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2023–2024

RISD Sustainability Design Lab Year One

Clay Matter(s)

Creative Approaches to Clay's
Material Cultures in New England



**RISD Sustainability
Design Lab Year One**

Edited by
Johanna Barthmaier-Payne
Tiago Torres-Campos
Eduardo Benamor Duarte

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Creative Approaches to Clay's
Material Cultures in New England

Tamara Kaplan leading students in wet clay forming experiments at the Weybosset Studio Space.



Sustainability Design Lab's Mission

Johanna Barthmaier-Payne

Director, Sustainability Design Lab

How do we address the gaps in mainstream environmentalism and the cynicism in politics when facing environmental crises and societal collapse?

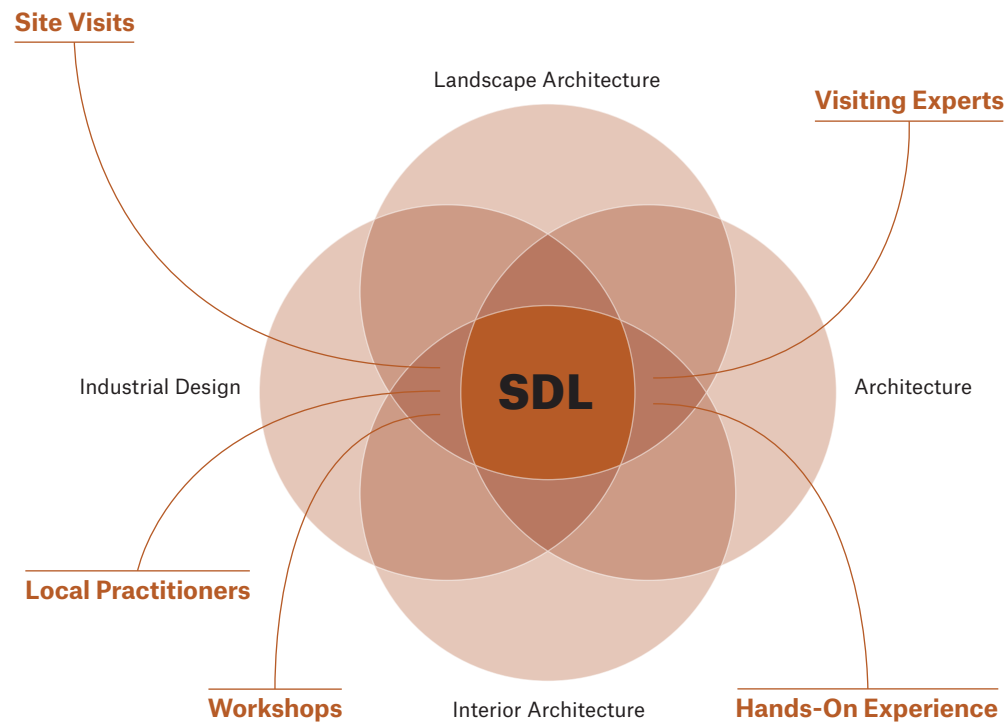
What are the alternatives to our harmful building and design practices, from construction details to global supply chains?

How can we free design from limiting systems and create solutions that benefit a broader range of people, as well as both human and non-human environments?

To answer these questions, we need to bridge the gap between design experiments and practical building practices, between industrial and local material

production, theory and education, and ideals and reality. The Sustainability Design Lab was created to rethink the built environment as deeply connected to landscapes and resource extraction. It emphasizes the urgent need to transform the construction industry and global supply chains by considering the entire cycle, from the land to the finished structure.

The local materials of New England — clay, stone, wood, water, and plant fiber etc. — are low in carbon and present a sustainable alternative to the carbon-intensive, socially damaging materials pervasive in the large-scale, conventional construction industry today. As the Sustainability Design Lab took shape, its main objective was to challenge the systems, technologies, processes, supply chains, regulations, and materials that currently define the material culture and design industries, with the goal of transforming how we understand land use and how we design within the built environment and more than human worlds. Designers work across multiple scales, from individual materials and buildings to the landscapes they come from, and they apply research-driven knowledge to shape the built environment. The Lab's curriculum aims to demonstrate the potential of design as part of a regenerative practice that engages not only construction workers and skilled laborers, contractors, clients, building users, maintenance staff, and, importantly, the designers, positioning them all as critical decision-makers in the process.



Collaboratively developed by the Interior Architecture and Landscape Architecture departments, the Sustainability Design Lab focuses specifically on materials common to the Northeast and New England region of the US. Through the hands-on curriculum, students deploy physical skill building and craft as a primary means of building competency and knowledge around each material and the landscapes they're commonly extracted from. The goal, to create an interdisciplinary space where students can critically examine their relationship with the land and more than human environments, its materiality, and the built environment using novel, low-impact design strategies to shape the future of the built environment.

The Lab's studio-based curriculum will unfold over the course of five years, each year focusing on one material local to the New England region. Building on the interdisciplinary ethos of the Lab's mission, each one-year curriculum sequence taps into the expertise from across the institution and region to guide critical investigations into how local materials are produced and assembled, where, how, by whom, and at what cost. Each year we welcome a new cohort of 12 graduate students from Landscape Architecture and Interior Architecture and across the Architecture and Design Division.

The following body of work marks the Sustainability Design Lab's inaugural year. It was fitting to focus on clay and mineral as the first materials of study, as these parent materials play a critical role in shaping the unique landscapes found throughout the New England region, and will deeply inform the material studies in following years.

The Sustainability Design Lab is generously funded by the Angelo Donghia Foundation and the Sparks Fund. It is currently being led by Johanna Barthmaier-Payne, Associate Professor and Department Head of the Landscape Architecture program at the Rhode Island School of Design.

Introduction

Tiago Torres Campos

Associate Professor, Landscape Architecture

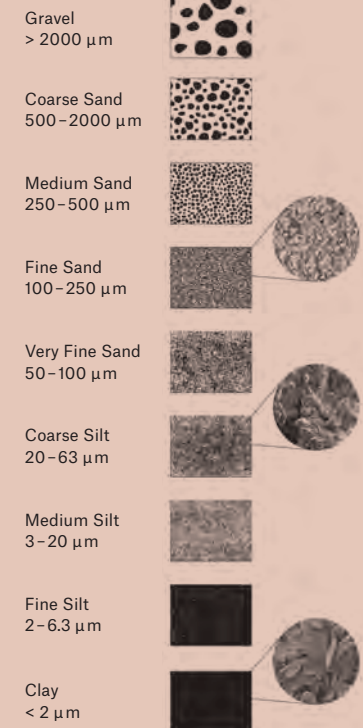
The Lab's first edition interrogated how clay has shaped the landscapes and built environments in different parts of the New England region, that we loosely define as our territory. We studied the many conditions of working with clay: from how it deposits geologically, to how it informs and helps shape the built environment; and ultimately, to how it may inform sustainable and creative approaches to design.

Clay's abundance in most soils has made it a widely used construction material, both in fired and raw states—in the form of bricks, tiles, floors, roofs, walls, swales—as well as in pottery and ceramics. Formed by geo-chemical processes that weather rocks and minerals over millions of years, clay's composition can vary depending on its location, but it is typically composed of minerals such as aluminum silicates, magnesium, and iron oxides. Clay is known both for its unique physical

properties—it is plastic and moldable when wet, hard and durable when dry—and for its transcultural significance throughout history.

In *Walden* (1854), a manual of self-reliance while mostly living away from other humans, Henry David Thoreau narrates the work involved in building his wooden shack in the woods.¹ The chimney—arguably the most complicated of the elements he built—was made of bricks that Thoreau jokingly suggested could be one thousand years old. He bought them second-hand, something he saw as being common practice, at least judging by how other civilizations had been forged at the expense of buying or looting bricks from previous ones: “Many of the villages of Mesopotamia are built of second-hand bricks of a very good quality, obtained from the ruins of Babylon, and the cement on them is older and probably harder still.”²

1 Henry David Thoreau, *Walden, or Life in the Woods* (1854; Library of America, 1985).
2 Ibid., 180.



1



2

fig. 1 A scale showing "clay" denoting a size of mineral finer than silt.

fig. 2 Walden's cabin in the woods (note the small chimney), as depicted on the book's 1854 title page.

Discussions around how clay can steer sustainability in design practices were framed by relationships between geology, history, and practice.

Thoreau's provocation was not historically naïve, for the American bricks he was reusing were based on the English bricks, which in turn were produced using millennial practices dated back from the period of Roman occupation. It is believed that the first bricks were produced some 12,000 years ago, a period that coincided with the rise of the first agrarian-based sedentary civilizations in the Fertile Crescent.

To investigate clay's material cultures is to embark on several trips around the world, for it "inherits a geological persistence that allows it to accumulate evidence of complex exchanges that are literally baked into its substrate, evidence that would not have otherwise survived the perils of time and change."³

In the Lab, discussions around how clay can steer sustainability in design practices were framed by relationships between geology,

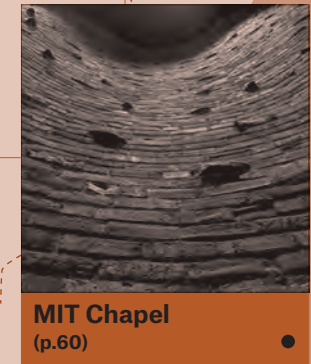
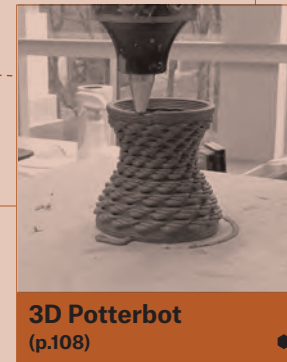
history and practice, between learning from what has existed and persisted and exploring new techniques, methods and practices, both analogue and involved in processes of digital fabrication.

As a multidisciplinary material research laboratory, the Sustainability Design Lab has allowed for a unique type of cross-fertilization of different disciplinary approaches to clay (in architecture, interior architecture, landscape architecture and industrial design). The Lab's curriculum encouraged faculty and students to expand on their practices by questioning current attitudes to clay and expanding the boundaries of its potential sustainable uses as material and technique in architecture, both in its spatial conditions of interiority and exteriority, as well as the experiential thresholds between the two.

³ Kristi Cheramie, "Clay: Spies the Making," in Matthew Seibert (Ed.) *Atlas of Material Worlds* (New York: Routledge, 2021), 185.

Site Visit and Workshop Locations

● Site Visit ● Workshop



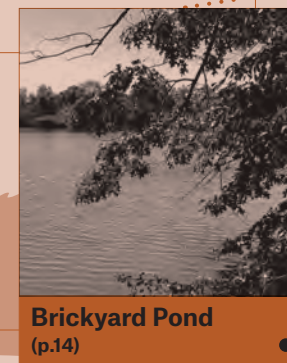
Cambridge, MA

Dorchester, MA

Providence, RI

Barrington, RI

Fall River, MA



Site Visit

Brickyard Pond

The Lab visited Brickyard Pond and its surroundings in Barrington, RI, to study the landscape that resulted from glacial retreat around Narragansett Bay. During the visit we examined different soil compositions at Tillinghast Place, and conducted fieldwork on Brickyard Pond, from which clay for brick-making was extracted in the past.

Site History

Brickyard Pond was once part of New England's Brick Company extraction pit network. The bricks were then transported to Providence and, from there, to other parts of the East Coast, including Cambridge, Boston, New York and Philadelphia.

DETAILS

14 September

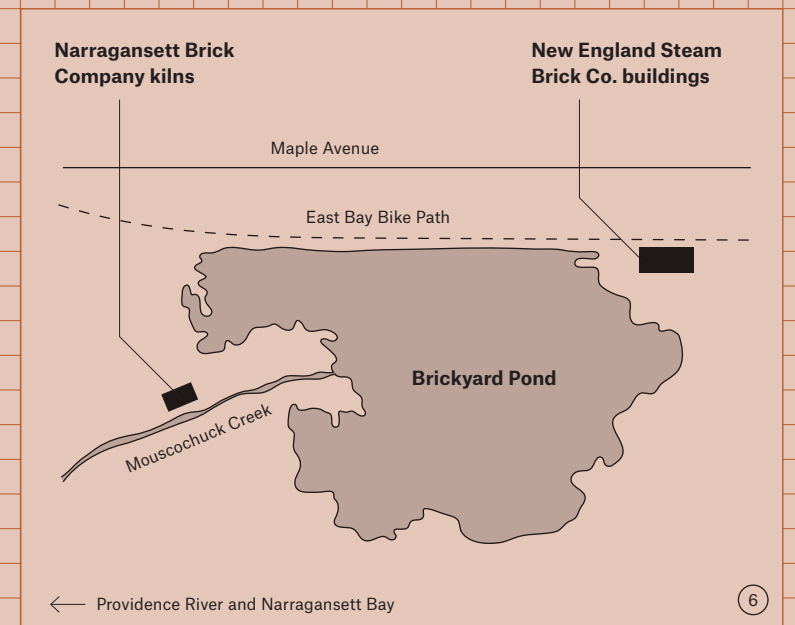
Location	Barrington, RI
Day	Thursday
Temperature	77 °F / 61 °F
Condition	Fair



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Eduardo Benamor Duarte points out potential clay content in the soils at Brickyard Pond.

Drying sheds and kilns (fig. 5) were positioned around Brickyard Pond (fig. 6).

Alexandra Goodenough

Thickness of Place: *Urban Stratigraphy and Rammed Earth Construction in Cambridge, Massachusetts*

LDAR

ABSTRACT How can people connect with a place through a new understanding of its stratigraphy? In urban environments, there is an inherent separation between people and the ground beneath us. We experience our landscapes solely through what is visible on the surface, and lack an understanding of the complex underground strata which create the world around us. Too often, landscape architecture contributes to this dissociation through superficial designs which mask the history of a site, bury its internal workings, and rely on global materials, resulting in landscapes which lack a sense of place and strain the planet's resources. In order to create site-specific landscapes which reconnect people to the ground, we must look below the crust and engage with the thickness of a place. Through a careful approach to site analysis, this thesis explores the intricate strata of Danehy Park in Cambridge, Massachusetts, and its recent but forgotten history as a marsh, clay mine, and landfill. The proposed design reimagines the historic boundary of the clay pit as an elevated rammed earth pathway, and carefully carves a stormwater swale and meadow into the deep cap. The new topography, ecology, and materiality invites visitors to revisit their relationship with this forgotten edge.



fig. 1 Conceptual section of Danehy Park's southeast corner that highlights its underground materiality.

fig. 2 Plan drawing of final design intervention in Danehy Park that includes new pathways, a wet meadow, stormwater swale, and rammed earth constructions.



Rammed Earth Typologies ④

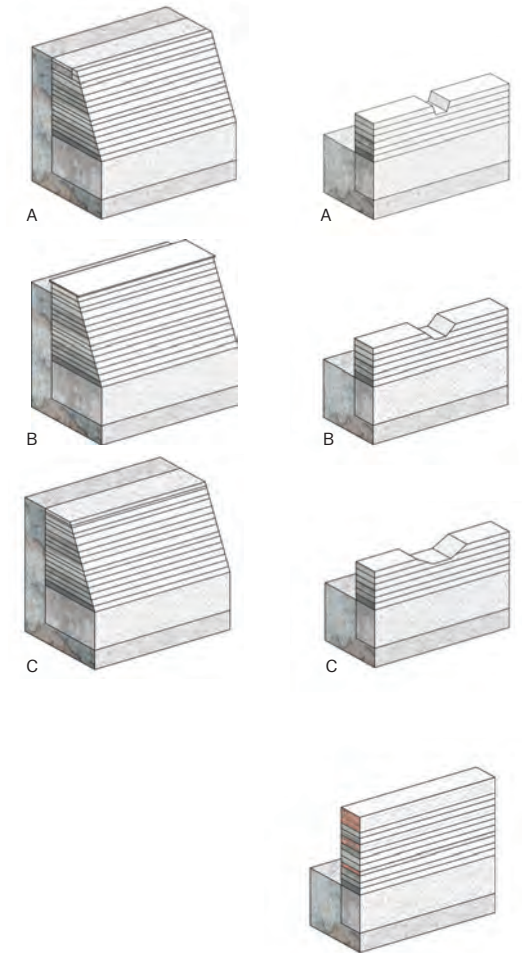


fig. 3 Perspective drawing of design intervention demonstrating how visitors might connect with the site through an understanding of its stratigraphy.

fig. 4 Research included prototyping walls, benches and check dams with unstabilized rammed earth combined with brick.

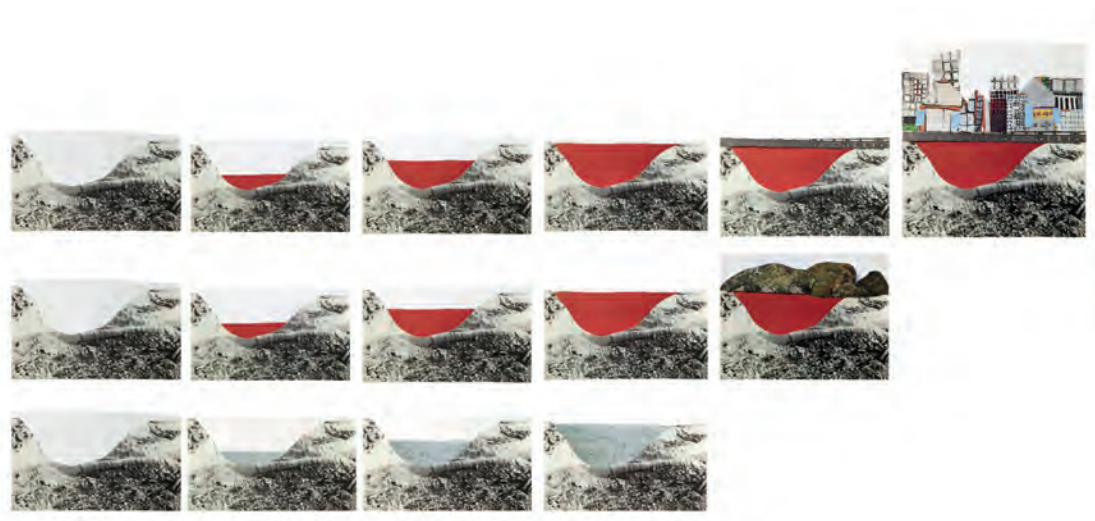


fig. 5 Iterations involved fine-tuning the prototype, from more conceptual stages (right) to more consolidated ideas using unstabilized rammed earth with brick banding (left).

fig. 6 Prototypes using unstabilized rammed earth were tested at different scales and using different methods including brick banding.

fig. 7 1:1 scale mockups of rammed earth assemblies were displayed in the final exhibition.

fig. 8 The rammed earth assemblies may erode and serve to register the passage of time.

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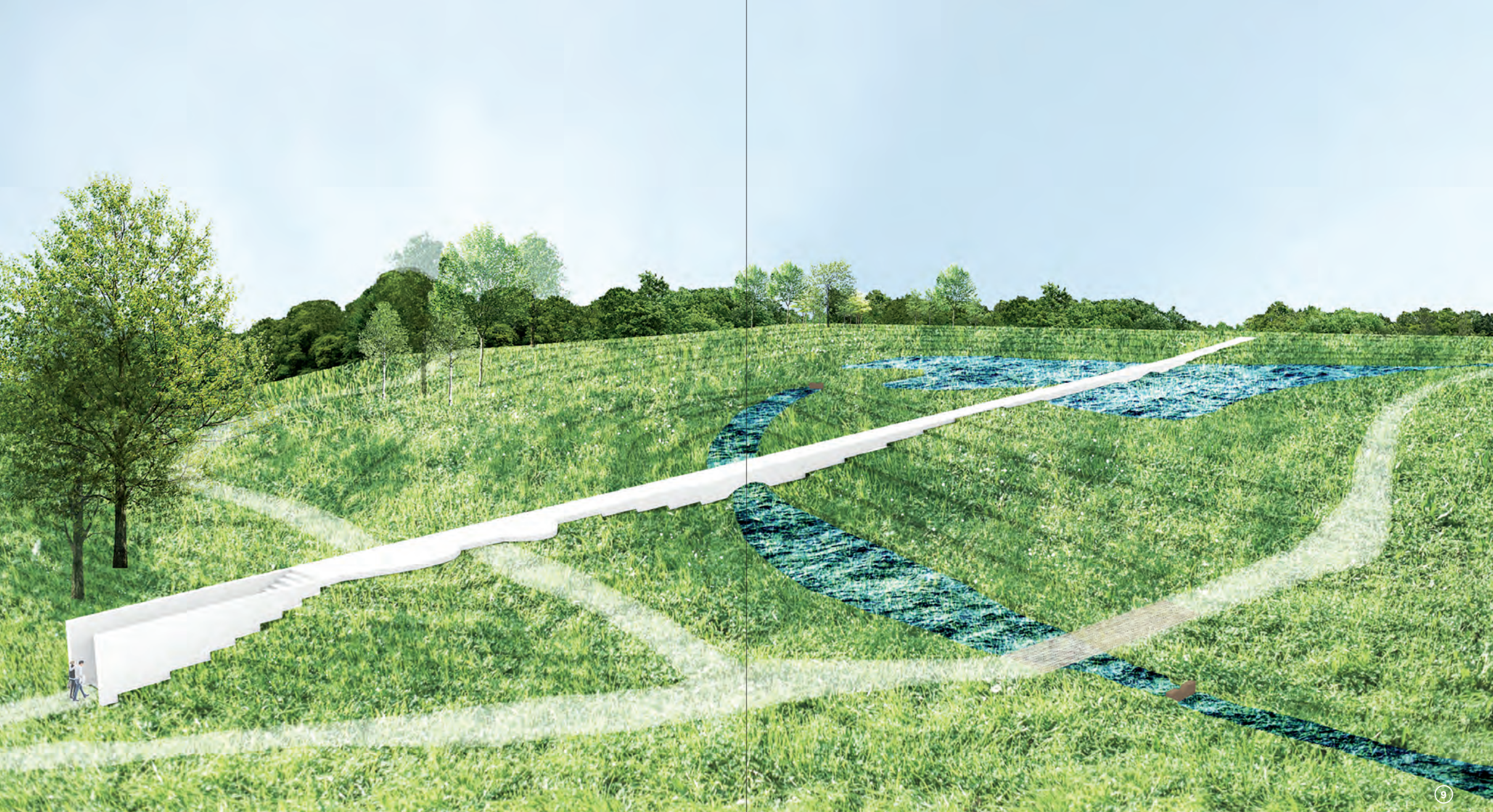


fig. 9 The proposed design reimagines the historic boundary of the clay pit as an elevated rammed earth pathway.

Renata Berta

Landing: *Body, Site, Material*

LDAR

ABSTRACT

I believe that in order to build on the land, I must establish a profound relationship with it. As an outsider to New England territories, I actively seek this connection through immersive activities such as swimming, surfing, climbing, and extensive walks, immersing myself in the land to better understand it and synchronize with its rhythms. In my artistic and architectural practice, I explore dissolving traditional boundaries, emphasizing the vital return to the land to create a more responsive and embodied architecture that symbiotically engages with the landscape.

Within this ongoing project, "Landing: Body, Site, Material," I conceptualize my body not merely as an instrument but also as site and material that resonates and vibrates with the forces and processes of the landscape. My approach to achieving this dissolution involves translating and transforming insights gained at various stages of the project. Starting with immersing my body in the landscape, I seek to synchronize my rhythms with those of the land before translating these experiences into material explorations involving clay, glass, textiles, plaster, and experiential drawings that abstract certain encounters.

My body of work aspires to align with architectural practices that acknowledge the inherent interconnectedness between humans, non-human entities, materials, and the land. I aim to challenge prevalent design approaches that view sustainability as the exclusion of human presence from landscapes. I argue that such perspectives undermine the crucial dialogue between humans and nature necessary to achieve true sustainability.



