

OPTIONS STUDIO SYLLABUS

CASTAWAYS MA/MX, MIT 4.154 D01
Spring 2024

Instructors:

Professor Sheila Kennedy, FAIA
Associate Professor Caitlin Mueller, PhD

Studio Teaching Assistant:

Celia Chaussabel, SMArchs AD

Meeting Times:

Tuesdays and Thursdays, 1-5pm, Options Studio at MIT

ODDS & MODS DESIGN AND RESEARCH INITIATIVE

The spring semester **Option Studio MIT 4.154 D01** and associated **Workshop MIT 4.185** launches the ODDS & MODS multi-year cross-disciplinary design and research initiative at the Department of Architecture at MIT. With a different material focus each year, ODDS & MODS seeks to create new architectural possibilities for material circularity through the reuse of standardized materials (MODS) and geometrically irregular materials (ODDS), that until now have limited the scale up of circular approaches to architecture. Central to the ODDS & MODS pedagogy is the integration of Studio research through design discovery and Workshop based technical learning, exploration, testing, and fabrication.

STUDIO & WORKSHOP ADJACENCY

The CASTAWAYS MA/MX Studio is offered in conjunction with the CASTAWAYS MA/MX Workshop. With a thematic focus on brick material circularity, the two subject areas are closely interrelated. This thematic adjacency is organized to enrich students' exposure to research that integrates historical and cultural contexts, projective architectural design, 'high' and 'low' technologies, and hands-on fabrication without the pressures of having to combine everything into a studio or having to separate research from architectural design. Together, the CASTAWAYS MA/MX Studio and Workshop seek to provide the technical and critical design thinking tools to enable students to position brick re-use as disciplinary project for architecture, located within the specific environmental, economic, and cultural contexts of Massachusetts (MA) and Mexico City (MX). While students may take Workshop or Studio independently, **it is anticipated that most MArch Option Studio students will also be taking the Workshop to benefit from these synergies and dive deep into reuse.**

STUDIO SUBJECT DESCRIPTION

This spring, CASTAWAYS MA/MX Studio will explore earth and mass, a fundamental material and property of architecture, and create designs for material circularity with a single building material, brick-- explored across the range of its multiple manifestations as volume, structure, and cladding in architecture—adobe and clay brick, molded water struck solid brick, and extruded cellular structural and screen brick. The excess of 'waste' brick mass and circular design logics offer a paradigm shift away from stick and sheet construction, towards a new brick architecture of abundance. The Studio will explore this paradigm, using the tools of architectural design as vehicles for discovery and the production of knowledge. The formal relationships of part to whole, exterior mass and interior volume are intrinsic to brick cavity wall construction and to the idea of the brick building as a vessel for light, air, water collection, heat, storage of goods and a wide range of human activities. By applying the rules of gravity and natural forces that govern the support of brick mass, students will apply principles of gravity loaded and post-tensioned brick. The vast existing stocks and 'waste' streams of undervalued, non-homogenous and broken or defective brick will constitute the materials for student's research and design projects. To address the global, industrial scale of brick production and its potentials for reuse, the studio will provide students with the opportunity to create two design projects utilizing distinct inventories of 'waste' brick, one locally sourced in New England, the other locally sourced in Puebla, just to the southeast of Mexico City.

SEMESTER ORGANIZATION

Local Heterogeneous Water Struck Brick Inventory

To begin the studio, students will select and work with a local inventory of heterogeneous solid 'waste' brick. The studio will visit a local New England Brick plant and become familiar with how these industrial bricks are manufactured and used, and with mainstream brick industry issues of excess production and/or damaged and irregular brick stock.

Design Probe: Figuring Brick

In a focused Design Probe entitled **Figuring Brick**, students will study and transform conventional brick cavity wall construction by enlarging and configuring the interior space of the brick cavity, exploring conditions of brick poche and developing 3D brick design techniques, through operations of twist, rotation, brick corbeling and stacking. While 'waste' brick is abundant and free, it is also heavy. By applying the rules of gravity and reactive forces that govern the support of brick mass, students will explore innovative design strategies for gravity loaded and post-tensioned brick. Working as individuals or in teams, or collaboratively with student peers in the CASTAWAYS MA/MX Workshop, students will advance their understanding of brick in these explorations and define brick programmatic components such as stair, vault, passageway, room, chimney, column, cistern, skylight, inhabitable wall. These brick components will be the focus of an architectural proposal for a public market building of re-used brick, that will serve local crafts persons and food producers in Somerville, MA. The Design Probe project on this local site with regionally sourced irregular 'waste' brick will enable students to acquire and explore computational form finding skills and a Digital Circularity Toolkit. Students will learn and creatively engage with 3D scanning of 'waste' brick, heterogeneous brick digital inventory management and characterization in 3D design with algorithmic matching, generative/parametric brickwork designs. Union brick masons Local 3 MA will train students to test/construct mock-ups of their Design Probe brick components with analogue masonry techniques and tools, such as plumb bob, string coursing, jigs and dry stack modeling.

Learning On-Site in Mexico City

Over **Spring Break, the students in the studio will travel to Mexico City**, an ancient site of Mesoamerican brick making and one of the world's largest urbanized concentrations of notable brick architecture and concrete construction. The studio will visit industrial cellular brick and artisanal brick factories in Aocolco (Puebla), on the kaolin clay deposits of the Trans-Mexican Volcanic Belt. In this unique geographic context, the studio will experience the close connections between brick technologies, geology, land and cultural practices and question if and how technique, material reuse, and place might be reconnected as forms of resistance to colonial extractive construction. Working in partnership with the non-profit Cochina Collaboratory, students will select sites for their studio projects, and visit traditional chinampa farming collectives in the autonomous Nahua territory of Xochimilco, to learn from them about their ecological practices and needs.

