

# CONCRETE DESIGN BOOK ON ENERGY 2011 2012

edited by bureaubakker  
for: Cement&BetonCentrum, FEBELCEM, Cement Manufacturers Ireland, TCMA and VDZ

[www.concretedesigncompetition.com](http://www.concretedesigncompetition.com)

## THE CONCRETE DESIGN COMPETITION

The Concrete Design Competition is a biennial ideas and design competition for students in architecture, engineering, design and affiliated disciplines. It is organized and funded by a consortium of European cement and concrete associations and open for students subscribed in an educational institute in one of the participating countries.

The Concrete Design Competition aims at promoting innovative design attitudes related to the use of concrete as a material and a technology. It is characterized by its format: each competition cycle is framed by a theme designating a specific property of concrete. Nationally chosen laureates are invited to participate in an international workshop. This workshop continues the investigation of the theme.

The Concrete Design Competition is material based. It focuses design attitudes towards material as a design-leading phenomenon. It does not prescribe 'traditional' design requirements like programme, location or typology. It asks participants to explore and exploit the potential of the material in a design-led environment. They are invited to approach the material from within its own merits and to push its potential to 'realise' developed ideas. It asks to present these ideas through design proposals. Ideas can only show their merits when they are applied. The choice of a design topic or programme is free. It should be chosen such that it presents the participant's ideas as accurately as possible and can range from building details to large structures, landscape projects or building complexes.

The Concrete Design Competition is 'open' for adaptations. Its character offers a platform for material research and design that can either be approached individually as a complete assignment or it can be incorporated within 'host' design and research assignments and thus becoming part of existing curricula.

The Concrete Design Competition is an initiative by a collaboration of European cement and concrete associations. Their aim is to promote innovative design attitudes related to concrete. They recognise that the use of concrete as an architectural medium shows room for improvements and development. They see the material not only as a means to 'solve' formal design ambitions. Material research and understanding will lead to innovative design and create possibilities to surpass existing limitations and visions.

The Concrete Design Competition also recognises the abundant energy, enthusiasm and potential of those studying architecture, engineering and design, the future professionals that will work with concrete. The cement and concrete associations are convinced this competition offers additional expertise alongside the regular education on materials students receive. In order to learn about and understand a material one has to experience and explore its properties, preferably in a design-led environment. This competition including its master class for laureates offers a unique opportunity to be part of future developments and to immerse oneself in conditions where materials are at the core of developments and design.

## ENERGY

**ENERGY** has become a powerful topic in the architectural debate on sustainable building. It is taking a prominent position next to reuse, CO2 emissions, reductions on waste materials and other environmental impacts. Current trends in addressing these issues tend to focus on imposing approaches, in which reducing, minimizing, restricting and preventing seem to be the buzz-words.

This competition seeks to investigate the inherent characteristics of one material, concrete, in relation to **ENERGY**. It asks to evaluate those properties of concrete that make it a relevant and versatile material for 'energy-aware' applications. It aims to fully pursue the potential of core properties like mass, volume, surface textures, mixtures and hybrids, in acting on current needs and ambitions.

The 5th Concrete Design Competition - **ENERGY** stands for a comprehensive strategy to optimize the relations between the built environment and its users. Production and consumption of energy can be dealt with intelligently when taking into account day and lifetime cycles. Storage and distribution needs to be managed with programmatic varieties in mind. Developing built structures that produce energy is part of a more inclusive approach as well.

**ENERGY** signifies a powerful presence in an architectural sense. How buildings activate and facilitate their users; how they project vitality to their surroundings in form and material – simply by how architecture is.

This competition aims to maximise the material's potential in its combined technical, physical and architectural opportunities. Applied mass can be embraced to facilitate 'formal' and expressive desires that so far have suffered in richness through strategies of minimizing. Simultaneously mass can be deployed to offer capacity for harvesting and storing warmth and coolness. Required volumes and structures can extend in meaning and use beyond their original task of facilitating program. Surfaces and structures can both be visually enticing and can be optimized to capture, store and transport energy.

Students are asked to explore and exploit the potential of concrete's properties with respect to any notion on **ENERGY**. These can range from issues of vitality, robustness, dynamic behavior and architectural presence to energy production, storage and consumption. Competition entries need to address technical and functional aspects as well as formal and programmatic ones – ideas need to be tested through design proposals to demonstrate their potential convincingly. They will be reviewed on the combination of inventiveness in addressing the competition's theme and architectural implications.

This competition does not prescribe a specific location or program; participants can choose a context of their own that supports their fascinations and ambitions and that fits an acute presentation of their ideas and solutions. The design proposals may range from objects, furniture and architectural details to housing, landscape interventions, complex buildings, infrastructure and structural systems.

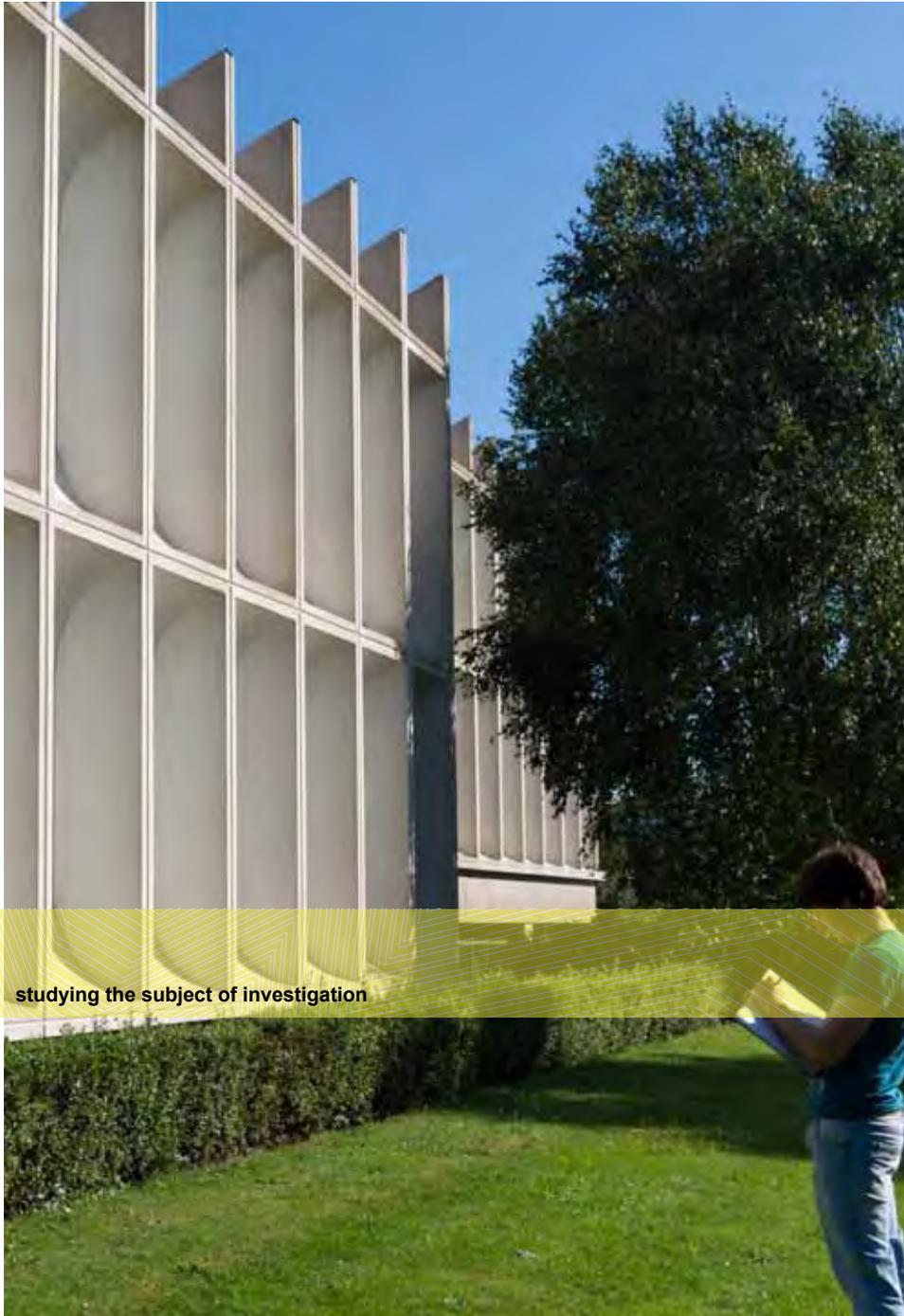
The 5th Concrete Design Competition – **ENERGY** runs in five European countries during the academic year 2011 - 2012. National laureates will be invited to participate in a week long international workshop facilitated by the industry's expertise featuring renowned lecturers and critics, further exploring concrete and **ENERGY**.



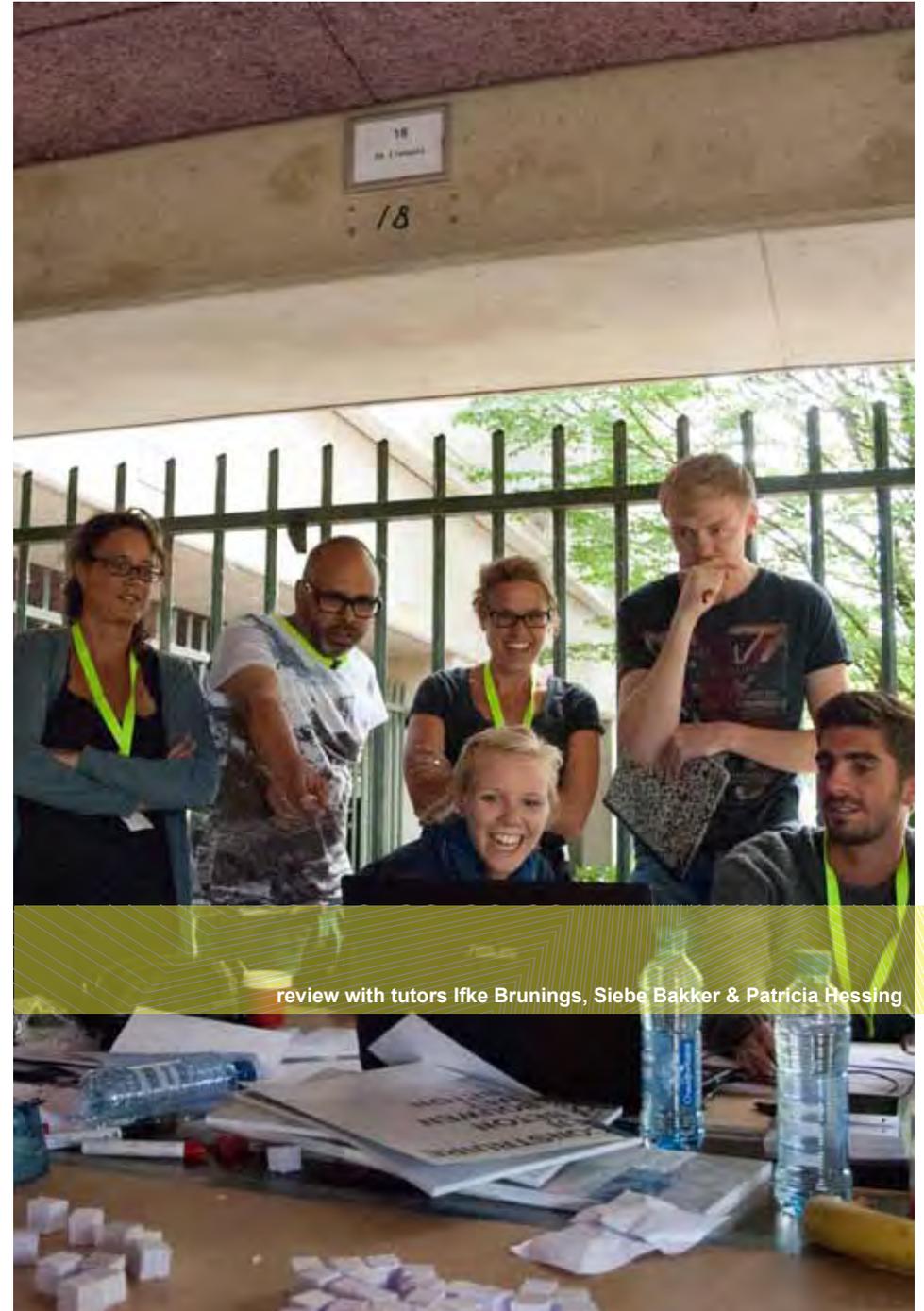
National jury in session



Mark Burry lecturing at kick-off event



studying the subject of investigation



review with tutors Ifke Brunings, Siebe Bakker & Patricia Hessing

## FIRST PRIZE - NL AA123

We bring an ode to two basic values of the Netherlands; wind and concrete.

Over one third of the Dutch surface is conquered on the sea, something with which we became one of the world's authorities on watermanagement. Without the wind however, which is always present on our flat landscape, we would never have managed to do so. The main use is through the use of windmills, still a characteristic sign of the Netherlands.

To be able to build on these lands we call 'polders', endless miles of concrete stakes are necessary for they are very moist grounds. Fertile, but swampy. Even though they are invisible in the landscape, these stakes are the fundament of developing our countryside.

Basically that is the relation between concrete and energy to us; Concrete helps contain the energy gained with the wind. It can structure the lands we win, in our project it can give moral energy to anyone passing by.

To show gratitude to these two invisible companions in our struggle against the sea we designed a piece of land art which will make them visible to the ear and the eye. It's a series of concrete stakes which will not be sunk in the ground any deeper than necessary to keep them up high safely. The inside of these stakes however is the exact same as a pipe organ. Every regular breeze will create a tone, and every different stake will create a different tone, depending on their length of the pipe inside.

Every musical part has different keys and a rhythm, which we transfer to the length of the stake and ~~in~~ distance in between the stakes. What could look like a random composition at first sight will change in a piece of music when one walks or cycles by the stakes in a regular speed. To decide the composition we will translate a theme from the 3th symphony by Bernard Zweers; part 3 called 'On the land'. This symphony is his ode to the Netherlands, in which he tried to create a typical Dutch style of composing.

Marijn Abelman, Robert van Middendorp & Thierry van Til  
ArtEZ Zwolle

## A concrete organ at the shore



NL-jury: 'Unlike the other designs, 'A concrete organ at the shore' interprets the theme of energy in a very abstract yet very tangible way. In an inspiring way it transforms a force of nature that often is regarded as unpleasant – strong winds – into a feast for the eye and ear.'



## HONOURABLE MENTION - DE AC123



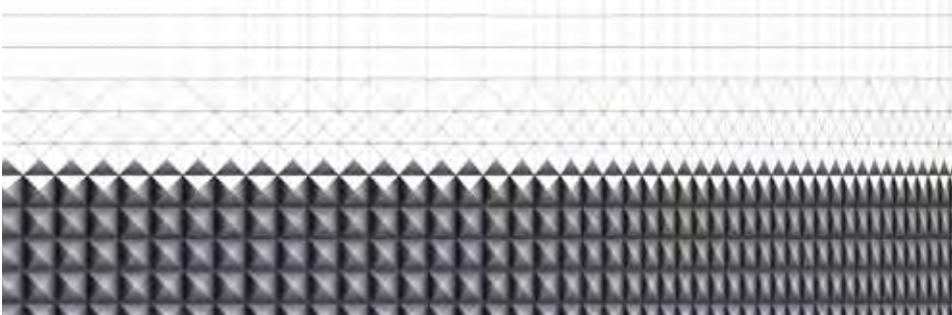
### Concept

Acoustics applied in metropolitan design is the main point of the project. A barrier is built in order to isolate noise. The geometry of the final shape works alongside the concrete itself to ensure the successful isolation of the noise. A metro station would be used as an example of an urban design where the theory would be put into practice.

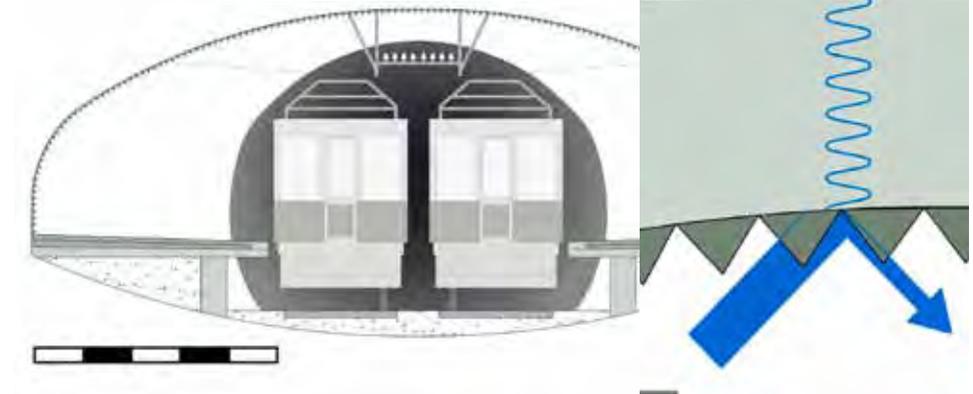
### Material

Cellular concrete is a very light material with an alveolar structure which makes it even light-weighter, but at the same time solid and resistant. Due to these features it works perfectlyly as an acoustic insulator. The concrete avoids the expansion of the noise by absorbing it through the cells. This absorption transforms the sound waves in not audible oscillating waves of energy. These waves are able to traverse small holes. When they hit agents a barrier they go through those little apertures as they curve themselves and then displace in orbits. The aperture works as a nem focal point.

Andrea Escudero Hoelscher & Carlos Garcia Criado  
FH Köln



## Metropolitan Design



DE-jury: 'This work focuses on sound as a constituent component of energy. Architecture is seen in its protective function to increase the well-being of users. By relating sound insulation and room acoustics, an important subject with practical relevance is tackled.'



## INTRODUCTION

Concrete and mortars aren't exactly going through their strongest era. Architects today are now over the hype building with concrete was in the last Century.

So how can we make concrete hot again and still offer "energy-aware" applications? How can we bring concrete back and make it better?

Because of the competition's theme: "concrete and energy" we thought of approaching the task literally. Coming up with ideas on how to apply energy directly to concrete we landed on the concept of Cymatics, and decided to do research on it and put the concrete to test.

