
First to Fifth- Triple glazed Curtain Panel
4. Part of the Transparent Facade -Aluminum Glass Fin Mullion and Transom
5. Shading System- Louvre System

02. OFF/ice

(Off Conventions, Off Consumption)

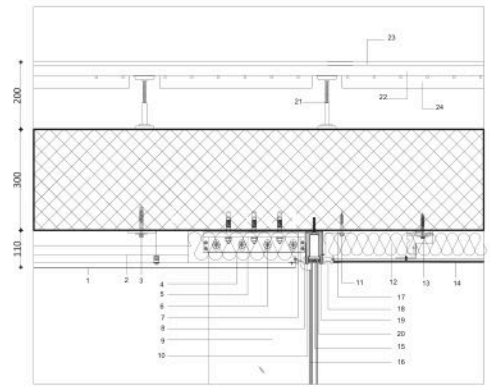
Office Building Design - Transparent Facade Design - Curtain Wall





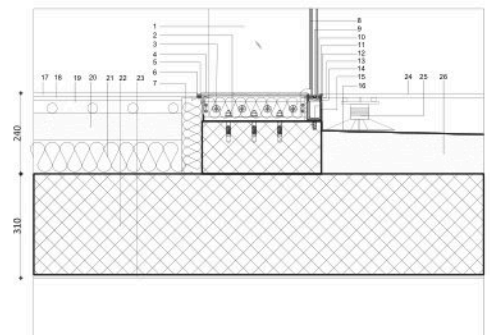
1. TATE LFFH Finish ready cavity floor system - Pedestal, 150 mm
2. TATE LFFH Finish ready cavity floor system - Access Floor Panels, 600x600x40 mm
3. TATE LFFH Finish ready cavity floor system - Wooden Finish Tiles, 600x600x40 mm
4. Anchor Bolt Halfen HB-BZ 12-15-35/110
5. ALUPROF Thermal insulation spacer 009279
6. 2 Layers XPS Extruded Polystirene Insulation 1200 x 2200 x 75
7. Polished Aluminium Panel Etalbond A2, 4 mm
8. Aluminium Panel Etalbond A2, 4 mm
9. Membrane 1 mm
10. Transom ALUPROF MB-SR50 A
11. Neoprene gasket ALUPROF MB-SR50 A 120487
12. Insulation ALUPROF MB-SR50 A
13. Pressure bar ALUPROF MB-SR60 A K417860X
14. Radiant Heating System, Dim: 570x570x37mm, with Ø8mm radiant tubes, Type: New Floor Radiafloor
15. Stainless steel plate 10 mm ISO 16286
16. Glass Mullion ALUPROF MB-SR50 A
17. Hot Rolled steel Z profile, 110 x 210 x 40 x 8 mm
18. Acoustic Insulation in Sheep Wool, 90mm thk, λ= 0.038 W/mK NRC= 1.05@100mm, Type: Thermafleece CosyWool
19. Anodised aluminium sheet
20. Permanently elastic joint
21. Anodised aluminium sheet
22. TEKS Plywood screw, 8 mm
23. ISO 657-1:1989, Hot-rolled steel equal-leg, 2 mm
24. CONSTRUCTION SPECIALITIES SF400 Expansion Joint
25. Butyl Tape
26. Fire-resisting mineral wool
27. Aluminium ceiling bracket for panel substructure
28. Rigid Thermal Insulation in Rock Mineral Wool, 80mm Thk. λ= 0.034 W/mK

Detail 03



1. Gypsum Board for false ceiling, 12.5mm Thk. and Finishing Render, 2mm Thk
2. Acoustic Insulation in Sheep Wool, 50mm thk, λ= 0.038 W/mK NRC= 1.05@100mm, Type: Thermafleece CosyWool
3. Aluminium Substructure for Suspended False Ceiling
4. ISOVER IBR K 4+ Fiberglass Insulation λ= 0.039 W/mK
5. Footplate and ALUMINUM STACKWALL CHANNEL, by Oldcastle BuildingEnvelope®
6. Threaded Rod GWS A4 M12 x 90 DIN 976-1
7. Setting block
8. CONSTRUCTION SPECIALITIES SF400 Expansion Joint
9. TEMPERED FIN GLASS (TBD) 300x40mm, by Oldcastle uildingEnvelope®
10. ALUMINUM STACKWALL CHANNEL, by Oldcastle BuildingEnvelope®
11. Anchor Bolt Halfen HB-BZ 8-10-20/70
12. Rigid Thermal Insulation in Rock Mineral Wool, 80mm Thk. λ= 0.034 W/mK
13. Aluminium ceiling bracket for panel substructure
14. Anodised aluminium sheet
15. Spacer block
16. Structural silicone by Oldcastle BuildingEnvelope®
17. Hot Rolled steel equal-leg angle ISO 657-1:1989; 80 x 80 x 8 mm
18. CONSTRUCTION SPECIALITIES SF400 Expansion Joint
19. Rod & Silicone by Oldcastle BuildingEnvelope®
20. Silicone by Oldcastle BuildingEnvelope®
21. TATE LFFH Finish ready cavity floor system - Pedestal, 150 mm
22. TATE LFFH Finish ready cavity floor system - Access Floor Panels, 600x600x40 mm
23. TATE LFFH Finish ready cavity floor system - Wooden Finish Tiles, 600x600x40 mm
24. Radiant Heating System, Dim: 570x570x37mm, with Ø8mm radiant tubes, Type: New Floor Radiafloor

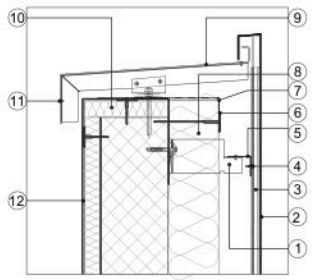
Detail 02



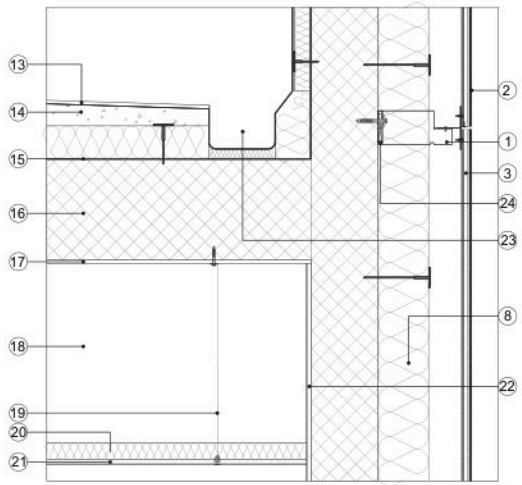
1. TEMPERED FIN GLASS (TBD) 300x40mm, by Oldcastle uildingEnvelope®
2. Footplate and ALUMINUM STACKWALL CHANNEL, by Oldcastle BuildingEnvelope®
3. ISOVER IBR K 4+ Fiberglass Insulation λ= 0.039 W/mK
4. Steel plate 220 x 8 mm
5. Rod & Silicone by Oldcastle BuildingEnvelope®
6. Expansion Joint
7. XPS thermal insulation boards
8. Structural silicone by Oldcastle BuildingEnvelope®
9. Spacer block
10. Rod & Silicone by Oldcastle BuildingEnvelope®
11. Fastener and anchor
12. Silicone by Oldcastle BuildingEnvelope®
13. Expansion Joint
14. Setting block
15. ALUMINUM STACKWALL CHANNEL, by Oldcastle BuildingEnvelope®
16. Waterproofing Membrane, 3mm Thk.
17. Parquet Natural Wood Flooring, Dim: 280x70x10mm
18. Tile Adhesive for Flooring, 10mm Thk.
19. Radiant floor heating system with Dry Screed and Crosslinked Polyethylene Tubes with Ø10mm, Type: Upono Radi Pipe
20. Dry Screed for Plants System, 80mm Thk.
21. Thermal Insulation in Extruded Polystyrene (XPS), 100mm Thk, λ= 0.033 W/mK, Type: Climafoam Extruded Polystyrene (XPS) Board
22. Reinforced Concrete Slab, 300mm Thk.
23. Plaster Board finish, 10mm Thk
24. Natural Stone Tiles, 600x600x10mm
25. Adjustable Paving Support, Dim: Adjustable ht. from 28-550mm, Type: New Floor SE
26. Sloping Screed with slope 1.5%

Detail 01

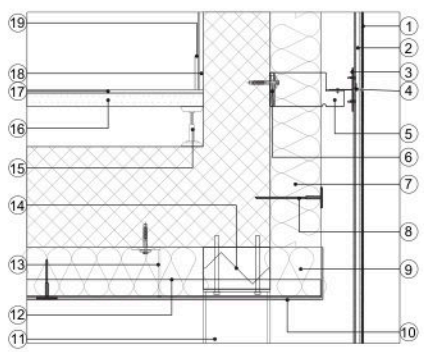
02. OFF/ice
(Off Conventions, Off Consumption)
Office Building Design - Opaque Facade - Aluminum Rain screen Cladding

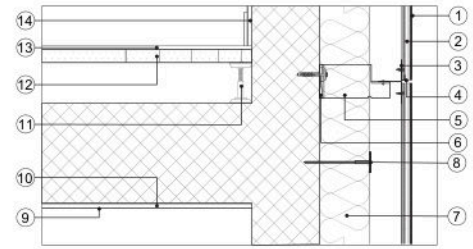


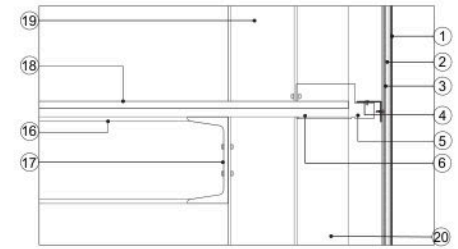
RAINSCREEN CLADDING ROOF DETAILS
1. Wall Bracket (210X100X4)
2. ALUCOBOND ACP Panel
3. ALUCOBOND Easyfix Profile 135-135
4. EJOT self drilling screws
5. L- Profile 60X60X4
6. Polypropylene Anchors with 60mm dia to fix Insulation
7. EPDM water proofing 3mm thk.
8. Rigid Thermal Insulation in Rock Mineral Wool, 150mm Thk.
9. ALUCOBOND ACP Panel
10. XPS Polystyrene Insulation, 50mm Thk.
11. Aluminium Blind Rivet
12. ETICS system with 5mm base coat and 2mm finish
13. Terracota Roofing Tiles 300X200X10 mm
14. 50mm Screed with 2% slope
15. Vapour Barrier Membrane 3mm thk.
16. Concrete slab 300mm thk.
17. 10 mm finishing plaster
18. 530mm Air Gap
19. Aluminium Substructure for suspended false ceiling
20. Thermal Insulation in Sheep Wool, 50mm thk.
21. Gypsum Board for false ceiling, 12.5mm thk with 2mm finish
22. Plaster Board, 12.5mm thk. with 2mm finish
23. Aluminium gutter 200mm dia
24. Thermal Stop for thermal separation of the wall bracket

