

MESO-COSM

Exhibition by HOME-OFFICE

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Project Leads: Daniel Jacobs [University of Houston] & Brittany Utting [Rice University]

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Location: Mashburn Gallery, Gerald D. Hines College of Architecture and Design, University of Houston, Houston, TX

Date: September-October 2023

MESO-COSM is sponsored by the Hines Scholar as Design/Design as Scholar (HdSd) Program of the Undergraduate Architecture Program at the Hines College of Architecture and Design, University of Houston. The exhibition is also funded by the Diluvial Houston Initiative, an Andrew W. Mellon Foundation-supported project, and Rice Architecture.

A mesocosm, or “medium world,” is an infrastructure for long-term outdoor ecological experimentation. According to the systems ecologist Eugene P. Odum, mesocosms are situated between the *microcosm* of the laboratory and the *macrocosm* of the planet, enabling observations of real-world conditions. Filling the gap between these scalar extremes, mesocosms are critical research infrastructures for studying the effects of anthropogenic climate change. They are typically organized into arrays of self-similar environmental “patches” in which variables such as temperature or atmospheric composition are adjusted to simulate changes in an ecosystem. Alongside the technical labor of scientific research, they accommodate the intimate labor of tending and nurturing their interior worlds. This tending extends to the architecture itself as their envelopes are breathable, operable, and adjustable, suggesting new ways to reimagine architecture’s relationship to the land and its cycles. The open-endedness of the mesocosm offers a way to reorient environmental thinking toward a less controlled and increasingly entangled spatial practice.

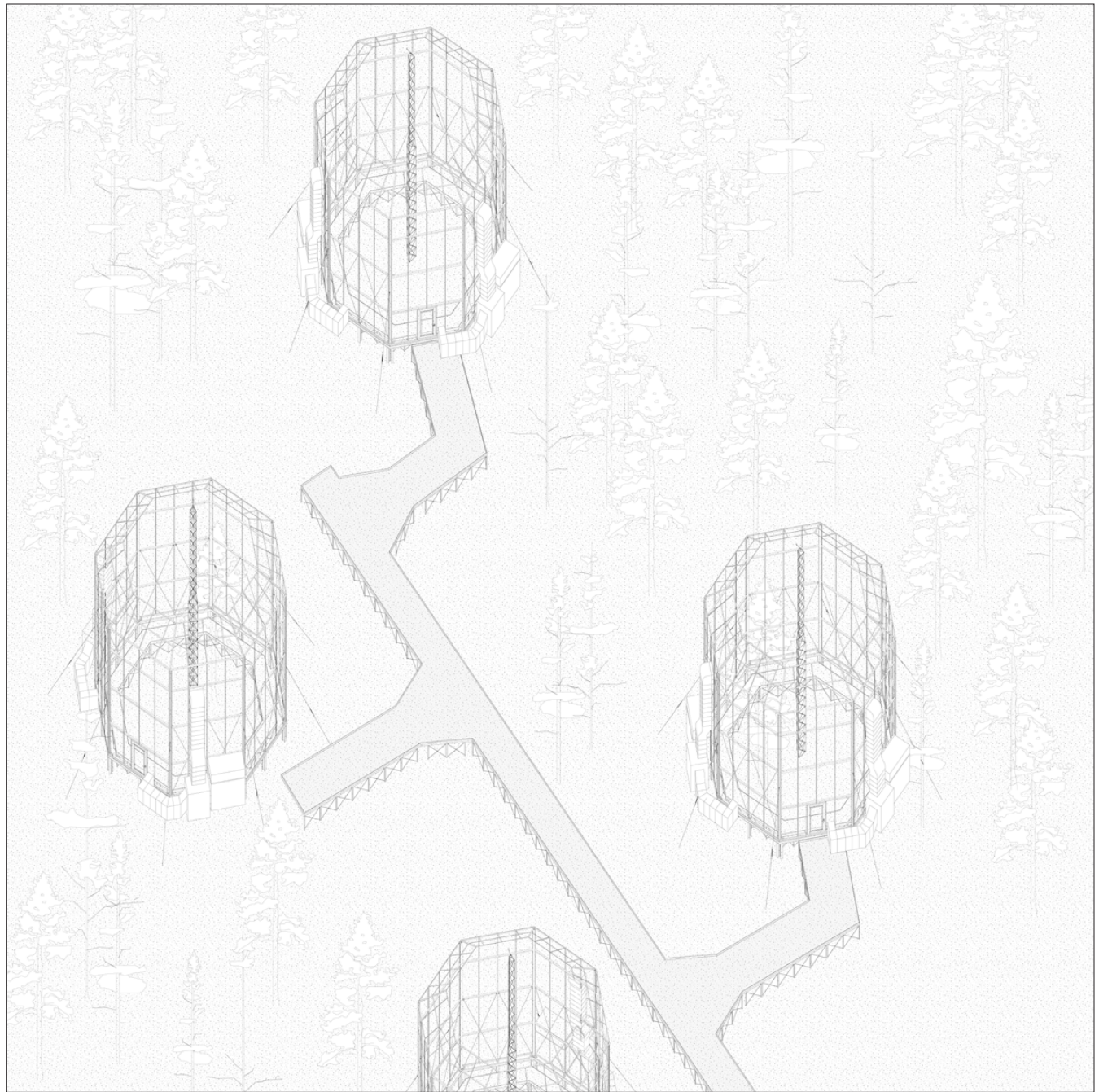
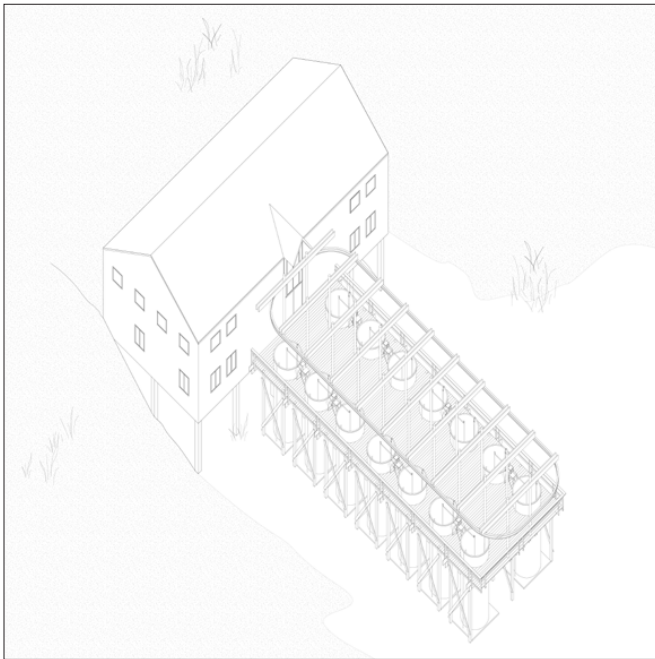
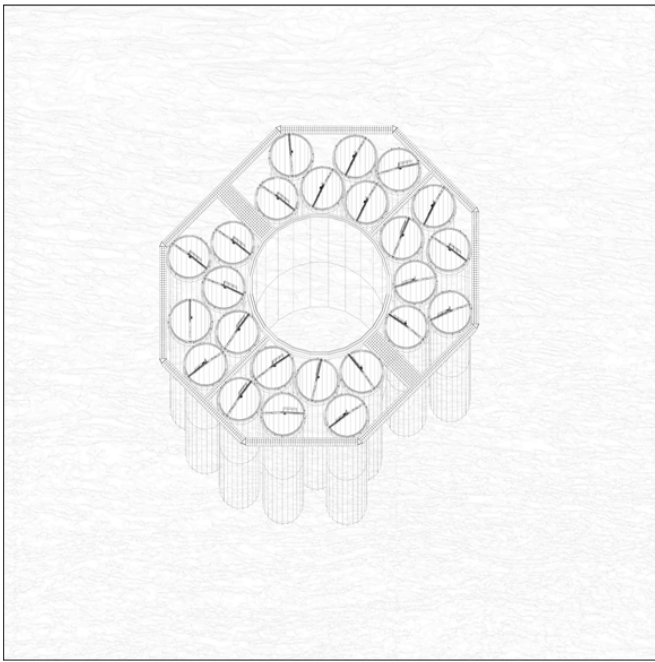
MESO-COSM proposes four architectural prototypes that test this open-ended tectonic through calibrated enclosures and environmental systems. Typical architectural assemblies reject the exterior, hermetically enclosing the interior to remove any possibility of climatic mixing. Instead, is there an alternative way to design the envelope, to reclaim architecture as a planetary assemblage? Like mesocosms, we imagine that these prototypes are both lively machines and living experiments: full of inclement weathers, pollinated winds, and creaturely communities. Multi-layered roof filters, facade shading enclosures, as well as water and energy capture infrastructures encourage environmental adjustments at the scale of the building. These systems create thermal gradients and ventilation currents, enabling a more sensuous open-air interior. Situated in the uneasy space between technical mediation and environmental encounter, these “meso-types” suggest architectures that participate in the frictions and mediums of our changing climates.



