EiT-landsby vår 2011:
AAR4912 Bærekraftig Arkitektur

Hvordan skal vi bo i framtiden?

Solar Decathlon Europe 2012

Hvordan skal vi bo i framtiden?

- NTNU deltar i den internasjonale konkurransen ”Solar Decathlon Europe” (www.sdeurope.org)
- Målet er å planlegge & bygge en bolig på 75 kvm som kan drives fullstendig på solenergi, inkludert elbil og matlaging. Boligen skal kunne bygges og tas fra hverandre igjen uten å etterlate spor på tomten.
- En første designskisse forberedes i september-oktober 2010 av arkitekt- og ingeniørstudenter på NTNU.
- EiT-landsbyen leter etter studenter fra ALLE fagretninger for å forbedre konseptet.
- Landsbyen er særlig aktuelt ifm Framtidens Byer og utbyggingen av Brøset som nullutslippsområde i Trondheim (www.broset.com)

EiT-landsby AAR4912

EiT-landsbyen leter etter studenter fra ALLE fagretninger for å kunne forbedre konseptet. Eksempler på aktuelle problemstillinger er:

- Markedsføring av boliger med ambisiøse energi- og miljømål, både ovenfor publikum og industri. Er det virkelig økonomien det skorter på, eller er det andre verdier på spill?

- Hvordan bor man i et plussenergihus? Hvordan kan vi få til en bolig som fungerer for alle mennesker, ikke bare miljøentusiaster? Blir man sunnere av å bo i et slikt hus?

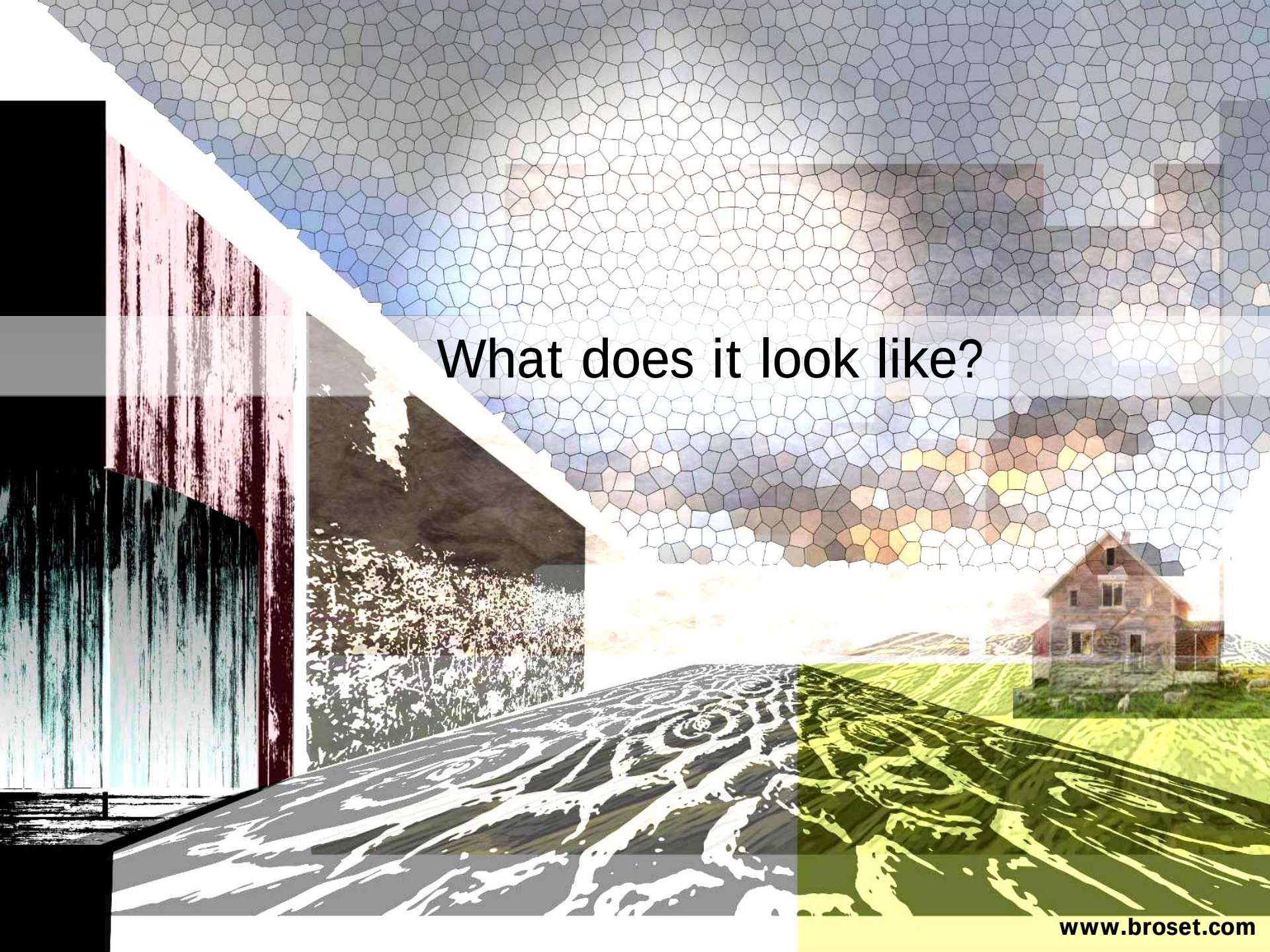
- Går det an å lage en bolig / et boligområde som gjør det enklere for folk å leve et miljøvennlig liv? Transport, matforsyning, materialer, fritid osv

