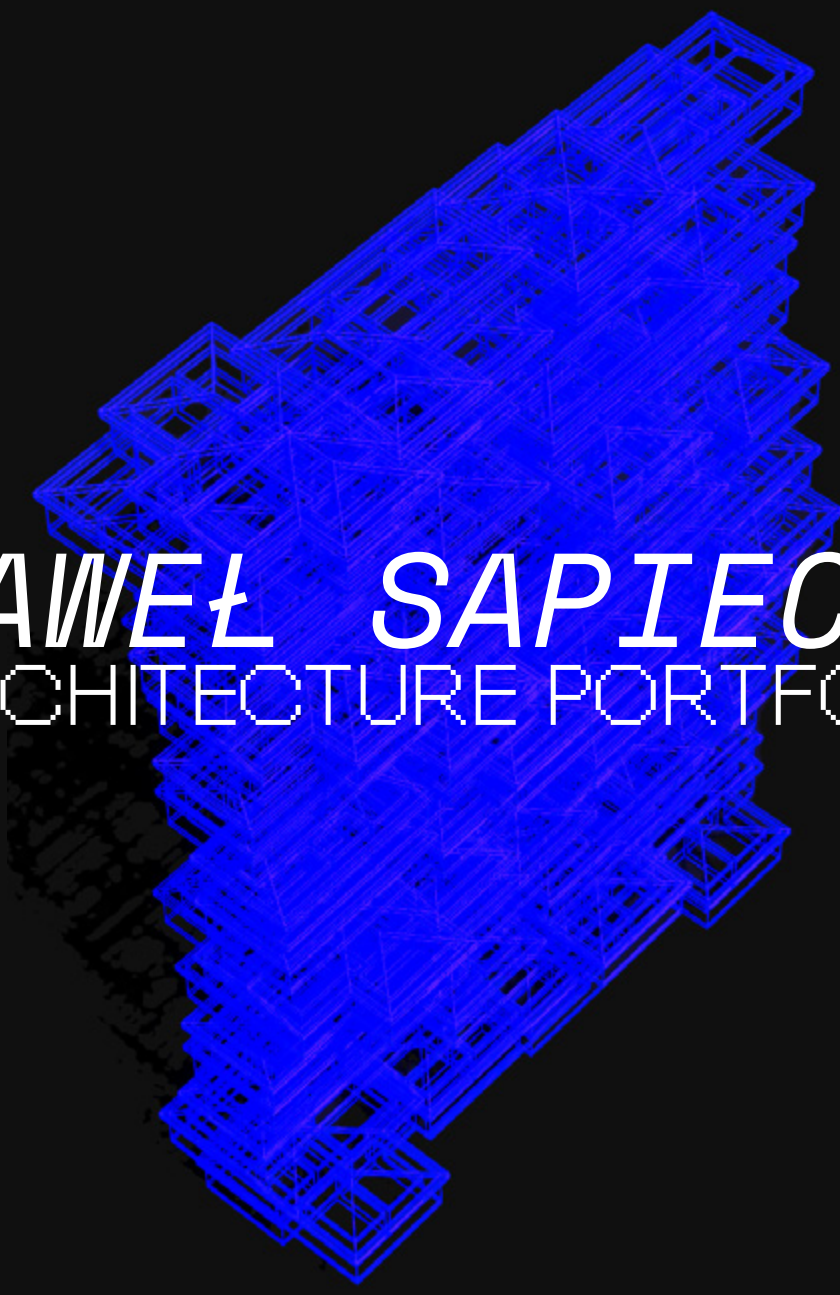

PAWEŁ SAPIECHA

ARCHITECTURE PORTFOLIO

PAWEŁ SAPIECHA

Architect - Researcher - Programmer

PROFILE

A young and dynamically developing architect with a BSc degree in Architecture, and Urban Design, and Master of Architecture degree completed in 2021. I am interested in innovative, digital technologies such as Machine Learning, Parametric Design or IoT (Internet of Things) in the context of optimization and the acceleration of the design process in architecture and urban planning.

EDUCATION

MASTER OF ARCHITECTURE

UNIVERSITY OF ARIZONA
Sept 2019 - June 2021
GPA 3.96

During my studies I focused on applications of computational design and robotic fabrication in solving architectural and urban design problems as well as improving current solutions.
During my final semester I focused on ways to digitally twin Phoenix's suburban sprawl areas, and lightweight carbon fiber structures weaved with the robotic arm.

MASTER OF ARCHITECTURE

WARSAW UNI. OF TECH.
Sept 2017 - July 2018

During my first year of the M.Arch program in Warsaw I started exploring possibilities of parametric design taking part in competitions and workshops. I transferred to UofA after the first year.

BACHELOR OF ARCHITECTURE AND URBAN DESIGN

WARSAW UNI. OF TECH.
Sept 2013 - July 2017

4 year program with a strong emphasis on engineering. A thesis design of the River Police Station in Warsaw needed a careful design answering multiple functional needs, the unique culture of the River Police unit, and a vulnerable site located on a river bank.

CONTACT

email: pawelsapiecha1@gmail.com
phone:(520)358-6068
www.linkedin.com/in/psapiecha/
www.pawelsapiecha.com

TECHNICAL SKILLS

PROGRAMMING LANGUAGES
Java [Processing]
C#

WEB DEVELOPMENT
HTML & CSS
Javascript [jQuery]

GEO-SPATIAL ANALYTICS
ArcGIS Pro

3D & BIM MODELING
Rhino & GH
Revit & Dynamo
AutoCad
ArchiCad
Unreal Engine [Speckle]

GRAPHIC DESIGN & VIDEO EDITING
Adobe CC

FABRICATION
KukaPRC
Slicer3D

LANGUAGES

English
Polish

AWARDS

ALBERT H. DRACHMAN MEMORIAL SCHOLARSHIP
UofArizona, 2020-2021

CARL RALD SCHOLARSHIP
UofArizona, 2020-2021

M.ARCH TECH STREAM AWARD
UofArizona, 2021

EXPERIENCE

BUILDING PERFORMANCE INTERN
Oct 2021 - Mar 2022
Olson Kundig
Performed building simulations to support design decisions on projects. Performed energy and solar radiation studies in the early schematic design phase to determine appropriate shading and orientation for projects. Produced daylight and embodied carbon simulations for project teams. Partnered with the Director of Building Performance to develop strategies to achieve net-zero energy and carbon for projects teams. Produceed written summary reports of completed studies to be shared with project teams.

RAPID PROTOTYPING LAB MANAGER
Feb 2021 - June 2021
University of Arizona
Researched, prepared, and implemented tools like the KUKA robotic arm, 3D printers, and Arduino electronics to model architectural research models. Trained and worked with over 80-student class members on fabricating architectural prototypes.

TEACHING ASSISTANT
Sept 2019 - June 2021
University of Arizona
Led lectures and workshops on the use of parametric techniques in architecture Advised over 210 students over three semesters about digital techniques. Handled class documentation and reorganized materials to teach remotely.

VISITING SCHOLAR
April 2019 - Aug 2019
University of Arizona
Conducted a research on „Synthesis of Self-Adaptive Architects using Developmental Genetic Programing" at Department of Electrical and Computer Engineering at the University of Arizona

INTERN ARCHITECT
July 2018, Nov 2018 - March 2019
Kurylowicz & Associates, Warsaw
Developed a multi-industrial conceptual design (bim model building, design of the facade, and selection of materials). Prepared graphic and presentation materials. Supported modeling and technical work.

METHODICAL SKILLS

GENERATIVE DESIGN
Data-driven urban and architectural design strategies with incorporation of evolutionary optimization components like Silvereye, Octopus or Wallecei.

ENVIRONMENTAL ANALYSIS
Complex analysis of site forces gives and opportunity to design hi-performing sustainable building and cities.

BIM INTEGRATION
Bridging the gap between complex Rhino 3D+GH parametric geometries, and highly organized building information modeling in Revit.

RAPID PROTOTYPING
Performed complex material research as well as applying various fabrication technologies to model certain material or technical qualities within hours.

RECOMMENDATIONS

Susannah Dickinson
Associate Professor of Architecture
srd@email.arizona.edu

Aletheia Ida
Associate Professor of Architecture
aida@email.arizona.edu

Paulus Musters
Laboratory Manager
musters@email.arizona.edu

Chris Trumble
Associate Professor of Architecture
ctrumble@email.arizona.edu

PERSONAL STATEMENT

I'm passionate about developing as an architect and I believe that my skills can make the design process more valuable and effective. I look for solutions and inspirations in a variety of disciplines. Technology is today central to the architectural practice. My work goes beyond architecture. My interests are the use of VR, Augmented Reality, Internet of Things, computational techniques, rapid robot prototyping, artificial intelligence and other advanced tools to create more refined and better performing built environment design.

Each of my designs puts a great attention on efficiency, reduction of material use, energy consumption and sustainability. With the use of big data I performed a city-wide simulation how my design will work as a part of an urban system. As a Techne class Graduate Teaching Assistant at the University of Arizona I share my experience, knowledge and skills with undergraduate students. Having those unique abilities I am also constantly looking for the possibilities to support traditional architectural research and design.

After getting my Master's degree I am going to continue my career in the United States as a computational designer. I want to work with architects to design Smart Cities, sustainable buildings and better built environment for the world of tomorrow.

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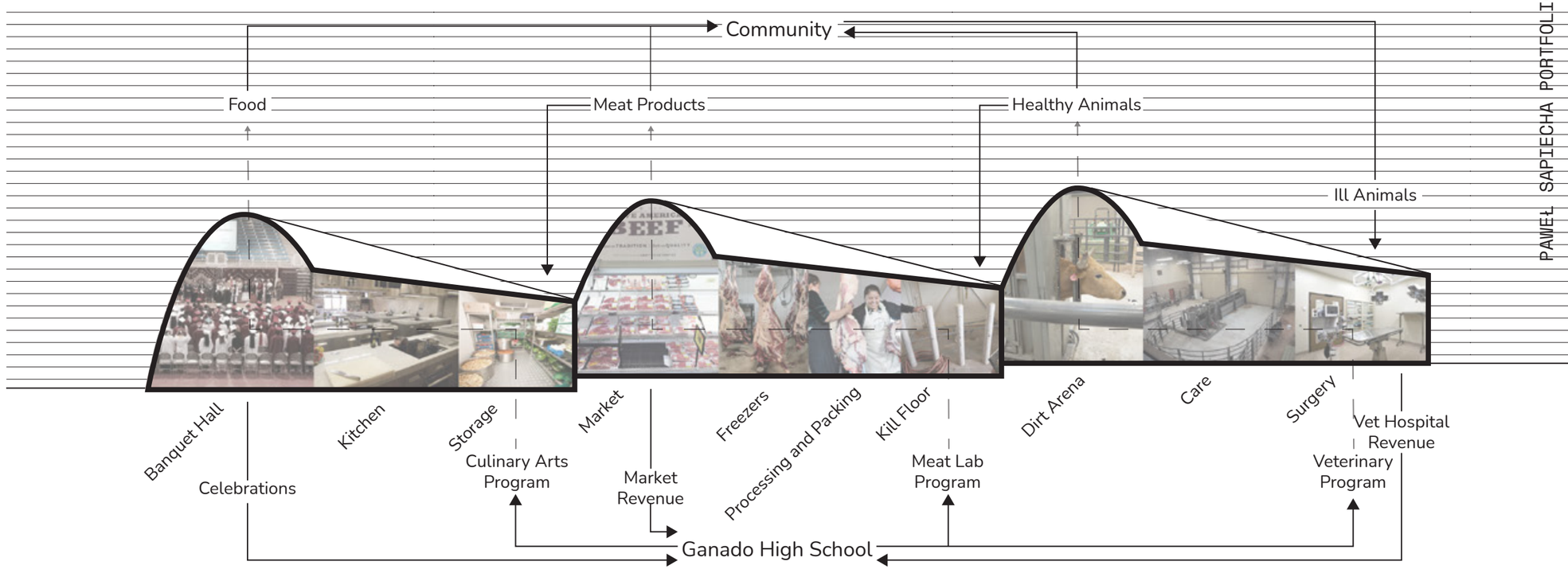
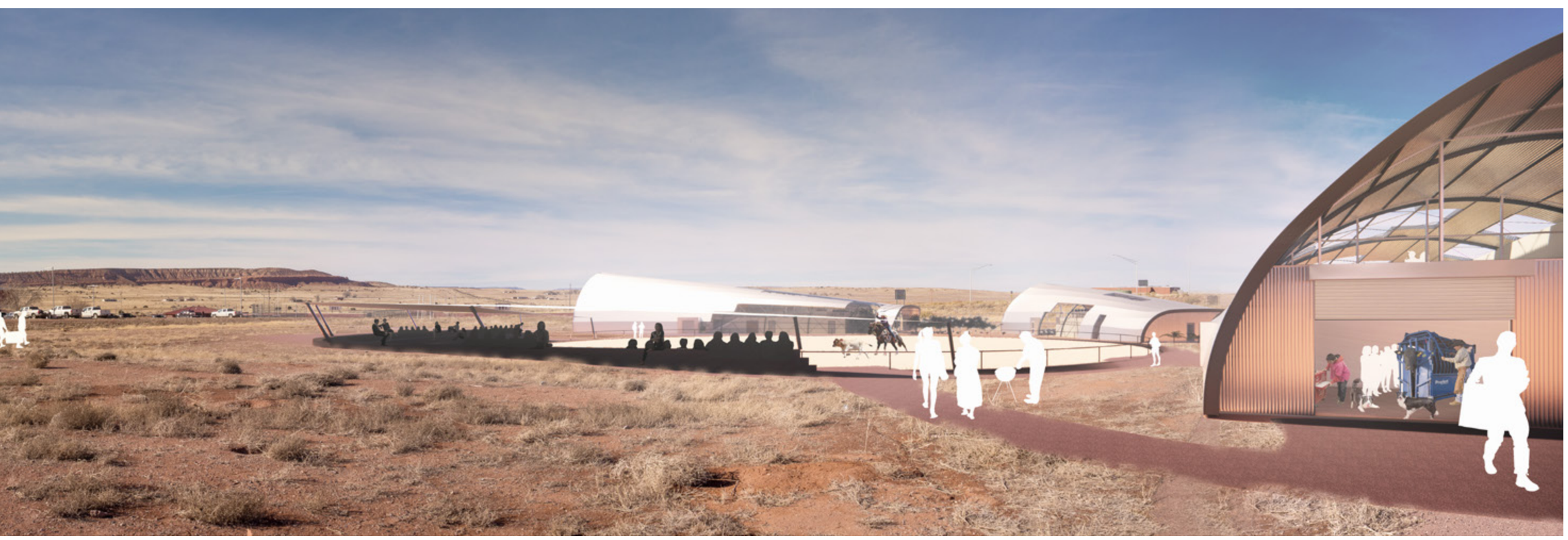
GANADO HIGH SCHOOL

