

Solar Decathlon – RevoltHouse

KIVI NIRIA 08-06-2011

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Architectural Engineering

Solar Decathlon – 10 Disciplines



Solar Decathlon – 10 Disciplines

Architecture	Architecture	120	200
	Engineering & Construction	80	
Energy	Energy Efficiency	100	220
	Electrical Energy Balance	120	
Comfort	Comfort Conditions	120	240
	House Functioning	120	
Social Economic	Communication & Social Awareness	80	160
	Industrialization & Market Viability	80	
Strategic	Innovation	80	180
	Sustainability	100	

Solar Decathlon

The Solar Decathlon competition has four main objectives:

1. To educate

... educate the general public ... raise society's awareness

...

2. To encourage

... use of solar technologies ... architectural attractive ...

3. To raise awareness

... awareness of students participating ... renewable energy

4. To clearly demonstrate

... built without sacrificing comfort ... attractive and affordable

Solar Decathlon Europe won the “**Sustainable Energy Europe Award Competition 2011**” prize in the category of “Communication”, one of the most important international sustainable energy awards.

Solar Decathlon Europe 2012



Solar Decathlon Europe is not “only” a European competition, but actually it is the most internationally ever ... (in 2012 20 teams from 15 countries/ 4 continents)

Solar Decathlon Europe 2010



SDE 2010 Team Virginia Polytech



SDE 2010 Team Rosenheim



SDE 2010 Team Paris



Team TU Delft

- Faculty of Architecture, Department of Building Technology
- Energy Club
- Delft Energy Initiative (DEI)

Further support

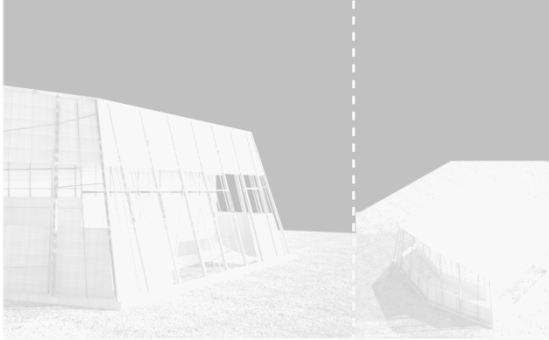
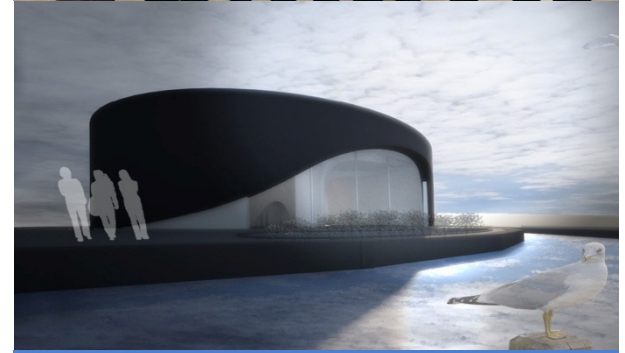
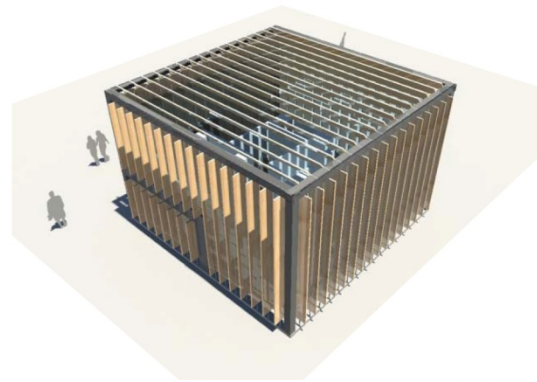
- Economische Faculteitsvereniging Rotterdam (EFR)



Student team (17 different countries/4 continents)



TU Competition



ReVolt House[®]