## So what is Cymatics?

Roughly, it's the study of visible sound and vibration and its name comes from the Greek word κύμα "wave". Normally the fluid to be tested would sit on a plate, diaphragm or membrane. While vibrated, regions of maximum and minimum displacement are made visible in a thin coating of particles, paste or liquid. Different patterns emerge depending on the frequency of the waves of the vibration applied.

## DOING IT WITH CONCRETE

Concrete is a Non-Newtonian fluid when mixed with water. Its viscosity depends on the shear rate or applied stress and so behaves differently from Newtonian fluids (like water) organizing its particles in different ways. Working with concrete then becomes very interesting combined with Cymatics and reveals its potential to us as we study its possibilities.

During our research we were lucky enough to work with an expert in this field. He is an architect, sound expert, and artist who has been experimenting with paint and Cymatics for three years and making art pieces with this technique. He was of course very interested in trying with concrete. He provided us with the materials and gadgets we needed and guided us during the process. Also, we were very inspired by his work and we learned a lot about the whole science from him.

We used a home-made amplifier and placed a customized round, flat plate on it with a small distance to the speaker. Attached to the amplifier was a synthesizer on which we streamed the sound through. We decided to work with 3 parameters when doing the tests. Amount of concrete, amount of water (which essentially is the parameter "density" on its own) and frequency of the sound waves induced.

Joanna Burton, Pablo Humanes & Sadaf Mirzaei

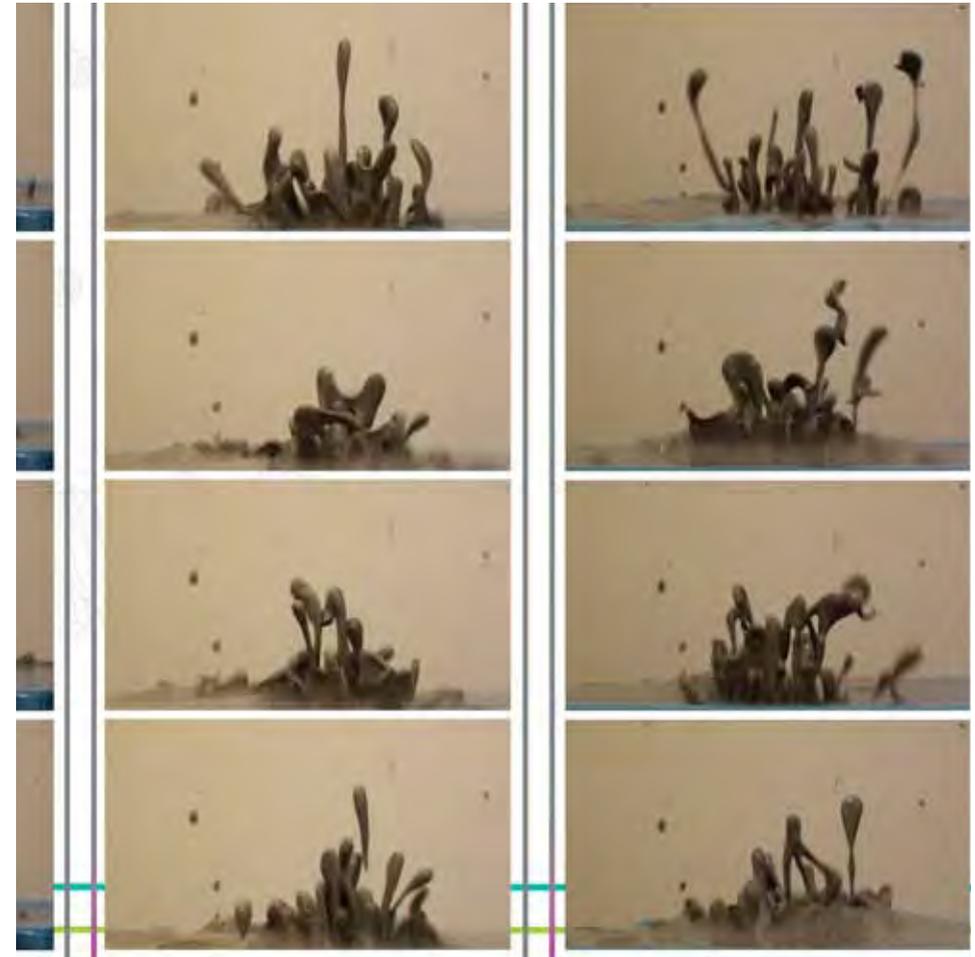
FH Köln & Macromedia Hochschule für Medien und Kommunikation Köln

The conclusions we make from reading the results we obtained are the following:

Very high frequencies produce interesting sinusoidal patterns but the liquid moves too fast and the waves aren't as noticeable and fairly small in height. Also it is noticeable how the water separates from the concrete and stays on the surface. For lower frequencies, and most of the rest of the spectrum, the results in form of patterns didn't differ too much. For almost all the musical notes we tried, even in different octaves, the outcomes were very similar.

**CONCRETE CYMATICS**

## Concrete Cymatics



DE-jury: 'The work transfers a natural science procedure for the visualisation of sounds and waves to architecture, and thereby ventures into new fields of creating and shaping space. The designers succeed in a mental experiment to transfer sound into a spatial dimension.'



## HONOURABLE MENTION - DE AZ253



The last years the public forum was dominated by the theme of renewable energies like no other. Although there is a general consent about the will to support sustainable technology, incisions in the private life are being refused. Concerning the fact that the regions of Germany have different preconditions for the use of sustainable energy, big power lines will become necessary to transport generated power. But especially the system of power lines or wind turbines is rejected, regarding their visually significant impact on their surrounding.

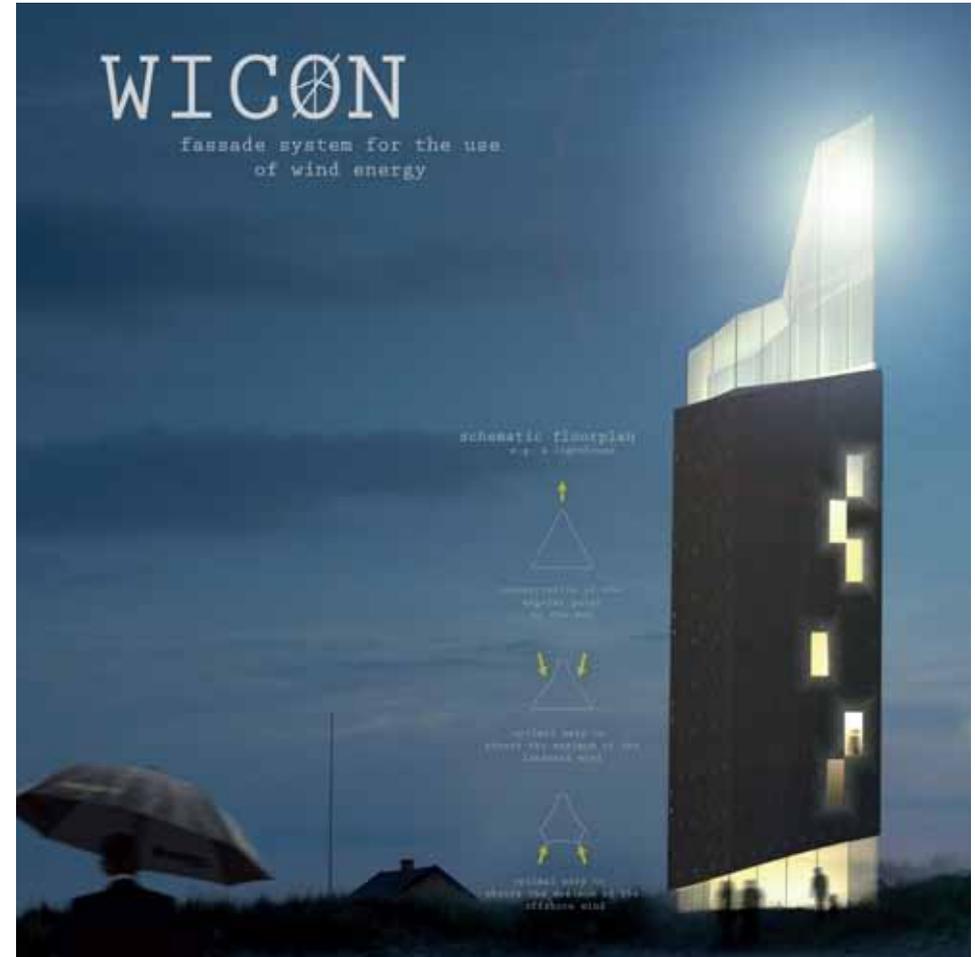
The design captures this theme and transforms it, making further transport or obtaining external produced energy irrelevant. The created autarchic lighthouse has the ideal shape to gain the impinging wind. Furthermore there is a modular facade-system, which leads the wind optimal through the included vents. Here the integrated rotors take it and generate electric energy. Thereby the design obtains the themes of plasticity and reproducibility of concrete with the help of reusable gum matrixes. At the same time the facade seems monolithic from distance, keeping the surrounding in its calm appearance.

All in all the goal of the design is to conceive a lighthouse, which could provide one person and the contained beacon with their awaited electric energy consumption. This concept could also be used on other tall urban buildings like skyscrapers.

Franziska Adler & Ronny Zschörper  
HTWK Leipzig



## WICON



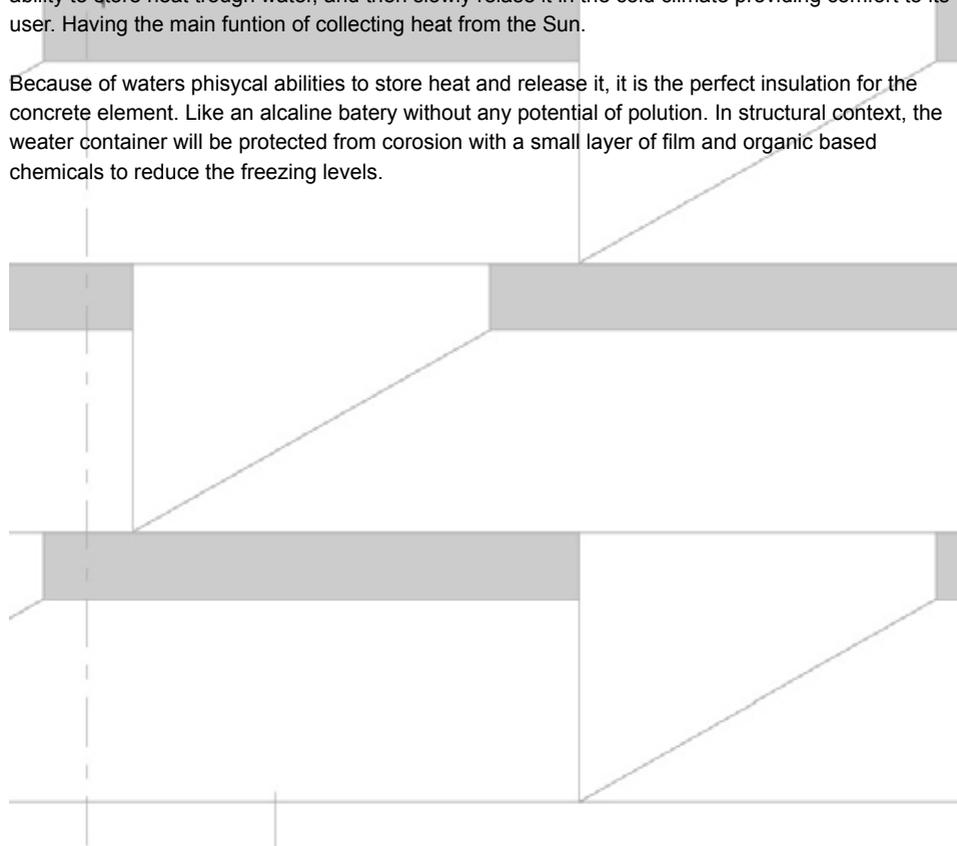
DE-jury: 'Based on a solid analysis of the relationship between energy generation and consumption, the work applies discussions in society to architectural issues. The jury welcomes the idea of integrating energy generation devices in the outer envelope of buildings.'



## HONOURABLE MENTION - IE BM351

The project is located on the old site of the Killilagh church near Doolin town. Main idea was to create man made seating to acomodate the visiting tourist during their hicking break and just to warm up for their way to the rest of the Burren sites. The main potential of the concrete element is its ability to store heat trough water, and then slowly relase it in the cold climate providing comfort to its user. Having the main funtion of collecting heat from the Sun.

Because of waters phisycal abilities to store heat and release it, it is the perfect insulation for the concrete element. Like an alcaline batery without any potential of polution. In structural context, the weater container will be protected from corosion with a small layer of film and organic based chemicals to reduce the freezing levels.



Bozidar Milosevic  
University of Limerick



## Warm up seat for you



IE-jury: 'A successful essay in the benefits of solar power and concrete's ability to absorb and re-radiate heat, with an elegant design which respects the context and land form.'



## JOINT FIRST PRIZE - IE BM890

"... You cannot keep everything the way it has been... we should focus on old buildings and see what we can do with them." Herman Herzberger

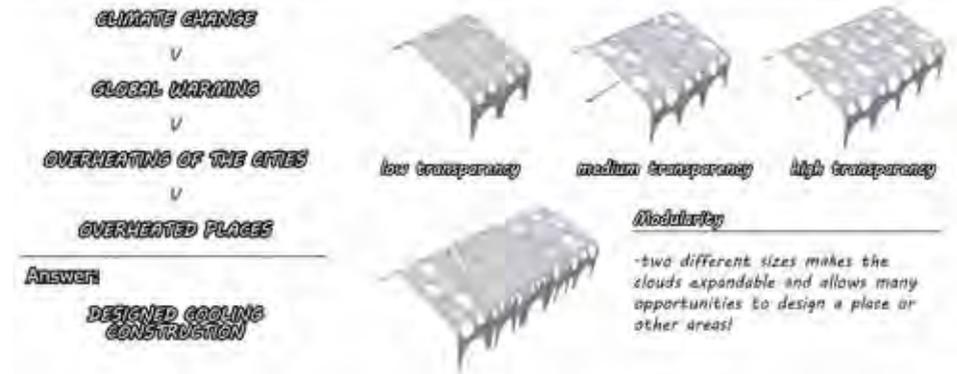
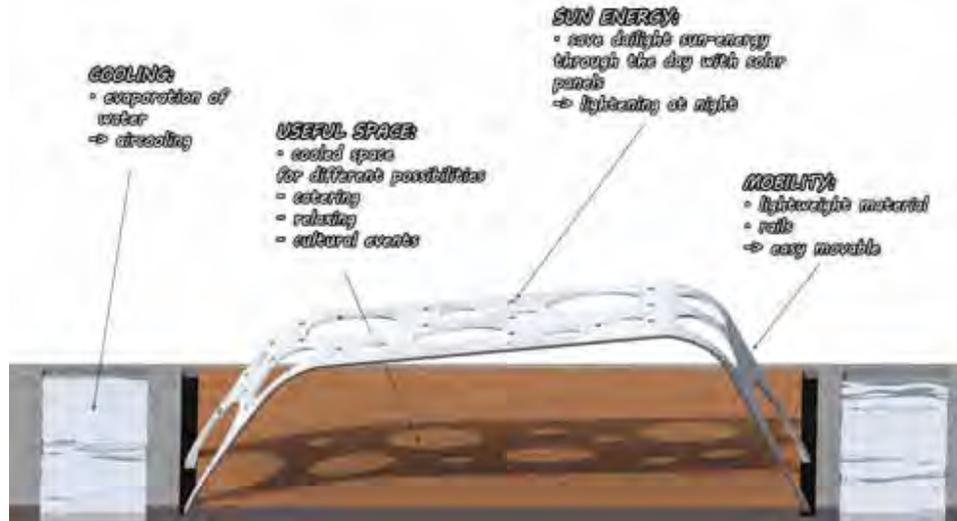
In times of doubt and skepticism, when congregations leave their ecclesiastical buildings in dereliction and disrepair, we as architects should look and re-think those spaces as what they could be. We must consider old buildings as being capable of accepting architectural interventions that are more than just temporary. We need to be thinking about reusing them in a contemporary and meaningful way. Every new use is part of a continuum and not a final installment. Secondly, any reuse is sustainable both environmentally and socially due to the embodied energy within the existing fabric and the life brought back to a community.

James Boyd & Julian Manev  
Queens University Belfast

## Energy - from Greek, energeia - activity

IE-jury: 'Long-term sustainability, rejuvenation and re-use within the existing architectural context are at heart of this entry. Its dynamic form subdivides the central void of the church into two new functional areas opening up possibilities for new use.'

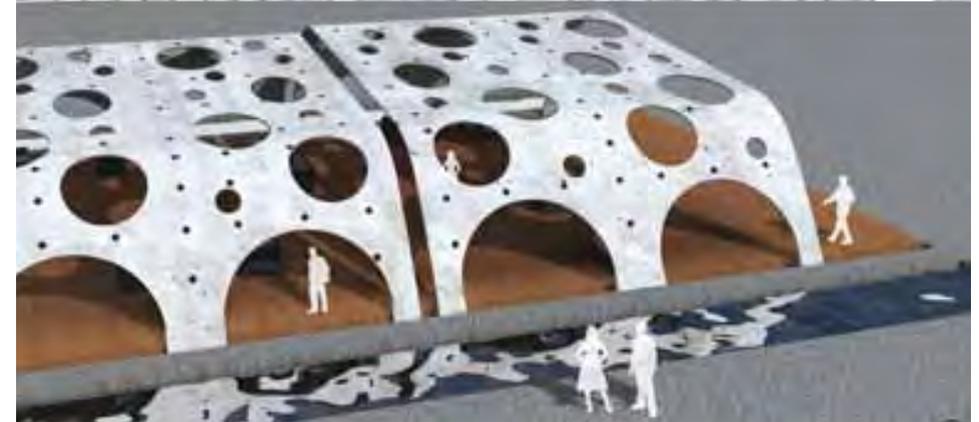
## HONOURABLE MENTION - DE CP143



Florian Zschoche  
HTWK Konstanz



## Moving Clouds, concrete-in-flow



DE-jury: 'The design centres on light and shadow as energy aspects. Aware of all implications of solar irradiation a flexible, movable solution is developed. In addition, the cooling effect of water basins is harnessed and solar energy is stored for night-time illumination.'