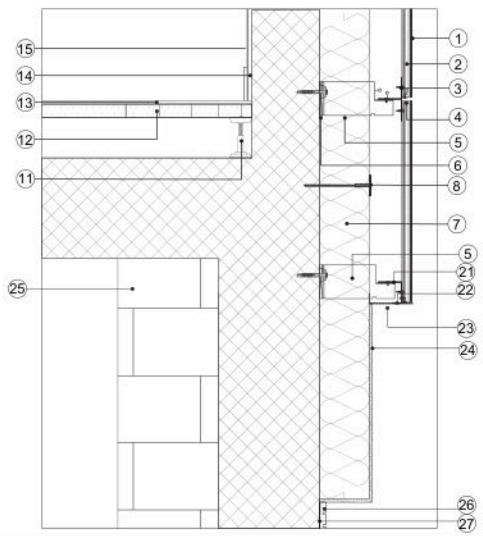


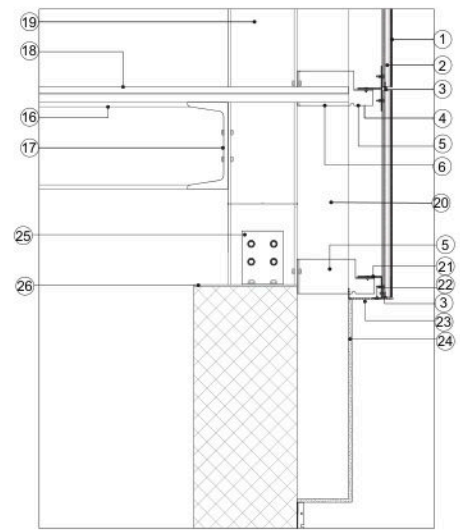
RAINSCREEN CLADDING ROOF DETAILS
1. ALUCOBOND ACP Panel
2. ALUCOBOND Easyfix Profile 135-135
3. Anodised Aluminium T- Profile 100X60X5
4. WURTH Gefu Screw M 4-16
5. Wall Bracket (210X100X4)
6. Thermal Stop for thermal separation of the wall bracket
7. Rigid Thermal Insulation in Rock Mineral Wool, 150mm Thk.
8. Polypropylene Anchors with 60mm dia to fix Insulation
9. XPS Polystyrene Insulation, 150mm Thk.
10. ETICS system with 5mm base coat and 2mm finish
11. Double T section, 200X100mm, Base structure for ACP Cladding
12. Aluminium Substructure to hold insulation
13. Aluminium Substructure for suspended ceiling
14. Armatherm Thermal Break, 150mm Thk
15. Steel Pedestal, 120mm high
16. Access Floor Panel, 40mm thk
17. Ceramic Tiles Flooring, 10mm thk
18. Plaster Board, 12.5mm thk. with 2mm finish
19. Ceramic Tiles Skirting, 100mm high









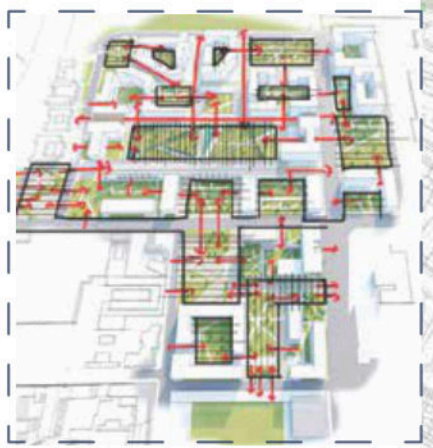


RAINSCREEN CLADDING TO INTERMEDIATE AND GROUND FLOOR DETAILS
1. ALUCOBOND ACP Panel
2. ALUCOBOND Easyfix Profile 135-135
3. Anodised Aluminium T- Profile 100X80X5
4. WURTH Gefu Screw M 4-16
5. Wall Bracket (210X100X4)
6. Thermal Stop for thermal separation of the wall bracket
7. Rigid Thermal Insulation in Rock Mineral Wool, 150mm Thk.
8. Polypropylene Anchors with 60mm dia to fix Insulation
9. 2mm Ceiling Finish
10. 12.5mm Plasterboard
11. Steel Pedestal, 120mm high
12. Access Floor Panel, 40mm thk
13. Ceramic Tiles Flooring, 10mm thk
14. Plaster Board, 12.5mm thk. with 2mm finish
15. Ceramic Tiles Skirting, 10 cm high
16. Secondary C channel 250 mm
17. Steel Angle
18. Steel Grid Landing
19. I section Substructure 200x100mm
20. Air Cavity 100mm
21. Anodised Aluminium L- Profile 60X60X5
22. Anodised Aluminium L- Profile 30X30X5
23. Perforated Metal Sheet for Ventilation and Insects
24. ETICS system with 5mm base coat and 2mm finish
25. Steel Anchor
26. Steel Plate

03. THE HUB
Social Housing

Location - Milan Viale Molise/ Via Lombroso , Milan Housing Project
Competition - Re - inventing cities
Course - Sustainable Multidisciplinary Process Studio

The Ex Macello site is a neglected area spanning around 15 hectares, the site of the communal slaughter house and of the poultry and rabbit market in the real estate compendium of the Milan wholesale market. Situated in the southeast precinct of the city, in the district of Calvairate in Municipality 4, the area is a stone's throw away from the Milan Porta Vittoria station, which is served by the suburban lines that link the metropolitan area to the city centre through the railway link. The proposed urban design takes the DESIGN CHALLENGE of this specific project which is to activate the site by injecting Multi- Functional Spaces that activate the Diversity of the site integrating with the existing functions and Open spaces. The Concept of the Local Master plan was thus to make the Ex-Macello site to be a synergy space an interactive transition space between the Private (Residential) to the Public (General Market).



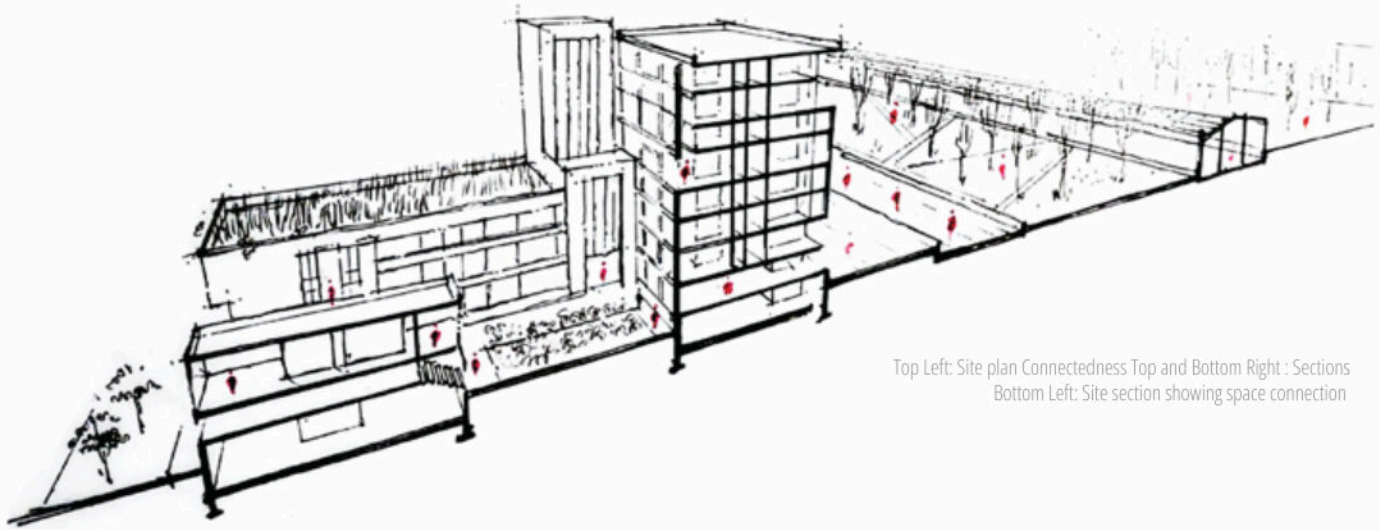
Urban Design : Local Master plan Ex-Macello
Left: Interconnectedness concept

03. THE HUB
Social Housing

The Urban morphology and extended paths that connect the existing site paths into the Ex-Macello site both Visually and Physically were studied. Extending the Green Network into Milan was one bold move that could make the Ex-Macllleo site interactive at a bigger scale.

Within the site, a Semi Private and Semi-Public functions are proposed in almost all ground level of the blocks. We proposed Reading spaces, Cultural shops, Cafeterias, Pizza Shops. As a whole we proposed a residential housing to the east side near to the Public (Market) and fully public (Commercial) buildings on the west side at close proximity to the residential. So that way we increase the diversity of different types of uses into our site.

The inside of the site is to be vehicle free to pursue the low carbon mobility challenge. The access to the parking of the residential and social housing has been kept out of the inside of the site by putting out all the blocks to the edges of the site.