ENERGY ADAPTIVE FLOATING UNIT



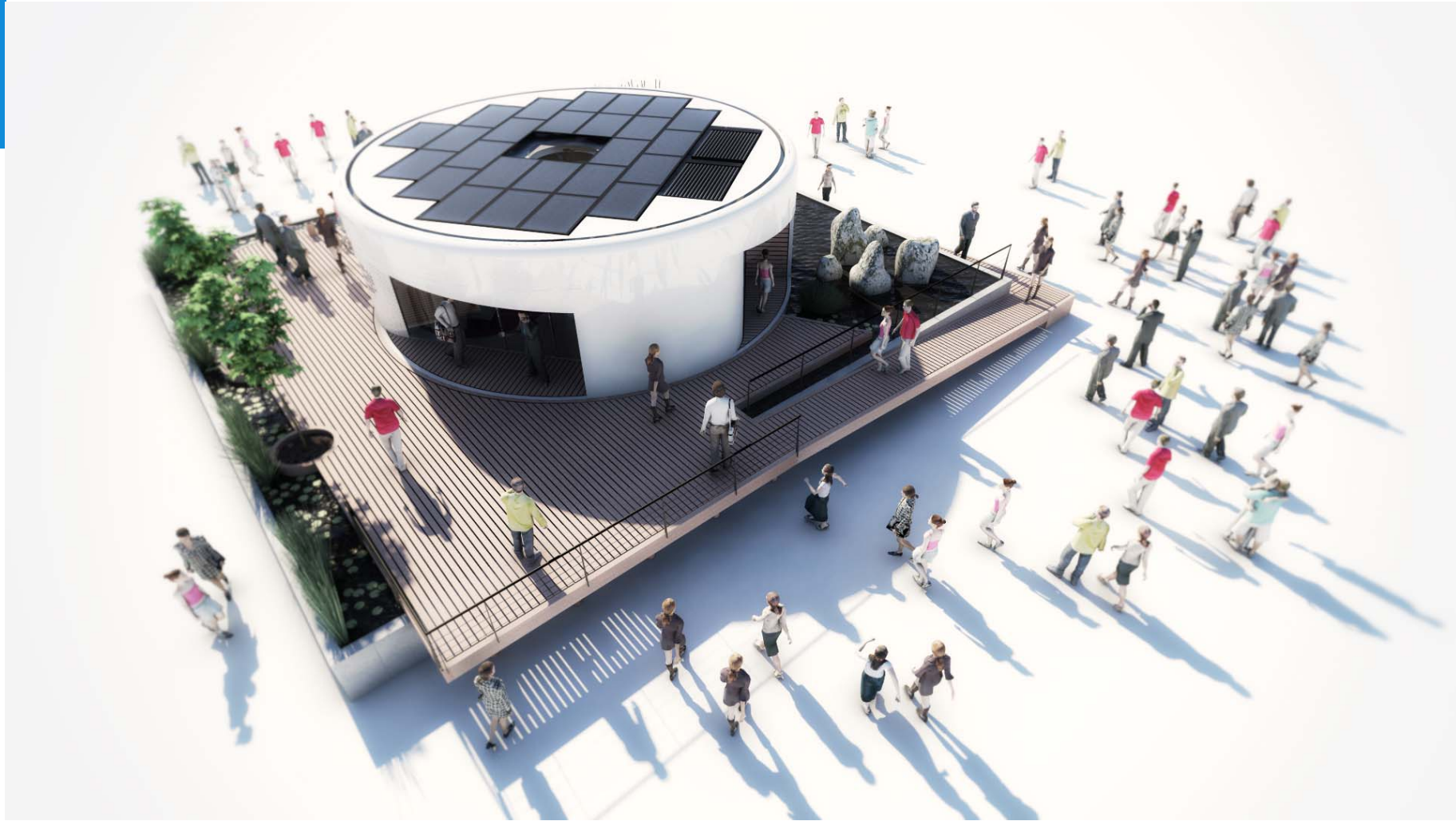
Solar Decathlon 2012

Schedule

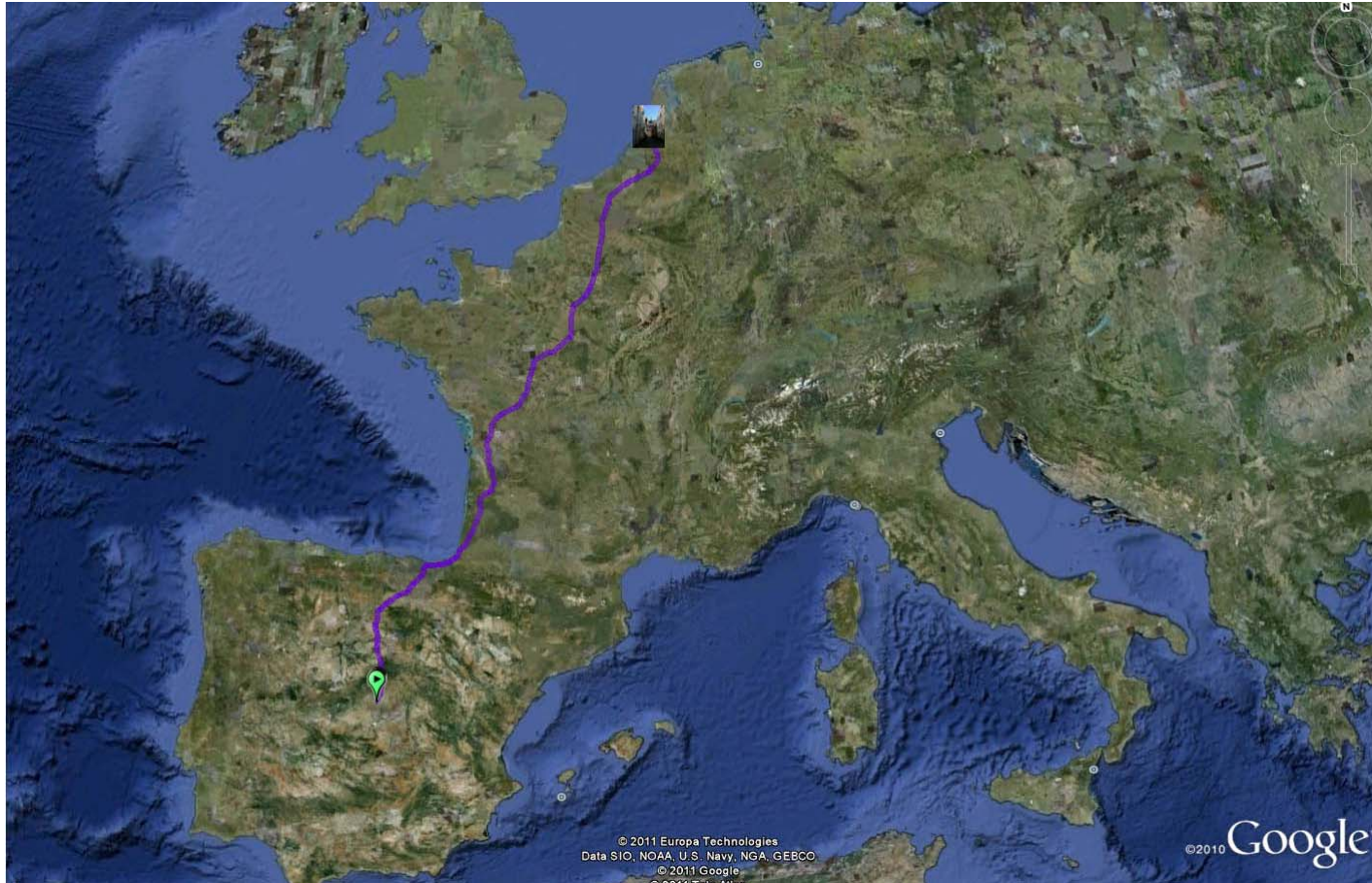
- Summer 2010 Preparing proposal and visit to Madrid
- October 2010 Technical proposal submitted
- November 2010 Student competition (TUD internally)
- December 2010 Decision about acceptance
- Spring 2011 Design development
- **Summer 2011** **Final design**
- Autumn 2011 Construction documents
- Spring 2012 Production and manufacturing
- September 2012 Competition in Madrid