②

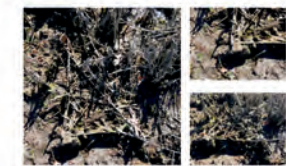
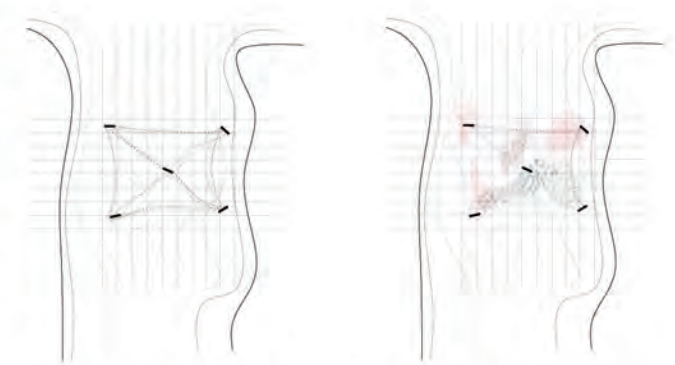
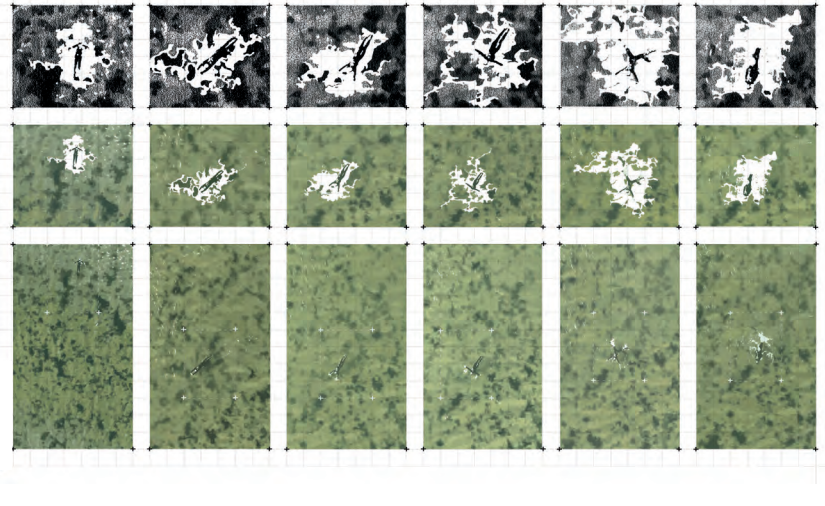
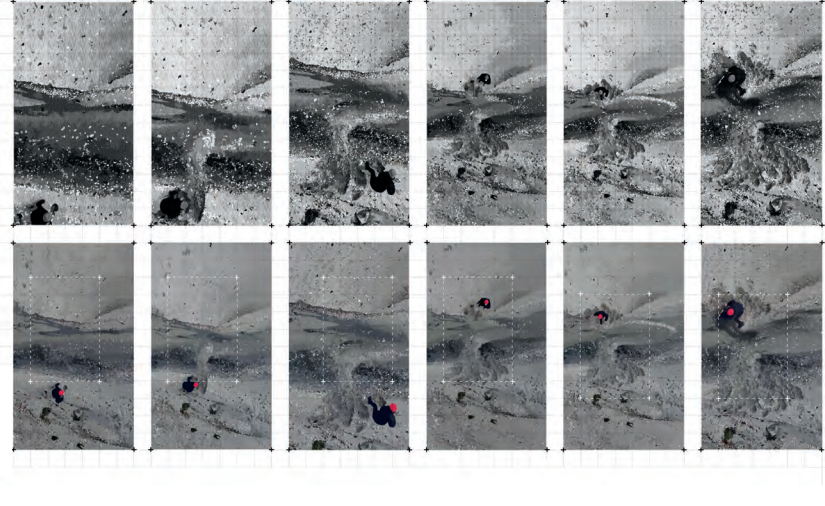


fig. 1 The body as a site and material that resonates and vibrates with the forces and processes of the landscape.

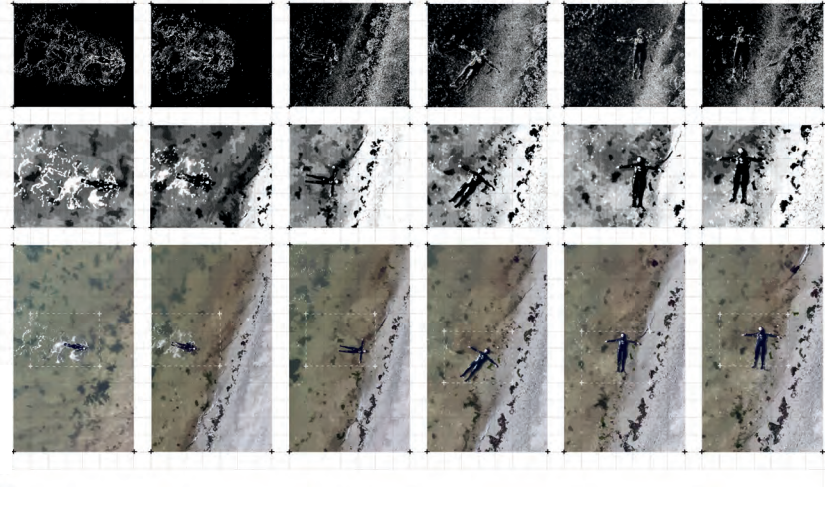
fig. 2 Understanding site materiality through embodied investigations.



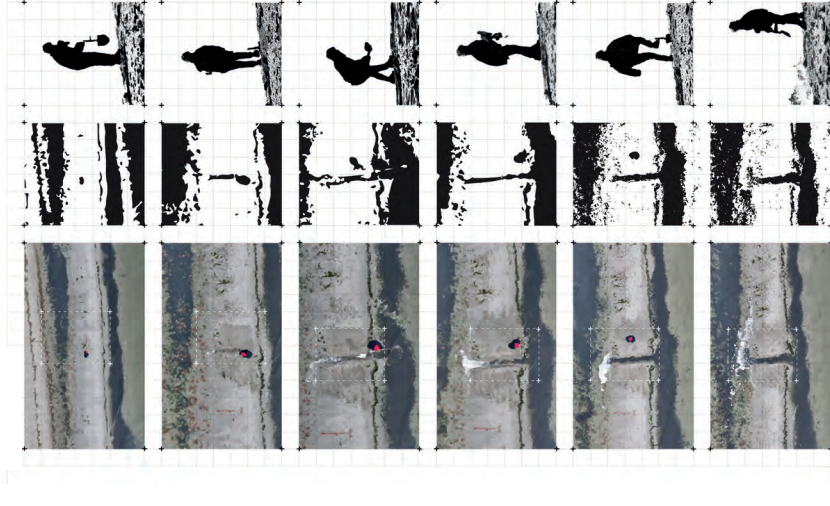
③ Embodied Action
Floating



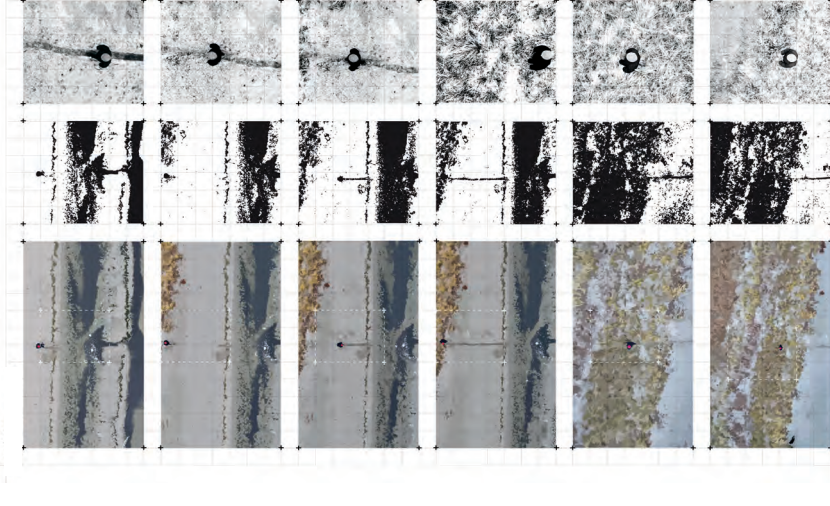
④ Embodied Action
Filling



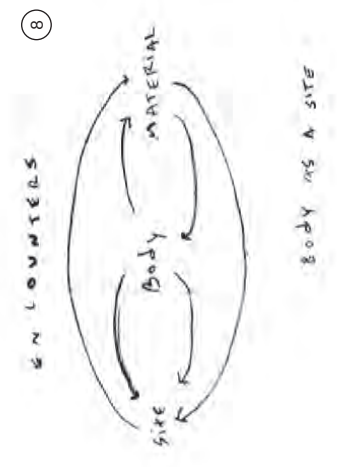
⑤ Embodied Action
Landing



⑥ Embodied Action
Excavating



⑦ Embodied Action
Walking



⑧

fig. 3-7 Video, time-lapse photography, and drone footage figure among the techniques used to register the reciprocity between body, site and material. Embodied actions were undertaken to gain a more profound understanding of the processes and phases inherent in the natural cycle of clay as a material. By documenting these actions, time and space are unveiled and body becomes intertwined with the site and its material conditions.

fig. 8 Exploring how the boundaries between body, site, and material intertwine to become a threshold.

fig. 9 Drone imagery of body floating through the salt marsh at Tillinghast Place.



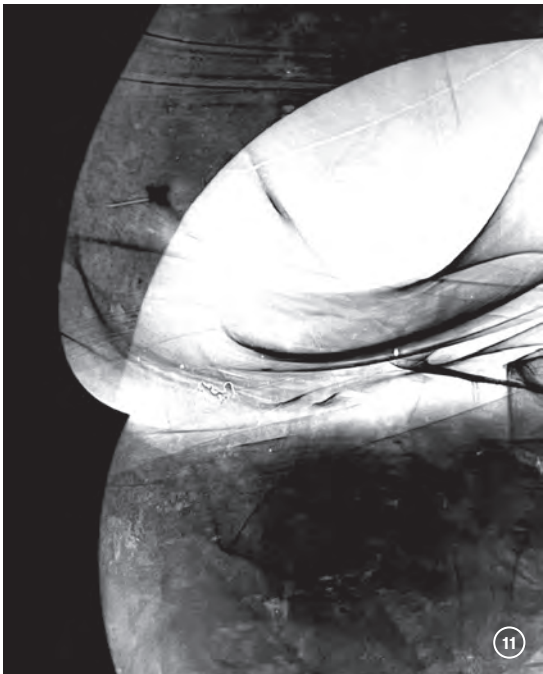
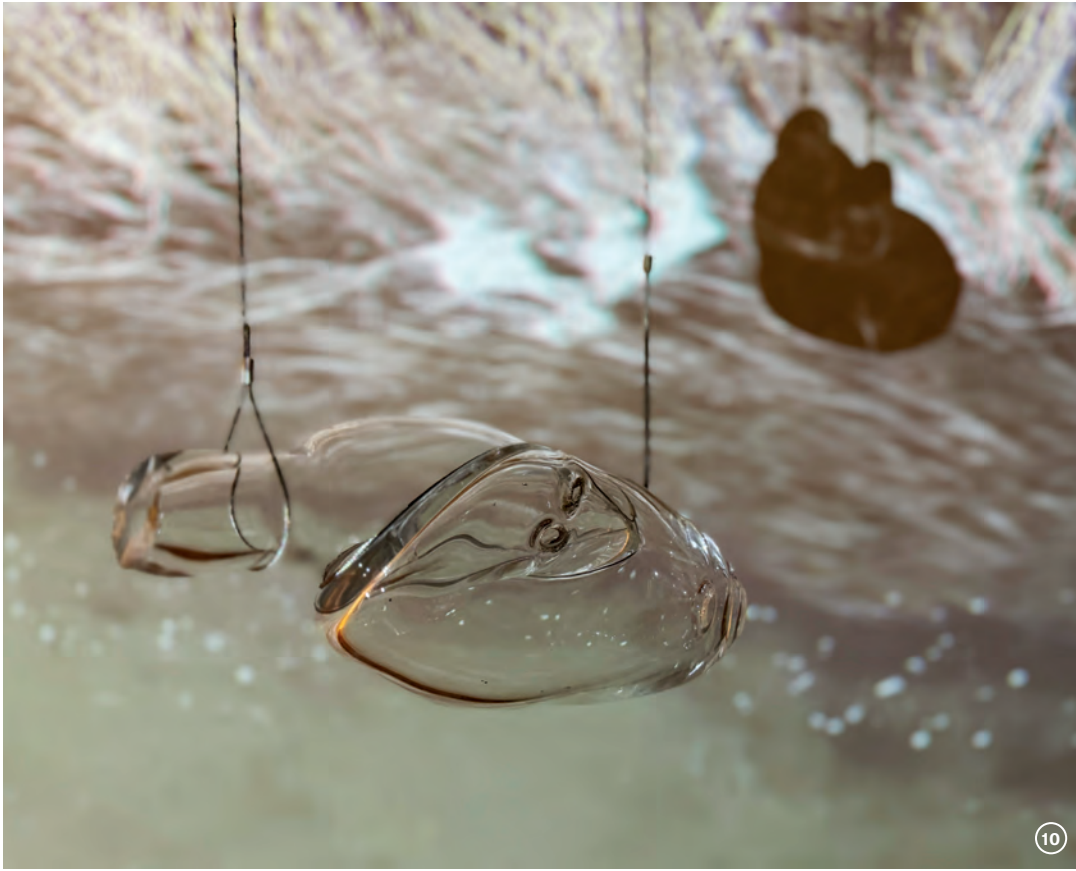


fig. 10–11 The information recorded in video and photographs was translated into iterative drawings and non-representational models.

fig. 12 Actions on the materials are just one part of a complex network of factors influencing the outcome of drawings and models.



Site Visit

Former American Printing Co.

We visited the former American Printing Company complex in Fall River, MA, to experience the scale of the industrial brick buildings and learn about the role of brick warehouses in pushing the local and regional textile industry. The visit included a walk around the underground network of train tracks used to transport goods.

Site History

Buildings like the ones that once hosted the American Printing Company represent an important innovation in brick construction. Cheaper than buildings in stone, these warehouses were large enough to accommodate industrial looms necessary to boost the textile industry that made the city.

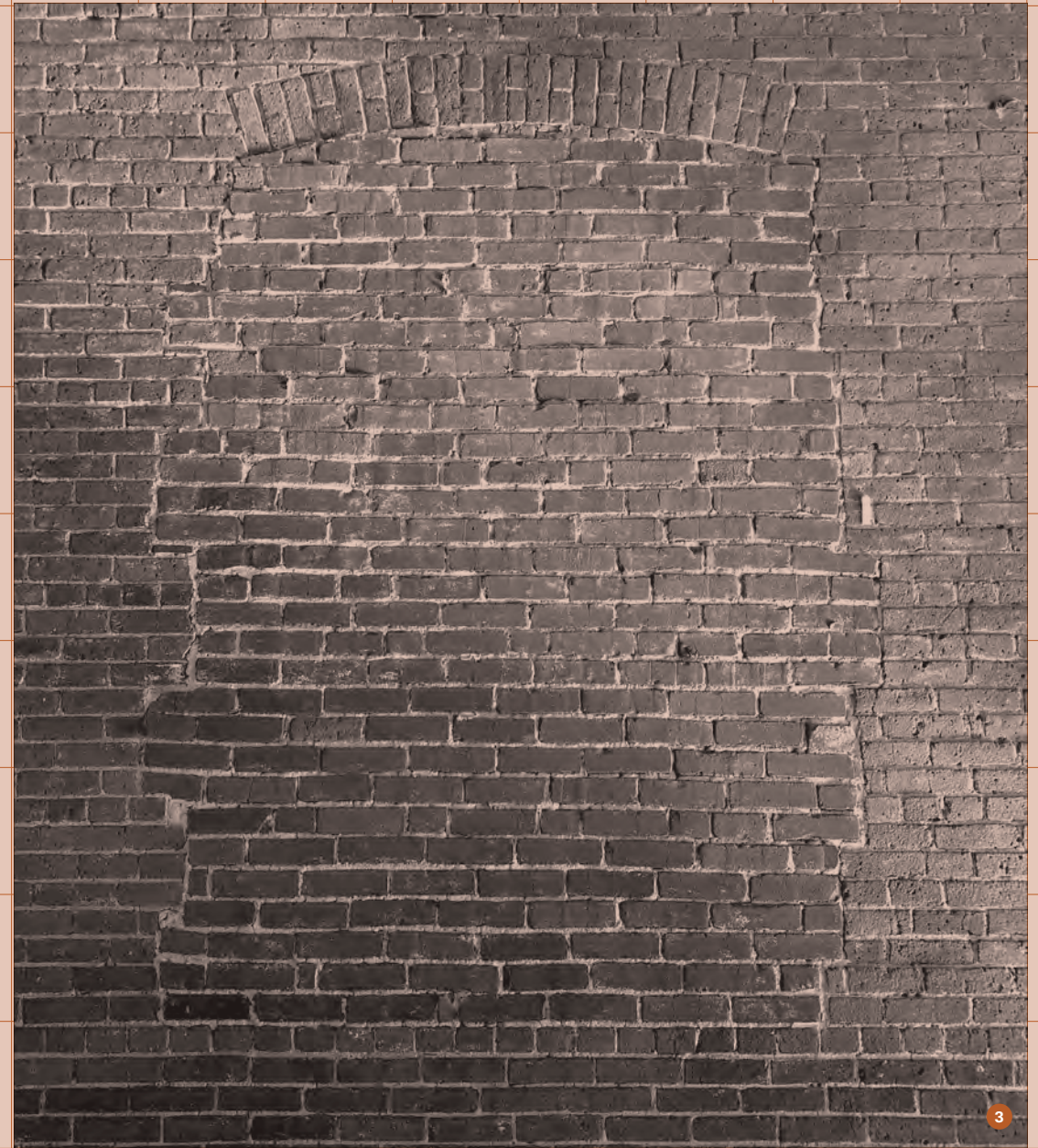
DETAILS

5 October

Location Fall River, MA
 Day Thursday
 Temperature 73 °F / 61 °F
 Condition Partly Cloudy



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The Lab visited the former American Printing Company complex in Fall River, MA, to learn about the role of brick warehouses in pushing the local and regional textile industry.



4

The visit included a walk around the underground network of train tracks used to transport goods.



Students observed sectional material assemblies and abandoned "waste" brick in the underground portion of the former American Printing Company.

This illustration (fig. 6) depicts a grand view of the mills and storehouses of the Fall River Iron Works circa 1910.

Ashley Pedersen
Conspicuous Repair: Drawing Attention to Brokenness in Public Landscapes

LDAR

ABSTRACT Repair, as a design provocation, encourages material conservation, hands-on engagement with materiality, and evaluation of maintenance routines all of which contribute to a model of sustainability that values a circular economy and degrowth. Through visible repairs that focus our ongoing attention on brokenness, repair has the potential to illuminate, and start to address the systemic causes of brokenness. In this way, repair can be a catalyst for increased stewardship of a place.

Conspicuous Repair: Drawing Attention to Brokenness in Public Landscapes investigates clay as a suitable material for the repair of masonry in urban landscapes which has the potential, through visible and tactile engagement, to draw attention to and reactivate forgotten or fallow spaces. Landscapes fall into disrepair for innumerable reasons and we tend to respond by restoring places to a previous condition or by redesigning them. Conspicuous Repair considers a middle road, one that recognizes the impermanence of materials, even durable masonry materials, and takes small, deliberate steps to highlight and address brokenness. Repair can slowly and intentionally shift spaces to better fit the ever-changing political and ecological conditions of a place, and, for this reason, should be designed.

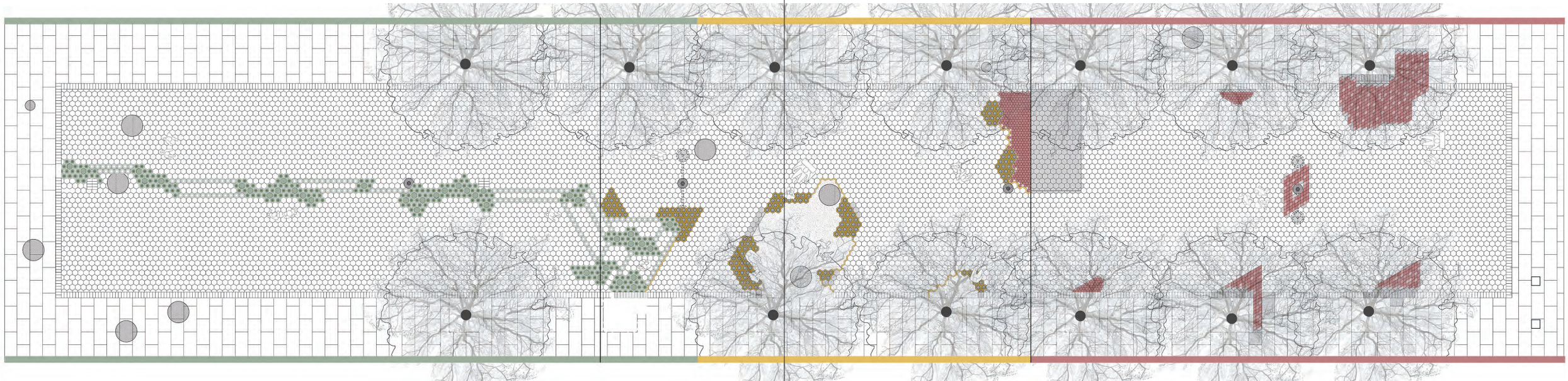
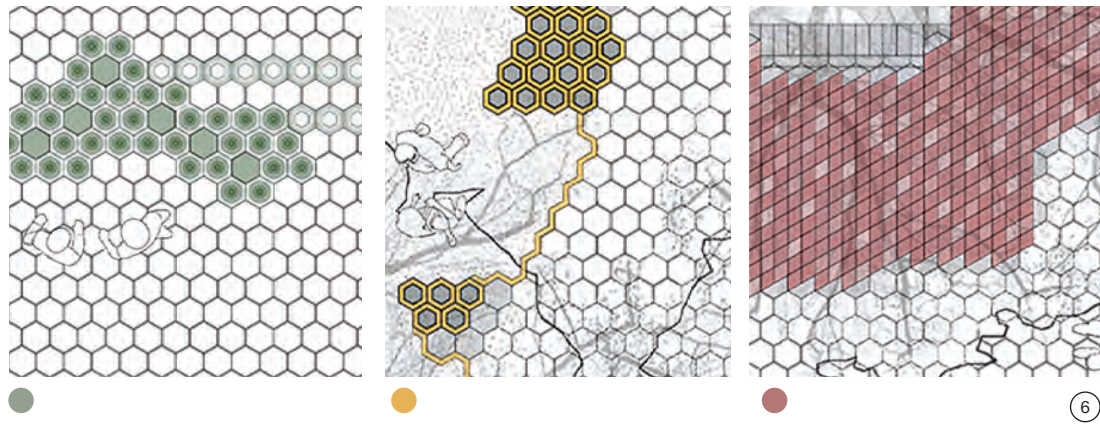
Using Cathedral Square—an underutilized and decaying public plaza in Providence, RI—as a case study, I investigated methods for repairing the battered paving with locally-sourced and salvaged clay materials. Ultimately, the resulting repair designs are meant to functionally repair the paving whilst



1

fig. 1 The modules allow for different paving compositions, using both full-scale and half-scale units.

conserving existing materials and reducing the carbon footprint of added materials as well as provoke interest in the space with aesthetic strategies that are not only visible, but also comment on the causes of brokenness. It is my hope that this type of visible repair will both signal and reproduce ongoing care of landscapes.



- Moss modules
- Extruded 18" tall columns
- Half-scale rhombus modules

fig. 6 Details of drawing

fig. 7 Prototypes included units for replacement of pedestrian and traffic pavements, and units for the growth of spontaneous vegetation.

fig. 8 Potential site applications for kit of parts material prototypes.