Advanced Design Studio II
University of Arizona
Professor: Laura Carr

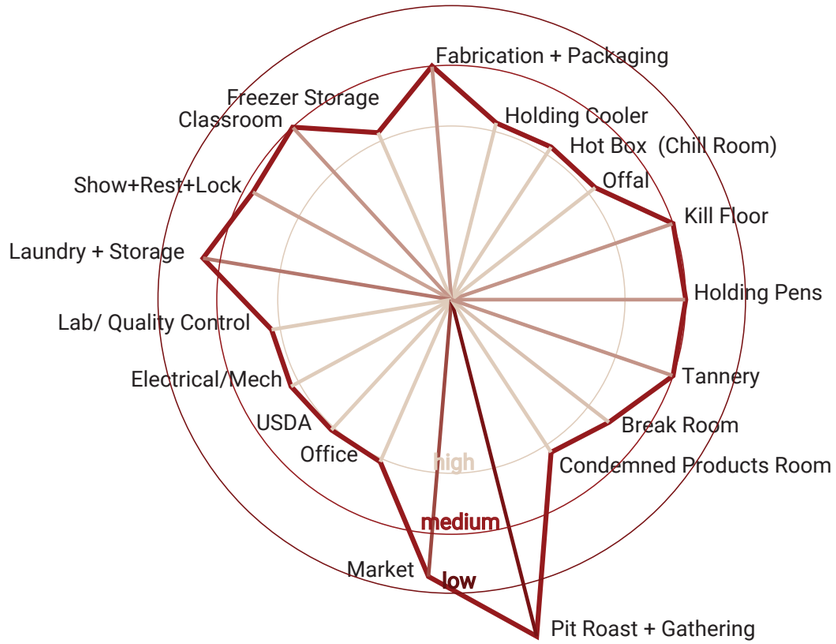
Ganado High School is an important place for the local Navajo youth. The main goal of the school is to provide a safe and supportive learning environment for over 500 students. The program of the school is focused on Career and Technical Education. Therefore it needs miscellaneous labs and workshops to recreate the real workplaces, where graduates will get the necessary skills.

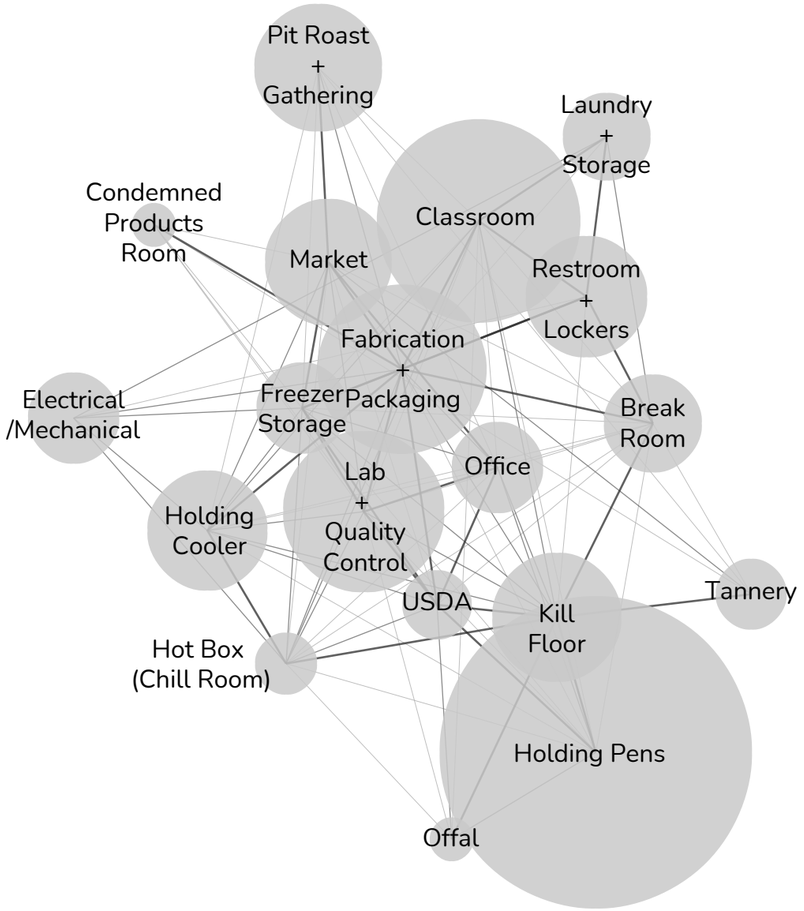




Visualizing Parameters

A variety of industrial and educational functions within the same building requires special awareness of the requirements of each of the space. 9 diagrams in total were generated each visualizing security, temperature and hygiene requirements for each of the three buildings. Spaces with the similar requirements should be placed close and those with different should be placed in the further part of the building. The less regular diagram outline (or greater amplitude of rays length), the more challenging and risky design of the boundaries between spaces within a building.

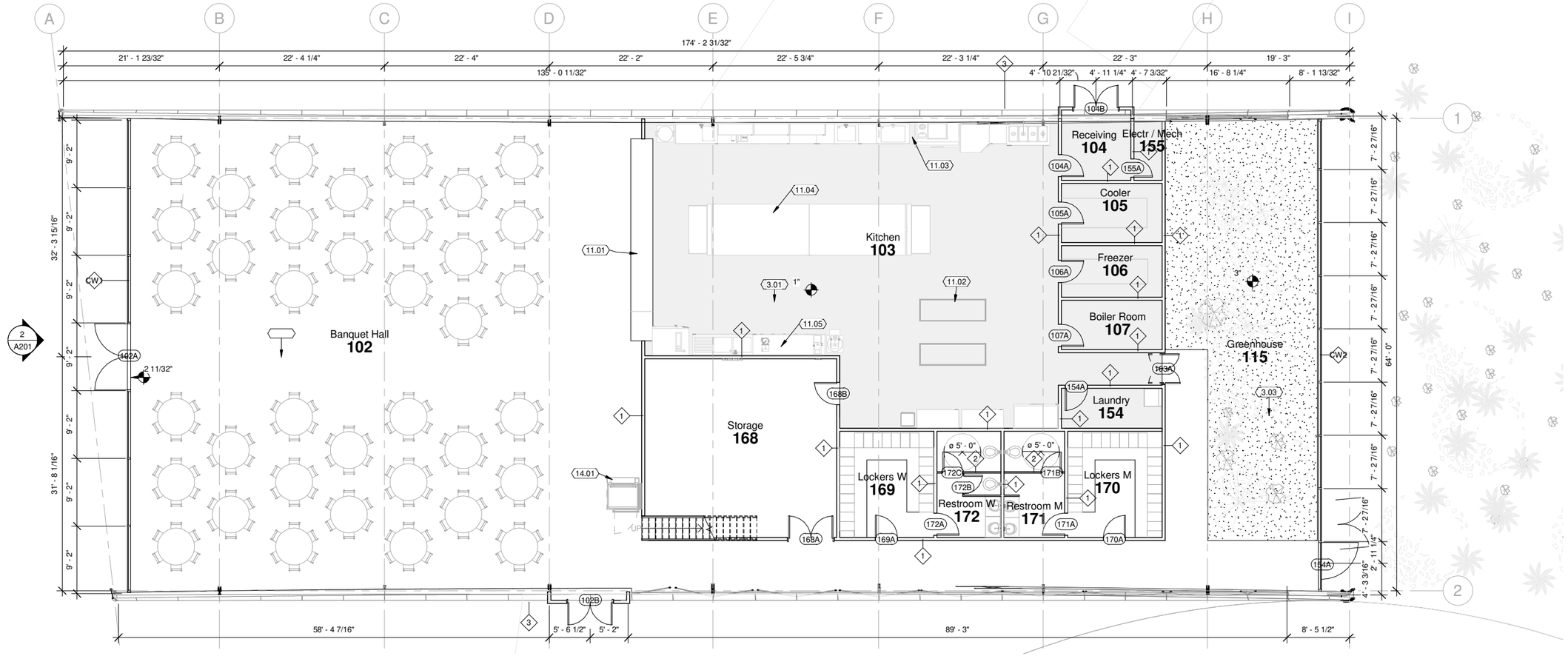




Self-organizing diagram

Complex spatial relations and characteristics of industrial workflows, inspired the creation of a tool that uses force vectors to diagram preferable placement of spaces within a building. Based on the previous analysis, the relation between each room was scored from 1 (set far away) to 3 (set close to each other) and organized into a Excel chart that was used as an input for a diagram generator. The size of the circles represent the specified size of the room. The algorithm cannot be directly used as a room plan, however it's a graphic representation of a complex dataset that makes design decisions more informed and minimize the building's functional flaws.

