

Title: Boardwalk
Date: Sept. 2022

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Design/Build (Mark Cushing), Ithaca Reuse (Diane Cohen)

Client: Dr. Neal V. Hitch + Bethel Woods Center for the Arts

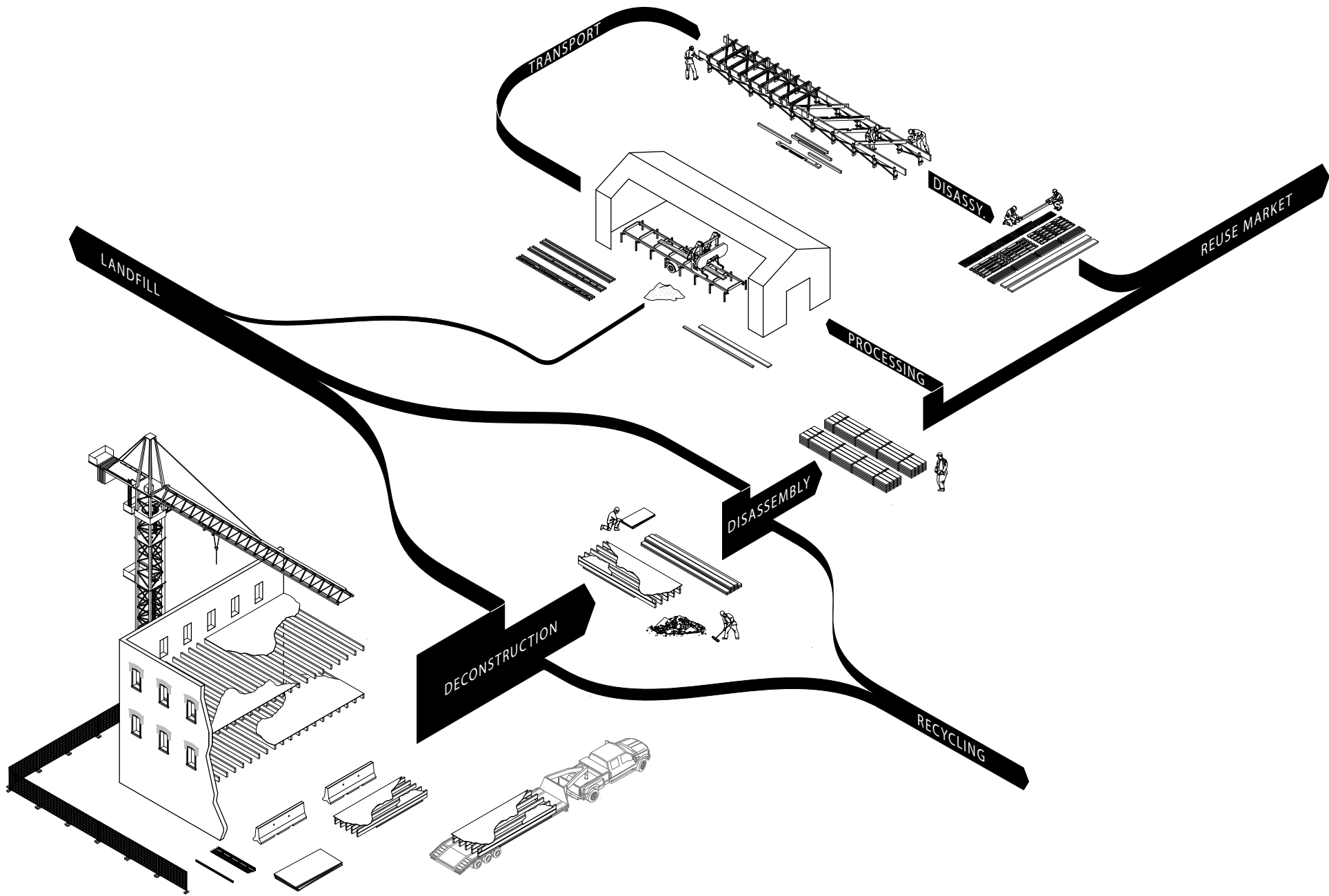
Funding: Bethel Woods Center for the Arts, Illinois Institute of
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Photography: Maxwell Rodencal, Sophia Chen

I. Background

This project is part of a larger ongoing effort to develop new design and construction methods aimed at maximizing material recovery and reuse while reducing waste in the built environment. While there has been a growing interest in material recovery strategies within the field of architecture, these models often fall short when it comes to their application at scale. Engaging with this material surplus requires more than a willingness on the architect's part and often involves a wide range of partnerships between local building industry personnel, stakeholders, and practitioners.

