TECTONICS IN BUILDING CULTURE

CONCRETUM

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CONTENTS

WOOD | NORWAY | 2007

BRICKWORK | THE NETHERLANDS | 2008

STONE | IRELAND | 2009

CONCRETE | BORNHOLM | DENMARK | 2010

INTRODUCTION

By Peter Sørensen and Urs Meister

'Tectonics in building culture' is a field of research, where tectonic aspects of a selected material related to local building culture and innovation is studied. Three different basic building materials in three different European countries have been studied: 'Wood' in Norway 2007, 'Brickwork' in the Netherlands 2008, 'Textile Blocks' in Ireland 2009. And now 'Concretum', Denmark 2010. The Erasmus workshops are organized in collaboration between the hosting universities and the coordinating University of Liechtenstein. The work is supported by the European Community.

Tectonic studies and material experiments are based on a succession of theoretical and practical group works. Within a well-defined space and time, the workshops confront students and teachers from different regions of Europe with physical laws of a seemingly well-known material. Preliminary studies and excursions provide the related cultural background for materiality and tectonics in highlights of traditional and contemporary architecture. The workshops give an intensive, academic, cross-cultural experience that breaks down barriers between idea, thinking and making, and it ends up with full-scale objects for local benefit.

The Erasmus IP 2010 workshop took place in August at locations related to The Danish Design School in Nexø, Bornholm. The program aimed to study concrete's unseen potentials, primarily by use of textile as a most flexible form material. Form investigations were made in gypsum and details were tried in full-scale concrete, before four 1:1 full-scale projects were realized on site; a bridge, a wall, sitting sculptures and store places for firewood. Social activities, visits to culture and architecture on Bornholm and excursions to works by Utzon, Lundgaard & Tranberg and BIG Architects were an integrated part of the program for 47 very dedicated students and teachers.

The work was supported by the European Community, especially the National Agency of Liechtenstein, The Royal Danish Academy of Fine Arts School of Architecture and the universities involved. The Danish Design School, Bornholm, Møbelfabrikken in Nexø and NCC Beton Bornholm have acted as location sponsors.

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Bagsværd Church, Copenhagen
Jørn Utzon, 1973-1976

STONE IN MOTION

By Urs Meister

Forces and Reaction

Concrete is heavy, massive and difficult to work with. Once set into shape, it is one of the most erratic building materials. However, despite of its hermetic appearance, it offers a manufacturing process that contains a series of exceedingly stimulating opposites and a whole bandwidth of potentials to research on. Using the limitations of textile formwork, our workshop focussed on a crucial point: the close relation between the concrete mass that is poured into the soft and flexible fabric mould and the direct and inevitable reaction of forces. The weight of the material mass leads to form.

The Swiss structural engineer Heinz Isler explored this phenomenon in the 1950s in his research about shell constructions. Observing draped frozen linen outside his house in the winter, he started to work with hanging models and thereby perfected his design of almost immaterial concrete structures. In the previous century Antoni Gaudí had worked with his famous string models in the design for the vaults of the church of the Sagrada Familia. But physical models were even used before as an essential part of the ancient techniques of vault modelling in the building process of domes in the Gothic period.

Heinz Isler, hanging models and draped fabrics, sprayed with water and frozen lead to almost immaterial shell structures.

Bauhütte

The vaults of these Gothic churches have been erected by ‘Bauhütten’ – conspirative groups of craftsmen that lived close together on the building site. This peculiar society of craftsmen working on a project might be a good metaphor for the kind of design and building community we try to cultivate in the Erasmus Intensive Programmes of the Tectonics series. All workshop sites were located far away from any urban distraction. This year, being literally out on an island in the Baltic Sea, supported the almost monastic character of intensive work. Also, we concentrated on real and built results in full scale – another key word in our tectonic research.
All the concrete objects reached a dimension that relates to our bodies,a physical appearance that cannot be achieved in scaled models. This has, beneath didactic aspects, the effect that we could give something to the people and the place where we worked – a fundamental and noble role of architecture. Part of the concrete objects now serve as outdoor furniture and firewood shelters on the campus of the design school, others serve as an overpass crossing a small watercourse and as a sculptural wall in the courtyard of the Møbelfabrikken.