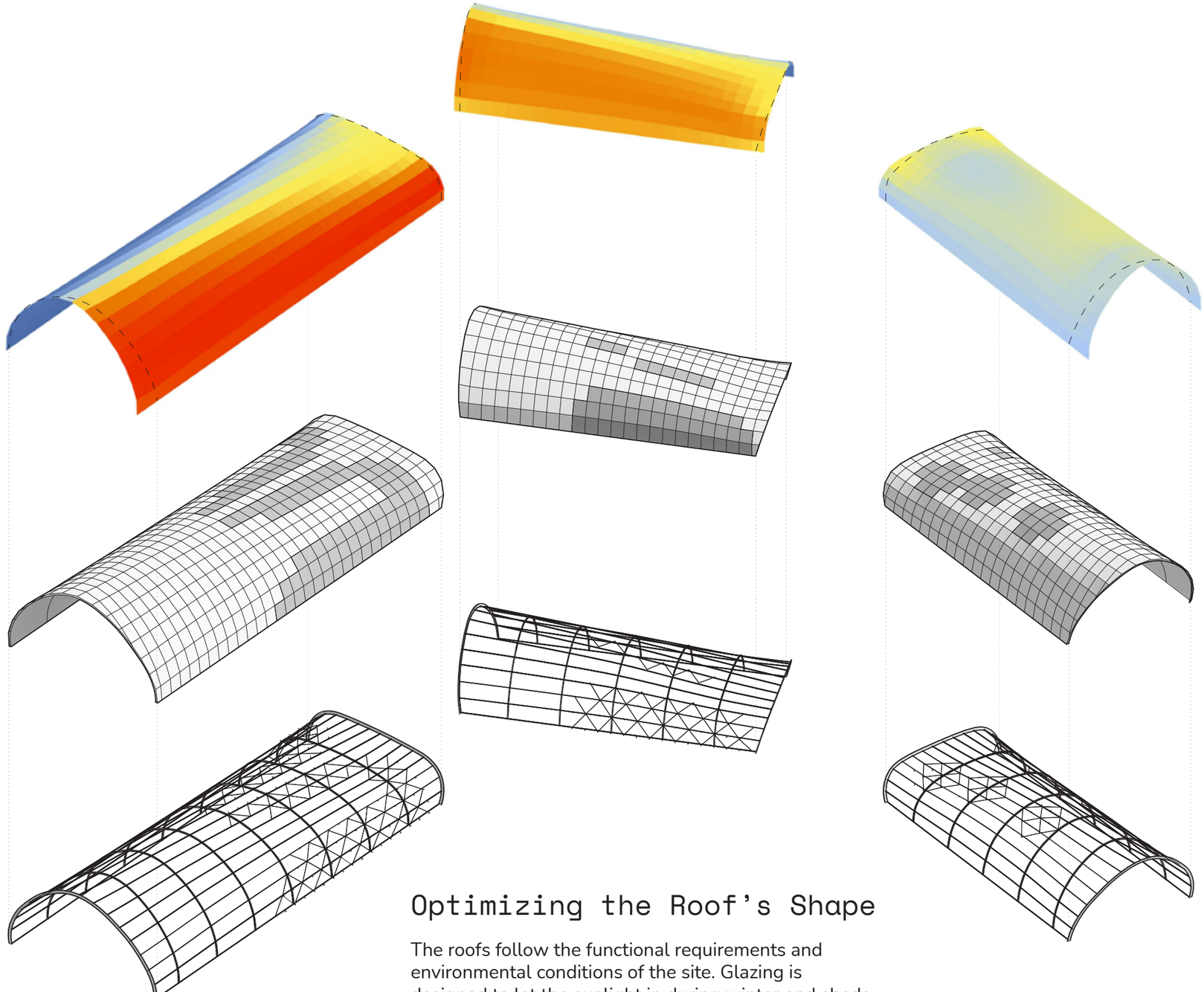
VET	Reception	File Room	Animal Exam	Animal Surgery	Sterilization Room	Recovery	Animal Exam /	Animal Holding	Dirt Arena (Indoor)
Reception		1	1	2	2	3	1	3	3
File Room	1		3	4	4	4	3	4	4
Animal Exam	1	3		1	1	1	2	3	3
Animal Surgery	2	4	1		1	1	2	3	3
Sterilization Room	2	4	1	1		1	1	4	3
Recovery	3	4	1	1	1		1	1	2
Animal Exam /	1	3	2	2	1	1		1	1


A
B
C
D
E
F
G
H
I
174' - 2 31/32"
21' - 1 23/32"
22' - 4 1/4"
22' - 4"
22' - 2"
22' - 5 3/4"
22' - 3 1/4"
22' - 3"
19' - 3"
135' - 0 11/32"
4' - 10 21/32"
4' - 11 1/4"
4' - 7 3/32"
16' - 8 1/4"
8' - 1 13/32"
1
2
32' - 3 15/16"
31' - 8 1/16"
9' - 2"
7' - 2 7/16"
64' - 0"
4' - 3 3/16"
2' - 11 1/4"
58' - 4 7/16"
5' - 6 1/2"
5' - 2"
89' - 3"
8' - 5 1/2"
Banquet Hall
102
Kitchen
103
Receiving
104
Electr / Mech
155
Cooler
105
Freezer
106
Boiler Room
107
Greenhouse
115
Laundry
154
Storage
168
Lockers W
169
Restroom W
172
Restroom M
171
Lockers M
170
11.01
11.02
11.03
11.04
11.05
14.01
3.01
3.03
102A
102B
104A
104B
105A
106A
107A
154A
155A
163A
165A
168B
169A
170A
171A
171B
172A
172B
172C
ø 5' - 0"
2.11/32"
CW
CW2
2
A201

Culinary School

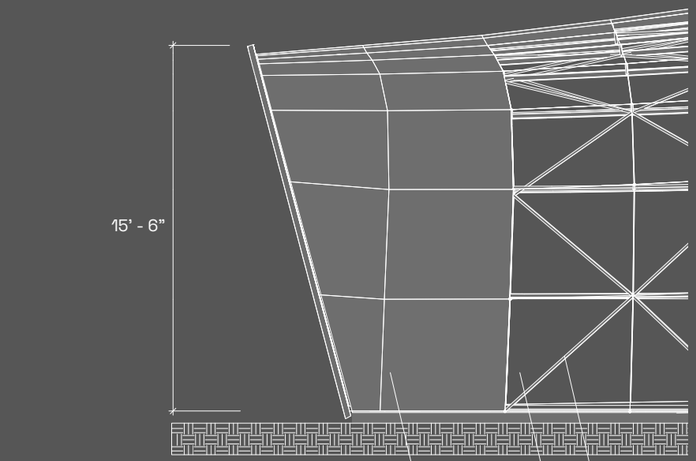
Meat Lab

Veterinary School

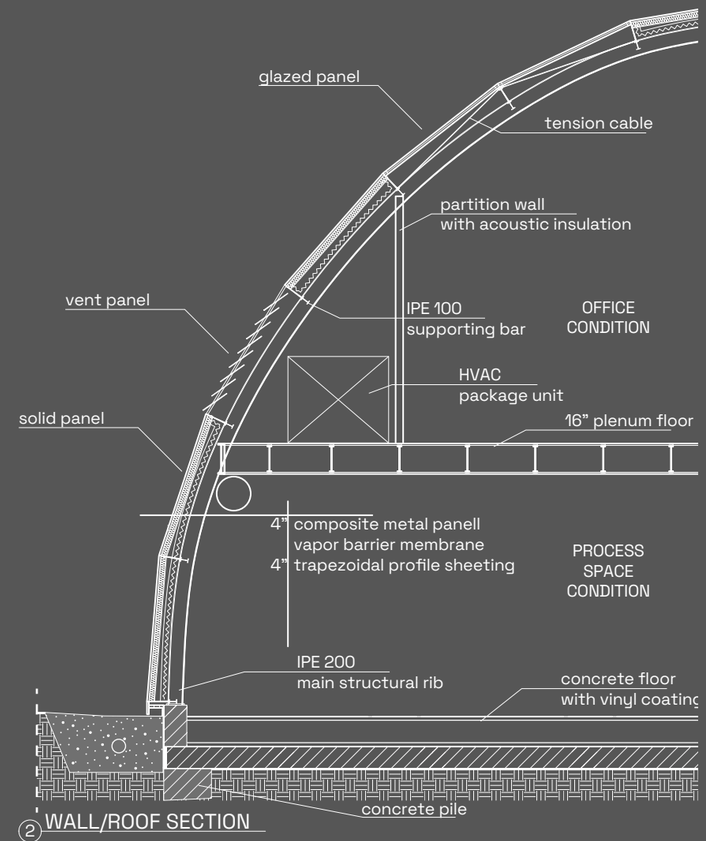


Optimizing the Roof's Shape

The roofs follow the functional requirements and environmental conditions of the site. Glazing is designed to let the sunlight in during winter and shade it during summer. The optimization of caps decreased sun exposure of the banquet halls 10% and classroom's in the meat lab by 33%. The BIM model was optimized in Grasshopper and imported to Revit as separate families through the Rhino.Inside.Revit.



① ENLARGED BUILDING ELEVATION



② WALL/ROOF SECTION

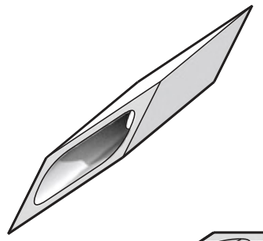
LIQUID

Design Communication III
University of Arizona
Professor: Susannah Dickinson

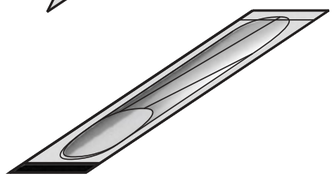
The Broad is a contemporary art museum in downtown Los Angeles designed by Diller Scofidio + Renfro. The first part of the study included analysis of the building's facade geometric rules, modeling the single modules and a 3d model of the whole building's exterior.

Solar
Optimization >>>

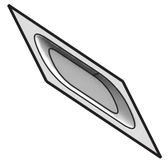
<<< North-East
Module



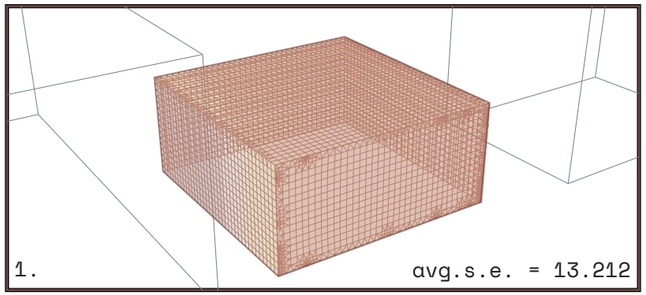
<<< South-East
Module

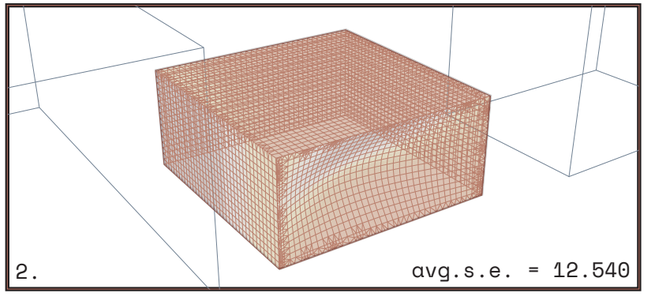


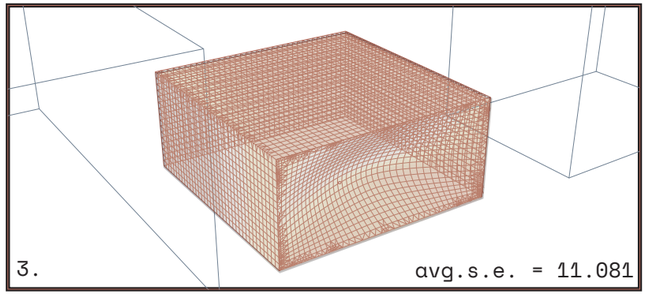
<<<South-West
Module

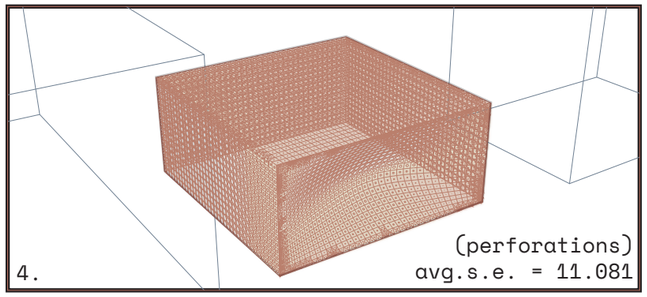


<<< North-West
Module



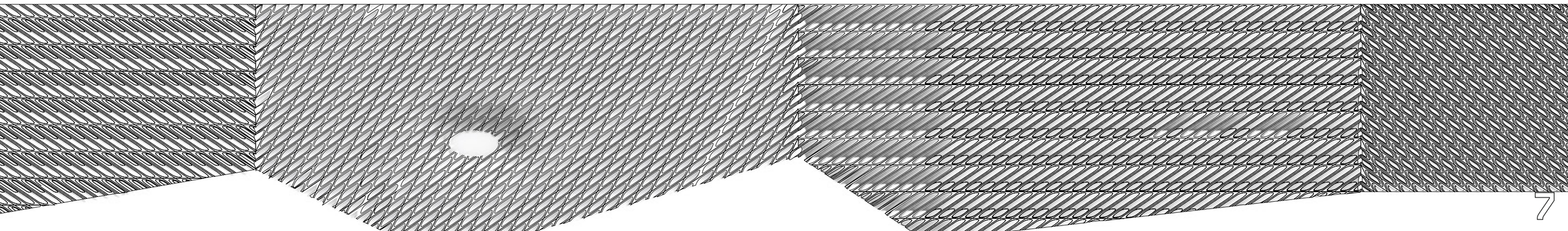






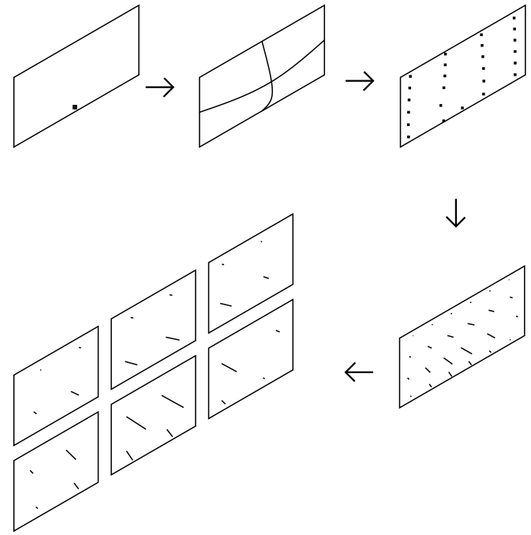
PAWEŁ SAPIECHA PORTFOLIO

During the exercise the shape of the building's front facade was optimized with the use of a genetic evolutionary algorithm, that decreased the sun exposure by 16% in comparison to the original facade. The perforation was adjusted to the radiation map of the facade.
The final model - Liquid - is a research project, that combines rapid robot prototyping with modeling thermoplastics. The spikes of the final model follow the curvature of the optimized front facade.