Building up 1 week, competition 2 weeks, taking down 1 week

Madrid location

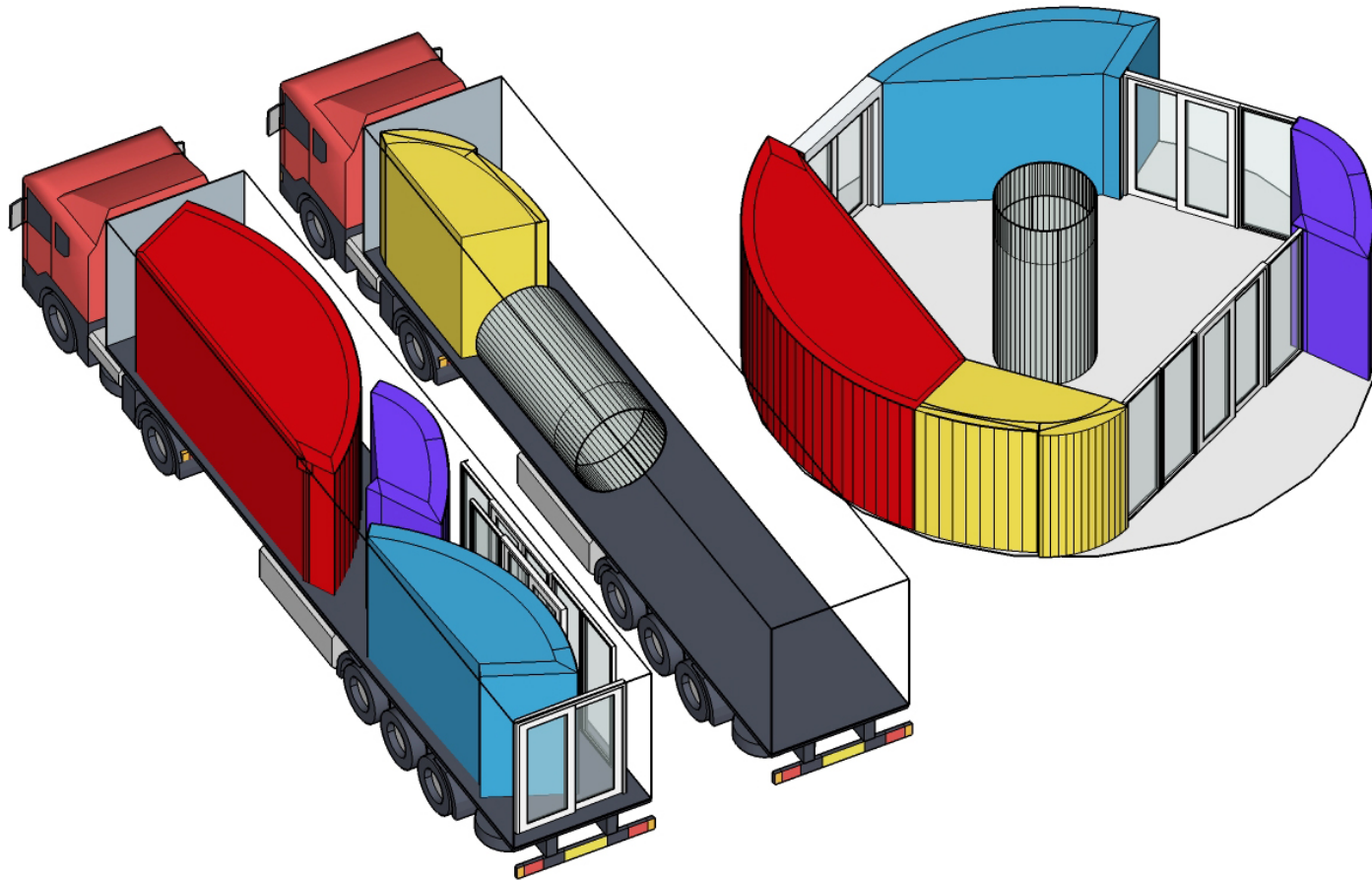


Transport to Madrid and back again



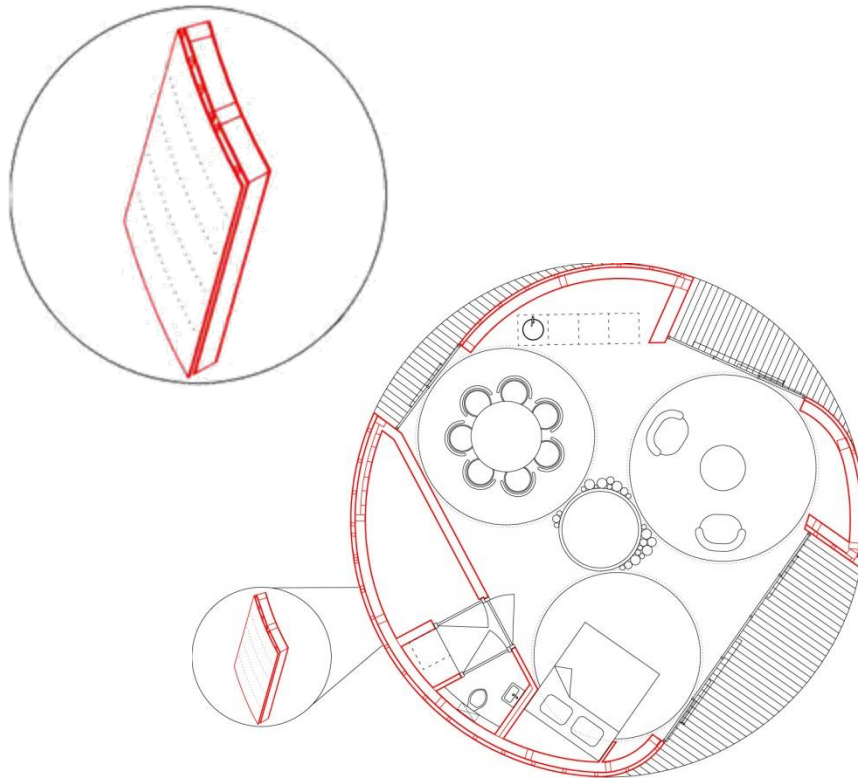
1740km

Transport to Madrid and back again

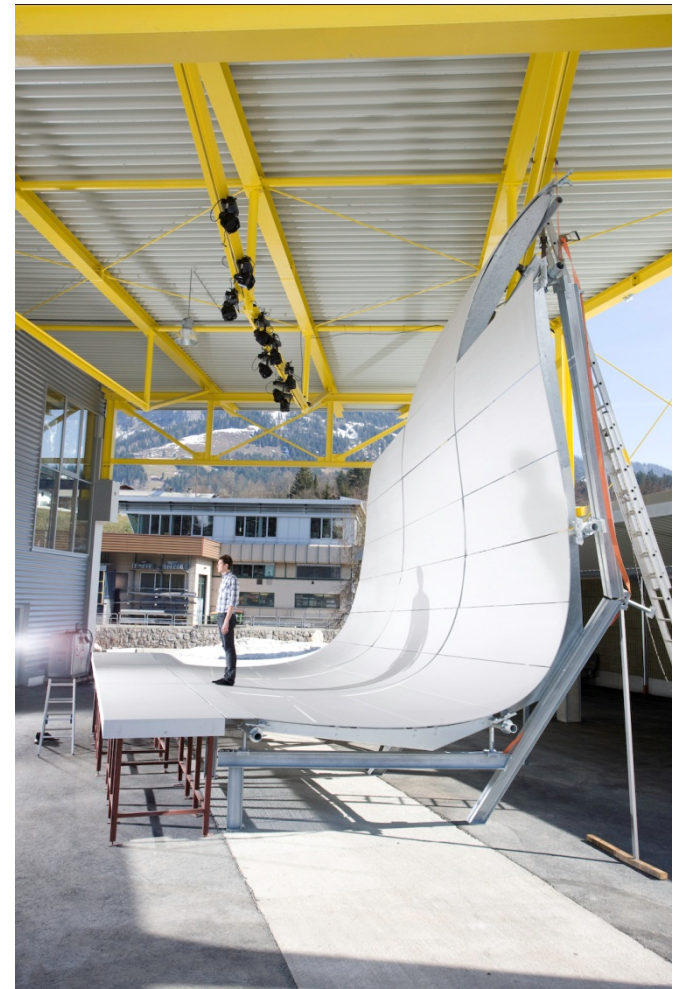


Prefabrication

Frame construction



Example: Category I- Exterior Walls



Fibre C

Materials

End of Life option

Environmental burden

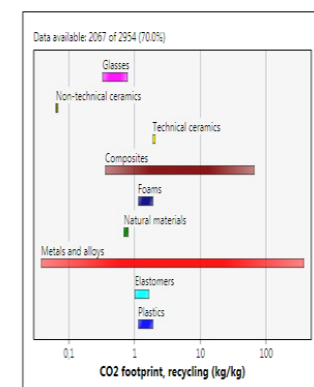
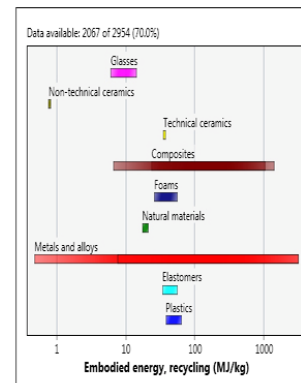
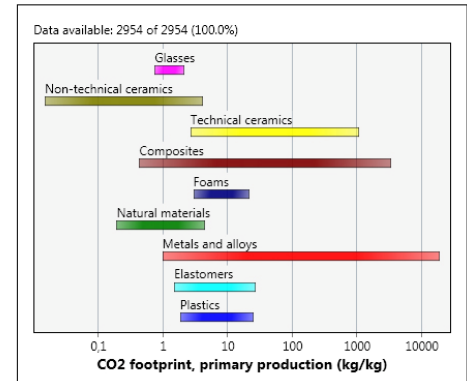
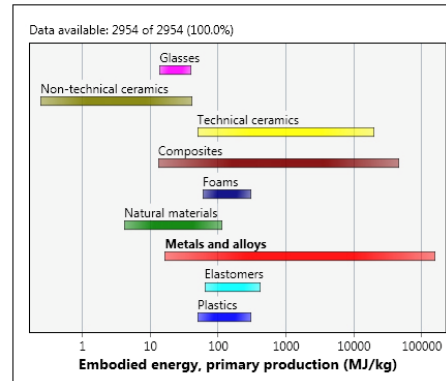
- Reuse
- Re-engineer
- Recycle
- Downcycle
- Combustion
- Landfill