## JOINT FIRST PRIZE - IE CR777



We imagined a piece of infrastructural sculpture to display a closer interaction of human activity and the growth of seaweed. We have made a floating concrete bath that would act as a tidal energy device and grow seaweed on a textured underside.



We have made extensive studies into the ratio of concrete mixes to create a formula that can float as well as ability to retain the texture of its fabric formwork. The potential of this floating infrastructure to produce energy is opportunistic and is making use of existing technologies being developed on the west coast of Ireland.

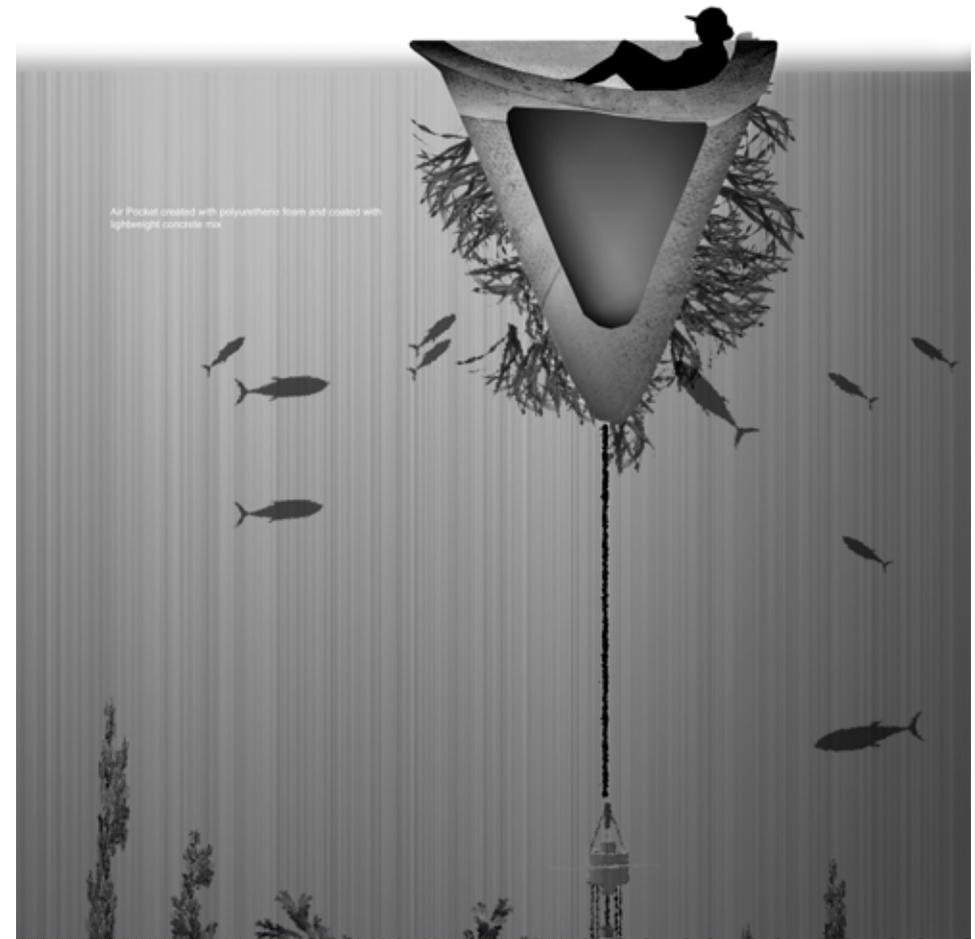


Colin Dorgan & Ray Mc Greal  
SAUL University of Limerick



The energy aspect of this piece is the unquantifiable awareness it will create for the seaweed industry and should provide another platform for it to grow from. Concrete as infrastructural art is also a theme that could be incorporated into larger projects to improve the aesthetic of Irish infrastructure networks.

## To Cast Light on Seaweed



Air Pocket created with polyurethane foam and coated with lightweight concrete mix

IE-jury: 'Concrete floats in this joint first entry, cast into a watery womb for human introspection and prospective thought. A hand's outline has been traced and formed into a handrail. The haptic sense is felt too on the proposal's submerged underside.'



## FIRST PRIZE - TR CS000



Concrete is a composite construction material composed primarily of aggregate, cement and water. Chamcrete includes polymers beside these materials. Large amount of energy which we use in producing polymer based thermochromic materials gained by hydration of cement. This hydration reaction occur every inch of concrete, thus usual concrete transform to thermochromic concrete, Chamcrete.

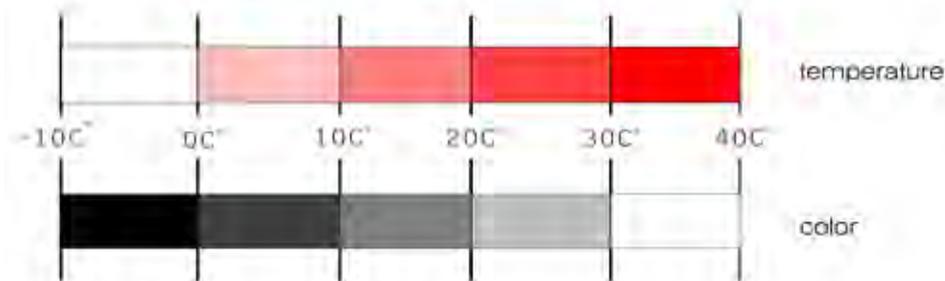
Chamcrete absorbs more heat in cold and reflect more sunlight in hot conditions by thermochromic materials in it. That gives opportunity to provide thermal comfort in every condition.

Thermochromism is the property of substances to change color due to a change in temperature.

Thermochromism can appear in thermoplastics, duroplastics, gels or any kind of coatings. The polymer itself, an embedded thermochromic additive or a high ordered structure built by the interaction of the polymer with an incorporated non-thermochromic additive can be the origin of the thermochromic effect. Furthermore, from the physical point of view, the origin of the thermochromic effect can be multifarious. So it can come from changes of light reflection and absorption properties with temperature.

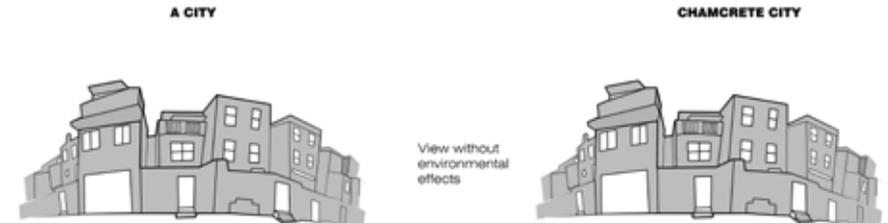
Chamcrete becomes whiter in hot conditions to reflect more light and cool down concrete structure. It becomes darker in cold conditions to absorb more energy to heat the structure.

Çoşku Çinkiliç & Semra Refkaeva Shukrieva  
Istanbul Technical University



## Chamcrete

For demonstrating Chamcrete effect in different conditions shadows represent cold conditions and lighted area stand for hot conditions



Without environmental factors chamcrete is just an ordinary material for architecture



The building structure in city be enlightened by sunlight

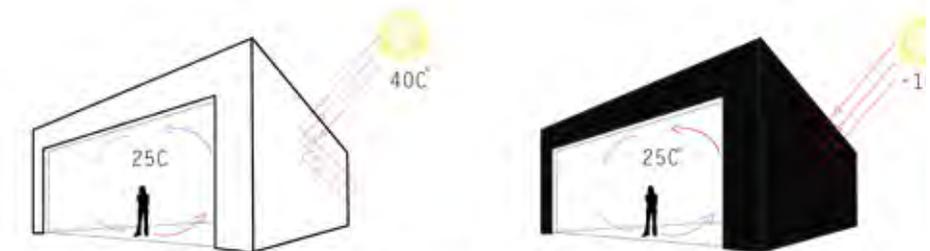
The building structure in Chamcrete city be enlightened by sunlight but all surfaces change it's color to reflect more light or absorb more energy.



It is able to see the heat difference in city. Facades which can get light get hot and others get cold.

The Chamcrete city just get the energy needed for comfort. Reflect surplus energy or absorb more to heat up. All city use the energy efficient.

TR-jury: 'The project is considered as outstanding suggestion based on the implementation of concrete utilizing energy released of hydration to large extent and additionally the work maximizes the energy storage.'



By using Chamcrete, it does not matter how outside conditions changes, temperature is stable inside.

## HONOURABLE MENTION - DE DV535

The concept uses the synergies between the thermal conductivity of the material concrete, solar energy and light. It helps to cool down the inner cities in the summer and produces energy. The plaza changes its surface and its functions during the day.

Additives like photoluminescent materials or blingcrete shape a new urban feeling and a better connection in the city. Paths and informations are possible to illustrate. This industrial prefabricated tiles work like a floor heating system. The negative conductivity of concrete is used to produce energy. Through a 'tube in tube system', a liquid is pumped through the plaza, which extracts the heat out of the concrete. With the help of a heat exchanger it is possible to use this for energy production.



In this study, the technology is used to design the side of the old synagogue in Freiburg, Germany. The surface of the side is covered by the concrete collector, the 24 hour square. In addition, the system will prevent temporary hot spots and climatic problems in our cities.

David Vogel  
HTWK Konstanz



## The 24 Hour Square



DE-jury: 'A design for a square combines common everyday tasks of urban design, such as lighting and information, with ideas for energy conservation and the city climate. The project is a very self-assured development of these ideas and is compelling in its formal application.'

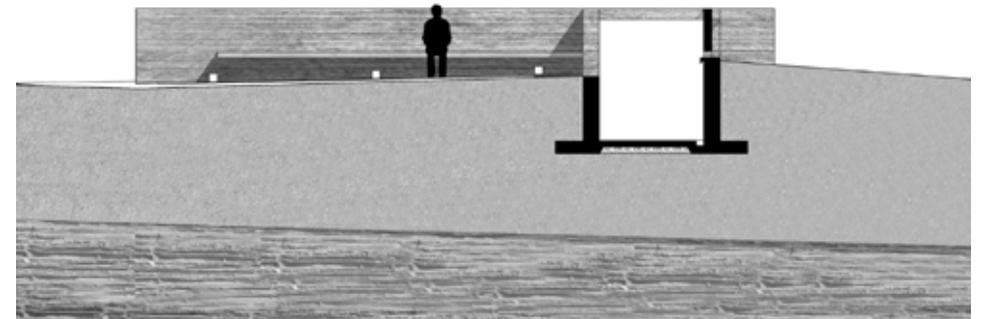
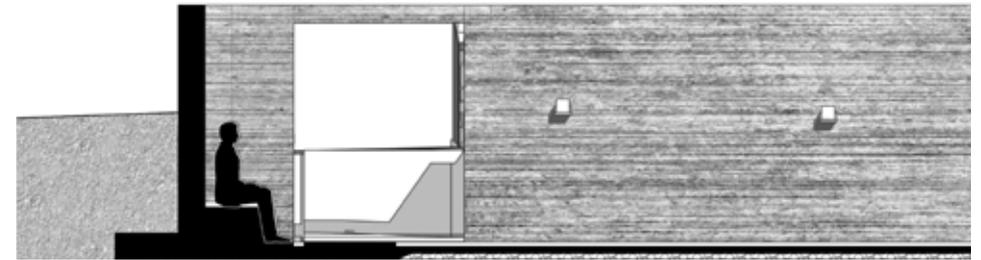
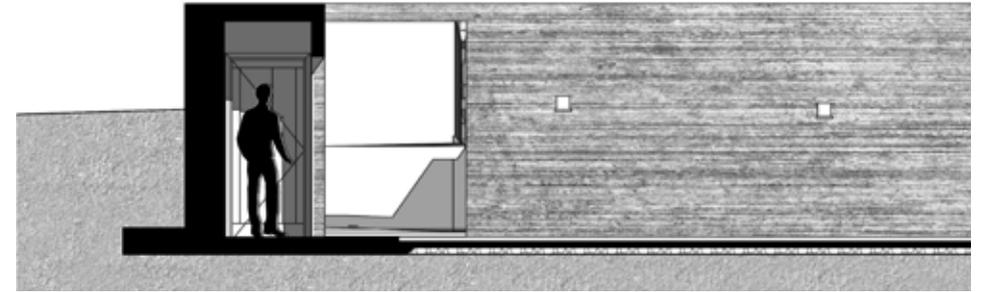


## HONOURABLE MENTION - IE DW123

The existing car park at Poulnabrone portal tomb is a square cut from the landscape that gives no regard to the site it serves. It is an example of a piece of large scale infrastructure unintelligently dominating a small meaningful place. The new car park is defined by a single linear element - a wall that is always implying a movement outward into the landscape. The geometry of the existing car park is prescribed by the road, the proposed car park moves into the landscape, bringing vehicles around the wall - the first move into the land. The wall follows a datum about which the landscape rises and falls, recessed an initial 1500mm into the soil. This reduces the visual impact of the car park as seen from the road, and physically brings you to ground, lowering you in before bringing you back out into the land. The cast in situ concrete wall collects rainwater and groundwater by a drainage channel along it's length, with water flowing downhill to the car park base level. Exaggerated weep-holes allow the wall itself to act as a water catchment. Collected water is stored in tanks within the wall and used to provide toilets for visitors, and to fill a trough for local animals on site.

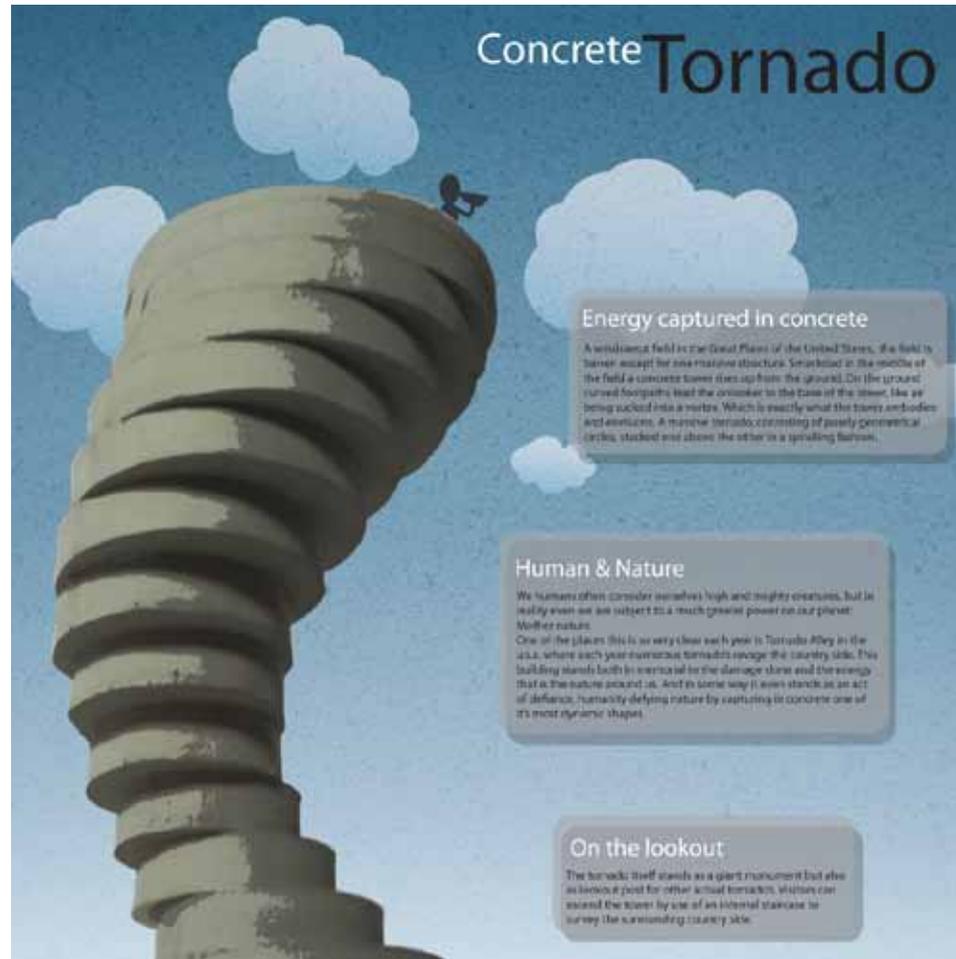
David Williams  
University of Limerick

## Poulnabrone



IE-jury: 'An elegant intervention in the landscape to enhance the setting of an ancient monument by hiding the car parking and making use of the form to collect rainwater for use by visitors.'





Ruben Geutjens & Nick Noordam  
Delft University of Technology



NL-jury: '... great power and energy speaks from the design. The designers see their concrete tornado as a public vantage point to look for actual tornadoes. Giving the object, in addition to its role as a monument, a meaning as an attraction, which is a remarkable combination.'

## THIRD PRIZE - IE HM148

The project is situated in the unique landscape of the Burren, a place where in spite of heavy rainfall there are often shortages of water due to the speed at which the limestone strata soak away surface water. The concrete insertion aims to provide for those who trek across the burren at a point where the road ends and in many ways the landscape truly begins.

Within its mass the "erratic" allows for the collection and storage of water, filtered through a biosand filter. It also allows some respite from the harsh south westerly winds and the driving rain. The "erratic" is a place of congregation, where intrepid hikers can share information and locations of ancient sites, or rare orchids. Or it can simply be a place to sit and eat a sandwich while taking in the vast horizon.