[photograph by Sean Fleming]

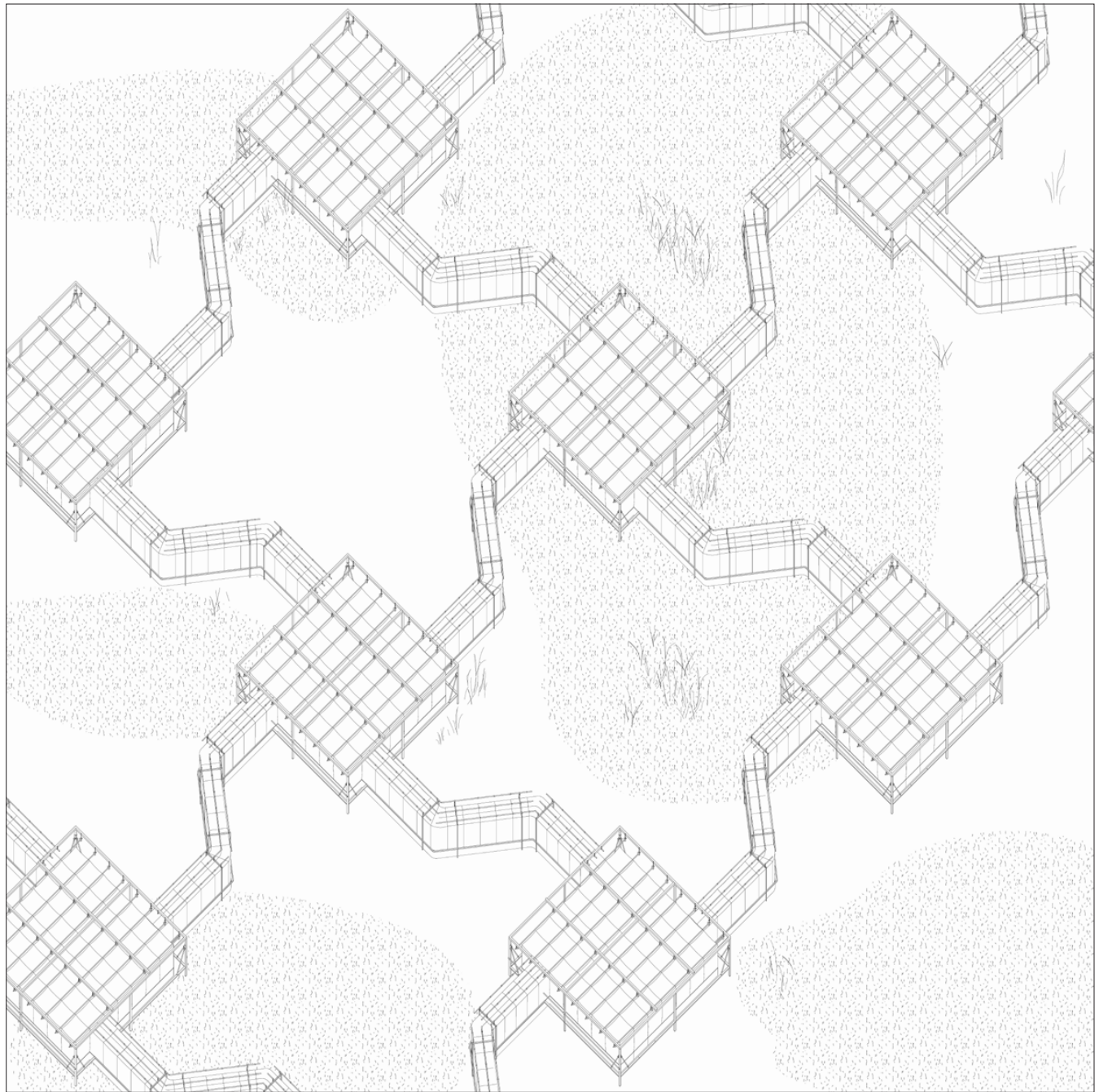
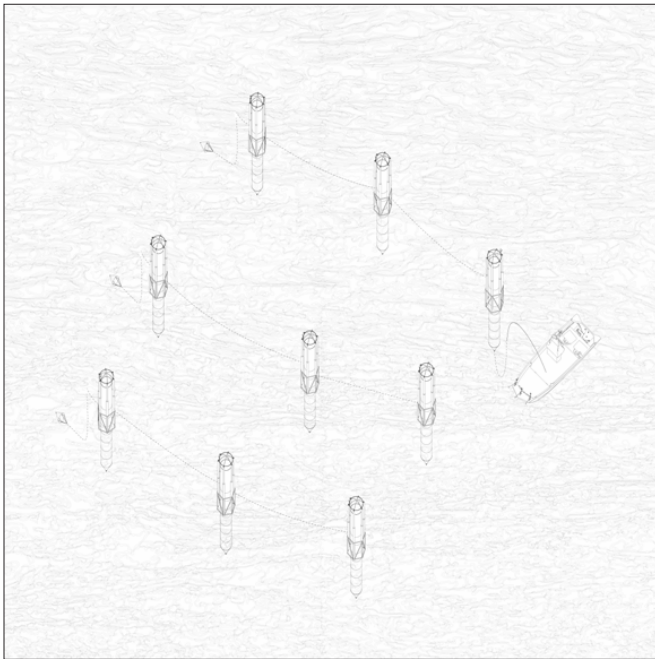
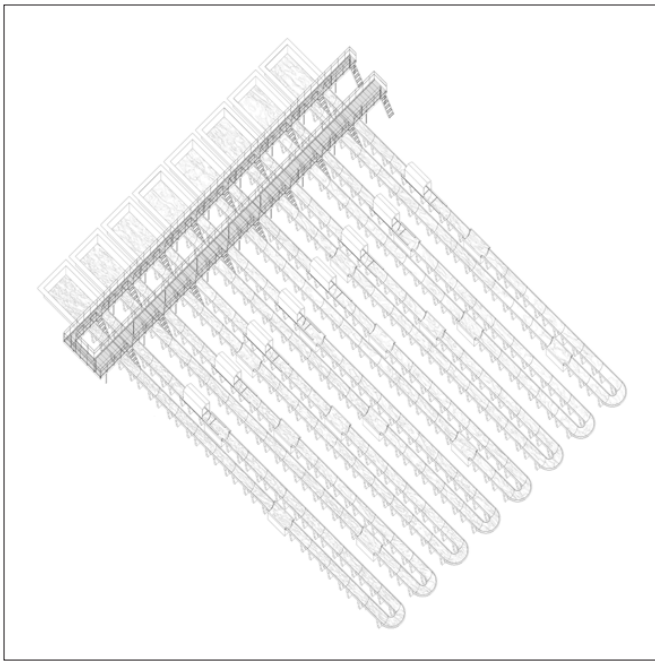
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MESO-COSM is a multimedia exhibition examining the relationship between architecture and large-scale ecosystem experiments in the Gulf Coast region, speculating on future forms of urbanization in Houston's periphery.