Lowest



Highest

Source: CES 2011 Educational version- sustainability strategy definition



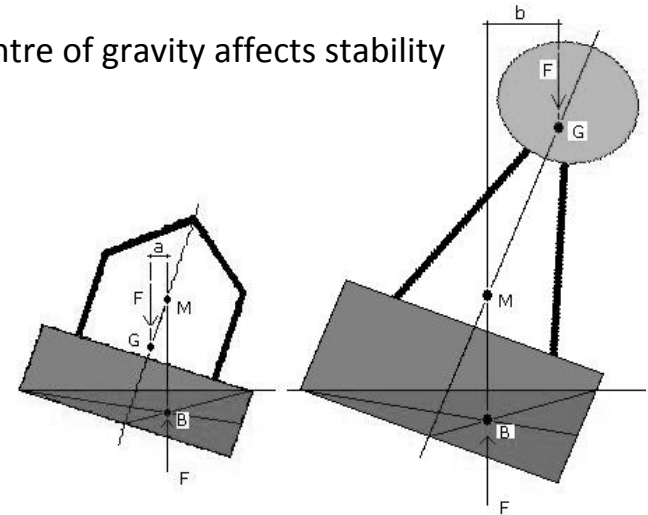
'Sustainability' can be relevant, depending on the life-cycle point chosen for strategy

Floating Principles

stability



Centre of gravity affects stability



$$M_{righting} = \phi * \rho * g * I_w = M_{acting}$$

ϕ = rotation

I_w = Moment of inertia of the water-plane

$$\sin\phi = M_{acting} / (F * GM)$$

$$GM \simeq BM = I_w / V$$

$$\text{Period of roll: } T = (2 * \pi * k) / \sqrt{g * GM}$$

K = radius of gyration

Floating Principles

Floating concept A: Composite modules

Based on the eps-concrete system



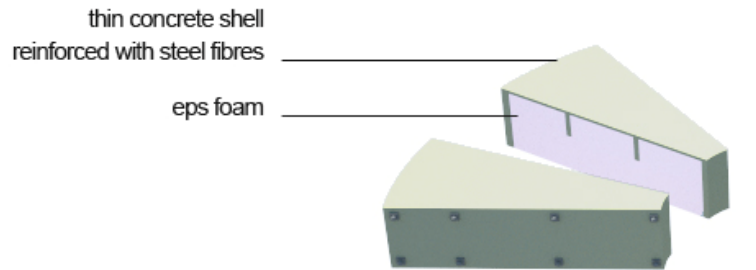
- +
 - unsinkable system
 - low density = high buoyant capacity = small draught
 - high durability/low maintenance
 - construction on water
 - variety of shapes
 - insulating