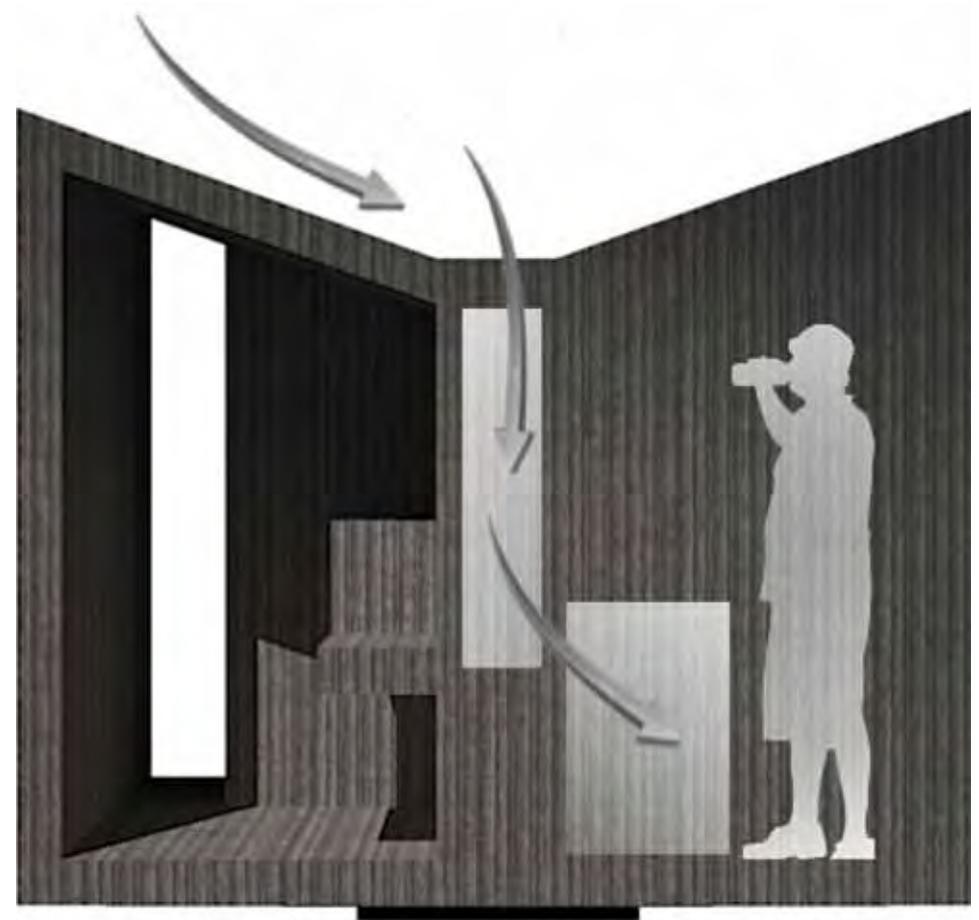
Though in theory the idea is one that could be replicated across the landscape at the innumerable points where paths and roads become dead ends, the site that I was investigating is close to the village of Doolin, located in the townland "Tir gan Éan", this place became especially important as through the topography of the site a view to the arran islands that opens up at the end of the road.



Jennifer Kingston  
University of Limerick



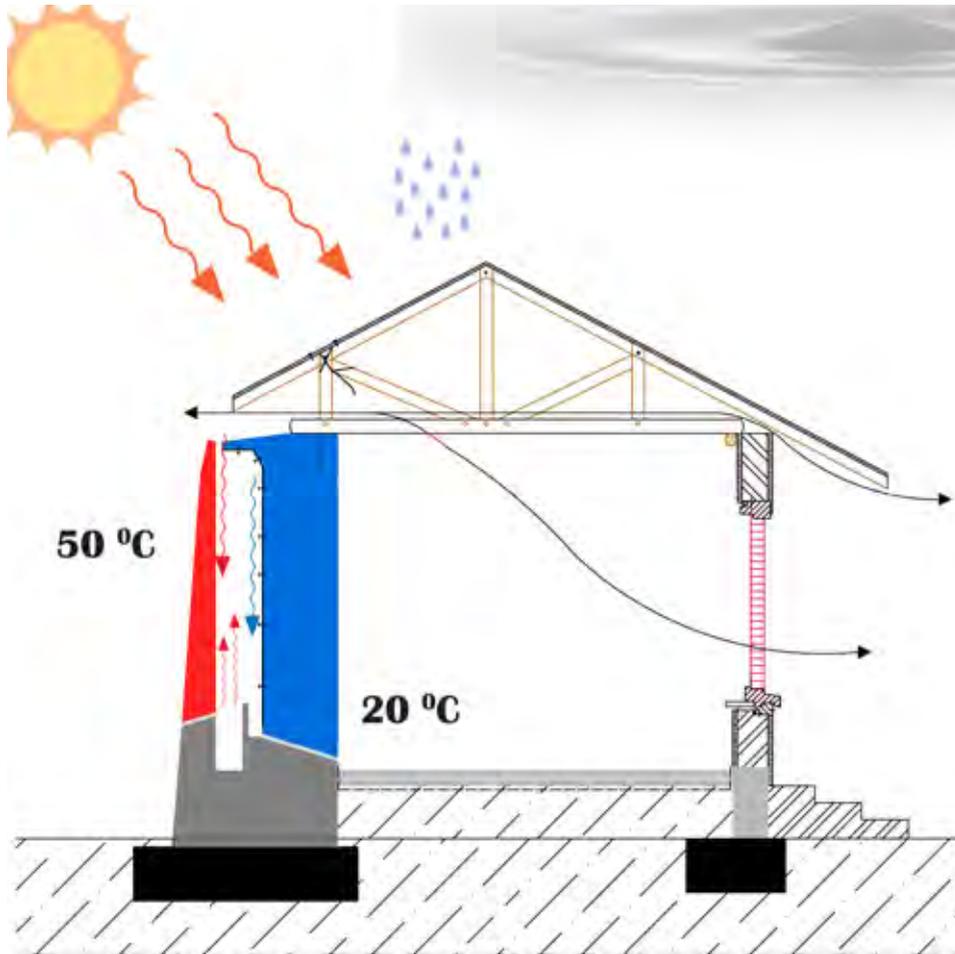
## The Erratic, Stopping Point



IE-jury: 'The form and positioning of the concrete shelter draws on the vernacular of agricultural huts but is give a fresh interpretation. The forms are simple and robust and take advantage of the homogeneity of concrete as a material.'



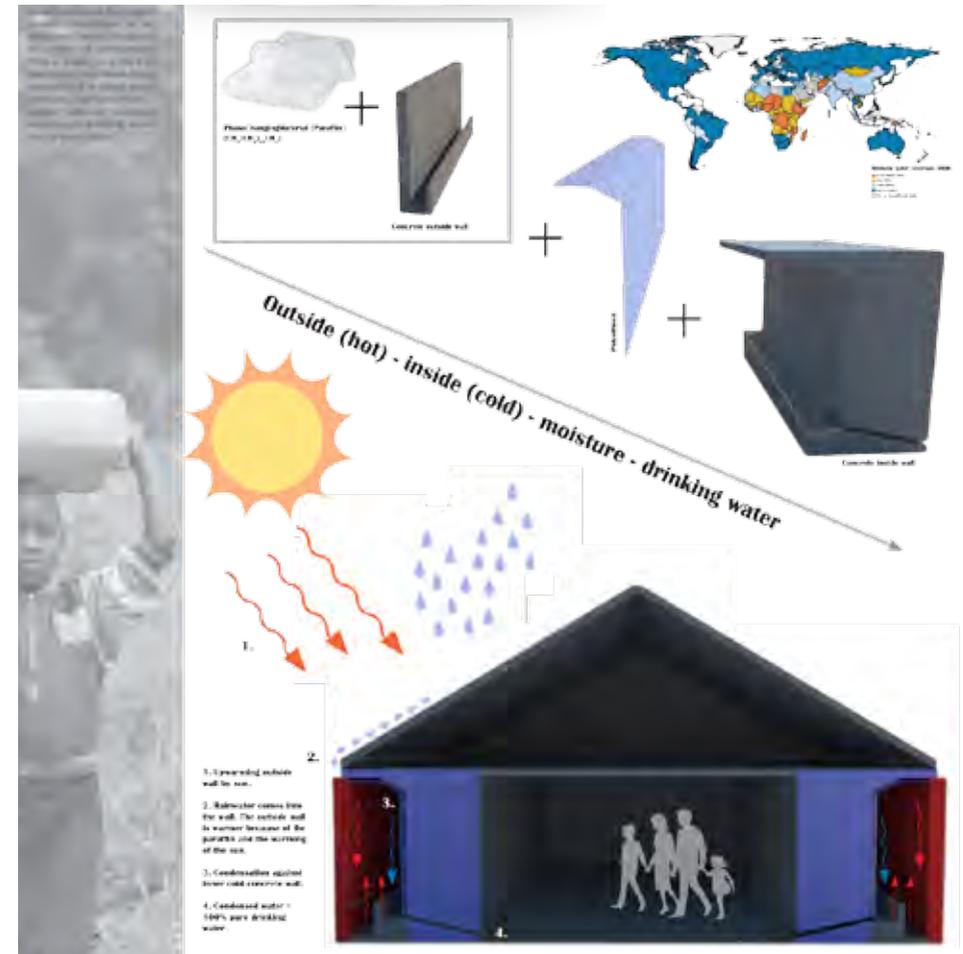
## HONOURABLE MENTION - NL IB612



Irene Boertien  
Eindhoven University of Technology

“The number of people without an improved drinking water source is now below one billion. More than half of the world’s households now have piped water connections in or near their homes. Progress is slowest in sub-Saharan Africa, home to a third of the global population using unimproved drinking water sources. Eight out of ten people without improved sources of drinking water live in rural areas.”

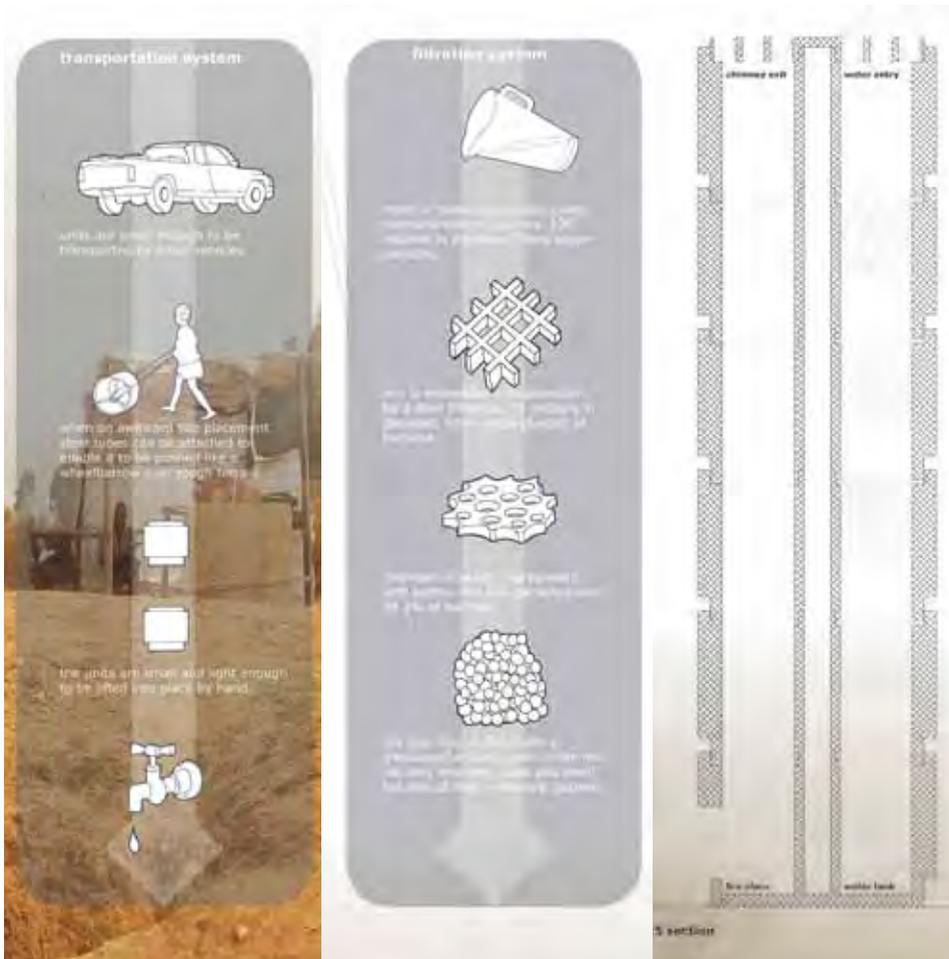
## Moisture School Practice



NL-jury: ‘Building on existing technologies, this design found an innovating solution to a real and global issue: clean drinking water. The jury is enthusiastic about the ingenuity which sought a direction to a new solution for a global problem.’

The MoistureSchool use the natural cycle of evaporation and condensation. Condensation occurs when water vapor is deposited on a surface colder than its surroundings. The outside concrete shell of the MoistureSchool contains a PhaseChangeMaterial (PCM), in this case Paraffin. The shell is able to absorb additional heat due to the phase change of the Paraffin from solid to liquid state. This allows the thin outer wall to become increasingly hot as it absorbs the sun’s heat. The inner wall is a thick concrete wall. This wall is very cold due to the large thermal mass of concrete. When rainwater penetrates into the cavity, the large temperature differences between outside and inside ensures condensation against the cold inside. This results in 100% pure condensed waterflows out of the wall. This system is best applicable in moist, warm climates with abundant rainfall.

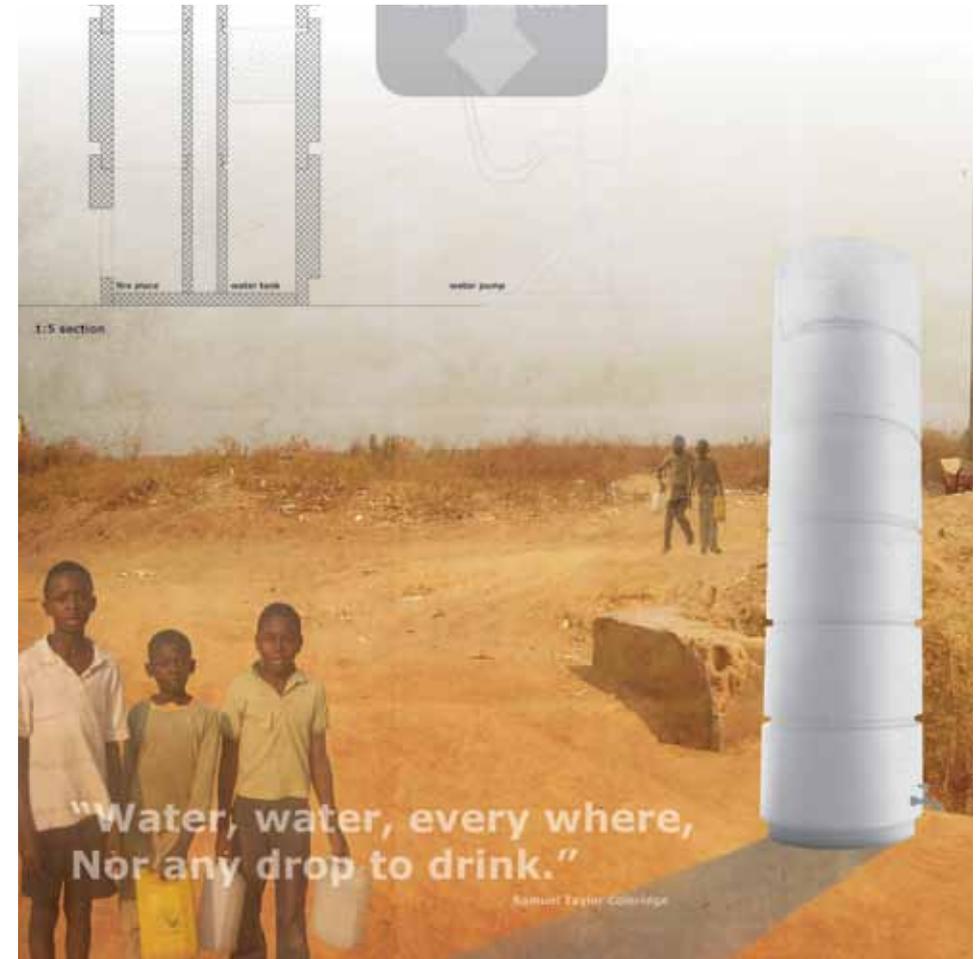
## HONOURABLE MENTION - IE KN209



Jarlath Burke  
DIT Bolton Street

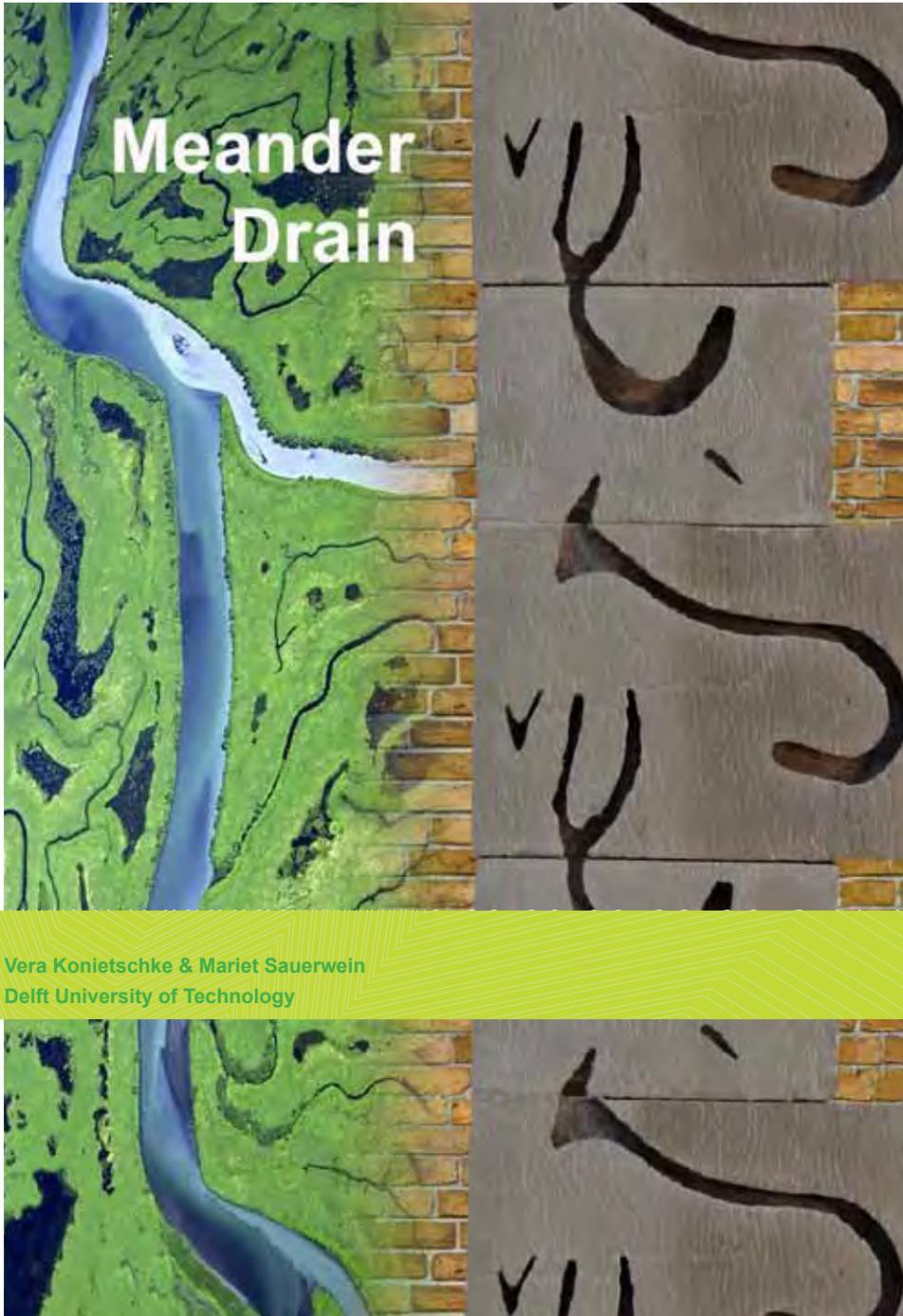
The main method of waste disposal in humanitarian sites across Africa is the pit latrine, a 3m. long drop into the ground. A major problem that has recently arisen is that waste is leaking from the pit into the surrounding water table thus contaminating all water produced by the wells on site. By adding different substances to the concrete mixture a porous/pervious concrete is formed. As explained below the quantity and type of substance added affects what type of filtration is achieved. The filtration units are precast. Each filter's mix is coloured with red dye, as a warning sign to the drinker, that is activated if the filters fail and bacteria makes it through. This allows easier transport and in the case of failure, removal from the system.