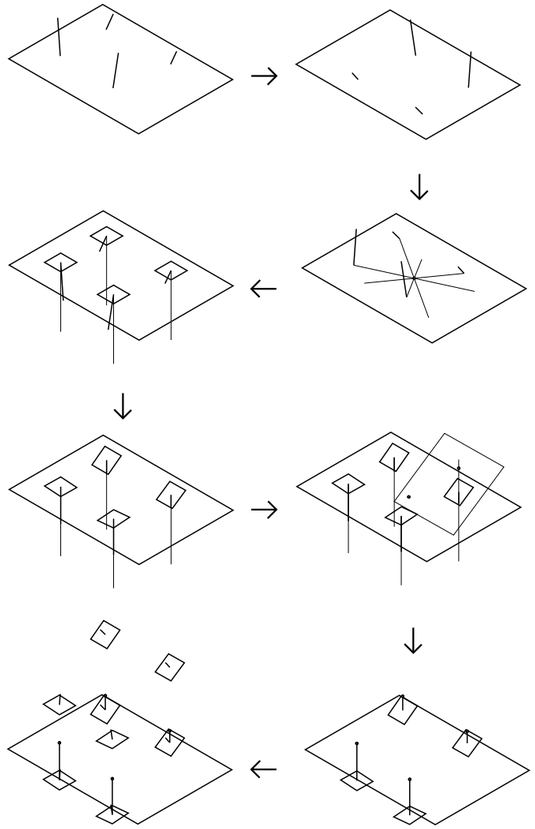


Manipulation with material over two tools is an unusual setup and needed multiple geometric transformations to reverse the tool movement and translate it into movement of a robotic arm holding a frame with thermoplastic.

Transformation and division



Designing paths for the robot



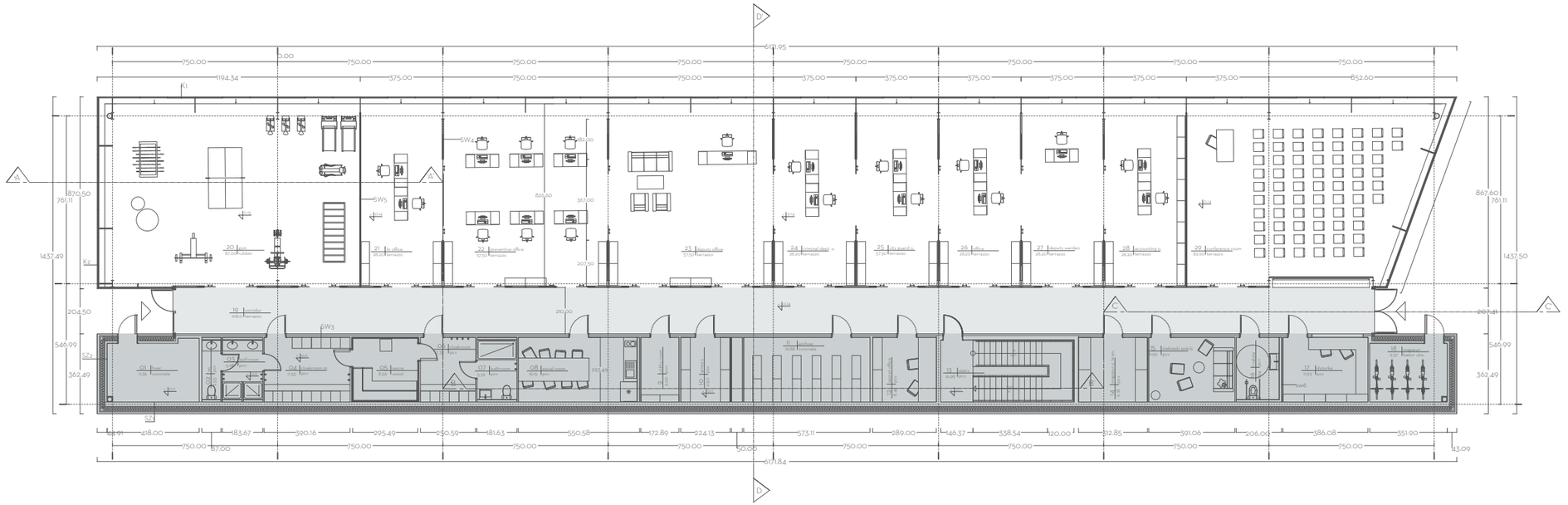
RIVER POLICE STATION

B.Arch Thesis
Warsaw University of Technology
Professor: Radoslaw Achramowicz

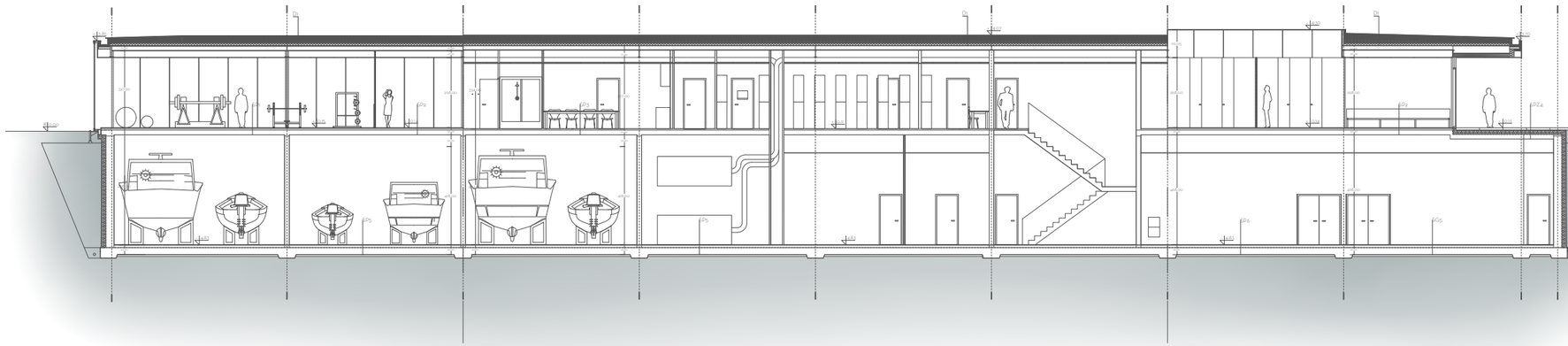
A new headquarters of the River Police is located in the heart of the revitalized port district of Warsaw. The idea of the project was a building that was a link between the river and a bank. The building was inspired by its users - enthusiasts of their work and people emotionally connected with the Vistula.

The interior of the building is designed to meet the needs of the work of the officers, who form a well-coordinated team that need large open space, but also need place for individual work that preserves professional secrecy. The office part has sliding soundproofing walls of milk glass, that allow to adjust the space to the current case. In the stone block of the building there are secret rooms, archives, armory and technical rooms.

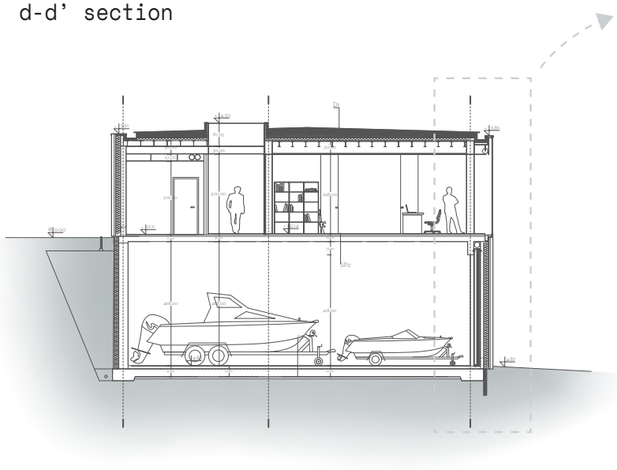
top floor



a-a'-b-b'-c-c'section



d-d' section



1 - flashing
2 - flashing support
3 - fixing the curtain wall frame
4 - Pilkington Planar curtain wall frame
5 - cantilever beam, T-section h = 6cm
6 - post, IPE I-section h = 8cm
7 - plastic cover
8 - bracket, IPE I-section h = 10cm
9 - fixing the glass razor to the steel structure
10 - fixing the glass razor to the curtain wall
Pilkington Planar
11 - Pilkington Planar curtain wall
11b - retractable gutter
12 - Sarnafil Sarnaclad metal profile fastened to the formwork with nails
13 - Sarnafil sealing tape (heat-sealed)
14 - glass blade reinforcing the curtain wall structure s = 1cm
15 - IPE pole h = 30cm
16 - IPE deck h = 20cm
17 - insulation from extruded polystyrene 8cm
18 - steel bracket h = 6cm, attached to the girder plate anchored in the reinforced concrete ceiling
19 - ventilator
20 - flashing
21 - ventilation duct pipe fi = 20
22 - roller handle for hangar gates
23 - roll of hangar gates
24 - tightening element
25 - roller rail for hangar gates
27 - horizontal insulation of the extruded polystyrene foundation s = 15cm h = 100cm
28 - concrete blocks
29 - roller rubbing hangar gates
30 - rail of the roller rubbing hangar gates
31 - compacted sand

SP5 - 10cm hardened concrete screed
waterproofing - bituminous roofing felt x2
42cm foundation slab

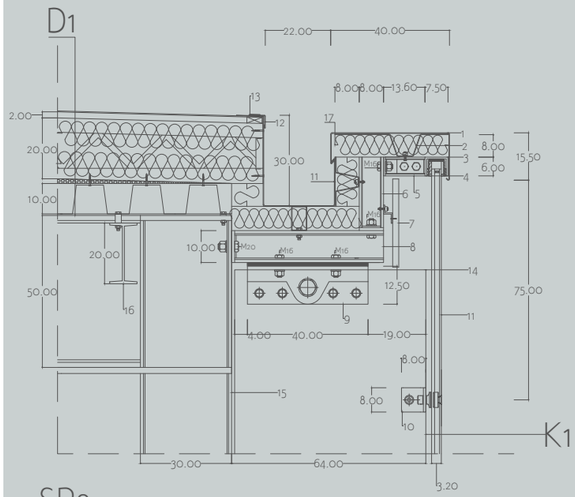
SZ10 - 10cm precast concrete lined with river pebbles
5cm air gap
20cm mineral wool
20cm silicate blocks
2cm air gap
5cm precast concrete slabs
river pebbles (gate)
8cm extruded polystyrene (gate)
8cm frame structure of the gate
2cm air gap
13cm aerated concrete

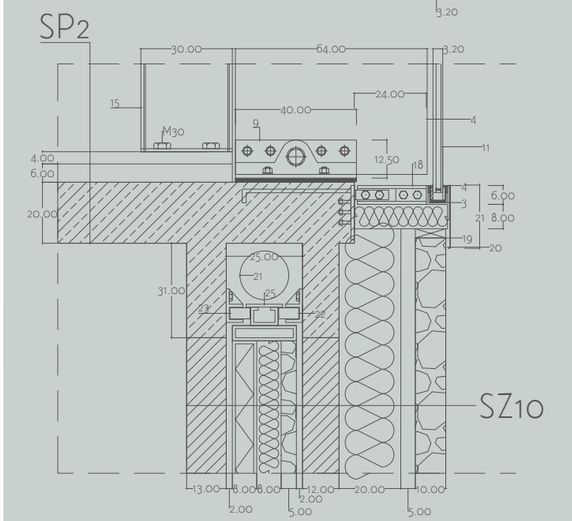
D1 - Sika Sarnafil membrane
2cm formwork
20 cm mineral wool
0-20 cm extruded polystyrene
10cm corrugated sheet