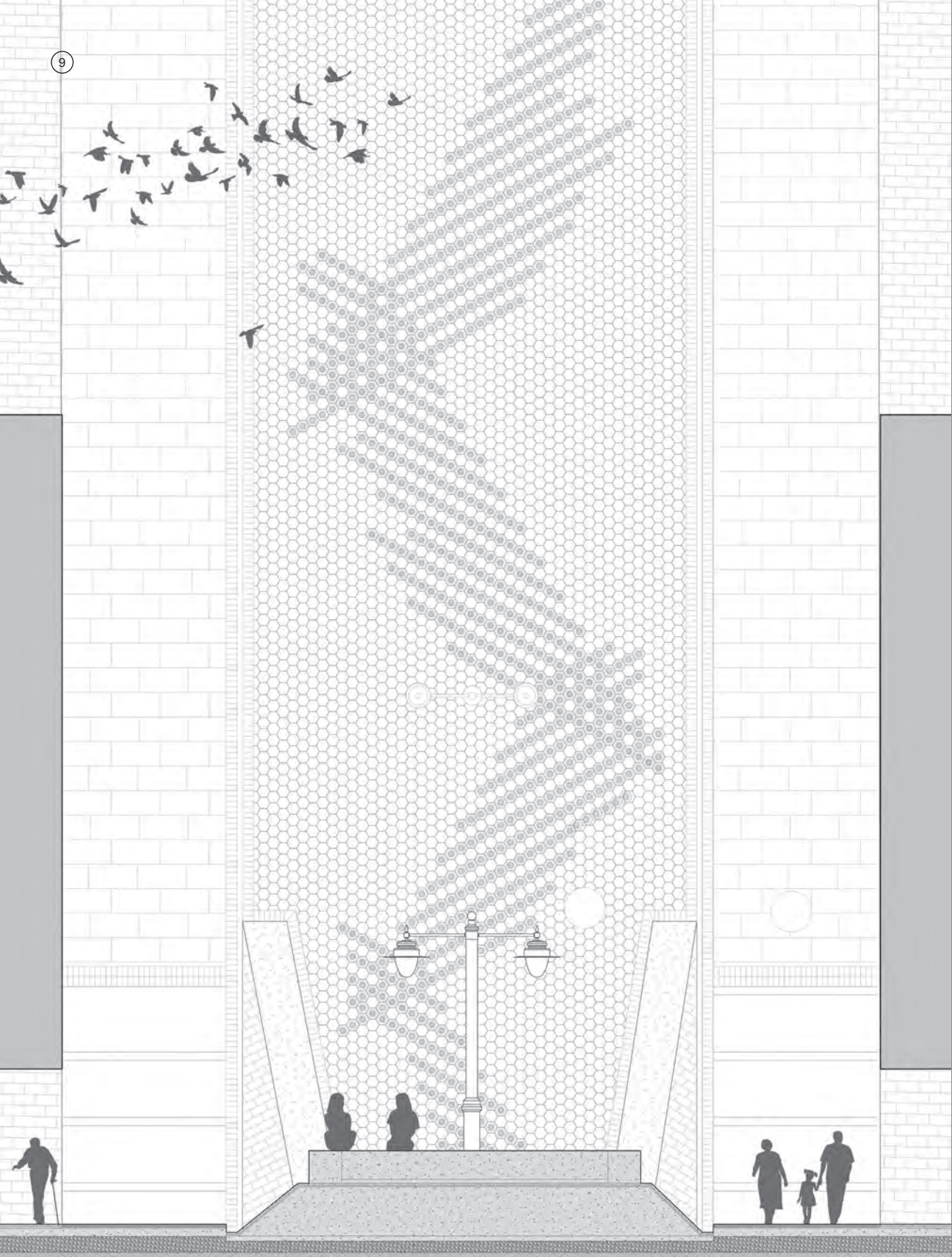


fig. 9-10 Section and plan drawings demonstrating potential paving repair strategies in Cathedral Square, Providence, RI.

Jen Ansley
Folding (and Unfolding): A Site-Responsive Strategy for Reusing Construction & Demolition Waste

LDAR

ABSTRACT Discarding—in its most reductive formulation— is a sorting operation that makes distinctions between materials (as well as objects, people, communities, and landscapes) based on perceived value. In her book *Waste of the World*, Nicky Gregson, therefore, argues for a more careful collection-curation strategy that revalues and re-signifies “waste” to make it available for repair and reuse. Gregson, however, points to limited space and infrastructural capacity as a potential barrier to the development of new material handling strategies.

My design responds by proposing a network of walls and paths that operate in each of the sites I’ve identified as an on-site waste collection-curation strategy while simultaneously articulating the historical and material processes that have produced each of these sites in their current conditions via processes of construction, demolition, and redevelopment that have destroyed communities alongside buildings and landscapes. These processes are articulated through the fold as both a concept and formal design strategy that harnesses the waste on site and subsumes it into new forms. Meanwhile, my design works to articulate a staging process for the disassembly of these buildings that makes more material available for collection and reuse, even in a densely developed urban metropolis, like New York City, allowing the history of the built environment to be incorporated into the city’s economic, cultural, and ecological transformation.

fig. 1 This installation illustrates how the module works as part of a wall, seat, path, and patio, breeze block, waste management strategy, and water filtration system.



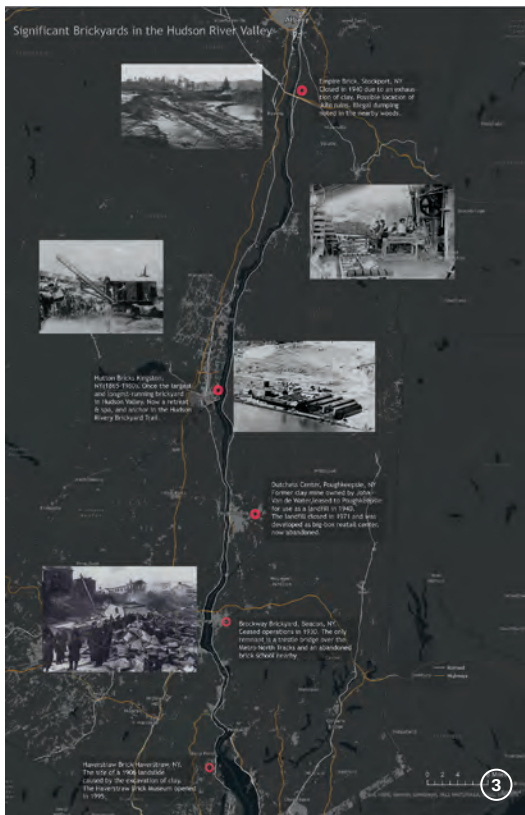


fig. 2 Perspective drawing of design intervention demonstrating the impact of tidal differences on assemblies.

fig. 3 The initial study of regional network of sites along the Hudson River Valley focused on Kingston Point Beach, NY.



fig. 4 The chosen site, Kingston Point Beach, is densely piled with brick rubble and clinker.

fig. 5 The design explored a wall that incorporates the rubble by folding it into clay modules.



6



7

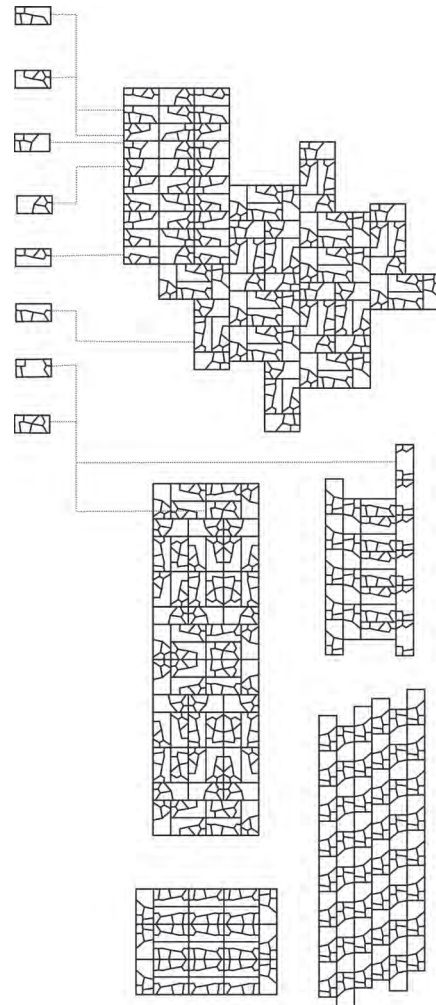
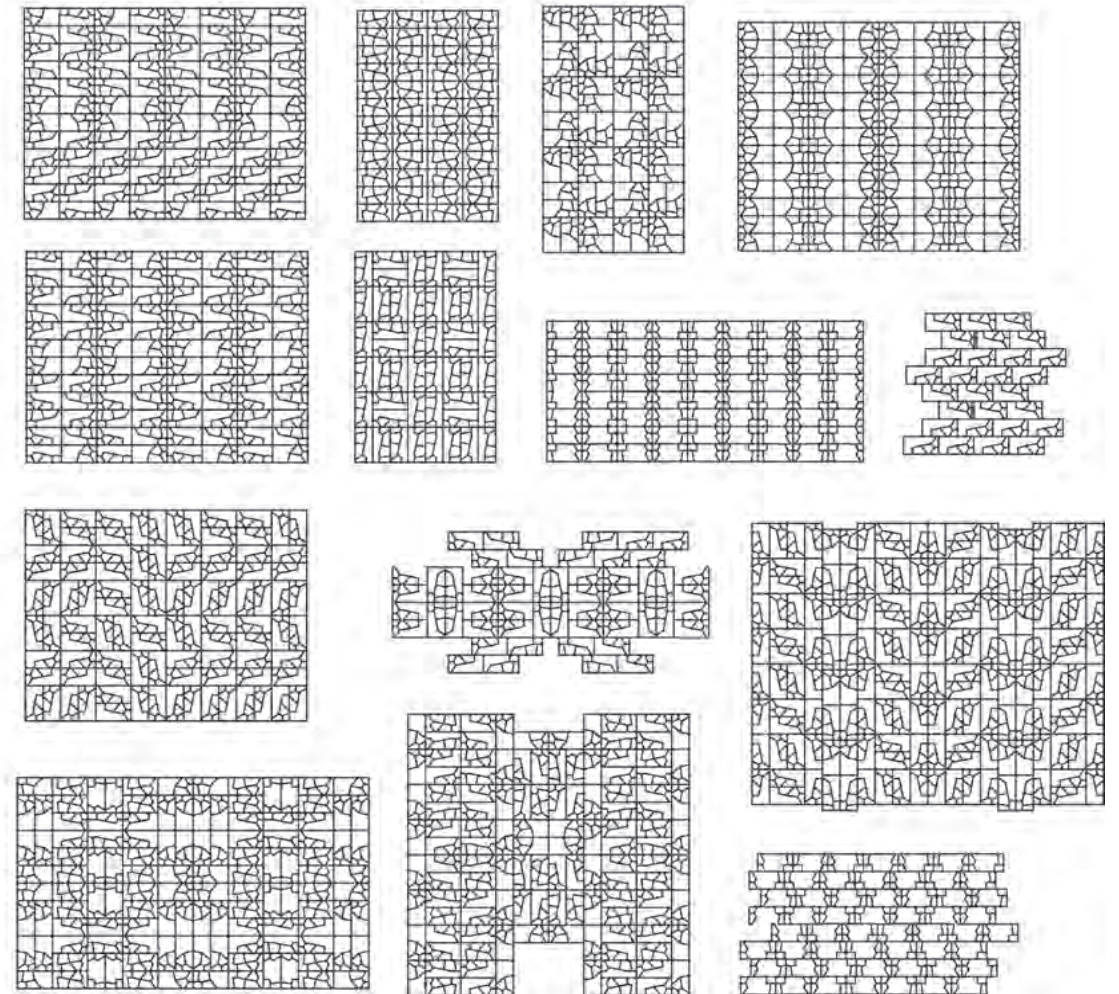


fig. 6 Initial conceptual ideas to materialize the fold using clay.

fig. 7 The design and prototyping of the wall included modules with different shapes and sizes, some of which fold the rubble in, while others offer structural stability.

fig. 8 Material assembly typologies for different applications and deployment strategies.

8





Rubble is folded into clay modules to create a wall that is also a waste maintenance strategy.

Site Visit MIT Chapel

We visited the MIT Chapel in Boston, MA, to experience its unique interior atmosphere and to study how its design affects that experience. understand the plasticity of clay, and bricks in particular, in generative architectural design. It included a workshop on 3D Mapping using cutting technology to create a point cloud model in situ.

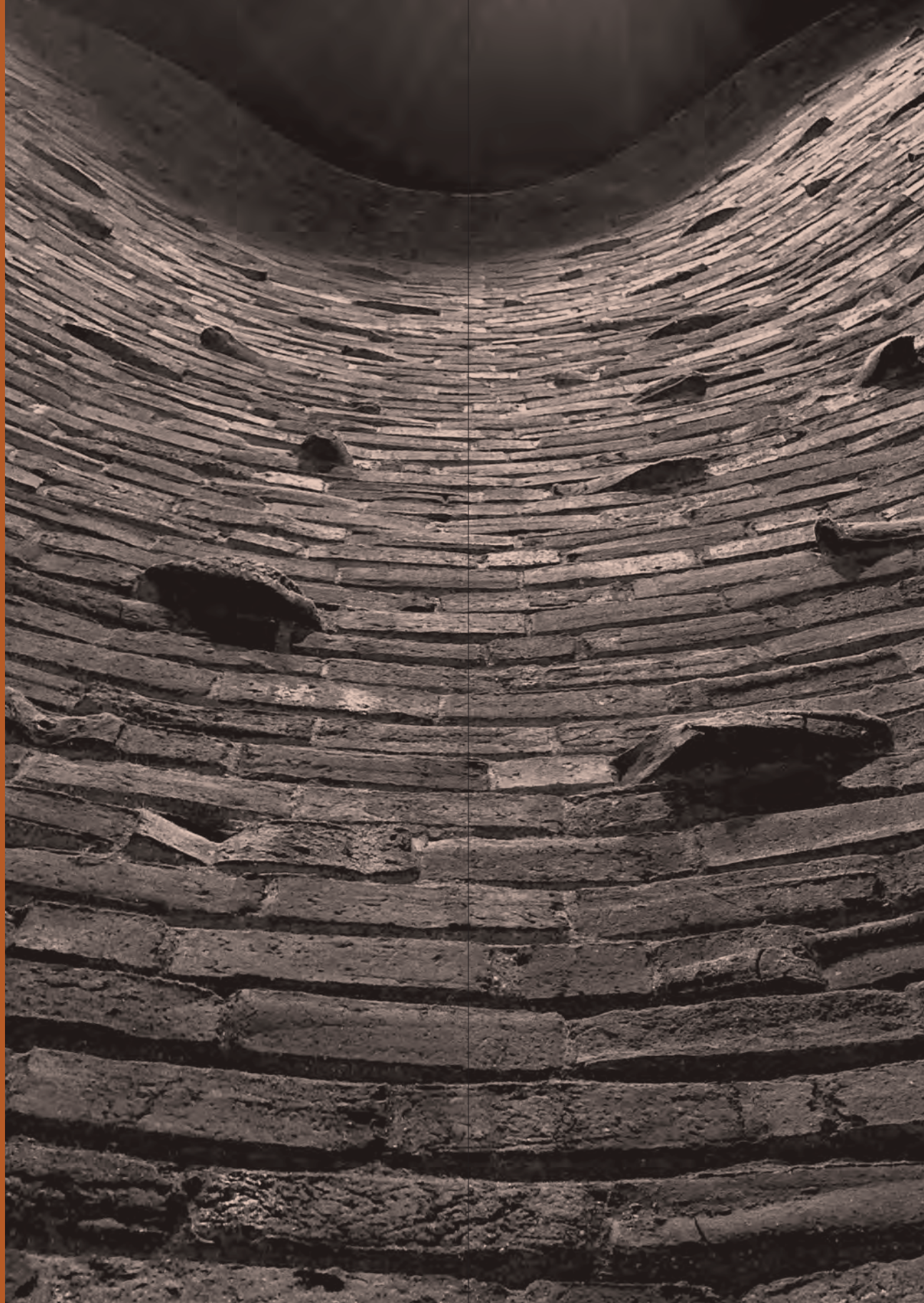
Site History

Designed by Eero Saarinen, the MIT Chapel is unique in its use of klinker brick (a type of brick that has been deformed by excessive heat during the process) to create irregular textures on walls and facades that diffract light and create an introspective design. Part of the visit included a full 3D scanning of the chapel.

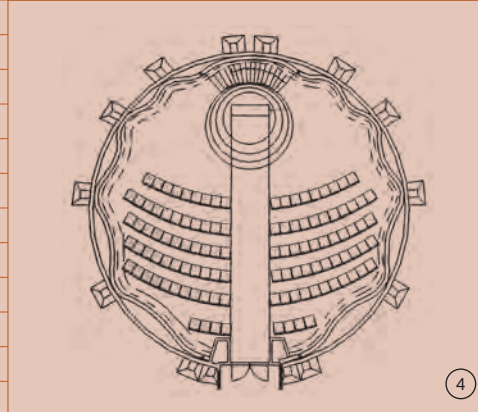
DETAILS

28 September

Location Cambridge, MA
Day Thursday
Temperature 63 °F / 52 °F
Condition Mostly Cloudy



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84	Workshop	Brick Laying
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A site visit to the MIT Chapel in Boston, MA, helped the students understand the plasticity of clay, and bricks in particular, in generative architectural design.



The students explored the atmospherical qualities of the building emanating both from the outside facade and its interior. Fieldwork activities often included sketching and diagramming architectural, landscape and interior spatial qualities and how clay affects experience.



8

The site visit included a quick trip to Cambridge where brick buildings inform the quality of the urban fabric around Harvard College. The students interacted with the thick facade of the Sever Hall to explore its visual, tactile and sonic qualities.



9



10



11

Victoria (Torie) Stotz

Space Between

INTAR

ABSTRACT

In a predominantly human-made, constructed world, the thesis explored how I can manifest the natural world with a hand made screen divider system, based on form and structure, that replicates that of a work of nature, more specifically simulating dappled light. Questioning sustainability through the limitations of terracotta clay, while introducing a passive, bioclimatic design, I explored how a fragile, rounded, hollow fired system impacts its structural integrity and its ability to embed nature like qualities in modular form. Clay is brittle when thin, dry, or water absorbing material is added; it absorbs water slowly, needs to be a certain plasticity to create rounded shapes, and has to dry slowly. Knowing these limitations, I worked with the material in order for it to respond the way I wish it to.

The proposed modular structures are meant to be self-supporting in exterior and interior contexts, using either artificial or natural light, designing complex patterns and gradients. Available to all climate types, the personal experience may compel diverse, or even contrasting fixations on one's body; whether that be the whistling of wind, temperature fluctuations, or the scattering of light and shadows, they are all a part of the sensory experience of the system. By using the least amount of material possible, and allowing the forms to connect to each other's tangencies, the modules allow for ambiguity, and an easy to assemble one piece module that encourages creativity and individuality, for each wall can be made completely different from the next. The modules may have the ability to bring nature in any context: urban, rural, interiors, or backyards. Versatility and ease are what makes this dappled, rounded module the new go to individualized, statement piece in any space.

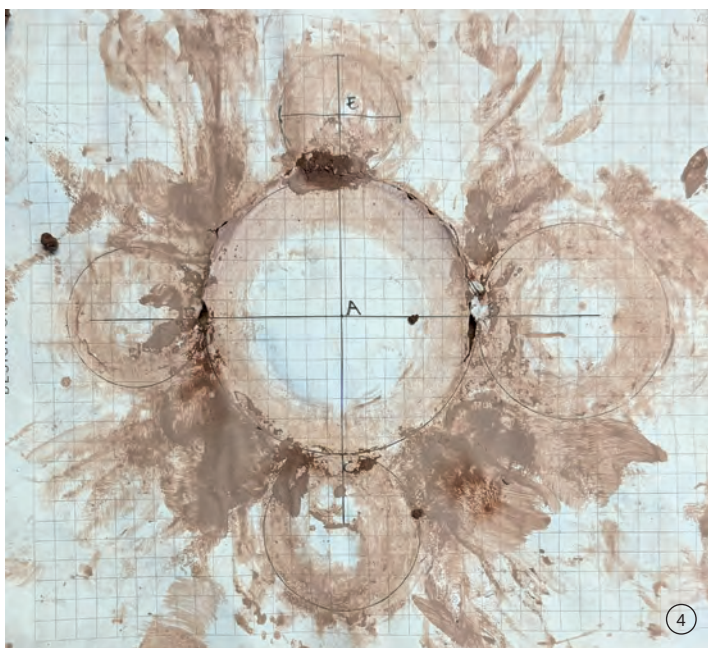


fig. 1 The screen design searches to explore the presence of nature in any context: urban, rural, interiors, or backyards.

fig. 2 Image capturing the effects of dapple light.



3



4



5

fig. 3 First experiments with rolled clay slabs and performed cut-outs to explore bio-mimetic shapes found in nature.

fig. 4 Clay material residues from module formation and casting.

fig. 5 Throughout an extensive modular process each unit is designed to connect to each other's tangencies.



fig. 6 Module for screen divider system that is self supportive and allows for permeability.

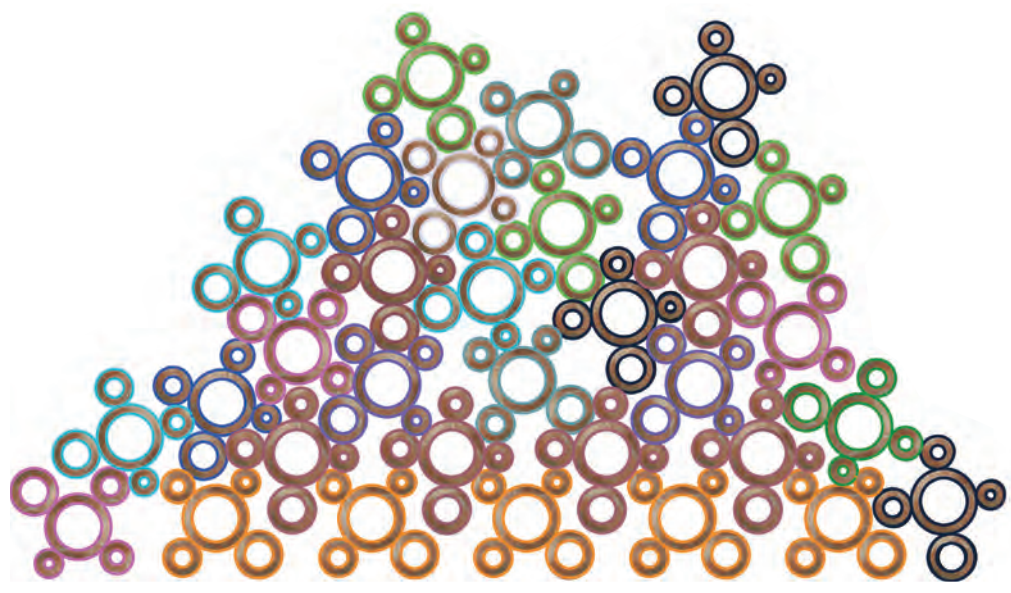
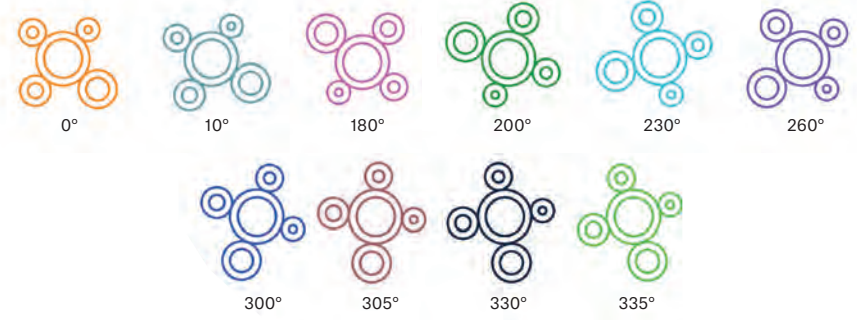
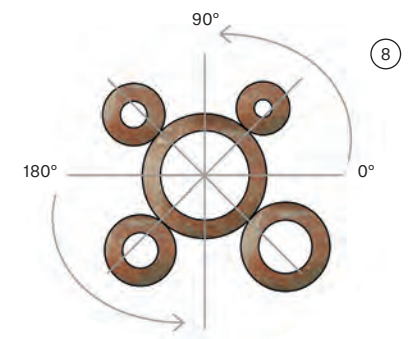
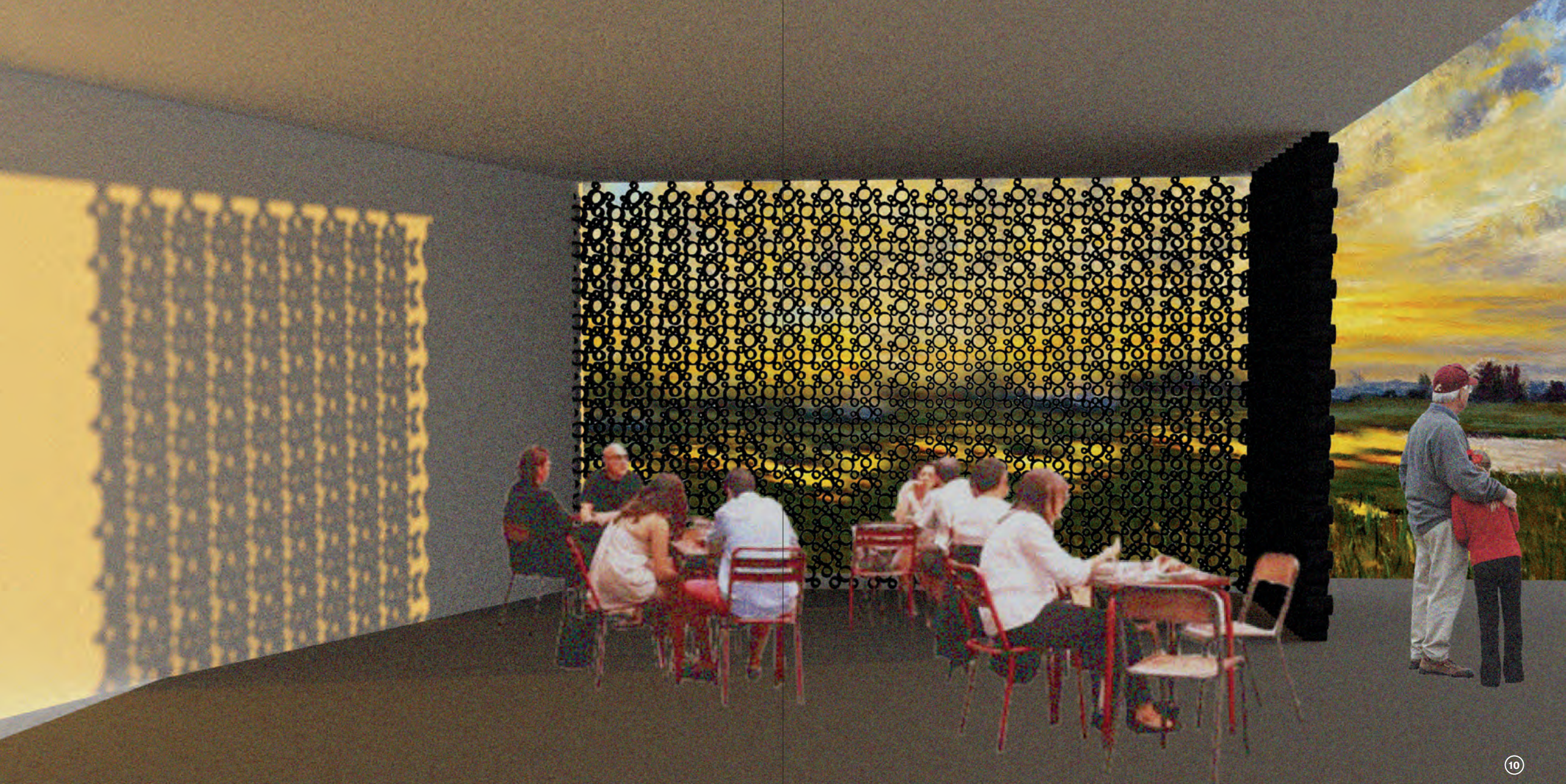


fig. 7 Singular module that demonstrates permeability of light, air, and other ephemera.

fig. 8 The modules support versatility and ambiguity seeking to encourage creativity and individuality.

fig. 9 Grouped modules that demonstrate self supporting patterns and modular connections.