Stone in Motion

Looking for the structural essence of ‘stone in motion’, as Pier Luigi Nervi used to call the building material that he was obsessed with all his life, we tried to focus on the tension between its inherent materiality and the particular properties of the mould. Using fabric not only to achieve thrilling surfaces and textures but as a vital form generator opened up the field of researching concrete as a universal mass. Concrete has a million faces and tends to cling on the aspects of its moulding formwork in a passive way, easily losing its characterising properties. Textile formwork gave us the potential to work on the reliance between fluid and solid and served as a tool to evoke and finally express this natural dependence without forgetting the capacities of concrete to serve very basic needs. Nervi, who built a concrete sailing boat for himself with a hull thin like an egg shell, found that it sailed perfectly, was stiff, watertight and needed no maintenance. “Concrete,” he said, “is a living creature which can adapt itself to any form, any need, any stress.”

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Antoni Gaudi's string models, researching the perfect distribution of forces for the domes of the Sagrada Familia.

"La Giuseppa", Nervi's concrete boat

Unité d'Habitation, Nantes
Le Corbusier, 1953-1955

CONCRETUM – SEEN AND UNSEEN

By Peter Sørensen

Concrete is a universal building material, which can take many forms – 'the material of metamorphoses' – as written by Ola Wedebrunn (Betong, 1996):

'Concrete is the material of change, of metamorphosis. Like a chameleon it appears in different disguises and in different contexts. The assessments of this substance have changed over the years. In the early modern period, it was considered to be a miracle material, which would solve all the problems of the building industry. Later it was seen as representing the inhuman scale of large building projects and sharply criticized. In many ways concrete is a universal material. It can take any form and shape, and it is made up of raw materials, which are so commonly found that they can be extracted and produced virtually anywhere. Still, concrete represents particular values that are hard to define but, at the same time, seem to be associated with modernity in architecture by many.' … 'Concrete is predominant in our culture. Hence it is important that we appreciate this material and that we learn to understand and assess both the technology and the means of expression that go with it.'

The term 'Concretum' refers to the 'forgotten' Roman method of building, using the volcanic earth material 'pozzolan' as a hardening mortar, tying stone and bricks together. Roman pozzolan concretum was used unreinforced for walls, vaults and dome constructions. In many ways it was a coherent building method, superior to stacked walls and arches of brick and lime in terms of formability, strength and span. The still standing aqueducts and the grand dome of Pantheon in Rome, built around year 120, give evidence of this material's potential and the art of engineering mastered by the Romans. A technology which was forgotten with the fall of the Roman Empire and was unrivalled until the nineteenth century.

Concrete is reinvented in the first half of the 19th century, re-establishing the properties of volcanic ashes by burning earth material, lime and clay to cement. It was given the name Portland cement after the concrete's similarity to Portland stone. Concrete's ability to harden under water was first used for building lighthouses along the English coast. After reinforced concrete was invented in France, this new construction material emerged and was used for building infrastructure, bridges and industrial buildings. It took much longer before it became an attractive material in architecture as a serious alternative to traditional building materials.

One of the pioneers, Auguste Perret (1874–1954), invented buildings with concrete constructions. In the beginning the visible concrete surface was decorated by glazed ceramic elements (rue Franklin, 1905). Later he refined the surface of the concrete by elaborating the handling of the concrete mixture, form details, profiles and surfaces. In rebuilding Le Havre after a totally new city plan (1946–1965) he used concrete as a universal building material for all buildings, domestic buildings as well as churches. 'My concrete is more beautiful than the stone: I work at it, I chisel it. Concrete is a stone which comes into existence.' (Auguste Perret, Église St-Joseph 1951–1959)

Le Corbusier introduced reinforced concrete as modernism's new material, and with his building and writings he provided the theoretical foundation for a new architecture of columns, open plans and facades. At first with a characteristic use of white cubist surfaces (Villa Savoye), later with untreated cast-on-site structures marked by the form's material, texture and imprint on the raw concrete (Unité d'Habitation, Nantes 1953–1955).

Concrete's actual breakthrough as a general building material in Denmark only happens when the house building takes off again after World War II. The aim is to rationalize the traditional building process of brick and wood, transferring the execution from the construction site to the factory with the use of prefab concrete elements. Theoretically and technologically Denmark pioneers with its prefab construction until the economy stagnates during the 1970s. This is the background for the extensive use of concrete elements in the Danish building industry. Concrete and concrete elements are used in many different ways, with more or less clarity and tectonic significance. Concrete may serve exclusively as load-bearing construction with no visible effect on the form or texture of the building. Or the presence of concrete may be perceived as crucial to the building's idiom and surface texture. Lastly, concrete elements and surfaces may be an integral part of the building's architectural statement.