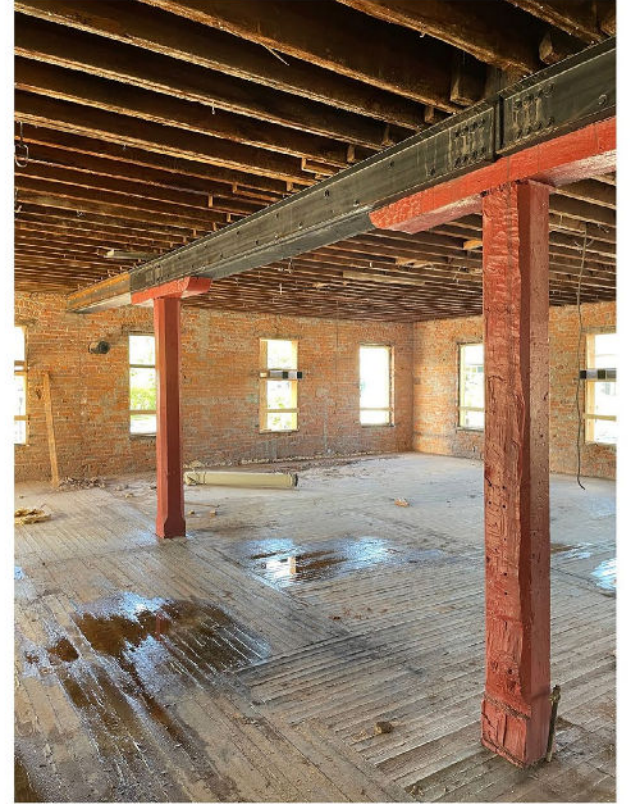
In 2022, the project was conceived as part of developing strategies to maximize material reuse through the disassembly of a former ironworks and foundry building in upstate New York. The building was comprised of exterior brick load bearing walls on the north and south facades along with a center beam supported by columns. Each level consisted of oak flooring and two rows of 26'-0" hemlock joists at 1'-0" on-center. Intended for future multi-family housing, the client requested that the exterior brick façade be left intact and incorporated into the future building program, whereas the remaining interior floorboards, subfloor, joists, beams, and columns were all eligible for disassembly and reuse. Working with the developer, general contractor, deconstruction team, and local haulers, the project team attempted to apply circular principles to this project through specifying these remaining components of the building be deconstructed as opposed to outright demolition.