10

fig. 10 By focusing on carrying the ephemeral nature of light to an artifact the project seeks to materialize nature both an optical and tactile effect.

Yicheng (Eason) Zhang

Exploring the versatility of clay in double curvature surface Formation

INTAR

ABSTRACT

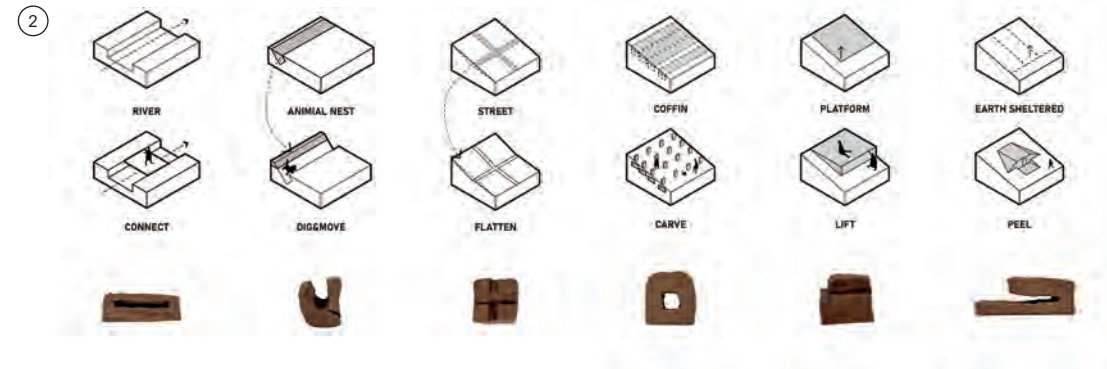
This thesis aims to investigate the efficacy of clay in shaping double-curved surfaces. In conventional interior design practices, Glass Reinforced Gypsum (GRG) is commonly employed to craft sculptural elements on surfaces such as ceilings and walls. However, despite its efficiency, GRG is not environmentally sustainable. As an excellent material for creating indoor curved surfaces, GRG offers the advantages of easy construction and high efficiency. However, during the demolition process, the inclusion of glass fibers makes the recycling process very complicated. It is difficult to separate these materials for recycling, which ultimately leads to a significant amount of construction waste. Additionally, the physical production process can release harmful chemicals that may impact human health. Furthermore, the additives used to make the GRG easier to work with can release volatile organic compounds (VOCs) post production, which may affect air quality. In response, this research seeks to explore the potential of clay as an eco-friendly alternative in the sustainability lab.

With the ability to be manipulated in terms of fluidity and softness, as well as its hardening properties when fired, clay holds more possibilities in similar construction processes than liquid gypsum. By comparing the performance of the two materials in terms of efficiency, ease of operability, production process, and final aesthetic effects, the thesis explored if clay can be a potential replacement for GRG in building double-curved surfaces.

The study was led by experimental models focused around experimenting with different examples of how clay can be used in replacement of GRG, including



1



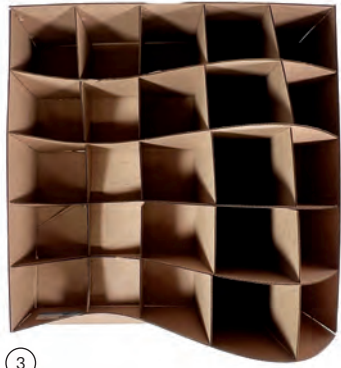
2

fig. 1 Perspective image of double curved surface ceiling with proposed material intervention.

fig. 2 Earlier typological studies on the fundamentals of underground constructed grounds served as the catalyst for the thesis investigation.

different potential material reinforcements such as reinforced fiber, metal mesh, Hemp rope mesh, and Plaster. The final experimental method uses clay 3D printing technology. A relatively ideal experimental method with the greatest implementational possibility was selected to simulate the ceiling shape made with GRG.

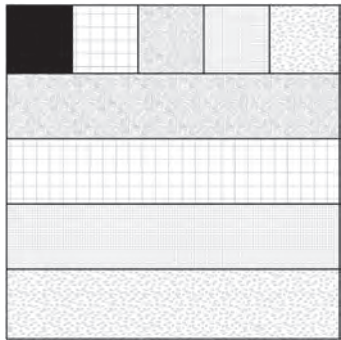
Experiment 1








③



Experiment 2

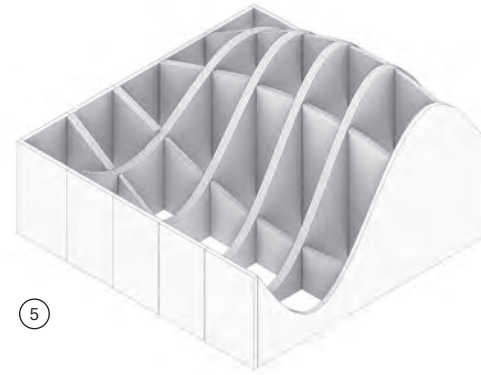


-  Solid Clay
-  Hemp Rope Mesh
-  Fiber Reinforcement
-  Metal Mesh
-  Plastic

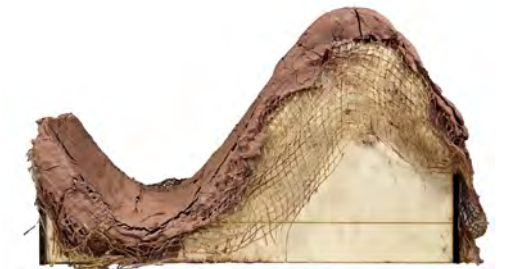
④



Experiment 4



⑤



Experiment 6

⑥



Experiment 7

⑦



fig. 3 Early experiment using a cardboard scaffold for formwork.

fig. 4 Explorations in plaster and clay casting.

fig. 5 Iterative textile and clay experimental forms in pursuit of a double curved surface.

fig. 6 Hand molded clay fired into bricks with curvature.

fig. 7 Earlier tests exploring the performative qualities of plaster in its capacity to hold form as similar construction processes as liquid gypsum.

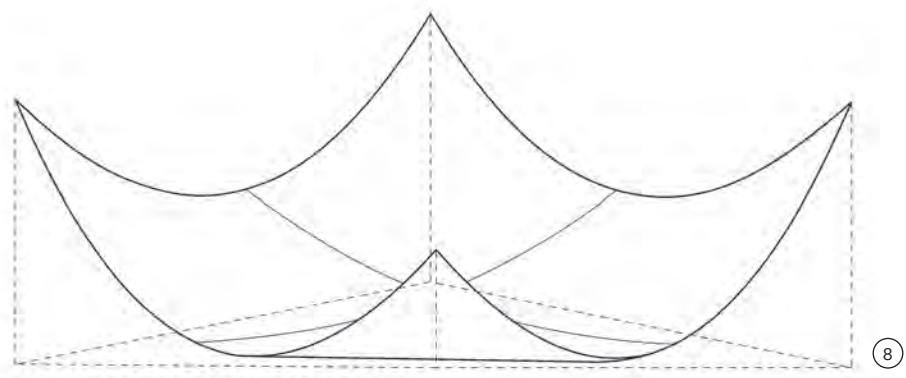


fig. 8 3D model of sculptural element for a wall or ceiling application that could be printed in a prototyping stage.

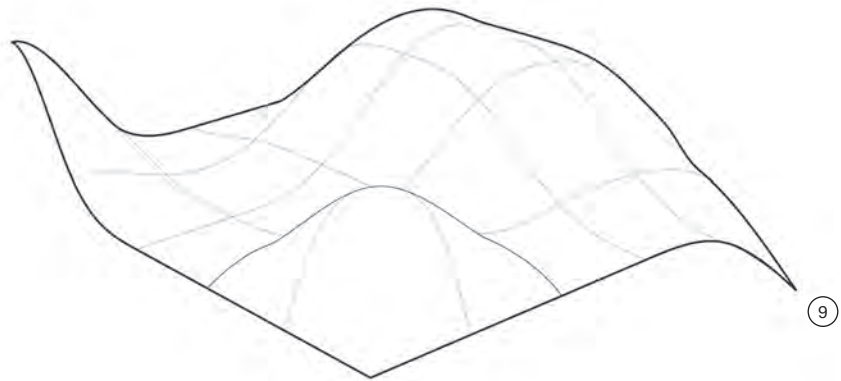
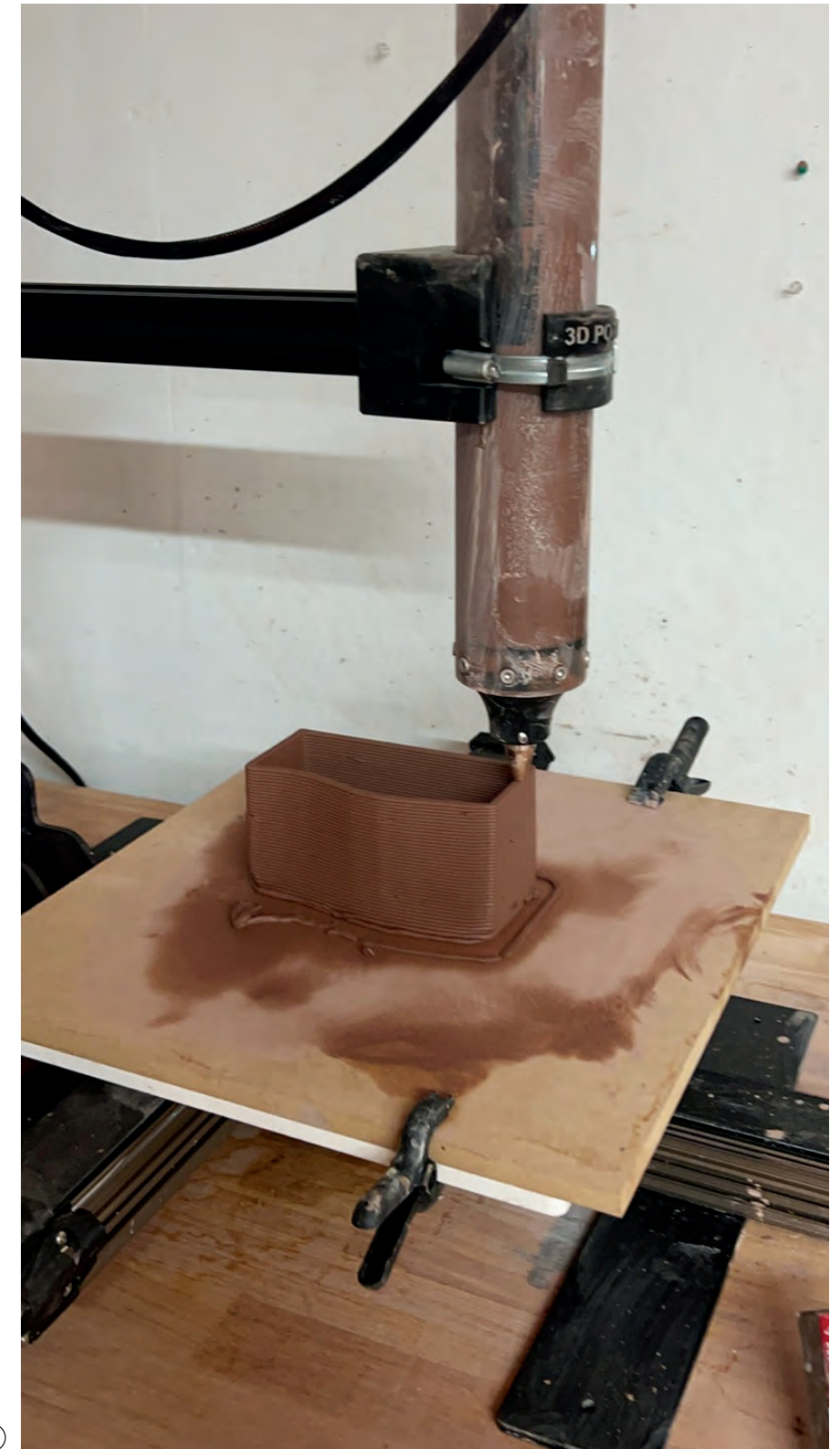


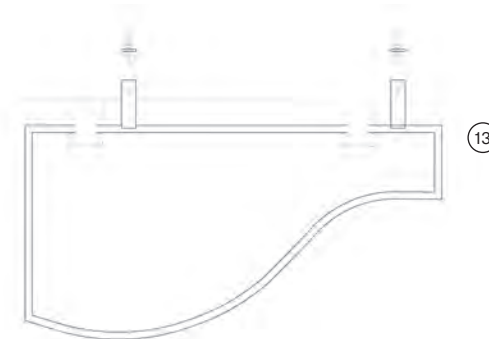
fig. 9 3D model of double curved surface for a wall or ceiling application.

fig. 10 The final experimental method used clay 3D printing technology.





12



13

fig. 11 The thesis explored if clay can be a potential replacement for GRG in building double-curved surfaces.

fig. 12 Installation view of work.

fig. 13 Detail drawings evidence how each module is suspended and anchored to the building slab.

Workshop

Brick Laying

To learn more about how to build using brick, the Lab visited the Bricklayers and Allied Craftworkers, Local No3, in Dorchester, MA. The hands-on workshop included the help of local brick masons, who taught students how to carefully lay bricks while adding stability to the test walls. The knowledge was then applied in iterative and generative approaches to designing with clay to question conventional building techniques and push towards more sustainable methods in the industry.

VISITING EXPERT

BAC Local 3 MA

BAC (Bricklayers and Allied Craftworkers) Local 3 represents thousands of tradesworkers in Massachusetts, Maine, New Hampshire and Rhode Island. Consisting of individuals skilled in every area of masonry craft, including restoration specialists water-proofers, mosaic workers and others, the union plays a critical role in adapting regional infrastructure to present and future ecological challenges.

DETAILS

19 October

Location Dorchester, MA
Day Thursday
Temperature 80 °F / 60 °F
Condition Mostly Cloudy



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To learn more about how to build using brick, the Lab visited the Bricklayers and Allied Craftsmen, Local No3, in Dorchester, MA.



The hands-on workshop included the help of local brick masons, who taught students how to carefully lay bricks while adding stability to the test walls.



Working in pairs, the students learned some of the important tools and techniques in the trade. The knowledge was then applied in iterative and generative approaches to designing with clay to question conventional building techniques and push towards more sustainable methods in the industry.

Owen Carey

Revitalizing Decay

INTAR

ABSTRACT

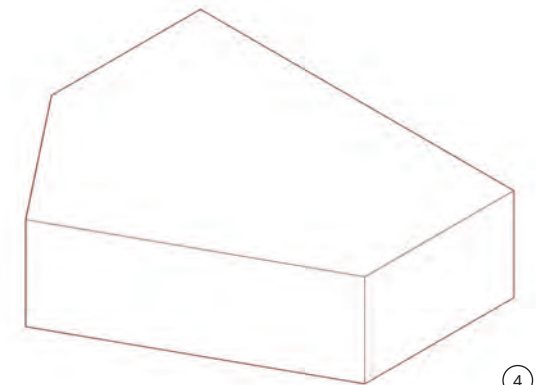
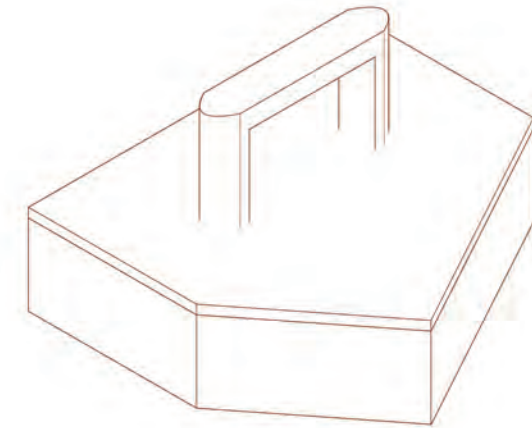
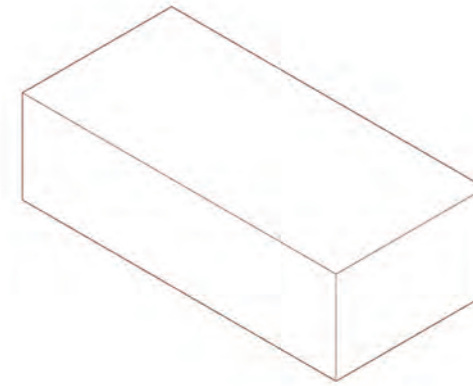
The thesis reimagines brick design, diverging from the conventional standardized brick, to introduce a crafted brick integrated with flora. Through the exploration of innovative sustainable solutions, this research aims to breathe new life into buildings facing advanced decay by embedding flora within the very structure of the brick. Buildings slotted for demolition typically go through a long process of approvals, signatures, etc. This thesis also aims to address the long process and instead pose an intervention that would streamline a typical demolition plan. With a primary focus on enhancing air quality, ensuring cost efficiency, and offering a temporary solution for urban public spaces in post-industrial cities, it offers a comprehensive approach to sustainable building regeneration.

fig. 1 1:1 prototype of masonry repair that offers a comprehensive approach to sustainable building regeneration.





3



4

fig. 2 The absence of brick mortar leads to an increasing deterioration with risk of wall collapsing.

fig. 3 Images featuring a customized clay infill brick a form of patch to prevent further deterioration.

fig. 4 Axonometric drawing exploring process to press clay to make bricks that would streamline a typical demolition plan.

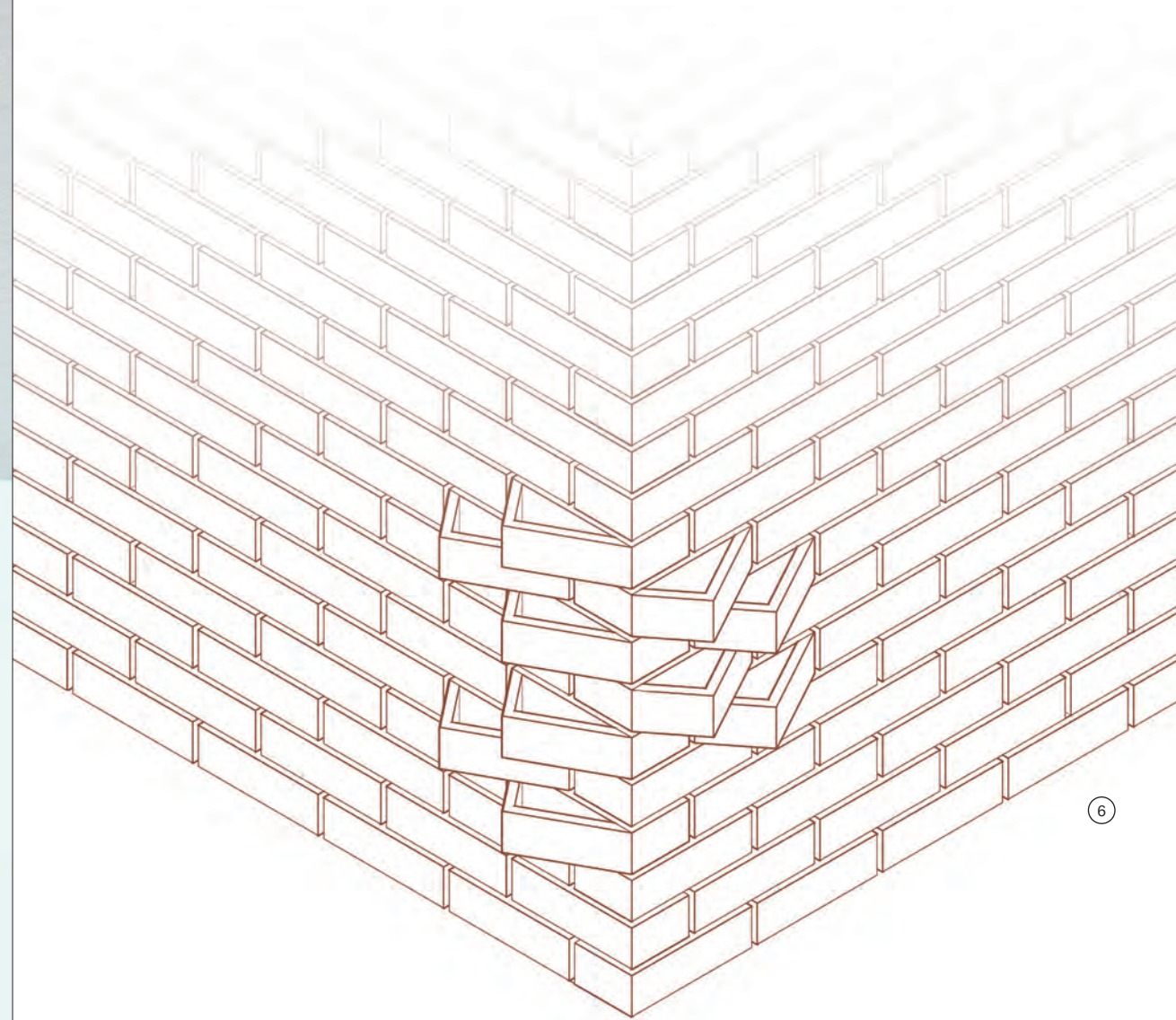
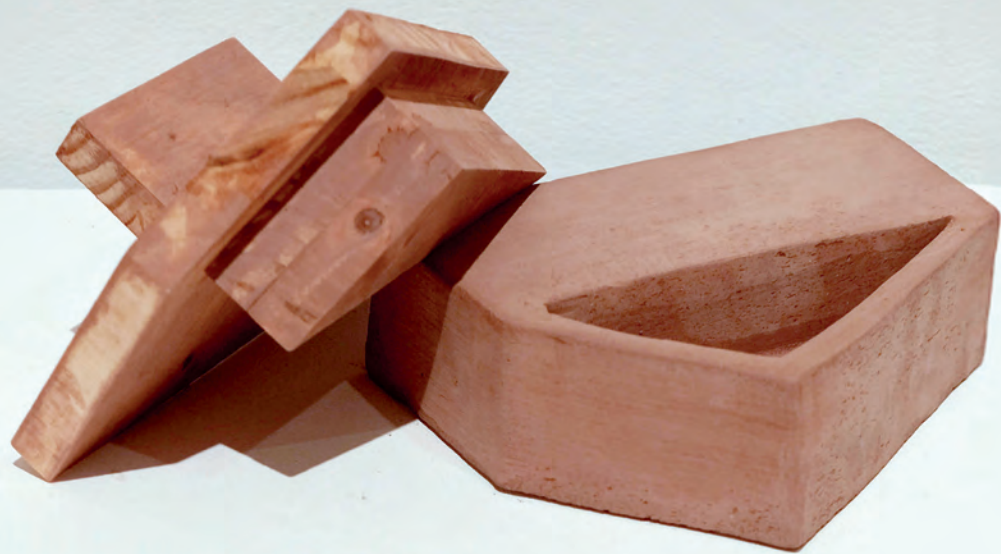


fig. 5 Masonry repair non-standard brick module with space for integration of flora..