- Kan iPhone applikasjoner o.l. gjøre det enklere for folk å styre energiforbruket sitt?

EiT-landsby AAR4912

- Intensivlandsby, åpent for alle fagretninger
- Norskspråklig, men mye av informasjonen er på engelsk, siden dette er en internasjonal konkurranse
- Landsbyleder: Annemie Wyckmans (fakultet for AB)
- Læringsassistenter: foreløpig ukjent
- Ressurspersoner fra: MSc in Sustainable Architecture, FME-senteret Zero Emission Buildings (ZEB)
- Vedlegg:
  - Brøset - imagine waking up in a world without carbon emissions
  - Solar Decathlon Europe info

Imagine waking up in a world without carbon emissions...

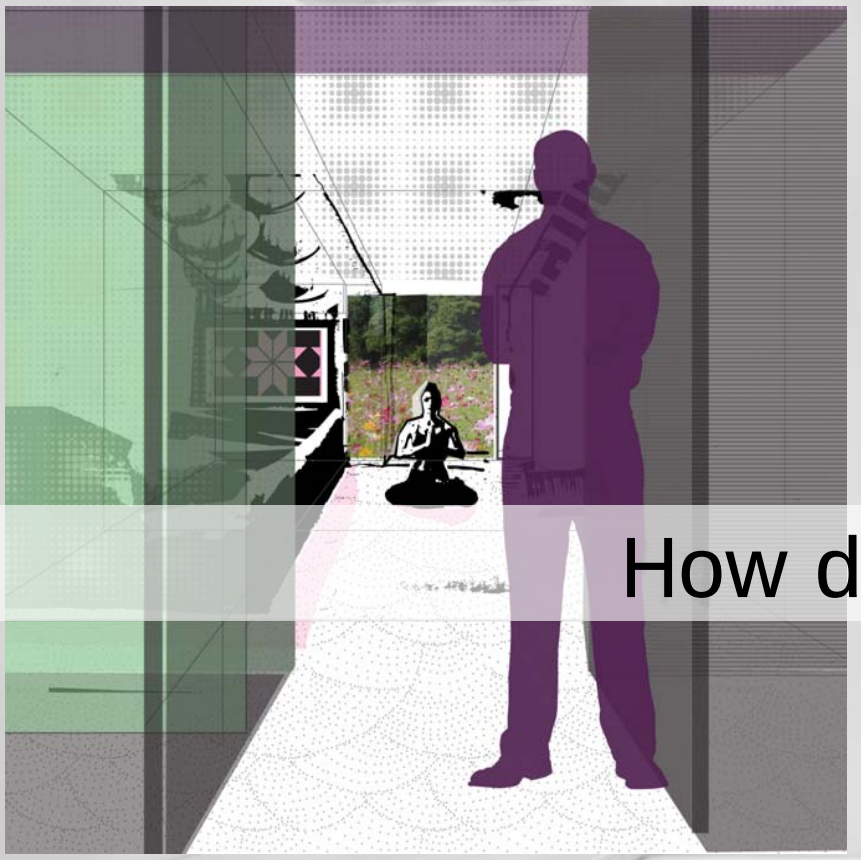

What does it look like?
www.broset.com


What does it sound like?

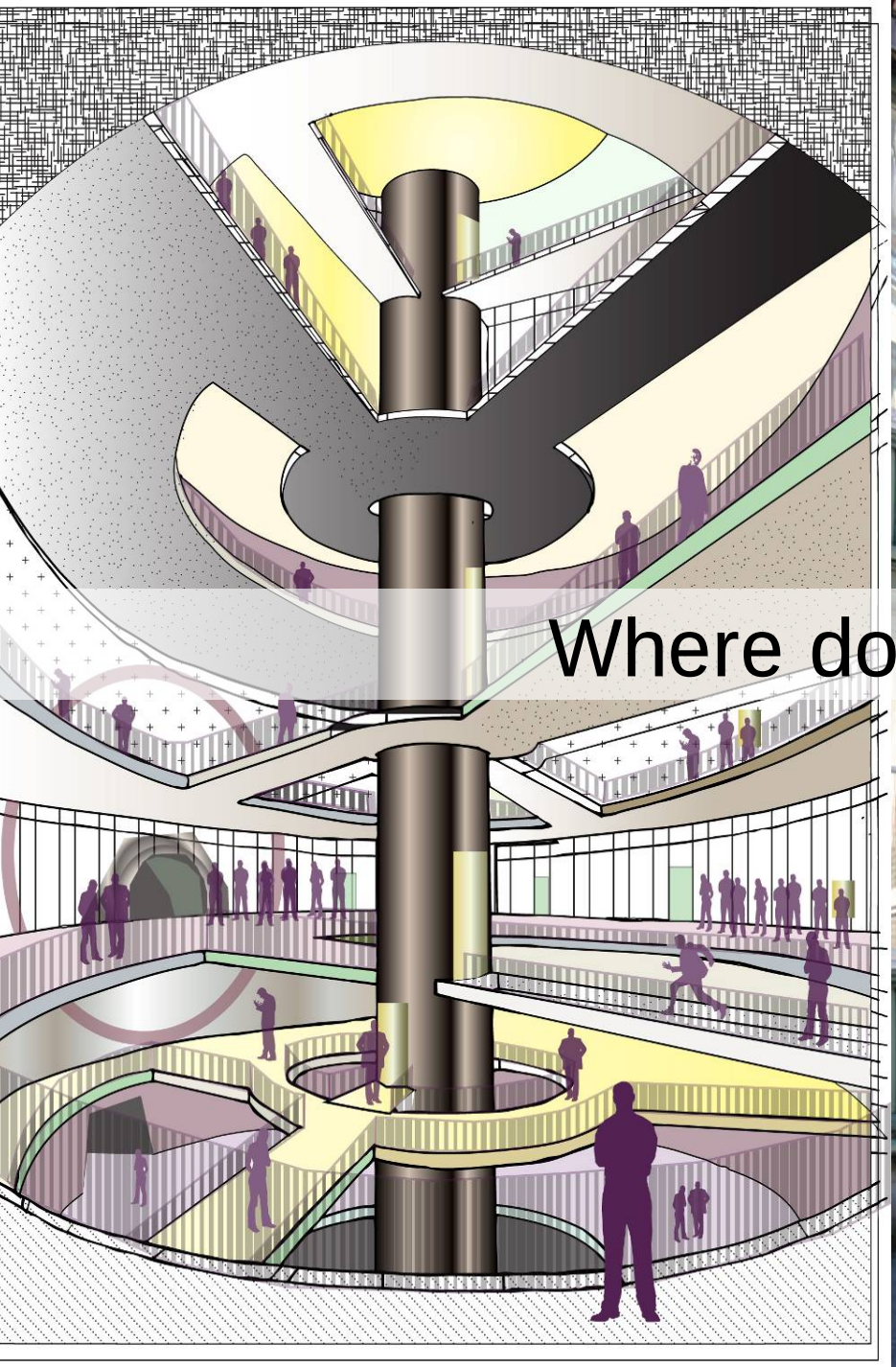
What do you do in the weekends?