Top Left: Site plan Connectedness Top and Bottom Right : Sections
Bottom Left: Site section showing space connection

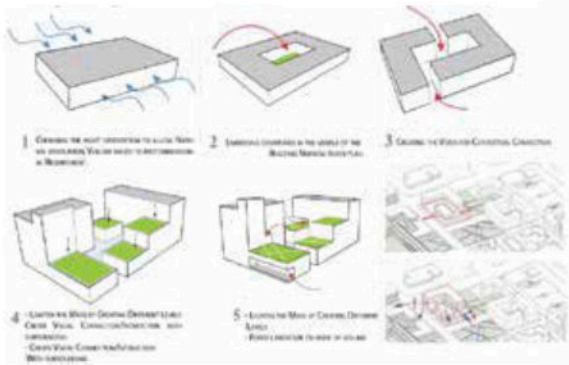
For the façade we added solar protection elements made of stainless steel mesh, It serves as protection against sunlight, reduces the thermal load, and guarantees natural air circulation, which has a positive impact on energy efficiency by lowering the need for air-conditioning. Meshes give architecture a new look. Mesh facade acts as an effective privacy and sun screen.

They give protection from the sun while reducing the need for cooling energy. An evergreen that protects the façade from wind flow, snow and rain in winter seasons, which can be relevant especially in temperate climates .In a second case scenario, where an indirect greening system is applied, vegetation is supported by cables or meshes.f

3D Rendering - Form Composition

03. THE HUB
Social Housing - Ground Floor Plan

When developing the Architectural Design of the building, we started by following up the paths and Greens developed on the master plan. We developed the form by first allowing POROSITY into the specific social housing site. (Human Scale). We raised Volume to meet Dimensional Requirements. Our Concept is Synergy, so we interlocked Volumes, to Maximize view into site.



In the building starting with the roof we used Photovoltaic Panels for using the solar radiation in electricity drainage surface that collect rain water and reuse it in the irrigation, green roof in some part of the building which reduces heat gain in summer by 87% and heat loss in winter by 37%, the green roof also used for food production.

Ground Floor Plan Layout

Five tyoe of Unit Layout

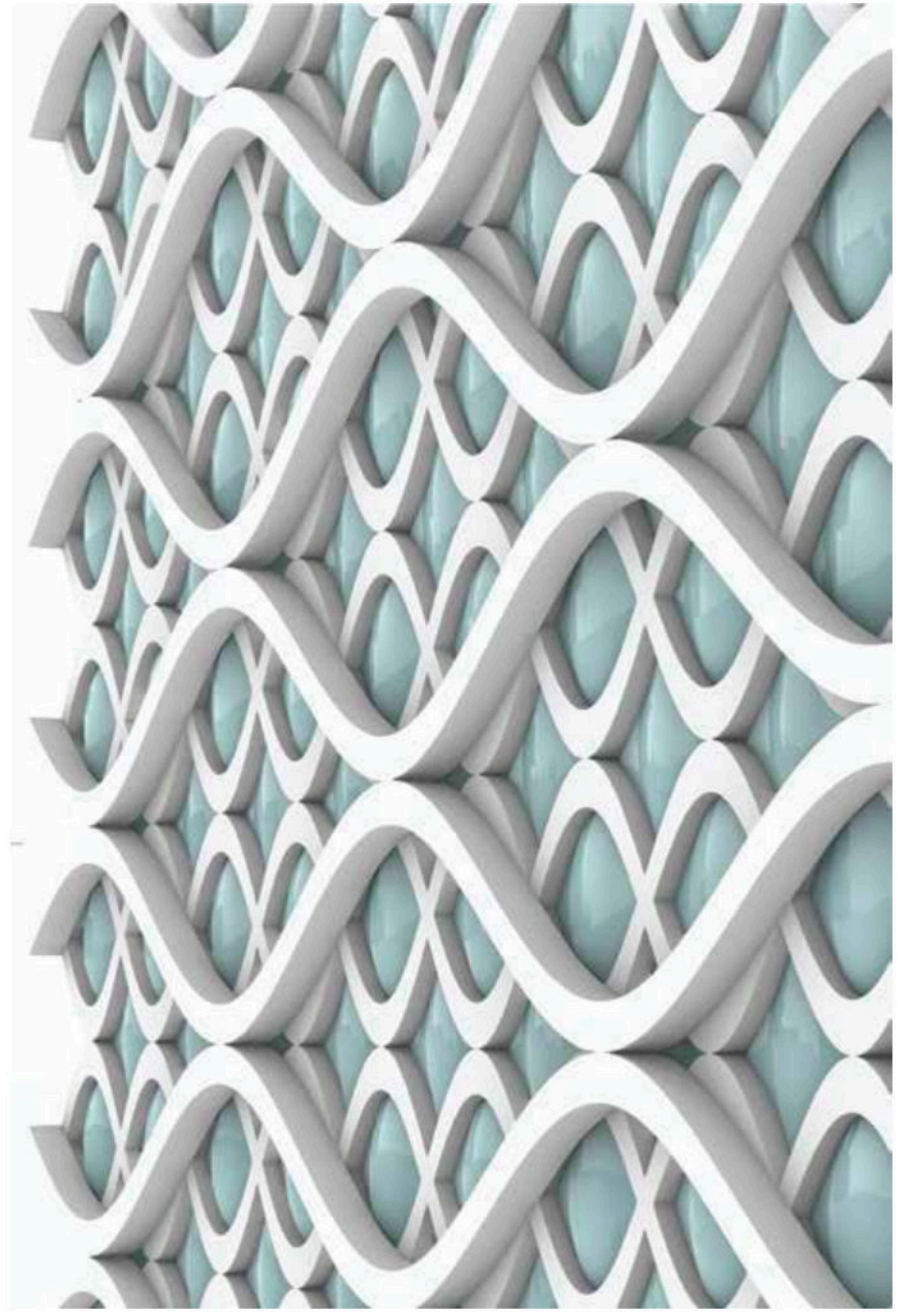
First Floor Plan Layout

04. SOLACE

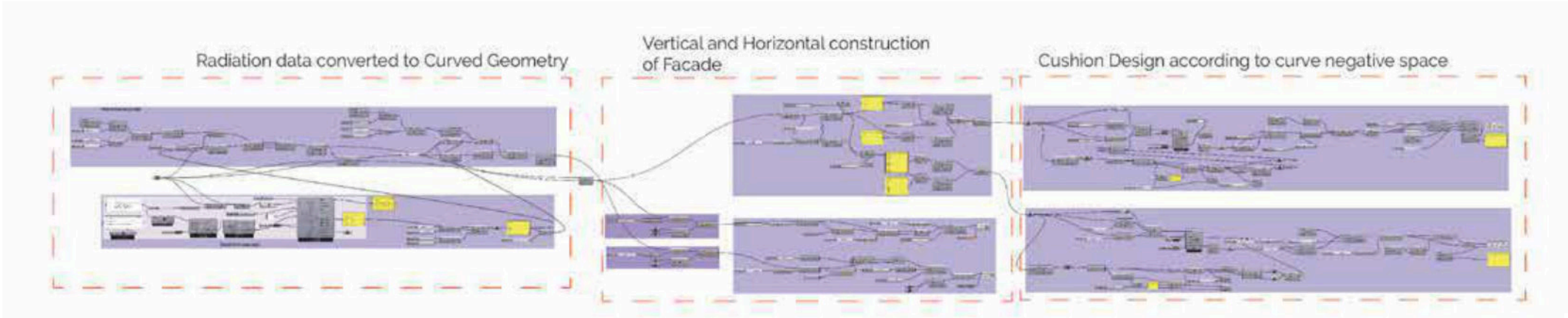
Facade Design (Robot Aided Additive Manufacturing Technology)

Location - Via Adamello,11 , Milan
Client - Client Ideal
Course: Adaptive Façade Studio 2022
Professor: Pierpaolo Ruttico

The objective of the studio is to create a façade that converses with the urban morphology but as well functions much more than a facade. Like most locations, buildings in Milan are significantly impacted by solar radiation compared to other environmental parameters such as humidity or wind for example. Hence, solar radiation is selected as a design element. The name SOLACE thus came to be the name of the project from combining the terms solar radiation and interlace. But the terms also according to Meriam Webster dictionary means comfort or consolation in a time of distress or sadness, which is fitting to what the façade is meant to do for the office residents. The concise behind the facade concept is to develop a geometry definition managed with a parametric modeling approach.



04. SOLACE
Facade Design
(Robot Aided Additive Manufacturing Technology)

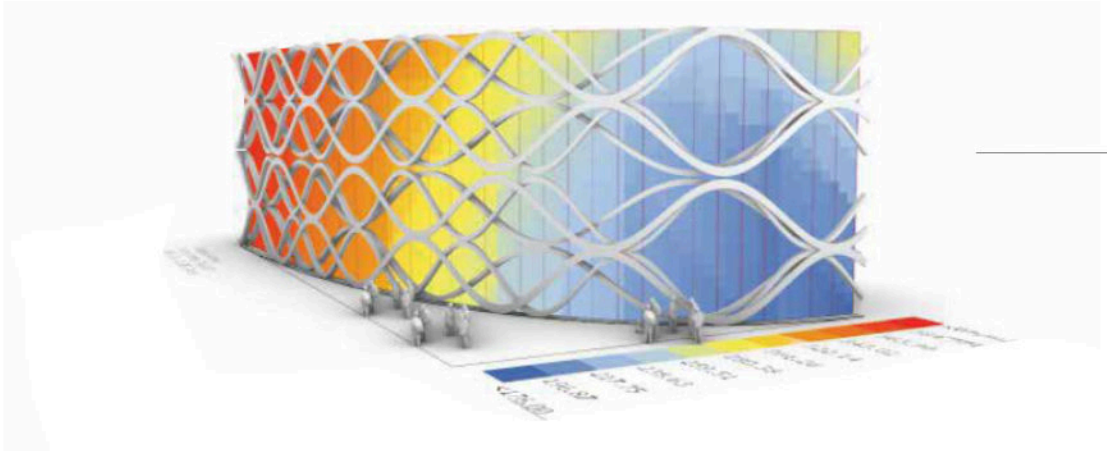


Design Process

Input
Site Analysis
Solar Radiation

Output
Different Frequency of Sine Curve on Different Sides
(Different Modules)