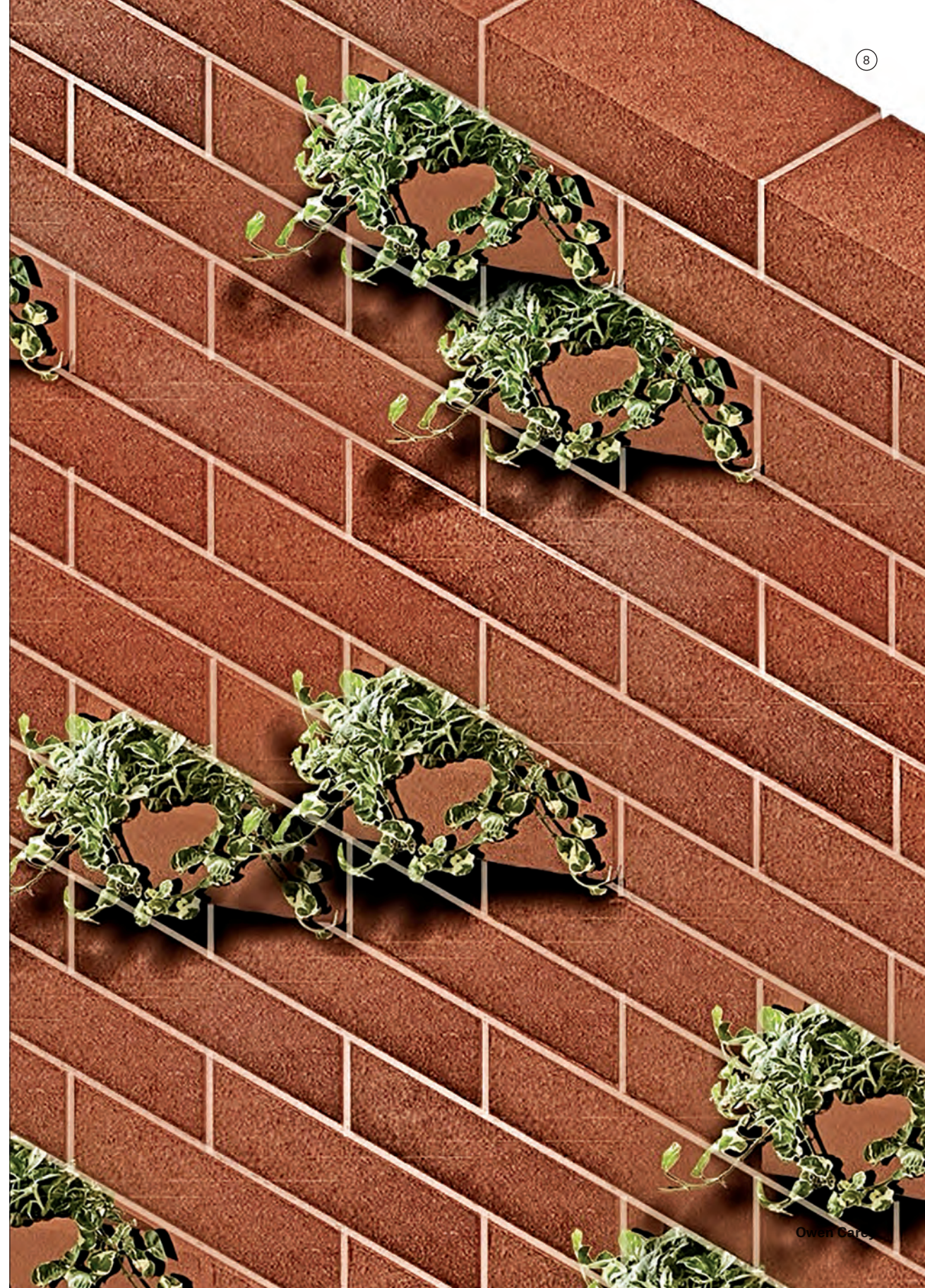
fig. 6 The repair of brick structures can become an opportunity to customize bricks to differentiate certain areas in the wall structures.



7

fig. 7 The effects of the passage of time and deterioration of brick walls became an opportunity for engaging change with natural cycles.

fig. 8 This work proposes a biophilic design that could integrate plants along a masonry construction.



Study models where the exterior and interior conditions of the MIT Chapel were abstracted and modelled in clay.



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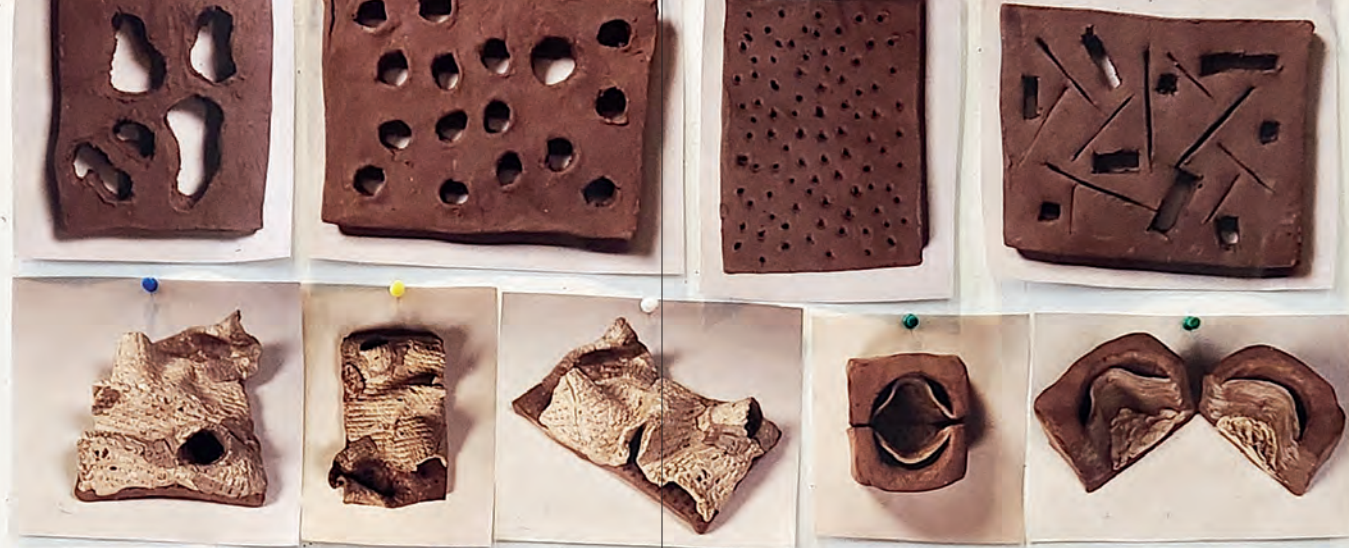
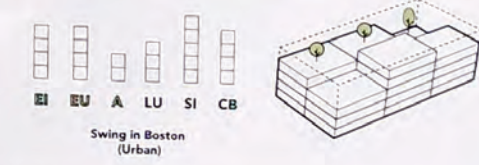
Exhibition of material explorations and studies of patterning and tessellation with clay for a midterm review.

- A shared swing can make more efficient use of limited space
- Increase community cohesion and social interaction
- A valuable recreational resource for a densely populated community, offering social, health, and economic benefits

ons. An urban swing may be seen as more sustainable if it efficiently uses urban space. Suburban swings may have higher energy costs and ecological impacts. A suburban swing may have lower energy costs and ecological impacts. A suburban swing may have higher energy costs and ecological impacts.

impact and human cost efficiency to achieve the purpose of sustainable development?

brick. From the models, it can be observed that, although the number of bricks corresponding to the same area appear to be more complex and expensive. This implies that the cost of the design is higher. In the future, these modular strategies can be pieced together during planning and implementation. This will help to better balance interests.



Frida Escobedo inspo

Erwin Haver

SCREEN / DENSITY / LIGHT / SHADOW

Kengo Kuma

sushi is a good metaphor for my architecture. The importance in sushi is to choose the best material from the place in season.

Wang Shu

Ningbo History Museum

Xiangshan Campus, China Academy

Patterns/Textures inspired by Barrington

- dense
- light
- imperfect
- shadow
- complexity
- dapple

Sycamore tree bark

fallen layered leaves

water ripples

fallen branches



Therapeutic Sustainable Clay Structures

Using waste materials in order to strengthen unfired clay to be used as building material for therapeutic/ wellness spaces and evoke different spatial experiences

Inspiration: Barrington Environment: Trees, Water, Foliage, etc.

MIT Chapel: Layers, Light, Shadows
Sever Hall: Density, Patterns

Fall River: Water Energy Source, and Community

- What sustainability means to this project:
- excavate less clay by adding waste materials
 - less waste going to landfills
 - waste strengthening unfired clay
 - unfired clay being recycled and repurposed



Exploration in clay of modular patterns for an eventual application in screens and walls.

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Abstraction of marsh conditions with burlap.



Early study model where clay behaves as a continuous fold that sorts out rubble on site.



Workshop

3D Potterbot

Architect Virginia San Fratello visited the Lab to teach about 3D printing techniques with clay. The students learned how to digitally model vessels and extrude them using a potter bot.

The workshop allowed the students to explore several techniques of coil extrusion, including applying progressively higher levels of distortion to input variation along the surfaces of their vessels.

VISITING EXPERT

Virginia San Fratello

Educator, designer and creative technologist Virginia San Fratello leads the multidisciplinary design firm Rael San Fratello (alongside Ronald Rael). A widely published scholar and practitioner across a range of design disciplines, she is also the chair of San Jose (CA) State University's Department of Design and a partner in Emerging Objects, a "MAKE-tank" focused on 3D printing in architecture, building components and product design.

DETAILS

11 November

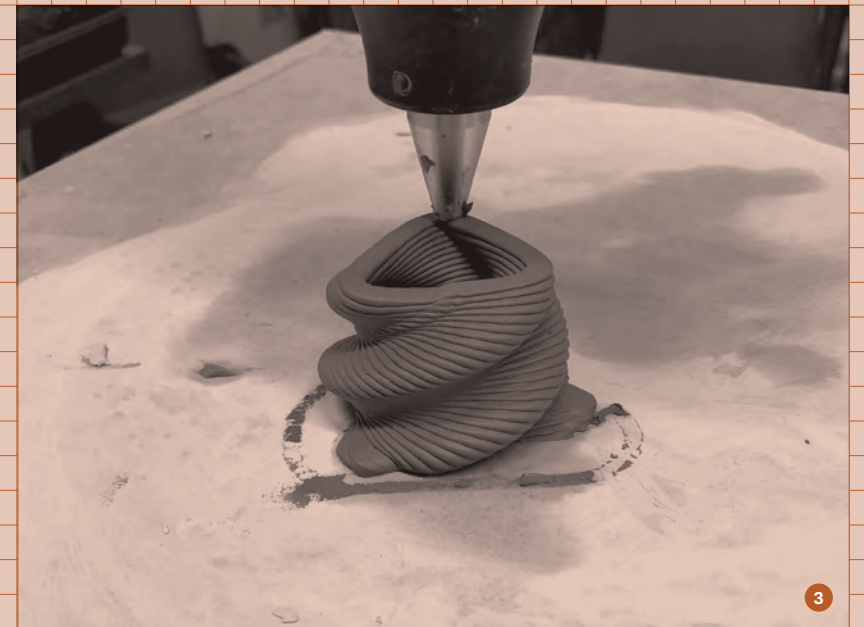
Location Providence, RI
 Day Saturday
 Temperature 53 °F / 34 °F
 Weather Fair



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Tiantong (Alice) Zhang

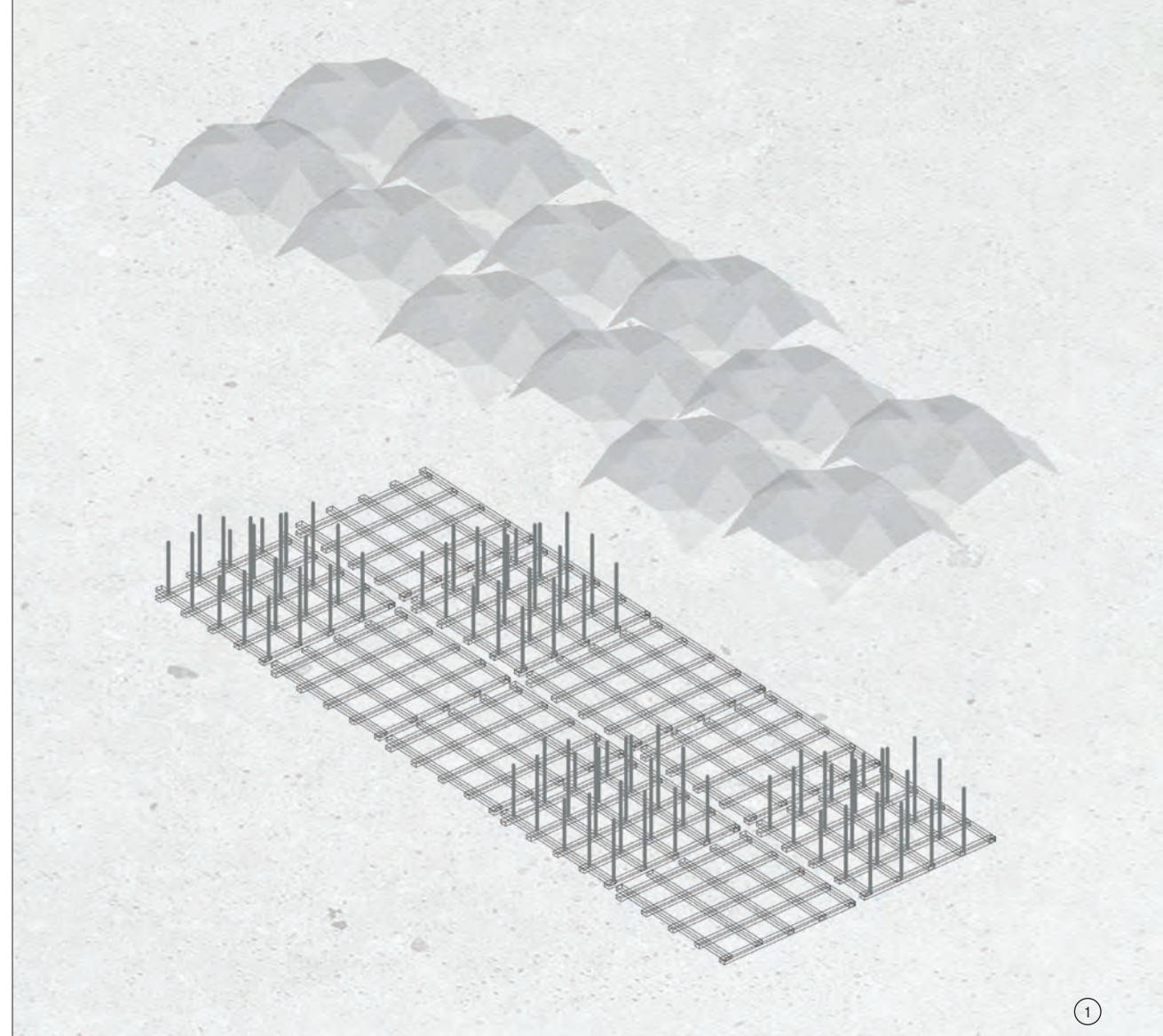
Clay Weave - Soft Nature: *Reimagining the Sustainable Use of Clay + Fabric in Interior Panels*

INTAR

ABSTRACT Landscapes are often investigated and understood through technological measuring instruments for field investigations and yet these lack the integration from a human scaled, psychological approach. How lands, materials affect the human body and how the laboring in clay + fabric mache reflects inherited knowledge in sustainable makings. The making with white porcelain clay still carries the sensational making and transformation by weaving with clay slip dipped felts.

The formation of the curves pulls away from the butaility of earth clay yet continues the investigation of repetition, paneling in the details of installation and applications such as opportunities for unfired, raw clay to participate in interior settings. This labor of weavings in clay has the qualities to be applied in interior spaces as an acoustic control factor by paneling and layerings.

The panels are easier to make with sustainable, easy sourcing, affordable materials that allow easy productions.



1

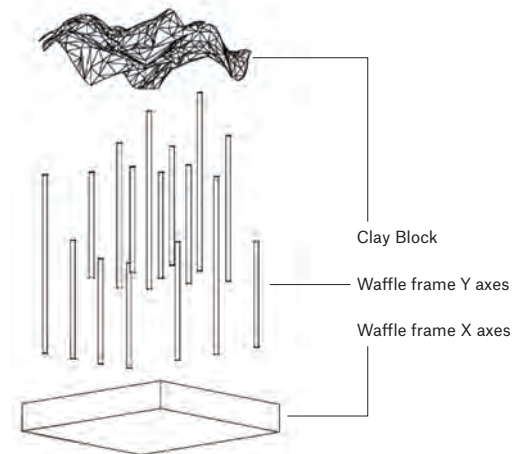
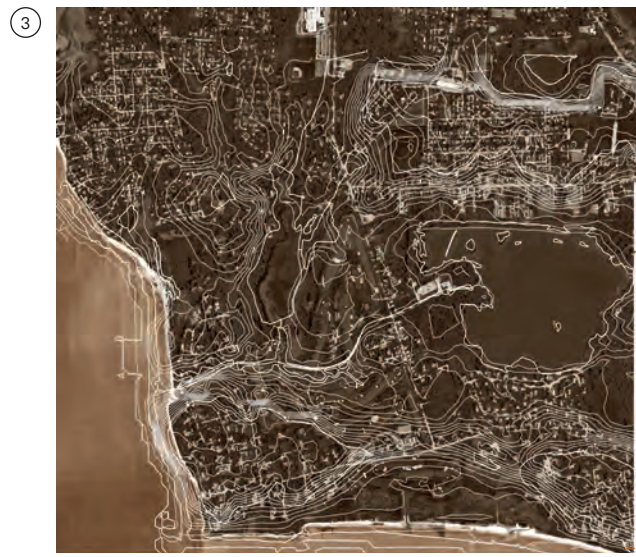


fig. 1 Schematic diagram exploring the relationship between surface morphology and suspension cables integrated in a lattice structure.



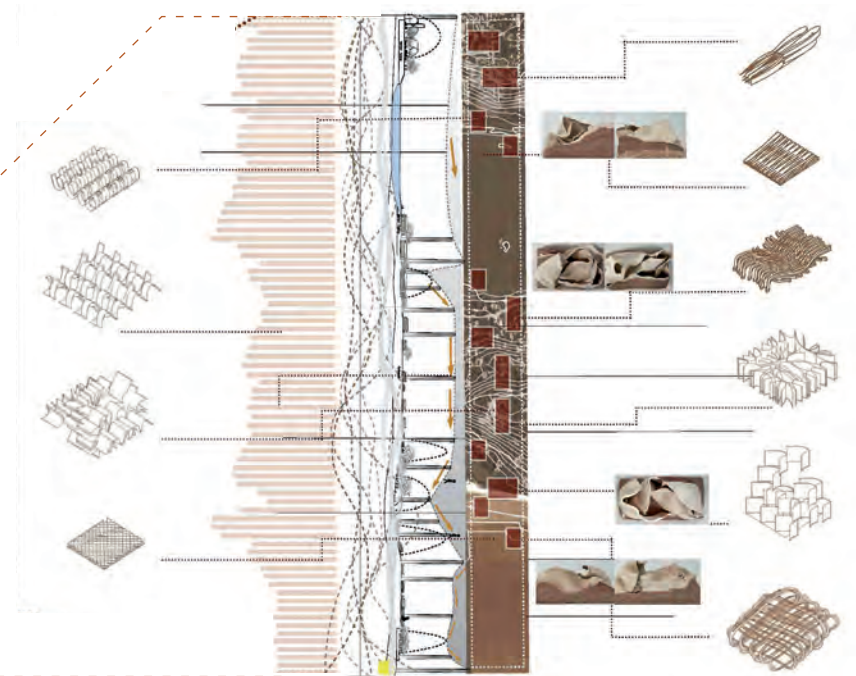
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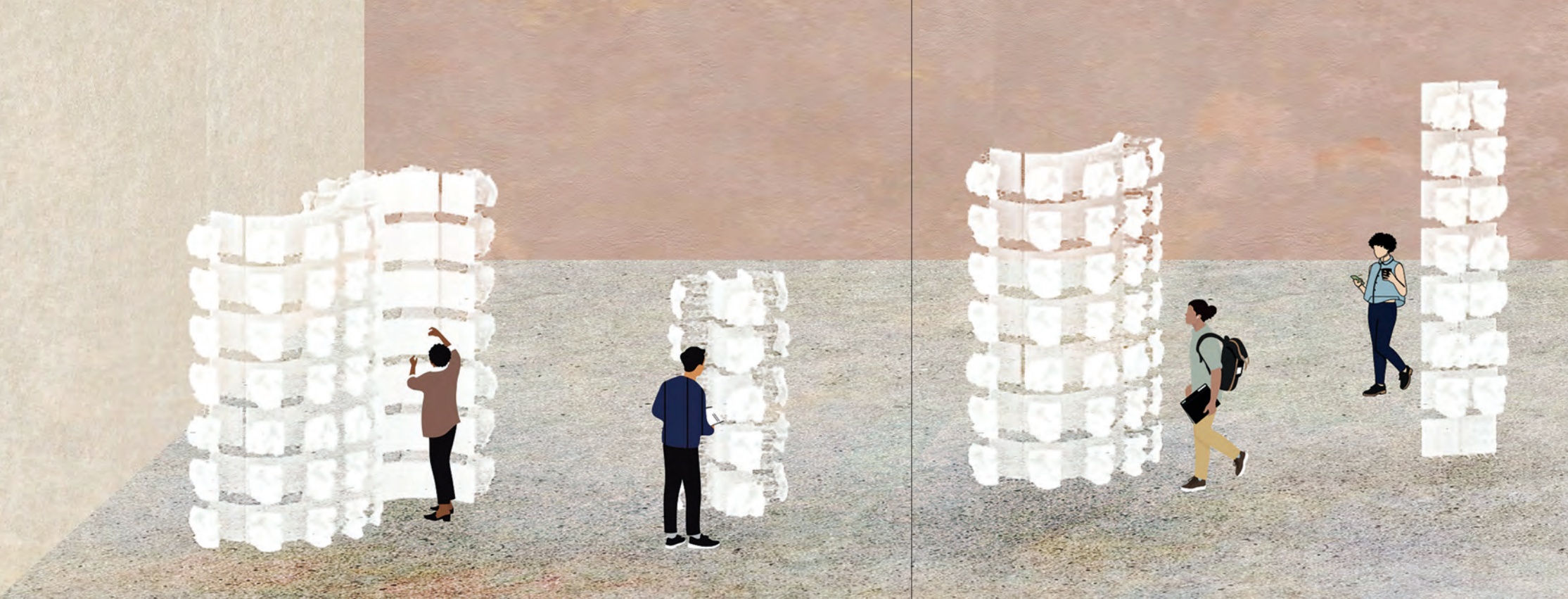
fig. 2 Early iterations of site conditions where surface and underground structure contribute to specific experiences.