## Water, water every where



IE-jury: 'An interesting exploration of how precast concrete can address both sanitation and water supply issues in these parts of the world where water and infrastructure shortages exist.'

All the filters are placed in larger concrete shells that slot together on top of one another to protect and separate the filters. These pieces are all cylindrical in shape for transport purposes. It is proposed that the shells are made from ec0-concrete that uses carbonates in the mixture that are obtained through the mineralization via aqueous solution of CO<sub>2</sub> produced in industrial processes. The exterior protective cylinders have 3 internal cells, 2 house the filter, the third is as void that can act as chimney. On the bottom unit there is a space to light a fire, this can be a communal cooking area. It can also be used to heat up the water sitting in the bottom chamber, should it be needed for washing or cooking.



Vera Konietzschke & Mariet Sauerwein  
Delft University of Technology

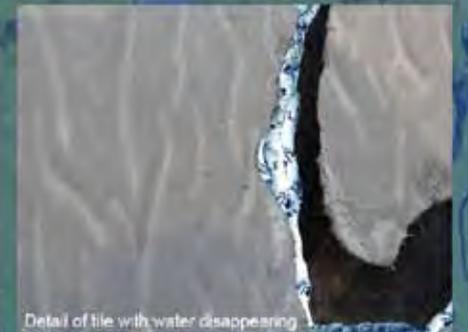


MD325

These tiles replace your drainpipe by meandering down the rain water.



At some places you can see the water flow, at other places the flow disappears into the wall.



Detail of tile with water disappearing

The surface of the tile has its remark

NL-jury: 'The designers have a simple but evocative solution for an everyday problem of designers: the drainpipe. While no one denies the usefulness of the drainpipe, few designers recognize this object as a design brief. Meander Drain proves that this assumption is wrong.'

winning through the wet concrete.

## THIRD PRIZE - NL OM023

In the century that we live in, we are obliged to think about energy. It therefore is subject to discussion in many different domains. Concrete, as a construction material, has proved its abilities to store energy and transfer it back through radiation. But who will notice? In most of people's eyes, concrete remains a passive material that doesn't interact with its environment. The unemotional feeling and coldness it represents makes the concrete an unattractive material for many people. When exposed, concrete can evoke a very hostile and harsh environment within the public sphere. The question could then be; how can we introduce a new way of perceiving the concrete and make its energy properties be understandable for the public?

By materializing the energy transfer and making its interaction with its environment visible we try to introduce the concept of concrete-energy to the public. The idea of "interactive concrete" shows its ability to be an active and responsive material and introduces a complete different perception of the material. By being a source of light the concrete shows its ability to store and transfer energy.

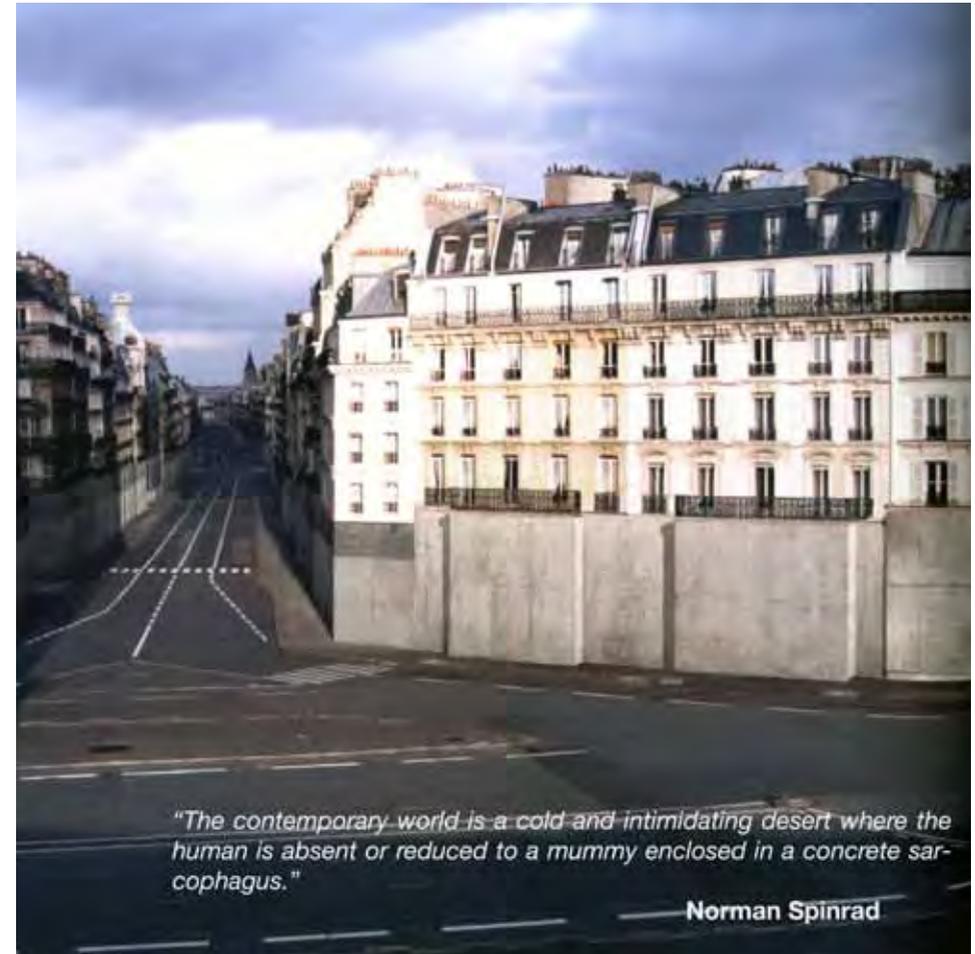
Energy-conscious-concrete can be used in public space to illuminate the streetscape while softening the urban condition. By adding a phosphorescent powder as an additive in the concrete mixture, the concrete becomes a source of illumination for public spaces during the night. The advantages are multiple: no need for external energy supply, smooth distributed lighting and long life cycle for the lightings are some of these.

Experimenting with the surfaces and textures are interesting for its perception changing. The textured concrete surface is highly tactile during the day, making the concrete playfully interesting. At night, as the texture partially flattens through the internal lightning, the gradient in texture will intensify the light pattern, making the concrete surface even more appealing.

Olaf Burlage & Muriz Djurdjevic  
Delft University of Technology



## Changing Perception



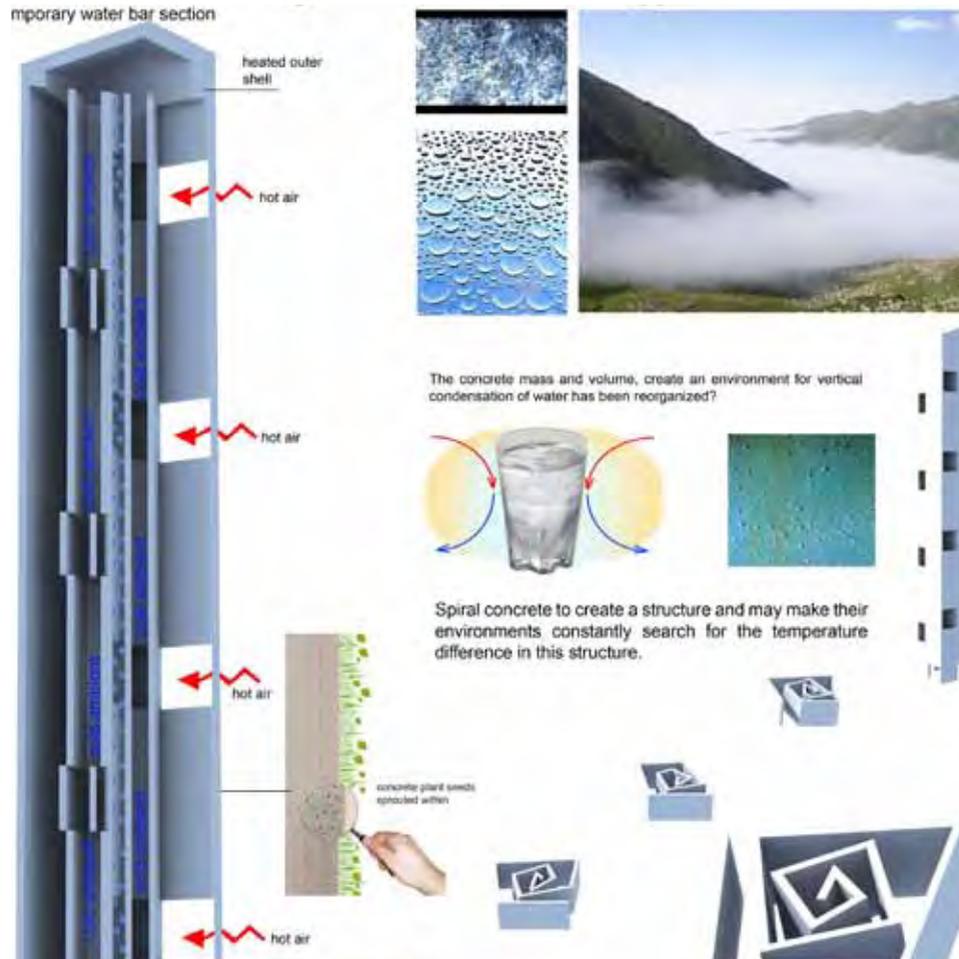
*"The contemporary world is a cold and intimidating desert where the human is absent or reduced to a mummy enclosed in a concrete sarcophagus."*

Norman Spinrad

NL-jury: 'The designers behind this exhibit reflect a world-view that is almost schizophrenic. The design proposes two very different sides. A refined form study of concrete reliefs and below that lies a deeper search to develop concrete that can emit light at night.'



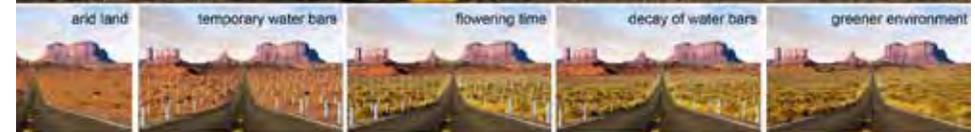
## SECOND PRIZE - TR TY241



Ibrahim Türkeri & Aylin Yegen  
Kocaeli University



## Through Water to Produce Concrete



Water vapor in the air near the earth takes the form of concentrates and a small water droplets. This is a very small water droplets remain suspended in the air. Astronomy Picture of the layer (fog) or 1% of moisture in the air into the water to be provided with concrete?

The concrete mass and volume, create an environment for vertical condensation of water has been reorganized?  
Spiral concrete to create a structure and may make their environments constantly search for the temperature difference in this structure.

Thus, the condensed water droplets producing this structure is aimed to create a greener environment.

TR-jury: 'The project represents good example of nature/material relation through design rather than proposing new structural application of concrete. It also generates relations and cooperation among various disciplines like meteorology, agriculture and landscape design.'







developing the designs



producing first models in foam



## Jury Report

Prize-winners

### AF111 – Concrete cymatics

Joanna Burton, Pablo Humanes, University of Applied Sciences, Cologne and Sadaf Mirzaei, Macromedia University for Media and Communication, Cologne

The work transfers a natural science procedure for the visualisation of sounds and waves to architecture, and thereby ventures into new fields of creating and shaping space. Hitherto, the application of cymatics processes has produced visualisations in the form of images or video recordings. By proposing the use of extremely fast curing concrete for this process, the designers succeed in a mental experiment to transfer sound into a spatial dimension.

The project therefore represents an outstanding approach to the subject. A specific property of concrete is utilised in an innovative and independent interpretation of the term “energy”. Energy in the form of sound is transposed into tangible form and made visible during the material curing process. At the same time the project attempts an emotional approach, in that the fleeting moment of the transition from a fluid, amorphous condition to a solid state is manifested. The authors have approached the briefing in an innovative and playful manner which attaches considerable charm to the project.

In spite of the visionary character of the work, its point of departure is one of quite traditional research. The illustration of the results of the different practical test theories is compelling. However, the jury is not fully in agreement with the conclusions for the applications of the proposed process. Details of the possibilities for practical implementation are still sketchy. Nevertheless, the jury fully supports the approach and vision of the work: with reference to the freeform property of concrete, the authors propose a production process that is virtually without formwork. This develops an idea and an objective which should be further substantiated in order to achieve solutions also at the technical level which would go far beyond current concrete processing and production methods.

In this project, the potential for shaping concrete as a material goes beyond conventional limits, providing considerable stimulus to the imagination. If the image of “frozen music” can be applied to architecture, the submission expands on the subject with a vision of “shock-frozen concrete”, thus expanding the potential future application of the material.

German Jury: Arno Brandhuber - Brandhuber+, Bettina Kraus - Wiel Arets Architects, Christiane Bohlmann - HeidelbergCement AG, Tobias Wallisser - LAVA and Volker Schmid - Technical University Berlin

Prize-winners

### WA628 – Ernst-Reuter-Platz

Michael Albertshofer, Sebastian Awick and Steffen Winkler, Technical University Berlin

The design approaches the subject from the premise of a modern metropolis, with one of its essential features being that of mobility. As a traffic intersection from the 1960s, Ernst-Reuter-Platz in Berlin is a space that accommodates the flow of traffic and energy but, at the same time, is empty in respect of other functions. A vacant urban space, devoid of function, must be considered wasteland from the point of view of social interaction. The project focuses on this problem and draws on opportunities for extended urban development in the context of the adjacent university campus.

## Germany

The systematic development of the architectural guidelines reflects the morphology of energy. Like an infrastructure building, the proposed structure is developed from the notion of moving vehicles. In this way, the project is inspired by the kinetic energy of the location and translates it into architecture. The scale of the design does justice to the location and the concept impresses with its morphological implementation. This activates the existing vacant space and regains it for the city's users. The city's existing energy resources are utilised in a positive manner and their effectiveness is increased.

The visual presentation of the project is compelling at first sight, but also stands up to closer examination. The layout plans have been worked out appropriate to the depth of the scale, thus confirming the functional solidity of the building beyond its presentation in the perspectives.

Overall, the project presents a convincing solution with an appropriate use of materials from the construction and aesthetics point of view. Although the basic structure of the building has been defined, changes in future uses have been allowed for. In this way the authors demonstrate their awareness of sustainable solutions that accommodate future changes, and thus the responsible long-term use of valuable resources. The design provides an opportunity for concrete as a material to fully develop its inherent strength. The feasibility of the structure is achieved by reducing loadbearing elements to just a few, which at the same time provides the desired flexibility of use. The proposed fare-faced concrete surfaces contribute to the charm of the building, both in the residential and car parking areas. In addition, the project playfully alludes to concrete as used for infrastructure buildings.

The work's special merit lies in its urban character, which is particularly expressed in the newly gained city square. The authors achieve a balance between transparency and enclosure, thus creating a central space for the surrounding urban fabric.

Commendation

### AC123 – Metropolitan design

Andrea Escudero Hoelscher and Carlos Garcia Criado, University of Applied Sciences, Cologne

This work focuses on sound as a constituent component of energy. Architecture is seen in its

protective function that is designed to increase the well-being of users. By relating topics of sound insulation and room acoustics to the design task, an important subject with practical relevance is tackled.

With its material-oriented approach, the work combines two sound insulation strategies: designing shapes and selecting materials. A highly porous concrete with the associated sound absorption properties is used to develop surface textures which in themselves have attenuating and sound reducing properties. The proposed design displays an appropriate robustness for the selected building task – an underground railway station – and at the same time creates flexible design opportunities. The work does not fully explain the technological implementation. For example, it is

## Jury Report

not clear whether the sound reduction element is installed separately or forms part of the structural tunnel shell.