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A mesocosm, or “medium world,” is an infrastructure for long-term outdoor ecological experiments. Mesocosms are situated between the microcosm of the laboratory and the macrocosm of the planet, enabling situated observations of real-world conditions.

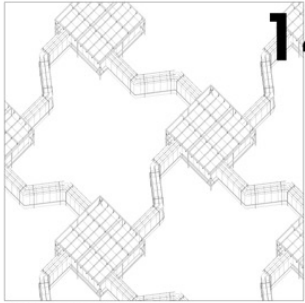


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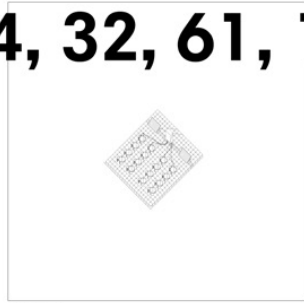
Organized as arrays of environmental “patches,” mesocosms allow scientists to observe ecosystems while controlling particular variables (such as carbon dioxide levels, soil toxicity, and rainfall amounts) in order to understand the impacts of anthropogenic climate change on the environment.

MESO-COSM

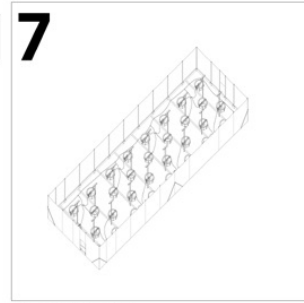
9 CASE STUDIES*
48, 09, 32, 16, 24,
14, 32, 61, 17



Metatron Terrestrial Mesocosm



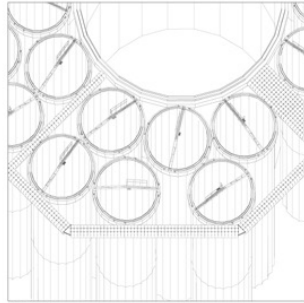
Sites Aquanet



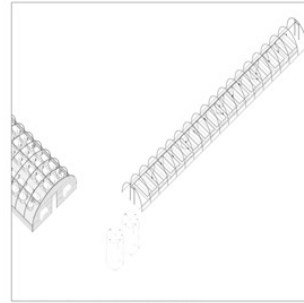
Aquatic Ecology Lab Mesocosm



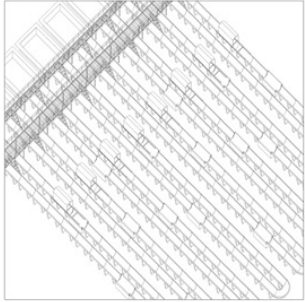
Kid Off-Shore Mesocosms for Ocean Simulations (KOSMOS)



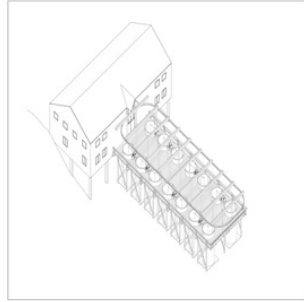
IGB LakeLab



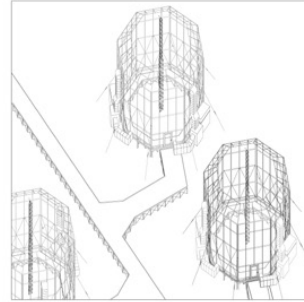
Sam Houston Center For Biological Field Studies



Artificial Stream And Pond System (FSA)



Marine Ecosystems Research Laboratory Mesocosm (MERL)



Marcell Experimental Forest

MESO-COSM

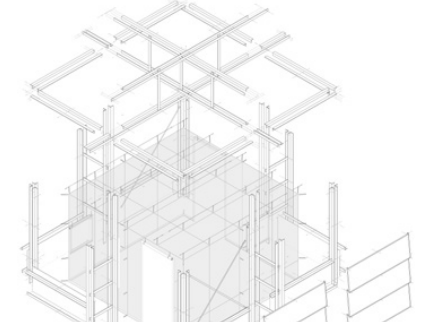
9 CASE STUDIES*
1 PROTOTYPE**
4 TYPES



| MESOCOSM | * CASE STUDIES | Area | Site (Ac.) | Vol (m ³) | ** PROTOTYPE |
|--|----------------|--------|------------|-----------------------|--------------|
| Metatron Terrestrial Mesocosm | 1 | 10,000 | 100 | 100,000 | 1 |
| Sites Aquanet | 1 | 1,000 | 10 | 10,000 | 1 |
| Aquatic Ecology Lab Mesocosm | 1 | 1,000 | 10 | 10,000 | 1 |
| Kid Off-Shore Mesocosms for Ocean Simulations (KOSMOS) | 1 | 1,000 | 10 | 10,000 | 1 |
| IGB LakeLab | 1 | 1,000 | 10 | 10,000 | 1 |
| Sam Houston Center For Biological Field Studies | 1 | 1,000 | 10 | 10,000 | 1 |
| Artificial Stream And Pond System (FSA) | 1 | 1,000 | 10 | 10,000 | 1 |
| Marine Ecosystems Research Laboratory Mesocosm (MERL) | 1 | 1,000 | 10 | 10,000 | 1 |
| Marcell Experimental Forest | 1 | 1,000 | 10 | 10,000 | 1 |

MESO-COSM

PROTOTYPE NO. 01
HOUSTON, TX



| MESOCOSM PROTOTYPE NO. 01 | STRUCTURE INVENTORY | MECHANICAL INVENTORY | ELECTRICAL INVENTORY |
|---------------------------|---------------------|----------------------|----------------------|
| Structure Inventory | 1 | 1 | 1 |
| Mechanical Inventory | 1 | 1 | 1 |
| Electrical Inventory | 1 | 1 | 1 |