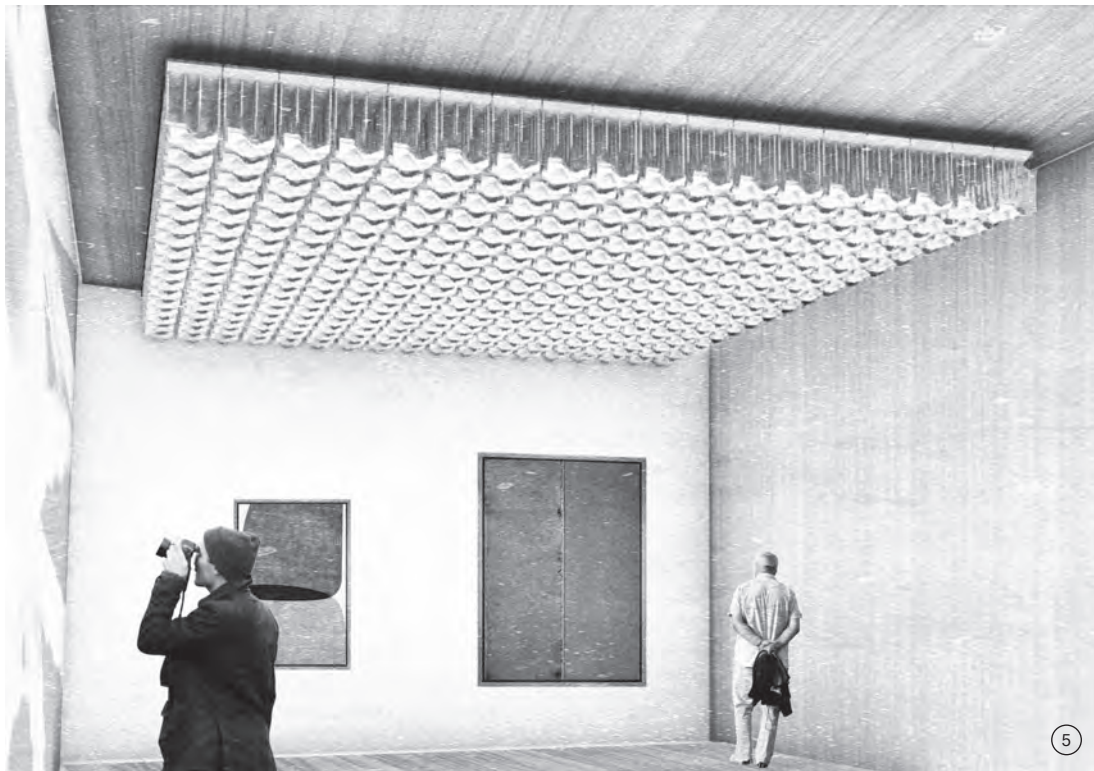
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fig. 3 Abstracting experiences on site through a series of clay weaves.

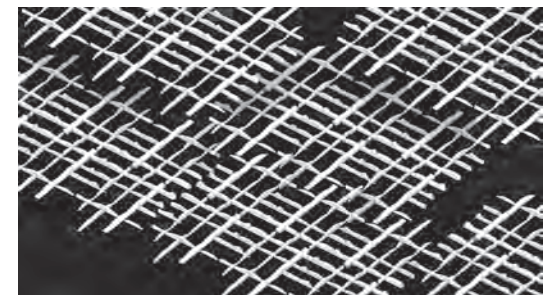




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fig. 4 The assembly allows for acoustic control to the interior environment determined by the spacing between paneling and layerings.

fig. 5 The application of this panel system produces a performative spatial effect.

fig. 6 The framework for the panel aggregation derives from a pattern system recognized by subtle x,y,z repetitive models.



7

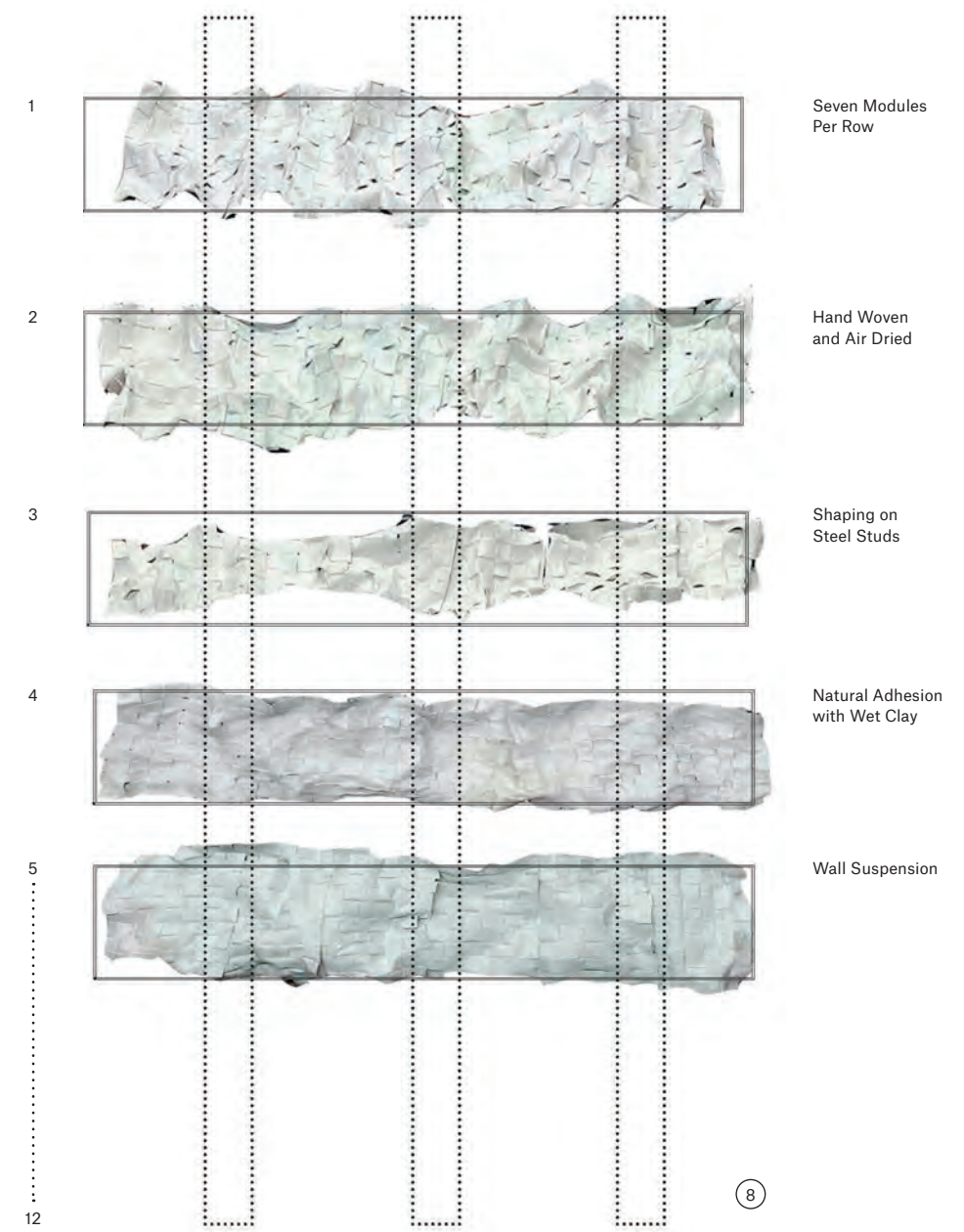


fig. 7 A clear transposition of the weaving procedural approach to textiles carried to ceramics.

fig. 8 A process based form-finding exploring the ductile qualities of white porcelain clay slip dipped felts.

Yechen Zhu

Waste Illuminates Worlds: *Printed Modular Lamp Design Based On Brick and Clay Tile*

ID

ABSTRACT

The building industry in the New England area is often in a state of entropy, with abandoned brick buildings contributing to urban decay. The recycling rate of brick and clay tile wastes generated by construction and demolition is only 12.2%, meaning the majority is sent to landfills. The expansion of landfills can lead to significant environmental and community challenges, including increased traffic from waste transport, habitat destruction, ecosystem degradation, and contributions to climate change. Specifically, the Bethlehem landfill in New Hampshire, which is planned to undergo a 5.71-acre lateral expansion through 2026, has already encountered issues such as leachate spills and water pollution. These problems underscore the necessity of proper waste management practices to mitigate potential negative impacts on the environment and local communities.

This thesis explores the use of various biocements for the adhesion of brick and clay tile grains, examining their bonding mechanisms under Scanning Electron Microscopy (SEM). The material application of the modular lamp which incorporates digital printing technology not only minimizes waste through precise material usage but also creates special textures and remind users of the importance of protecting our planet. The creation of this lamp contributes to environmental sustainability by diverting still-usable materials away from landfills, reducing the energy required in the manufacturing process, and decreasing the demand for clay extraction, which makes sustainability development tangible.

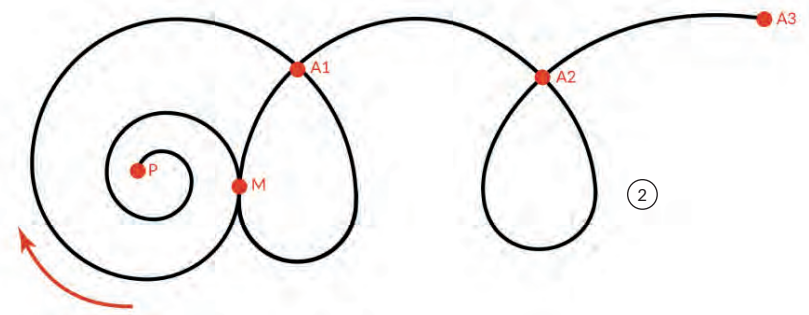


fig. 1 This thesis explores the use of various biocements for the adhesion of brick and clay tile grains.

fig. 2 Design methodology used to iteratively move between problem (P), method (M) and application (A).

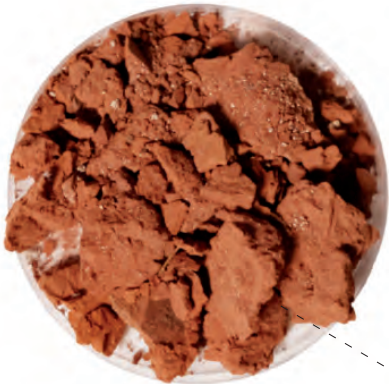
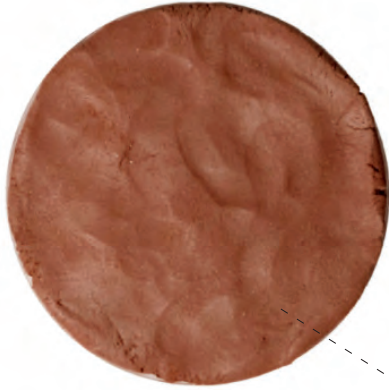
In general, the focus of the thesis is on using recyclable rather than extractive materials to create amenities that enhance human comfort while preserving the characteristics of traditional materials and extending the history of clay in New England from a new perspective.

④ Construction and Demolition Waste

Material	Composition
Stony Fraction	75%
Bricks, wall tiles and other ceramic material	54%
Concrete	12%
Stone	5%
Sand, gravel, and other aggregates	4%
Rest	25%
Wood	4%
Glass	0.5%
Plastic	1.5%
Metals	2.5%
Asphalt	5%
Plaster	0.2%
Rubbish	7%
Paper	0.3%
Other	4%

③

Raw Clay



Clay Brick

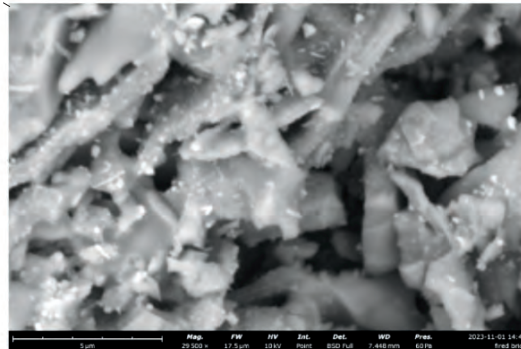
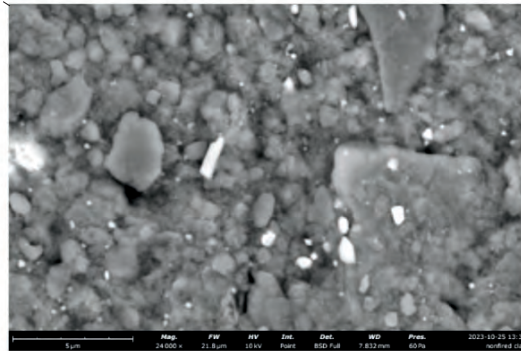


fig. 3 Comparative analysis of crushed brick and fine clay powder using the scanning electron microscope.

fig. 4 This thesis diverts still-usable materials away from landfills, decreasing the demand for clay extraction.

fig. 5 Early material experiments for the use of clay brick for 3D printing.



⑤

Recipe	Brick + Alginate	Brick + Sugar	Brick + CaO	Brick + Urea	Brick + Casein	Brick + Clay	Brick + Resin
Manufacture Method	Cast, 3D Print	Cast, 3D Print	Cast	Cast	Cast	Cast, 3D Print	Cast
Curing Time	Fast	Fast	Low	Very Low	Fast	Fast	Fast
Waterproof	Yes	No	Yes	Yes	Yes	No (pre-fire) Yes (post-fire)	Yes
Reduces	Landfill	Landfill	Landfill, Carbon	Landfill, Biological waste	Landfill	Landfill	Landfill

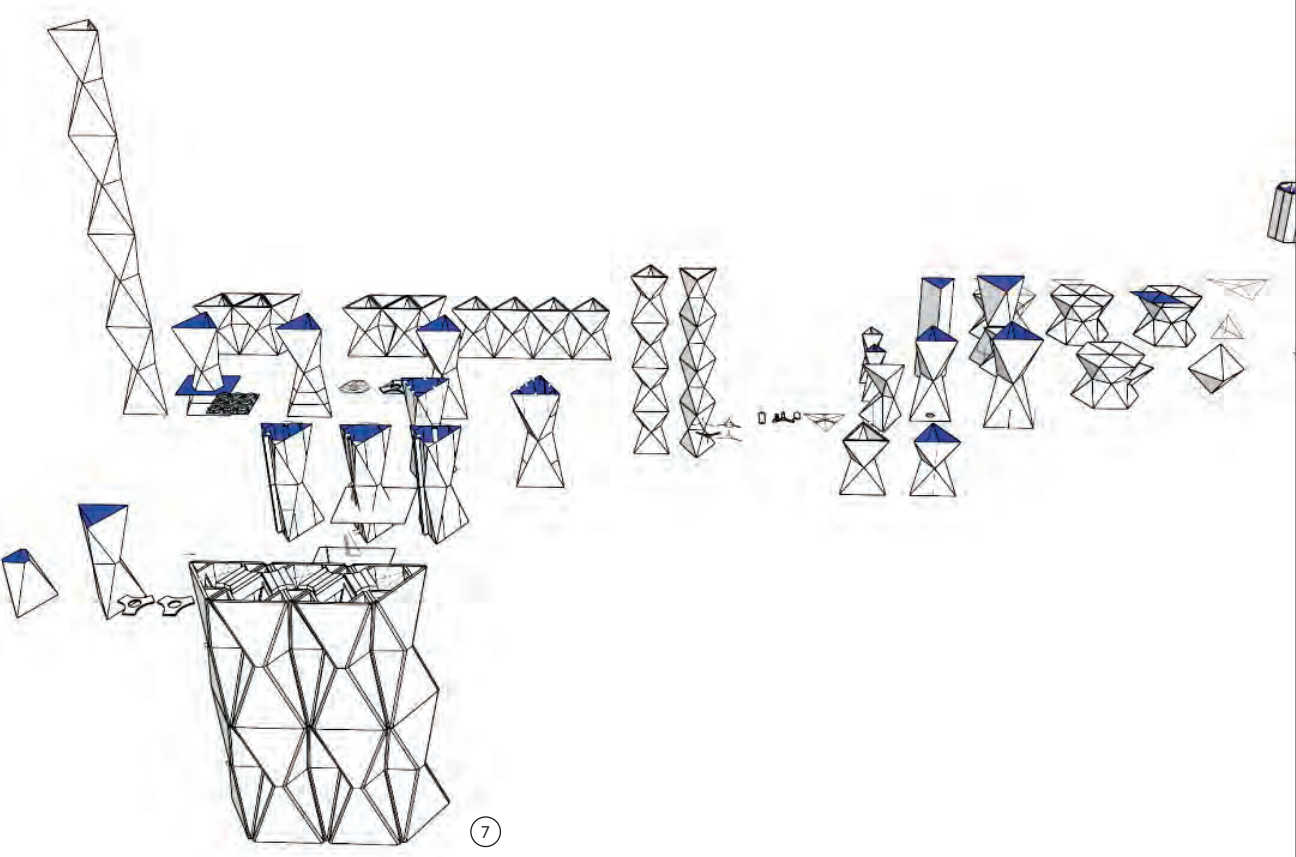
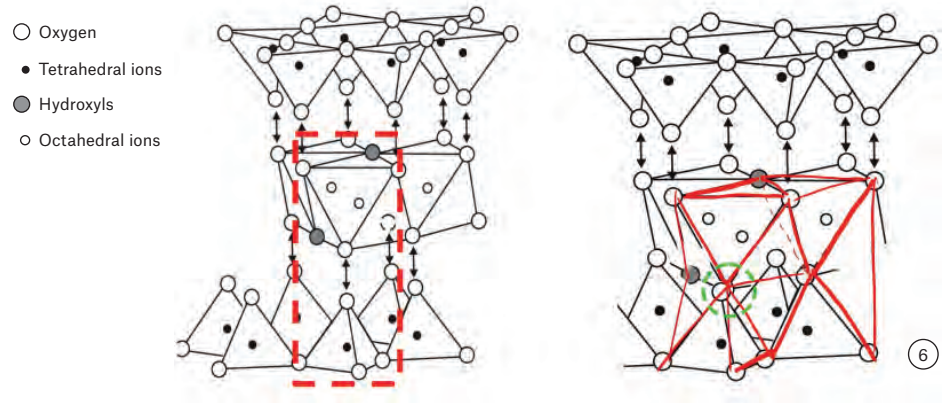


fig. 6 Design inspiration came from clay's molecular tetrahedral geometry and molecular assemblage.

fig. 7 Digital Modular aggregation studies lead to the creation of a multi-purpose and modular lighting system.

fig. 8 Photograph of 3D printed light module made by recycling clay "waste."



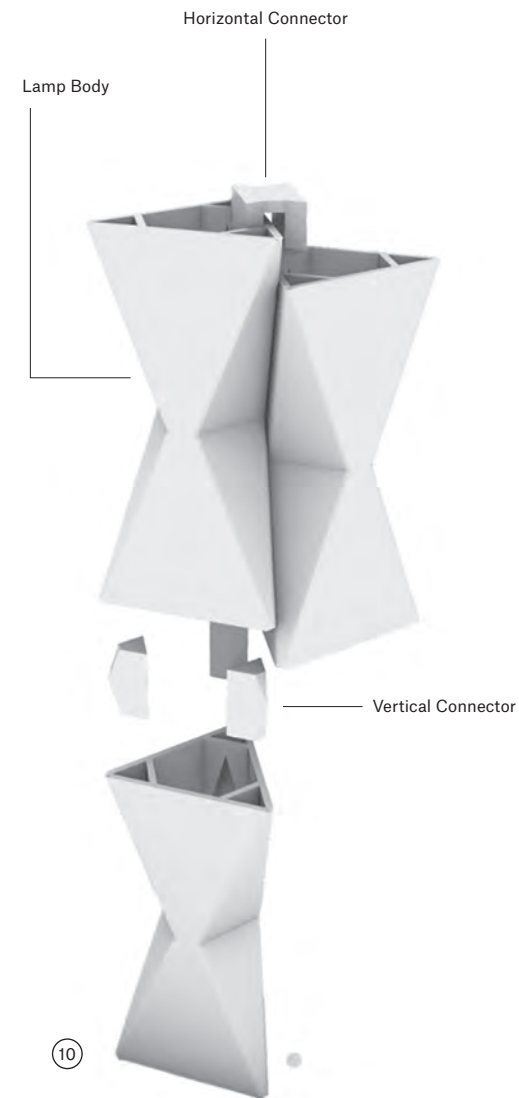
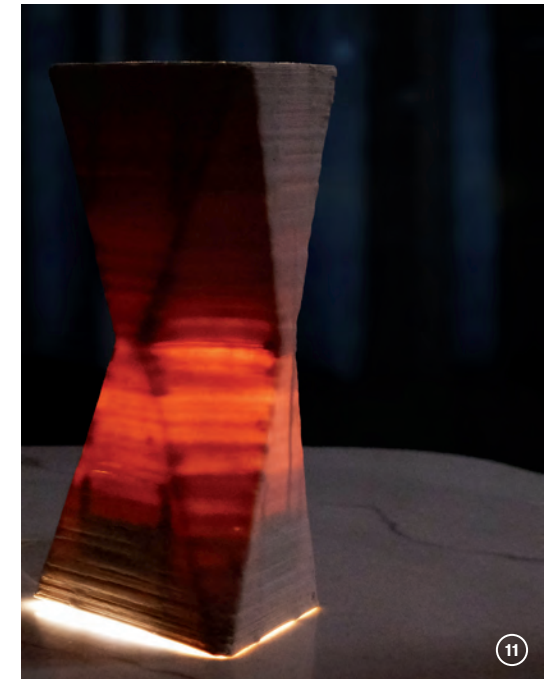


fig. 9 Photograph of 3D printed light module that shows areas where modules can be fitted together.

fig. 10 3D model of light module and how modules can attach to one another once assembled.

fig. 11 Illuminated modular light shows 3D printer toolmarks and materiality of recycled clay.

fig. 12 The 3D printing layering process enables the creation of custom textures evoking the haptic quality of fired bricks.





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The work was periodically reviewed by a group of critics that included academics, practitioners and artists with a focus on clay.



Early prototypes for a modular clay wall that sorts out rubble and debris on site.

Workshop

Earth Architecture

The students learned about earth architecture with world-leading expert, Maddalena Achenza. The techniques and tools explored during this workshop included the preparation of mixes of earth, natural pigments and natural fibers as sustainable materials for construction. The two-day workshop included the study of earth mixes in terms of color, texture, resilience and applicability in cladding. The students also learned how to construct wattle-and-daub thick surfaces, used in some regions for the construction of walls.

VISITING EXPERT

Maddalena Achenza

Maddalena Achenza is an expert in earthen architecture and associate professor at the University of Cagliari (Italy), Faculty of Civil and Environmental Engineering and Architecture. Achenza is a scholar and practitioner in conservation, restoration and architectural engineering, and the president of the International Scientific Committee on Earthen Architectural Heritage at the International Council on Monuments and Sites.

DETAILS

Two Day Workshop

Location	Providence, RI
Day 1	Tuesday, 9 April 72 °F / 39 °F Mostly Cloudy
Day 2	Wednesday, 10 April 55 °F / 40 °F Cloudy



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1

JUST SOIL	1 SOIL 1 SAND	1 SOIL 2 SANDS	1 SOIL 3 SANDS
1 SOIL 1 FIBER	1 S. 1 SA 1 FIBER	1 S. 2 SA 1 FIBER	1 S. 3 SA 1 FIBER
YOUR BEST (CONCRETE) MIX			
METAL	RUBBER	SPONGE	BRUSH
1 KAWLIN 1 BRACKET 2 SAND-WHITE	1 KAWLIN 1 PUNCH 4 SAND-LIGHT	1 KAWLIN 1 PUNCH GRAND LAYER	2 SAND-LAYER
↓	↓	↓	↓
1 FIBER	1 FIBER	1 FIBER	
MATERIAL MIX			
METAL	2 RUBBER	SPONGE	BRUSH

3



4



2



5

The students learned about earth architecture with world-leading expert, Maddalena Achenza. The techniques and tools explored during this workshop included the preparation of mixes of earth, natural pigments and natural fibers as sustainable materials for construction.



The two-day workshop included the study of earth mixes in terms of color, texture, resilience and applicability in cladding.

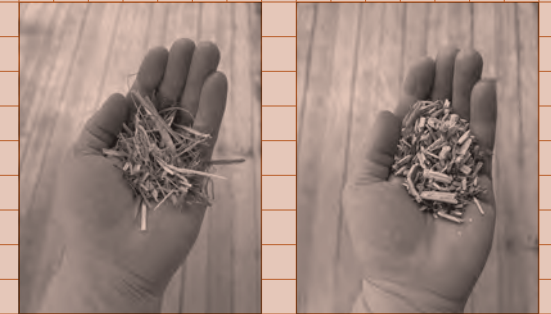


9



10

11



Students also explored the use of different fibers in collaboration with earth based construction techniques.