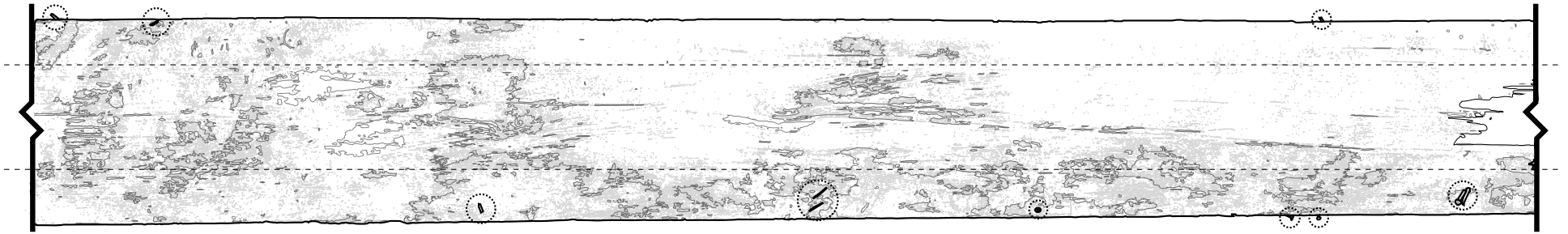
Building Deconstruction + Material Flow



Ironworks Building Facade After Disassembly



Existing Interior Conditions Prior to Disassembly



II. Methods of Disassembly + Reuse

Working with the contractor to develop methods for disassembling the four-story structure, large floor cassettes were cut from each level of the building, craned out of the existing structure, loaded onto a flatbed trailer, and transported to an adjacent site nearby. This resulted in the recovery of 7,200 board feet of old-growth eastern hemlock and 6,000 sq. ft of red oak flooring that was diverted from the waste stream. The disassembly logistics were dictated by parameters of the on-site machinery and the workable dimensions of each cassette once they were on the ground. Each cassette was cut from the building with its assembled layers intact including the joists, plaster, structural floor underlayment, hardwood flooring, and other miscellaneous architectural elements accumulated over the years. Once these dimensional sections were transported to an adjacent site, the design team looked to inventory what materials were salvageable and the best method of continued disassembly and sorting.

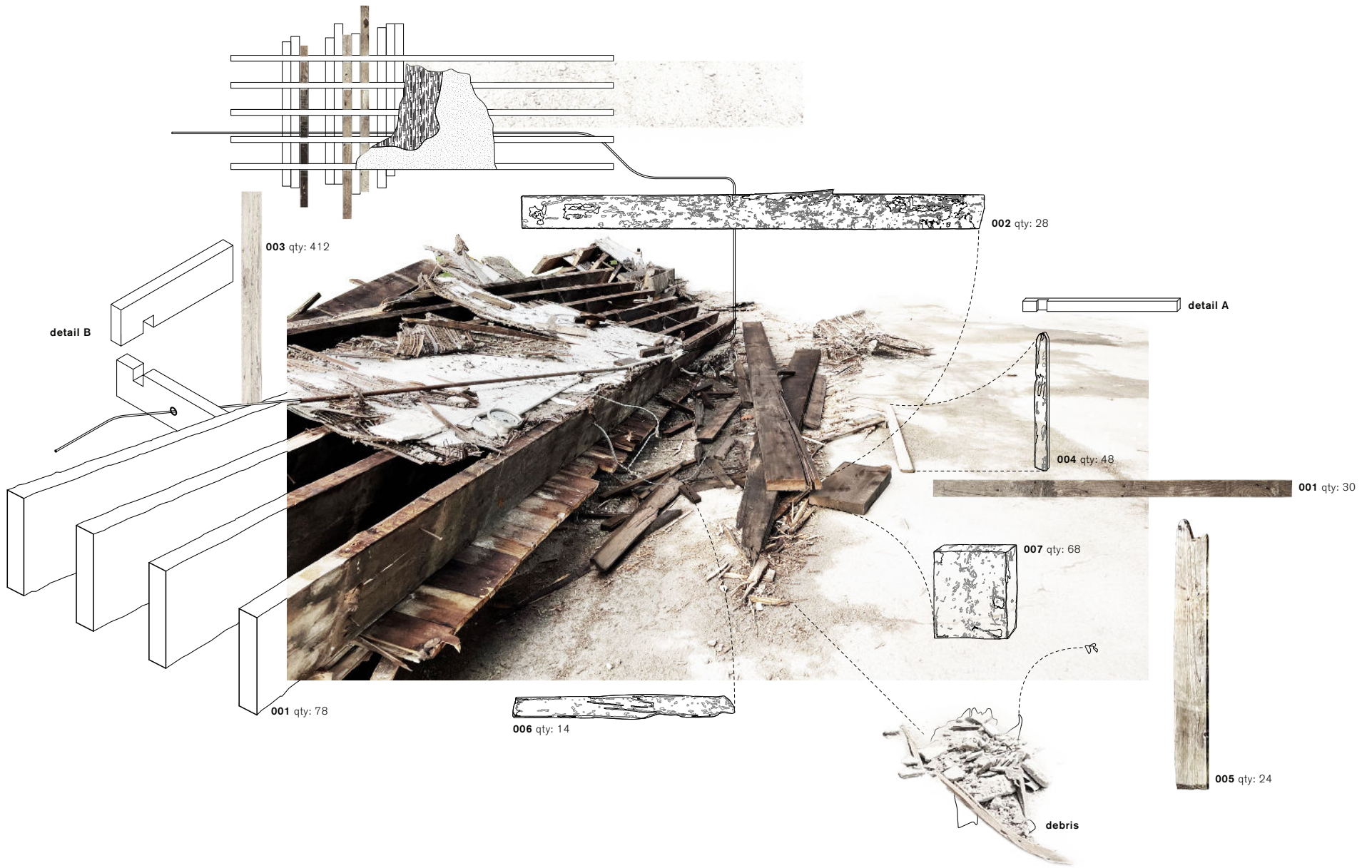
After building disassembly, the materials from each cassette were separated yielding over 300 old-growth hemlock beams at around 24' in length. However, the beams consisted of various defects ranging from chips, dents, cuts, holes, and splits.

