

# FABRIC-FORMED CONCRETE WORKSHOP

in collaboration with Southeast University (China),  
The Royal Danish Academy of Fine Arts School of Architecture, Design and Conservation (Denmark)

## The Background

Fabric (Flexible) forming as a concrete casting method has been known to construction industry for more than a century. One of the earliest patent on fabric forming method can date back to 1899, and since then, design applications and technological investigations have seen continual development; especially through internationally renowned figures such as Jame Waller, Felix Candela, Miguel Fisac and Mark West. In 2008, the first international conference on fabric formwork was held by The Centre for Architectural Structures and Technology (C.A.S.T.), led by Professor Mark West at the University of Manitoba, Canada. At this very event, *The International Society of Flexible Forming* was founded. Following the first conference in Canada, the Second and the Third International Conference on Flexible Formwork took place at the University of Bath, U.K. (organised by Dr. John Orr) in 2012, and Amsterdam, Netherlands in 2015 respectively. The conferences presented inspiring work and visions of international participants from various disciplines; and the range of discussions is often in a wide scale from *computational* form finding methods, through understanding *environmental, structural and construction* aspects of fabric formed elements, to *aesthetic* qualities of the final built forms. Thus, it has been discussed for the field of fabric forming (as in many other fields), that possible technological advancements must be sought through more successful *cross-disciplinary contexts*.

## The Workshop

The current workshop has its aim at international cross-disciplinary development for *Technological advancement in concrete construction using fabric formwork*. Thus, the workshop should provide the necessary platform for researchers, educators and students to join and collaborate for design research.

The main agenda of the workshop is to explore the possible design and construction methods for more dynamic concrete form using fabric formwork, in respect of conventional concrete construction methods. The agenda is based on the understanding that the known advantages of fabric formwork, which enables more affordable construction for complex materially efficient forms (related to allocation of materials where only necessary with respect to resisting fundamental loads), must be better informed and more actively considered for future development in concrete research.

It is a hands-on concrete workshop, which starts from smaller prototypes; not bigger than 1m by 1m in the first week. In the second week the students will use the learned skills to construct full scale elements (approx. 2m by 2m walls and/or columns), which will be tested in the structural laboratory at the civil engineering department of Southeast University.

The workshop has invited a number of international scholars in the field from *Denmark, U.K., Australia and Canada*. The students will be given a series of keynote lectures, and hands-on tutorials throughout the workshop. There is a plan for book publication of the workshop which has its aim to promote the innovative and inspiring methods of casting concrete, and also the international collaboration for education.

# The Programme - Week 1

## 27th June

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09.00 - 09.45	Welcome and Introduction
10.00 - 10.45	Key Note Lecture 1 Anne-Mette Manelius & Daniel S-H Lee
10.45 - 11.00	Q & A
11.00 - 11.45	Key Note Lecture 2 Ronnie Araya
11.45 - 12.00	Q & A
12.30 - 13.30	Lunch
13.45 - 14.45	Demonstration by Ronnie Araya
14.15 - 14.45	Q&A
15.00 -	Brief/ Student Work Starts

## 28th June

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09.00 - 09.45	Key Note Lecture 1 John Orr
09.45 - 10.00	Q & A
11.00 - 11.45	Key Note Lecture 2 Keith Milne
11.45 - 12.00	Q & A
12.30 - 13.30	Lunch
13.45 - 14.45	Demonstration by Keith Milne
14.15 - 14.45	Q&A
15.00 -	Brief/ Student Work Starts

## 29th June

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09.00 - 09.45	Key Note Lecture 1 Gabriel Tang
09.45 - 10.00	Q & A
11.00 - 11.45	Key Note Lecture 2 He Xiaoyuan
11.45 - 12.00	Q & A
12.30 - 13.30	Lunch
13.30 -	Student Work

## 30th June

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09.00 - 09.45	Key Note Lecture 1 Remo Predreschi
09.45 - 10.00	Q & A
11.00 - 11.45	Key Note Lecture 2 Yi-Min (Mike) Xie
11.45 - 12.00	Q & A
12.30 - 13.30	Lunch
13.30 -	Student Work

## 1st July

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Whole Day Student Work

## 2nd July

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09.00 - 13.30	Student Work and Presentation Preparation
13.30 -	Presentation



# The Programme - Week 2

## 4th July

09.00 - 09.30  
09.30 -

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Brief  
Student Work Starts - DESIGN DAY

## 5th July

09.00 - 13.30  
13.30 -

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Student Work Starts - DESIGN DAY  
Construction Starts

## 6th July

09.00 -

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Construction Day

## 7th July

09.00 -

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Construction Day

## 8th July

09.00 -

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Construction Day/ FINALISE

## 9th July

09.00 - 13.30  
13.30 -

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Presentation Preparation  
Presentation





# Programme Description

## *Week 1: Key Note Lectures and Prototype Construction*

The key note lectures cover various topics on the designs, developments and applications of fabric formed concrete. The lectures also open discussions on how the flexible casting technology has affected the researchers and practitioners' views on the existing technology, design directions, and the material's physical and visual characteristics.

The key note lectures from Prof. Yie-Min (Mike) Xie (RMIT), and Prof. He Xiaoyuan (SEU) cover computational optimisation in concrete design and digital image correlation as digital concrete testing methods. The intentions of the lectures are to inform the participants two examples of computational design method and experiment method in current concrete research; which are also applied in the current workshop.

After the first two sets of lectures, Keith Milne and Ronnie Araya give practical demonstrations for simple prototype construction; the method of controlling/tensioning fabric over supporting structural elements, mixing and handling plaster and concrete pastes during construction, and etc. In the current workshop the students are encouraged to produce concrete mix themselves from the provided raw materials.

Following the demonstrations by the tutors, the students start with their own design of columns, panels and walls in size no larger than 1m by 1m. There will be temporary steel frames prepared (3 no. of 2m high and 3m long), where the students can hang their panels for presentation if necessary. Through the exercise the students are expected to develop their own understanding and necessary skills for design and construction of concrete elements using flexible formwork.

The students present their work on Saturday after lunch, and the presentation must include clear descriptions of their design ideas including source of design inspirations, construction process, and the outcome. There is no fixed forms of presentation; both digital and physical presentation formats are welcome. The students will also be asked to comment on how they could improve their construction method if further developments take place.

## *Week 2: Further Exploration and Construction of Shear Walls*

The architectural design students are offered to choose; either to continue developing their prototypes from Week 1, or to move on to further collaboration with engineering students for construction of form optimised shear walls (with the ultimate load of 100 kN).

For shear wall constructions, the students will further explore and develop their skills from Week 1 in constructing 2m by 2m concrete shear walls; with the given context for designing for earthquake resistant buildings.

It has been proposed to build 3 shear walls; one to two of the walls will be designed and developed by Southeast University, University of Edinburgh and The Royal Danish Academy in prior to the workshop; and minimum one shear wall will be designed and constructed by the students at the workshop. The reinforcement details are designed by Southeast University. The presentation format is as same as Week 1.