MESO-COSM

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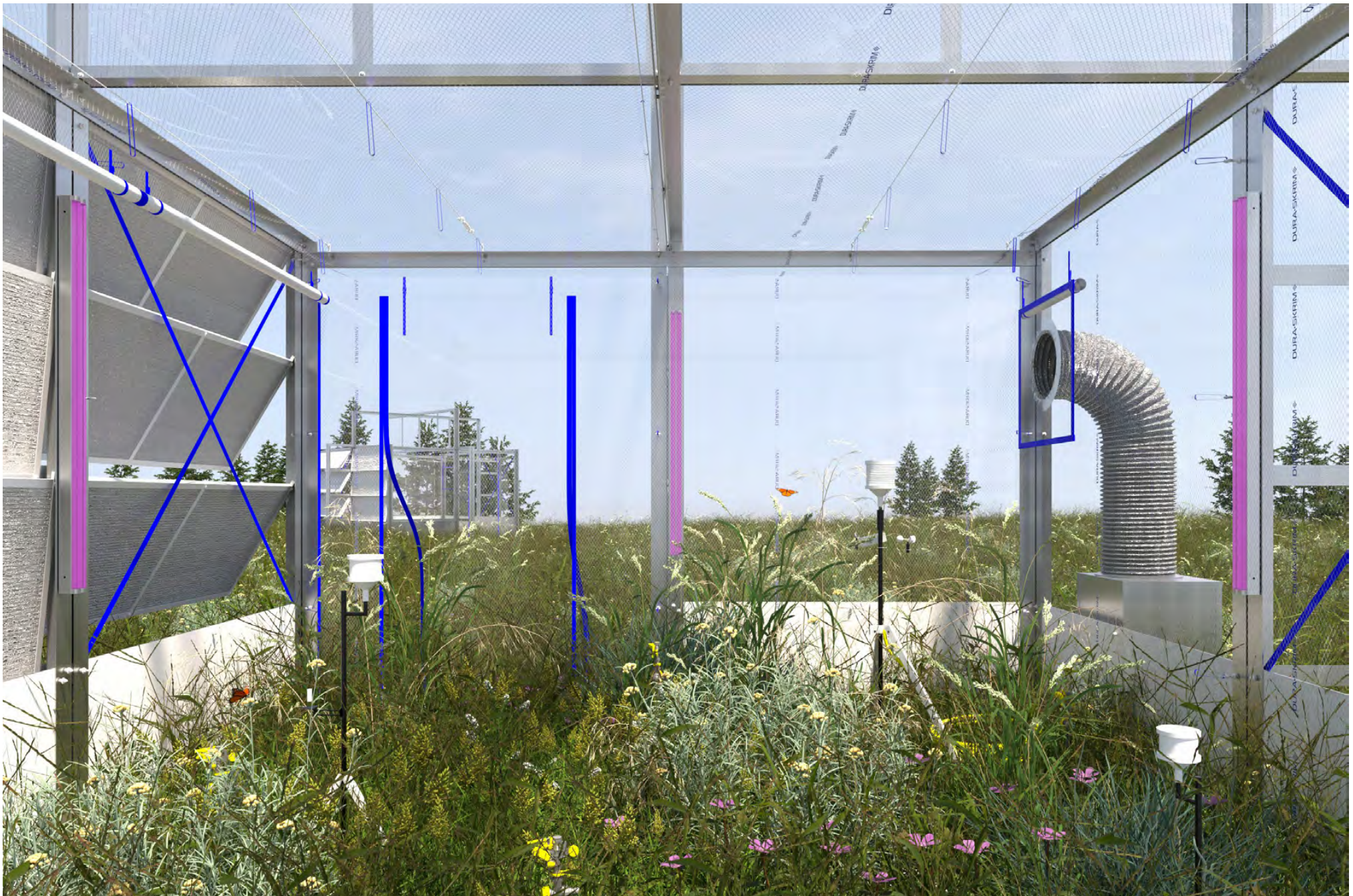
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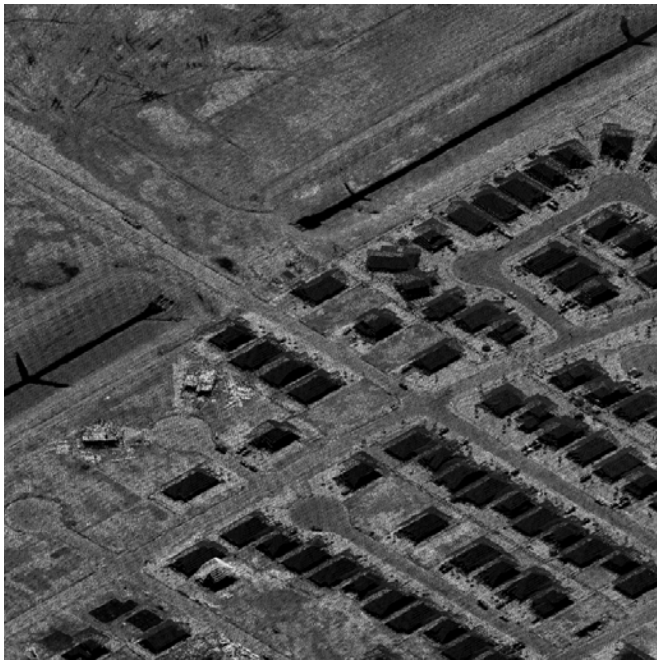
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Mesocosm experiments can be found all over the world and in all types of landscapes, but information and representation about them is sparse. The exhibition includes research and drawings documenting these infrastructures, suggesting new tools and possible architectures for a changing climate.



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Learning from this research, we developed a mesocosm prototype situated within the ecosystems typical of Houston. Situated within the coastal prairies and wetlands of the city, the prototype can be used to study the long-term effects of drought as well as atmospheric and soil-based toxins.



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One possible site is the Greens Bayou Wetlands Mitigation Bank, a protected landscape of ponds, marshes, and forests operated by the Harris County Flood Control District in East Houston. These wetlands offer “credits” that offset the loss of wetlands from development in the county.



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Another critical site is the Addicks and Barker Reservoirs, crucial flooding infrastructures operated by the Army Corps of Engineers. The reservoirs were built in the 1940s to reduce flooding risks downtown along Buffalo Bayou, draining a watershed of roughly 138 square miles in area.