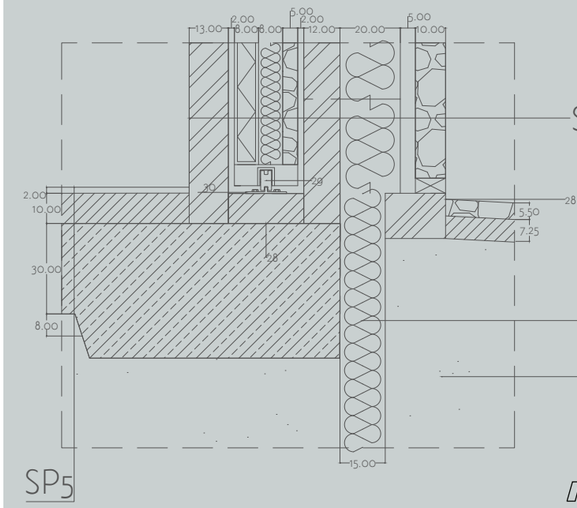
K1 - double glazed curtain wall Pilkinton Planar

SP2 - 4cm terrazzo
6 cm concrete screed
20 cm monolithic reinforced concrete ceiling

front wall details







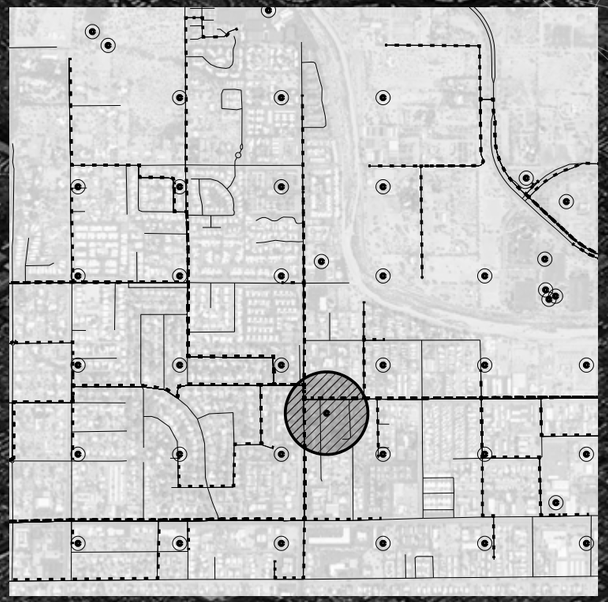
PAWEŁ SAPIECHA PORTFOLIO

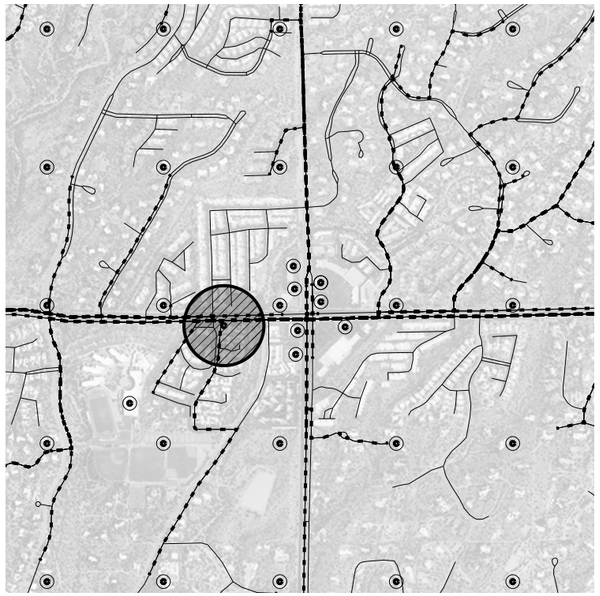
TUCSON URBAN GONDOLA

Advanced Design Studio I
University of Arizona
Professor: Bill Mackey

The gondola concept is an answer for the three main urban design problems in Tucson; the orthogonal system hinders the free exploration of the city, low visibility range, and homogeneous development disturbs the spatial orientation, the center is poorly connected with Catalina Foothills, making this picturesque district practically inaccessible to pedestrians. The gondola, which moves diagonally over the orthogonal grid, allows residents to rise above the suburbs, provides a different perspective on the city's structure, and allows them to commute between the center, Foothills, and local mountain parks.

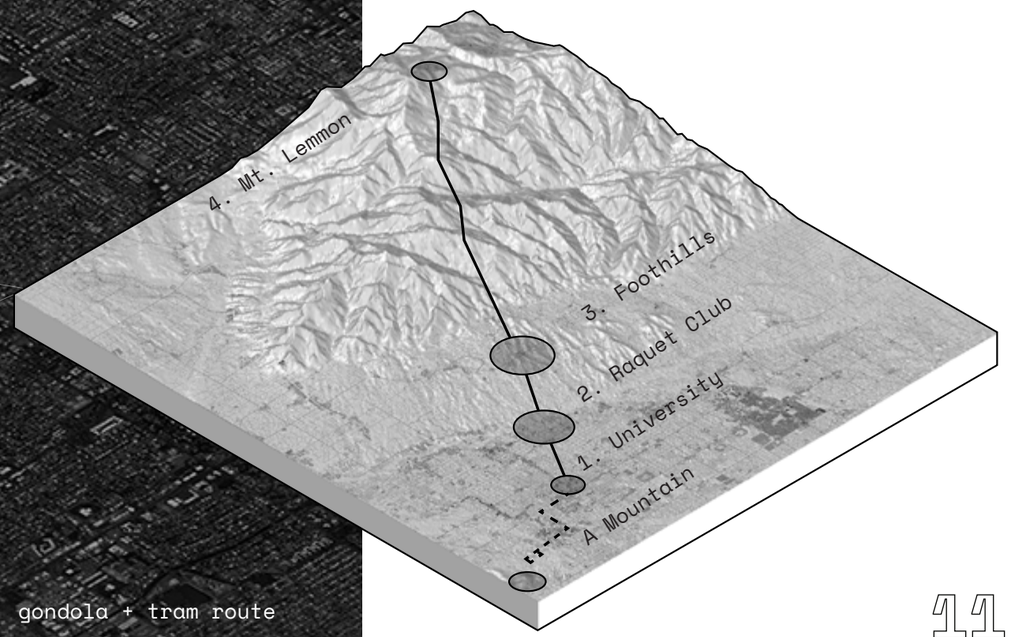
Raquet Club site analysis





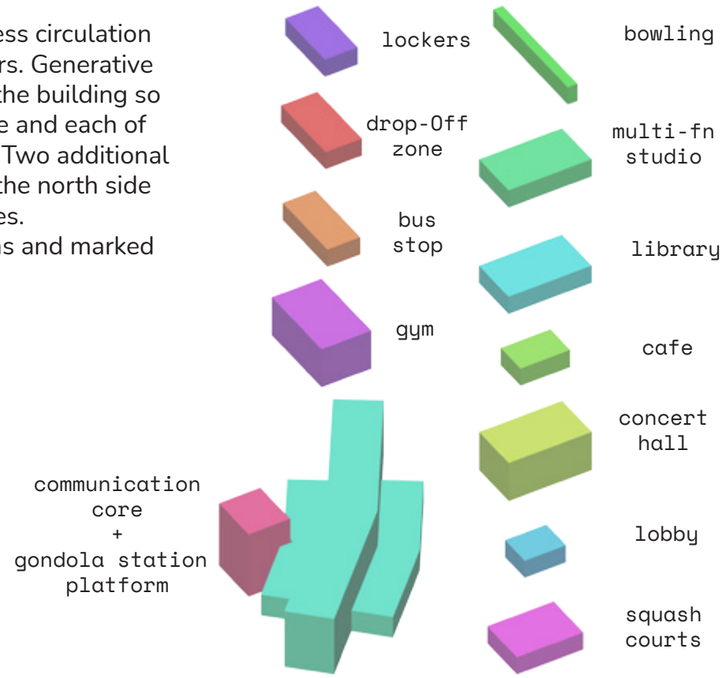
Catalina Foothills site analysis

A multi-objective evolutionary optimization algorithm was used to analyze thousands of possible routes and find the most accessible one. Route length and average distance from the stations to local focal points (shops, restaurants, schools etc.) designated as the objectives. In the local scale the same algorithm used the topology of the streets to designate the most accessible site for the gondola station.



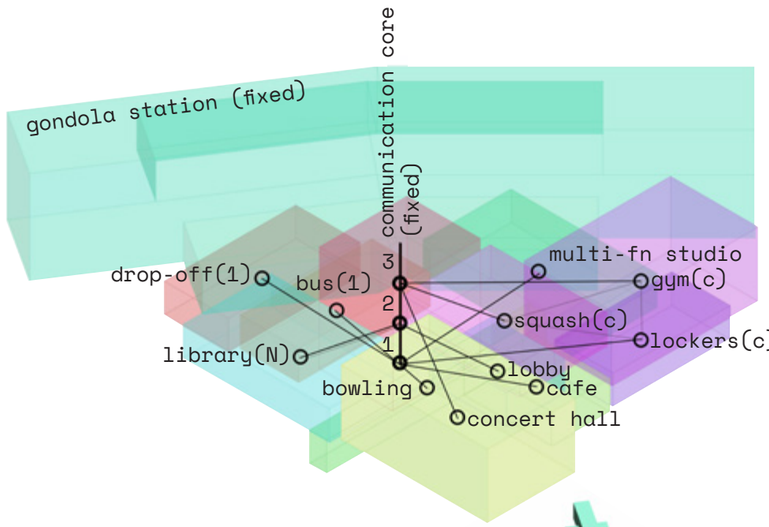
3.1 Foothills Station

A public transportation hub needs a flawless circulation design to handle the flow of the passengers. Generative design was used to improve the layout of the building so the paths between the communication core and each of the main spaces are the shortest possible. Two additional criteria were the location of the library on the north side and the close placement of the sport spaces.
The algorithm generated over 30,000 plans and marked the best solutions.



Program
Definition >>>

3D model of every building's space

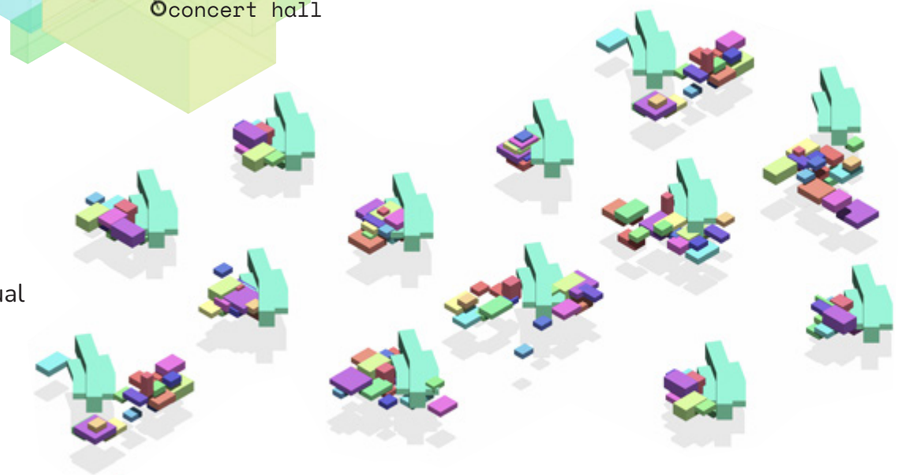


<<< Performance
Criteria

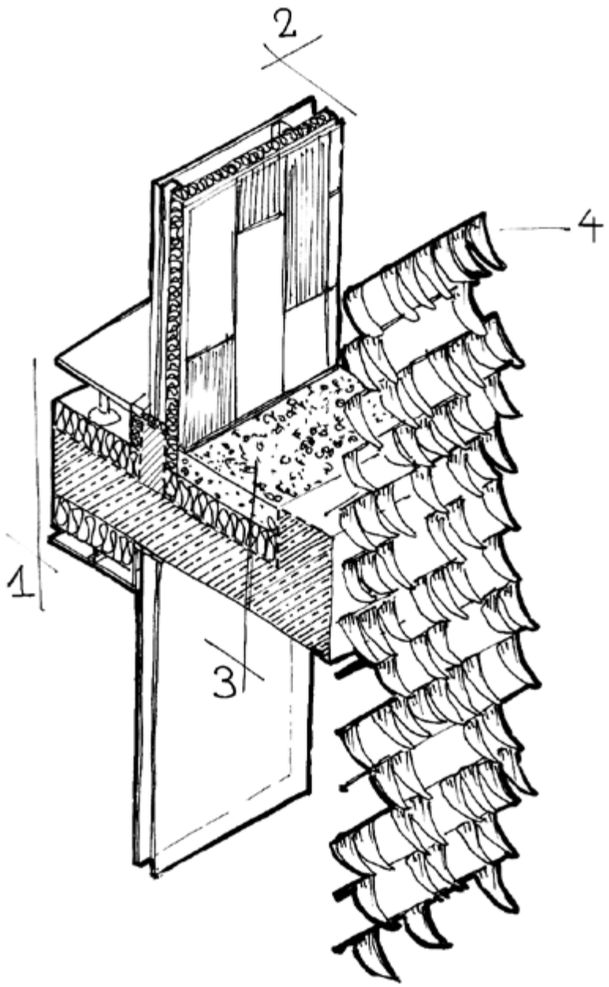
Location of the fixed elements, defining which elements needs to stay on the ground level, specifying the evaluation criteria (communication, north library placement, sport rooms close to together), modeling the local code requirements, setbacks, max height

