

Choreographing a Logic of Assembly

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Choreographing a Logic of Assembly: An investigation of tensile formwork for in situ Concrete casting.

Targeting the excessive economic costs and loss of embodied energy in traditional and digitally fabricated in situ concrete formwork, this poster presents a series of material studies investigating the weaving of an adaptive cable network into tensile formwork. Inspired by Frei Otto's cable net structures, the fabric formwork studies by Mark West at CAST, and the soft use of digital fabrication by William Massie, this work aims to engage site responsive design strategies by creating an assembly system that embraces the complexity and variation possible when casting concrete. Through a series of phases, these objectives are accomplished by developing a logic of assembly, testing the assembly for limitations through parametric and physical modeling, analyzing the resulting form, and then comparing the results with other methods of assembly.

PHASE 1: SWELLING

The initial stage distinguishes the variables in the formwork that control the overall gestural form from those that incite variation through the funicular swelling during the casting process. These explorations began with a series of plaster then concrete casts. With consistent

use of a casting materials and textiles, the number and location of control points defined the potential fidelity of the cast, while the amount of pre-tensioning and staging of lifts became key in facilitating swelling.

PHASE 2: LOGIC OF ASSEMBLY

While the first investigations relied on tension directly on the textile, this second phase aims to develop a scalable cable net system. Loose primary lines gesturing the intended form are bound taunt to their context (a steel frame) by a secondary system. Repetition, rhythm, and transition are refined within this second supporting layer. A tertiary netting weaves between the primary and secondary systems as an open definition of the fabric formwork to come. During the pour, the textile panels are allowed to swell against and distend beyond the tertiary netting.

PHASE 3: EMBEDDED SYSTEMS

Intrigued by Kiel Moe's reflections on the complex vs. the complicated, the cable net system is refined to address structural and thermal relevance. Here are specific opportunities:

Structure: By substituting and composing the established network connection types, a building roadmap choreographs the structural systems and articulates the future framing logic.

Thermal Gain: By adjusting the pre-tension level in the secondary system, the severity of the swell can be manipulated to best utilize surface exposure for thermal gain.

Thermal resistance: By reversing the intended use of Sonotubes, an encapsulated negative space is cast, thus improving thermal resistance.

Radiant heat: By strategically placing radiant heat systems in the cast, the variable thickness allows for maximum influence.



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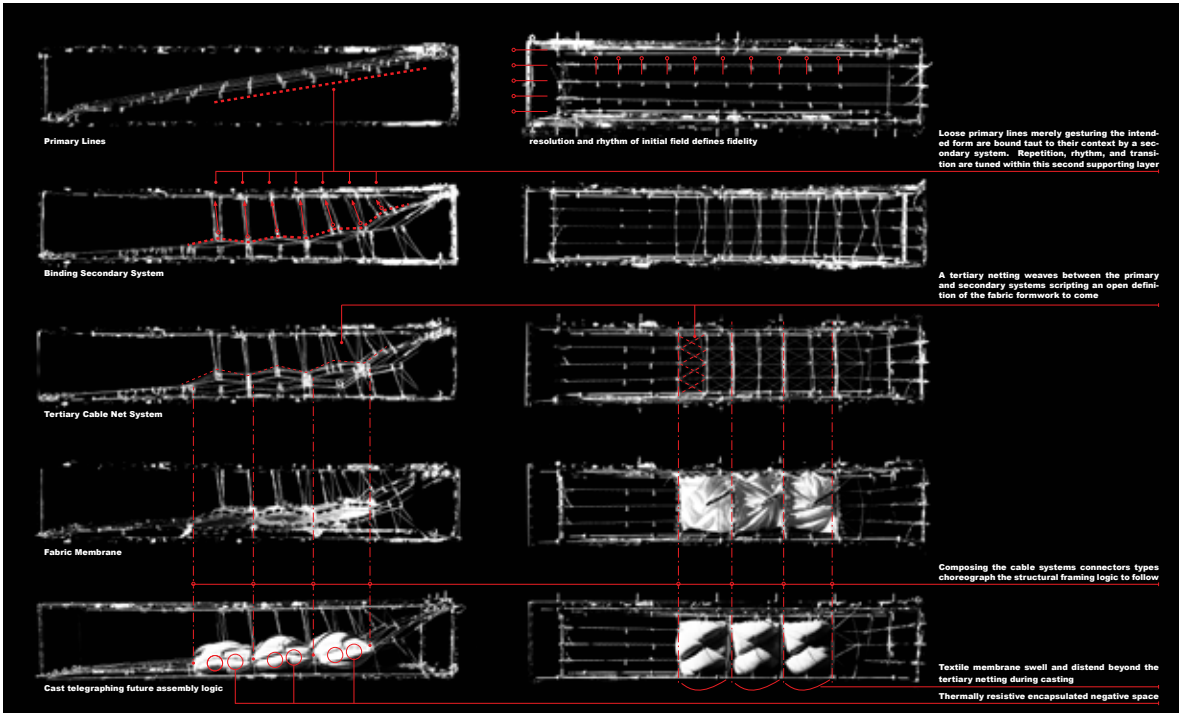
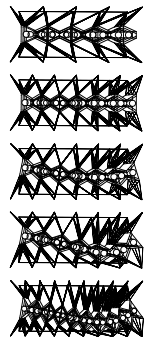
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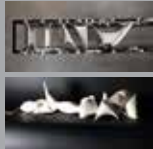
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Phase 1: Swelling

The initial stage distinguishes the variables in the formwork that control the overall gestural form from those that incite variation through the funicular swelling during the casting process. The explorations began with a series of plaster and concrete casts. With consistent use of a casting material (concrete) and textile (PET filter fabric), the number and location of control points defined the scope of the cast, while the amount of pretensioning and staging of lifts were key in facilitating swells.



Phase 2: Logic of Assembly

While the first investigations relied on tension directly on the textile, this second phase aims to develop a scalable cable net system. Loose primary lines merely gesturing the intended form, are bound taut to their context (a steel frame) by a secondary system. Repetition, rhythm, and transition are refined within this second supporting layer. A tertiary netting weaves between the primary and secondary systems as an open definition of the fabric formwork to come. During the pour, the textile panels are allowed to swell against and distend beyond the tertiary netting.