How do you get to work?

www.broset.com



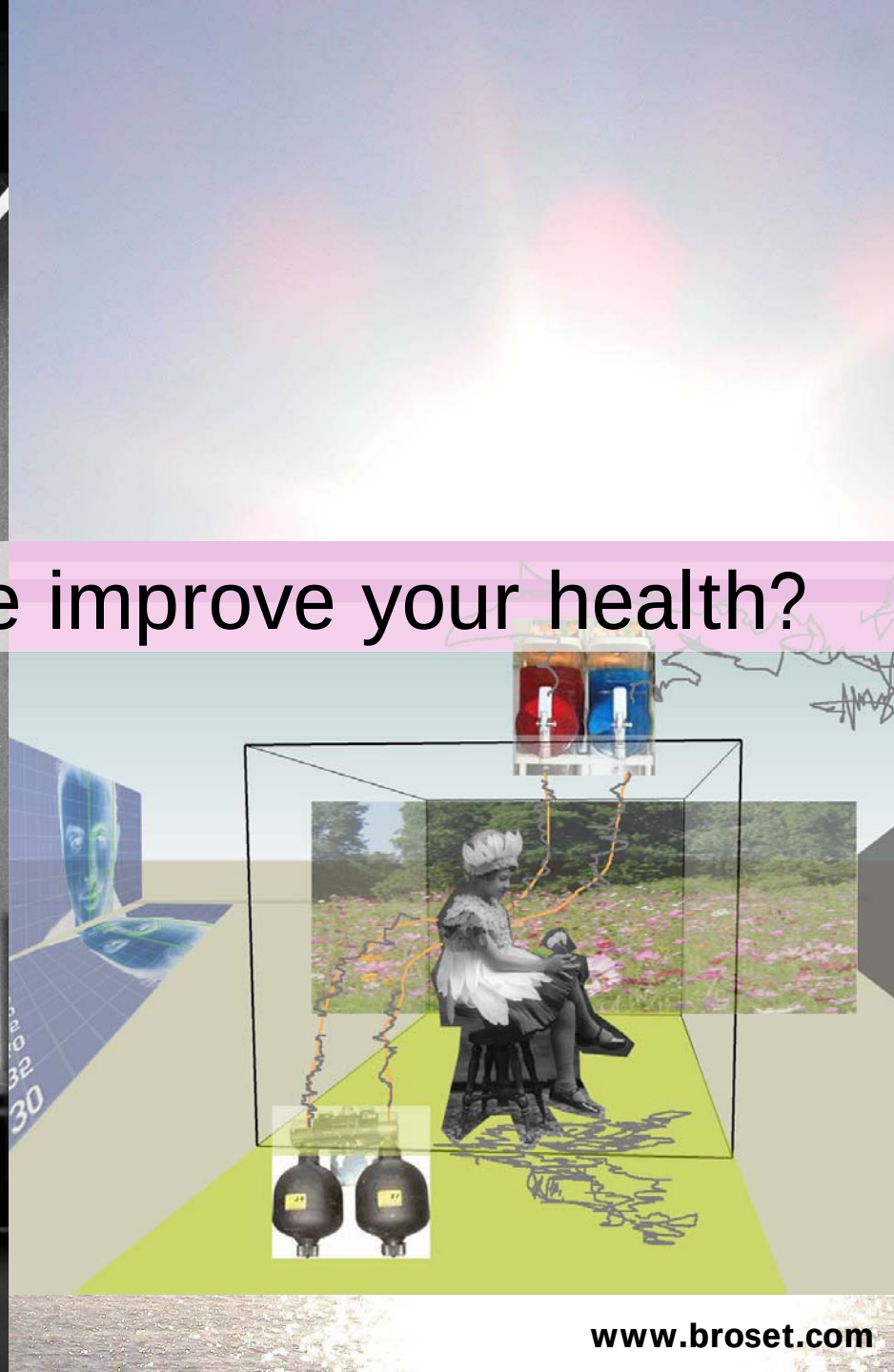
How do you live?