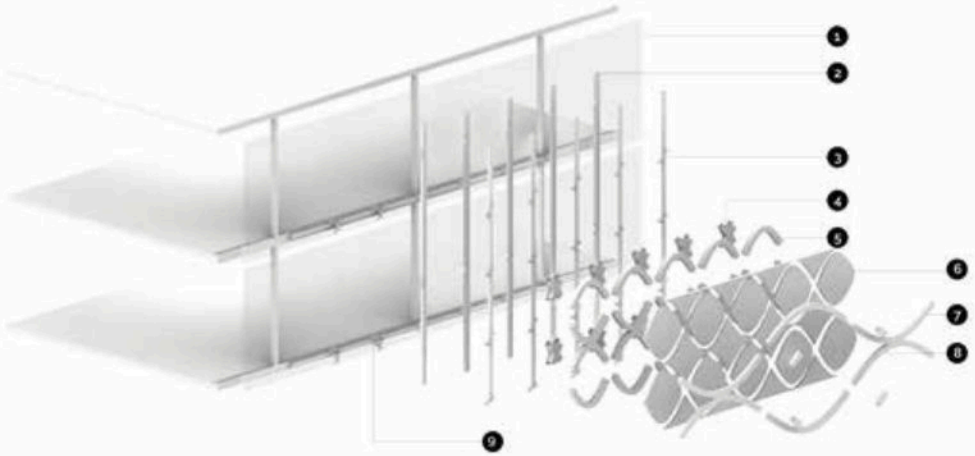
In the project, genetic algorithm optimization according to the properties of a sine wave were used to define the transparent to opaque size and their frequency to minimize solar radiation entrance during year while maintaining a good outdoor view. In orientations of the facade that receives low annual radiation, sine waves that have higher frequency are chosen during design optimization to allow grand entry of sunlight and warm the space specially during winter while in the parts of the facade where low annual sun radiation has been registered lower frequency of the waves are used to protect the building from high heat intake that results in increased energy consumption related to air conditioning and humidity moderation.



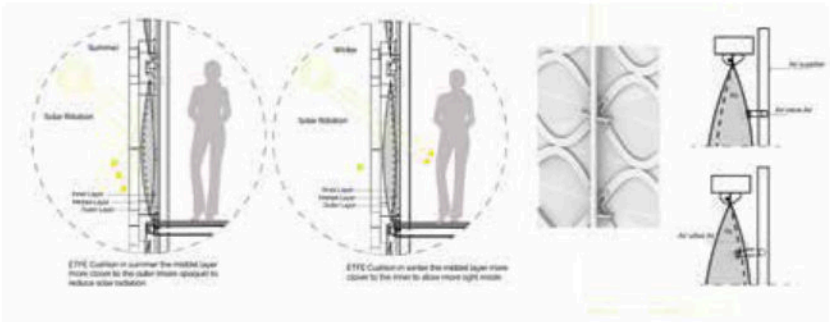
Computational Tools

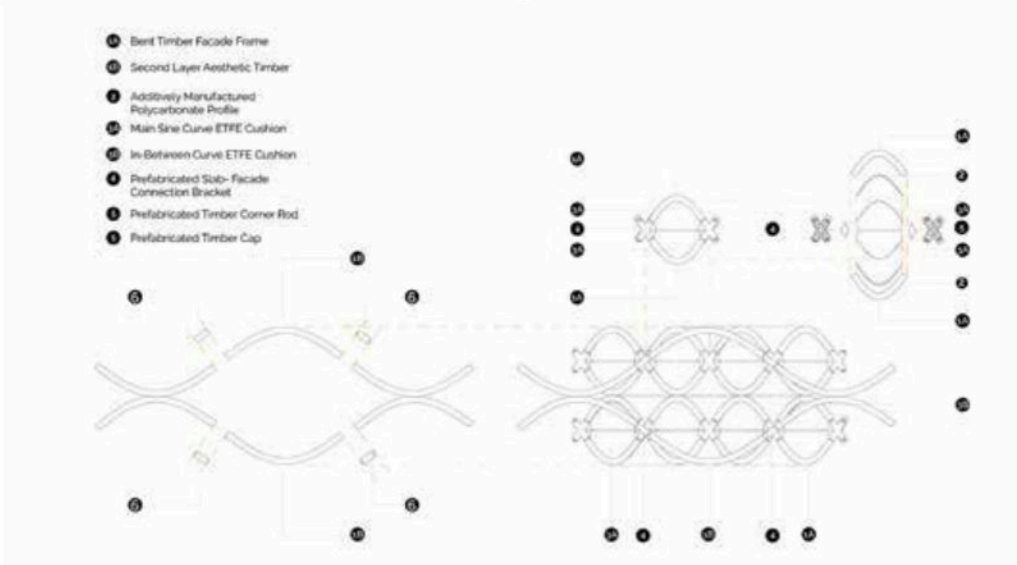
-Model the curves in desired Floor Plan
-Observe behavior of double curved cushion in curved profiles.
- Observe how curved geometries behave on facades

04. SOLACE
Facade Design
(Robot Aided Additive Manufacturing Technology)



1. Clear Glass for Intact Thermal Insulation
2. Steel mullion with C cross section
3. Air tube for ETFE inflating
4. Prefabricated joint (Laminated wood piece factory assembled)
5. Prefabricated joint (Laminated wood piece factory assembled)
6. Double ETFE Cushion
7. Second Layer Timber Bent Frame
8. Prefabricated joint (Laminated wood piece factory assembled)
9. Concrete cantilever slab with Thermal Insulation

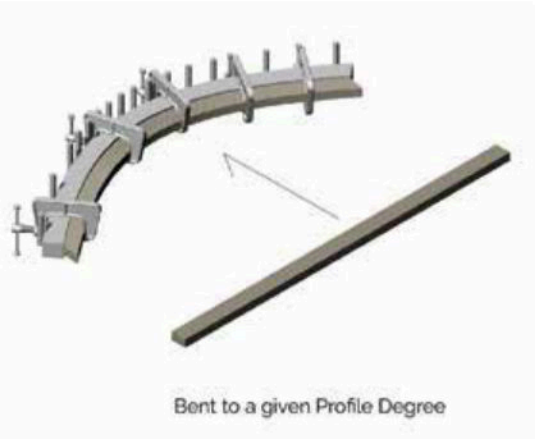




- Bent Timber Facade Frame
- Second Layer Aesthetic Timber
- Additively Manufactured Polycarbonate Profile
- Main Sine Curve ETFE Cushion
- In-Between Curve ETFE Cushion
- Prefabricated Slab- Facade Connection Bracket
- Prefabricated Timber Corner Rod
- Prefabricated Timber Cap

Th project is employing multiple layer installations, three multiple layers of ETFE foils are assembled to create a cushion with air pockets in between the layers. This comprises the transparent part of the facade while bent timber is used as the opaque part of the facade. The peculiar part of this project is that it uses robot aided additive manufacturing of thermo-plastic filament a polycarbonate profile in place of an extruded aluminum profile as a connecting detail between an opaque and transparent element of a facade.

Additive Manufacturing is a green and novel technology which develops a product layer by layer and is an emerging and an exponentially progressing field for both industrialists as well as for researchers. (Next Page)

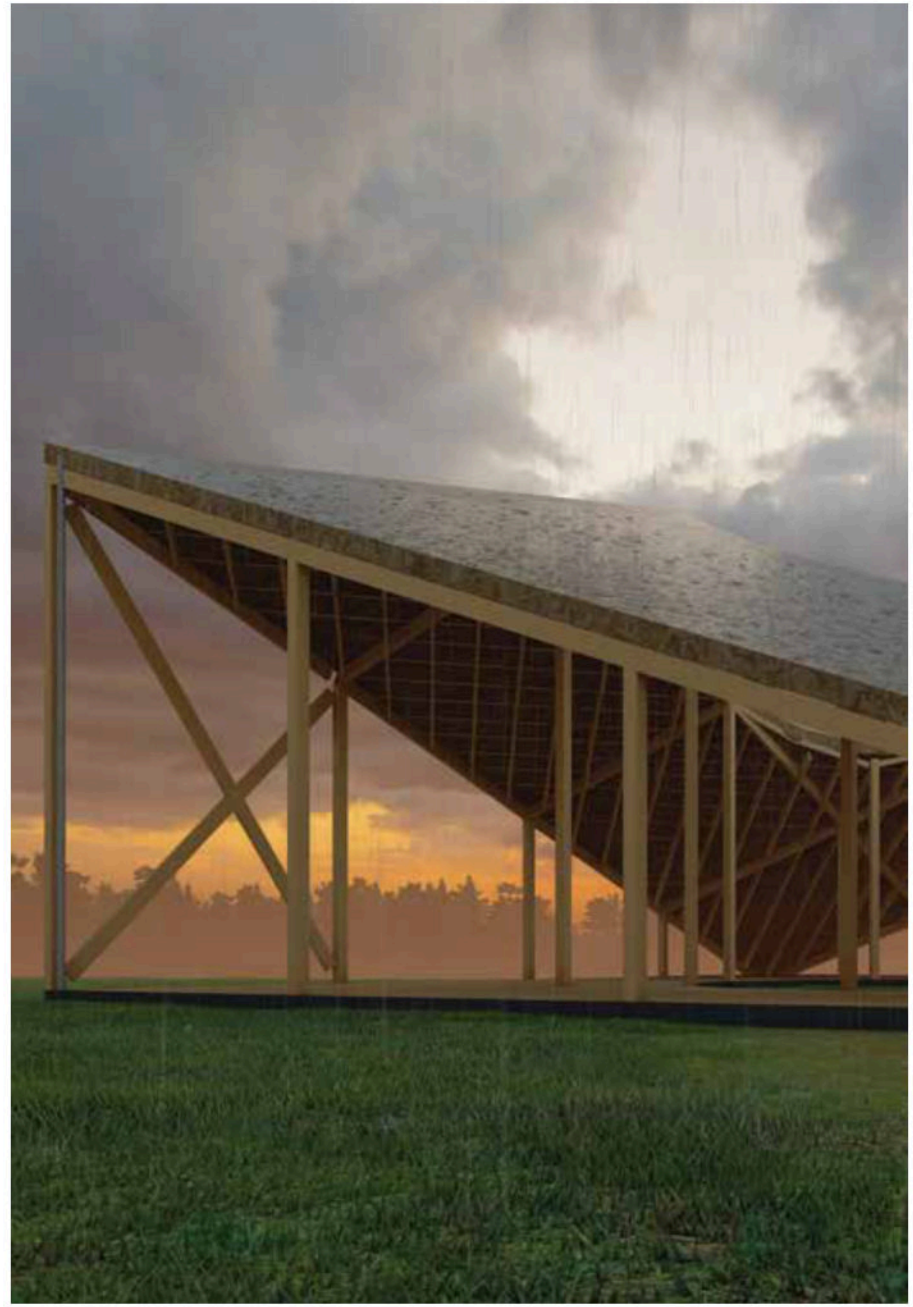


Bent to a given Profile Degree

05. Healing Pyramid
Children House Design

Location - Baghere, Senegal, Africa
Client - Humanitarian programme
Kaira Looro Architecture Competition 2022
In Collaboration with - Solomon Tamiru Tesfaye

The architectural outcome of the competition, named 'Children's House,' aims to combat child malnutrition through various initiatives. These include the provision of nutritional materials, the implementation of hygiene and healthcare awareness programs, the facilitation of pediatric and social care appointments, accommodation for at-risk patients, and the training of community nurses. These nurses will educate local families on preventive measures and nutrition best practices. The design concept draws inspiration from an anonymous quote: 'A good physician treats the disease; the great physician treats the patient who has the disease.' This philosophy gave rise to the title 'Healing Pyramid'. A person that is hurting doesn't need to be reminded that he/she is hurting, it is a lot more crucial when he/she is just a child.



