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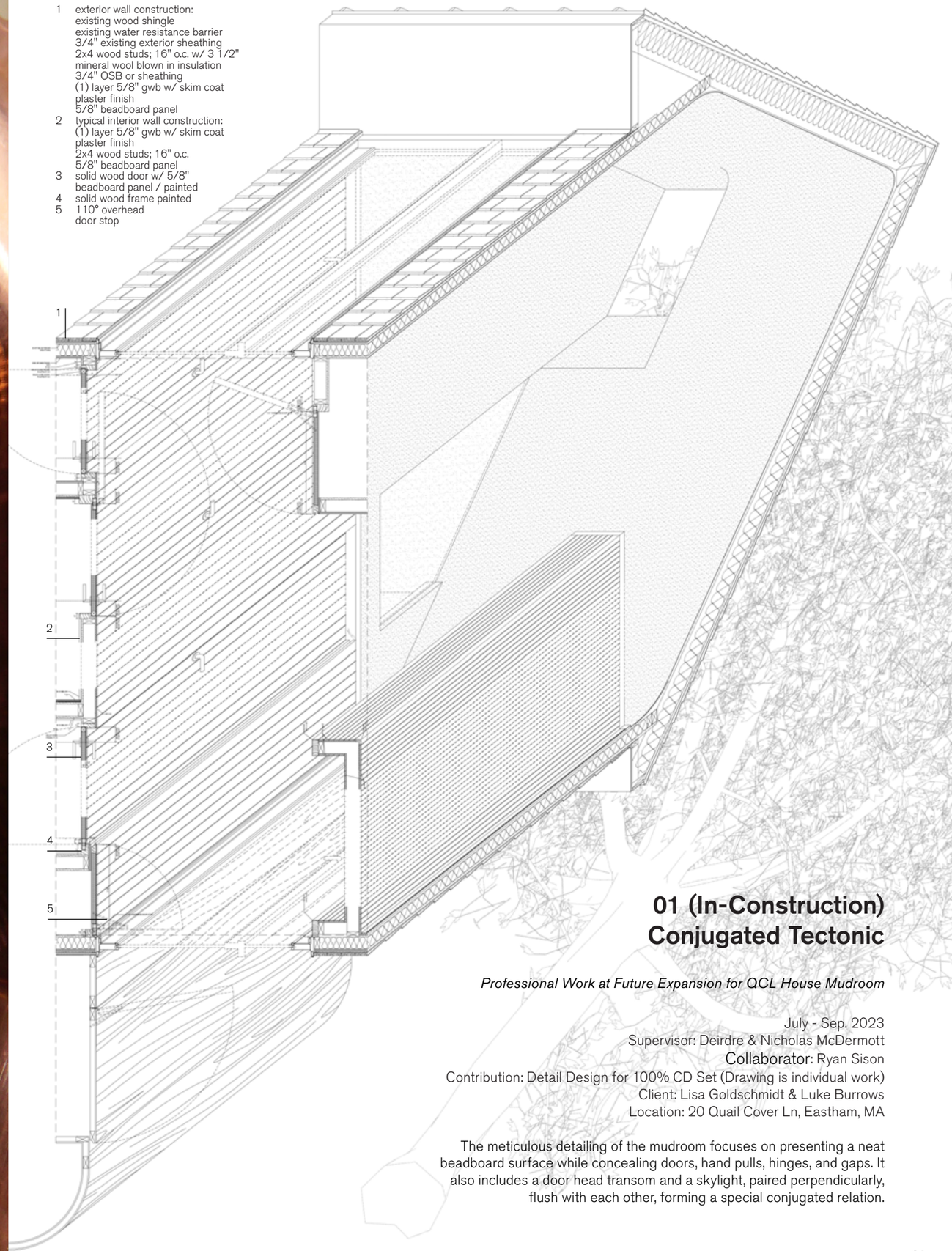
M.S.Arch (2022-2023), The Cooper Union
B.Arch (2015-2020), Tsinghua University

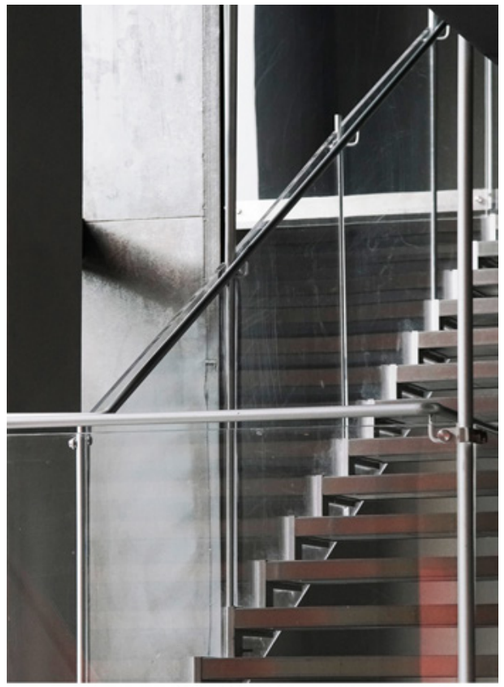


01 (In-Construction)
Conjugated Tectonic

Professional Work at Future Expansion for QCL House Mudroom

July - Sep. 2023
Supervisor: Deirdre & Nicholas McDermott
Collaborator: Ryan Sison
Contribution: Detail Design for 100% CD Set (Drawing is individual work)
Client: Lisa Goldschmidt & Luke Burrows
Location: 20 Quail Cover Ln, Eastham, MA

The meticulous detailing of the mudroom focuses on presenting a neat beadboard surface while concealing doors, hand pulls, hinges, and gaps. It also includes a door head transom and a skylight, paired perpendicularly, flush with each other, forming a special conjugated relation.



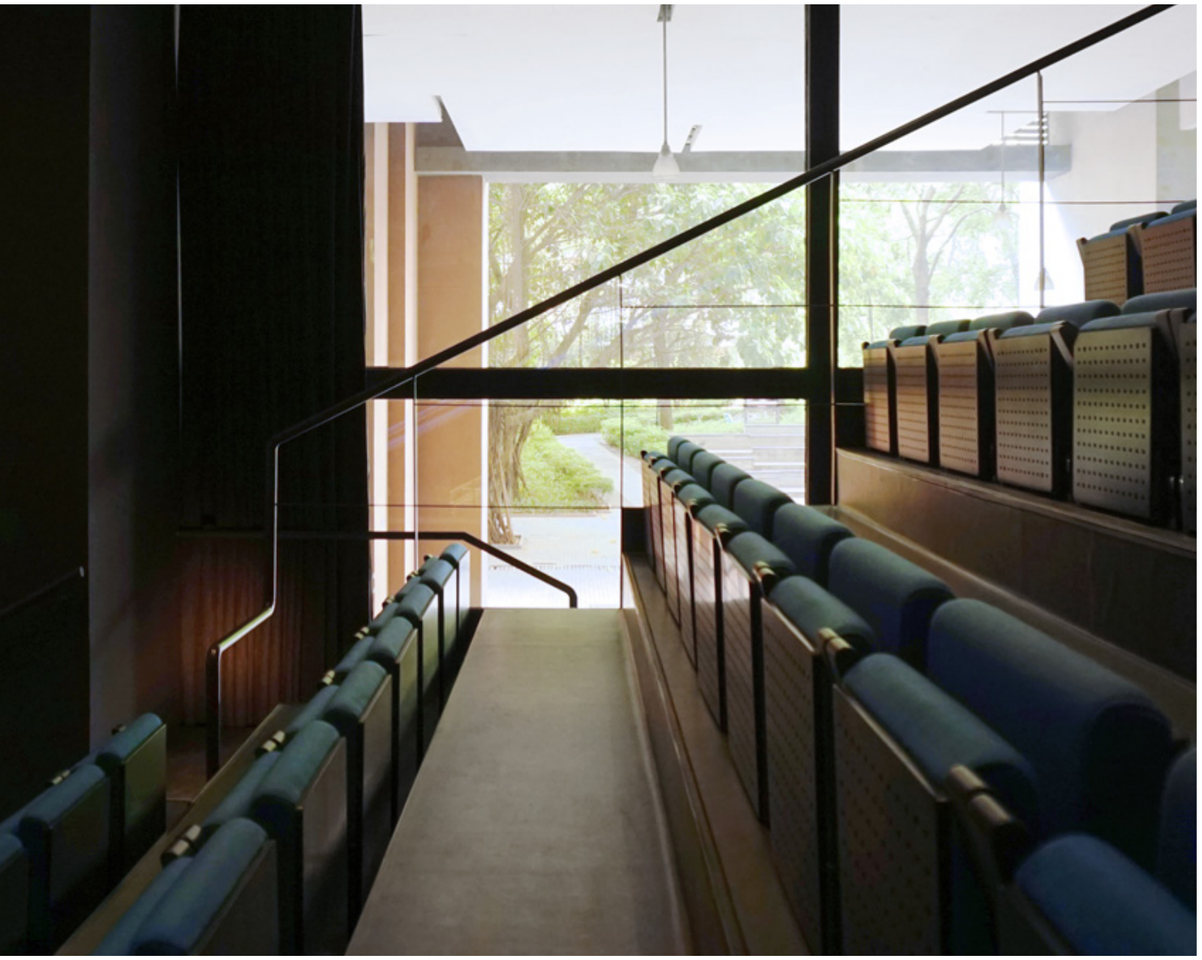
02 (Built) Times Museum Renovation

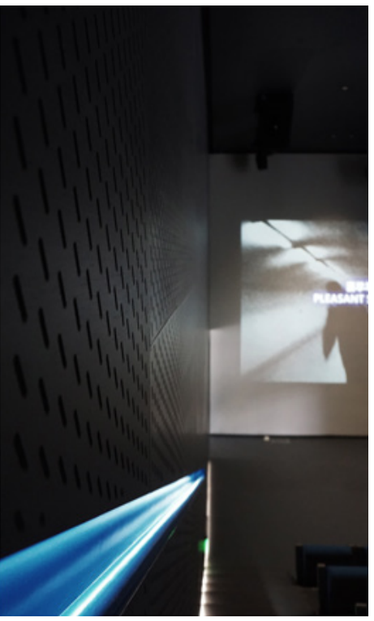
Professional Work at O-Office Architects, as Project Designer

Oct. 2020 - Nov. 2021
Supervisor: Jiangxiang He, Ying Jiang, Kelvan Dong
Role: Project Designer (Detail drawings are individual work)
Client: Guangdong Times Museum
Location: Times Rose Garden, Huangbian North Road, Baiyun Avenue North, Guangzhou (510440)