Via his architecture Jørn Utzon (1918–2008) has made an impact with his deliberate tectonic use of cast-on-site concrete in combination with juxtaposed prefab elements. The 'plinth' of the Opera House in Sydney is supported by beams which are shaped and cast on site, whereas the large 'sails' are made from joined, stereometrically modulated elements. His church in Bagsværd is built with a similar combination of the two techniques – elements in the shape of frames and fillings form the galleries and support the transverse, cloudlike vaults, which are cast on site as thin, reinforced shells with visible imprints from the formwork.

Église St. Joseph, Le Havre
Auguste Perret, 1951-1959

VM Housing, Copenhagen
BIG, 2005

Bagsværd Church, Copenhagen
Jørn Utzon, 1973-1976

SEB Bank, Copenhagen
Lundgaard & Tranberg, 2011

Bagsværd Church, Copenhagen
Jørn Utzon, 1973-1976

Lundgaard & Tranberg Architects have used concrete innovatively in their buildings, both in terms of structure, space, texture and process. The recently completed SEB Bank Headquarters (2011) consists of nine towering silos, which constitute the core and support the thin, organic decks of the two buildings. The towers are cast on site in sliding formwork in an uninterrupted casting process. The concrete is carefully treated as part of the interior surfaces, which vary from grey cast concrete over white poured cement to polished concrete, revealing the granite stones. Space and surfaces continue out in the terraced landscape park.

BIG, Bjarke Ingels Group's, projects in Copenhagen's Ørestad district represent a creative but more pragmatic attitude to building in concrete. The VM project's structural principle is based on standard load-bearing concrete walls and non-bearing lightweight facades. The V-building has an inside common corridor space that gives access to apartments with one, two or three storeys and many different spatial variables.

The three mentioned architects' projects illustrate different attitudes to the use of concrete in architecture. For BIG's office, the use of standard elements in concrete is a pragmatic way of minimizing costs, a tool to be used for a new conceptual play with variety in space, colour and surface. The concrete in itself is neither visualised in form, elements or surface. L&T Architects think and visualize both the process of building, materiality and details in a straightforward way by using concrete both for structure and surfaces in a simple, but sophisticated play with selected contrasting materials; whereas Utzon's buildings reveal a specific tectonic approach. His architecture both forms and expresses the buildings' structural and complementing elements, and the additive forming principle is supported by the clear expression of surface materialities and the serenity of details.

Peter Sørense, Associate Professor, Architect MAA
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FABRIC FORMWORK

By Anne-Mette Manelius

Sheets of woven textiles can be used as flexible, lightweight formwork for concrete structures. The relevance of developing fabric formwork touches upon two fields of evolution: that of concrete construction, which has continued for millennia, and that of textiles, with an even longer history – recently of an almost revolutionary character.

Concrete is the most widely used building material worldwide. At the same time developments in digital design and engineering tools have changed the way architecture is conceived and calculated. However, methods for constructing concrete structures haven't developed at the same pace; the architectural vocabulary of concrete can be developed with regards to form, structure and surface in order to exploit the potentials of the so-called liquid stone.

Textile technologies have undergone an immense technical development, in which existing, previously crafts-based production techniques are combined with new or alternative material fibers and scales in order to produce flexible, strong and light fabrics with new material properties. As such, textiles are finding their way into construction at different scales. With regards to formwork it could be asserted that the carefully considered combination of textile technologies used as formwork for concrete may participate in unfolding potentials for concrete and extend its existing architectural vocabulary.

There are two technical characteristics about fabrics which are essential when used as concrete formwork. The first technical aspect is that fabrics act in tension under the hydrostatic pressure of wet concrete. This dynamics results in a bulging surface between points of restraint. The deflections are all catenary curves, which indicate that the forces are spread evenly all along the fabric surface. This means that fabric is an effective formwork material in transferring the pressure upon the inside to the entire surface That's why so little fabric can hold heavy amounts of concrete.
The second technical aspect deals with the porosity of woven fabrics. Excess air and water go through the formwork membrane as the concrete is poured – the fabric appears to be sweating – it results in fewer blowholes and a higher level of cement compared to water – the so-called water-cement ratio is low. A smooth, tight concrete surface is desirable because it is stronger and less likely to crack.