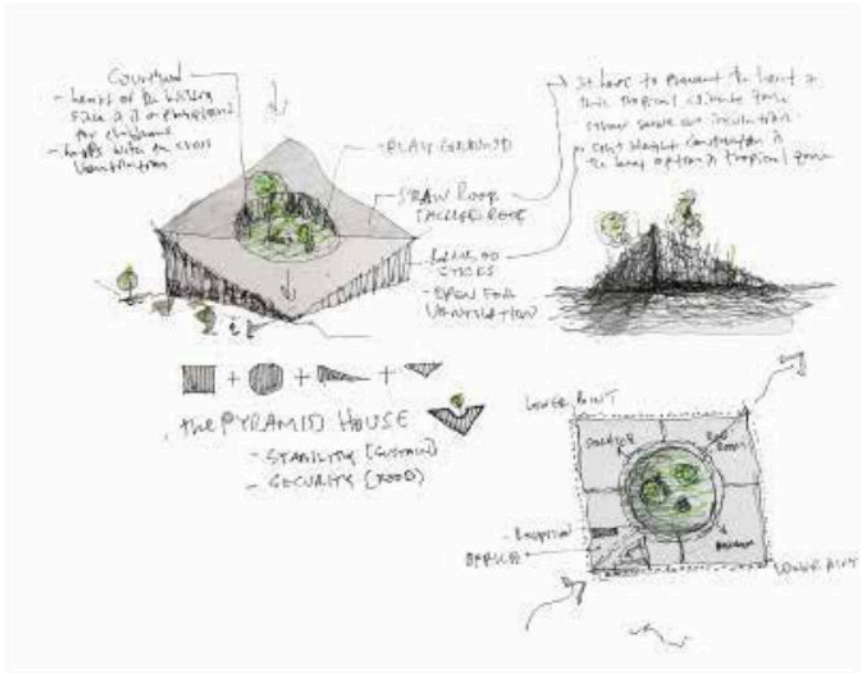
kaira looro competition | healing pyramid | 2022

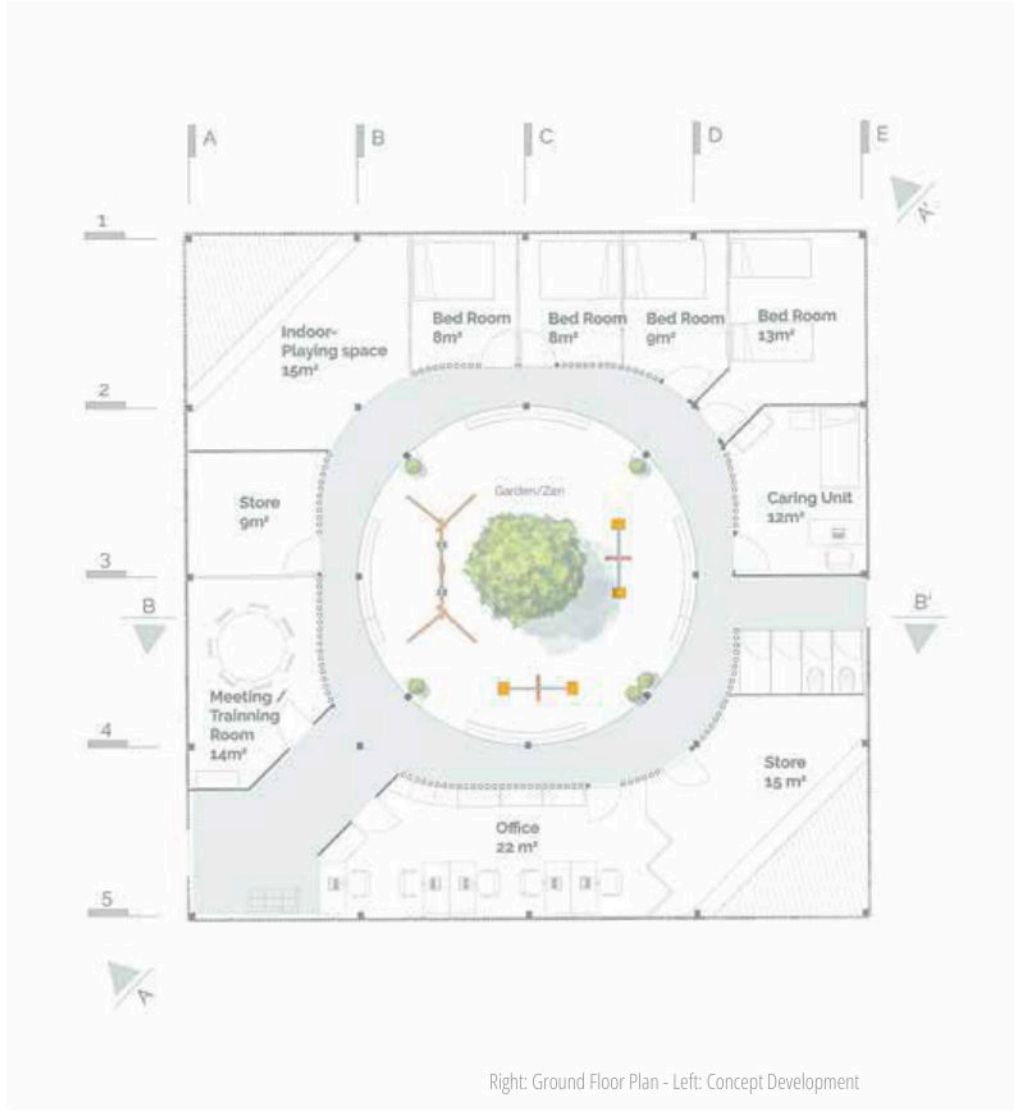
05. Healing Pyramid
Children House Design

The Senegalese way of life is close to Earth and Nature, which can be used in reverse to heal the children that reside in the house. A full circle is usually used in most African settlements to define functions, perform activities and arrange spaces. This concept is used as an initial inspiration to arrange the spaces in this design. It is then inscribed in 16*16 meters square geometry from the outside.

The Circular Garden found at the center is the heart of a Zen space created that Integrates with traditional aesthetics and spatial artistic concept where the children will recognize the strong inclined colorful walls that surrounds them and protects them while they play inside in the green garden.

A person that is hurting doesn't need to be reminded that he/she is hurting, it is a lot more crucial when he/she is just a child. Nature is a proven stress reliever, being close to nature heals the mind and the soul.





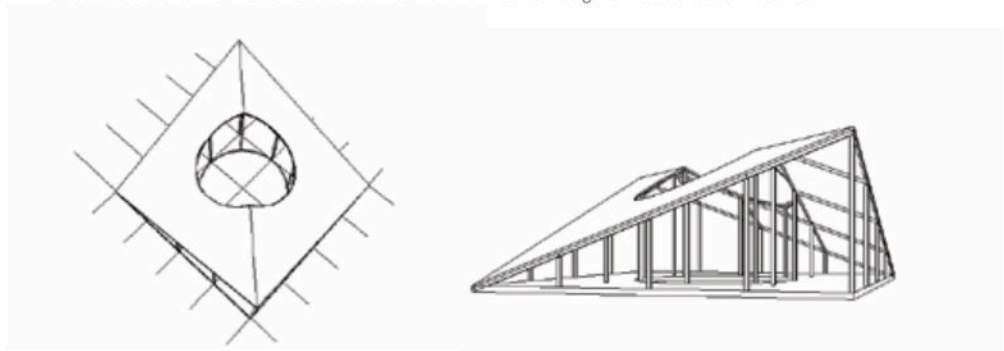
Right: Ground Floor Plan - Left: Concept Development

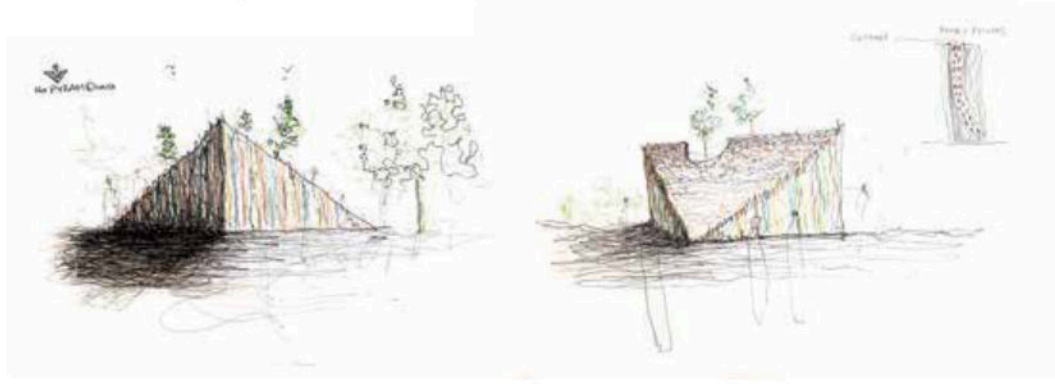
05. Healing Pyramid
Children House Design