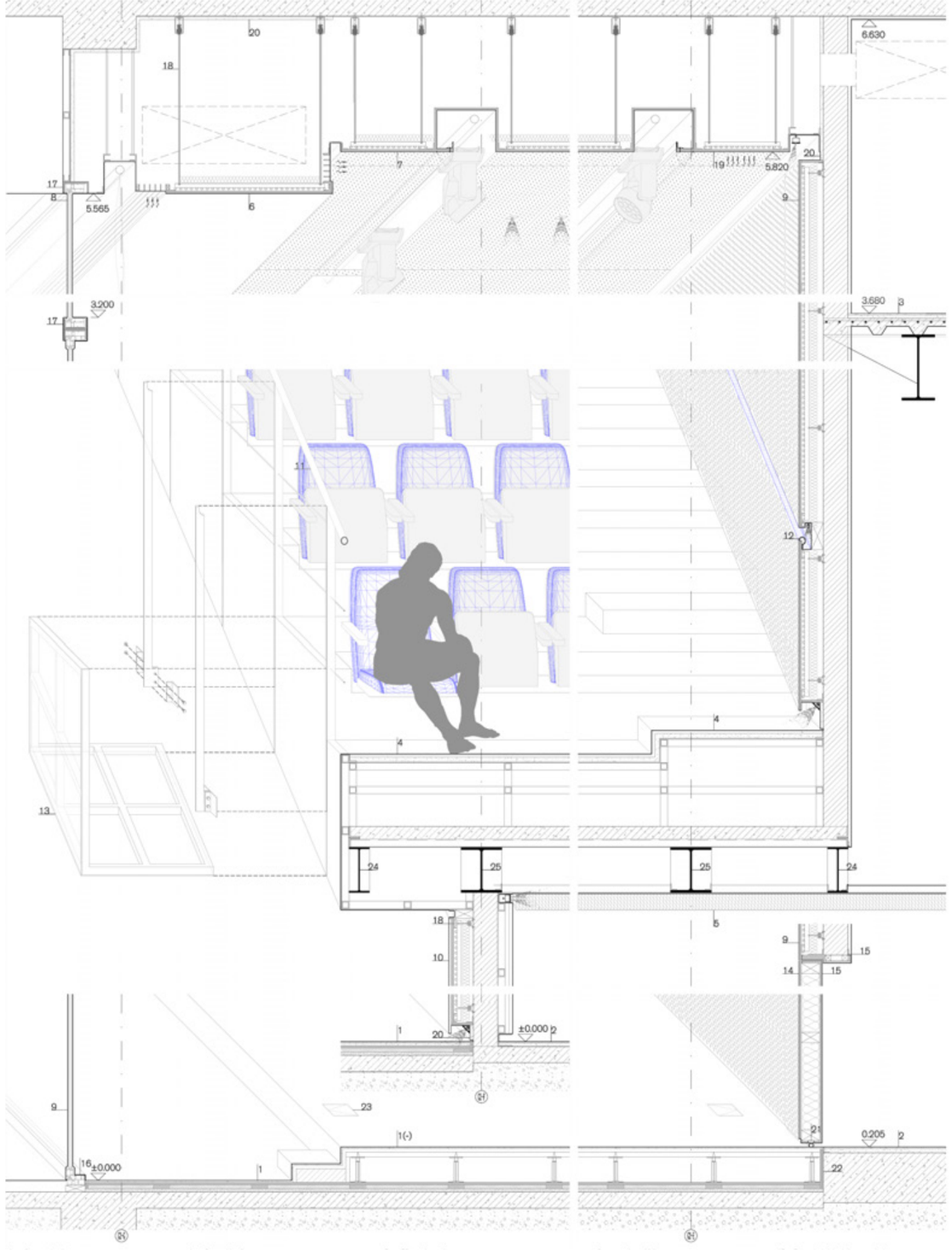
The Guangdong Times Museum, a non-profit public art museum embedded in a residential building, was designed by Rem Koolhaas and Alan Flaux in 2005. A renovation in the lobby replaced the once-closed stairwell with a floating staircase, presenting the open image of the gallery and the precision of the metal industry in the Pearl River Delta region. The entire staircase is suspended from the ceiling and framed by a pair of laser-cut one-piece steel plates. Acrylic panels and thin round steels constitute the transparent guardrail that reflects the rich colors of the museum lobby.

1 floor construction:
6 mm self-levering concrete, with polyurethane cover
2 mm floor sealer
20 mm 1:3 cement screed
original concrete base
2 6 mm rubber floor
20 mm 1:3 cement screed
220/60/1/600 mm steel deck concrete composite slab
3 ceiling construction:
25/25 mm steel section
10 mm cement fibreboard, dark grey
4 25/25 mm steel angle, dark grey
expanded aluminium mesh, dark grey, 30/20mm rhombus-pattern
5 prefabricated mesh panel:
45/45 mm galvanized steel section
3 mm aluminium panel
aluminium frame
expanded aluminium mesh, 30/10mm rhombus-pattern
6 pair of 250/82 mm steel channels
7 pair of 80/43 mm steel channels @2400mm
8 Φ30mm stainless steel rod, sandblasted
9 Φ20mm stainless steel rod, sandblasted
10 80/20mm stainless steel beam
11 prefabricated step panel:
2mm perforated steel panel, 5mm hexagon-pattern
50/30 mm galvanized steel section
2mm expanded steel mesh, 5mm hexagon-pattern
12 railing:
Φ20 mm stainless steel post, sandblasted
15 mm Acrylic panel, installed with glazing brad
Φ30 mm stainless steel handrail, sandblasted
13 expanded aluminium mesh, 30/10mm rhombus-pattern
14 3 mm aluminium panel
15 2mm perforated aluminium panel 5mm hexagon-pattern
16 400/200 mm steel I-beam





To offer a public-facing window towards the community, one side of the auditorium is entirely transparent, presenting a challenge in maintaining optimal interior acoustic performance. The final design addresses this challenge by incorporating custom-made acoustic glazing and custom-pattern perforated sound-absorbing panels. These elements not only meet the acoustic requirements but also contribute to shaping an auditorium characterized by simplicity.



1 floor construction:
6 mm rubber floor
15 mm layered damping panel
25 mm glass cotton
20 mm 1:3 cement screed
100 mm fine aggregate concrete

2/3 6 mm self-levering concrete, with polyurethane cover
2 mm floor sealer
20 mm 1:3 cement screed
100 mm fine aggregate concrete/ 220/60/1/600 mm steel deck concrete composite slab

4 6 mm rubber floor
15 mm fire-resistant plywood
220/60/1/600 mm steel deck concrete composite slab

5 prefabricated ceiling panel:
3 mm aluminium panel
expanded aluminium mesh

6 ceiling construction:
50 mm glass cotton
15 mm layered damping panel
10 mm cement fibreboard

7 15 mm perforated acoustic panel

8 6+6a+6+6a+6 acoustical glazing

9 wall construction:
15 mm perforated acoustic panel
50 mm glass cotton
150 mm aerated concrete block
10 mm cement fibreboard

10 15 mm layered damping panel
50 mm glass cotton
150 mm aerated concrete block
45/45 mm steel section
10 mm cement fibreboard

11 railing, dark grey sandblasted:
8/50 mm post, Φ5 mm rods,
Φ40 mm handrail

12 hidden handrail, painted blue
Φ40 mm steel pipe, 3mm folded steel plate

13 5 mm folded steel plate
14 15 mm perforated acoustic panel
15 5 mm steel plate, dark grey coated
16 3 mm steel plate, dark grey coated
17 140/60 mm steel channel
18 damper@800 mm
19 15 mm perforated acoustic panel, without backing cloth
20 20mm inorganic fibres
21 flexible sealing strip
22 damping pad
23 ground socket
24 250/125 mm steel I-beam
25 250/250 mm steel I-beam

VERNACULAR PALIMPSEST

Undergraduate Thesis, as Project Designer

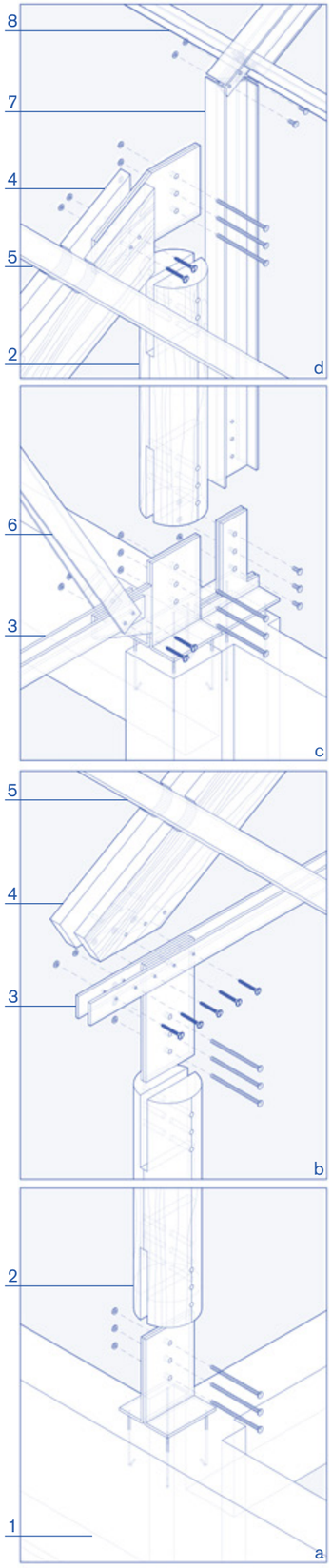
Rural Revitalization Program, July 2018-Aug. 2021
Instructor: Hong Zhang
(E-mail: zhanghong@tsinghua.edu.cn)
Role: Student Project Leader
Collaborators: Yingpei Li, Jiaxin Zhang, Yixi Shen & others
Contribution: Concept 70%, Design 80%,
Modeling, Visualization & Photography in this portfolio 100%
Location: Dongjiao Village, Fuding, Fujian

What's left is palimpsest - one memory bleeding into another, overwriting it.
-- Natasha Trethewey

It's hard for us to imagine the time when writing material was so precious that people chose to rewrite completed manuscripts, resulting in a palimpsest. It's even harder to imagine if a settlement has been preserved and reconstructed simultaneously and constantly in a similar manner.

Yet, this is exactly how people build in Dongjiao Village. Here, houses grow and metabolize, absorbing new materials and structures. With well-chosen locations facing the sea and hills as a backdrop, they develop into distinct and complementary dual appearances.

This practical project explores how this vernacular palimpsest would continue today. A workstation is renovated based on an abandoned schoolhouse, accommodating volunteer students and startup teams, and serving as venues for rural festivals.



1 200/600 mm concrete beam
2 Φ200 mm round timber
3 cast iron secondary beam
4 principle rafter with the tail cut
5 Φ100 mm round timber
6 cast iron bracing
7 140/80 mm I-column
8 120/60 mm I-beam

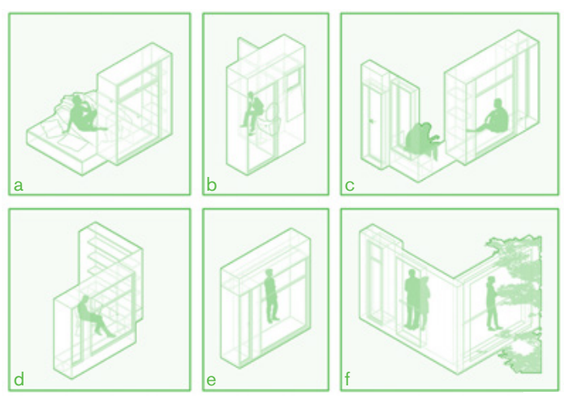
Sea-Side
Compound Columns

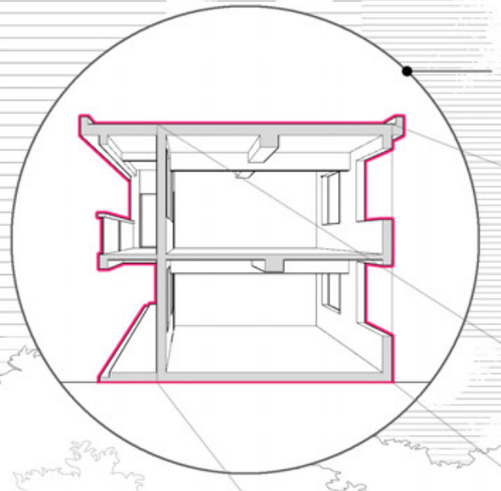
The front side is built as if in many times - concrete, timber, and I-steel columns grow out of the original building in succession, resulting in a rich sequence of details.