A third, formal aspect is the result of the two technical characteristics. The direct formal consequence at stake in fabric forming seems to be the most architecturally intriguing.

Concrete will always show the imprint of the surface structure and connections of the applied formwork material, yet this is particularly expressed using fabrics: the form, size and placement of restraining device, and the detailed weave of the chosen fabric will show on the form and surface of concrete. This reveals the narrative of architecture becoming embedded in concrete.

Stereogenés
With kind assistance of Greek author Iosif Alygizakis I've attempted to coin a word attempting to embrace this duality in, on one side, the experienced, sensed qualities of a cured concrete structure as material and, on the other, those almost metaphysical traces of becoming that may be the most poetic feature of concrete! Stereogenés is Greek. It consists of two words, stereo, solid, and genés, derived from ginomai, procedure of becoming. Cured concrete then is stereogeneous, solid but, as the word indicates, obviously has become so through a number of processes from a liquid state.

These procedures to become happen through chemistry and statics; the chemical processes within the concrete mix when cement reacts to water; and the formwork statics when the form is filled with concrete. Both are results of human actions: the former through the design of the concrete mix; the latter through the design and construction of the formwork tectonics.

Concrete construction can be seen as a series of carefully conceived and executed processes that inform concrete architecture. One can look at the potentials for the future implementation of fabric formwork in several of them, namely in the design and production of fabrics; of 'haute couture' or mass-produced fabric forms or concrete elements.

Concrete is nothing without its process – yet is definitely something during its use, and something more than merely a space-defining structure. The further unfolding of Stereogeneity will attempt to create a holistic view of concrete as both process and material.

Anne-Mette Manelius, Architect, Industrial PhD- student
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FORMWORK CONSTRUCTION

By Daniel Sang-Hoon Lee

The modern construction industry has established methods to build concrete elements with great efficiency and precision through the development of innovative formwork technology. Often the realisation of concrete form is greatly influenced by the formwork construction, and sometimes it is even seen as design restraints. In any concrete project the initially conceived design should take account of the available formwork solution to minimize any design modification at later project phases due to the initial design's impracticality. Thus continuous research and development of formwork technology can free more imaginative concrete forms, and the exploration of the use of fabric formwork for concrete construction has its purpose to find more innovative ways to express the material's aesthetic quality while increasing the construction"s practicality.

Concrete in its initial state is liquid, and not only can it be moulded into various forms but it can also copy the texture of what it is cast against. To express this material quality of concrete conventional rigid formwork has its limitation. On the other hand, flexible fabric formwork can mould concrete into more organic and self-defined forms with a minimum of cost, time and labour compared to formworks made of timber or steel. It is true that fabric formwork requires other supporting elements made of rigid materials to hold the fabric in the right positions, however, as there are more supporting elements, the amount of construction work increases. Therefore, ideally, this should be kept to the minimum.

The fun of using fabric as formwork lies also in choosing the right types. The decision should be made based on a number of factors including the fabric's ability to sustain the weight of poured concrete, colour and texture of fabric (as they will be imprinted onto the concrete), pore sizes (this governs the mechanical properties of concrete such as the durability and strength; for example, with the pore sizes being too large, the cement particles will escape with the excess water in the mix and in fact reduce the quality of concrete. Thus it is important to choose a fabric with the right permeability (in order to filter out only the excess water) and stiffness.

Stiffness is an important characteristic of fabric to consider in the formwork construction. Often the use of stiff fabric causes excessive creases and folds, which may later be trapped between cast concrete, and these become impossible to remove. However, if the fabric is too flexible, it will deform too much under the weight of the concrete, and the geometry of the cast form would be different from what was initially intended. In such cases the fabric could be further tensioned to overcome the excessive deformation.

Fabric formwork has both aesthetical (organic, flexibility, texture and colour) and practical (light, affordable, compact and durable) merits, and there are an increasing number of global interests. Yet for its future growth it is considered that more commercially driven developments are required at this time, and it is important to develop the fabric formwork technology to the level where it can completely duplicate the conventional concrete structures cast with the rigid moulds. With extensive research and development it has the potential to be used as commonly as steel, timber and other formwork materials.

Daniel Sang-Hong Lee, Assistant Professor, PhD, Civil Engineer
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PROCESS

FABRIC EXPLORED

By Anne-Mette Manelius

Four concrete pieces in the Bornholm town of Nexø show potentials of fabric formwork. Each piece was designed for a specific Nexø location and each formwork structure explores a fabric property in a different way leading to concrete structure that could not have been cast in any other material than fabric.