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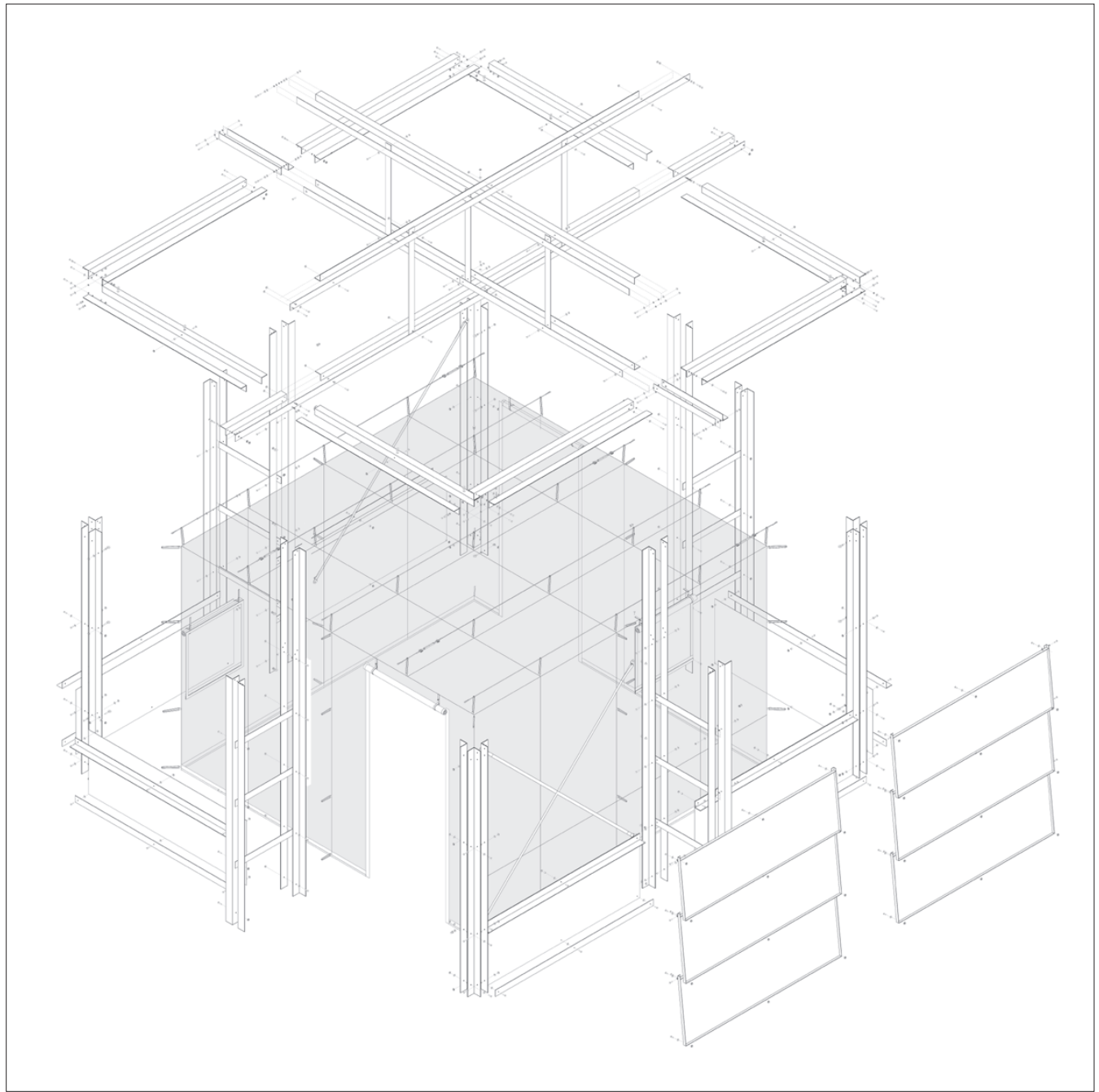
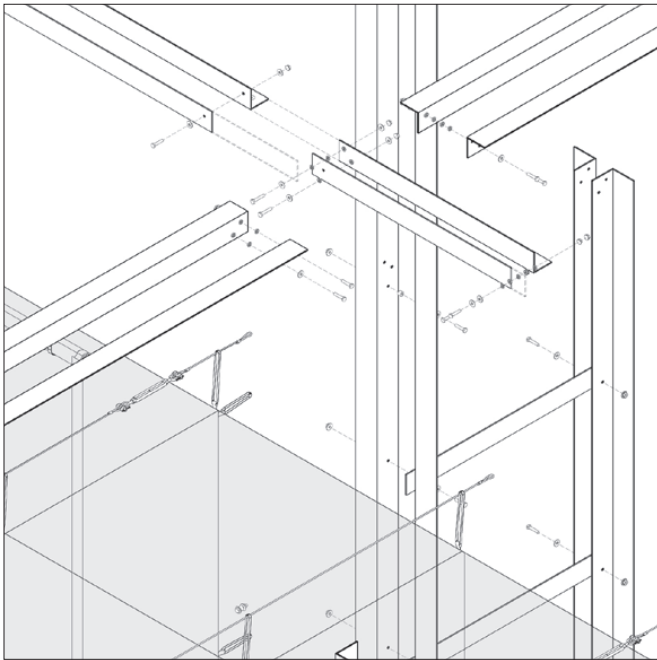
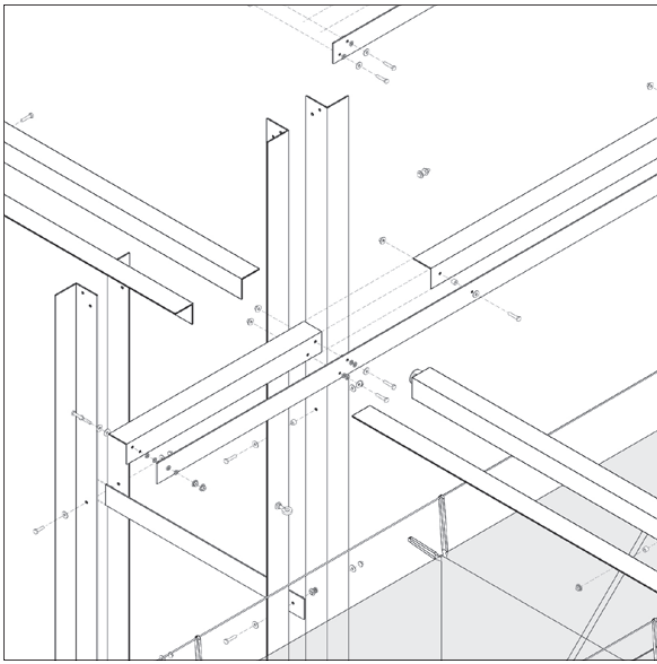
Both landscapes operate as urban voids, serving as flooding infrastructures and preserving ecosystems that are critical to the city's resiliency during storm events. However, these landscapes are also spaces in which environmental systems and the economics of human settlement are in conflict.



[photograph by Sean Fleming]

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Within this context, the project asks: How can the mesocosm offer a possible methodology to reimagine the ecological-urban future of the city? The exhibition contains a full-scale mesocosm prototype transplanted into the gallery, used by students as an immersive learning environment.



