AMBIGUOUS CHAIRS CAST IN FABRIC FORMED CONCRETE

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Summary.

On the basis of a specific experiment with a new casting technique for concrete structures, this paper discusses explorations of materiality as a way of generating discussion of the use of new technologies.

FABRIC FORMWORK FOR CONCRETE STRUCTURES

Fabric formwork is a building technology in which sheets of woven textiles are used as flexible, strong and lightweight formwork for casting concrete structures on site or as prefabricated elements. The PhD project on which this paper is based further elaborates research by pioneer in the field: Professor Mark West, University of Manitoba[1], Professor Remo Pedreschi[2], University of Edinburgh, and build works by Japanese architect Kenzo Unno (fig. 1)

The technology has been used for building only in a few cases[3]. Issues regarding production, structural behavior and aesthetics of fabric forming have yet to be examined further before architectural perspectives and the development of yet unknown structural solutions can be fulfilled in building. The aim of the PhD project is to further discuss the development and possible implication of the building method in contemporary architectural practice.

The use of prefab concrete elements is prevailing for building in Denmark; the use of exposed concrete surfaces and on site cast concrete structures less so, this due to a long tradition of facades with exposed brick; high cost of skilled labor; and the social image of concrete architecture which is still heavily influenced by large scale prefab housing schemes of the 60s and 70s - Works done hastily and inhabited by socially challenged groups of people. In order to generate discussion of the architectural perspectives of a new building method it seems crucial, constantly to expound on aesthetical as well as technological and structural aspects which are balanced in an integrated architectural practice. Besides these issues, the social notion of concrete can be seen as a barrier for initiating a discussion of the implementation of a new concrete technology: if nobody likes the idea, never mind how clever the technology.

POLARITY BETWEEN MATERIALITY AND TECHNOLOGY

The Industrial PhD[4] project has two commercial partners involved in the project: a large contracting company and an architectural office respectively representing the basic polarity of the project between the terms Technology and Materiality.

The technology pole contains subjects of material properties, techniques and praxis, thermal mass, surface properties etc. Questions related to the production and technical aspects of the project regard how to produce fabric forms and fabric formed concrete structures; what is possible and how to do it e.g. seen in relation to current building practice. A central technical issue is the production of defined tension geometries when wet concrete is poured into a tensile membrane. Another aspect comes from casting in woven fabrics. During curing excess water and air bubbles filter through the formwork which lowers the water/cement ratio and in effect leaves a smoother, less porous concrete surface. This technical advantage connects to the materiality pole.

The materiality pole of the project has issues regarding the perception of space, shapes and surfaces, optic vs. haptic appearance, indoor climate etc. In terms of architectural articulation, concrete is nicknamed 'Liquid stone' – poetic traces of the becoming of concrete shows on the surface as imprints. The technical filtering aspect mentioned above, adds a layer of narration to concrete architecture because the character of the tensioned fabric and its woven detailing is articulated on the concrete surface.

OXYMORONS AS EYE OPENER

In the following I'll elaborate on associations with fabric formwork as an oxymoron; a term which contains two terms of opposite meanings, the terms fabric and formwork. The architectural exploration of the oxymoron is hereafter suggested as an example of a strategy for creating a new perception of concrete and initiating a dialogue on what concrete architecture cast in flexible fabric forms could be.

Textiles can be seen as something light and delicate which can be draped and tailored. According to Semper, the general purpose of textiles is to cover, to protect, and to enclose[5]. This broad definition covers a multitude of functions: covering the body, the floor, furniture, a spatial enclosure etc. At a more everyday level, the function of textile varies greatly with the addition of highly technological textiles used as concrete reinforcement, gas filters, ground securing and more delicate functions at a small scale as replacement for ligaments in the human body[6].

Concrete formwork has the function to enclose as well, however only temporarily as it contains wet and heavy concrete until cured. Formwork can be considered very sturdy, manual, rigid, and heavy, a temporary structural system build up and torn down after casting. Technically formwork system varies from being completely handmade – the more advanced the form, the more handcraft is needed to build the formwork in wood – to formwork systems in aluminium frames and plywood – to aluminium all over.