Result
Analysis >>>

Analyzing Pareto frontier solutions, creating graphic representation of data, manual adjustment of the most preferable model



front wall details



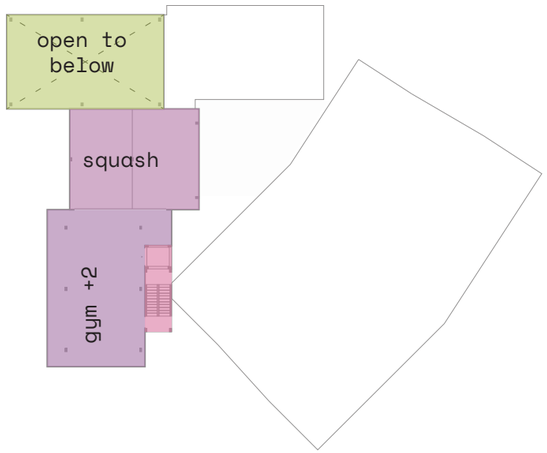
1 -
antistatic laminate/PVC tiles
G.I. stringer
pedestal
4’ insulation XPS
sealing, bitumen, two-ply
10’ steel reinforced concrete
4’ insulation XPS
drop ceiling tiles

2 -
aluminium cladding
4’ mineral fiber insulation
gypsum board shearing,
exterior rated with joints
taped/sealed
steel studs
gypsum board

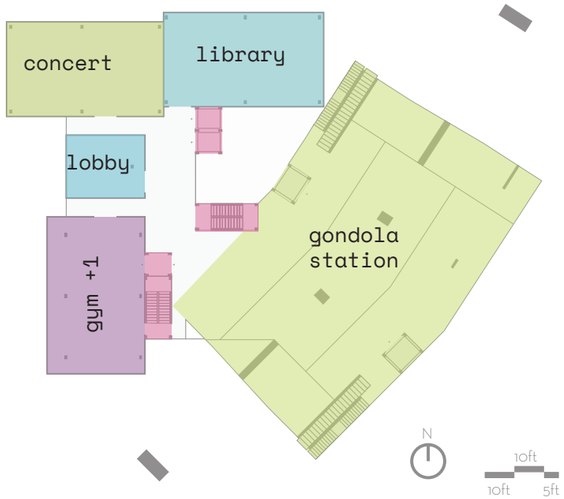
3 -
4’ gravel bed
4’ insulation XPS
sealing, bitumen, two-ply
10’ steel reinforced concrete

4 - auto-shading thermal
bimetallic pieces mounted on
steel-framed modular panels

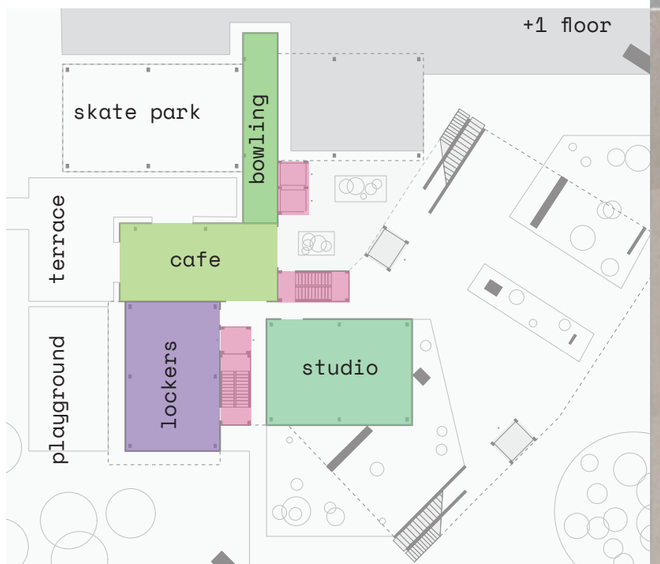
+3 floor



+2 floor



+1 floor

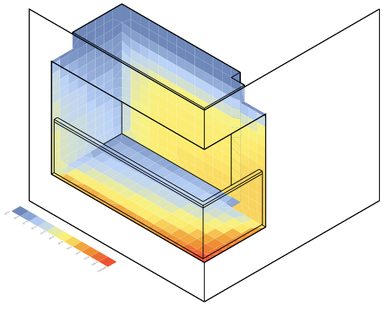


NATURIA APARTMENTS

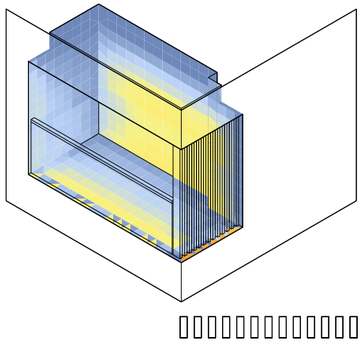
Internship
Kurylowicz & Associates
Supervisor: Maria Saloni-Sadowska

The Naturia residential complex in Toruń consists of 13 low-rise residential buildings. When designing the layout of the buildings, the priority was to preserve as many trees as possible and maintain the forest character of this place.

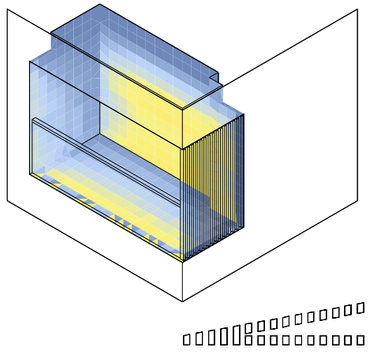
solar shading radiation simulations



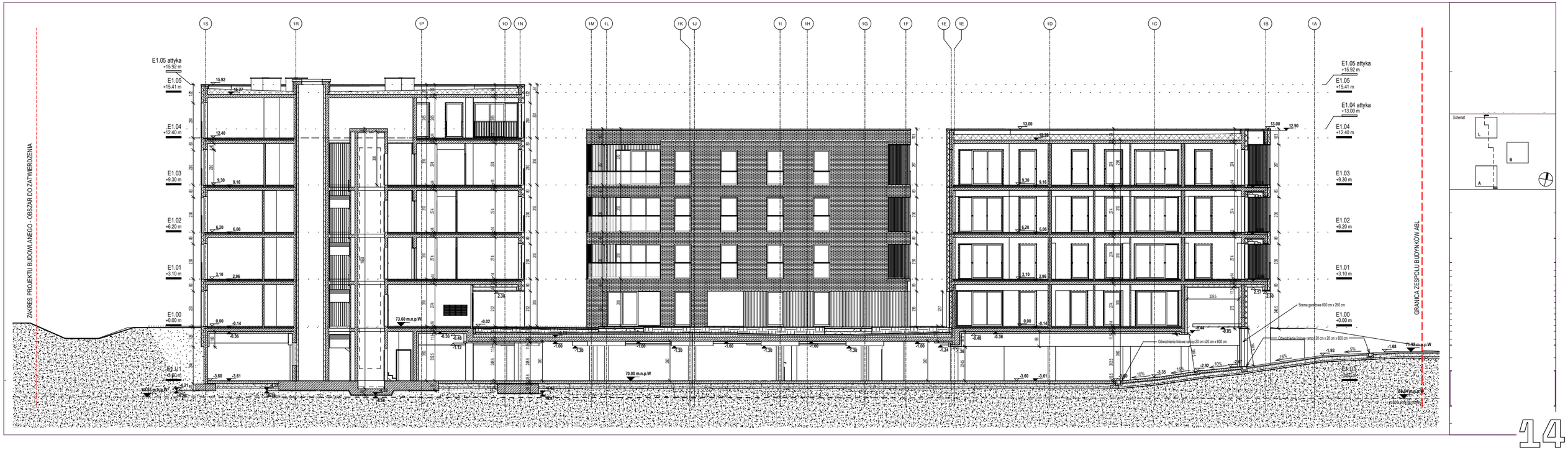
No shading - 3.963 kWh

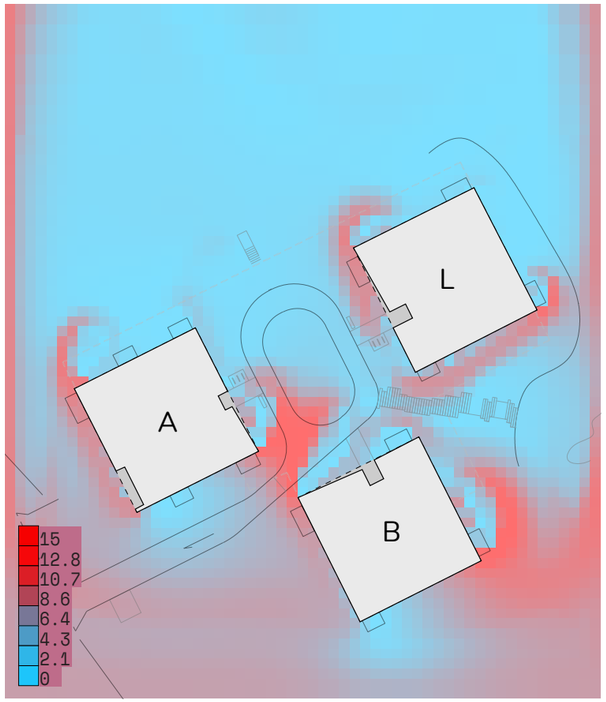


Simple shading - 2.922 kWh

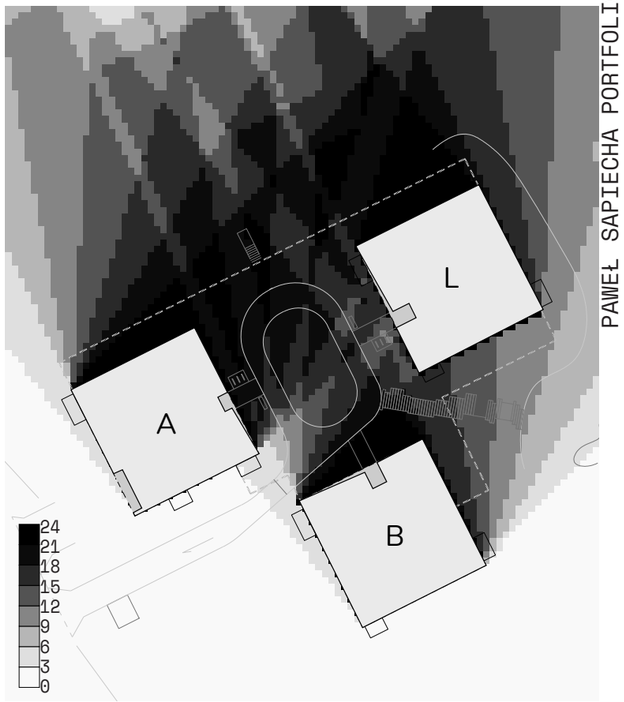


Complex shading - 2.901 kWh

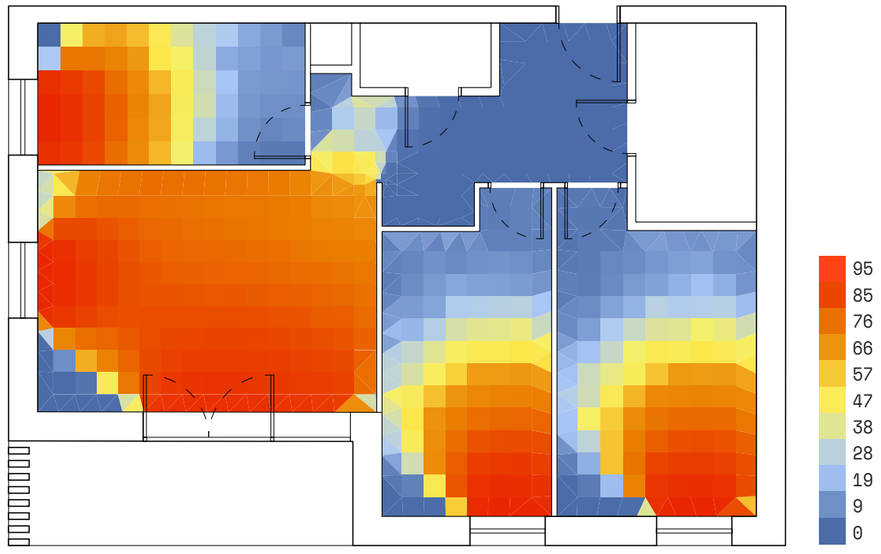




CFD analysis - wind speed diagram (m/s)



shadow study (hours of sunlight, June 21)



annual daylighting study (% of time with sufficient natural light exposure)