TENSIONED FABRIC (ELEMENTS)

One workshop group produced four familiar but unique concrete shells to function as sculptural furniture units for the garden of the design school. Double curved elements share matching curved geometric shapes along the edges, which allow students to position elements anew and create variations of a sturdy furniture topology. The formwork for the shells consists of fabric stretched out between sides of a plywood frame with curved edges easily cut and in 2D.

EMBRACING (SHELTER)

One workshop group created a simple and effective formwork solution for a sculptural wood shelter for the outdoor kilns at the design school. Fabric acts as an embracing agent – a formwork jacket is closed loosely around a tight cluster of firewood and concrete filled the gap between wood and fabric to create a tubular container fitted perfectly to the intended inhabitant.

EMBRACED (WALL)

A curved wall was produced on site at Møbelfabrikken in fabric restrained by rows of reinforcement iron connected by steel wire. The structure is tall enough to allow the inhabitants of the hostel and office building to have a coffee break protected from the wind – yet low enough to look over.

The structure presented some challenges: How to finish the pour when the formwork can be folded – and how to scale findings from previous test pours?

The structure revealed a fragile part of the formwork technology: When the concrete is compacted and has set it will be damaged from further vibration. Traditional rigid formwork protects the vulnerable, wet concrete here – and flexible formwork should be left alone.

DESIGN (BRIDGE)

The design of a bridge or passage across a below-ground stream was initiated by playing with fabric and plaster to create beautiful and statically effective, double-curved, tensioned structures. The diagonal shape opened up alternative ways of designing the passage itself, and the final piece was cast on site with an intricate design for stripping the supporting formwork afterwards. The final, twisted bridge was cast in a combination of wood and a tarp membrane.

FREEDOM WITHIN THE MOULD

By Machiel Spaan

A mould can be made for every shape. You can make the inverse shape of any object if you have the right knowledge, materials and tools. Making the right mould was not the objective of the Concretum workshop. The formal design did not determine the mould. Rather, it was the material of the mould that inspired the design. The interaction between mould and design can thus play out at different levels. The relation between shape, power and appearance plays a crucial role here.

The mould is a representation of the product. Hidden in the mould lies the shape of the product. The inner side of the mould must fix the shape of the concrete. During the workshop participants considered both the shape and its inverse shape. The mould is a design tool and enables the designer to reflect on the tectonics of his design. By physically making the mould, the designer is aware not only of the size and scale of the object but also of the complexity and the weight of the form. The idea is set in the size. Design themes result from experimentation with the textile mould: the double-curved surface (bridge), the relation between mould and shape (wooden boxes), the connecting of a module (lounge elements), and the undulating surface (wall).

The mould is the inverse shape not just in the formal sense. Structurally too, the mould is the opposite of the eventual object. The dry concrete and the steel engage in an interplay of forces, of tension and compression. As long as the concrete is still wet, the mould can absorb all forces. All the forces want to escape from the object as the concrete is being poured. The soft concrete wants to flow everywhere. Once dry, the object contains all the forces. Textile possesses interesting properties. In contrast to many materials that are used to make moulds, textile is not stiff but flexible. Accordingly, totally different shapes can be created. In addition, a textile mould can set up an interesting play of forces. Textile ‘gives’ under the weight of the concrete and dictates the shape and texture of the product in its own unique way. Because of this, a less fixed and more dynamic contact with the shape is possible.

The soft concrete adopts the texture of the textile. This texture is more than an imprint of the surface of the mould. You can actually read the forces in the texture. The 'appearance' of the concrete is determined not only by the imprint of the mould but equally by the visible play of forces: the smoothness, the imprints of the seams of the mould, the bubble that couldn't escape, the bulging of a surface, and the folds in the fabric. Building at scale 1:1 means that the makers become aware of the thickness of the seam and of the edge. Concealed behind every line is a whole process of designing, making and building. The edge and the seam are no longer lines but surfaces that also have a texture and extend around the corner.