12

The students also learned how to construct wattle-and-daub thick surfaces, used in some regions for the construction of walls.

Olivia Newroz

Settling Dust, Unsettling Ground

LDAR

ABSTRACT In summer 2023 smoke from Canadian wildfires blanketed the United States. Places that were ordinarily unconcerned about wildfire smoke, like the New England and the Midwest, were suddenly under air quality advisories. Though widespread, the smoke wasn't distributed evenly; as one area cleared up another became the epicenter. People were angry and confused—a couple from California, self-proclaimed “climate pioneers”, were outraged by the smoke in the Upper Midwest, as they had moved in order to escape it—an impossible feat given the interconnected nature of air(s). Seeing atmospheric conditions as “single exchange” rather than a “system of relations”¹ obscures this interconnectedness. At the same time, air is experienced locally, and felt unequally. It is “multiple, diverse, a chemical composition and material state at once. It is (atmo)air. There are many airs.”²

Dust, like smoke, is an atmospheric material; it's distributed unevenly and connects geographies spanning long distances. Dust is manifested at different geographic and temporal scales. Here, where I write this in New England, dust is everywhere, yet unseen. Conditions for dustiness exist, but the spatio-temporal scale at which dust exists renders it invisible to the human eye. Plumes of dust are produced as cars drive along salted winter streets, and as wind blows through construction sites. In the summer, drought conditions leave lake beds exposed, creating small-scale, seasonal dusty conditions. In drylands, dust storms, or haboobs, are common and widespread. The dust belt, an area that expands from the Sahara to the Gobi desert, is the source of the majority of the world's dust emissions, as dust is advected and dispersed over large distances,



fig. 1 Concave, convex and planar conditions were used to experiment with how clay dust can form ground.

eventually settling sometimes thousands of miles away from the original source. A cyclical process, settled dust eventually becomes airborne again.

It is through this cyclical process that I began to understand dust as a material system that blurs the line between ground and atmosphere. While this blurriness is visualized at both particle and planetary scales, at the human scale, it becomes less evident. I developed a Dust Machine as a tool for bridging these scales. Drawing from Lisa's Moffitt's discussion of “environmental models”—that is, models that don't merely simulate phenomena, in this case dust, but rather produce the underlying force itself³—I produced visualizations of how dust operates at a human scale with the aim of “uncoupling” ground “from the physical and conceptual strangleholds of [the] merely solid.”⁴

1 Geros, Christina Leigh. “The Architecture of Weather #1. Have You Seen the Weather?” The Architecture of Weather #1. Have you seen the weather?, February 6, 2023. <https://www.koozarch.com/columns/the-architecture-of-weather-1>.
 2 Calvillo, Nerea. *Aeropolis*. New York, NY: Columbia University, 2023, 24.
 3 Moffitt, Lisa. *Architecture's Model Environments*. London: UCL Press, 2023.
 4 Zee, Jerry C. *Continent in dust experiments in a Chinese weather system*. Berkeley: University of California Press, 2022, 24.

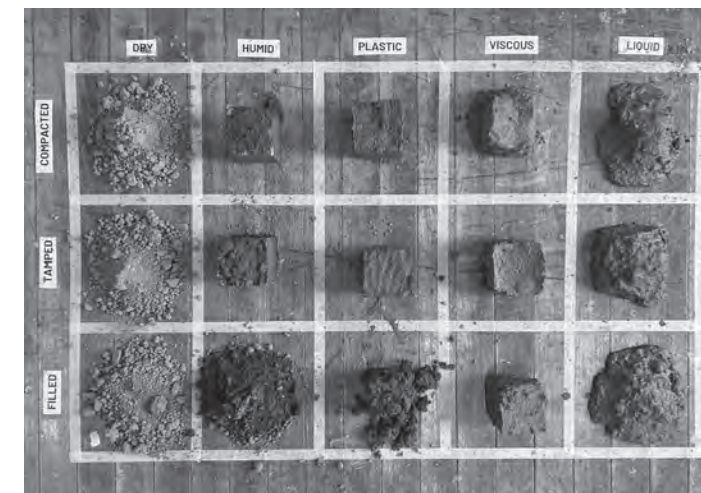
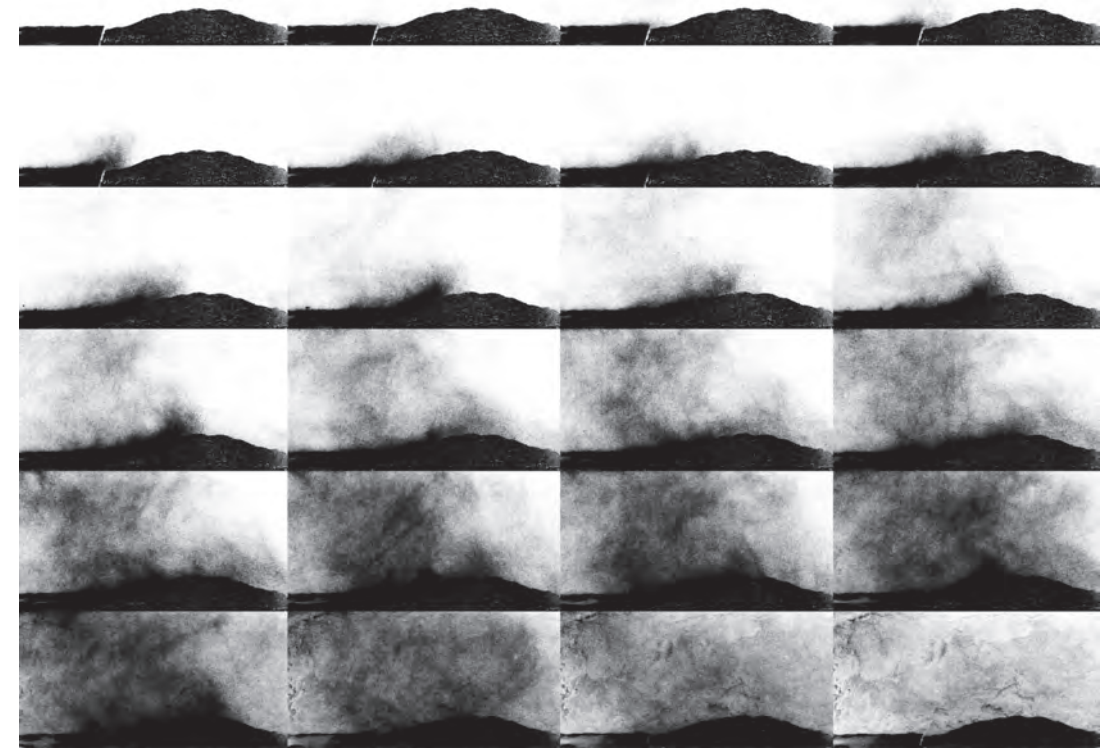


fig. 2 Testing ground as a surface onto which dust is deposited, using different techniques and machine prototypes.

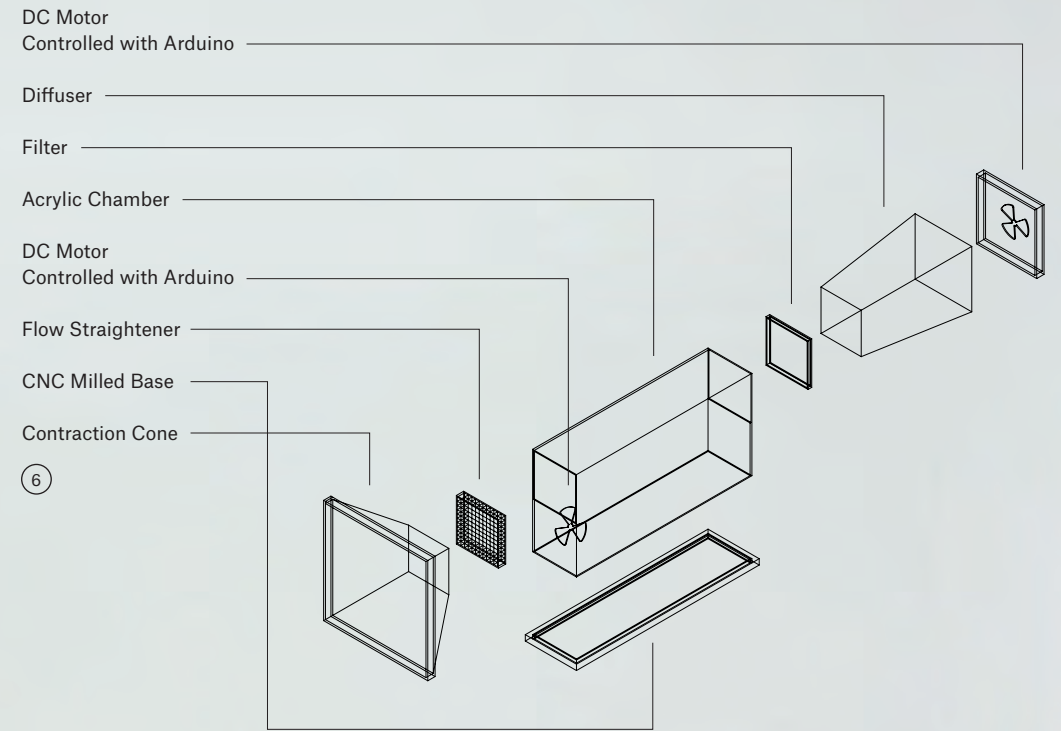
fig. 3 This work allowed for a thinking about surface as an articulated ground.

fig. 4 Tile matrix of abstracted ground conditions constructed with varying mix-ratios of kaolin, soil and sand.

fig. 5 The final iteration of the dust machine continues to use methods of both pushing and pulling air.

fig. 6 The dust machine has two flows—one a direct push of air against the ground, and the other a continuous flow of air being pulled through the chamber, creating an air column with upper and lower air masses and layers of friction where the two meet.

5



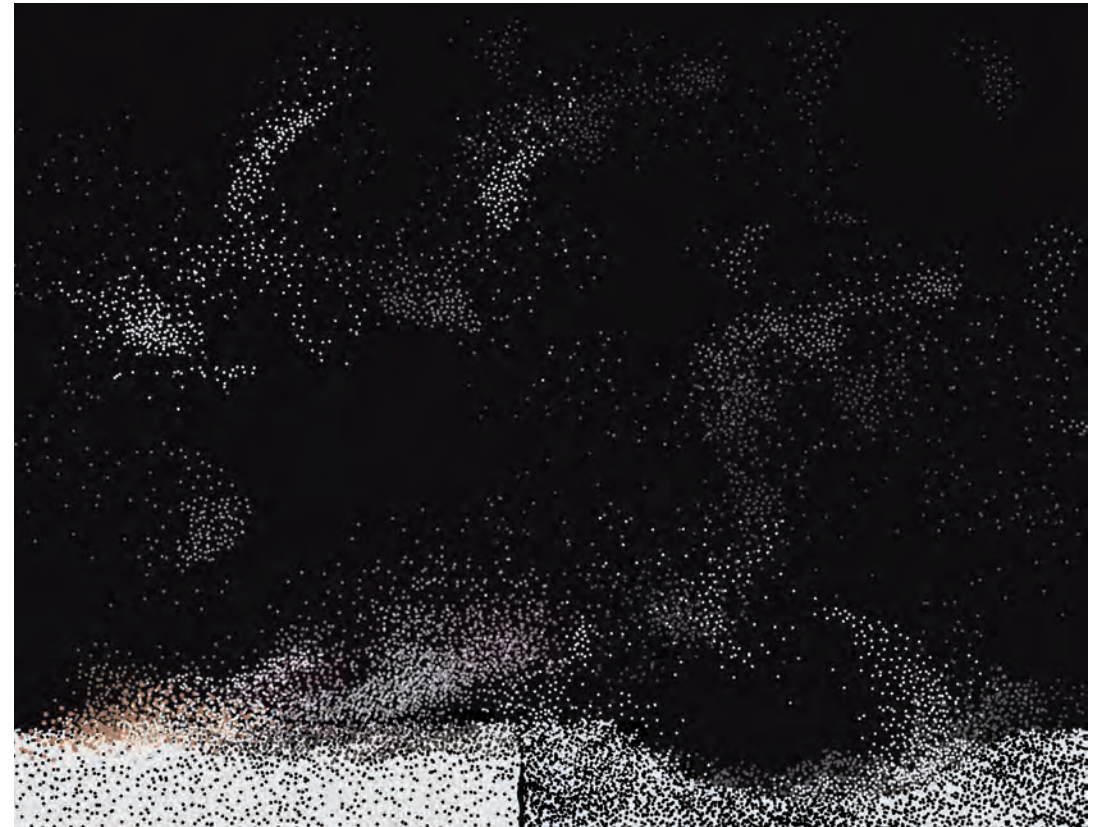
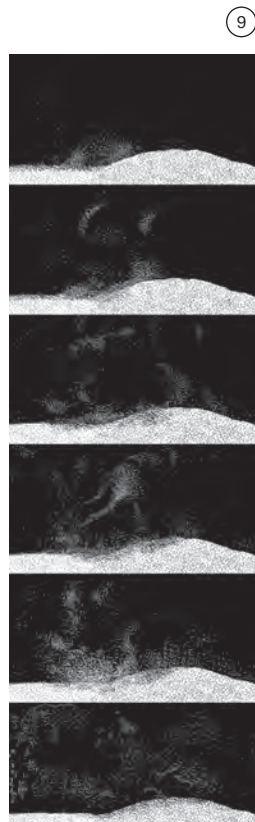
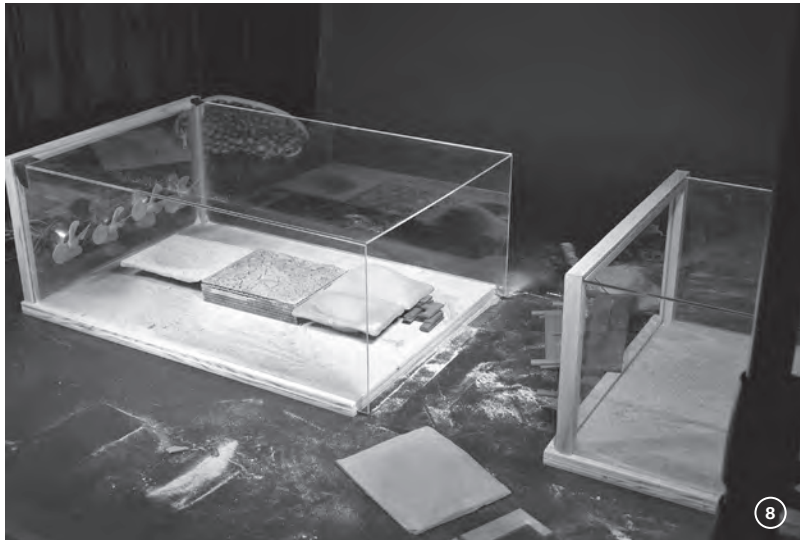


fig. 7-8 The dust machine operates not as ground or air, but as the meeting of the two.

fig. 9 Each iteration from the matrix was ran through the dust machine and the simulation recorded.

fig. 10 Series of drawings that shows how dust moves through the machine and articulates the densities of the material.

Yiming Lei

Migrating with the Salt Marsh

LDAR

ABSTRACT With global warming and rapidly rising sea levels, drowning marshes have become a global issue. Due to the critical ecological value of marshes, the phenomena of marsh migration (a horizontal shift in the salt marsh to the neighboring inland habitat) has attracted increased attention across different fields.¹

With its long coastal lines, the state of Rhode Island, in particular, has been supporting marsh migration for the past decades. Successful methods include but are not limited to Thin Layer Placement (TLP), marsh replanting, impermeable surface removal, fence building, and channel digging.

In Rhode Island, marsh migration has been supported mostly by methods related to water filtering and management, sediment building, land forming, and the creation of porous conditions. Based on the studies and integration of these effective methods, the straw clay technique was chosen as the primary construction method for the design exploration due to its flexibility and ability to achieve a large range of permeability. The flexible and porous nature of straw clay can flexibly inhibit tidal flux, allowing the marsh peat to grow progressively upland, making it a suitable building method to support marsh migration. What's more, the building materials that are required for straw clay can all be sourced locally, which can reduce the carbon footprint of material transportation, making the whole construction process more sustainable.

Using a combination of straw clay with wattle frames, and dug channels as the main design language, this thesis investigates its application in Tillinghast

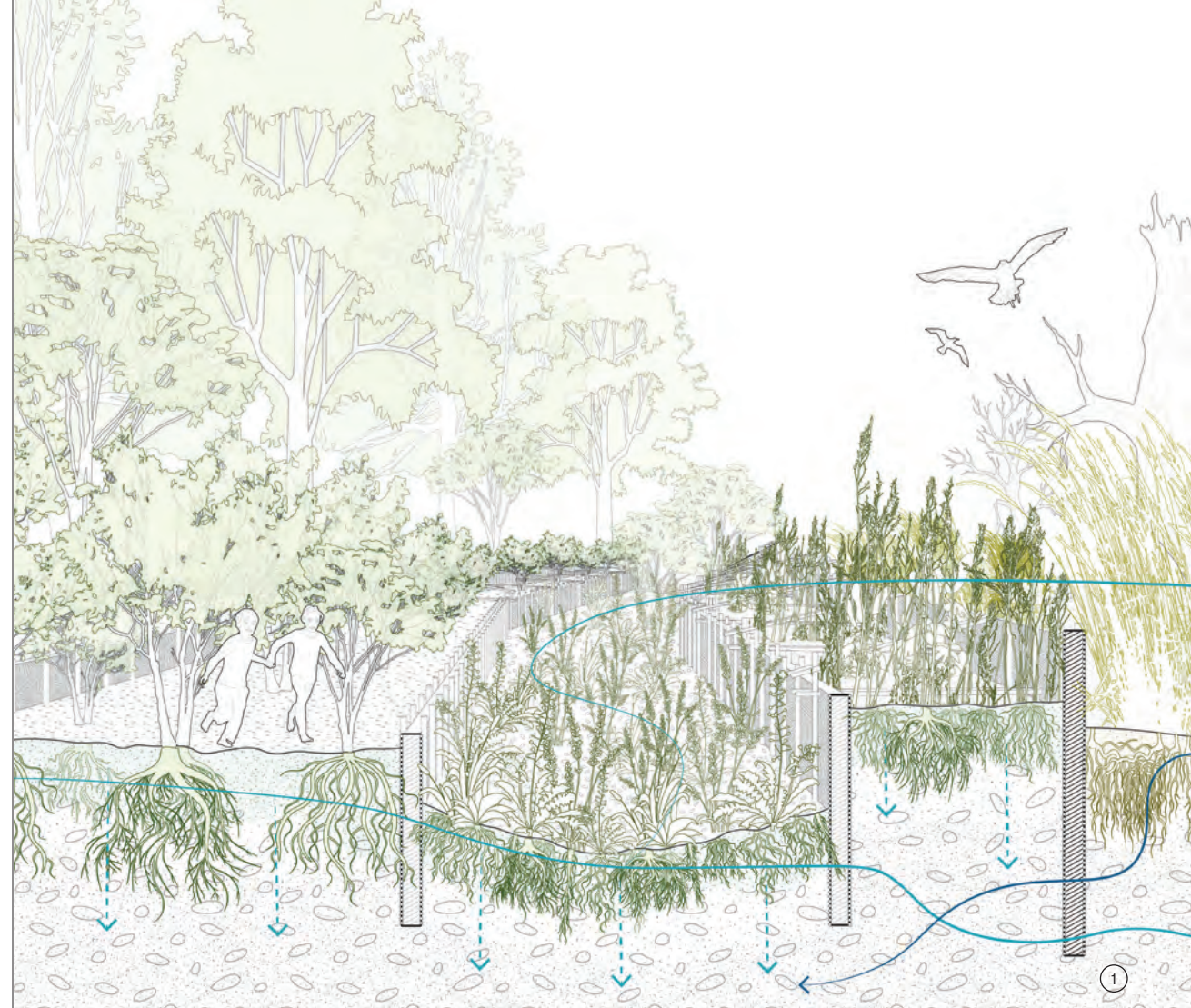
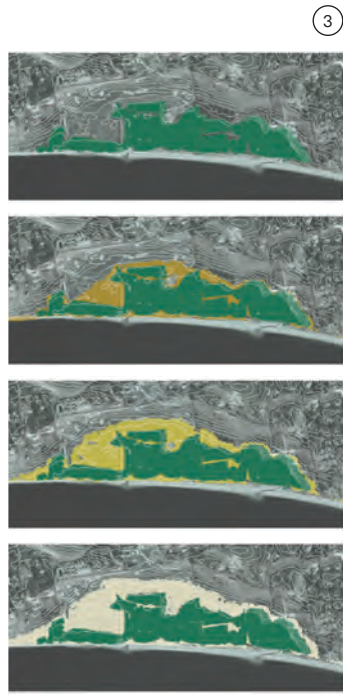
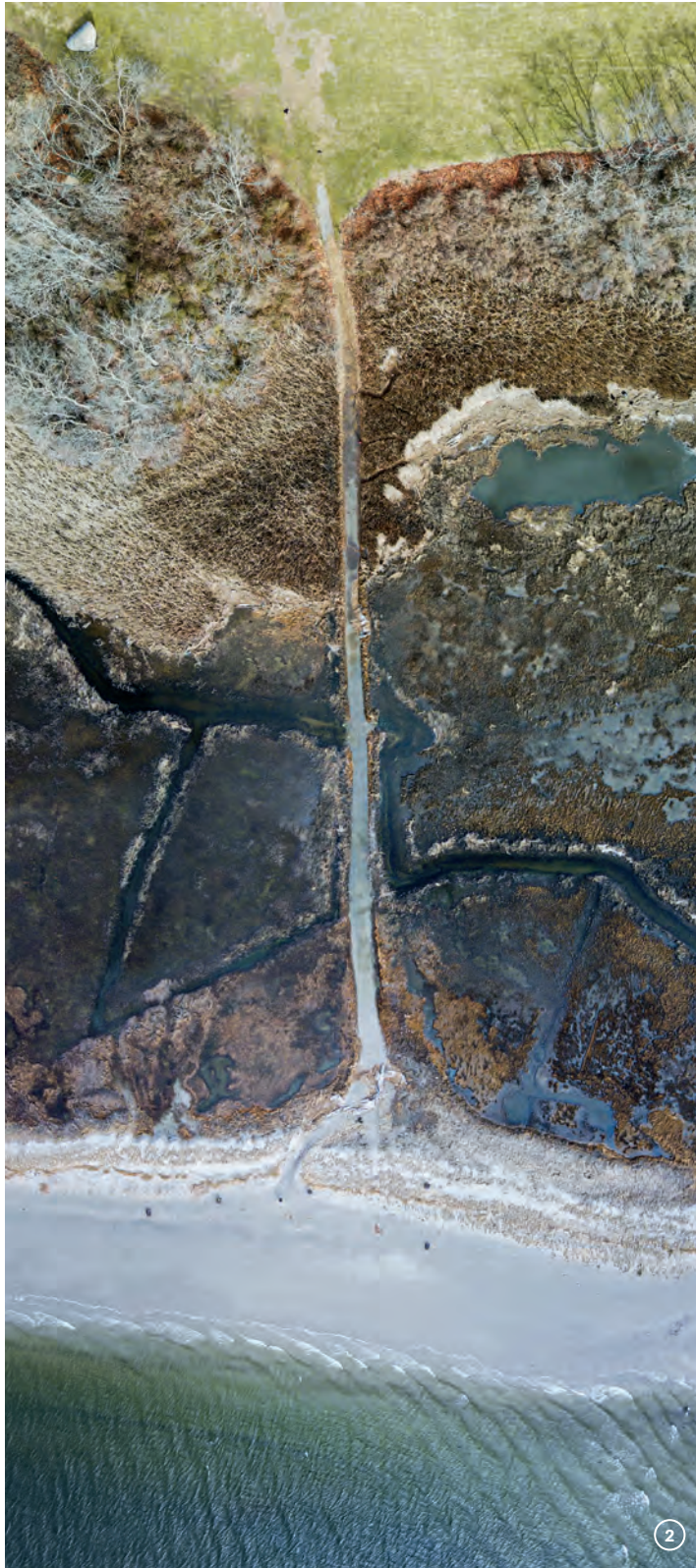


fig. 1 The thesis proposes the design of a holistic system that can aid the migrating marshes in Rhode Island.

Place, a coastal system in Barrington, Rhode Island, that shows a typical drowning marsh with a surrounding forest fringe.