The design offers interesting approaches for dealing with the interaction between acoustics and the perception of space. However, it does not pursue the opportunity for developing new patterns of experiencing space. Thus the project remains firmly on the level of practical implementation, which, should it come about, nevertheless opens up the expectation of interesting spatial experiences.

Commendation

### AZ253 – Wicon

Franziska Adler and Ronny Zschörper, University of Technology, Business and Culture, Leipzig

Based on a solid analysis of the relationship between energy generation and consumption, the work applies current discussions in society to architectural issues. The jury welcomes the idea of integrating energy generation devices in the outer envelope of buildings. For this purpose, the design uses small-scale turbines integrated into specially developed façade elements. The idea appears plausible in its application within the construction, even though the question arises as to whether the back ventilated façade is able to provide the energy gain that is necessary to justify the required technical investment.

The design of the shape of the façade panels convincingly reflects technical considerations and studies. However, there are only tentative approaches to the use of the material properties of concrete. Overall, the design impetus deriving from the façade principle has not been fully transferred to the architectural design of the overall project. Nevertheless, the documentary evidence supporting the implementation of prototypes and test series is positive.

Overall the work, which demonstrates how additional energy resources can be harnessed via building designs, is a valuable contribution to the range of issues and deserves special commendation.

German Jury: Arno Brandhuber - Brandhuber+, Bettina Kraus - Wiel Arets Architects, Christiane Bohlmann - HeidelbergCement AG, Tobias Wallisser - LAVA and Volker Schmid - Technical University Berlin

Commendation

### CP143 – Moving clouds

Florian Zschoche, University of Applied Sciences, Constance

The work focuses on the problem of overheated inner city areas using the design of a square in Trieste in Italy as an example. The proposed design centres on light and shadow as energy aspects. The author is fully aware of the positive and negative implications of solar irradiation and develops a flexible, movable solution. In addition, the cooling effect of water basins is harnessed and solar energy is stored for night-time illumination.

## Germany

The potential of glass-fibre reinforced concrete is utilised in the conceptual design strategy in order to develop a monolithic roof structure without any separate individual elements such as columns or beams for the loadbearing structure. The choice of material is justified in the context of the briefing. The material allows the design of a large, polymorphous shape which motivates the designer to propose that the elements be movable in order to increase flexibility of use. Open questions remain with respect to the details of the semi-transparent interior space and design of the square. The design options presented by the choice of material and its construction parameters are only utilised in part.

A review of the self-imposed complex questions relating to the city climate, taking into account the proposed solution, would have enriched the work. Nevertheless, the manner in which the subject is approached and the resulting design implementation deserves special commendation.

Commendation

### DV535 – The 24-hour square

David Vogel, University of Applied Sciences, Constance

As part of a design for a square in Freiburg, the designer combines quite common everyday tasks of urban design, such as lighting and information, with ideas for energy conservation and the city climate. The proposed project is a very self-assured development of these ideas and is compelling in its formal application.

The governing idea is that of utilising solar radiation for the generation of energy. In this context, established solutions for the interior of buildings such as that of activating thermal mass – for example underfloor heating or cooling through solid floors – are applied to urban design. This idea does not lack credibility, although the technical aspects of the implementation have only been shown very superficially. A more in-depth verification of the energy potential of this project would have been desirable.

The material properties of concrete are utilised in a number of ways in the design. First of all, the thermal storage capacity of the material contributes to the improvement of the overall energy

balance. The manufacturing process makes it possible to insert the installations required for energy generation, as well as efficient pre-fabrication. Beyond that, the designer expands on the conceptual design idea in order to generate additional levels of significance. In addition to the sense perception of unexpectedly cooler or warmer zones in the city, the project provides very practical support for its users by integrating control and information systems as well as lighting elements. Overall, this results in an urban space which appeals through its level of comfort and density of information.

## Jury Report

### Two equal awards

#### “To Cast Light on Seaweed” (CR 777)

Concrete floats in this joint first entry, cast into a watery womb for human introspection and prospective thought. A hand's outline has been traced and formed into a handrail. The haptic sense is felt too on the proposal's submerged underside: a gift for a new habitat for a sea life. Mixing, making and moulding are all evident here in a well presented proposal with a unique outlook on the concept of energy. It floats!

#### “Energy- Energia-Activity” ( BM 890)

Long-term sustainability, rejuvenation and re-use within the existing architectural context are at heart of this entry. A bold curved concrete platform is inserted across the nave of disused church, bravely suspended on a discretely placed new structural pillars, positioned at the perimeter of exterior walls. Its dynamic form subdivides the central void of the church into two new functional areas opening up possibilities for new use: an auditorium on the Ground level and skateboarding piste at the First floor level! The work considers energy in its broadest sense and suggests its values to be in kinetic, sound and social manifestation, drawing inspiration from the Greek origin of the word. This powerful concept follows on the current discourse on holistic interpretations of sustainability and multifaceted evaluation of energy use.

Irish Jury: Ciarán Ferrie - Ciarán Ferrie Architects, Douglas Carson - Carson & Crushell Architects, Guy Thompson - MPA - The Concrete Centre and Selma Harrington - ANIMA DESIGN, ACE President

## Ireland

### Third award

#### “The Erratic, Stopping Point” (HM 148)

While a number of entries built on the idea of water collection in the karst landscape of the Burren, we felt that this proposal was the most refined and considered in its execution. The form and positioning of the concrete shelter draws on the vernacular of agricultural huts but is give a fresh interpretation. The forms are simple and robust and take advantage of the homogeneity of concrete as a material. The structural properties of the material are exploited to minimise the effective footprint of the building giving it the appearance of an object floating over the landscape. The collection and filtration of the water drives the external form and acts as an ordering device for the sheltered spaces. The project is beautifully presented and is a rigorous and elegant development of a strong initial concept.

### Honorary Mentions

#### “Warm up seat for you” (BM 351)

A successful essay in the benefits of solar power and concrete's ability to absorb and re-radiate heat, with an elegant design which respects the context and land form.

#### “Water, water everywhere” (KN 209)

An interesting exploration of how precast concrete can address both sanitation and water supply issues in these parts of the world where water and infrastructure shortages exist.

#### “Poulnabroue portal tomb” (DM 123)

An elegant intervention in the landscape to enhance the setting of an ancient monument by hiding the car parking and making use of the form to collect rainwater for use by visitors.

Dublin 30.05.2012

## Jury Report

### Apples and pears

A jury's standard answer to the questions that follow their decision is that choosing a winner ultimately comes down to comparing apples with pears, for the deeper one goes into the entries, the greater the differences and the more difficult the choice.

What is remarkable about the Concrete Design Competition is that the jury is asked to do just that: To compare apples with pears. Unlike other contests, the Concrete Design Competition gives no specific brief in which participants must adhere, no site and no program. Instead designers are given one theme to investigate in relation to concrete. The result is an inspiring series of seemingly incomparable ideas.

The theme for the 5th Concrete Design Competition was 'Energy'. Energy takes many forms. In daily life, energy is often interpreted in terms of performance: energy consumption, waste of energy or simply energy efficiency. In a metaphorical sense energy is a source of 'vitality', and in the spiritual sense one could speak of good or bad energy.

### Energy

Although the full meaning of energy could be explored in the entries of the Concrete Design Competition, after examination of material there appears to be a limited number of fundamentally different interpretations.

An obvious but effective interpretation of the theme, which is recognized and explored in a number of entries, is the ability of concrete to store heat. Several designers used this opportunity using special aggregates and piping to hold chemical or solar energy. To give an example, the '**Active Wall Modular System**' of Mi-Jung Gim and Minjung Kim (**MJ567**), convincingly shows how a simple concrete block with pipes create delicate patterns that are capable of heating water. The entry '**Catch the Sun**' by Sandra Augustyniak, Mattias Svensson Lembke and Karl Jon Petter Tibell (**CC666**) is based on the same principle. In this case the striking feature of the design is the wide scope of options the design can be applied to. The proposed concrete bricks can work for blinds, as boundaries and as a building block for a bus shelter. Collectively, all these elements absorb solar heat and see it stored in a shared aquifer. This gives an energetic addition to the design and also a social component.

**Dutch Jury: Laurens Jan ten Kate (chairman) - architectuurstudio HH, Olv Klijn (secretary) - FABRIC, Michiel Haas - NIBE, TU Delft, Rogier van Nalra - Pieters Bouwtechniek and Tom Bosschaert - Except Integrated Sustainability**

### Proven technology well done

Another category of entries is committed to the further development of existing ideas. There is for instance the long cherished desire of designers to make concrete less massive. Some even dream of transparent concrete. With the introduction of optical fibers in concrete now it is possible to make concrete with light transmitting properties. Several submissions have tried taking this existing technology a step further. '**Light Emitting Concrete**' by Joep Rutgers (**JR002**) is a good example. The

design shows that it is in fact possible to apply existing innovative techniques. In this case, by the use of optical fibres in the ground floor, a form of daylight is possible in a cellar. The entry '**Wonderwal**' by Theo van Meijel (**WW001**) is also in the jury's category of 'proven technology well

## Netherlands

done.' In this case, it is not the combination of concrete and light, but the possibility for concrete construction blocks and pipes to be integrated in one system. Although none of these designs succeeds in transcending the level of the existing, the jury finds the aesthetic quality of these entries worth mentioning.

### Objects

Another notable category of entries focuses on the scale that stretches between tool and furniture. Although concrete is not, for many people, the first material they associate with a sofa, a chair or a lamp, several designers sought precisely these possibilities. The combination of concrete, and various additives which provide better insulation, help make concrete more environmentally friendly or assist in processing waste in this category are frequently tested. In some cases, this approach results in unconventional objects like the '**Sound Enhancer**' designed by Titus Wybenga (**AR500**). Although the jury is surprised by the translation of the theme of energy in terms of sound, they wonder whether concrete is the most appropriate material to make a portable amplifier for your smartphone with?

### Memory

A special characteristic of concrete is that the material can express the abstract notion of memory in a very direct way. Concrete is, in principle, a liquid material. Once it solidifies, it takes the literal shape of the mould in which it was the cast, thus expressing something that is no longer there. In several entries, this property of the material is used. The jury finds only one entry portraying the concepts of memory in a convincing manner, using energy to connect it in an innovative way. The design '**Concrete Tornado**' by Ruben Geutjens and Nick Noordam (**GN123**) is a monument to the natural strength of tornadoes. The designers want to build a concrete tornado in the centre of the Tornado-stricken landscape of Tornado Alley in the U.S. Just like a real tornado great power and energy speaks from the design. Strikingly abstracted into a series of concrete piers, variable forms are created that realistically resemble a whirlwind. But Concrete Tornado is more than a striking image. The designers see their concrete tornado as a public vantage point for people who are looking for actual tornadoes. This gives the object, in addition to its role as a monument, a meaning as an attraction which is a remarkable combination. Finally the compelling choice for concrete that

resists the forces of nature convince, the jury to award 'Concrete Tornado' with an honorable mention and a cash prize of 250, - euro.

### Innovation

As mentioned, there are various designs attempting to develop existing ideas and technologies. In most cases, however, it is difficult to find a truly innovative contribution. Thus the jury was positively surprised by the entry '**Practice Moisture School**' by Irene Boertien (**IB612**). Building on existing technologies, this design found an innovating solution to a real and global issue: clean drinking water.

## Jury Report

The designer of this submission used the heat-accumulating capacity of a thin shell concrete linked to the inertia (read cold) of a very thick concrete wall. In the intermediate space between the two, rainwater can evaporate and condense to form clean water. Applied on the southern wall of schools in Africa, the two things work together. They offer shelter to education and yield clean drinking water. Although the jury doubts whether the system really works, they are enthusiastic about the ingenuity which sought a direction to a new solution for a global problem. At the level of architectural design, the jury is less enthusiastic. Nevertheless, the jury has decided to reward **'Practice Moisture School'**, the innovation award. This prize is awarded this year for the first time, consists of a sum of 250, - euros and an expert meeting in which the winner is brought into contact with experts on the issue to stimulate and develop the idea into reality.

### Beyond categories

So far entries that represent recognizable categories and entries that reveal striking use of materials or innovative capacity have been appreciated by the jury. Yet there are also entries that transcend these classifications. The first example is **'Changing Perception'** by Olaf Burlage and Muriz Djurdjevic (**OM023**). The designers behind this exhibit reflect a world-view that is almost schizophrenic. The design that they proposed knows two very different sides. The first is a refined form study of concrete reliefs with qualities reminiscent of the work of Jan Schoonhoven, one of the most famous representatives of the Nul movement in the visual arts. The reliefs however are only the surface of the design. Below lies a deeper search into the possibility of adding phosphorescent powder to develop concrete that can emit light at night. Translated to the public space of the street, the designers created a totally new perception of concrete. A material that generally is regarded cold and hard in this new experience will absorb solar energy during the day and broadcast a mysterious glow during the night. It sounds like a poetic new world could occur. However the processed images of Nicolas Moulin that the designers use to illustrate their idea suggests something totally different. This image reveals an almost dark side of the design that the jury thinks is intriguing. Good design in the end indeed often has something disturbing.

The entry of **'Meander Drain'** by Vera Konietschke and Mariet Sauerwein (**MD325**) for totally different reasons transcends the above-mentioned categorization. The designers have a simple but

**Dutch Jury: Laurens Jan ten Kate (chairman) - architectuurstudio HH, Olv Klijn (secretary) - .FABRIC, Michiel Haas - NIBE, TU Delft, Rogier van Nalva - Pieters Bouwtechniek and Tom Bosschaert - Except Integrated Sustainability**

evocative solution, sought for an everyday problem of designers: the drainpipe. While no one denies the usefulness of the drainpipe, few designers recognize this object as a design brief. **'Meander Drain'** proves that this assumption is wrong. Instead of the standard pipe that always seems to have been added at the last moment, the designers take the winding course of a river as an inspiration. This meandering pattern is applied vertically in a series of openwork concrete building blocks. Cemented in the plane of the façade it creates a swirling path for the rainwater to bridge the distance between gutter and ground. With this design, the energy is visible from something as mundane as rainwater. Furthermore this design offers a useful alternative for the ugly, but necessary drainpipe. Also **'Meander Drain'** eliminates the inconvenience of an ordinary pipe that can block

## Netherlands

easel, instead in offers a visual spectacle in its place.

The last entry that has surprised the jury is **'A concrete organ at the shore'** by Marijn Abelman, Robert van Middendorp and Thierry van Til (**AA123**). The designers of this submission are not only different due to the presentation - black and white hand sketches and texts typed on a typewriter - the content of this exhibit also differs significantly from all previous ones.

Unlike the other designs, **'A concrete organ at the shore'** interprets the theme of energy in a very abstract yet very tangible way. The design involves the creation of a monument for all the energy invested in the Netherlands for the built environment to survive. Although most people do not realize, an important part of investment in the built environment in the Netherlands is spent underground, in concrete piles to be exact. In the heroic battle of the Dutch against the water this investment plays no role. As a tribute to the invisible energy that we require to build in marshy grounds, the designers propose a series of concrete piles in the dunes of the Dutch coast. Besides the visual power of this concrete forest in the transition zone between land and water the designers use the piles of the design as organ pipes.

Besides a powerful image the design thus also offers a powerful sound. In an inspiring way it is also transforms a force of nature that often is regarded as unpleasant - strong winds - into a feast for the eye and ear. In other words, a design that makes a contribution at the highest possible achievement for designers: to contribute to the wellbeing of people.

The jury decided these three entries were all with an exceptional price to value. **'Changing Perception'**, is awarded the third prize and a cash prize of 500, - euro won. The second prize and EUR 1000, - euro goes to **'Meander Drain'** and the first prize and EUR 1500, - is awarded to **'A concrete organ at the shore'**. Besides money and winning praise, the designers of these three awards also won participation in the International Concrete Design Competition Workshop in Den Bosch, in the last week of August 2012, where all international winners meet.

## Jury Report

### Intro

Students were asked to explore and exploit the potential of concrete's properties with respect to any notion on ENERGY. It asked to evaluate those properties of concrete that make it a relevant and versatile material for 'energy-aware' applications. It aimed to fully pursue the potential of core properties like mass, volume, surface textures, mixtures and hybrids, in acting on current needs and ambitions.

2011-2012 Concrete Design Competition is attended by architectural, engineering, designing departments and related fields of the universities. The projects were reviewed by jury members on June 15, 2012 Istanbul.

### Review /Evaluation

The jury performed a common evaluation and discussion sessions on the projects followed by individual touring. The result of the competition, which includes attracted and creative ideas in 3 terms, is reached with consensus: based on the features of concrete as material, production process and the way of execution (construct).

### General Considerations on Winning Projects

#### CS 000 – Chamcrete

Semra Refkaeva Shukrieva, Istanbul Technical University  
Cosku Cinkılıç, Istanbul Technical University

The project named “**Chamcrete**” with code number **CS000** considered as outstanding suggestion based on the implementation of concrete utilizing energy released of hydration to large extent and additionally the work maximizes the energy storage. Its correlation on the main idea of the theme and the structure featuring the theme is developed well enough to match the purpose looked forth within the scope of competition. The structure featuring the theme is successfully phrased to match the purpose. Moreover, the approach is environmentally friendly like capturing heat from the sun and reserving it and vice versa as a result of using additives to concrete. The project highlights the usage

**Turkish Jury: Murat Arif Suyabatmaz (chairman) - Suyabatmaz Demirel Architects / Bilgi University, Alpaslan Ataman, M. Burak Altınışik - Bahcesehir University, Hasan Çalışlar - Erginoğlu&Çalışlar Architects and Tulin Hadi, TeCe Architects**

of different additives for different purposes.

The proposal is worth doing further researches on it that would lead to sustainable construction. Nowadays throughout the country Urban Development Projects are initiated by the Government mostly concentrated at low income and earthquake regions. New housing construction projects are potential areas for material and structural developments.

Consequently, the project titled “**Chamcrete**” coded **CS000** is awarded to first prize, which is built on concrete utilization having a feature that turns colour obtained from the energy created by sun. Main focus of this project presented is that **Chamcrete** becomes whiter in hot conditions to reflect more light and cool down concrete structure and becomes darker in cold conditions to absorb more energy to heat structure.