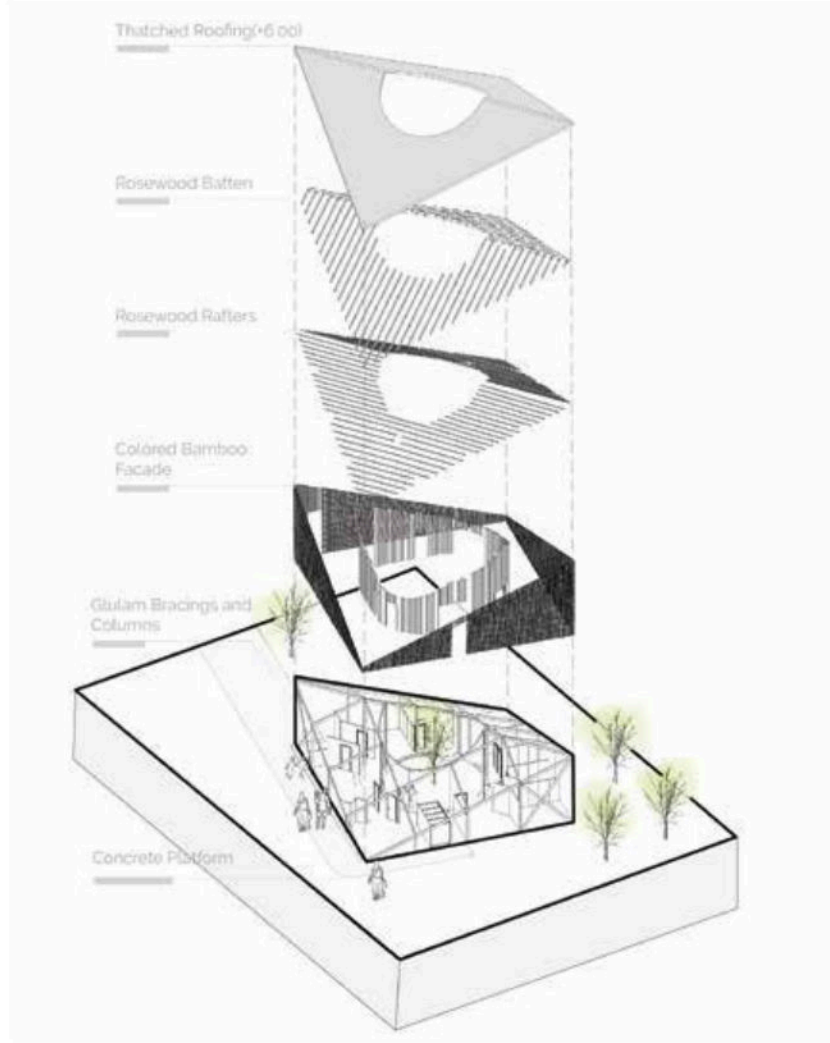
The overall pyramidal geometry that can be seen from the outside is the exaggeration of the use of inclined thatch roofs in indigenous African vernacular architecture including Senegalese Architecture. It is purposefully made to stimulate the eyes of the children, since at this stage they tend to recognize and get fascinated by shapes and geometries. A pyramid shape also symbolizes stability and grounded-ness, which we wish happens for the children that stay in the housing.

Local grown and harvested thatch is layered on top of a timber substructure providing a low cost and sustainable building solution representative of traditional construction techniques. Thatch is a seasonal product that has always been used in traditional house roofing. Maintenance is required and often in the laying method it is not possible to totally protect from the rain seasons. Wall structures are made to be flexible. Clay bricks will be formed on-site by local villagers, enhancing the participation of the local community in the construction of the student housing.

In Addition, a colorful wild bamboo screen is used on the outside to mark change in space and to decorate externally. Shells and pieces of Fabric are also used to decorate the wall elements, inside and outside. It has been tried to create a harmonic balance between human and nature through vernacular use of materials.







Building Components Exploded 3D Visualization

06. ZAYED NATIONAL MUSEUM

Public Amenity

Location - Al Saadiyat Island - Cultural District - Abu Dhabi United Arab Emirates
Client - UAE Department of Culture and Tourism
Status - Under construction*
Design by - Foster + Partners
BIM Consultants - 3-im Virtual Projects Consulting Company
Assumed Role - 3D- Modeling and Clash Detection

The Zayed National Museum's design is notable for its unique architecture, which reflects the country's cultural and environmental context. The design, created by the renowned architectural firm Foster and Partners, integrates modern architectural elements with traditional Arabian design motifs. With 1 Principal Architect, 2 Coordinators and 3 Modelers our task in 3-im was to prepare the fractal inorganic surface mound that serves as a man made landscape and a facade that encloses the podium. Our main goal was to use CAM technology to help with the fabrication of the exterior panels of the project.

*The technical details of this project confidential.

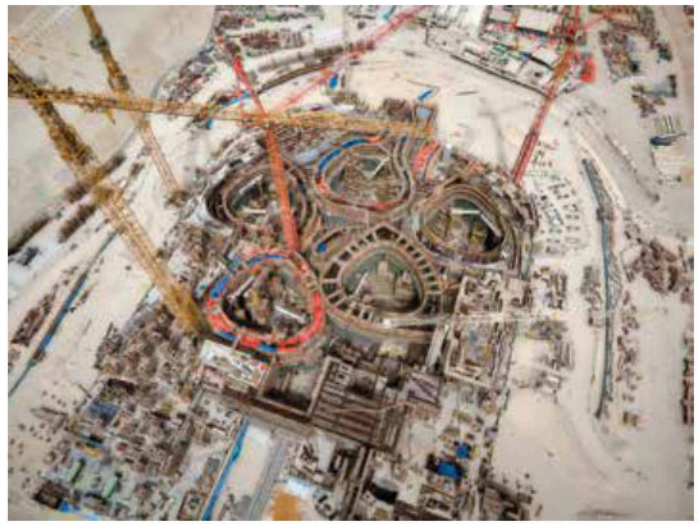
Zayed National Museum
Source: https://www.azernews.az/nation/178913.html

06. ZAYED NATIONAL MUSEUM

Public Amenity

In celebration of Sheikh Zayed's enduring legacy and his profound love for nature, the museum is nestled within a meticulously landscaped garden—a beautifully crafted, man-made mound. We encountered a particularly notable challenge in creating the detailed 3D model of the mound's exterior envelope, primarily due to its unique fractal geometry. What made this task especially demanding was the fact that all surfaces exhibited different vector orientations, meaning that adjacent surfaces did not lie on the same plane. This intricate aspect of the project required careful attention and articulation to ensure accurate representation and execution. (Fig 1).

We were in charge of preparing these surfaces to fabrication in alignment with the structural, sanitary and space designs which meant working in BIM Environment to avoid possible clashes.



Zayed National Museum Construction
https://www.akt-uk.com/projects/zayed-national-museum/

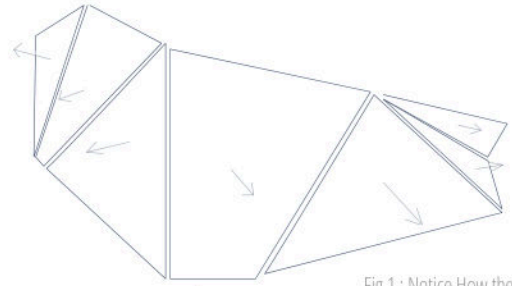
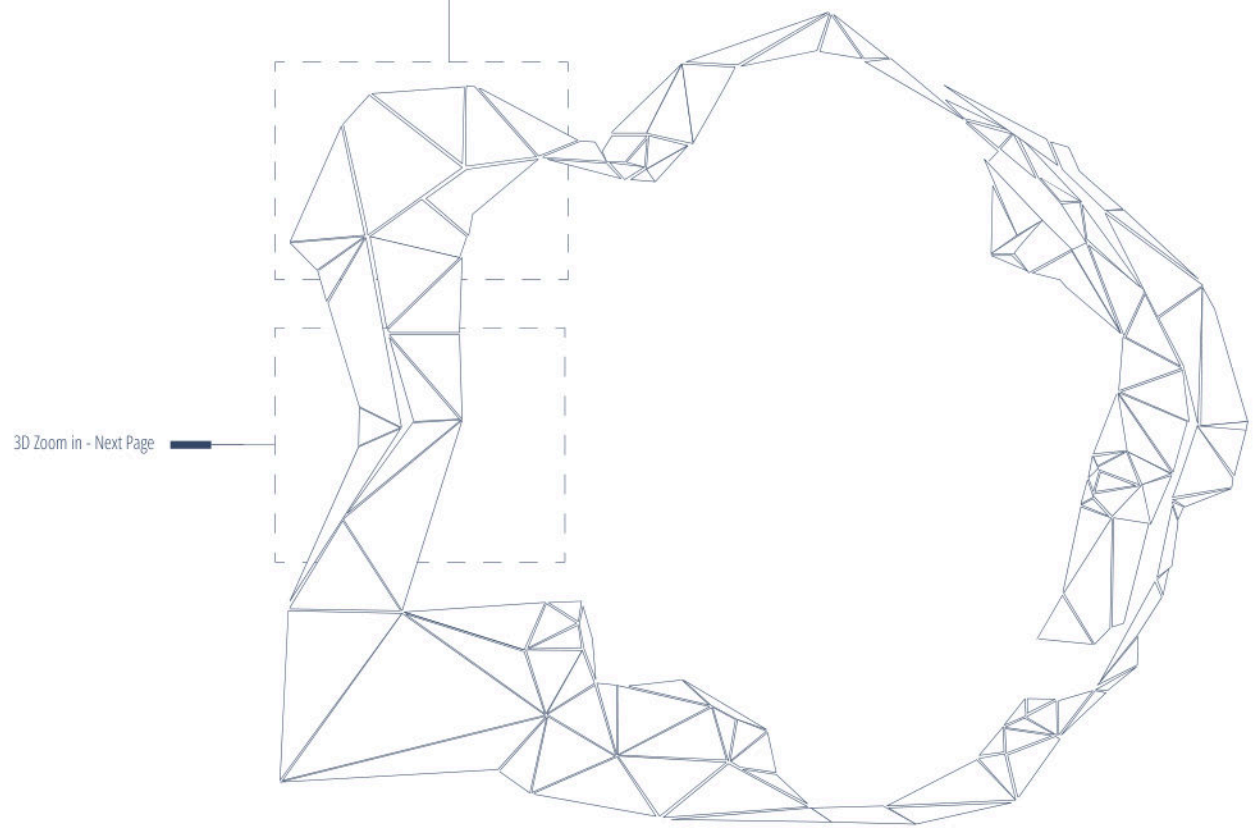