- - non-demountable
 - eps: non-eco-friendly
 - total weight still high

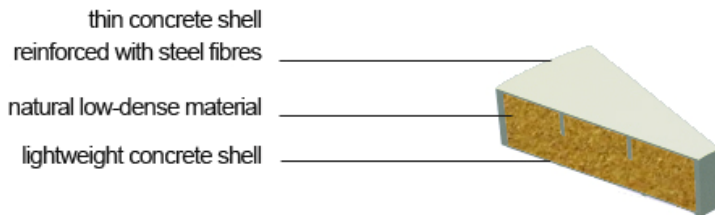
Floating Principles

Floating concept A: Composite modules

Sustainability: Choose natural low-dense materials for the core



eps, density*: 15-22 Kg/m³



straw bale, density: 100 -110 Kg/m³



expanded cork, density: 110 -120 Kg/m³






balsa foam, density: 80 Kg/m³

Floating

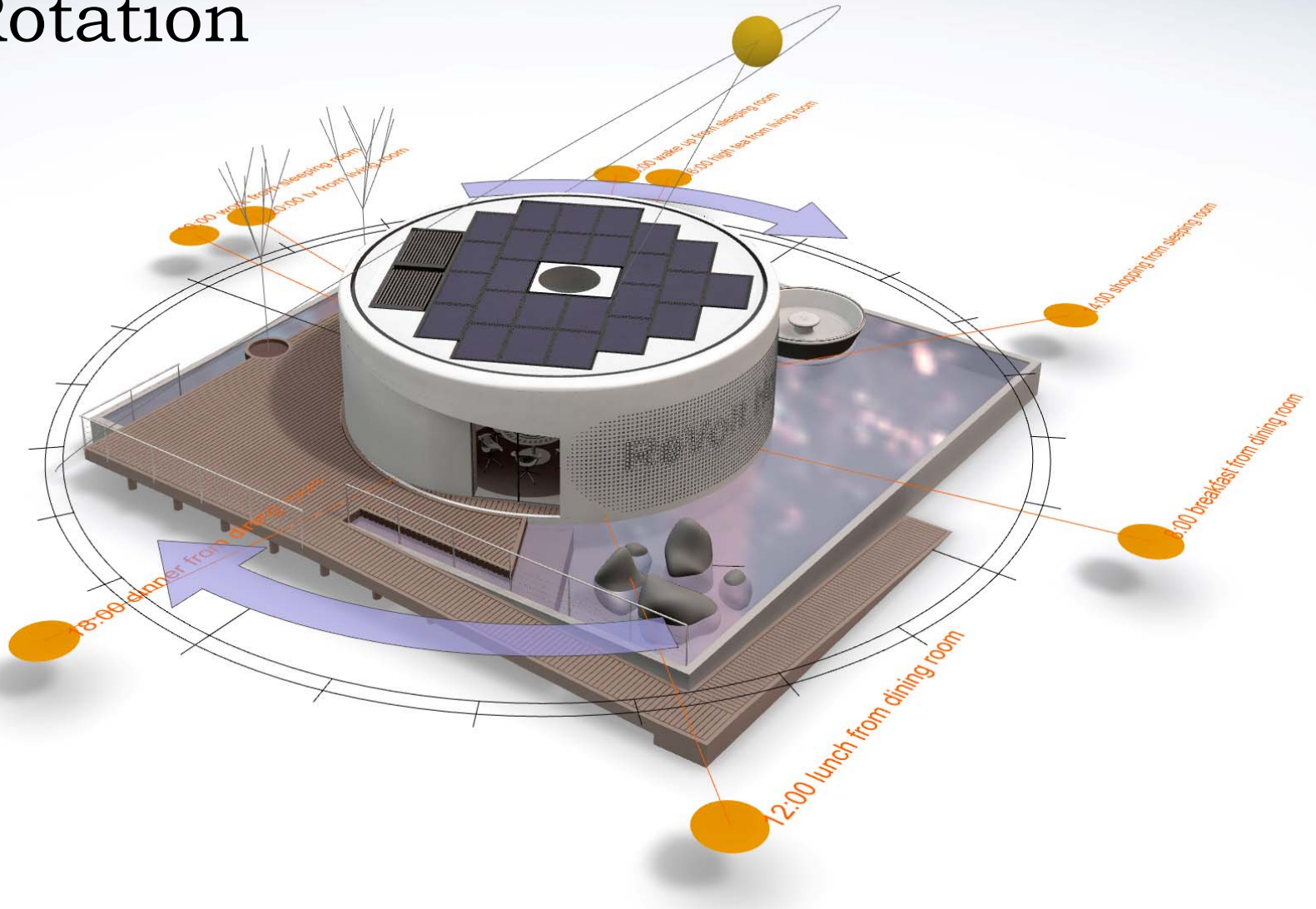


A possibility is to use sectional storage tanks for making a dismantlable water basin for the Solar Decathlon 2012.

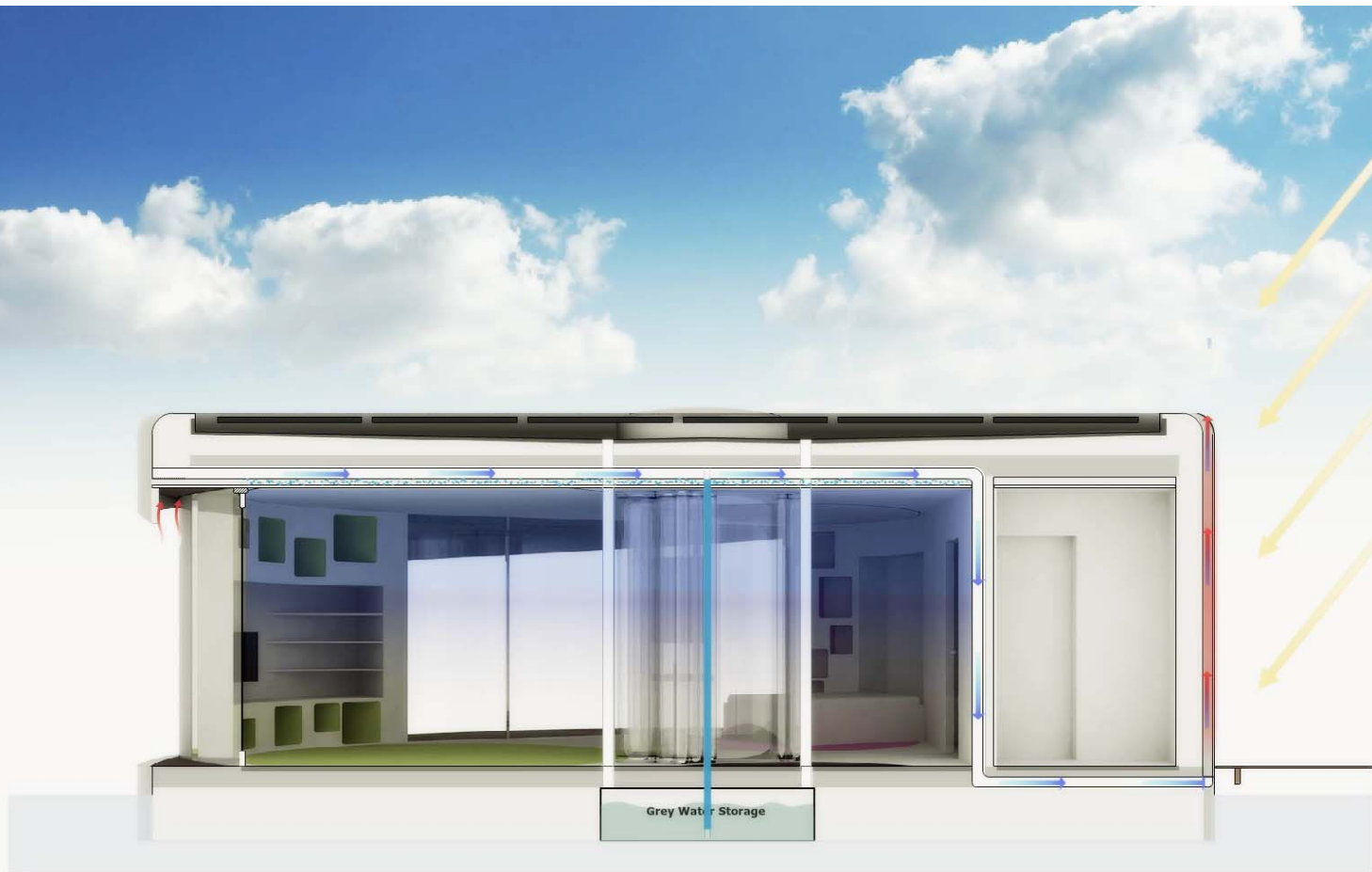
Rotation

Device	Energy Efficiency	Manufacturing	Transport	Control	Visibility	Advantages	Disadvantages
Mechanical Devices							
Gears 	<ul style="list-style-type: none"> - High efficiency (95 - 98%) 	<ul style="list-style-type: none"> - Difficult and expensive to manufacture in large dimensions. 	<ul style="list-style-type: none"> - Heavy weight. - Main gear can't be cut into smaller pieces. 	<ul style="list-style-type: none"> - Very easy to control. - Accurate positioning. - Easy to change direction of rotation 	<ul style="list-style-type: none"> - It cannot be underwater - It can be easily cover. 	<ul style="list-style-type: none"> - It can be a spur, helical or bevel gears. - Suitable for low speed applications. - Good for heavy loads. 	<ul style="list-style-type: none"> - Needs alignment. - Needs lubrication. - Some noise and vibration problems.
Worm Gear 	<ul style="list-style-type: none"> - Lower efficiency (90-95%). - High friction losses. 	<ul style="list-style-type: none"> - Difficult and expensive to manufacture in large dimensions. 	<ul style="list-style-type: none"> - Heavy weight. - Main gear can't be cut into smaller pieces. 	<ul style="list-style-type: none"> - Very easy to control. - Accurate positioning. - Easy to change direction of rotation 	<ul style="list-style-type: none"> - It cannot be underwater - It can be easily covered. 	<ul style="list-style-type: none"> - Good for large loads. 	<ul style="list-style-type: none"> - Needs alignment. - Needs lubrication. - Not good for low speed ratios. - Some noise problems.
Transmission belt 	<ul style="list-style-type: none"> - Poor power transmission. - Heat generation. - Efficiency of 95% 	<ul style="list-style-type: none"> - Cheap to manufacture. - Difficult to manufacture in very large dimensions. 	<ul style="list-style-type: none"> - Low weight. - Easy to transport since belt is flexible. - Pulleys can be divided into smaller pieces. 	<ul style="list-style-type: none"> - Easy to control. - Good accuracy for positioning. - Easy to change direction of rotation. 	<ul style="list-style-type: none"> - It can be underwater 	<ul style="list-style-type: none"> - Simpler system than gears. - No lubrication needed. - It can be replace easily. - It can cope with minor misalignments. - No noise. 	<ul style="list-style-type: none"> - It has slippage and stretch problems. - Not suitable for high torques. - Short lifetime. - Not very suitable for low speeds.