## Turkey

### TY241 – Through Water to Produce Concrete

Aylin Yegen, Kocaeli University  
Ibrahim Türkeri, Kocaeli University

The project named as “**Through Water to Produce Concrete**” numbered **TY241** is found successful on main idea, formation process and being precise in the presentation for all these ideas and the processes. Moreover, the condensed water droplets can also be produced with other materials. Driving from the concept, the proposal can be searched more profoundly.

The second project titled as “**Through Water to produce Concrete**” coded **TY241** was awarded to second prize proposing to create greener environment through the condensed water droplets by producing spiral concrete structures. The project represents good example of nature/material relation through design rather than proposing new structural application of concrete. It also generates relations and cooperation among various disciplines like meteorology, agriculture and landscape design.

The visual presentation is found rather extreme but venue selection is successful to draw attention to draught. Although the project concept is open for plastics as material still without questioning concrete is environmentally friendly.

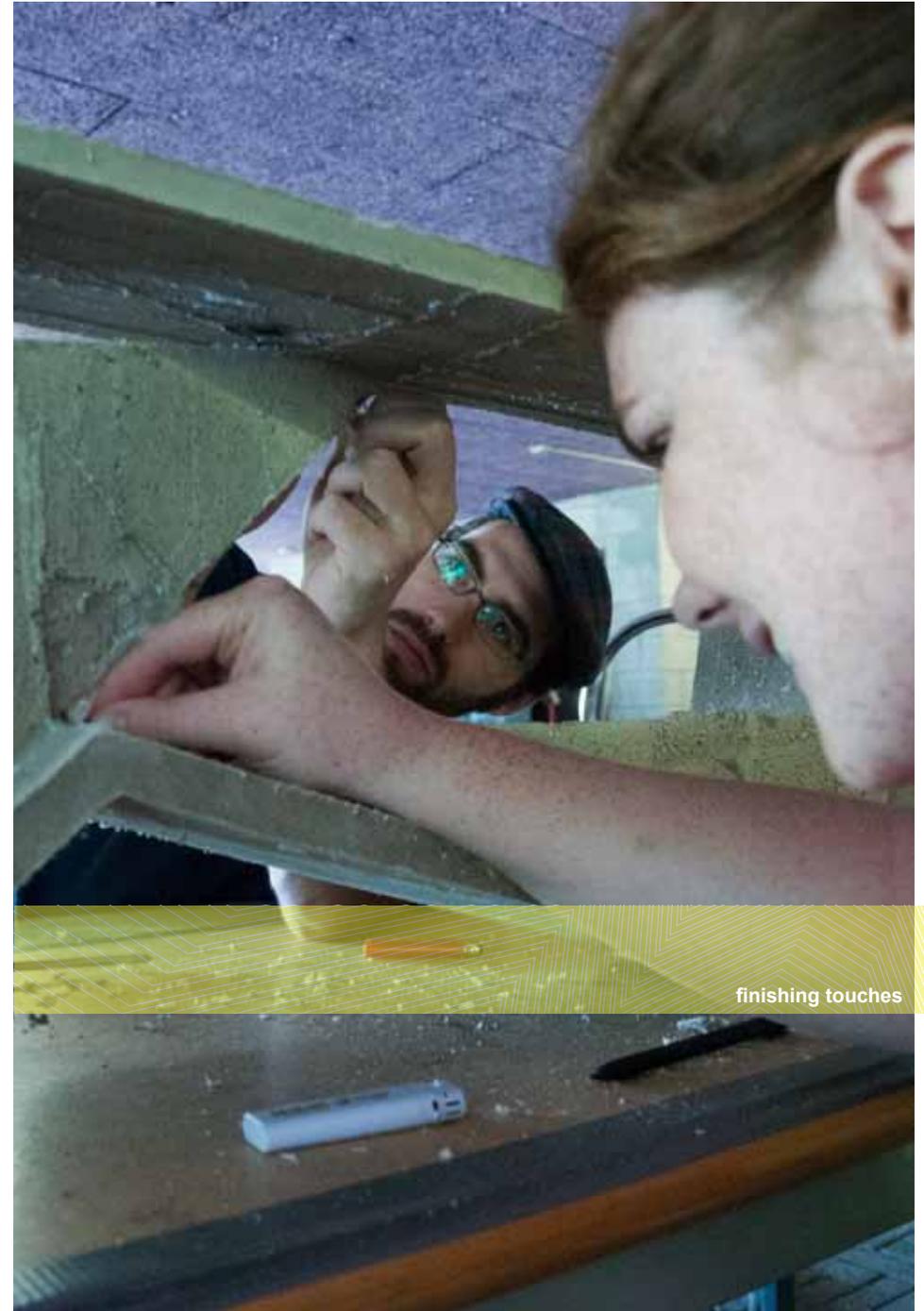
### Other Projects

The projects, which stated themselves by using the keywords as: “**Thermochromism**”, “**chromatophores**”, “**changing colour of concrete**”, “**more heat in cold**”, and “**more light**”, stood out upon the level of ideas presented, answers received to expectations of the main theme of the competition and the successful statements.

Detailed examination through sessions jury noted the need for further investigation and idea development for above projects but still found them promising.



assembling the scale 1:1 mould



finishing touches

## ENERGY - exploring mass & volume

### Assignment

**Explore and design** a replacement facade system for the Cementrum building in which thermal active measures, use of mass and volume caters to architectural, formal and energetic ambitions. Form, function, technique, structure, interior, exterior all come together.

**Design & Produce** a concrete prototype of 1 facade element (scale 1:1)

- Envelope is; width: 1,8 meters, depth; 0,9 meters, height 3,7 meters
- Thickness of facade is max 0,9 meters. Which part of section is 'inside' and which is 'outside' is part of design.

**Design & Produce** series of concrete models of facade elements, scale 1:5 (iterative design process)

**Produce** presentation (panels / ppt) of design ambitions and solutions (whole building system / technique / architecture / etc.), including 3d digital model of the building

## THE CONCRETE DESIGN WORKSHOP

### Design Framework

- size of facade panel: width x height x depth: 1,8 x 3,7 x 0,9 meters
- glass surface area is 35 %
- concrete volume percentage max 40 %

### 3 groups:

- each group produces 4x 2 facade proposals (iterative design development)
- 1st iteration: foam model, scale 1:5
- 2nd to 4th iteration concrete models 1: 5
- each group produces digital design models for whole building (sketch-up model)

- 1 selected proposal will be developed into scale 1:1 prototype

### scale 1: 5 models:

- w x h x d = 0,36 x 0,74 x 0,18 meter
- volume 'envelope' = 0,05 m<sup>3</sup>
- volume of concrete max. 40 % = 0,02 m<sup>3</sup> = 20 liters = 46 kg
- 3 groups, 3 pours, 2 models per pour

### scale 1:1 prototype:

- w x h x d = 1,8 x 3,7 x 0,9 meter
- volume 'envelope' 6 m<sup>3</sup>
- volume of concrete max. 40% = 2,4 m<sup>3</sup> = 5.750 kg
- 40 % foam = 2,4 m<sup>3</sup>



## tour NL, opening dinner & kick-off



arrival at hotel



bisected WWII bunker



basketbar, Utrecht



3XN



experience

The Concrete Design Workshop - ENERGY took place in 's-Hertogenbosch, Netherlands from Sunday August 26 till Saturday September 1. 19 Students, all national laureates, participated in this 7-day international and extremely intensive 'hands-on' event.

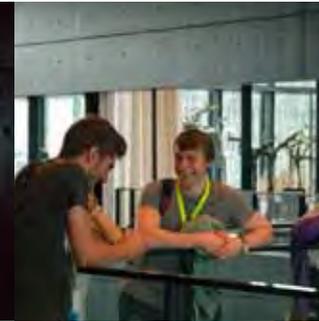


Cementrum, workshop location

## Sunday August 26, 2012



Wiel Arets' library, Utrecht



Claus & Kaan



the Rietveld-Schröder house



West 8

The NL tour demonstrated various applications of concrete in architecture, as well as well-known Dutch buildings. On the menu: dissected WWII bunker, 3XN, UNStudio, Wiel Arets, OMA, NL architects, the Rietveld-Schröder House, Claus & Kaan, and West 8.



first dinner



introducing the assignment

the assignment, the Cementrum & Daan Roosegaarde



the material...

the object of investigation

The first day at the Cementrum was briefly dedicated to discuss the assignment; redesign a facade system for the Cementrum. Use existing panel dimensions of hwxwd of 3,7 x 1,8 x 0,9 m. Activate the nowadays unusual depth of 90 cm for architectural expression or functions.



Monday August 27, 2012



foundation for scale 1:1 prototype



Mark van Halderen on cement



Moving directly forward with generating ideas and producing foam models to be tested and reviewed. All three groups had to deliver at least two different proposals. The first evening we welcomed architect/artist-Daan Roosegaarde for an energetic keynote lecture.



Daan Roosegaarde's keynote

first ideas, foam models & selection of 'one to one'



assembling the 1:1 formwork base

Steven Gelderman on formwork

critic with Daan Roosegaarde

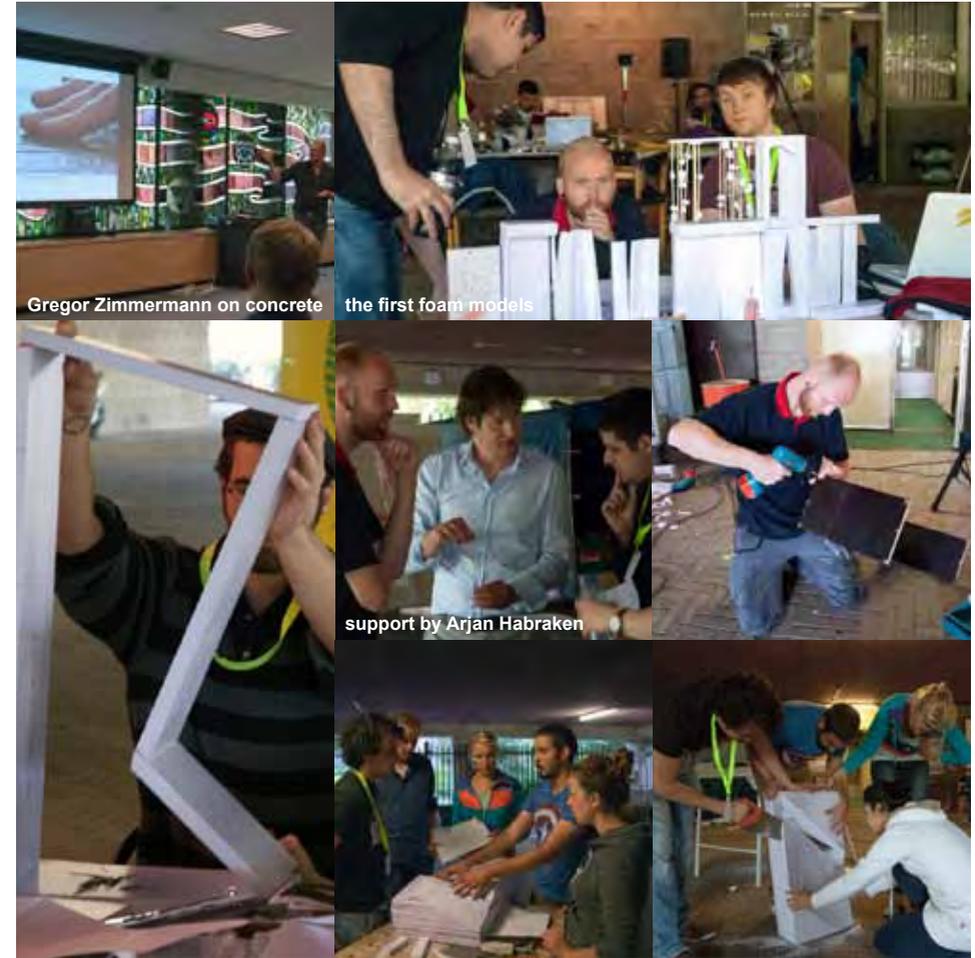
experimenting with chemicals...

Daan Roosegaarde stayed on for a day of discussions and critics. Plus lectures by Steven Gelderman - NOE Betonvormgeving - on formwork and by Gregor Zimmermann - G.tecz - on 'state-of-the-art' concrete technologies and amazing applications. 'Everything is possible'!



testing

Tuesday August 28, 2012



Gregor Zimmermann on concrete

the first foam models

support by Arjan Habraken

During the afternoon structural engineer Arjan Habraken - SIDstudio - joined the team. A welcome expertise for finetuning the proposals. The day ended with an evening session presenting all proposals and selecting one of those to be developed into the scale 1:1 model.



presenting first proposals

selecting proposal for 1:1 model

## the first concrete prototypes, scaling to '1:1' & late night #1



more instructions



Leo Dekker on concrete

After the presentations of Tuesday, some regrouping was necessary. All criticism needed to be digested. The 1:1 group was confronted with a refreshing reality-check. After all, there are some major differences and challenges compared to making models scale 1:5.



## Wednesday August 29, 2012



first tests with concrete models



The prepared outside mould for the 1:1 prototype needed to be complemented with a foam core, determining the actual form of the object. Thinking, drawing, cutting, glueing and lots of sanding. Meanwhile the other groups produced their first concrete prototypes.



working through the night ...

... waiting for the glue to set ...

formwork 1:1, iterations on 1:5 & late night #2



more foam

demoulding the first results



for smooth surfaces...

The art of demoulding takes some patience and precision. The 'unwrapped' models give cause to rethink, alter designs and improve moulds for second runs. Editor Caroline Kruit lectured on architecture and senses, an inspiring addition to the mostly technical input.



Caroline Kruit on senses

Thursday August 30, 2012



assembling the 1:1 mould

The 3 cubic meter core of foam demanded intelligent techniques to meet the criteria for precision and assemblage. The sanding, filling, sanding and even more sanding never seemed to stop. Somehow 'supersmooth' is needed. And what about 'the straight curve...'?



scale 1:1 pour, final 1:5's & Kasper Jørgensen



complex geometries

carefully cleaning

The day of the pour. Every minute was needed to prepare the mould. Foam tends to float and the volume is enormous. The 1:5 groups had set new goals easily meeting the standards of difficulty of their 1:1 peers. Computer generated geometries are not easily fabricated in foam.



closing the mould

Friday August 31, 2012



the 'real' works

unexpected failure

regrouping and planning

Kasper Jørgensen's keynote

A true truckmixer arrived on the scene for the 'tall one'. Unexpectedly the mould collapsed just before being totally filled. Disappointing indeed! However, no desparation. Plan B was developed, Kasper Jørgensen - GXN - lectured and the last batch of 1:5's was filled.



another night, last pouring

## demoulding, finishing touches & presentations



After a rainy Friday the last hours of the workshop were used for demoulding, cleaning the models and finishing presentations. And resting ... a little. 6 Days working from 10 til midnight had taken its toll. And produced some amazing and beautiful prototypes!



## Saturday September 1, 2012



Party and dinner were preceded by a presentation with Caroline Kruit and Kasper Jørgensen joining the fulltime staff with Hans Köhne, Patricia Hessing, Ifke Brunings and Siebe Bakker. Thanks to our host the Cement&BetonCentrum and to all supporting companies!



Julian, Mariet, Michael, Ray, Robert & Semra



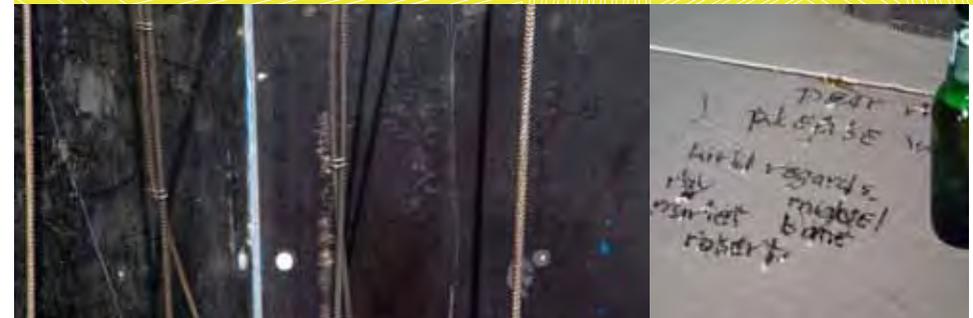
A proposal for an undulating functional facade system provides for indirect light and views. The 'cosy' seats offer welcome additions to any office space. This proposal was chosen to be made in scale 1:1 in order to experience 'real-life' challenges of working with concrete.



group 1 - curtain



Group 1 was seriously limited in time for 'design-development'. All available energy was needed to produce the mould. Never seen so many people sanding at the same time. A wonderful job resulting in an amazing prototype.



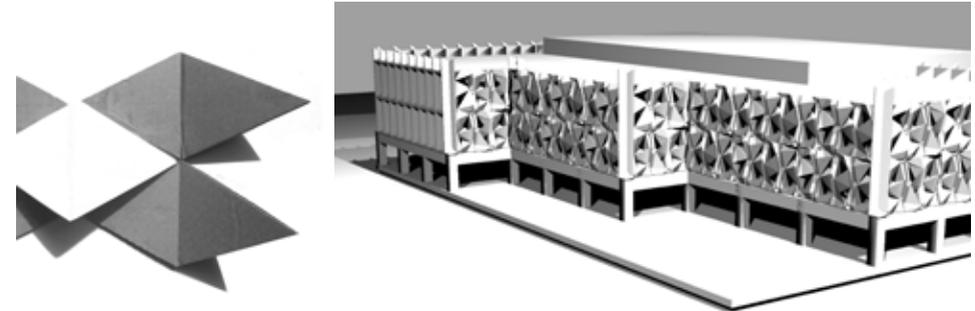
Aylin, Coşku, James, Olaf, Pablo, Thierry & Vera



Two approaches combining 'state-of-the-art' digital technology ideas with concrete. A static interpretation of a pixelated media facade. And a seemingly straight-forward sculptural system for which it appeared to be a challenge to built smooth and precise formwork.



group 2 - pixelfotogenica & euclideswaswrong



Besides some beautiful prototypes as indicators for how the Cementrum could look like, both ideas demonstrated the complicated relationship between computer generated geometries and actual production of moulds and objects in real materials.