Fig 1 : Notice How the surfaces all are facing different

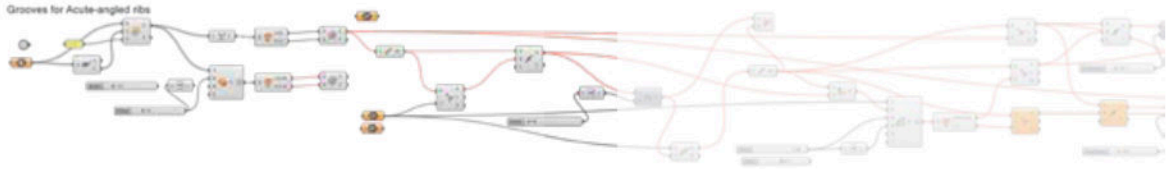


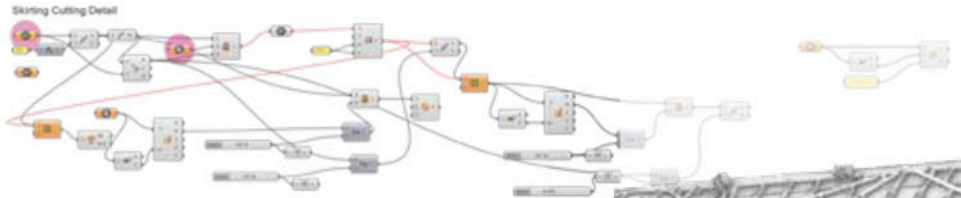
Zayed National Museum line representation of the man-made mound for the Landscape.

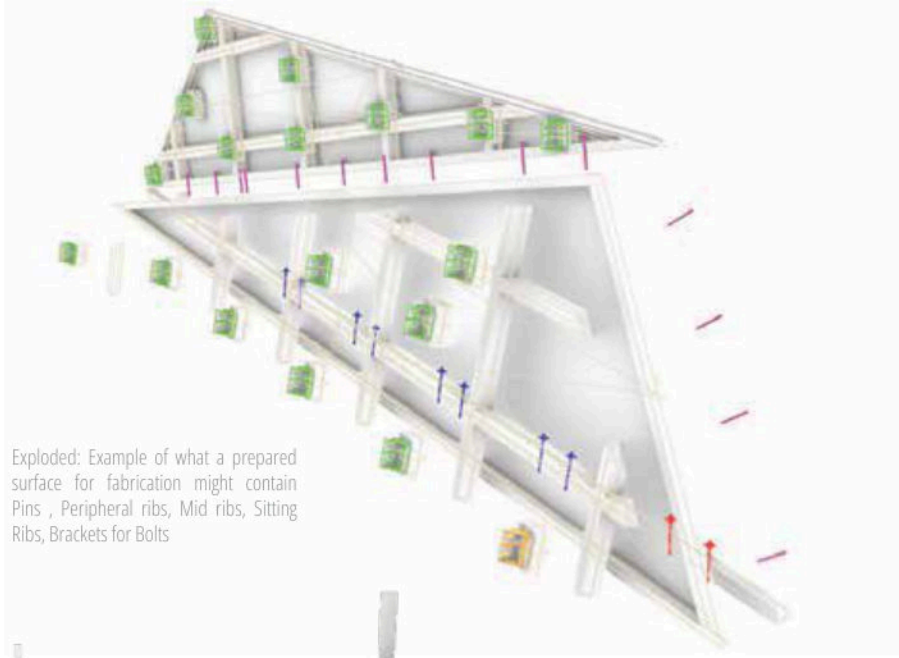
06. ZAYED NATIONAL MUSEUM

Public Amenity

Technologies Used:* Rhino Grasshopper, Human UI, Autodesk Navisworks, Rhino Inside, Revit, BIM 360



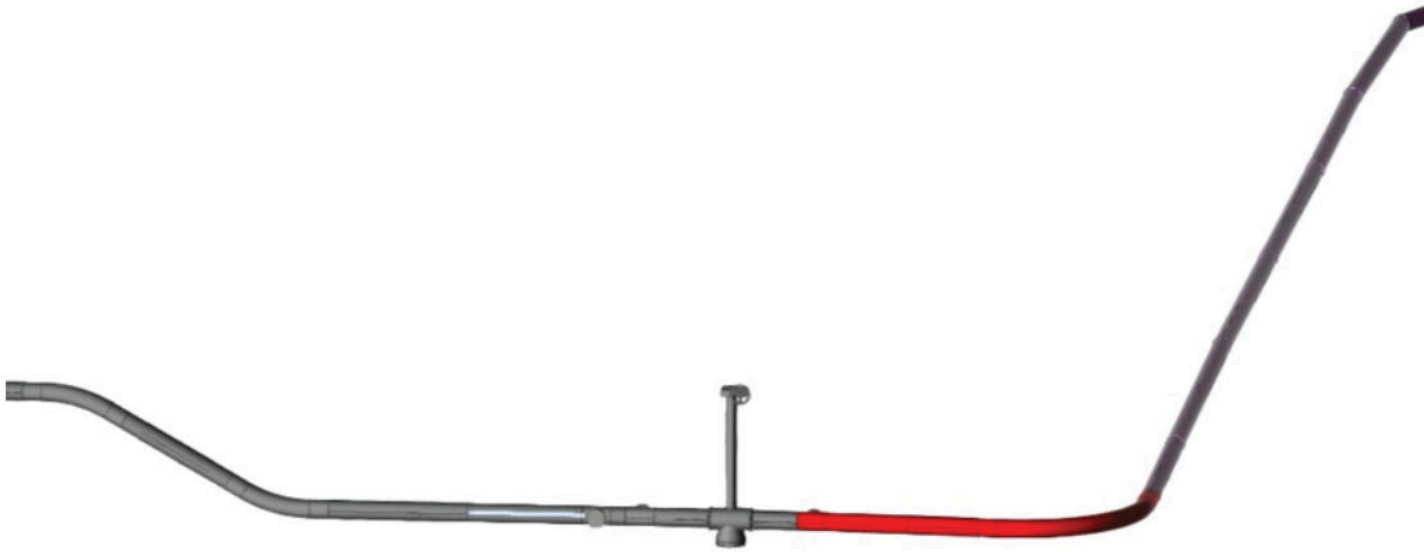




Exploded: Example of what a prepared surface for fabrication might contain Pins , Peripheral ribs, Mid ribs, Sitting Ribs, Brackets for Bolts

Challenges inherent in the project's unique fractal geometry were met head-on, requiring innovative problem-solving and creative solutions. Furthermore, efforts to enhance modeling efficiency and develop a user-friendly interface using the Human UI plugin ensured seamless collaboration within the team. Coordinating with contractors on structural design and leveraging Autodesk Navisworks for clash-free integration were pivotal in ensuring the project's structural integrity. Contributions extended to the detailed panel designs, respecting the original architectural vision while accommodating the complexities of fabrication. This collaborative effort spanned international boundaries, fostering synergy between teams in Italy and Abu Dhabi, ultimately translating Foster and Partners' visionary design into a tangible, clash-free model poised to stand as a testament to architectural excellence.

07. SNAM
Energy Infrastructure



Location - all through out Italy
Client - IBM - SNAM
Status - Existing
BIM Consultants - 3-im Virtual Projects Consulting Company
Assumed Role: Algorithm Developer, 3D modeller

SNAM, an energy infrastructure company headquartered in San Donato Milanese (MI), has been active in transportation, storage, and methane regasification since 1941. With the majority of their pipeline installations stored in either Excel or paper formats, their new initiative involves creating digital twins of all their installed pipelines. This strategic move promises significant advantages, notably ensuring a comprehensive understanding of the installed lines for maintenance purposes and beyond.

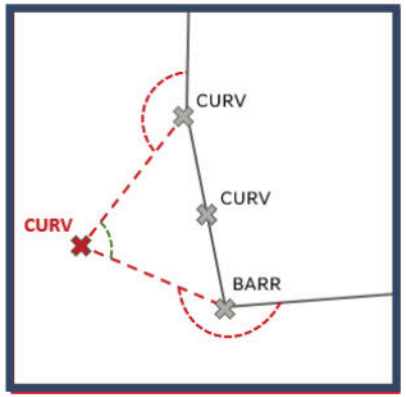
*The technical details of this project is confidential.

07. SNAM
Energy Infrastructure

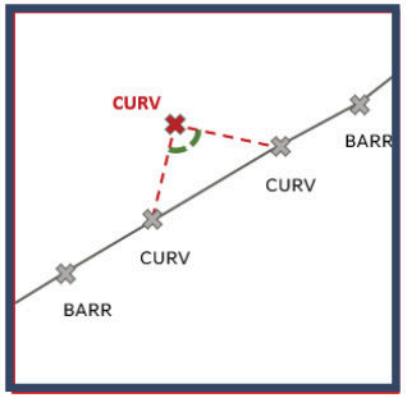
Given the diverse array of data types at hand, a tailored solution was imperative. Our focus shifted towards developing algorithms capable of organizing points based on provided coordinates, discerning the specific elbows utilized at various pipeline locations, and integrating data on element types to construct the pipelines. While this represents an ideal scenario, practical implementation encounters diverse situations where scripts may necessitate rewrites or adaptations. These adjustments become essential for anticipating and approximating potential human errors in recording or inaccuracies stemming from measurement tools.