Mountain-Side
Integrated Openings

Inspired by primitive stone houses, the thickness of openings are designed into a furniture system containing bay windows, closets, hidden pipelines, etc.

window+tatami+shelf a
window+toilet b
bay window+shelf +seat+door c
window+desk+shelf d
french window+storage e
balcony+hanging bar f





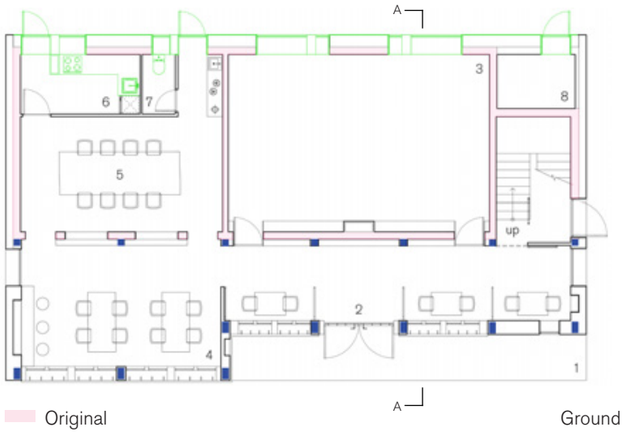
original schoolhouse

The abandoned school, a generic concrete building, is wrapped up by the continuous flow of composite structures, various materials, and additional programs.

roof construction 1
10mm blue roofing tile
38/38mm tile batten
38/38mm counter batten
3mm waterproofing membrane
30mm fir wood plank a
timber structure
30mm fibreboard b
I-beam structure
suspended bamboo ceiling
wall construction 2
120mm blue brick fixed with
adjustable masonry veneer anchor
30mm air space
20mm insulation
original wall
grey concrete paint
wall construction 3
20 mm dry-hang lava plate
30mm air space
20mm insulation
100mm aerated block masonry
10mm cement fibreboard
white latex paint
floor construction 4
6 mm self-levering concrete, with a
polyurethane cover
2mm floor sealer
20 mm 1:3 cement screed
250 mm fine aggregate concrete

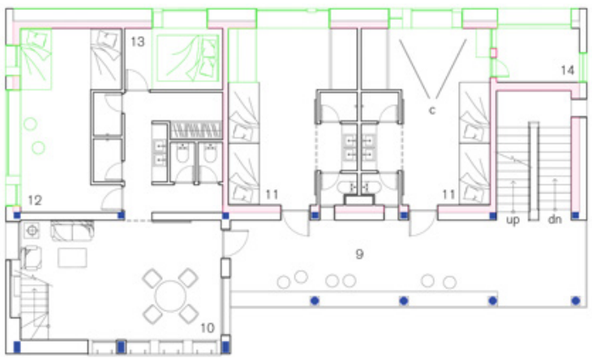
glazing 5
6mm toughened glass + 6mm
cavity + 6mm toughened glass
capping 6
8mm metal plate (with 3% slope)
20/20mm galvanized steel section
150mm air space, pipelines within
20mm insulation
concrete slab overhung
10/10mm galvanized steel section
30mm fir wood plank
clear varnish
wall construction 7
20 mm polycarbonate panel
20/20mm galvanized steel section
150mm air space, pipelines within
20mm insulation
concrete beam
concrete coating
floor construction 8
preservative-treated timber
30/30mm galvanized steel section
dark gray peddle
20 mm 1:3 cement screed
100 mm fine aggregate concrete

Tectonic Palimpsest
A-A Sectional Perspective



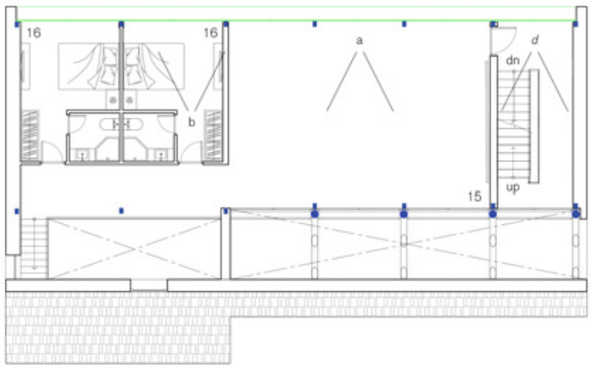
Original

Ground Floor



Original

Second Floor



Attic Floor

0 4m

1 Terrace
2 Lobby
3 Multifunction
4 Studio
5 Meeting Room
6 Kitchen
7 Restroom
8 Equipment
9 Terrace
10 Living Room
11 Room for 5
12 Room for 4
13 Tatami
14 Balcony
15 Tea Room
16 Business Single

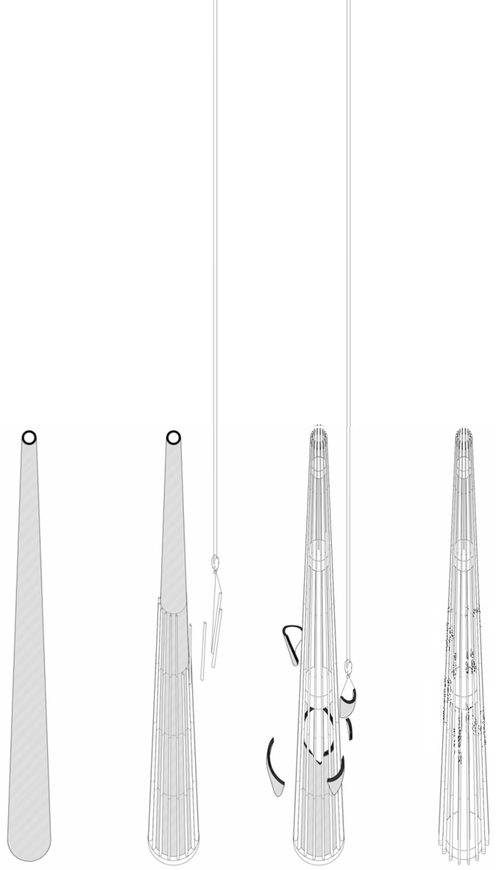
In the interior design, the original floor slabs and walls are kept as simple and low-key as possible, setting off the texture and color of the additional part and the dual landscape pouring in through openings.


a


b


c


d



04

TOWER

Individual Academic Work

Mar. - May 2018
Instructor: Weiping Shao
(shaoweiping@biad.com.cn)
Location: Xicheng District, Beijing

This is a project about construction, deconstruction, constructing a constructive deconstruction, and a deconstructed construction.

It intervenes in a site marked by conflicting constructions, where two towers stand side by side, embodying an outdated urban development approach that disrupts the continuity of urban history. The ancient pagoda finds itself emasculated by a nearby chimney three times its height, which, ironically, is also abandoned today as an industrial relic.

By weaving the typically linear construction timeline into an intricate storyline, the renovation process of the chimney becomes an aesthetic subject, a dynamic event, and a manifesto of the beauty and expressiveness in architecture's temporality. Eventually, a complementary landscape of a lightsome lighthouse and the solemn pagoda would replace the current discordant urban spectacle.

Chimney of Beijing No.2 Thermal Power Plant
Height:180m
Constructed Year: 1967
Material: RC
Status quo: Abandoned

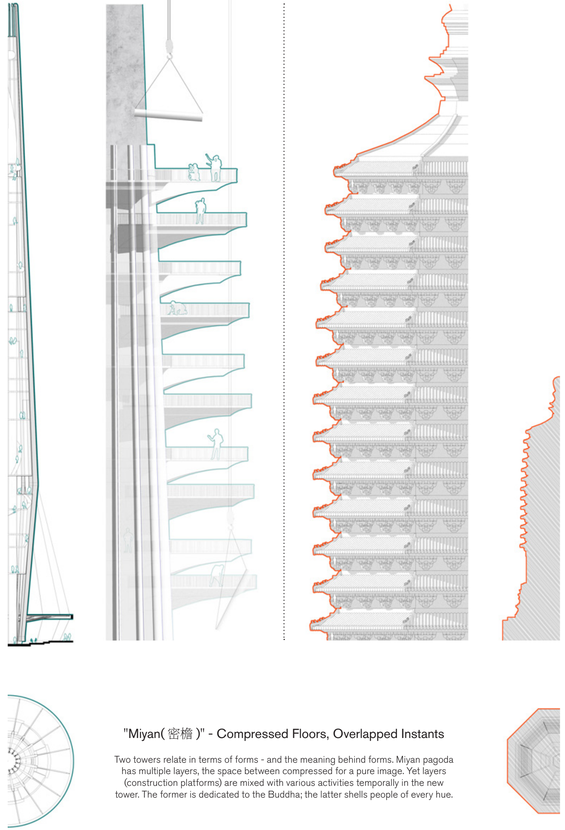
Pagoda of Tianning Temple
Height: 57.8m
Constructed Year: 1119
Material: Brick
Status quo: Cultural Relics

Site East Elevation

Zhongdu, Jin Dynasty ..... Peking, Ming&Qing Dynasty ..... Beijing, PRC

Dramatic Irony - Religion Emasculated by Industry

Tianning Temple, the oldest historical building in Beijing, represents the city's long history and religious culture. By contrast, the No.2 Thermal Power Plant is the legacy of a unique period in modern Chinese history. It stands for the backward industrial era and development concept. In this way, the two towers generate a tense confrontation in this area - a city spectacle.



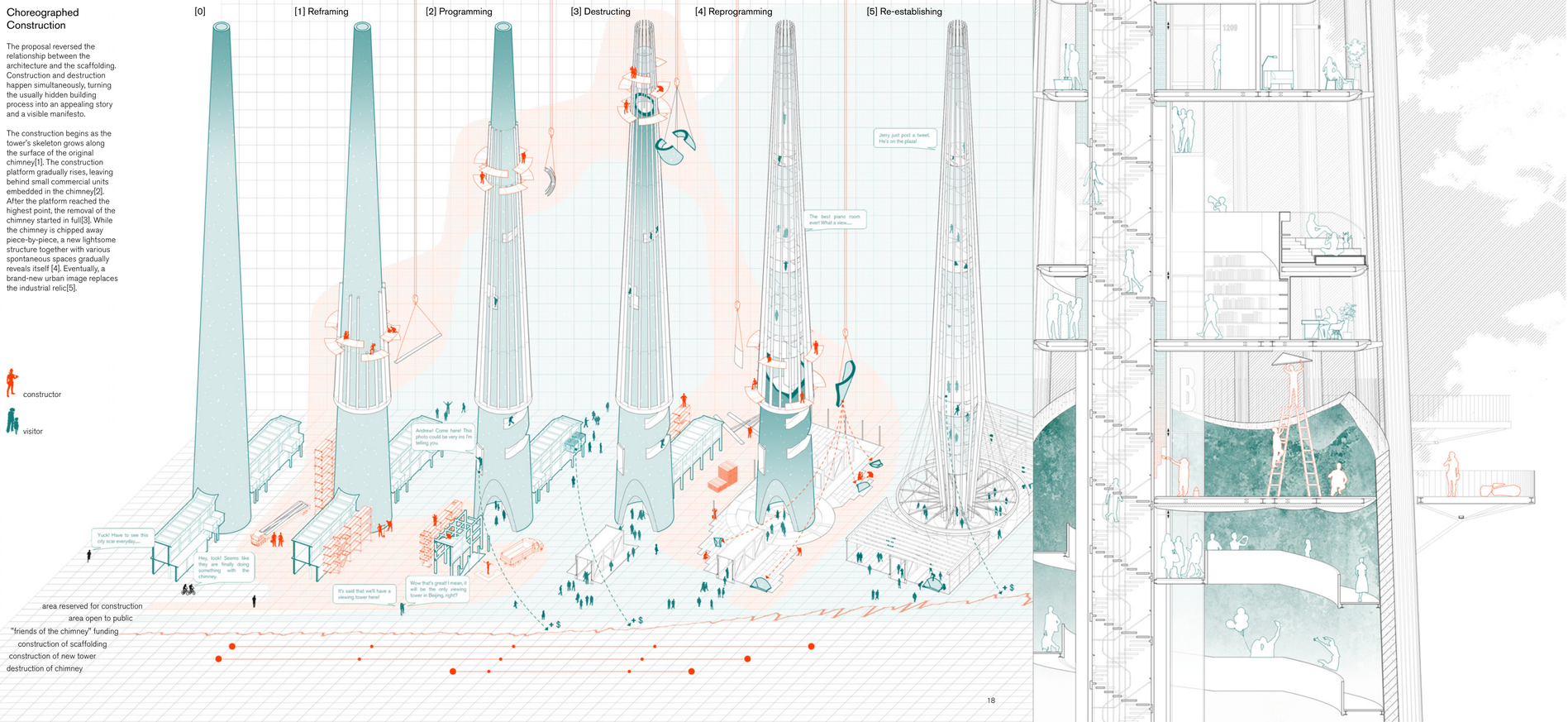
"Miyan(密檐)" - Compressed Floors, Overlapped Instants