The work investigates ways to enhance marsh migration by exploring design methods with site-specific issues and opportunities. It proposes a holistic and sustainable design system that can be applied to other drowning marshes in New England.

1 Goetz, Emily. "Marsh Migration Mania!" (2021).



- Salt Marsh
- Submerging Salt Marsh
- Sea Level Rise 1ft
- Sea Level Rise 3ft
- Sea Level Rise 5ft

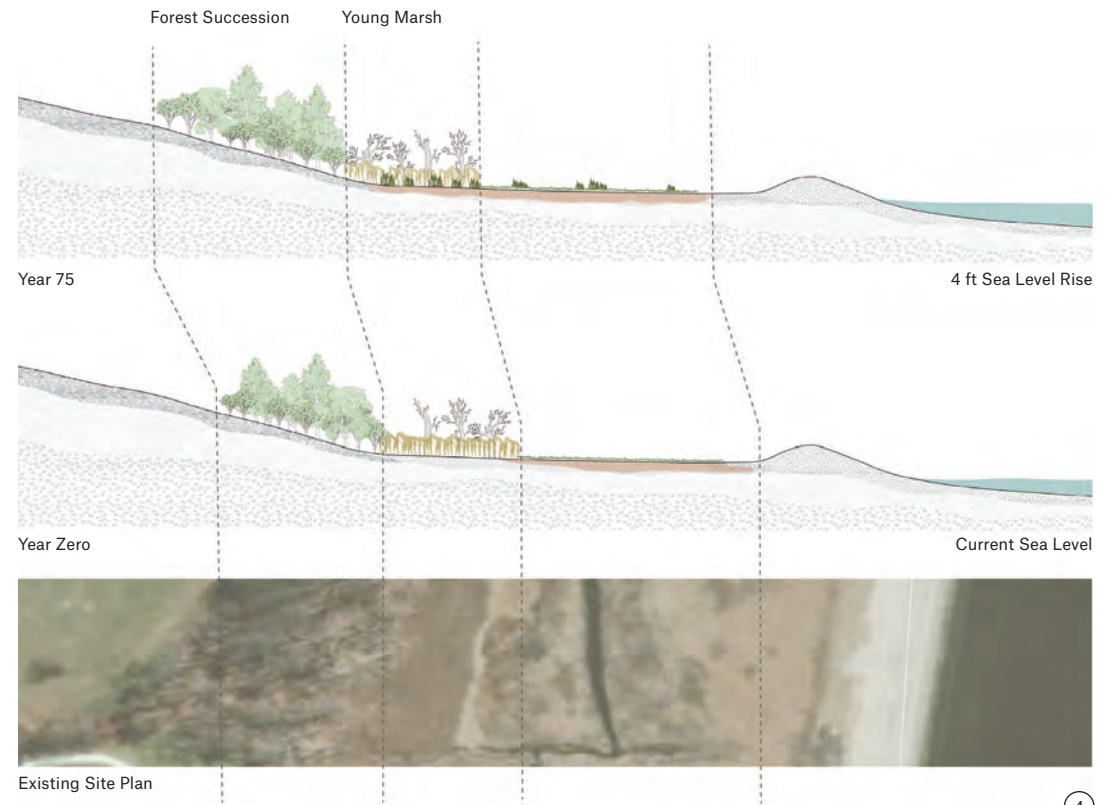


fig. 2 Aerial photograph of site for proposed intervention at Tillinghast Place salt marsh.

fig. 3 Map indicating the potential submersion of the salt marsh given 1-5 feet of sea level rise.

fig. 4 Section drawing demonstrating results of design intervention on marsh migration.



5

fig. 5 The design of iterative prototypes were developed with the design of the channels in the landscape.



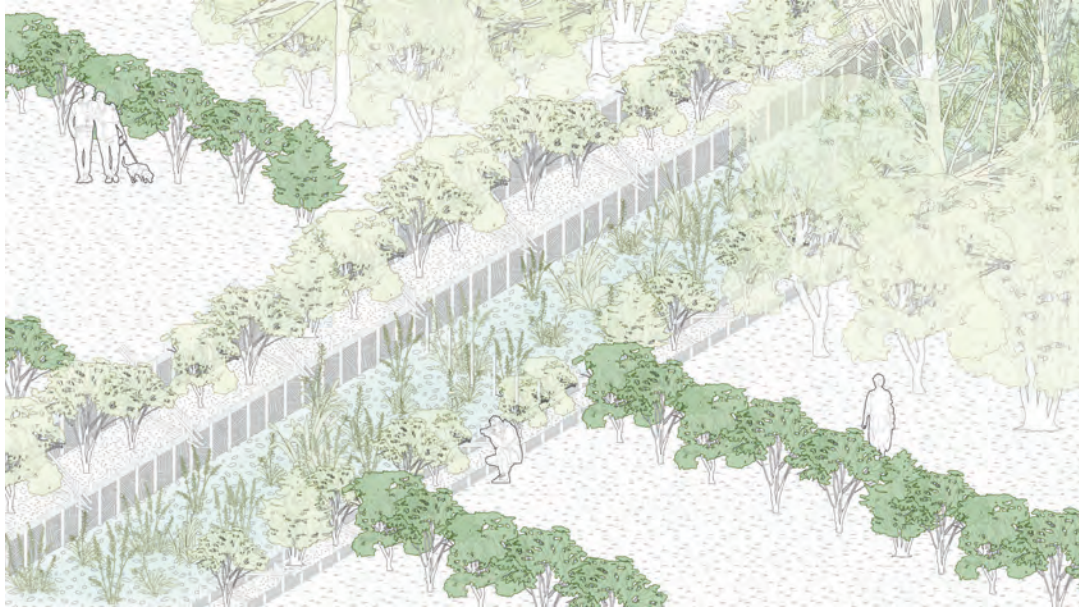
6

fig. 6 Different scales of prototypes were built with different earthen bases.



7

fig. 7 Several straw clay with wattle frame prototypes were tested with different ratios of kaolin to soil and earth to fiber.



8



9

fig. 8 The prototypes' primary function is to work as retaining walls that can achieve a large range of permeabilities.

fig. 9 Perspectival view of the proposed site installation with wattle frame.

fig. 10 Axonometric drawing depicting new site conditions and potential new uses with the proposed project.



10



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Different clay tests exhibited in the gallery to put emphasis on the importance of the design process in support of the students' theses.

CLAY MATTER(S)

Creative Approaches to Clay's Material Cultures in New England

Sustainability Design Lab - 2023/2024

The Sustainability Design Lab, an endowed interdisciplinary collaborative between the Departments of Architecture and Landscape Architecture, focuses on the study of materiality and material practices in design and our professional industries.

The Lab's first edition interrogates how clay has shaped the landscapes and built environments in all of New England. We explore the ways in which clay appears geographically, to how it informs and helps shape the built environment and ultimately, to how it informs our design practices.

Clay's abundance in most soils has made it a widely used construction material, used in fired and raw states. It is used in bricks, tiles, roof, walls, and pipes—as well as in pottery and ceramics. Formed by geo-chemical processes that weather rocks and volcanic ash, clay's composition can vary depending on its location, but it is typically composed of minerals such as aluminum silicates, magnesium silicates, and iron silicates. Clay is known both for its unique physical properties—it is plastic and moldable when wet, hard and durable when dry—and for its historical and cultural significance.

To investigate clay's material cultures in New England, the Sustainability Design Lab embarked on several trips around the world, beginning with the first local field studies in 2023. All the way up to the contemporary period of globalized industrialization.

New England is not an exception: clay's material cultures extend far beyond the region and rely on reciprocal relations between places of extraction and production and places of consumption. They stem from innovative energy and sustainability, but they are also intertwined with power relations of subjugation, violence, racism and slavery. Its extraction from the territory has sometimes negatively impacted local clay sources in the Massachusetts, Nipmuc, Wampanoag, Pokanokid, and many other Indigenous communities in the region.

Most clay found in New England is secondary, meaning that it is found deposited in valleys, lake and sea floors, and in other places where it was produced. This first geological terminal exchange of clay happened because of the grinding and shrapnel occurring during the last glacial age, even though the clay itself is much older.

Clay is generally accepted to be a sustainable building material due to its durability, thermal performance, and ability to regulate moisture. Because most clay can be sourced locally, it also can reduce transportation emissions and the general carbon footprint of construction, as it often requires much less energy to produce compared to other building materials such as concrete and steel.

Depending on how it is utilized, however, sustainable uses of clay vary significantly. Bricks and tiles, for example, represent more earth-intensive techniques, such as kilns, a fired earth technique commonly used in the American southwest, cob, a masonry from both of earth and straw, and rammed earth, a more modern compressed earth technique known for its energy efficiency and used to improve soil health and fertility, especially when combined with organic matter and other soil amendments.

In the Lab's discussions around how clay can foster sustainability in architecture and landscape architecture were framed by relationships between learning from what has existed and persisted and exploring new techniques, methods and practices in processes of digital fabrication.

As a multidisciplinary material research laboratory, the Sustainability Design Lab has offered for a unique type of cross-fertilization approaches to clay for architecture, interior architecture, landscape architecture and industrial design. The Lab's curriculum strove to expand on their practices by questioning current attitudes to clay and expanding the boundaries of its potential sustainable uses in architecture, both in its spatial conditions of interiority and exteriority, as well as the experiential thresholds between the two.

Eleven graduate and senior students from LIDAR, INTAR and ID conducted collective and individual design explorations that included fieldwork, material explorations, and design proposals and prototypes. Through their ideas, the students have acquired different practices which led them to the establishment and development of their individual graduating theses, now showcased in this exhibition.

Students: Alexandra Goodenough, Ashley Pedersen, Jen Ansley, Olivia Newroz, Owen Carey, Renata Barta, Victoria (Torie) Stotz, Yichen Zhu, Yicheng (Eason) Zhang, Yiming Lei

Faculty: Johanna Barthmaler-Payne, Wolfgang Rudolf, Eduardo Benamor Duarte, Tiago Torres-Camacho de Pace, Tamara Kaplan, Ernesto Aparicio

Guest Instructors: Maddalena Achenza, Steven Blankenbeker, Robert Thorson, Virginia San Fratello

Exhibition: John O'Keefe



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Kit of parts for replacing pavers by Ashley Pedersen.



Waste Illuminates Worlds Printed Modular Lamp Design Based on Brick and Clay Tile by Yechen Zhu.



Detail of gallery wall with photos of field trips and the thesis books on display.

Sustainability Design Lab - 2023/2024 Field Trips, Workshops, and Guest Instruction

Fall



Students working at a table during a workshop.



Students walking through a gallery space.



Students gathered around a table with a screen.



A student working at a desk with a computer.



Students in a lecture hall or workshop.



Students in a classroom setting.



Students standing in a gallery.



Two students working together at a table.



Students working at tables in a workshop.

Spring



A student presenting at a table.



Hands working with soil and small objects.



Students working together on a project.

Migrating with the Salt Marsh Straw clay with wattle frame prototypes by Yiming Lei.



Procedure-based Pedagogy: A Methodological Approach for 1:1 Fabrication

Eduardo Benamor Duarte

Professor, Interior Architecture

Sustainability in the academic design context is often paired by an unbalanced knowledge of systems of production and the designer's active participation in their shape. Often the relationship between form, function and performance is indirect or seldom related. If sustainability is often centered at the intersection of conflicting values towards *novelty* and *traditions of making*; or even on measuring environmental performance with access to resources how can design students derive an ethical position towards sustainability along the learning and processing of tools and techniques that operate at the intersection of these inherently conflicting values?

To stimulate exploration the lab sought to offer students from Landscape Architecture, Interior Architecture and Industrial Design disciplines a pedagogical model to question, decompose and repurpose how the conventional relationships between *form*, *function* and *performance* may serve to better measure the environmental impact of a design solution. The hope would be

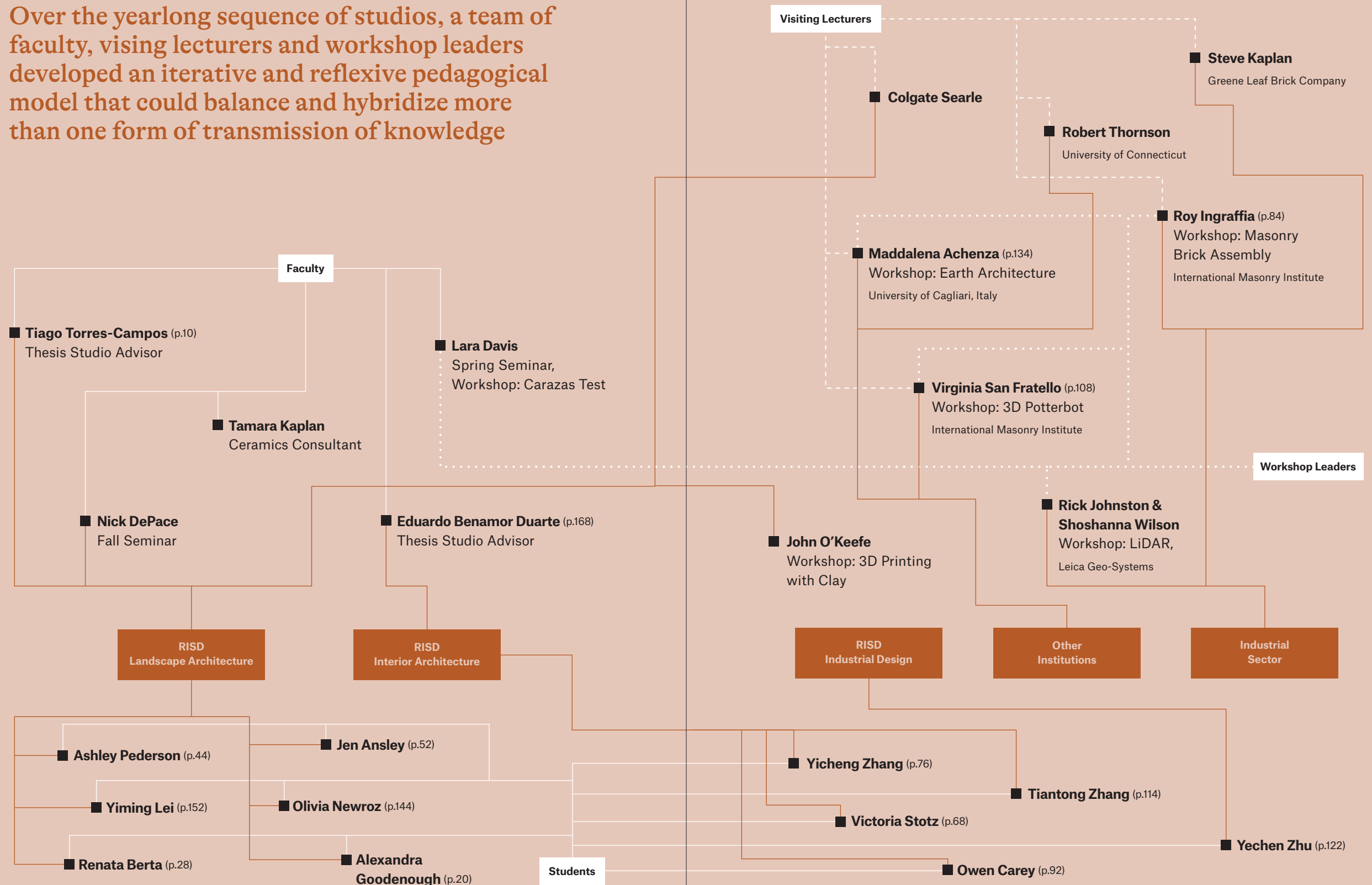
to offer a navigation support on the complexity of finding a position on *sustainability* with a practical experience with tools and techniques to realize a 1:1 prototype. A full-scale model that would directly respond to environmental change and capable of embedding geographical, cultural, material, technological and geometrical data to produce disciplinary knowledge relevant on the topic.

The making of 1:1 models in full scale in the context of professional practice was situated within the increasing presence of digital generative and fabrication processes along with knowledge about local and traditional contexts of extraction and production. Over the yearlong sequence of studios, a team of faculty, visiting lecturers, and workshop leaders developed an iterative and reflexive pedagogical model that could balance and hybridize more than one form of transmission of knowledge. If the field visits to three sites (Barrington, RI; Cambridge and Fall River, MA) were centered on the survey of key landscape and



fig. 1, 2, 3 Examples of 1:1 prototypes from Yiming Lei (1), Owen Carey (2), and Alexandra Goodenough (3)

Over the yearlong sequence of studios, a team of faculty, vising lecturers and workshop leaders developed an iterative and reflexive pedagogical model that could balance and hybridize more than one form of transmission of knowledge



architecture sites and conditions to the learning of clay in New England the teaching model for the developing of a 1:1 full scale model relied mostly on the classroom studio physical space. Throughout the year students were exposed to a combination of *descriptive* (or memory-based acquisition of knowledge), *generative* (or associative based knowledge) and *exploratory* (or experiential based knowledge) as a notion of procedure or *process-based* approach. While a procedure-based approach assumed the studio practice as the core of the student curricula the uncertainty, and balance between rational and subjective thinking would not be taught as a vocational or doctrinarian form of practice. Instead, a procedure-based approach sought to shift students away from a direct problem-solution linear model towards an exploratory method with feedback loops: Where *tools* would be taught with an ethos of “learning by doing” while informed by disciplinary and material knowledge.

As in most academic environments the *descriptive* transmission of knowledge was delivered in field visits; lecture or seminar courses through written, graphic, visual and oral based documentation to introduce students to disciplinary based issues in Landscape and Interior Architecture. National and international experts on topics ranging from clay geological formations in New England; fired and unfired masonry systems; or clay-based digital additive manufacturing processes generated a considerable amount of student participation dependent upon the lecturer’s instigation or sporadic questioning. The second pedagogical model or *generative approach* instead was based on an individualized student-centered acquisition of abstract composition principles inherent to the knowledge of landscape or architectural drawing; site survey; and composition protocols or in manipulating the material properties of clay. This pedagogical method was centered around individual studio and seminar assignments and collective workshops

within the thesis studio. Learning experiences included exposure to a broad scope of tools and techniques from analog and digital means of surveying land and canonical masonry buildings in New England production; weekly workshops on the modulation of clay through the learning of basic ceramics hand building making procedures such a coiling; rolling slabs or using an extrude; to day long workshop on the relevance of associating tridimensional digital modeling information with the learning of 3D printing with clay. Further contact with traditional building industry methods on fired and unfired clay was acquired in the three workshops on masonry brick layering techniques; the *carazas* test as an indication of the suitability of the earth to the various construction techniques; and the *wattle and daub* panels combining raw earth and fibers.

The third pedagogical model exploratory or *experiential* research phase led to the development of 11 theses in 1:1 full scale models. All theses were characterized by methods of transformation of the generative models embedding individual concepts measured according to the disciplinary and technical constraints acquired along the first two pedagogical stages. During this last phase students had the chance to identify how specific material, and phenomenal characteristics could become design tools for form finding; developed technical literacy and elaborated further on their ethical stance on sustainability.

When observing all 1:1 full scale models it was evident that every approach combined both a form of *standard* and *non standard* model of production. The *standard* nature partly arised from the relevance of the experiences learnt in field surveys, lectures and workshops in the generative phase and how each example relied on highly descriptive means of experiencing conventional forms of production. Often the learning curve to acquire basic skills and knowledge about practice in the ceramics or

A procedure-based approach sought to shift students away from a direct problem-solution linear model towards an exploratory method with feedback loops: Where tools would be taught with an ethos of “learning by doing” while informed by disciplinary and material knowledge.

building industry restrains the project development. Instead, 1:1 models that focused on individual means of embodied experience with clay as a material; or on the potential for algorithmic digital design tools to shape the formal language of the work may have instead lead to more customized or intricate investigations on the tactile qualities of hand building with clay.

Some of these 1:1 models are characterized for proposing *adaptive prototypes* mostly developed through the modulation of building components where the solutions were thought and generated without one specific context but adapted towards a set of various conditions. Other 1:1 models were essentially *site specific* and realized both as a set of informational parameters of instructions at a larger scale and a sample scale. Lastly many share among their qualities the principles of *modularity* from a systems perspective focused on the specificity for each unit to become capable to be

multiplied and expanded in larger assemblies of constructs.

To measure or speculate on the environmental value of a given solution in managing available resources and affirm an ethical stance towards sustainability, a methodological approach offers the opportunity to trace how the relation between *use, form* and *performance* of every full scale 1:1 model may be distinguished and inherent to the students’ design awareness. The goal may then be centered on how to modulate each learning model (*connectionism, cognitionism, exploratory*) or the object types (standard and non-standard) and the systems of assembly and site response to further contribute to the direct or indirect relationship between form, function and performance of every 1:1 model.



A Johanna Barthmaier-Payne	F Lara Davis	K Jen Ansley
B Tiago Torres Campos	G Eduardo Benamor Duarte	L Olivia Newroz
C Owen Carey	H Tiantong (Alice) Zhang	M Alexandra Goodenough
D Maddalena Achenza	I Renata Berta	N Victoria (Torie) Stotz
E Jisu Yang	J Yechen Zhu	O Ashley Pedersen

Faculty

Tiago Torres Campos Associate Professor, LDAR

Tiago Torres-Campos is a Portuguese landscape architect who explores multidisciplinary approaches to contemporary landscapes. He focuses on intersections between landscape practice and the anthropocene as well as representation, with experimental and speculative work ranging from modeling and digital fabrication to video and writing. In his practice, Torres-Campos is experienced in landscape architectural design, and regional and master planning. He is the founder of CNTXT Studio, a research-by-design platform focusing on the transdisciplinary study of landscape.

Eduardo Benamor Duarte Professor, INTAR

Eduardo Benamor Duarte is a member of OA Portuguese Architects Association / Ordem dos Arquitectos and founder of Benamor Duarte Architecture, a studio focused on design of objects and spatial environments at large. His work has been commissioned for several group exhibitions worldwide and published in a number of international magazines, books and newspapers. He has also won awards from several institutions in Portugal and the US.

Nick De Pace Senior Lecturer, LDAR

Nick De Pace has taught at RISD since 1999 and, since 2002, has designed numerous award-winning residential and commercial projects through his independent practice, Ad Hoc/Architecture in Providence. In 2005 De Pace earned a Fulbright Fellowship to document the Emissarium of Lake Albano, a monumental subterranean water conduit of ancient Roman engineering. He has collaborated on numerous archaeological activities, most recently the architectural reconstructions for a publication on the Villa Magna Project in southern Latium.

Lara Davis Lecturer

Lara Davis is an architect and mason with two decades of experience in masonry design and construction, and a specialist in earthen building and thin-shell vaulting. She is the founding partner of Limaçon Design. Widely recognized for her research, Lara has taught structural theory of masonry and led hands-on training programs on several continents. Her work has been exhibited at the Modern Museum of Art, MIT Museum, Cooper-Hewitt National Design Museum and Venice Biennale.

Tamara Kaplan Artist

For over 19 years until 2020, Tamara Kaplan was a youth worker/arts administrator for New Urban Arts (NUA), an arts studio for high school students in Providence, where she collaborated with young artists creating a space that fused mentorship, interdisciplinary arts education and creative youth development. After NUA, Kaplan started barreyard studio, a creative space for her clay and paper practice. An alum of Interlochen Arts Camp, she also consults with small nonprofits and serves on the board of The Collaborative, an artist space in Warren, RI.

SDL Director Johanna Barthmaier-Payne Associate Professor, LDAR

Johanna Barthmaier-Payne is a landscape architect and cofounder of the multidisciplinary studio A TON. In her professional practice and research she examines the relationships between urban design, ecological and cultural systems, and community collaboration. Leveraging her expertise as a graphic designer, artist and visualizer, Johanna explores large-scale ecological opportunities involving social and environmental issues in urban and built environments. She is dedicated to advancing knowledge on how ethical design, narrative, and visual communication can support the broader public and promote nature-based design solutions.

Students

LDAR



Alexandra Goodenough

LDAR



Ashley Pedersen

LDAR



Jen Ansley

LDAR



Olivia Newroz

INTAR



Owen Carey

LDAR



Renata Berta

INTAR



Tiantong (Alice) Zhang

INTAR



Victoria (Torie) Stotz

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Yechen Zhu

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Yicheng (Eason) Zhang

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Yiming Lei

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Eduardo Benamor Duarte

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Nick De Pace
Lara Davis

Technical Faculty

Tamara Kaplan

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Virginia San Fratello
Bricklayers + Allied Craftsmen
Local No.3.

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Medium Silt
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Fine Silt
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