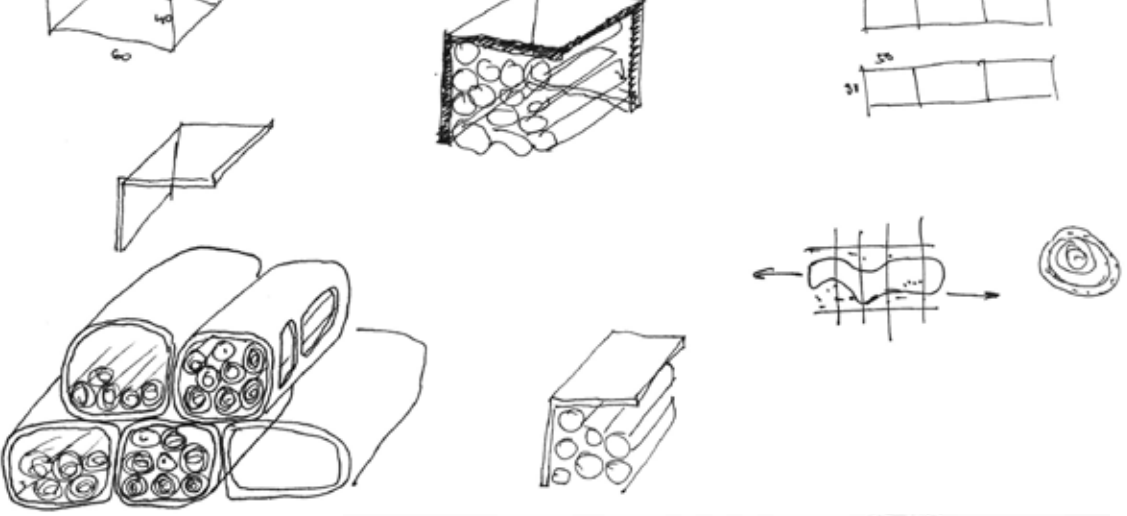
Coincidences such as the stretching, folding or creasing become part of the design. It is a matter of varying with the interplay of forces and allowing these to find their expression in the eventual shape, without actually dictating the exact shape in advance. Repetition, experience and intuition teach the maker what should and should not be fixed. The textile stimulates this testing and thinking about shapes, forces and appearances. In the end, every object divulges how its mould is made through its shape, seams, textures and edges.

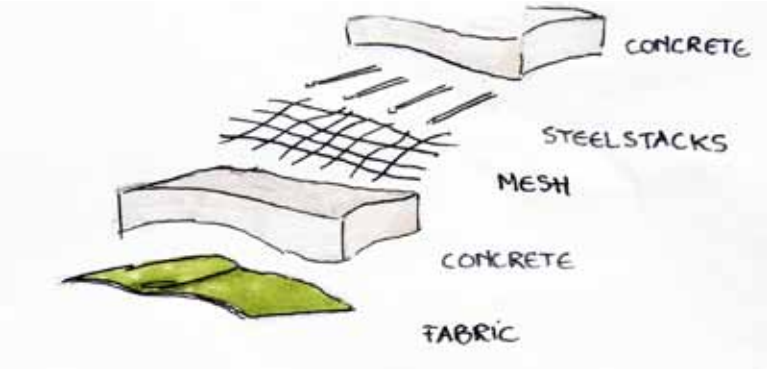
When coincidence is admitted and freedom is pursued in a controlled manner, exciting and inventive experiments are within reach.

Machiel Spaan, Architect MA. Head of master program,
Amsterdam Academy of Architecture

GYPSUM

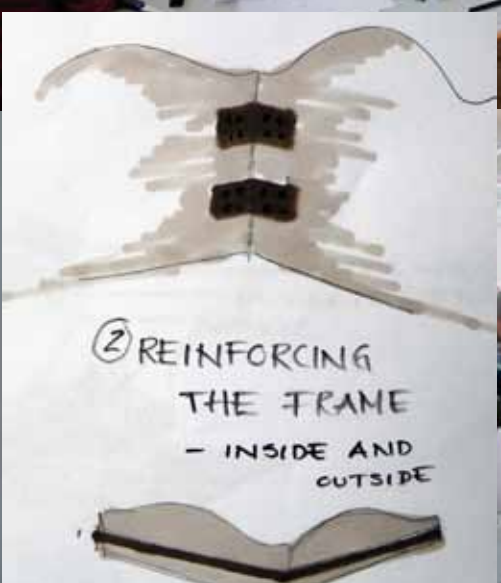
Confrontation – group work, a few simple materials and tools – why, what, how to do? Enter a new world of materiality, forming with fabric, gypsum and water. Use your hands, feel the mixture, pour into form, observe what the weight does to the fabric, and follow the magic transition from fluid to fixed form. During the short time of change it is still soft, warm and formable, then hardening until setting and getting cold, firm and brittle. Now the imprint has taken over the ability to keep itself in form. A new experiment can be performed for a short time based on the first experience. The gypsum models are inspiring and challenging for the next step. Except in time and scale, there are close relationships to forming in concrete.