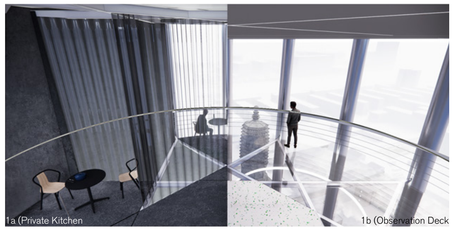
Two towers relate in terms of forms - and the meaning behind forms. Miyan pagoda has multiple layers, the space between compressed for a pure image. Yet layers (construction platforms) are mixed with various activities temporally in the new tower. The former is dedicated to the Buddha; the latter shells people of every hue.

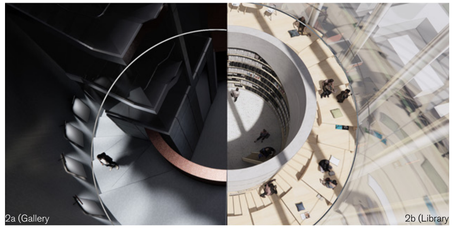
Choreographed Construction

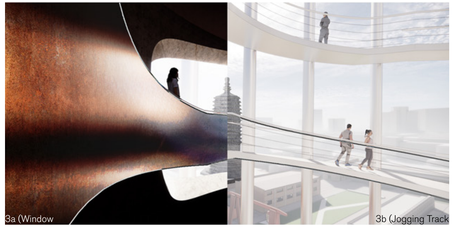
The proposal reversed the relationship between the architecture and the scaffolding. Construction and destruction happen simultaneously, turning the usually hidden building process into an appealing story and a visible manifesto.

The construction begins as the tower's skeleton grows along the surface of the original chimney[1]. The construction platform gradually rises, leaving behind small commercial units embedded in the chimney[2]. After the platform reached the highest point, the removal of the chimney started in full[3]. While the chimney is chipped away piece-by-piece, a new lightsome structure together with various spontaneous spaces gradually reveals itself [4]. Eventually, a brand-new urban image replaces the industrial relic[5].



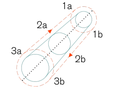


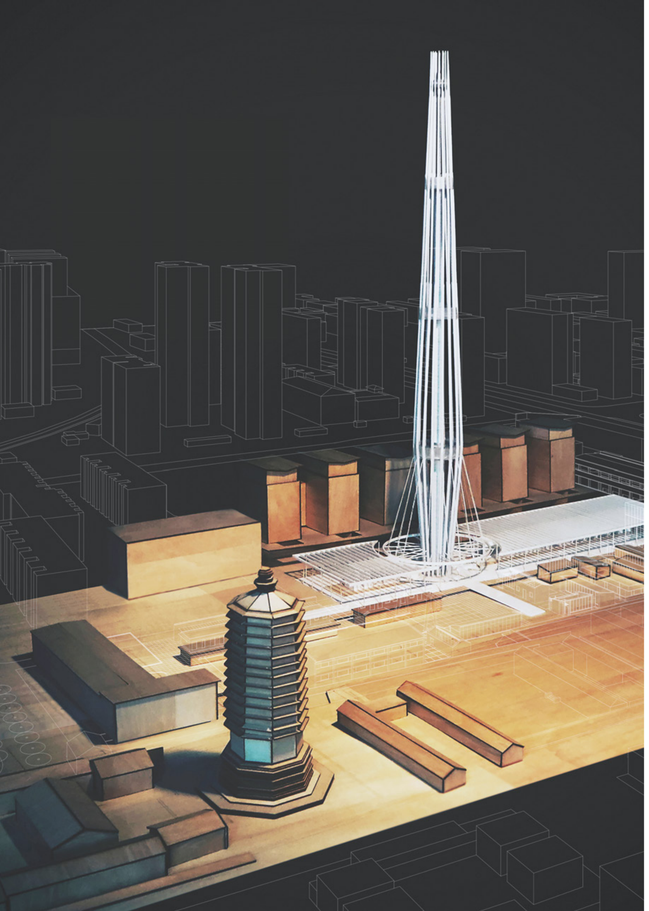




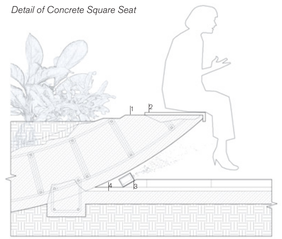
A Spatiotemporal Sequence

Construction, demolition and usage co-occur in the tower, and various programs are organized into different heights and time points, forming an intertwined spatiotemporal experience. The chimney's height facilitates construction organization and provides a variety of perspectives for viewing the pagoda.





Detail of Concrete Square Seat

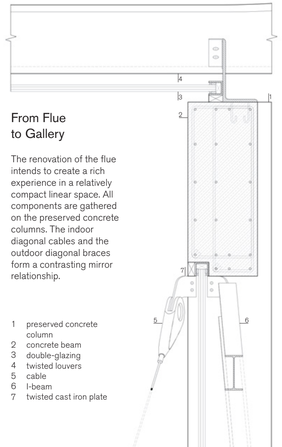


From Chimney to Landscape

The dismantled chimney fragments would have a more intimate relationship with visitors as they become part of the square landscape in the form of seats, flower ponds, skatepark, etc.

1 chimney fragment
2 steel plate
3 ground spotlight
4 concrete base

Detail of Gallery Column



From Flue to Gallery

The renovation of the flue intends to create a rich experience in a relatively compact linear space. All components are gathered on the preserved concrete columns. The indoor diagonal cables and the outdoor diagonal braces form a contrasting mirror relationship.

1 preserved concrete column
2 concrete beam
3 double-glazing
4 twisted louvers
5 cable
6 I-beam
7 twisted cast iron plate

05

CITY WALL

Individual Academic Work

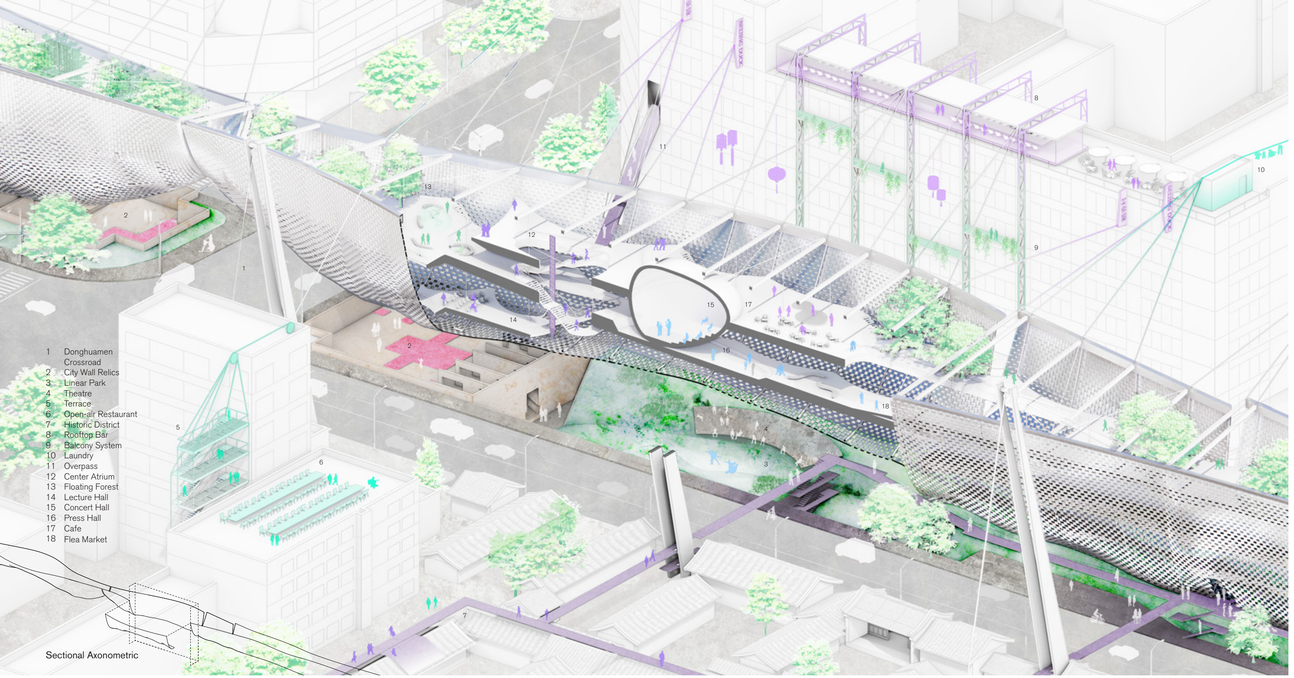
Sept. - Dec. 2021
Instructor: Alfred Pun
(alfredap@gmail.com)
Location: Beijing

"Walls, walls, and yet again walls form, so to say, the skeleton or framework of every Chinese city.

-- Osvald Sirén.

Unfortunately, today's Beijing, a skeleton-less that chose to dismember its own wall - may disappoint this art historian. Indeed, a modern metropolitan no longer needs a physical barrier to restrict its circulation, yet we risk betraying our culture and history with brutal demolishment and quickly forgetting.

This design develops a new typology, a "wall" inverted both tectonically and spatially, to continue the shattered history of this unique and paramount infrastructure. It's also an experiment to combine the ambition of "grand narrative" represented by the ancient landmark with the trivial, the personal, the incidental, the daily life - the "petit narratives" of contemporary society.