Another design challenge was the embedded mechanical fasteners found within the material. Nails and screws from various decades needed to be located and extracted before the wood was able to be reprocessed with either digital and traditional woodworking tools. Looking at the logging industry and how their digital tools have optimized the yield of material from irregular profiles, a similar approach was applied when considering the hemlock joist and its physical irregularities or foreign artifacts that are present.

Ultimately, the majority of the hemlock beams were cut based on the constraint of embedded nails. The oak flooring's tongue and groove system was removed as most were broken during the disassembly process. Through these transformations, materials are no longer considered as only a hemlock beam or oak flooring to be reused in the exact same manner as before, but instead they are understood as entirely new elements. Within the deconstruction and re-use of physical objects, a material's original purpose or state of existence does not necessarily dictate or determine its future use. These materials are seen within a new light within the design process as a library to design from in new and creative ways.



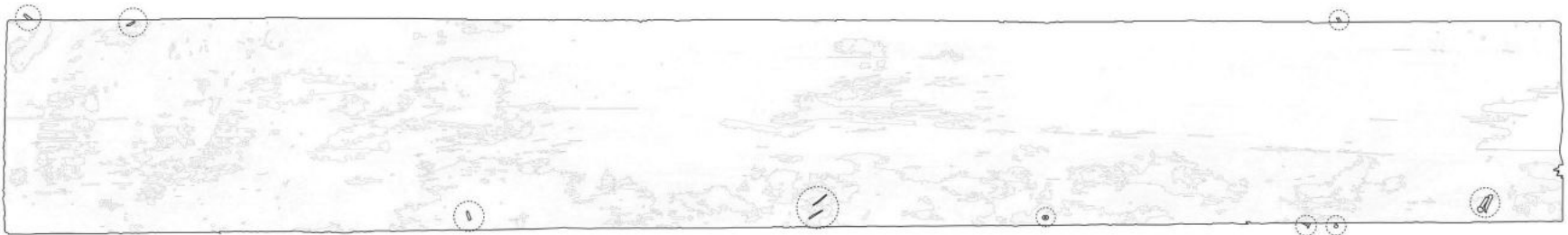
Material Recovery Process



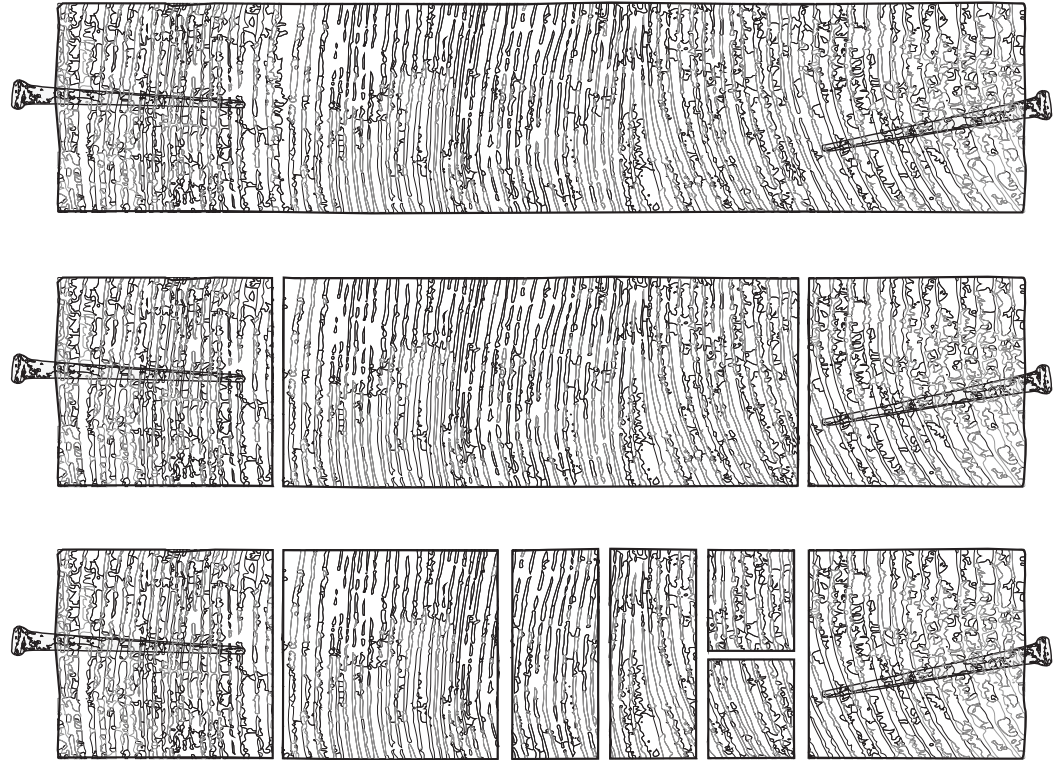
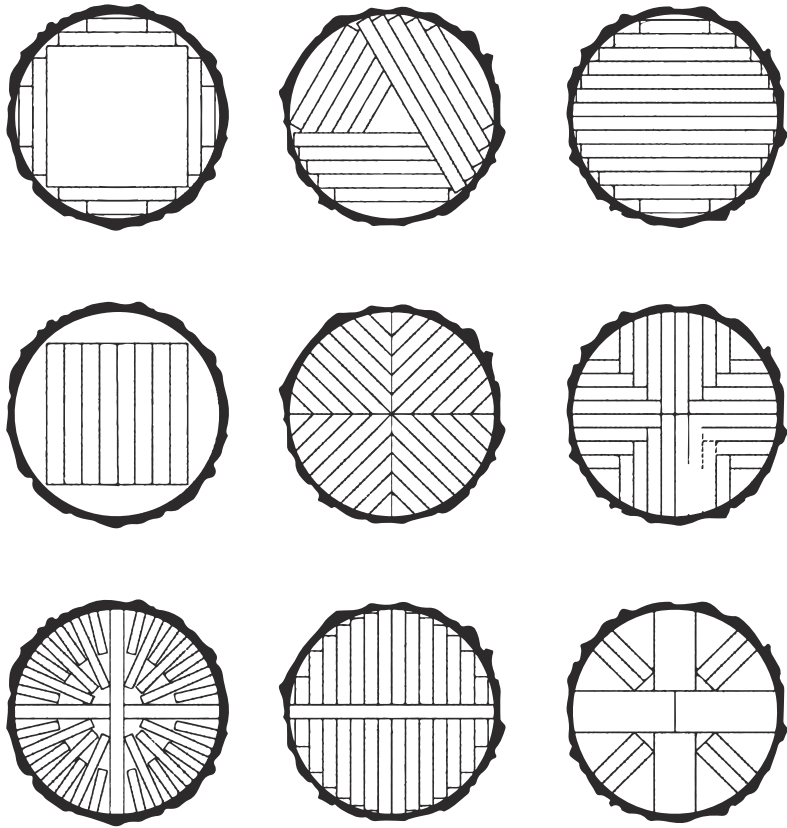
Material Inventory