Design Project: Communal Kitchen

In the second part of the studio, students will apply the Digital Circularity tool kit skills they acquired and draw upon brick form and mass studies from the initial Design Probe: Figuring Brick. Studio students will work in teams or collaboratively with peers in the CASTAWAYS MA/MX Workshop, to define and design a collective set of smaller scale 'waste' brick program components to support Nahua traditional farmer/producer communities in Xochimilco. Designs for these re-used brick structures will serve functional programs that support (and help preserve) Nahua agricultural practices and culinary processes, such as communal kitchens and rainwater collection cisterns. During this design project, the studio will consult via zoom with Cochina Collaboratory and share student work in progress in dialogue with Chinampa Amapola and Chinampa Tlazoltéotl. Educators, artist activists and engineers from Materia Abierta and Isla Urbana will provide context on the ecology and urgent water crisis in Xochimilco and Mexico City.

The design problem of creating smaller scale infrastructural designs of 'waste' brick in Xochimilco will perhaps be more challenging for MArch students than the design of larger building programs of assumed conventional construction, where many materials are typically not modeled and remain unknown. A willingness to explore brick material circularity and its specificities of place, technique and culture and a passion for design and are key for this studio. Where the local MA Design Probe and site will facilitate physical mock-ups with brick, the MX design project will rely upon a digital inventory of Mexican 'waste' brick, with large-scale physical models made of selected 3D printed bricks.

The architectural representation of reused, heterogenous brick and the positioning of design for material circularity as a disciplinary project are significant open questions for studio students to explore. The Xochimilco design project will provide students with the chance to inventory, model and understand the location and physical characteristics of every 'waste' brick in their projects—and to create a set of architectural drawings, visual instructions, and strategies for 'waste' brick construction that could be implemented by members of the chinampera community.

A Summer Fabrication Workshop in 2024, pending funding availability, will enable interested MIT students to construct a selected project of reused brick on site with Cochina Collaboratory in Xochimilco, Mexico.

STUDIO CULTURE

The CASTAWAYS MA/MX studio will be fully in person, except for 4 class sessions with guest lectures/virtual desk crits that will be conducted via zoom. Re-used brick is an embodied, heavy, and sometimes dirty material so the studio workspace and associate MIT shop resources will be critical for studio design, discussions and fabrication.

Student Participation is an important part of the learning experience, and explorations of brick material circularity, a topic that still new to the discipline and MIT. Participation can occur across many forms, including collaborative participation on project teams, leading class discussions with speakers and guests and participation in project discussions.

The CASTAWAYS MA/MX studio and Workshop support a positive and respectful environment for critical thinking and innovation in material circularity conducted through the medium of architectural design, testing and material exploration. Respectful collaboration, information sharing, experimentation and engagement among teaching assistants, instructors, students, studio guests and administrative staff are encouraged.

Productive engagement in the studio content and contribution to a positive learning environment for all throughout the semester is expected.

STUDIO FIELD TRIPS

Site visits to Davis Square site
New England visits to brick factories
Travel to Mexico City over Spring Break

STUDIO SCHEDULE

A studio schedule noting review dates and class activities will be made accessible on Canvas and circulated at the beginning of the Studio course, Thursday 8 February.

READINGS

On the Studio Canvas site and in PDF formats, students will access a set of readings and technical resources for this CASTAWAYS MA/MX studio and adjacent Workshop subjects. This reference collection is intended to support student design and research and includes book references, articles and technical papers, on material circularity in architecture, brick manufacturing, construction details, histories of labor, the ecology of Xochimilco and Nahua agrarian practices, brick architecture precedents and work by ancient and contemporary ceramic artists.

STUDIO GRADING RUBRIC

Grades for the studio Design Probe: Figuring Brick and Collective Infrastructure Projects will be based upon the following criteria:

- Quality of design concept with re-used brick inventory and its development at overall and detail scales
- Ability to establish a design process to explore and assess options for brick material circularity
- Ability to engage/experiment with Digital Circularity Tool kit, brick material, and program needs
- Self-Reflective capability: the student's capacity to reflect upon and critique her/his own work
- Participation in class discussions, design projects, and collaborative teamwork
- Consistent effort and engagement in studio work throughout the semester

LEARNING OUTCOMES

Learning outcomes of the CASTAWAYS MA/MX studio and workshop will include hands-on experience and skill-building in emerging practices of reuse in contemporary architectural design, the critical and creative application of digital tools in support of circular design and construction, and fluency and agency in disciplinary discussions of circularity as a key lever in building sector decarbonization. In the studio specifically, students will gain experience and skill in developing and testing design concepts and design proposals with a circular material system. They will apply principles learned in the studio to both specific design proposals and to more generalized processes of designing with reused inventories. They will develop their own authorial voices in design discourse around reuse, exploring opportunities for creative expression and cultural production beyond mere economic and efficiency-driven optimization. Students will gain practice in serving as intellectual and disciplinary ambassadors of reuse concepts and strategies that help to imagine and bring about material reuse in real world practices.

CONCLUDING REMARK

This studio is designed to address the climate crisis from a unique perspective of brick material circularity. Students will engage the medium of architecture and the choice of materials and constructive systems to think about the world around them and position their work with regards to the dynamics between built and natural environments. In this, architecture functions not only to try to *so/ve* grand challenges – such as decarbonization, inequity or food security – but more importantly, as a means of identifying priorities, strategies and actions that can constitute possible new forms of activism and agency for architecture.