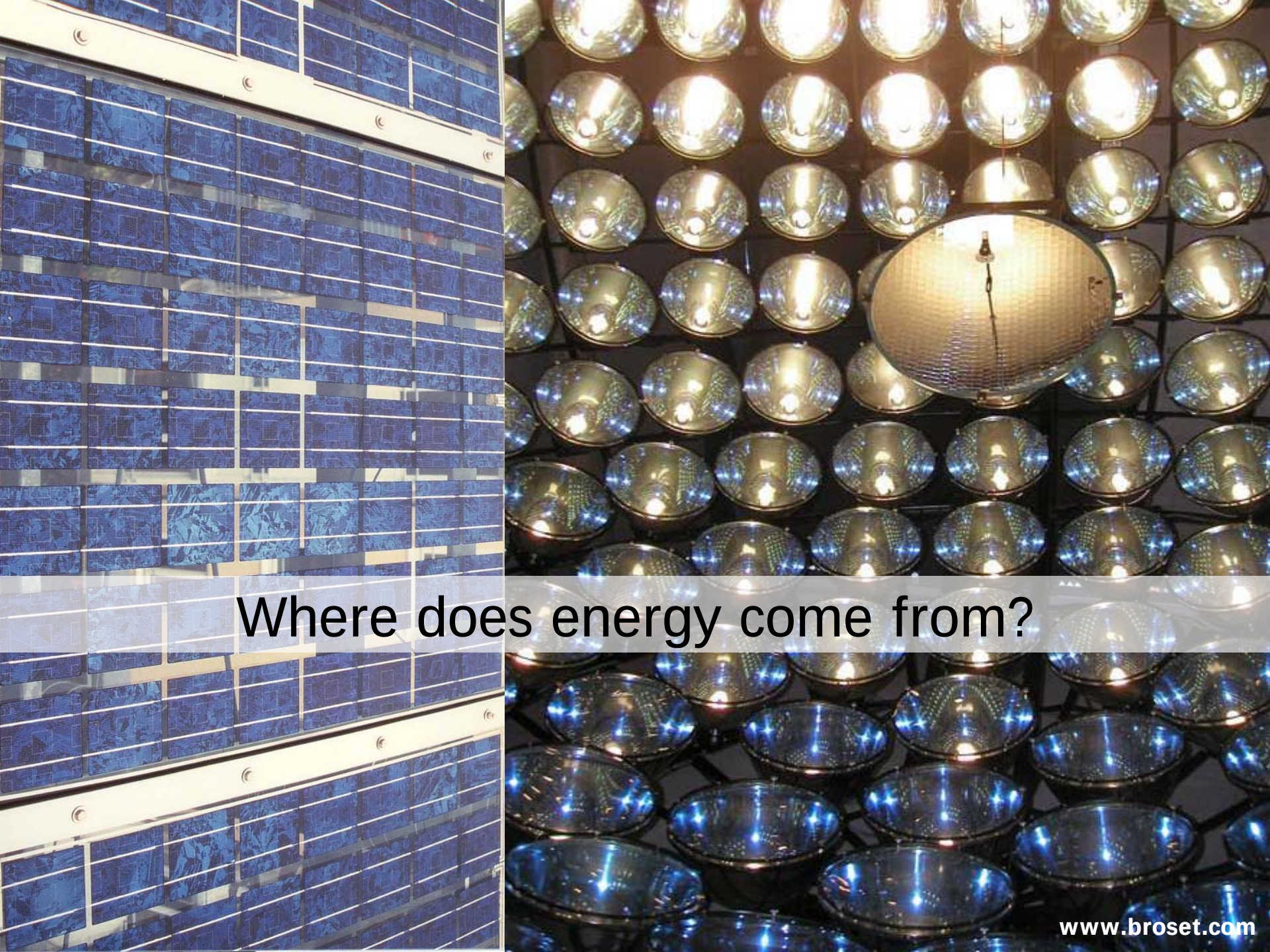


Where do you live?

www.broset.com

How can architecture improve your health?




Where does energy come from?
www.broset.com

Where does the air you're breathing come from?

Where does the rainwater go?

How do you generate value and quality?

www.broset.com




How to create an interactive planning process?