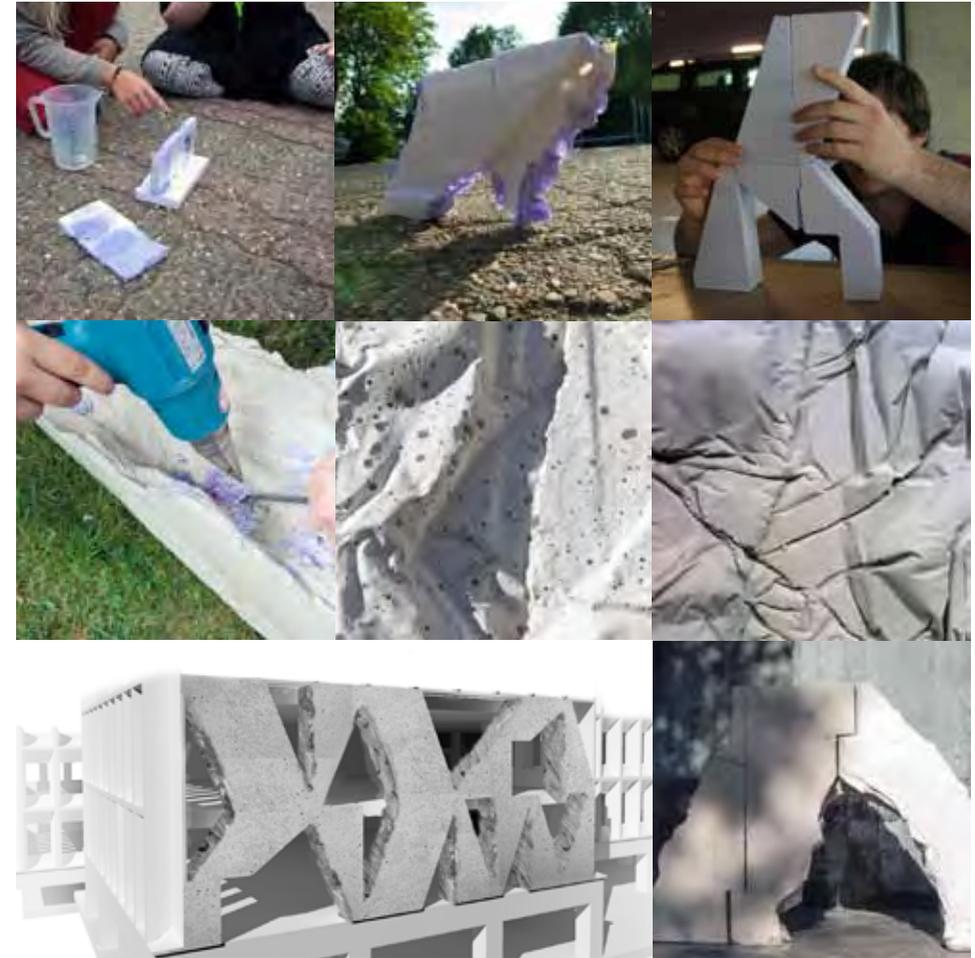
Colin, Ibrahim, Jenny, Jo, Marijn & Steffen



Group 3 investigated a series of possibilities. The first one working with light, shadows and sound, resulting in a facade system that should actually 'whistle' in the wind. A second proposal investigated the rougher sides of concrete. How can it show being broken.



group 3 - instrumental facade, π-casting & Ew



It led to a 'beton brute' interpretation in an unprecedented scale. The last series explored a more 'cubic' or 'panel' approach, activating an almost poetical interpretation of 'bris-soleil', playing with light and shadows as well.



## demoulding 1:1 - the second try



After the unforeseen failing of the formwork for the scale 1:1 model all participating companies decided to give the prototype another chance. It took almost a week to clean, repair and strenghten the formwork and prepare for the second pour.

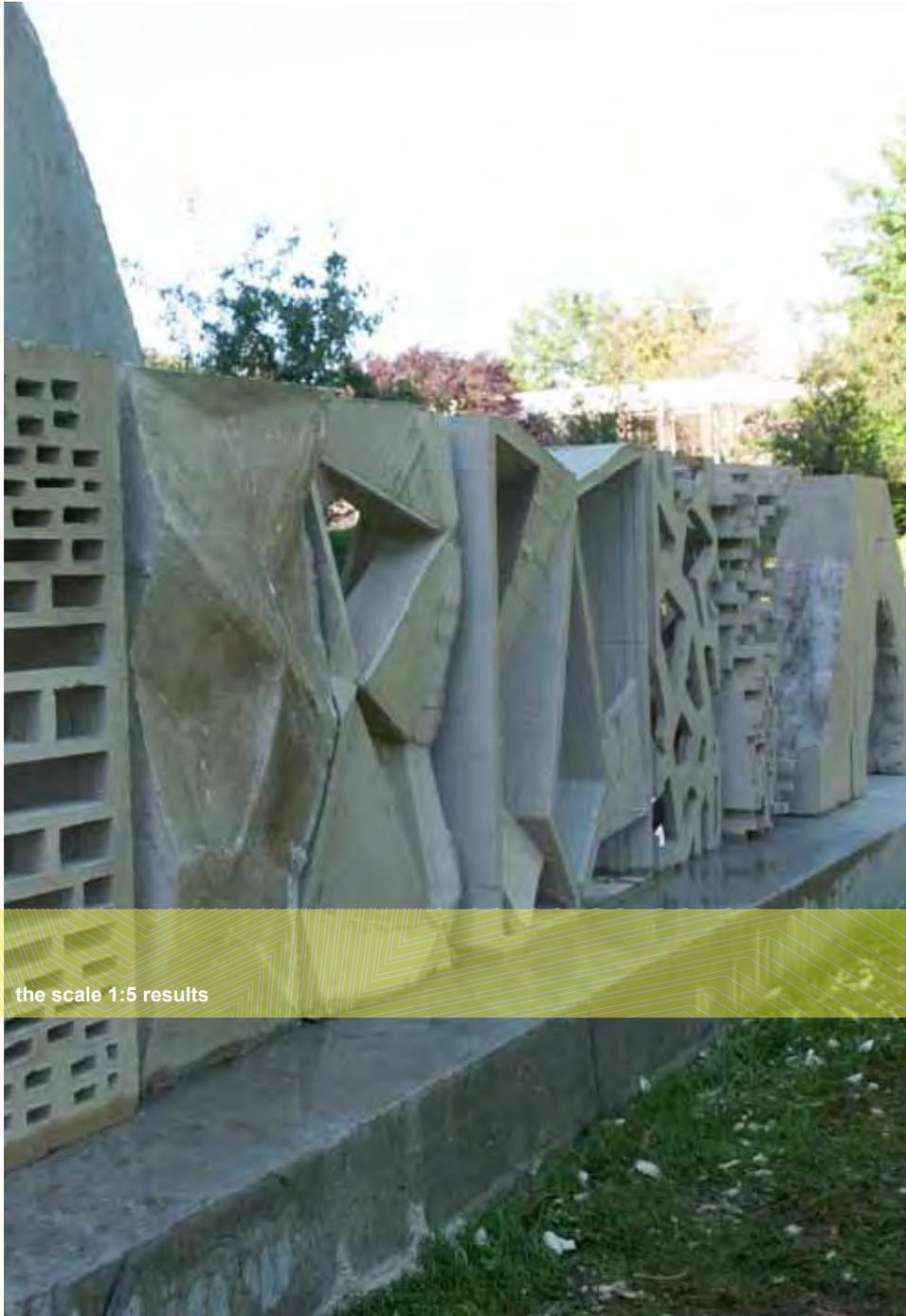


## Friday September 7, 2012

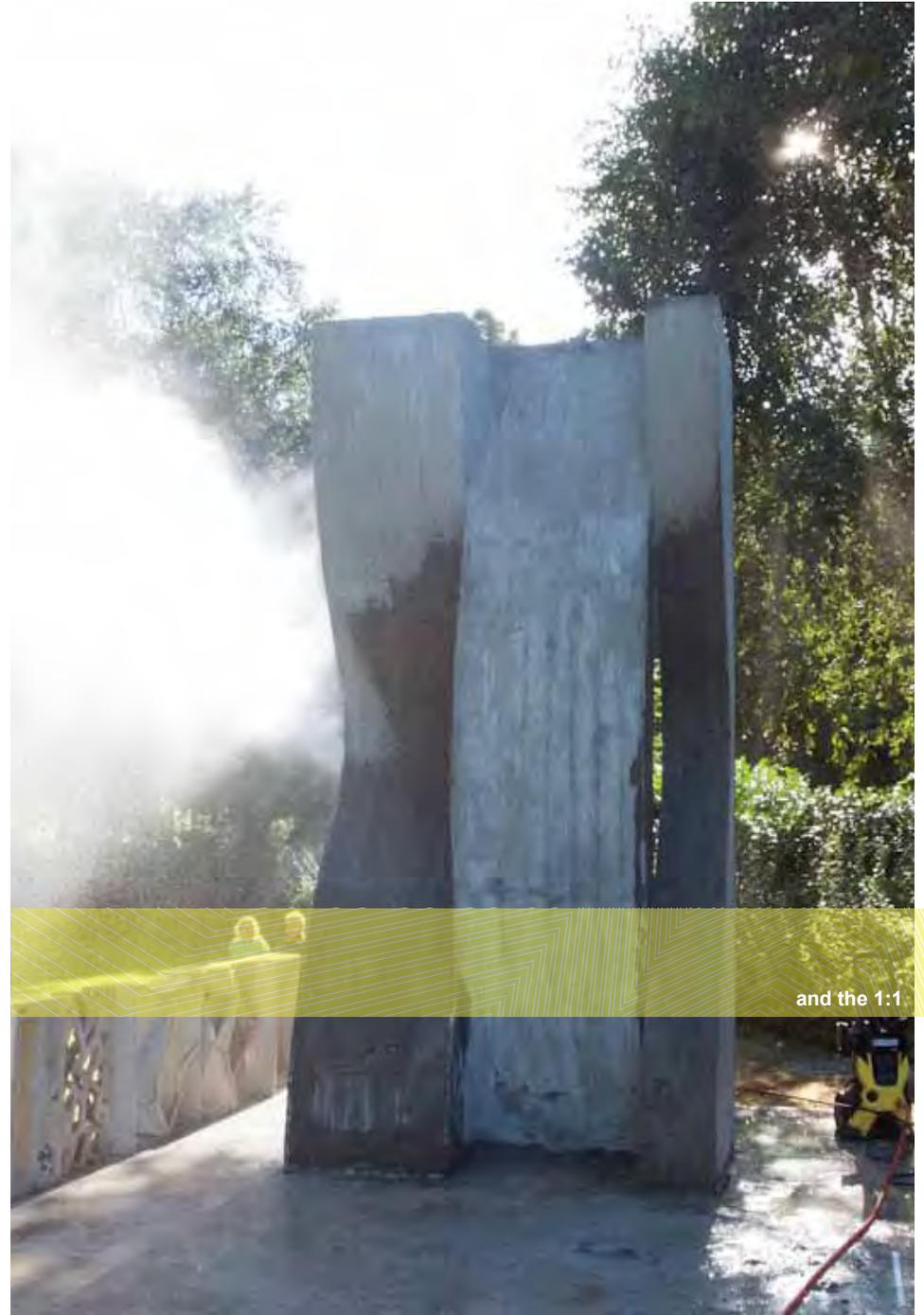


Thank you: Beamix, de Bonth van Hulsten, Cugla, ENCI, Mebin and NOE Betonvormgeving for your unrelenting support. And Cement&BetonCentrum for remaining faithful, for hosting the workshop and for adopting this amazing physical concrete prototype for your own facade!





the scale 1:5 results



and the 1:1

## competition

### Initiative and organization

### International coordinator

#### Netherlands

Cement&BetonCentrum

Hans Köhne: [hanskohne@cementenbeton.nl](mailto:hanskohne@cementenbeton.nl)

### National coordinators

#### Belgium

FEBELCEM

Noël Naert: [n.naert@febelcem.be](mailto:n.naert@febelcem.be)

Jean-François Denoël: [jf.denoel@febelcem.be](mailto:jf.denoel@febelcem.be)

#### Germany

VDZ

Torsten Förster: [foerster@bdzement.de](mailto:foerster@bdzement.de)

#### Ireland

Cement Manufacturers Ireland

Richard Bradley: [rbradley@irishcement.ie](mailto:rbradley@irishcement.ie)

#### Turkey

TCMA

Çaglan Becan: [caglanb@tcma.org.tr](mailto:caglanb@tcma.org.tr)

### Consultant / coordinator & format

bureaubakker

Siebe Bakker: [siebe@bureaubakker.com](mailto:siebe@bureaubakker.com)



Exhibition at award event

## colophon

### National Juries

#### Belgium

Audrey Contesse - A+ Belgian architectural review, Bernard Kormoss - University of Liège, Christophe Van Gerwey - Ghent University, Henk De Smet - De Smet Vermeulen Architecten, Jean-Didier Bergilez - ISA-La Cambre and Klaas De Rycke - Bollinger + Grohmann Paris

#### Germany

Arno Brandhuber - Brandhuber+, Bettina Kraus - Wiel Arets Architects, Christiane Bohmann - HeidelbergCement AG, Tobias Wallisser - LAVA and Volker Schmid - Technical University Berlin

#### Ireland

Ciarán Ferrie - Ciarán Ferrie Architects, Douglas Carson - Carson & Crushell Architects, Guy Thompson - MPA - The Concrete Centre and Selma Harrington - ANIMA DESIGN, ACE President

#### Netherlands

Laurens Jan ten Kate (chairman) - architectuurstudio HH, Olv Klijn (secretary) - FABRIC, Michiel Haas - NIBE, TU Delft, Rogier van Nalta - Pieters Bouwtechniek and Tom Bosschaert - Except Integrated Sustainability

#### Turkey

Murat Arif Suyabatmaz (chairman) - Suyabatmaz Demirel Architects / Bilgi University, Alpaslan Ataman, M. Burak Altınışık - Bahcesehir University, Hasan Çalışlar - Erginoğlu&Çalışlar Architects and Tulin Hadi, TeCe Architects



National jury in session

## workshop

### Participants:

Aylin Yegen, Colin Dorgan, Coşku Çinkiliç, Ibrahim Türkeri, James Boyd, Jenny Kingston, Joanna Burton, Julian Manev, Mariet Sauerwein, Marijn Abelman, Michael Albertshofer, Olaf Burlage, Pablo Humanes, Ray Mc Greal, Robert van Middendorp, Semra Refkaeva Shukrieva, Steffen Winkler, Thierry van Til and Vera Konietschke

### Tutors:

Hans Köhne - Cement&BetonCentrum, Ifke Brunings & Patricia Hessing - Ateliers and Siebe Bakker - bureaubakker

### Experts, critics and lecturers:

Arjan Habraken - SIDstudio, Caroline Kruit - dax, Daan Roosegaarde - Studio Roosegaarde, Gregor Zimmermann - G.tecz, Kasper Jørgensen - GXN, Leo Dekker - Mebin, Mark van Halderen - ENCI and Steven Gelderman - NOE Betonvormgeving

### Support:

de Bonth van Hulten; Fer van Dommelen, Jorg Klomp, Lamberto van Mook, Marcel de Gouw, Rick Boelen and Toon van Mook  
Cement&BetonCentrum; André Burger, Anja van den Bogaart, Natasja Steenbergen and Wim Kramer  
ENCI; Hennie Kemper  
Sodexo; Fanny Marcé, Henny van der Linden and Willeke Segers  
&  
Ton Kwaytaal

### Photography:

Bram Rutten for bureaubakker

### The Concrete Design Workshop - ENERGY has been made possible through the added support of:

Beamix, de Bonth van Hulten, Cement&BetonCentrum, Cugla, ENCI, Mebin and NOE Betonvormgeving



## colophon

### Concrete Design Book - ENERGY

editor & design: Siebe Bakker - bureaubakker



The 5th Concrete Design Competition - **ENERGY** took place in 2011 and 2012. It asked students to explore and exploit notions on **ENERGY** in relation to the material concrete and architecture. Developed ideas were to be tested and presented through architectural design proposals, which could range from details and furniture to large buildings and technical systems.

The competition resulted in over 100 entries from more than 150 students. The topics of investigation varied from ingenious proposals of how to manage thermal concrete mass activation, to water-purification-systems and energy storage or energy harvesting building envelopes. Besides the 'technical' approaches many participants favoured to explore more poetic or ephemeral notions on **ENERGY**.

The national winners of the competition were invited to participate in a week long workshop, hosted by the Cement&BetonCentrum in the Netherlands. Facilitated by a staff of various experts, lecturers and critics and provided with ample working spaces, tools and materials, the students continued their architectural investigation into **ENERGY** and concrete. They were asked to redesign the facade system of the office building where the workshop was located. A true 70's facade with a nowadays unusual depth of 90 cm. The students had to embrace and activate this depth, being able to either exploit architectural expression, offer new functionality, or both.

Working mostly in scale models, the ideas had to be developed through series of concrete models. Early on during the week one of the proposals was chosen to be produced on site in scale 1:1. A true learning experience unveiling some of the specific challenges occurring when building for real.

The workshop program saw a range of lectures on cement and concrete as well as two keynote lectures by architect / artist Daan Roosegaarde and architect Kapser Jørgensen, director of GXN. Especially the scale 1:1 prototype was made possible through the added support of Beamix, De Bonth van Hulst, Cugla, ENCI, Mebin and NOE Betonvormgeving.

The Concrete Design Competition is an initiative by Cement&BetonCentrum (NL), Cement Manufacturers Ireland (IE), FEBELCEM (BE), TCMA (TR) and VDZ (DE). Their aim is to stimulate innovative design attitudes related to concrete. They recognise that the use of concrete as an architectural medium shows room for improvements and development. The material is more than a tool to 'solve' formal design ambitions. Material research and understanding will lead to innovative design and create possibilities to surpass existing limitations and visions.