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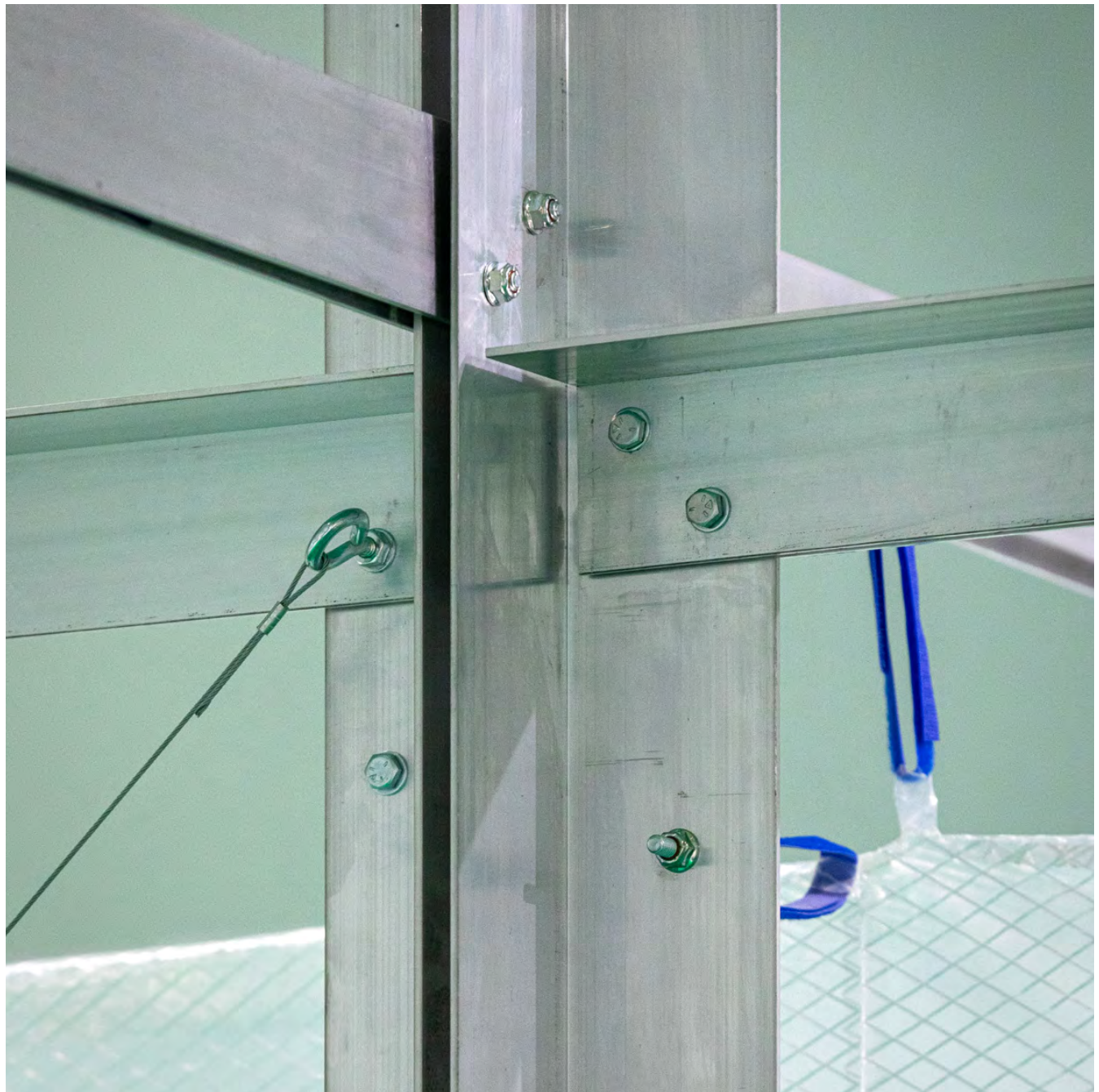
This full-scale mesocosm prototype is constructed out of aluminum extrusions using a long-span truss to suspend an enclosure of light-permeable and water-resistant sheet material, as well as hard surface panels, to mediate the air, water, and particulate environment.



[photograph by Jason Chen]

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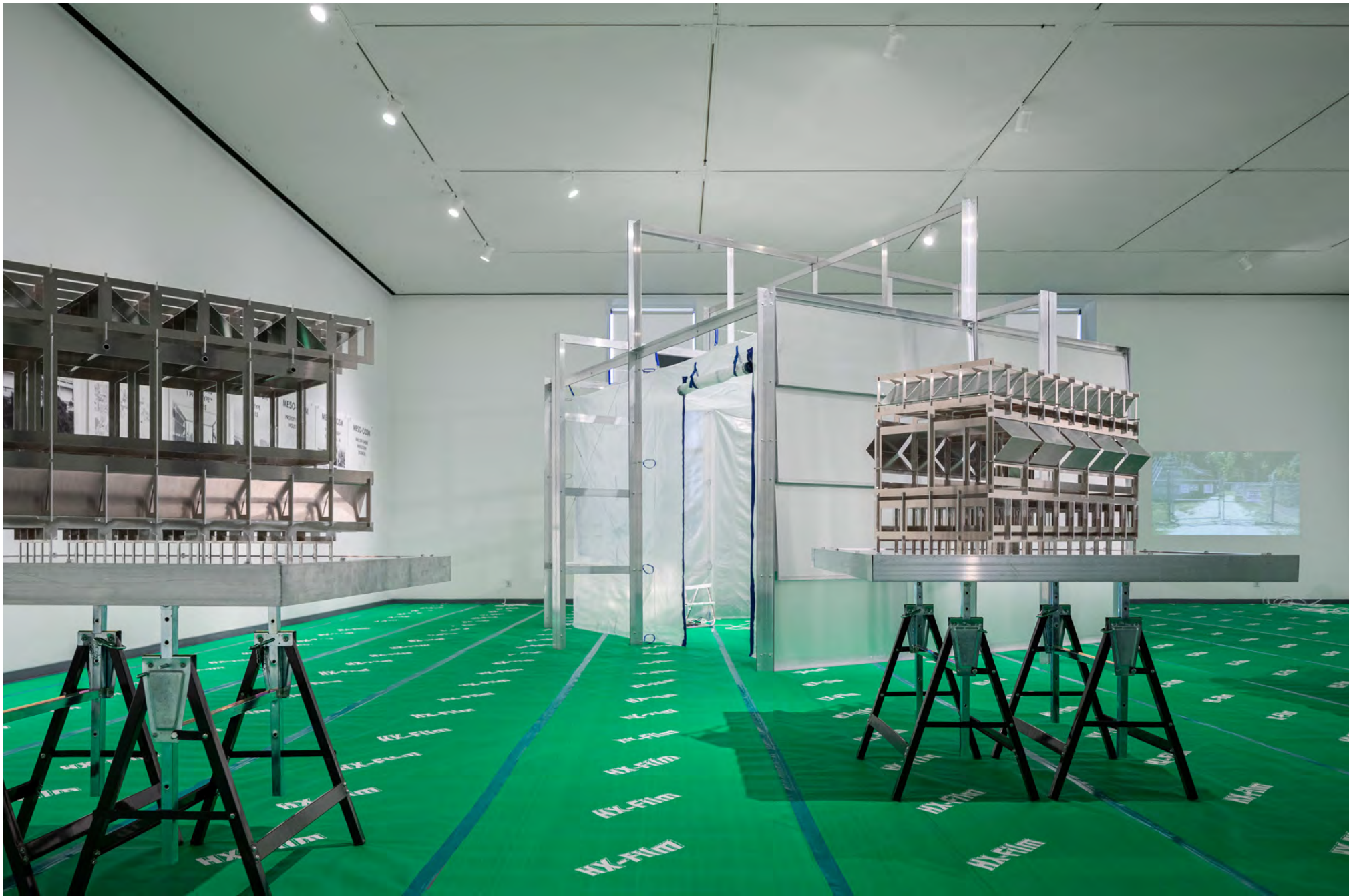
The gallery and mesocosm prototype are filled with large inflatable pillows for lounging and playing, suggesting new forms of encounter within the technical spaces of environmental research.



[photograph by Sean Fleming]