Building Performance Analysis

Computer simulations can be a valuable tool for architects. In the case of the Naturia estate in Torun, PL, the simulations helped to optimize the design of the courtyard between the buildings, as well as to design better apartment layouts, which brought profits for both the investor and the residents. Presented simulations were generated with Ladybug Tools in Rhino/Grasshopper. Top of the page: wind flow diagram

A series of simulations were carried out to illustrate the different wind circulation patterns in the square between buildings during different seasons (November - February simulation on diagrams). Shadow studies helped to understand how buildings will self-shade. Thanks to the annual daylighting analysis design team could take more conscious design decisions to improve the comfort of the future users.

MAPA DO CELÓW PROJEKTOWYCH

SKALA 1:500

WGiK.6640.1461.2018

Układ odniesienia:PL-ETRF89,układ wsp.płaskich:PL-2000, strefa 6(18) układ wys:Amsterdam 55

Województwo: kujawsko-pomorskie
Powiat: toruński
Jednostka ewidencyjna: 046301_1, Toruń
Obręb: 0030
Działka: 173/1, 173/3
Adres: ul. Konrada Grasera 4-6

PAWEŁ SAPIECHA PORTFOLIO

dz.nr 173/1

(105.03 MW13)

173/3

Konrada Grasera

Wałzenrodego

LEGENDA

granice działki nr.ewid. 173/1

1,2,3,4

zakres projektu budowlanego - obszar do zatwierdzenia

nieprzekraczalna linia zabudowy wg MPZP

(105.03 MW13)

oznaczenie terenu wg MPZP

obrysy parterów

nadwieszenia nad parterem

antresole

kondygnacje podziemne

(III) ilość kondygnacji

F oznaczenie budynków

śmietniki

HP hydrant pożarowy zewnętrzny

wjazd do garażu i na teren inwestycji

wejścia do klatek

drzewa do adaptacji
90 - kolejny nr inwentaryzacji

drzewo do adaptacji warunkowej po wyznaczeniu poziomu terenu; 90 - kolejny nr inwentaryzacji

drzewa wnioskowane do wycinki
251 - kolejny nr inwentaryzacji

SIECI I PRZYŁĄCZA WG ODRĘBNEGO OPRACOWANIA

proj. przyłącze kanalizacji sanitarnej

proj. przyłącze kanalizacji deszczowej

proj. podłączenie wpustów

projektowany wpust deszczowy

proj. przyłącze wodociągowe

proj. przyłącze sieci cieplnej

proponowana lokalizacja złącz kablowych

Kabel zasilający wg opracowania ENERGA

Kabel oświetleniowy nn-0,4kV

projektowana latarnia wys. 250 cm

projektowany słupek oświetleniowy wys. 80 cm

1.02 1.03 1.04 ABL-3-01 1.06

2187

31 725 675 725 31

148 435.5 110 180 110 180 110 180 110 475.5 148

B22-OP-01 110x230 ×4

1E 1D 1C 1B

148 338 244 277 288 244 343 148

A.01.M.04.03 LOGGIA 4.95 m²
B22-OP-03 285x230

A.01.M.04.04 POKÓJ 10.49 m²
A.01.M.03.04 POKÓJ 10.57 m²
A.01.M.04.05 POKÓJ 8.94 m²
A.01.M.03.05 POKÓJ 8.86 m²
A.01.M.03.03 LOGGIA 4.92 m²
B22-OP-03 285x230

A.01.M.03.01 SALON Z ANEKSEM 25.09 m²

A.01.M.04 - M3a
POW. 56.83 m²
POW. D. 4.95 m²

A.01.M.03 - M3a
POW. 57.88 m²
POW. D. 4.92 m²

B22-OP-01 110x230

A.01.M.04.01 SALON Z ANEKSEM 24.69 m²
A.01.M.04.02 PRALNIA 1.20 m²
A.01.M.04.07 ŁAZIENKA 4.14 m²
A.01.M.03.07 ŁAZIENKA 4.87 m²
A.01.M.03.06 HOL 7.48 m²
A.01.M.04.06 HOL 7.37 m²
A.01.M.03.02 GARDEROBA 1.06 m²

A.01.M.05 - M2a
POW. 38.46 m²
POW. D. 4.50 m²

A.01.M.05.05 ŁAZIENKA 4.78 m²
A.01.M.05.04 HOL 4.25 m²
A.01.M.05.03 POKÓJ 11.28 m²
A.01.K.01 KLATKA SCHODOWA
A.01.M.02.06 ŁAZIENKA 4.52 m²
A.01.M.02.04 POKÓJ 10.30 m²
A.01.M.02.05 HOL 8.67 m²
A.01.M.02.02 KUCHNIA 8.17 m²
A.01.M.05.02 LOGGIA 4.50 m²
B22-OP-03 285x230
A.01.M.05.01 SALON Z ANEKSEM 18.46 m²
3x17.22x26

A.01.M.02 - M2k
POW. 51.34 m²
POW. D. 4.01 m²

A.01.M.02.01 SALON 19.68 m²
A.01.M.02.03 LOGGIA 4.01 m²
B22-OP-03 285x230

A.01.M.06 - M3k
POW. 61.61 m²
POW. D. 6.81 m²

A.01.M.06.03 KUCHNIA 7.68 m²
A.01.M.06.07 HOL 8.51 m²
A.01.M.06.02 WC 1.67 m²
A.01.M.06.08 ŁAZIENKA 4.54 m²
A.01.M.01.07 ŁAZIENKA 4.54 m²
A.01.M.01.06 HOL 4.62 m²
A.01.M.01.01 SALON 19.64 m²
A.01.M.06.01 SALON 16.51 m²
A.01.M.06.06 POKÓJ 10.45 m²
A.01.M.01.03 KUCHNIA 7.02 m²
A.01.M.06.05 POKÓJ 12.24 m²
A.01.M.01.05 POKÓJ 10.81 m²

A.01.M.01 - M2k
POW. 49.91 m²
POW. D. 6.45 m²

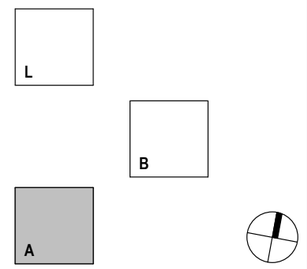
A.01.M.06.04 LOGGIA 6.81 m²
B22-OP-02 300x231
A.01.M.01.04 LOGGIA 6.59 m²

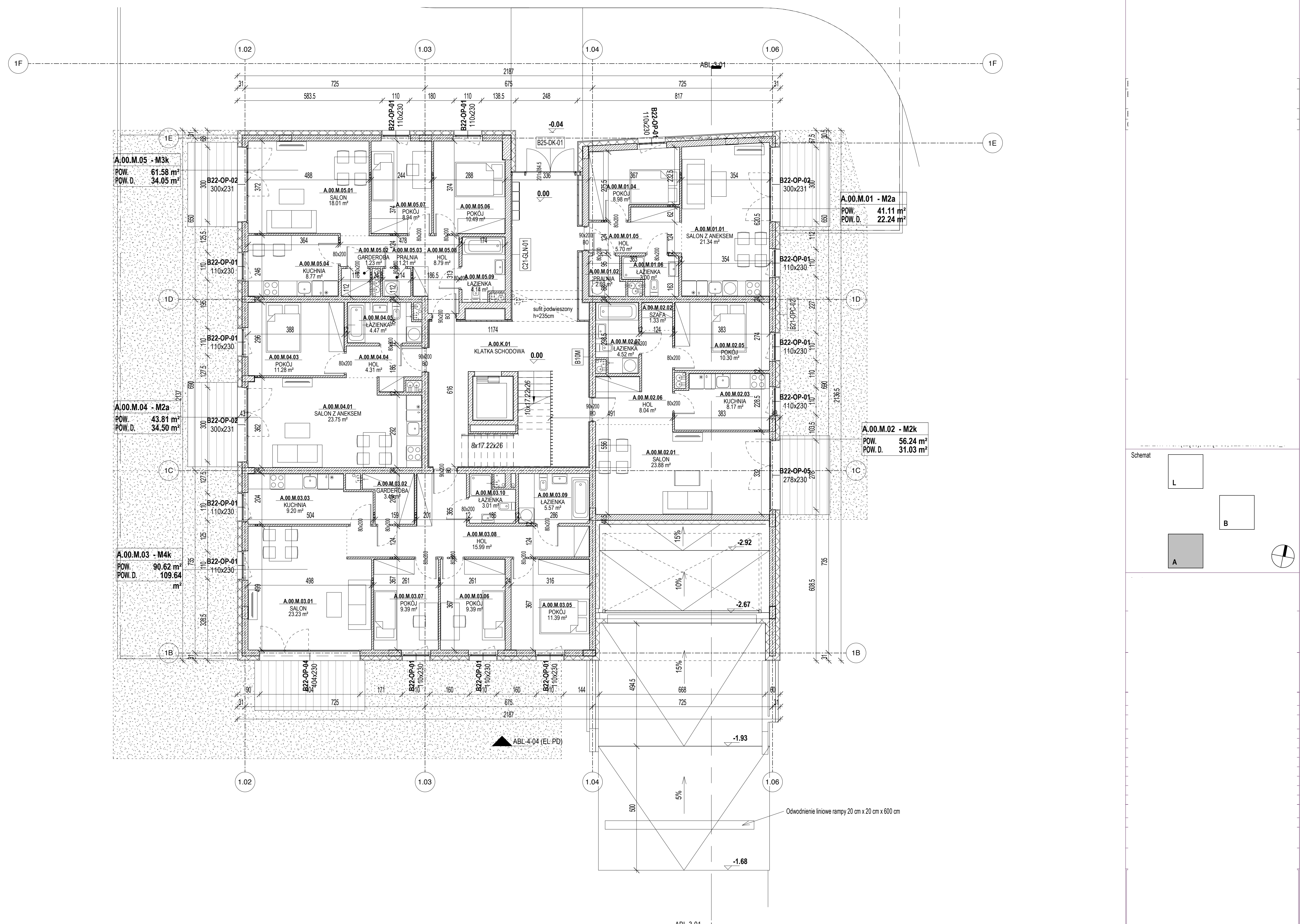
194 300 171 10 160 10 160 10 155 10 128.5 478.5