CURV* - Elbow
BARR* - Pipes

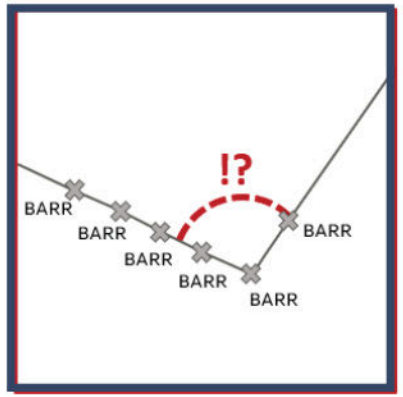
Inaccuracy in position of Elbow points



Inaccuracy in position of Elbow points

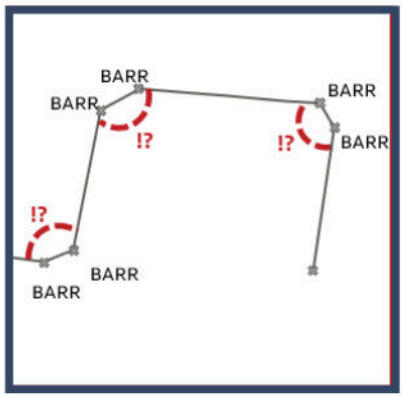


Wrongly recorded Curv (Elbow) point reading

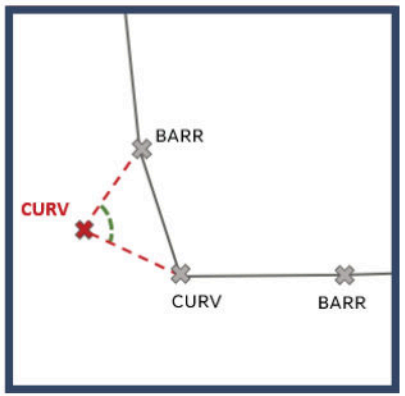


Forgotten (Elbow) point reading

CURV* - Elbow
BARR* - Pipes



Unavailable information for obvious Elbows



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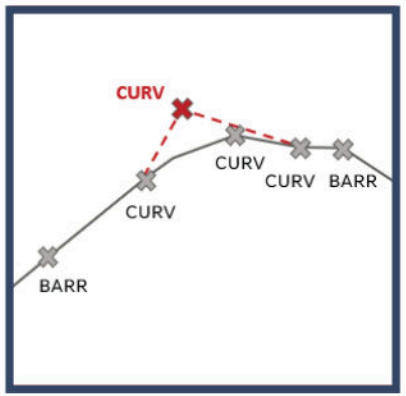
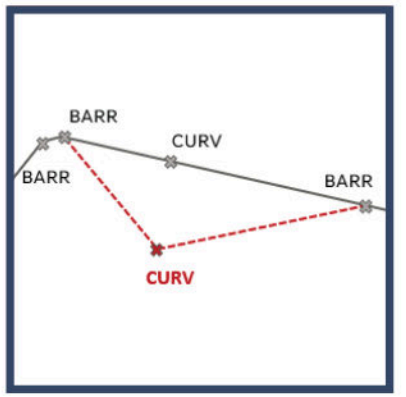
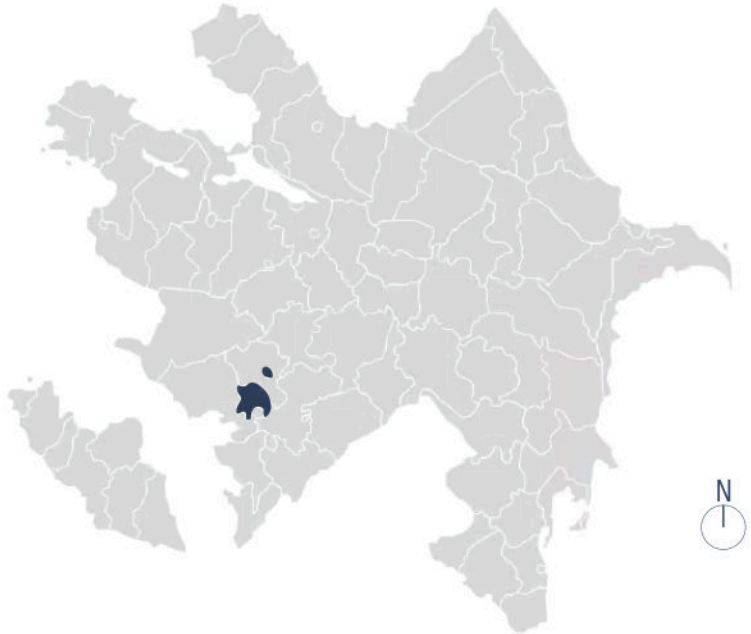


Unavailable information for obvious Elbows



Wrong information for obvious Elbows



08. SHUSHA MOSQUE
Public Amenity

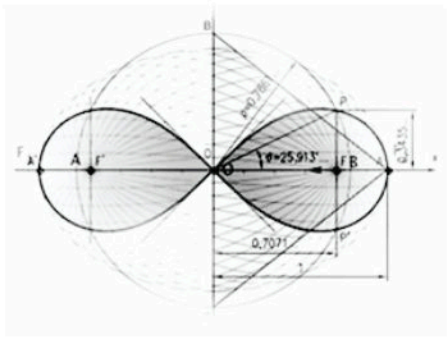
Location - Shusha, Azerbaijan
Client - Pasha Holding
Status - Under construction*
Design by - iDEAS in collaboration with Symmetrico

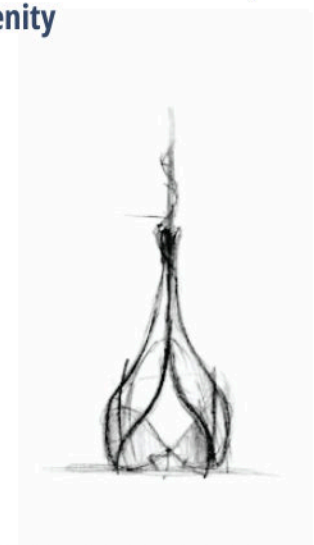
The initiative marked a significant event following Azerbaijan's victory in the second Armenia-Azerbaijan Nagorno-Karabakh War. The foundation stone for the mosque was laid on May 12, 2021, attended by dignitaries. The mosque design, a collaborative effort between Azerbaijani and Italian architects, features a distinctive facade made of Glass Fiber Concrete and ETFE (Ethylene Tetrafluoroethylene) material. Its structure incorporates innovative hexagrid and diagrid systems, promising a unique architectural identity.

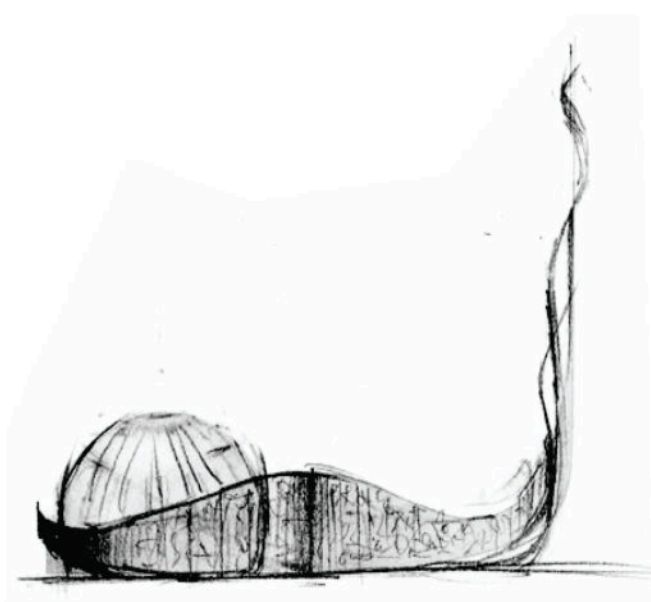
*The technical details of this project are under Non- Disclosure Agreement.

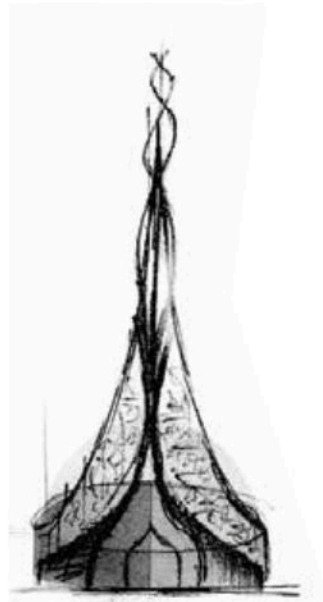
Shusha Mosque 3D Render
Source: https://www.azernews.az/nation/178913.html

08. SHUSHA MOSQUE
Public Amenity









Architectural schematic sketch led by Architect Francesco Giordano
Source: https://www.simmetrico.it/simmetrico-wins-internation-al-competition-for-shusha-mosque-in-azerbaijan/

Technologies Employed

- Steel Technology Hexagrid structure for the main Hall dome
- Steel Diagrid for facade structure
- ETFE membrane technology

Role in the project

- BIM Modelling of the details of the employed Technology
- BIM Coordination with Structural and MEP team
- Material and Element schedule along with BOQ
- Content Creation

Tools

- Rhino inside, Grashopper, Revit, Rhino

09. MEMORIAL PARK
Public Amenity

Location - Baku , Azerbaijan
Client - Pasha Holding
Status - Under construction*
Design by - iDEAS in collaboration with Symmetrico

A memorial monument marking Victory Day, November 8, will stand at the park's entrance, symbolizing unity and eternity. Additionally, the park will include themed gardens, a cascading waterfall, a Karabakh memorial garden, and an observation point. Occupying 9 hectares along 8 November Avenue, the Victory Park will feature 44 arches at its entrance, symbolizing the journey to victory. The entrance portal, 44 meters tall and 22 meters wide, will bear the names of Patriotic War heroes. The names of fallen soldiers and officers from the First and Second Karabakh Wars will be inscribed on the museum walls.

*The technical details of this project are under Non- Disclosure Agreement.
Similar role as the first project has been employed here.

https://www.youtube.com/watch?v=5eVK5vHBWcw