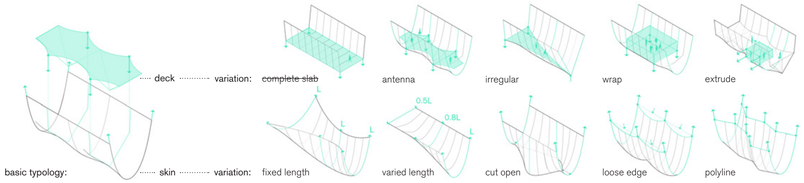


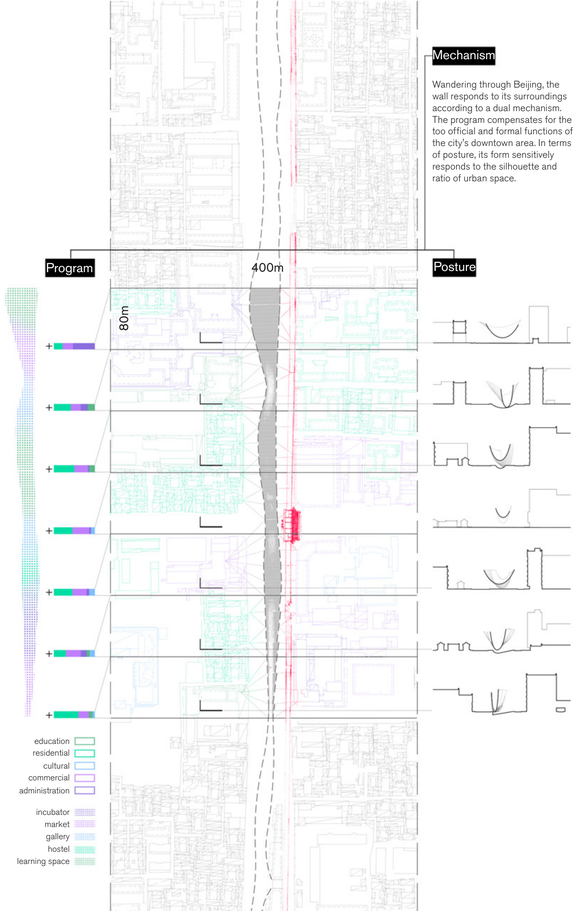
Sectional Axonometric

Spine of Urban Dynamics

In most cases, places where the erased city wall once was are left as unnecessarily broad city roads. The new "wall" floats on them, transferring the monotonous traffic line into a spine of urban vitality. Like a neural network, the cables and flyovers extend from the spine and activate the surrounding urban space.

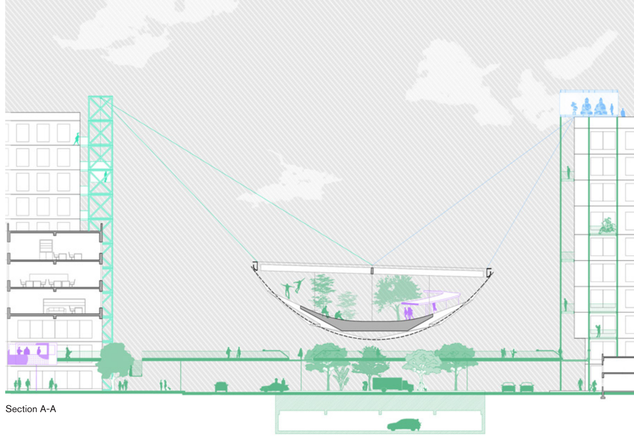
And just like the spine of an animal, the city wall is resilient, flexible and twistable. Its form changes freely in response to the different suspension points provided by the external environment and the varying internal space and structure. Some of its catenary form vocabularies are listed on the right.



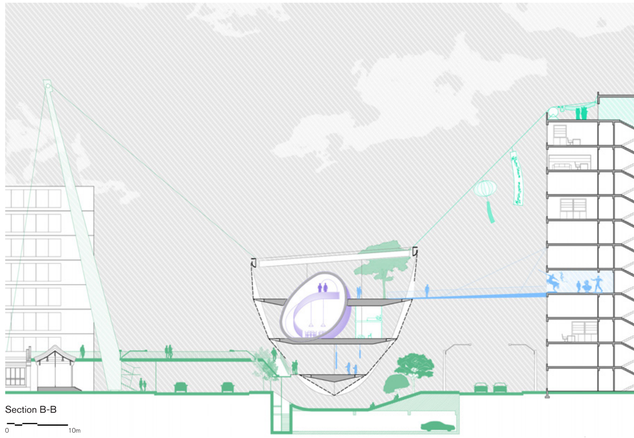


Mechanism

Wandering through Beijing, the wall responds to its surroundings according to a dual mechanism. The program compensates for the too official and formal functions of the city's downtown area. In terms of posture, its form sensitively responds to the silhouette and ratio of urban space.



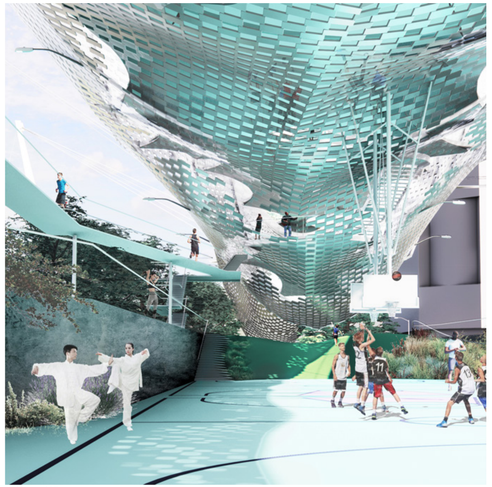
Section A-A



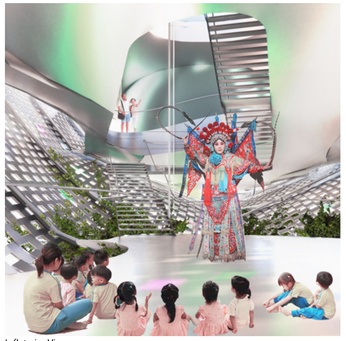
Section B-B

0 10m

Roof Floor Plan



a (Ground View

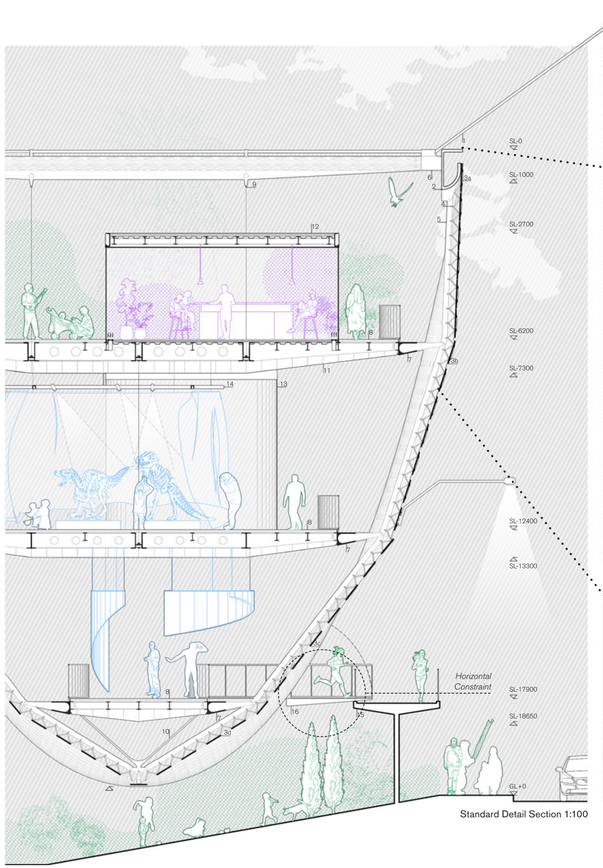


b (Interior View

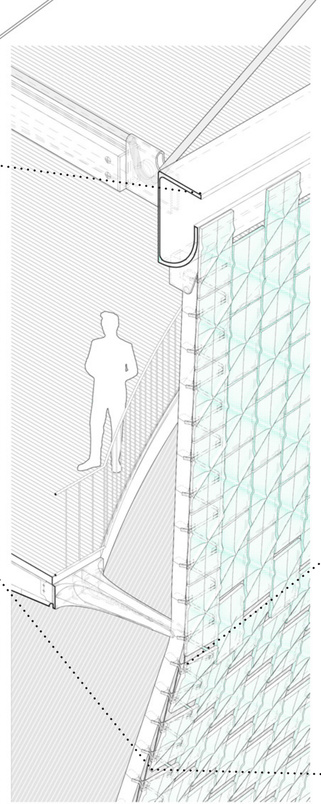
c (Roof Floor View

Publicity under/in/on the Wall

The wall provides multiple public platforms at different elevations. Continuous landscape parks, blurred boundary between in and out and decks that float in the air integrate into an endlessly extending venue for carnival.



Standard Detail Section 1:100



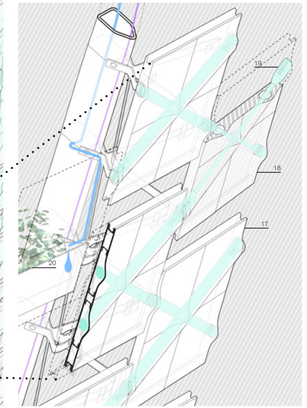
Detail Axonometric 1:40

Structural Facade - "Masonry" in Tension

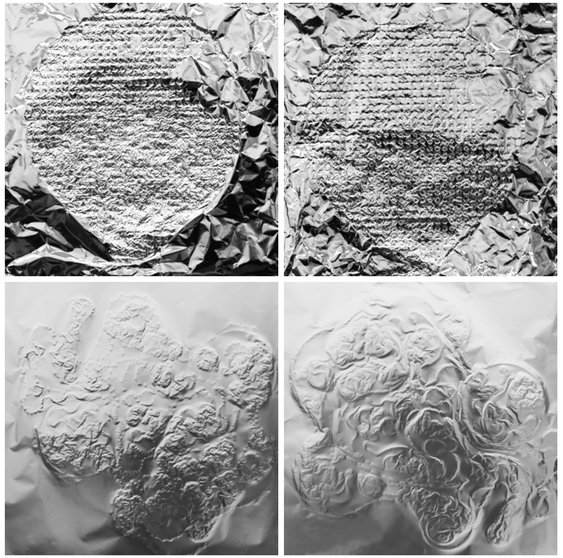
Tectonically, structural metal nets and pipelines are wrapped into the prefabricated blocks, forming a holistic inverted masonry system. Thanks to the good tensile performance of metal, the overall size of the structure system is reduced. The blood vessel-like bulges give the facade a sense of a living creature.

1 carbon-fibre cabel
2 anchor-shape steel beam
3a 925/475mm brick
3b 775/475mm brick
3c 665/475mm brick
3d 555/475mm brick
4 x-shape gripper
5 assistant profile
6 steel-wood beam
7 ▲-shape gripper
8 grating
9 assistant cabel
10 assistant stay bar
11 self-levering concrete floor sealer
steel deck
perforated metal mesh ceiling
12 roofing membrane
insulation
vapor barrier
steel deck
suspended ceiling
13 space enclosed by glazing
14 space seperated by curtain
15 footbridge
16 suspension bridge
17 anodized aluminum plate
18 colored glaze
19 structural metal net
20 prefabricated planter

tension
electricity
rain water



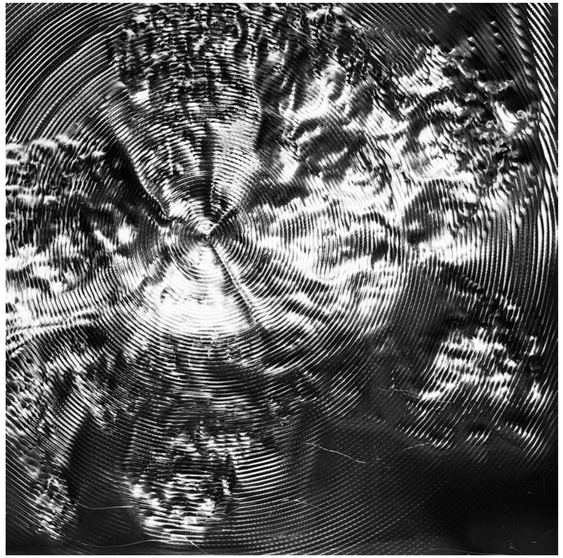
Detail Axonometric of the Prefabricated Blocks 1:15



Steel Balls, Silver Prints, Aluminum Translations

Opposite:
Bernd and Hilla Becher, *Water Tower*

From metal, of metal, through metal. In their serene typological portrayal of water tower structures, Bernd and Hilla Becher present an almost indifferent, cold depiction of those steel balls through gelatin silver photography. The S.P.I.F. project begins by translating this iconic image of steel balls into aluminum foil drawings engraved by a desktop drawing machine—an experiment pushing materiality to its surprising intricacy.