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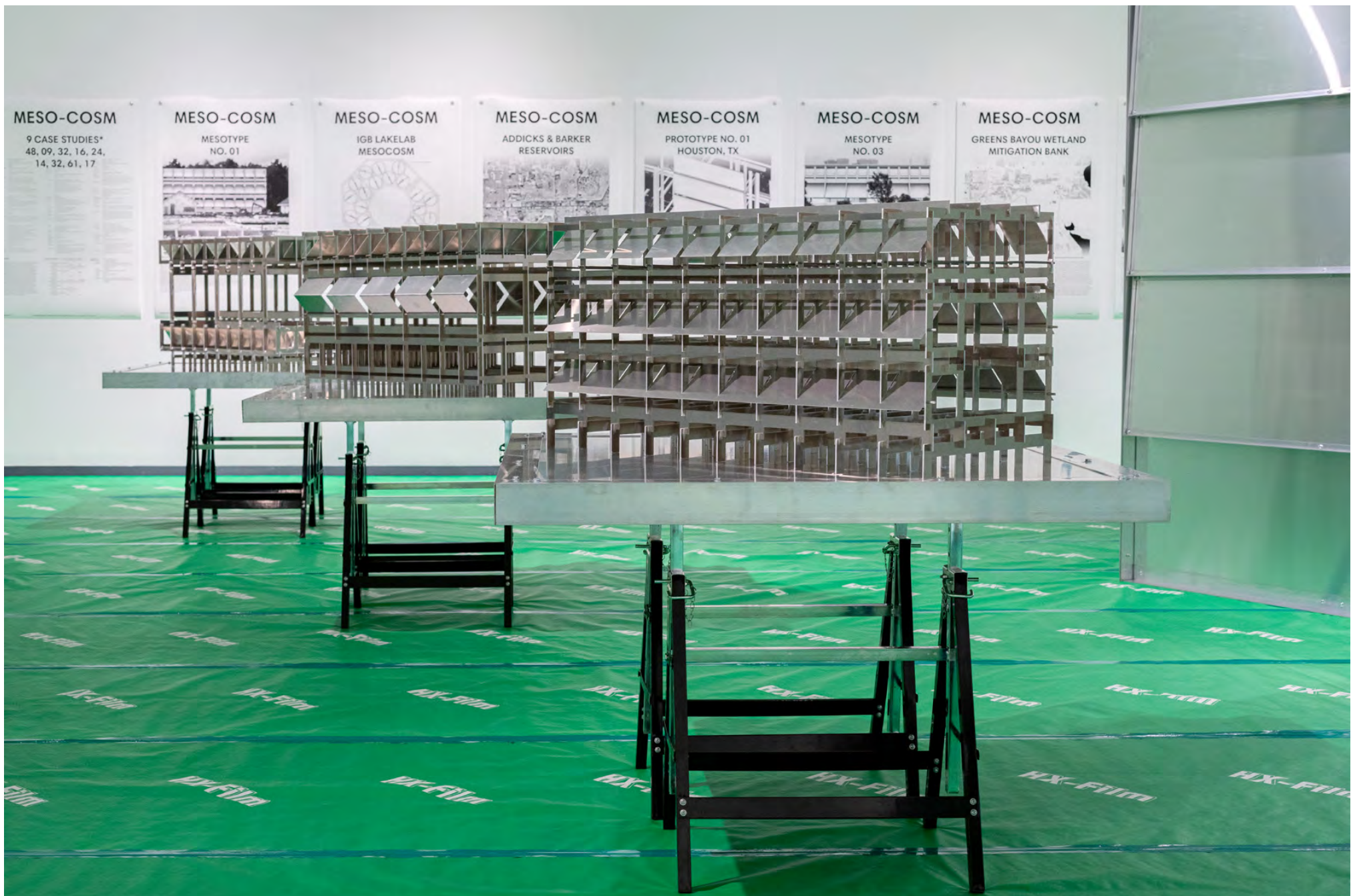
The aluminum angles are fastened together with bolts, washers, spacers, and tension cables, creating an accessible DIY assembly system. Using a minimum of tools, these prototypes can be simply constructed and disassembled.



[photograph by Sean Fleming]

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Can architecture itself be understood as a type of mesocosm: a space mediated by technical systems as well as a medium entangled within planetary processes? How can architecture register environmental transformations, test open systems, and interact with climates and atmospheres?



[photograph by Sean Fleming]

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Alongside the full-scale mesocosm in the gallery, we also proposed four architectural prototypes that experiment with different climate systems and gradients of enclosure. Rather than operating as hermetically sealed boxes, these prototypes are instead open-ended and open-air environments.



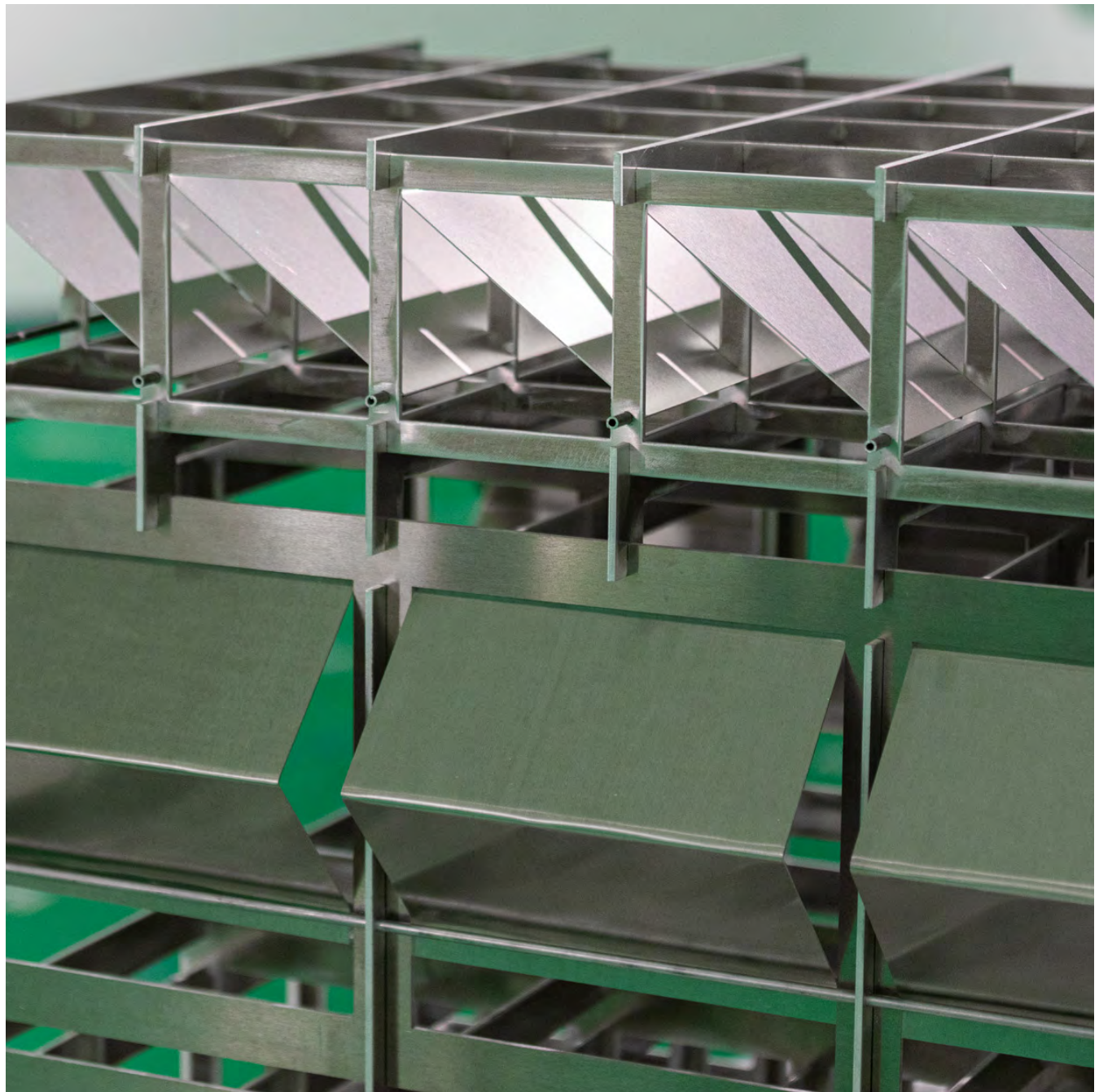
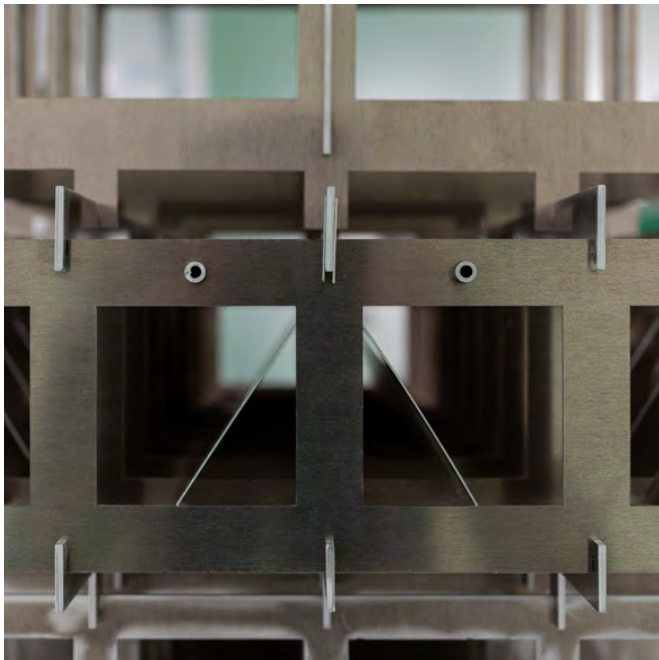
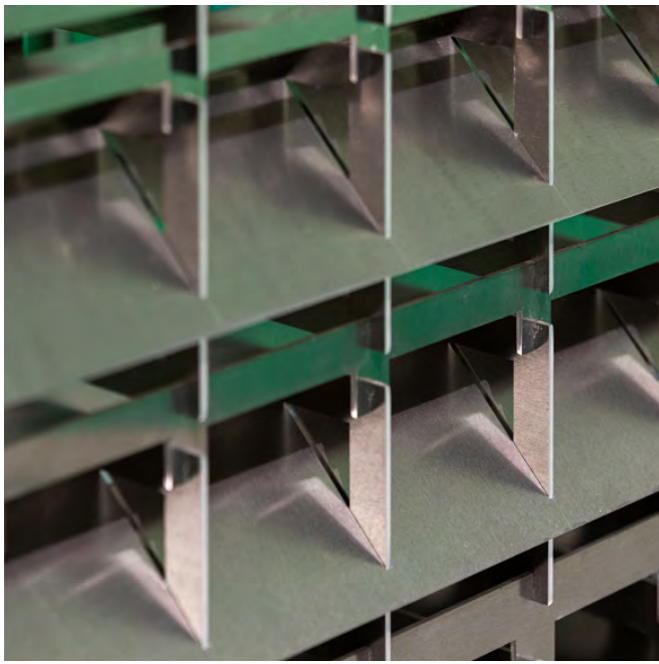
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Situated within the conflicted edges of Houston's peripheries, each proposal offers an alternative to suburban sprawl. Breathable, operable, and adjustable, these architectures suggest ways to reimagine architecture's relationship to the land and its hydrological, atmospheric, and biological cycles.