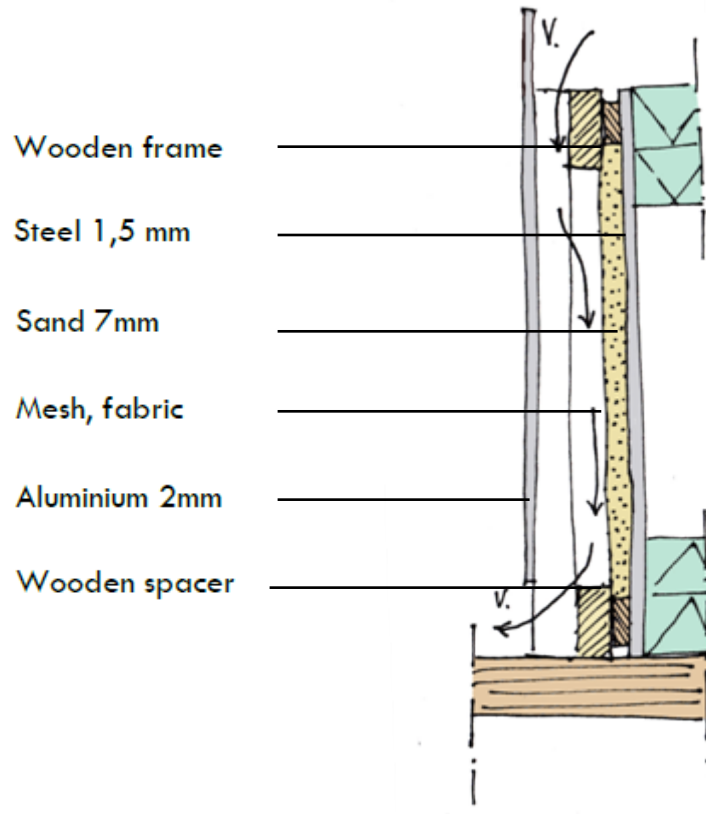
Rotation



Climate – passive cooling



Climate – passive cooling



Climate – passive cooling

TEST 1:

T = 19 °C

RH = 49%

16,1 W/m²

T = 13,8°C

RH = 93%

TEST 2:

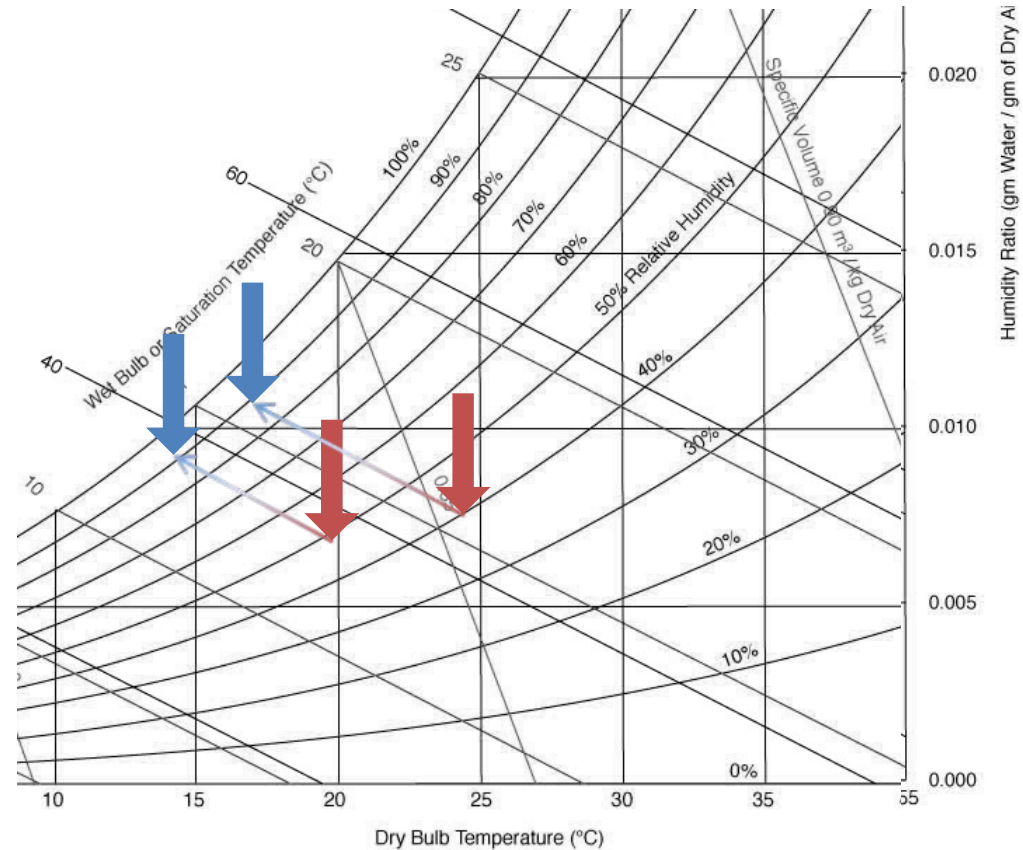
T = 24 °C

RH = 39%

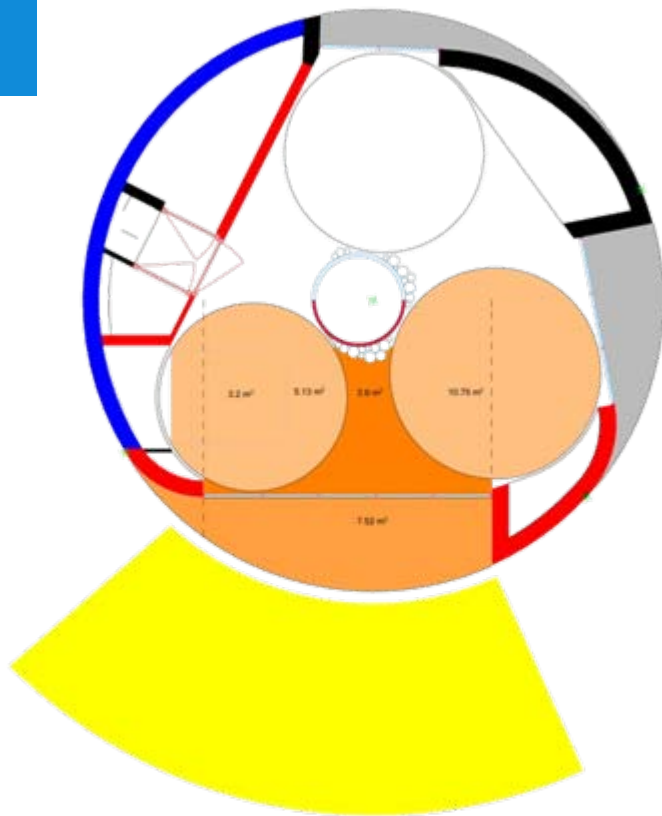
23,3 W/m²

T = 17,0°C

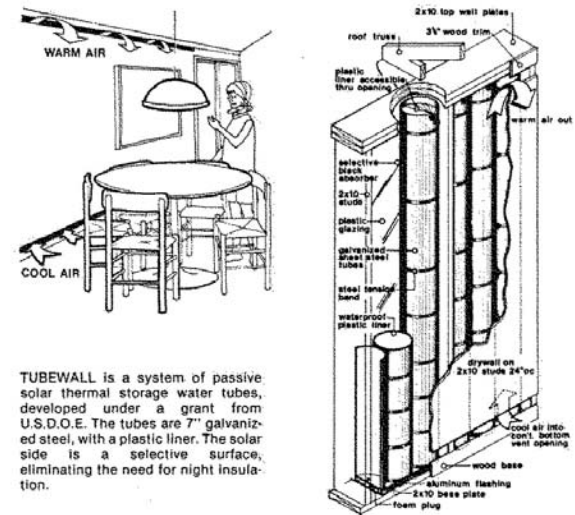
RH = 87%



Climate – passive heating



TUBEWALL

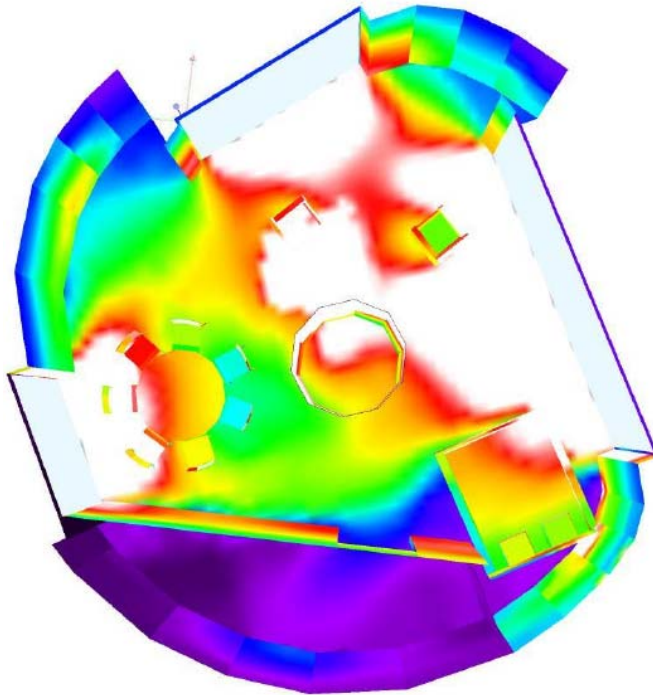


TUBEWALL is a system of passive solar thermal storage water tubes, developed under a grant from U.S.D.O.E. The tubes are 7" galvanized steel, with a plastic liner. The solar side is a selective surface, eliminating the need for night insulation.

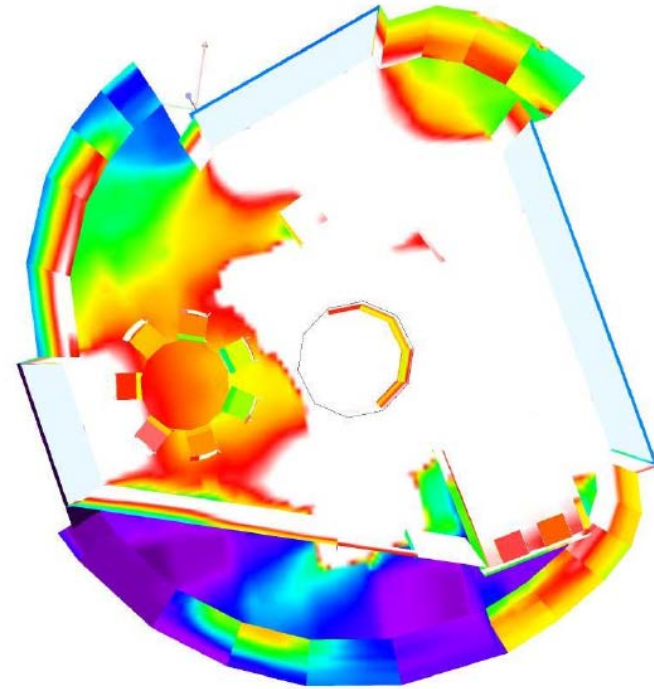
WME WATERWALL ENGINEERING

Use of water as thermal mass (water-wall)

Climate - Daylight



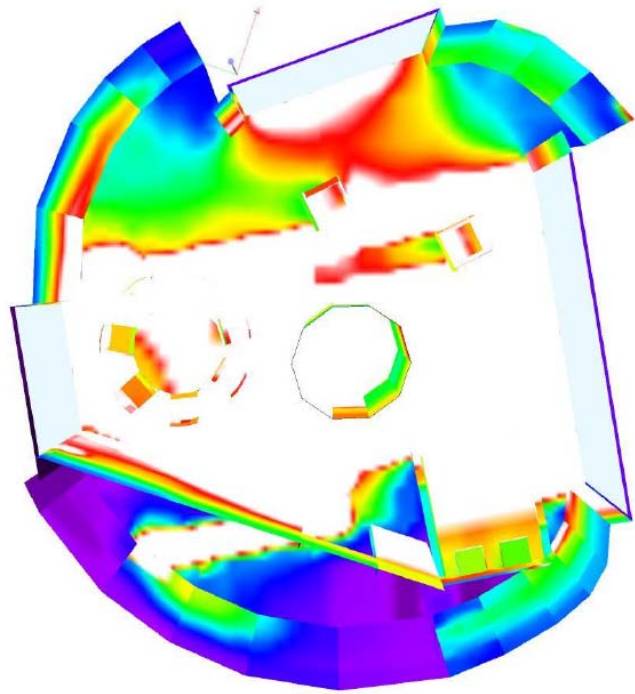
Summer, Mad, 12:00, Clear sky



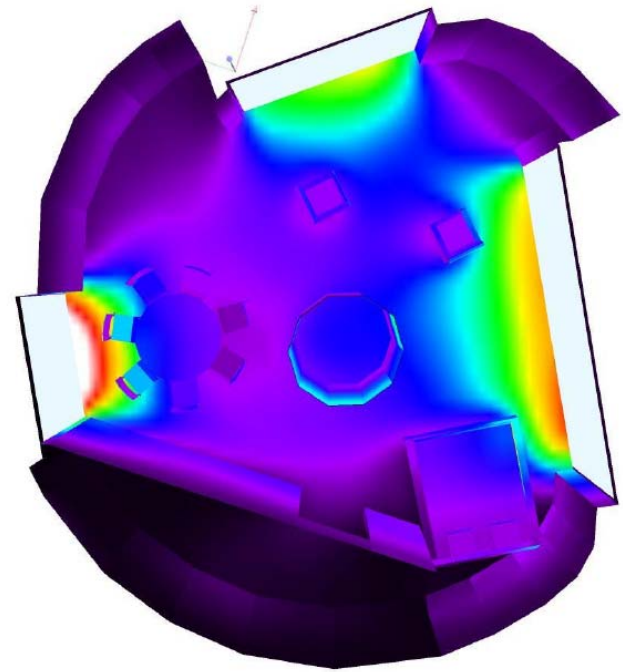
Winter, Mad, 12:00, Clear sky



Climate - Daylight



Winter, R'dam, 12:00, Clear sky



Winter, R'dam, 12:00, Overcast



“After Life”

Possibilities include

- TUD campus
- RDM campus
- Main sponsor’s site
- ...