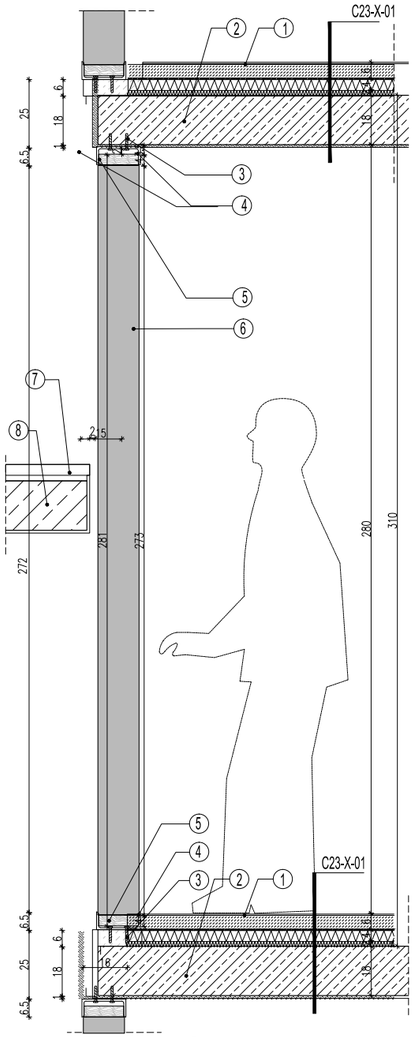
725 675 725

2187

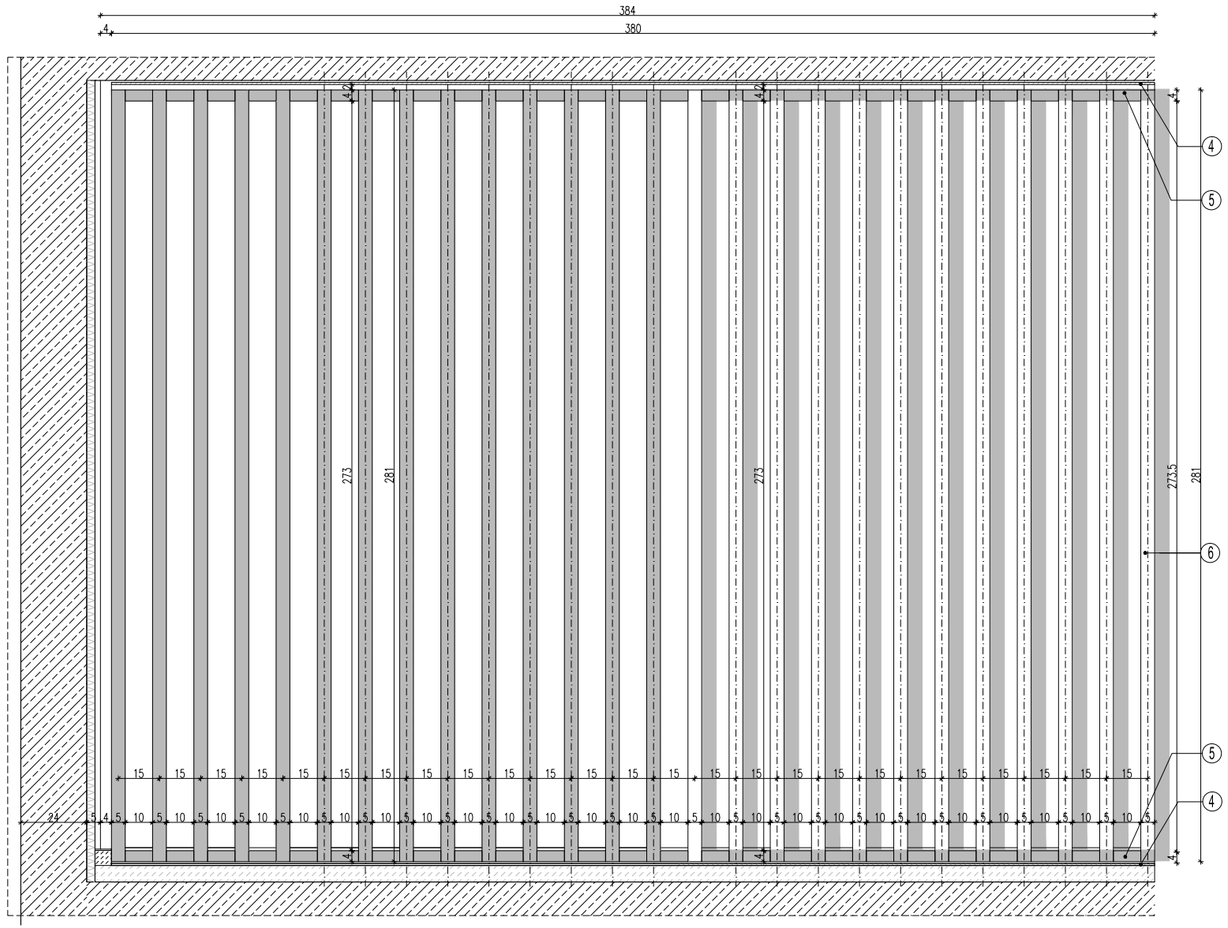
Schemat



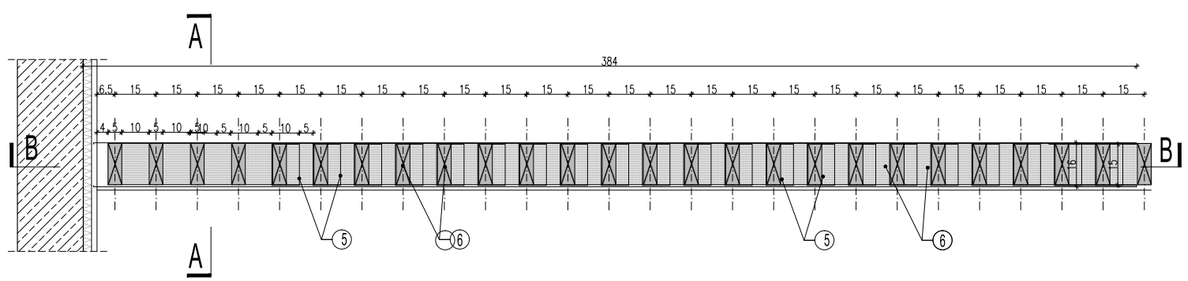

A.00.M.05 - M3k
POW. 61.58 m²
POW. D. 34.05 m²
A.00.M.04 - M2a
POW. 43.81 m²
POW. D. 34.50 m²
A.00.M.03 - M4k
POW. 90.62 m²
POW. D. 109.64 m²
A.00.M.01 - M2a
POW. 41.11 m²
POW. D. 22.24 m²
A.00.M.02 - M2k
POW. 56.24 m²
POW. D. 31.03 m²
A.00.K.01
KLATKA SCHODOWA
sufit podwieszony h=235cm
Odwodnienie liniowe rampy 20 cm x 20 cm x 600 cm
ABL-3-01
ABL-4-04 (EL.PD)
Schemat
L
B
A



PRZEKRÓJ A-A



PRZEKRÓJ B-B



RZUT

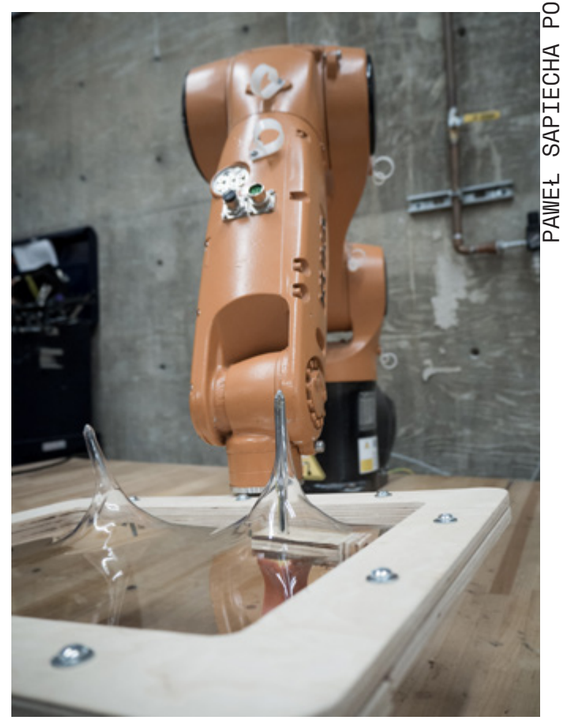
LEGENDA:
1 - C23M-KO-07 - WARSTWA WYKOŃCZENIOWA Z BEZSPOINOWEJ POSADZKI Z MIKROCEMENTU O GRUBOŚCI 3MM, CREATIVO BAUTECH;
LUB:
FLOWCRETE PERAN STB, BEZSPOINOWA POSADZKA PRZEMYSŁOWA NA BAZIE BEZBARWNEJ ŻYWICY EPOKSYDOWEJ I ZACIERANEGO, BARWIONEGO PIASKU KWARCOWEGO, GR. 3MM
2 - PŁYTA ŻEBETOWA WYLEWANA WG PROJEKTU KONSTRUKCJI
3 - WKRĘT STALOWY DO BETONU ø 8 x 60MM
4 - CEOWNIK GORĄCOWALCOWANY STALOWY 160X65mm GR. 0,75mm, CAŁY ELEMENT OCYNKOWANY OGNIOWO, POWLEKANY PROSZKOWO NA KOLOR RAL 7016
5 - C19-BA-02 - DREWNIANA DESKA ŁĄCZĄCA, 100x150mm, wys. 40mm - MODRZEW SYBERYJSKI, MALOWANY NA KOLOR JASNY DĄB - DO POTWIERDZENIA Z ARCHITEKTEM, DODATKOWE MALOWANIE W CELU UZYSKANIA KLASY NRO (NIE ROZPRZESTRZENIANIE OGNIA), PRZEPIERZENIE DREWNIANE MONTOWANE NAPRZEMIENNIE BELKA I DESKA, IDENTYCZNIE GÓRNA I DOLNA, ELEMENTY ŁĄCZONE NA KLEJ Z ZACHOWANIEM GÓRNEJ DYLATACJI 20MM
6 - C19-BA-02 - DREWNIANY SŁUPEK - KANTÓWKA Z MODRZEWIA SYBERYJSKIEGO 50X150MM, MALOWANY NA KOLOR JASNY DĄB - DO POTWIERDZENIA Z ARCHITEKTEM. DODATKOWE MALOWANIE W CELU UZYSKANIA KLASY NRO (NIE ROZPRZESTRZENIANIE OGNIA). PRZEPIERZENIE DREWNIANE MONTOWANE NAPRZEMIENNIE BELKA I DESKI GÓRNA I DOLNA. ELEMENTY ŁĄCZONE NA KLEJ Z ZACHOWANIEM GÓRNEJ DYLATACJI 20MM
7 - C23M-KA-01 - PŁYTY STOPNICOWE TERAZZO, DASAG CENTRO/TERRASTONE NR 7105
8 - SPOCZNIK ŻELBETOWY WYLEWANY WG PROJEKTU KONSTRUKCJI
9 - NADLEWKA BETONOWA POD MONTAŻ ŚCIANKI DEKORACYJNEJ, SZER. 15cm, WYS. 6cm

UWAGA:
NA OSTATNIEJ KONDYGNACJI W BUDYNKU L, BELKI STALOWE O PROFILU CEOWYM NALEŻY MOCOWAĆ DO STROPU POWYŻEJ PRZY POMOCY ZAWIESI ORAZ DO ŚCIAN BOCZNYCH, ZGDONIE Z OPISEM PONIŻEJ:
ZAWIESIA DO PODWIESZENIE PROFILU CEOWEGO (NP. C160) Z PRĘTÓW GWINTOWANYCH FI 10 MM, MAKSYMALNIE CO 100CM. ODCINEK DŁUGOŚCI OKOŁO 300 MM WKLEJONY W STROP KLEJEM HILTI HIT HY-200, A DO NIEGO PODWIESZONE ZAWIESIE PRZY POMOCY ŚRUBY RZYMSKIEJ ABY MOŻNA BYŁO REGULOWAĆ DŁUGOŚĆ ZAWIESIA/POŁOŻENIE BELKI STALOWEJ, W BELCE CEOWEJ (W ŚRODNIKU) OTWORY FI 12 MM DO PODWIESZENIA/SKRĘCENIA ZAWIESIA Z BELKĄ. JEDEN KONIEC BELKI NALEŻY PRZYMOCOWAĆ DO ŚCIANY ŻELBETOWEJ, DRUGI POZOSTAWIĆ WOLNY (TYLKO PODWIESZONY ZAWIESIEM).
ABY USTABILIZOWAĆ BELKĘ W POZIOMIE PROPONUJĘ WYKONAĆ DODATKOWE BELECZKI Z RURY KWADRATOWEJ NP. 50X50X4MM W ROZSTAWIE MAX. 100 CM, KTÓRE BĘDĄ POŁĄCZONE Z BELKĄ STALOWĄ I ŚCIANAMI ŻELBETOWYMI SZACHTU WINDOWEGO.

Szczegóły rozwiązania i wymiarowanie elementów według rysunków warsztatowych i obliczeń Wykonawcy - do akceptacji Projektanta Konstrukcji i Architektury.

Schemat

R&D WORKS



SKILL MAP

IN THE OFFICE

OUTSIDE THE OFFICE

SOFTWARE

MATERIALS