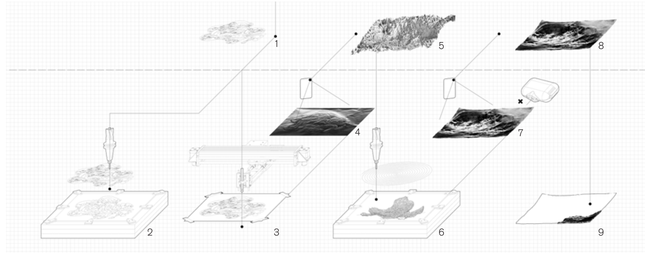
06 S.P.I.F. Metal Fabrication

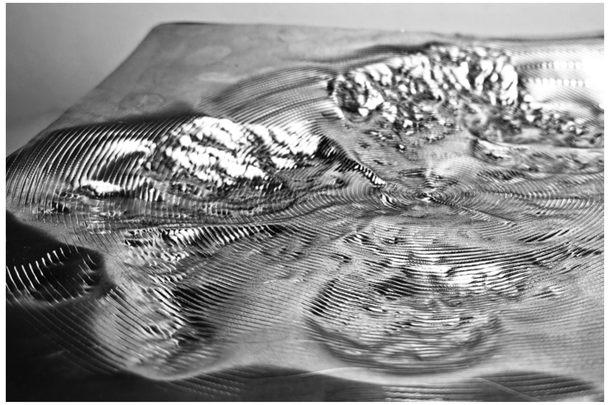
Individual Academic Work

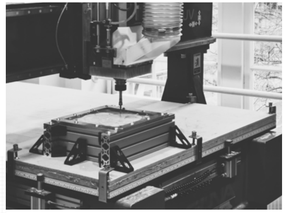
Sept. 2022 - Present
Instructor: Harrison Tyler (harrison.tyler@cooper.edu)
Benjamin Aranda (benjamin.aranda@cooper.edu)
Project funded by the AACE Lab of the Irwin S. Chanin School of Architecture

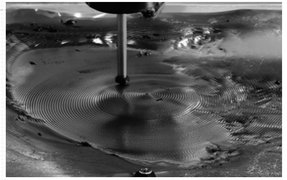
How could malleable materials, such as aluminum foil or annealed aluminum sheet, interpret geometry information? Translated by an auto drawing machine, a milling machine, a 3d printer, and the photogrammetry program, a curve pattern passes through the threshold of digital and material. The experiments exploit the materiality of metal, and play with the digital artifacts' reflectiveness and the beholder's perception.

folding curve pattern 1
pattern+elevation->cnc milling machine 2
->aluminum sheet
pattern->drawing machine->aluminum foil 3
engraved foil->photogrammetry->digital model 4
digital model+elevation 5
digital model+elevation->cnc milling machine 6
->aluminum sheet
engraved foil->photogrammetry->digital model 7
digital model+thickness 8
digital model+thickness->powder 3d printer 9



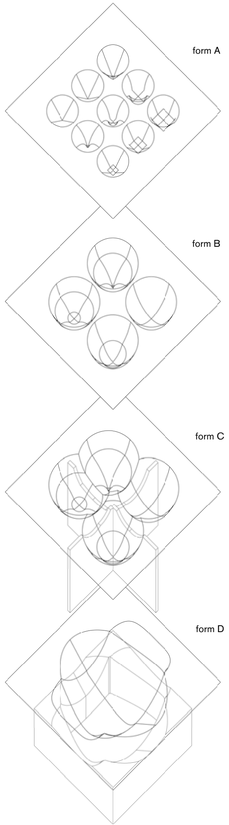






Single Point Incremental Forming

Single Point Incremental Forming (S.P.I.F.) is an innovative digital fabrication technique for 3-dimensional sheet metal forming that has gained popularity due to its affordability, efficiency, and sustainability. Unlike traditional sheet metal forming methods, S.P.I.F. enables freeform manipulation of metal without the need for large and expensive molds, resulting in significant reductions in material waste and making it a more environmentally friendly option. Through its versatility in creating a wide range of forms and textures, its precision in fabricating architectural and industrial parts, and its potential to explore new material possibilities, S.P.I.F. is a potentially valuable tool for architecture, art, and engineering projects.



01

form A
aluminum sheet
0.032"
horizontal machining
without step-down
error: thin material
→ material tore up

02

form A
aluminum sheet
0.032"
horizontal machining
without step-down

03

form B
aluminum sheet
0.032"
horizontal machining
without step-down

04

form C
aluminum sheet
0.032"
horizontal machining
without step-down
error: mold misplaced
→ tooling ball broke

05

form C
aluminum sheet
0.032"
horizontal machining
without step-down
error: pinching effect
→ tooling ball broke

06

form C
copper sheet
0.021"
spiral machining
with step-down
error: no touch off
→ material tore up

07

form C
copper sheet
0.021"
spiral machining
with step-down

08

form D
copper sheet
0.021"
spiral machining
without step-down
error: pinching effect
→ tooling ball broke

09

form D
copper sheet
0.021"
spiral machining
with step-down

10

form D
copper sheet
0.021"
spiral machining
with step-down
off-center

11

form E
copper sheet
0.021"
spiral machining
with step-down

12

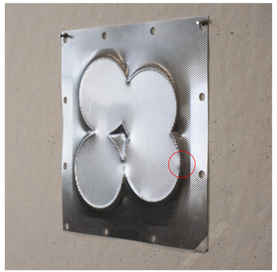
form E
copper sheet
0.021"
spiral machining
with step-down
silk-print texture

13

form A (zx0.75)
aluminum mesh
0.032"
0.0625" Hole
30% open area
horizontal machining
without step-down
error: thin material
→ material tore up

14

form B (zx0.75)
aluminum mesh
0.032"
0.0625" hole
30% open area
horizontal machining
without step-down



15

form C
aluminum mesh
0.032"
0.0625" hole
30% open area
horizontal machining
without step-down
error: thin material
→ material tore up

A quarter of the Utah Teapot "rendered" by single point incremental forming.

X,Y,Z - U,V

Engraving may not be the right word to describe the forming process. Here, the engraving on the metal plates does not occur on a 2D plane but rather on a time-form in the slippage between a flat surface and a dimensional form. Thus, the outcome pattern is conditioned both by the x, y, z axes and the u, v axes. Unlike the topographical layer lines on a 3D printed or CNC-milled model, in this case, the toolpath is folded into the gradually formed metal sheet and deeply entangled with the form. The stretching where the sheet touches the mold, and the reflectiveness of the metal, add other layers of visual pleasure to the final artifact.

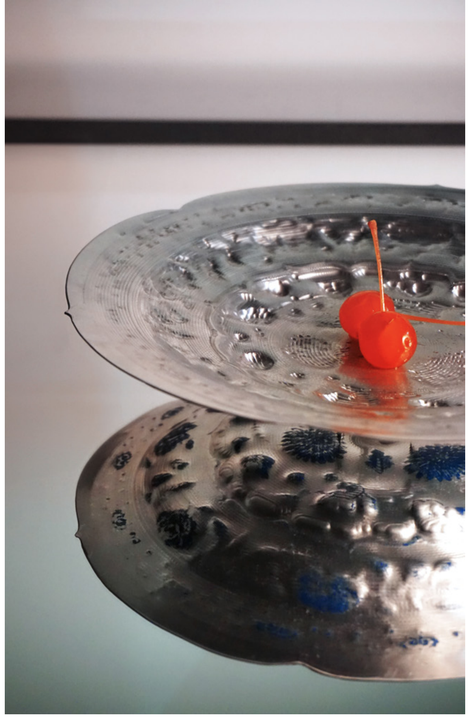
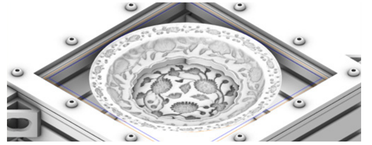
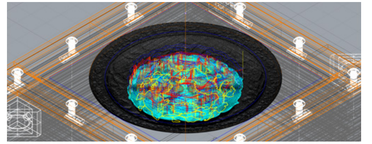
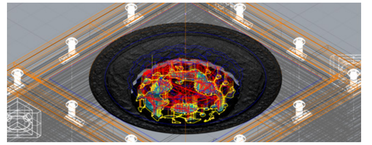


Plate with chrysanthemums and peonies, after a Ming dynasty porcelain in the Metropolitan Museum of Art. The flowery pattern is both screen-printed onto the malleable metal plate as a texture map and engraved into the surface as a bump map.







Reality Misfabricated from Images

This conceptual section of layers of image maps implies a special "rendering tectonic." As we start to imagine its analogue in material reality, there is a family of techniques (printmaking, hydro dipping, embossing, engraving, vacuum-forming, ...) that could be reshuffled and recombined into new fabrication procedures where "images give birth to models, models become renderings, renderings become textures, and textures take shape through material research."[1]

1. Hans Tursack, "Theoretical Notes on the Aesthetics of Architectural Texture Mapping," *ACADIA*, 2020, 685.

Pieter de Hooch, *A Woman Drinking with Two Men*, c.1658.

07

Dressing, Cladding, Mapping: Notes on Check and Stripe

Graduate Thesis

Sep. - Dec. 2023
Advisor: Michael Young (michael.young@cooper.edu)
Coordinator: Guido Zuliani (guido.zuliani@cooper.edu)
A special thanks to Diana Agrest, Nader Tehrani, Benjamin Aranda, Lauren Kogod, Harrison Tyler, and a83

Note the dress of the maid in Pieter de Hooch's *A Woman Drinking with Two Men*. As the paint fades away, we peer through the layers and discern the black-and-white checkered floor underneath. In this uncanny moment, the maid is disembodied, levitated into a ghost. Nudity is replaced by transparency — where the dress is gone, what we see is, not the naked female body, but the "naked" image. Here, the check assumes a threefold role as the ground: it is simultaneously the physical floor tiles, the instrument of perspectival space construction, and an anachronistic nod to the default setting of digital canvas.