SKETCHING

Four places and spaces are presented – ideas and concepts are to be created. Sketching and modelling, investigating the site, purpose and function. Illustrating and communicating ideas in models and drawings and in presentations on paper and in PowerPoints. 'Kill your darlings', yes, but individuality and diversity are fruitful concepts in creative teamwork. Eight groups make their projects presentations and are merged into four with selected projects.


2 REINFORCING
THE FRAME
– INSIDE AND
OUTSIDE

PROTOTYPES

The real building material has come, dry concrete in bags, wood laths, plywood, steel rods and wire mesh. The workshop changes character. Each group is focusing, coming from several possibilities to the trying out and making of one prototype. The groups are gaining important experience with the materials and process of building in 1:1. Notes and photos are taken, process documentation is prepared. Projects and prototypes are presented and evaluated on the sites. Getting local approval for the realizing of each of the four projects is a turning point for the next step.

FORMWORK

Serious work is starting up. Clearing and simplifying the project down to realities. What is the amount and weight of concrete, what materials and tools are needed. Storyboards are made in order to check all steps in the process. The working with foundations, formwork and fabric details and reinforcement is carried out in the workshop and on site. Stability and security from loads and wind forces are checked. The limited time before the pouring of concrete encounters the planned work process. Unforeseen problems will turn up and call for extemporizing and new solutions. Who is doing what, how and when – each student taking responsibility in the group work for finishing in time.

CASTING

Now is the time. Every form is ready in the last minute. The place is cleared. How to pour or get the heavily fluent concrete, conveyed from the large, rotating concrete trunk into the form. Can the form and fabric hold the weight and take the movements, when compacting the slowly moving concrete mixture. How does it react inside with the reinforcement. Adding concrete by hand, compacting and smoothing it out so that water penetrates the fabric, and removing the air bubbles. The hardening process has started, time to stop working on it, stretching out your back. Checking the result, repair where you can and nothing more to do. Now resting and waiting for the concrete to harden and a day off with a free program for individual activities.

DEFORMING

Peeling of ‘the skin’, revealing an unseen form coming into light for the first time, is exciting. Then cleaning up the site and making documentation of the result, what was good and what went wrong. After deforming, inaugurating and celebrating of the result at the four sites with the invited local community and supporters.

LEARNING BY DOING

By Torbjørn Tryti

The society is rapidly changing around us, and with this change new potentials are revealed. There is a broad field of opportunities in the building industry today due to new technologies, materials, production methods and more. To be able to take advantage of these possibilities we need a span of knowledge, from theory to practice. Students of architecture today have a quite different background and knowledge than those of some years ago. They start and finish younger, are now mainly recruited directly from high school, not from other university studies and not from carpentry, bricklaying or other crafts in the building industry. This leads to a material reference that is more and more theoretical. The understanding of materials can only be complete if theory is accompanied by the physical experience of materials. Therefore, experiencing materials in 1:1 should be an important and integrated part of architecture education, or as one student of mine replied when I told him it was a bad idea to cut wood like that; "I know, but I need to feel it myself." Without experiences with real materials, in real life, how can we plan, design and think construction and create architecture?

What happens when you ask students of architecture to investigate and study one specific material – in a hands-on process, instead of the abstract process they usually apply in their design process? What happens when we investigate the material as it is, not a representative of the material, nor in scale or form? – They become creative, they seem open-minded and investigate at a very fruitful basic level. These basic investigations are important, it seems to be easier to experiment, test and study when it is a material that is the object of study and not a task based on a defined function. It seems like the strict internal control designers often operate under is easier to escape when the 'program' is a material and not a function. We experience that the study can very well be only the material itself; – try to join it, stack it, split, deform, – investigate span, pressure or stretch, – react to a site with the material or construct a structure to the limit of the material proprieties. The possibilities are close to endless.