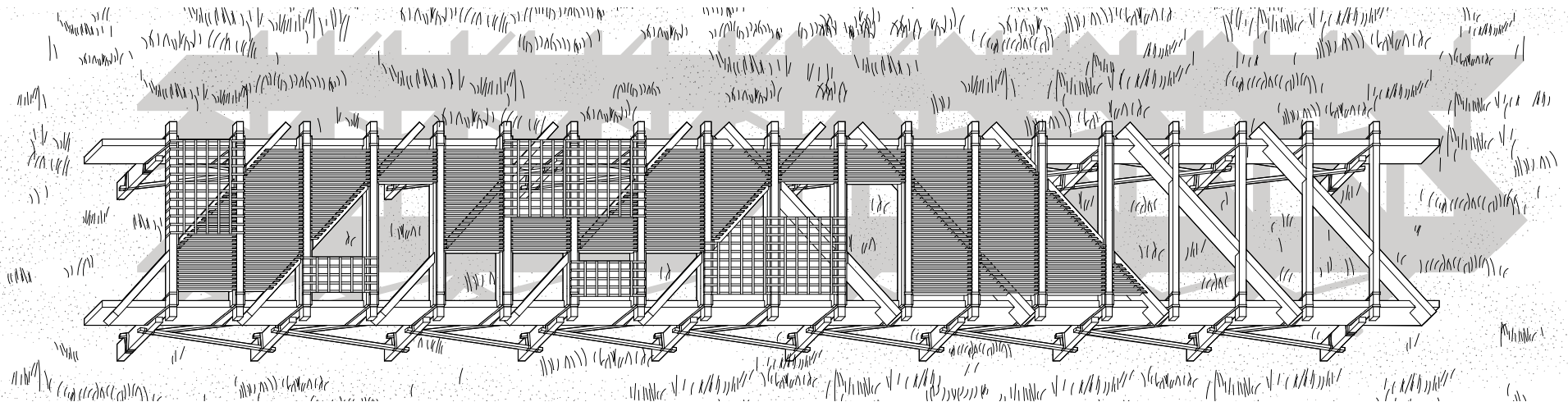
Salvaged Oak Flooring



Material Irregularities + Nail Detection



Hemlock Joist Material Optimization Based on Logging Industry Processes



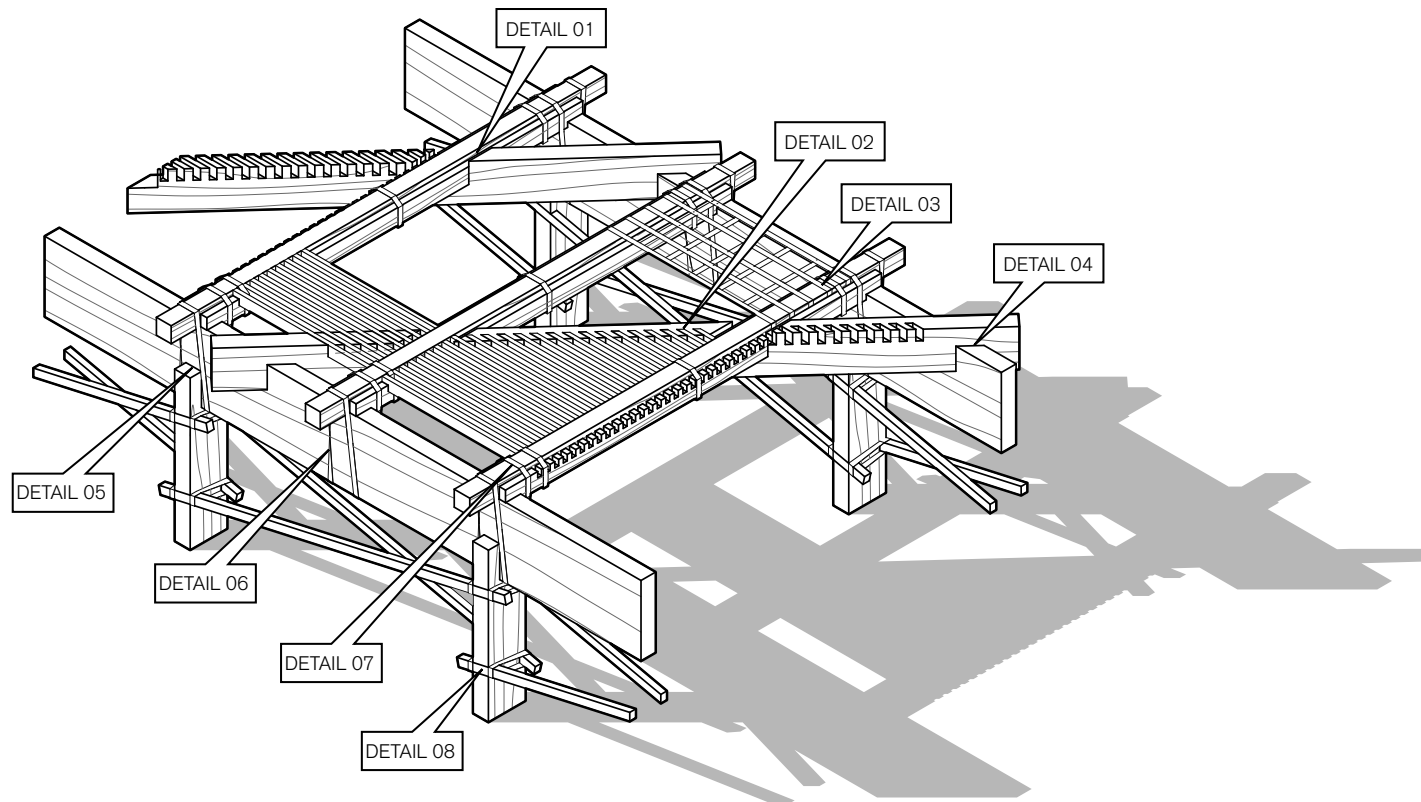
III. New Design Opportunity

Composed of only recycled nylon strapping and reclaimed wood members, the resulting design uses no adhesives or mechanical fasteners. The intention is for the 40-foot-long installation to be disassembled, moved, and reused over again with ease. However, to eliminate the use of typical fastening methods tight tolerances were required between all material connections. To combat this problem, BoardWalk employs a series of resolutions within its joinery to create tight interlocking tectonic connections. The project relied on using CNC fabrication to assure this accuracy and tolerance was achieved. These joinery typologies were derived from research into dry fit joinery while looking at techniques of lapping, notching, shimming, and flip milling. Prototypes were first fabricated by hand using traditional saws and woodworking tools before translating cutting logics to automated processes using digital tools. As a result, each new component was then prefabricated off-site, and test fit for ease of assembly before being packed and transported to the site.

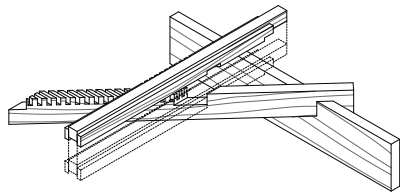
Following the assembly of each wood member, a series of reversible nylon strapping connections are used to further stabilize critical connection points throughout the project while simultaneously offering hammock-like surfaces as playful moments designed for leisure throughout the project. The result is a seemingly floating compilation of materials that appear delicate in assembly yet massive in scale. Newly processed areas of each element juxtapose the old aging surface characteristics of the eastern hemlock wood based on one's orientation bringing into question whether the project is something new or still a relic of the past.