The specific experiment is the design and production of two fabric formed chairs. The exploration includes presenting to the observer physical objects of a familiar function and scale, but containing ambiguities of the materiality, construction and affordance[7]. The

mentioned ambiguities concern optical appearance vs. the haptic perception and information which comes when touching the object and from the act of sitting down.

Using fabrics for furniture and thus getting some associations right that come with the function of a chair: Fabric, patterned surface structure and a bulging surface are all associated with the notion of an upholstered chair such as the Chesterfield.

It seemed a natural choice to use upholstery fabrics for casting a chair in fabric formed concrete. Architecture students at University of Edinburgh have studied the aesthetic surfaces of concrete cast in a number of conventional fabrics bought at the local fabrics store, including both very thin and cheap materials and more sturdy fabrics for upholstery. It was the intention of using upholstery fabric that the pattern from the fabric would transfer to the concrete surface making the appearance of the chair even more ambiguous to the observer.

Concrete – and Chesterfield furniture - is associated with something heavy, sturdy and solid. It is load bearing, however not usually of the small load of a person, but more likely a beam or a roof. The chairs were cast in fibre reinforced concrete. With flexible fabric formwork the chairs were designed and produced as a folding plane with thin dimensions, a big cantilever as the seat and perforated surface for water to run off. This shell structure was intended with a fragile look not associated with concrete

MATERIALITY AND REACTION

The gestalt psychologist Kurt Koffka wrote that "Each thing says what it is"[8] but the thing may lie.[9] The deliberate exploration of this statement is the essence of the described experiment for creating discussion of fabric formed concrete. When observers are confronted with the two chairs it has been evident that there was a shift between expectations derived from the optical appearance of the objects versus the actual haptical information obtained from the experience of engaging with the object – touching and sitting (fig2-5). As my conclusion I'll mention a few remarks from observers: "Is the fabric still on the chair?" The remark reflects how the concrete surface has a tactile feel, defined fabric appearance, transfer of patterns and even colored fibres – "this could not possibly be concrete". Another observer is intrigued: "I looked at the chair and in my head I knew it was concrete and couldn't understand that it wasn't fabric. Then when I sat on it, in my head I knew it was concrete and would be hard but I was still surprised to find that the chair wasn't as soft as it looked."

While one of the two casts resulted in a functional chair, the other one became an object with only an abstract notion of the functionality of a chair; instead showing, more directly, aspects of materiality and technology (fig6). Several clamps blew out of the fabric form. This lack of constraint to the fabric caused the form to fill more with concrete. When the cast was terminated the bottom was more than ten times thicker than the unfilled top. The fibre reinforced concrete created a paper thin surface at the top; a hollow cardboard feel when tapping on the fragile surface as opposed to the solidity much associated with concrete.

It is the assertion that a surprising encounter with concrete can be a generator of curiosity and discussion. Confusing the senses activate new levels of perception and emotion, besides previous experience and tradition of the observer. The discussions concern the perspectives for using flexible formwork for new types of structures, forms and surfaces.

Figure 1: Fabric formed wall by Kenzo Unno

Figure 2: The author seated in a fabric formed concrete chair

Figure 3: Chair cast in fabric formed concrete

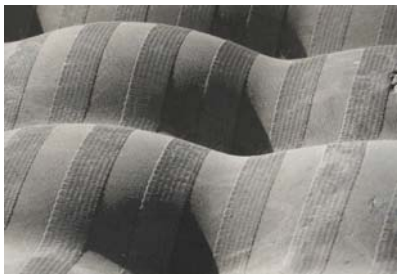

Figure 4: Detail of concrete surface with imprints from the woven fabric pattern of the formwork

Figure 5: Detail of concrete surface showing pattern and fibres from the used upholstery fabric and exposed clamps holes.

Figure 6: Chair cast in fabric formed concrete. The formwork blew while casting.

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