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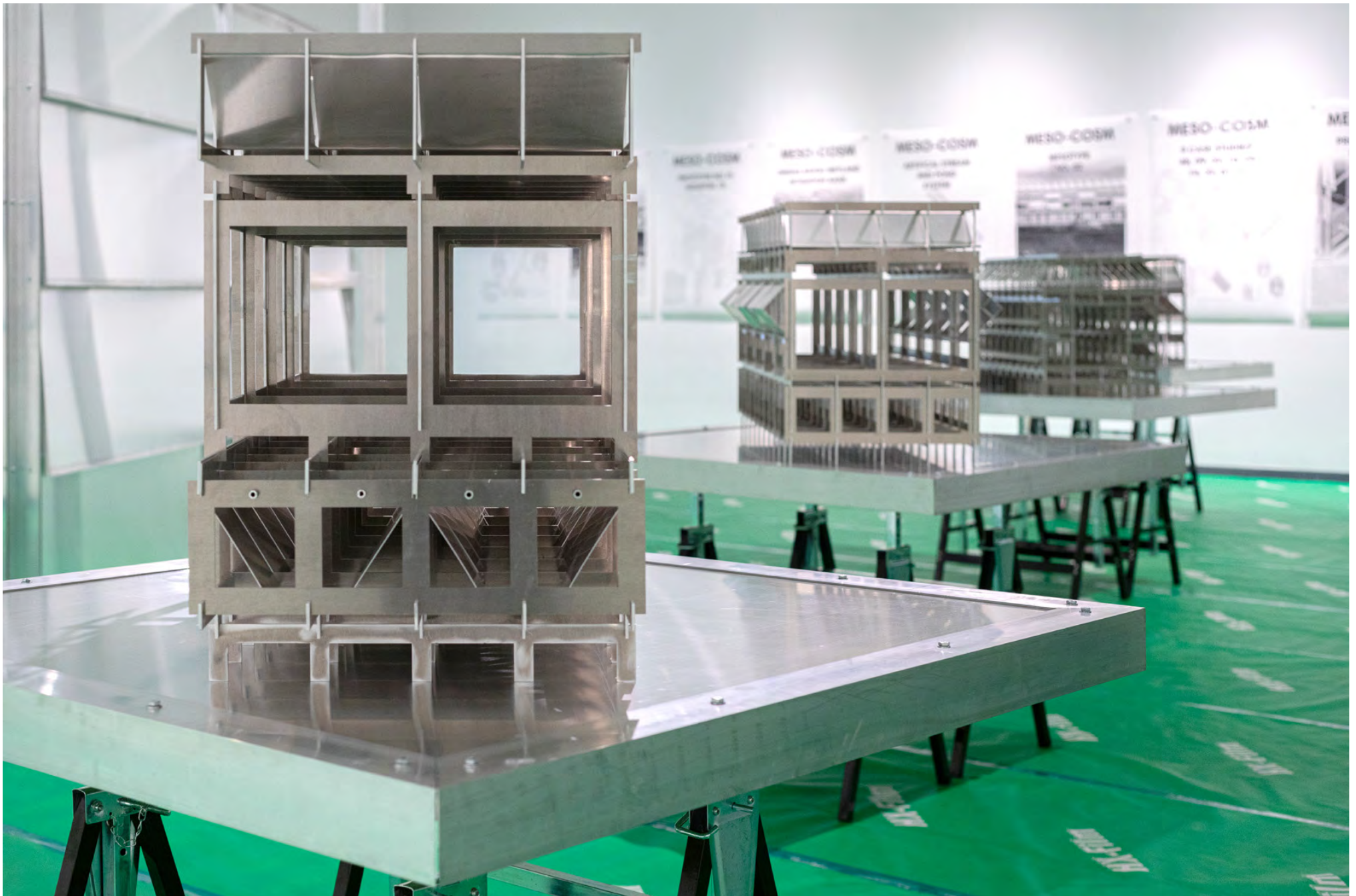
Using responsive louvers, retractable shading enclosures, solar capture roof systems, water catchment infrastructures, and low-impact foundations, these prototypes encourage new ways to calibrate temperature gradients and ventilation currents.



[photograph by Sean Fleming]

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In the exhibition, the models are constructed from laser-cut aluminum pieces fitted together with folded metal plates and piping, creating a legible assembly system that abstracts the large-scale tectonics of the design proposals.



[photograph by Sean Fleming]

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The tectonic layering system creates sub-floor and above-ceiling interstitial spaces, accommodating active and passive environmental systems. These strata create open frames that can accommodate a variety of climatic enclosures, recentering the relationship between architecture and its environment.



[photograph by Jason Chen]

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