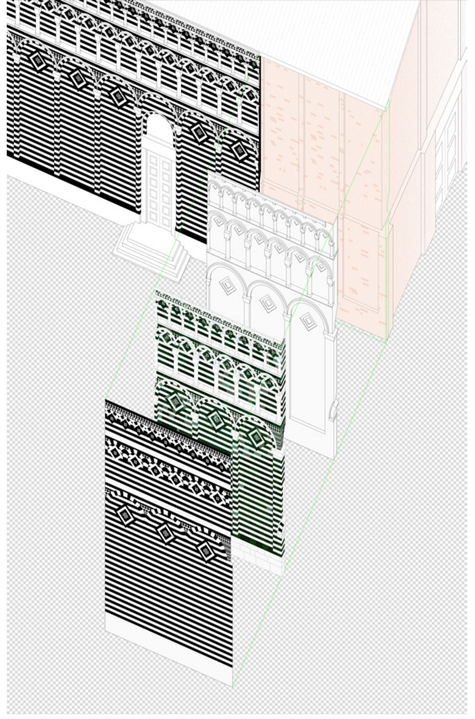
Dichromatic patterns, woven into dressing, cladding, and mapping, are deeply intertwined with the body, architecture, and today's image culture. Despite the enduring efforts of our discipline to actively neglect them,[1] we are witnessing the return of the repressed in this post-digital era. Now is the opportune moment to consider the resurgence of check and stripe in both built reality and their representations not just as passing fashion, but as a chance to scrutinize architectural flatness beyond skin-depth.

The ambition of this thesis is to establish check and stripe as the new architectural dress code, gathering the necessary terms and references for a critical understanding of these patterns, and testing their productivity as instruments through design experiments. It takes audacity to wear check and stripe,[2] but the reward is a new ground for design agency in the crevice between 2D and 3D, surface and body, sincere labor and infidelic gimmick.

1. For some rare cases discussing architectural check or stripe, see John Ruskin, *The Stones of Venice*, Volume I (of 3), Chapter XXVI. 'The Wall Veil and Shaft'; Mark Wigley, *White Walls, Designer Dresses: The Fashioning of Modern Architecture* (Cambridge, MA: MIT Press, 1995), 102-103; and more recently, Ashley Paine, 'The Problem of Stripes,' *AA Files*, no. 63 (2011): 70–73.

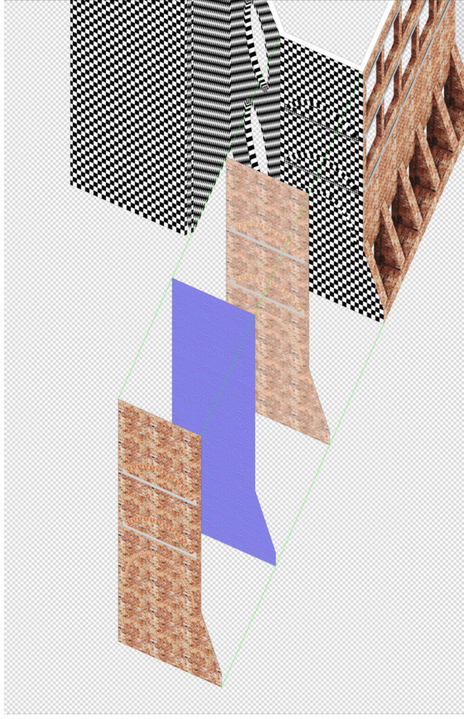
2.For a history of condemned striped garments for counterfeiters, criminals, outcasts, clowns, sorcerers, and prostitutes, see Michel Pastoureau. *The Devil's Cloth: A History of Stripes and Striped Fabric.* (New York: Columbia University Press, 2001). The author highlighted that in this context, checks serve as a superlative form of stripes (19-20).

2. For John Ruskin, "it is perfectly natural that the different kinds of stone used in its successive courses should be of different colors." He considers this approach, as opposed to non-architectural mosaic and fresco, a decoration that honestly follows the logic of construction and poetically implies the growth of the structure and the formation of rocks. Ruskin further draws a comparison between the 'alternate bars of horizontal colors' and the 'chiseling of the stones,' noting that the latter, while requiring more time and labor, paradoxically weakens the stone. For more insights, refer to John Ruskin's 'The Stones of Venice,' Volume I (of 3), Chapter XXVI, titled 'The Wall Veil and Shaft.'



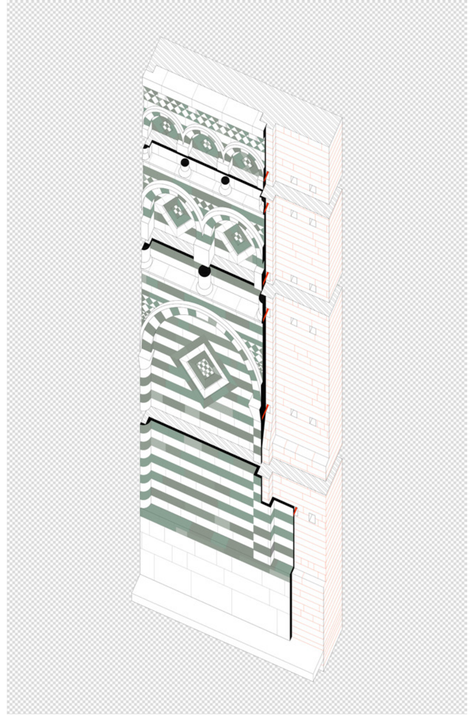
A Labor-Saving Dress - Failed Abstraction

The facade of San Giovanni Fuoricivitas is a noteworthy case for analysis due to two reasons. Firstly, the application of check and stripe patterns is highly intricate, suggesting a developed system for a practice often deemed unsophisticated. Secondly, the church used to be "naked" — in the 1323 renovation, the new facade of the church was "dressed" in the fashion of the time, while the original facade remained a plain brick structure.[1] Noteworthy is a small piece of fabric that spans the



Pattern Cladding - UV Mapping

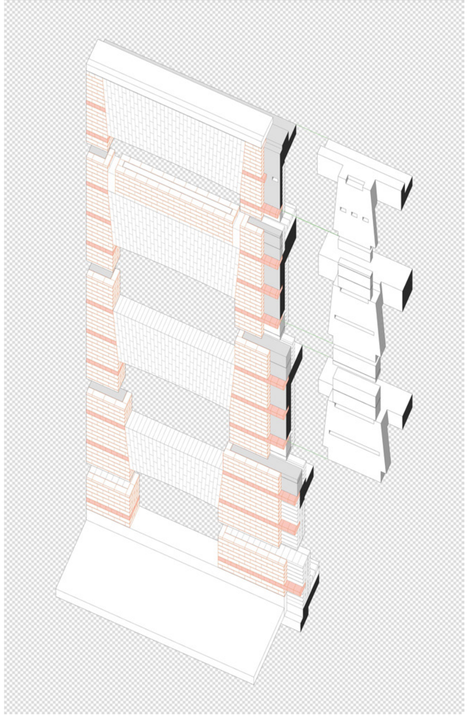
Amusingly, today we are literally inserting specific content into these black-and-white visual tools in the digital rendering process. As we juxtapose the historical practice of pattern cladding with contemporary UV mapping, the parallel is surprising. Both deal with dematerialized materiality and the substitution of 3D information with 2D images (e.g., a normal map dictating the bumpiness of a digital surface). In one case, we dress a brick wall with a black-and-white pattern; in another, we render a black-and-



The Black-and-White Veil of San Giovanni Fuoricivitas

Judging from the exposed sections of the church, we can see through the main facade and observe how the overall condition of the black-and-white patterned dress is almost dictated by the brick structure behind it. Simply dressing the church in a color pattern does not require any tectonic struggle. The dress acts as a soft veil, akin to wrapping paper. It endeavors to conceal, but unavoidably reveals the body beneath, and cannot force back upon the body.

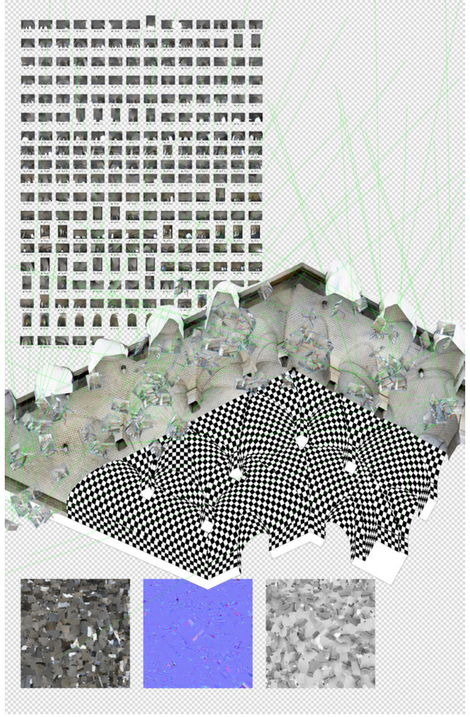
1. The tectonic integrity of Louis Kahn's work has been scrutinized by numerous critics. Another commentary on Exeter Library's veneer can be found in Mark Rakatansky's "Tectonic Acts of Desire and Doubt, 1945—1980: What Kahn Wants to Be," published in *ANY: Architecture New York*, issue no. 14 (1996), pages 36–43. The illustration provided by the author is derived from a section drawing (on page 212) revealed in the publication of *Louis Kahn: The Importance of a Drawing*, edited by Michael Merrill.



The Brick-Pattern Corset of Exeter Library

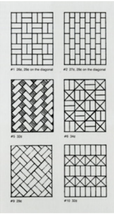
In the case of Exeter Library, Louis Kahn's brick pattern "veneer"[1] is no longer a boneless veil. On the ground level is a real brick wall built in the American bond fashion: there are seven courses of stretchers between each course of headers. As the façade rises, to maintain the image of a real brick wall, there are still courses of headers. And to accommodate them, the concrete slabs are punched and slotted— they are heavily corseted by the brick "map".

2. Dave Hickey, "Not Knowing," in *25 Women: Essays on Their Art*. (Chicago; London: University of Chicago Press, 2016)
3. Michael Young, "Fluctuations of Attention," in *Reality Modeled After Images: Architecture and Aesthetics after the Digital Image*. (New York: Routledge, 2021)



The Guastavino Issue - Collision of Perception and Linguistics

A central argument of this thesis is that digital mapping, the act of introducing the patterns of building materials into the black-and-white ones, holds significant consequences. There is something fundamentally "wrong" with the stubbornly repetitive mapped surfaces, as mapping enables a collision between the perceptual, kinesthetic experiences evoked by the graphic pattern and the linguistic, symbolic responsibilities inherent in material pattern.



Some of the Guastavino Texture "Maps"

4. John Ochsendorf, Guastavino Vaulting: The Art of Structural Tile (New York: Princeton Architectural Press, 2010), 126-127.
5. Ochsendorf, 50-51.

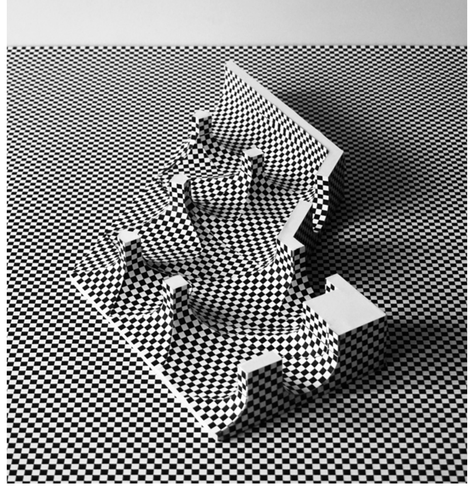
This dichotomy between perceiving and reading mirrors the discussion surrounding op and pop arts. In his commentary on Bridget Riley in comparison to pop art, Dave Hickey discusses "the imposition of syntactical meaning on pattern and the attribution of linguistic reference to shapes," highlighting how Riley's art has been initially criticized and later admired both for its detachment from linguistic interpretation.[2]

Expanding on this discourse in his essay "Fluctuations of Attention," Michael Young elucidates the influence of op and pop arts on architecture: while the gradient flow patterns in op art immediately inspire parametric surface fabrication, since the 2010s, the techniques of pop art have become increasingly relevant in terms of architectural surface treatment.[3]

There seems to be a chance though, to imagine a post-digital image discussion speaking to op, pop, and their collision. And until we achieve a fair understanding of this collision, architects have not fully instrumentalized this new representation technique.