Sponsorship

Confirmed ...



or to be confirmed ...



Press

nrc.nl nrcnext.nl nrcboeken.nl nrccarriere.nl nrcdus.nl

De Club van Maarssen

Een initiatief van de overheid, het bedrijfsleven en de kennisinstellingen.

TU Delft doet mee aan de Solar Decathlon 2012

In september 2012 vindt in Madrid de tweede Europese versie van de Solar Decathlon plaats. Tijdens deze competitie

architectenweb.nl

de grootste architectuursite van Nederland

home projecten producten materialen archipedia bedrijven va

→ ReVolt House - Solar Decathlon (uitloggen)

Studenten TU Delft ontwerpen draaiend huis

home → nieuws binnenland → Studenten TU Delft ontwerpen draaiend huis

Studenten TU Delft ontwerpen duurzaam draaiend huis op water

fd.nl

het financieel dagblad

donderdag 28 april 2011

Start onbezorgd smartphone in

Klik hier ▶

Cobouw

Laatste nieuws: Richtlijn herpen voor de veiligheidsbeoordeling van installaties in gebouwen (NEN-EN-18136:2011) (http://tinyurl.com/2amg6f)

→ terug naar vorige pagina

Studenten geïnspireerd door oosters koelsysteem

Het drijvende zonnehuis waarmee studenten van de TU Delft zich willen onderscheiden, koelt op zonne-energie. Het principe is op een beproefde oosterse methode.

duurzaamnieuws.nl

al het groene nieuws bij elkaar elke week gratis in je mailbox

20-03-2011 | Bron: iNSnet | print | reageer |

Een drijvend, draaiend duurzaam huis

Het ReVolt House is de inzending van studenten aan de TU-Delft voor de Solar Decathlon die in september 2012 in Madrid wordt gehouden. In het ronde huis, dat in het water ligt, draait alles om het gebruik van passief en actief opgewekte zonne-energie. Het ontwerp behoort bij de laatste twintig uitverkorenen van deze wedstrijd tussen een groot aantal internationale

SBR

Prettig kennis te maken.

Studenten TU Delft bouwen ReVolt House: drijvend en zeer duurzaam

17 februari 2011

Een team van TU Delft is, samen met 19 andere teams uit diverse landen, geselecteerd om deel te nemen aan de Europese Solar Decathlon 2012. Solar Decathlon is een internationale competitie gericht op het creëren van bewustzijn voor en het realiseren van duurzame architectuur. Het Delftse studententeam gaat het ReVolt House ontwerpen op bouwen: een huis dat volledig zelfvoorzienend is. Een groot deel gebruikt met van

CAMPUS TV

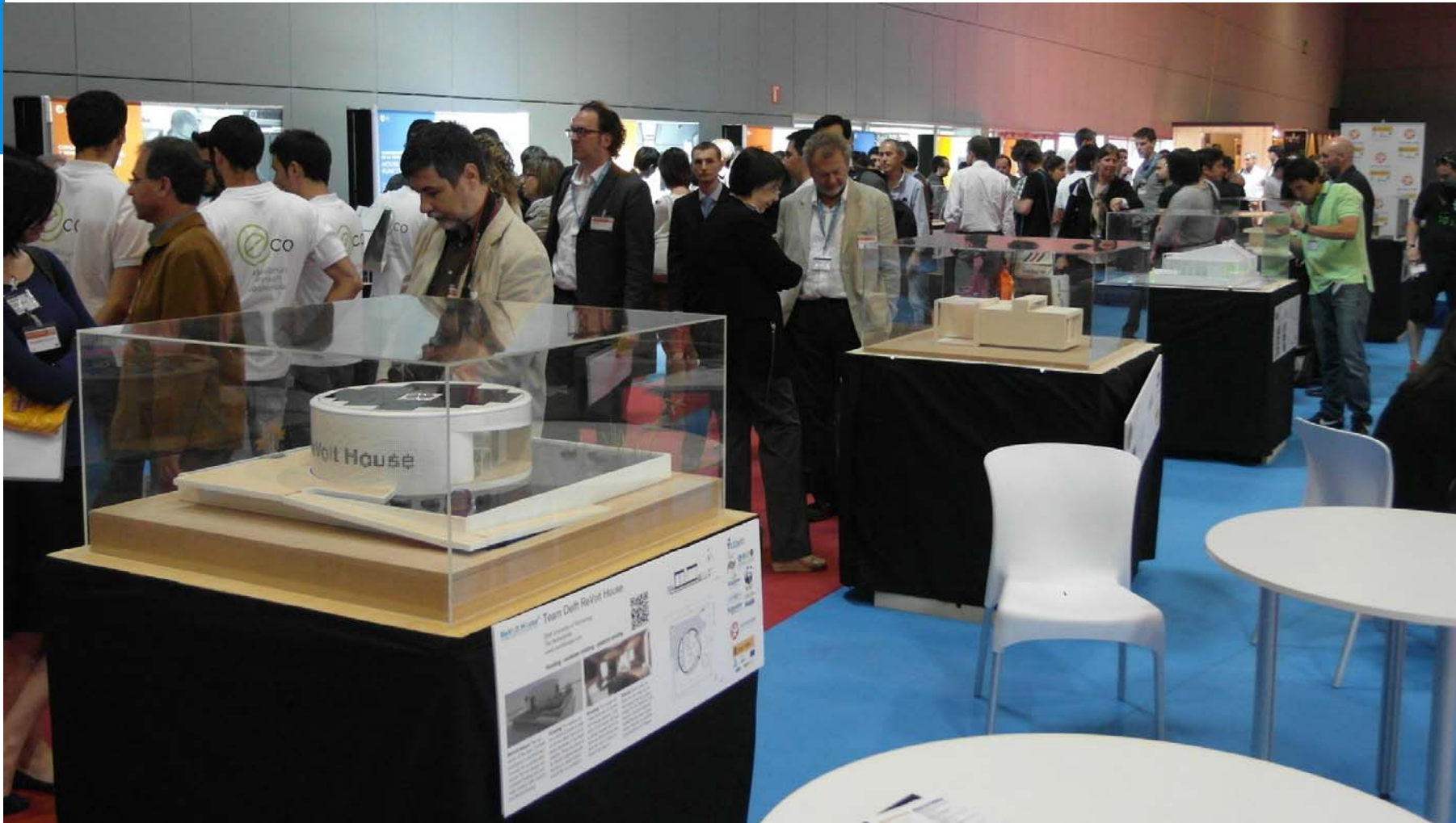
Voor studenten, door studenten

« Een wit doek, allemaal bloed en een brandblusser » #baño Brassens, Pilsen en Skinnydipping #Varsity »

#Studenten TU Delft ontwerpen duurzaam draaiend huis op water

Olivier 15 april, 2011 studie, wonen |

Construmat Barcelona 2011



Llowlab @ Lowlands in August 2011