A tectonic investigation can be much more complex than this, but it might be that the simpler the starting point, the more rewarding and interesting processes come out of it. In various wood workshops in my PhD project, at the Erasmus IP workshops, in both Ireland and especially at Bornholm, we observe that when parameters like site and function are introduced, the students stop much of their tectonic studies and turn their focus (unconsciously) into being responsible architects; they want to solve the problem or task given. Focus turns from material investigations into a concern for the users and the function. This is something one should be conscious about when planning and arranging workshops and courses, but we see that through tectonic studies the students get interested in the construing of architecture, not only the programming of architecture.

The method of tectonic investigations through material studies can be a powerful tool in architectural education. We need to think tectonics, the students need to learn materials by experience, construing and thinking architecture hands on, in 1:1. The task is then to; establishing learning situations where basic and bodily investigation and understanding of a specific building material is possible. Through this we will find inspiration, insight and new understanding that can have importance in the development of architecture and architects, this as a crucial supplement to the architectural practice and education of today.

Torbjørn Tryti, Architect MNAL, PhD student
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WALL

SHELTER

BRIDGE

CONCRETUM BORNHOLM 2010

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Mette Berg
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Tuva Skaret
Torbjørn Tryti
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UNIVERSITY COLLEGE DUBLIN SCHOOL OF ARCHITECTURE
Ciaran Conlon
Patrick Phelan
Clare Mc Menamin
Luke O'Callaghan
David Healy
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PROGRAMME

DAY 1 TUESDAY 17.08.2010
Copenhagen
Arrival and accommodation
Meeting at RDA School of Architecture, Holmen
Welcome, introduction to students and program
Reception and Danish "smørrebrød" bar
Copenhagen group tour and dinner

DAY 2 WEDNESDAY 18.08.2010
Copenhagen, Sweden, Bornholm
Excursion to recent works by Utzon, Lundgaard & Tranberg and BIG Architects (Bagsværd Kirke, Paustian, SEB-Bank, Tietgenkollegiet, VM-huset and Bjerget)
Bus across Sweden, ferryboat to Bornholm and bus to Nexø.
Welcome dinner and accommodation at Møbelfabrikken

DAY 3 THURSDAY 19.08.2010
Gypsum workshop
Introduction to workshops at "Glas og Keramik skolen" Nexø
Gypsum workshop, instructions to materials, tools and processes
Fabric and gypsum model experiments, eight student groups
Group presentations
Danish dinner

DAY 4 FRIDAY 20.08.2010
Gypsum workshop
Introduction to competition, four sites and four groups
Group work, gypsum models and process drawings
Idea project proposals, presentation and critics
Belgian Dinner

DAY 5 SATURDAY 21.08.2010
Evaluation and excursion
Documentation and presentation of idea projects
Bus excursion Allinge, Svaneke, Gudhjem
Bornholms Kunstmuseum, Østerlars Rundkirke
Norwegian dinner




DAY 6 SUNDAY 22.08.2010

Concrete prototype
Introduction to materials and tools
Concrete, fabric formwork and details
Concrete mixing and pouring
Lecture on material and statics (DL)
Liechtenstein dinner

DAY 7 MONDAY 23.08.2010

Prototype and project
Deforming of prototype models
Presentation of models and projects on site
Approval of projects on sites
Irish Dinner

DAY 8 TUESDAY 24.08.2010

Full-scale formwork
Process planning and organisation
Form production indoors and on site
Coordinating and security meeting
Finishing formwork and details
Dutch dinner

DAY 9 WEDNESDAY 25.08.2010

Concrete casting
Concrete delivering, casting and pouring at four sites
After works, repairing and cleaning
Registration and digital documentation
Local press visit
Catalan dinner

DAY 10 THURSDAY 26.08.2010

Free day program
Slovenian dinner

DAY 11 FRIDAY 27.08.2010

Deforming and documentation
Presentation and evaluation
Reception with guests at Glas og Keramikskolen
Barbecue and goodbye party

DAY 12 SATURDAY 28.08.2010

Departure day
Breakfast and cleaning up
Bus to Rønne and goodbye

CONCRETUM | TECTONICS IN BUILDING STRUCTURE

Editor: Kunstakademiets Arkitektskole | Peter Sørensen
Graphic design and photo | Jens V. Nielsen
Photos | Participating students and teachers
Translation | Cornelius Holck Colding
Print: Vilhelm Jensen & Partners

The work was supported by the European Community, especially the National Agency of Liechtenstein, Kunstakademiets Arkitektskole and the universities involved.

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School of Architecture

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Bildung und Kultur
Programm für lebenslanges Lernen