The Guastavino vault serves as a highly relevant case study in this context. The exterior tiles on a Guastavino vault are not cladding, but they are also *not* not cladding. As in the original Mediterranean tile vaulting technique, tiles here form the structure itself. Yet, while the vernacular system requires only two layers of tile for the structure to hold, a mature Guastavino vault consists of three layers, with the extra and final layer serving more as a finish than a structural component.[4] This subtle differentiation between the decorative and the structural within the thickness of the thin vault frees the final layer from its obligation in construction, and allows it to be expressively "mapped" with different pattern choices and in varied directions as fit in the case. The Guastavino vault is simultaneously cladding and mapping. The company even had a catalog of decorative patterns, each with its calculated labor cost, for clients to choose from[5]—a feature that uncannily resembles today's texture map database.

This mapping quality at the beginning of 20th century is especially remarkable as we think about how implausible it actually is to map a flat tile pattern on a curved form without glitch in our software. Did Guastavino's work ever glitch?



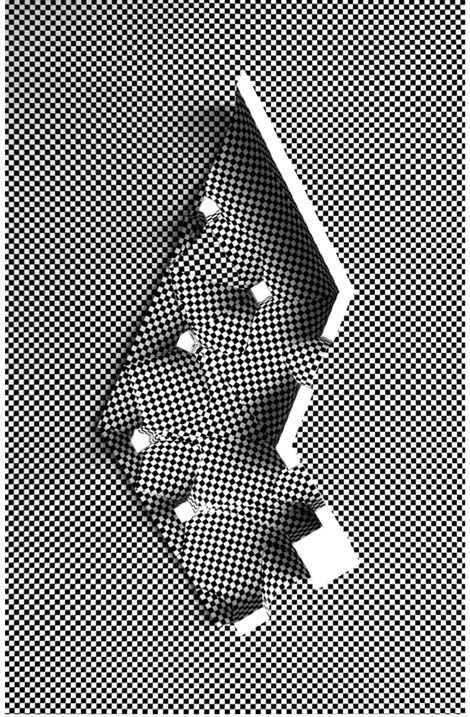
Paper model showing the overall UV logic of the Municipal Building's Guastavino Vault. It reveals the locations where extra thought is required to resolve inconsistencies and glitches in terms of cladding.

The best place to look for a glitch is perhaps the Manhattan Municipal Building (1909–1914) in New York City, a rare case in Guastavino's prolific career where he had to deal with an irregular plan.[1] The geometry developed from the plan is quite complex, as a ring of cross barrel vaults surrounding a sausage of four groin vaults, three of them highly misshapen. In terms of cladding/mapping of the running bond pattern, the overall strategy is to set the starting line at the crown of each vault and descend to the spring (for barrel vaults) or the groin (for groin vaults). The long edges of tiles run along the crown, so the tile fabric could remain most flexible along the bend. Where the surfaces meet, there would naturally be a misalignment of tiles – these glitches were concealed all at once by borderlines of two rows of slightly downscaled (to increase the bendability) tiles that run along the intersection.

In this way, the finished dress seems to be well-resolved, articulating both the directionality of each surface and the turn in geometry. An impressive moment occurs at either right-angled corner of the relatively square part of the corridor, where the vaults have to turn three times to keep up with one turn in plan. Three intersections spring out of one column corner, the middle one transforming smoothly from concave to convex, flanked by the other two curling from convex to concave. When they are so close to each other at the base, the dynamic surface indeed looks like a piece of fabric with pleats. A busy corner, but still elegant, honest, and clearly legible.

However, there is a critical juncture where the system could rupture without Guastavino's specific care.

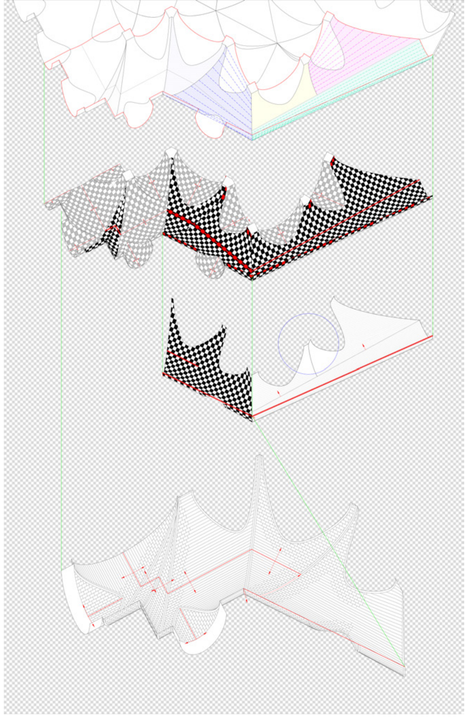
1. John Ochsendorf, Guastavino Vaulting: The Art of Structural Tile (New York: Princeton Architectural Press, 2010), 157.



Strip(e) the Guastavino Vault

Geometric analysis reveals that there are two double-curvature surfaces and one single-curvature surface joined together. While they meet smoothly at the crown, two of them form a fold that is only half of the vault span and therefore no longer concealable by the border strategy. If builders clad this area without preactive planning, this fold could easily be rendered full of misalignments and glitches. However, in the finished project, this fold is smartly hidden, and

The Guastavino moment occurs at the intersection of the single-curvature surface (yellow) and the double-curvature ruled surface (magenta). At the crown, they intersect with another double-curvature ruled surface (green).

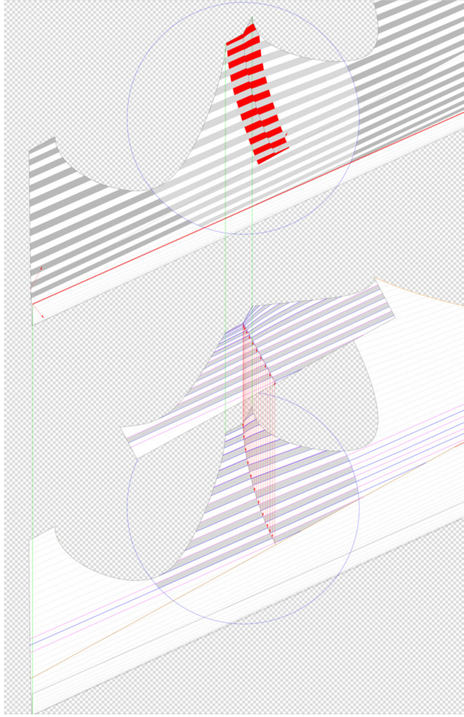


The Guastavino Moment - Rendering Three Surfaces into One

these three surfaces appear to be a consistent whole.

This is a Guastavino moment that deserves a superficial analysis as deep and rigorous as a formal analysis, with the black-and-white grid as a handy tool. The detail might come from an experienced contractor with good craftsmanship, but let's speculate how Guastavino, relying only on draftsmanship, might have resolved it.

The blue lines are defined by mapping along the single surface, a process that takes place on the 3D curved surface. Each magenta line is determined either by projecting a blue line onto the opposite side of the fold or by drawing a parallel line starting from the blue line; these operations occur on the 2D plane.



The Guastavino Instrument - Projection/Mapping

One way to minimize the mismatch across the fold is to alternate between a projection method and a mapping technique to determine the cladding pattern. On the design side, this entails oscillating between two representation systems. On the fabrication side, it involves balancing standardized mass production with customization. Hands must move both along and off the surface, and the texture is literally woven across the fold.

1. Current UV condition of the corner without concealing borders

2. A UV that could camouflage the two flanking edges while admitting the middle one

3. Current condition of the corner without concealing borders

4. A cladding that could camouflage the two flanking edges while slightly admitting the middle one

5. A more Guastavino proposal

6. A less Guastavino proposal

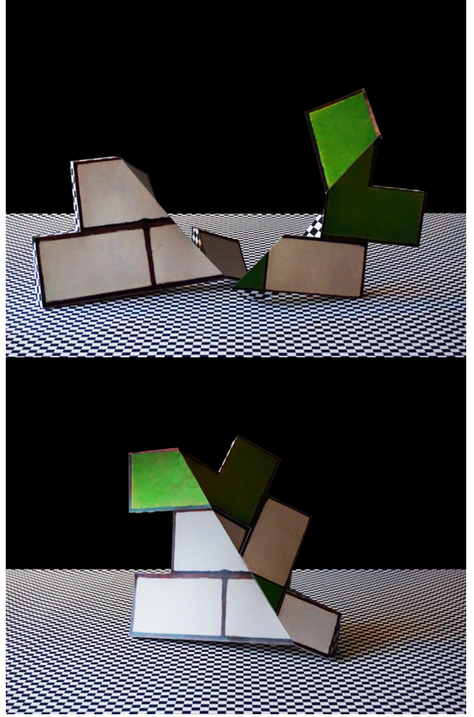
Proposals: To be More/Less Guastavino

The design challenge of this thesis is to remap/reclad the triple-turn corner without relying on concealing borders. Two proposals could be developed by instrumentalizing the speculated oscillation between projection and mapping that resolved the Guastavino moment.

The first proposal aims to depart from the Guastavino style: rather than covering up

A less Guastavino proposal

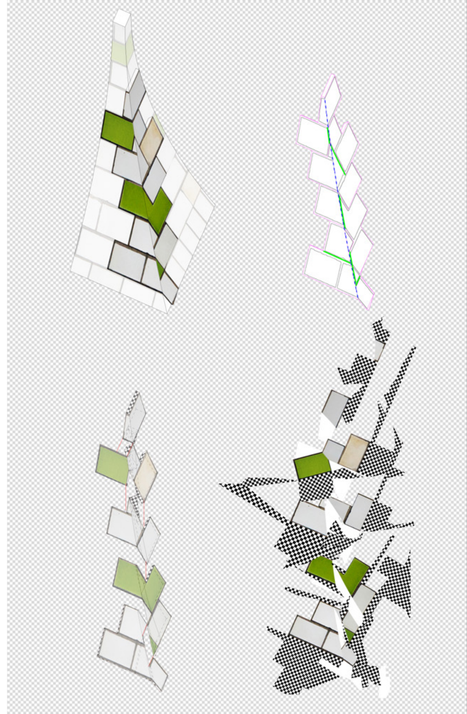
A more Guastavino proposal



1. An articulation of the parametric part-to-whole relationship can be found in Nader Tehrani's 'A Disaggregated Manifesto: Thoughts on the Architectural Medium and its Realm of Instrumentality,' published in *The Plan*, Issue 090, May 2016.

Tile/Texel: A Post-Digital Part-to-Whole Issue

Once again, the discussion comes back to the classic corner issue. What's proposed is a post-digital part-to-whole relationship, as an escape from the parametric approaches featured in the digital era.[1] There is also a critique about the 'cheapness' of patterned texture maps: if historically, pattern has been employed by architects as a labor-saving machine, as in the case of San Giovanni Fuori Civitas, here pattern operates in the exact opposite way - what seems to be a spontaneously, awkwardly,



A Labor-Hiding Corner: Seam within a Seam within a Seam

and even glitchily mapped corner is actually constructed with a ridiculous amount of labor. Every tile has to be meticulously scaled, shifted, or rotated, without alarming our attention, for the map to climb through the turn, and in this way, each building block is customized out of the same map. At some moments, there is a (paper) seam within a (block) seam within an (image) seam, enticing the viewer to rip off this dress with their eyeballs.