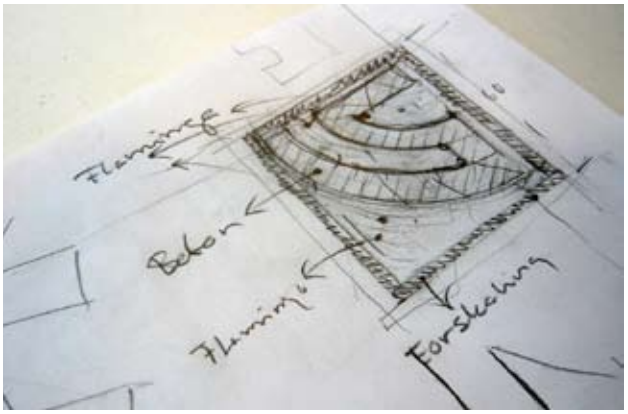
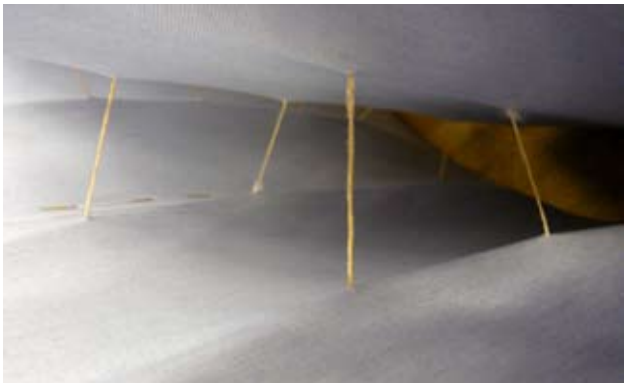
LEARNING BY DOING
BETON AS AN ARCHITECTONIC MATERIAL
WORKSHOP AT THE ROYAL DANISH ACADEMY OF FINE ARTS, SCHOOL OF ARCHITECTURE
FEBRUARY 9-13 2009





LEARNING BY DOING – CONCRETE AS AN ARCHITECTURAL MATERIAL
By Anne-Mette Manelius

How to tailor make concrete forms out of flexible materials – and how is flexible formwork challenged and changed by heavt fluid concrete?
This question was the focal point during a week long workshop for 60 first year students at the Royal Danish Art Academy's School of Architecture.

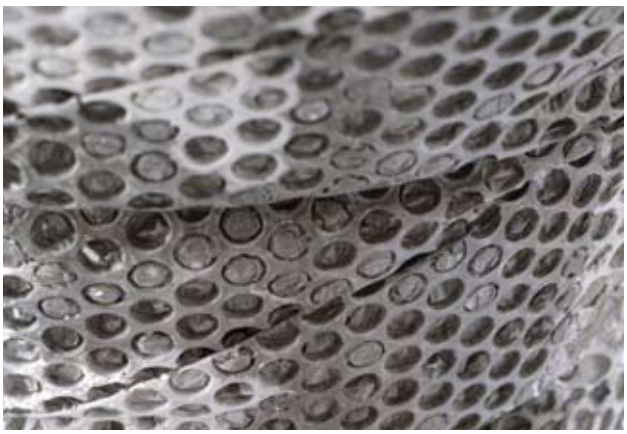
The aim of the five day workshop was to introduce the students to the world's most commonly used building material, concrete – which better way than working hands on.

The assignment was laid out as an experiment in which the students in groups were to construct concrete formwork exploiting textiles and/or thin, bendable plywood – easily manageable into a form of complex geometry. But what happens to the form when filled with concrete wich density is almost two and a half the one of water.
Wooden laths and plywood were available to keep the formwork together.

During the first two afternoons the groups brainstormed and shared their thoughts on fabric forming principles. Without much introduction to references from the fabric formed world the ten groups quickly focused their work.

Little models were constructed and tested with sand and plaster of Paris. This gave a good feeling of what would happen in a larger scale and adjustments of the design were made before building the large formwork.

Overall the experiments investigating structure and surface could be devided into three categories:
>> Concrete shapes textile
>> Combining boards and textiles
>> Free form: textiles and clamps



The object were to be quite small: fitting onto a EUR pallets of 80x120 cm and not heavier than 1-200 litres – within these restrictions a variety of textiles were used spanding from grandma's curtains to heavy sheets of woven polypropylene, socalled geotextiles.

During the week the rest of the class of 200 students studied brick work, timber and steel. These other workshops more than filled the woodshop facilities at the Academy.
We were fortunate to use facilities at the technical university faculty of building engineering. This again had the benefit to show and use a concrete work facility that is long missed at the academy!
Forming principles and materials were cast in self compacting concrete in little rigid forms.

On Friday morning the formworks were moved and placed outdoors on the quay on the academy campus. Most of the groups had expected to fill the forms by hand and buckets – 1.5 m3 ready mixed concrete came by truck of a size that quieted the crowd.

The sturdy concrete handler knew how to work the conveyor belt and group by group directed and filled their form in close cooperation with Mr Concrete.
We cut a slit in the buttom of a bucket and created a funnel for acurate pouring.

The weather was sunny and 0 deggrees Celcius. All the casts were wrapped in thermal mats to avoid the concrete to freeze before hardening. One form couldn't cope with the pressure. Grandma's curtains tore and concrete flooded the quay.

Vibrator sticks were used to compact the concrete. Additionally, the fabrics were vibrated – massaged is a better word - from the outside by hand. Inspired by japanese fabric formwork architect and builder Kenzo Unno, punching sticks were made by padded wooden laths.
The permeability of the fabrics allows eccess air and water to filter through the formwork.

The physical result of the workshop is a number of concrete structures left behind on the quay. Each has its individual appearance and bear witness to the fluid origin of concrete, and to the variety of structural possibilities of concrete cast in flexible formwork.
The used materials have left traces in the concrete surface – plastic bobble wrap, the structure from the woven textiles as well as dye transfered to the concrete.

A few days work has produced interesting forming principles worth exporing further. Fortunately the young architecture students have many years ahead tp experiment.

The workshop was planned and carried out by researchers at the Institute of Architectural Technology at the Royal Danish Academy of Fine Arts, School of Architecture in February 2009.

The workshop recieved kind sponsorships from concrete company Unicon and geotextile company Bluepack.

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/ E. Pihl & Søn
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Restaurant & café