Designed as a temporary installation, BoardWalk is a multifunctional destination serving as an informal gathering space, temporary stage, and viewing platform. BoardWalk creates a concentration and gathering space between the two linear lines. These vectors of construction, one out of the accumulation and stacking of dry-laid stone, and the other of wood joinery hovering above the ground both use unique geometries to hold their forms in place.

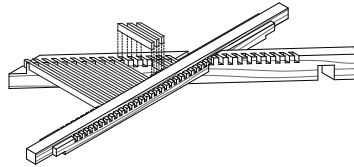
Ultimately assembled as a series of dry-fit layers, the project is to be understood as only a temporary moment in time. With the ability to be as easily and quickly dismantled as it was put together, the project offers each of its elements yet another lifecycle opportunity beyond their present one while responding to the context of the historic site.



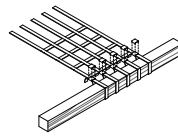
Assembly Chunk



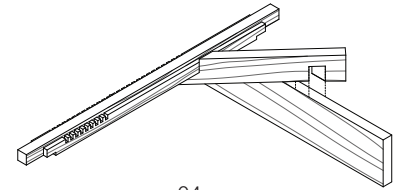
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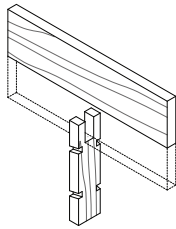
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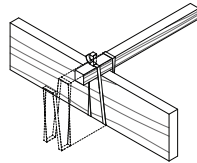
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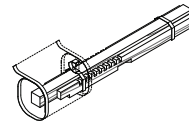
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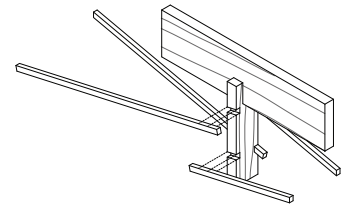
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8 Reversible Assembly Details



CNC Tolerance + Joinery Details



Photos: Sophia Chen

On-site Assembly



Photo: Sophia Chen



Photos: Maxwell Rodenca



Photo: Maxwell Rodencal



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