www.broset.com

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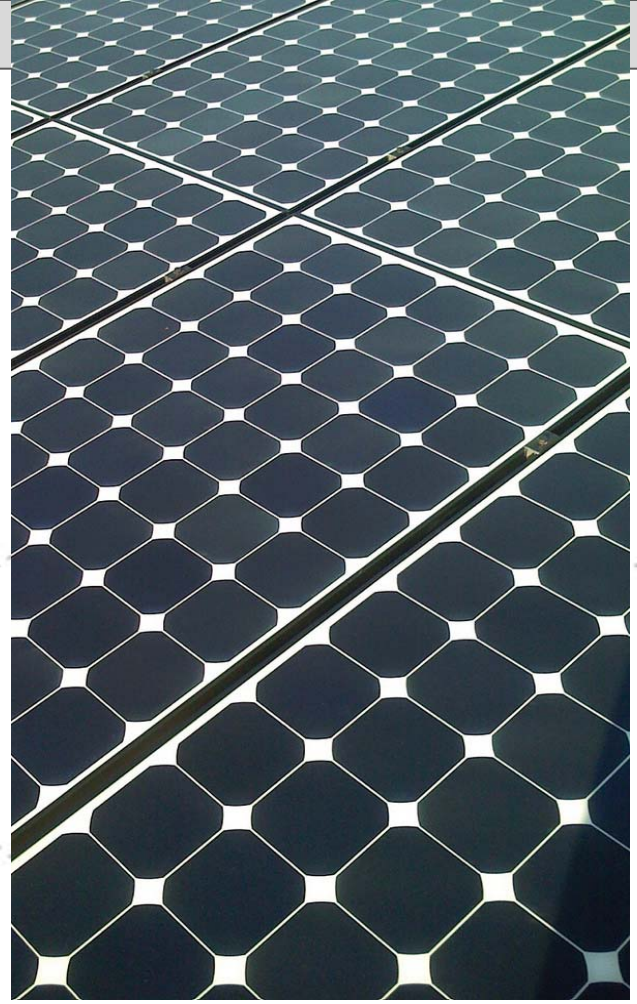
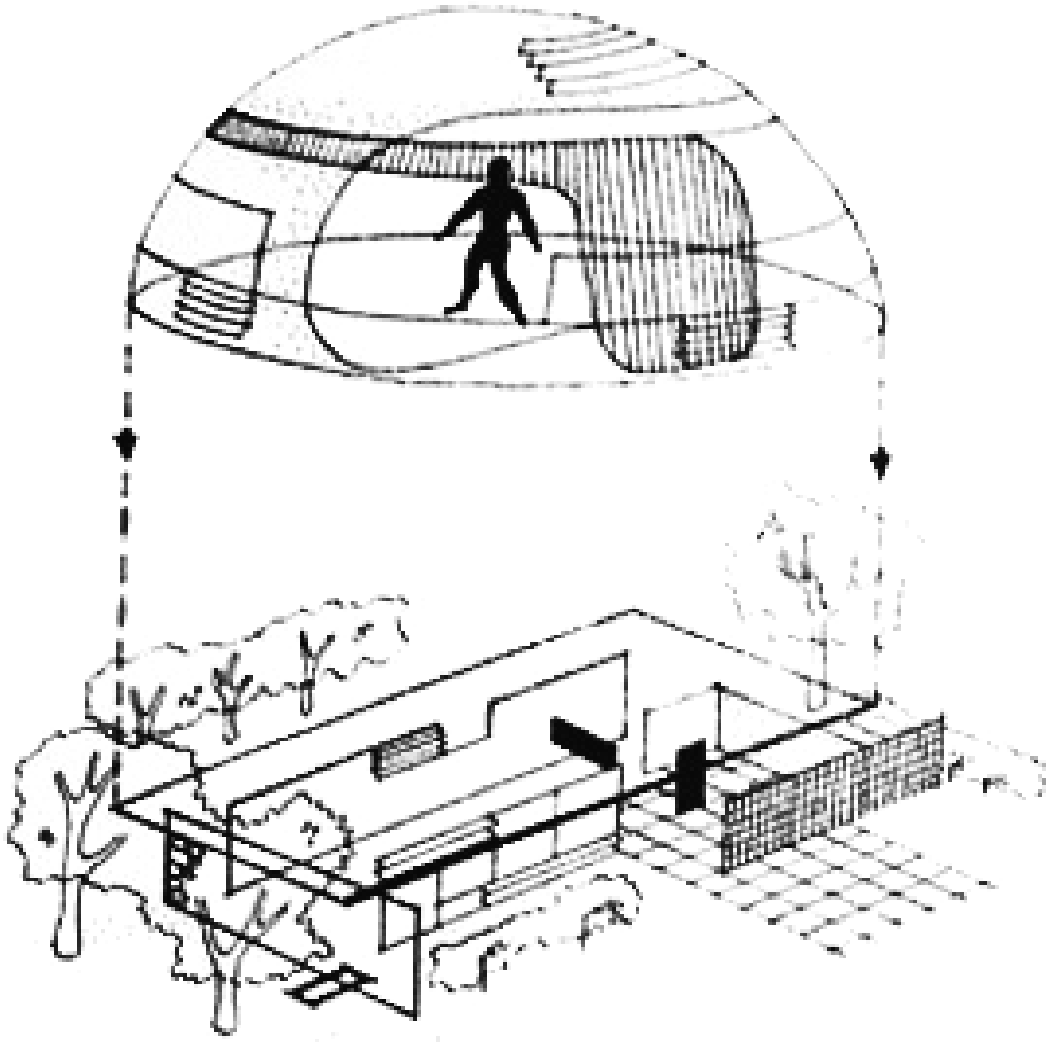


2012SOLARDECATHLONEUROPE

1. Overview
2. Rules and regulations
3. The contexts
4. Proposal
5. Examples

The House. *A shelter against heat, cold, rain, thieves, and the inquisitive. A receptacle for light and sun. A certain number of cells appropriated for cooking, work and personal life.*

Le Corbusier



Victor Olgyay: **Architecture and climate**.

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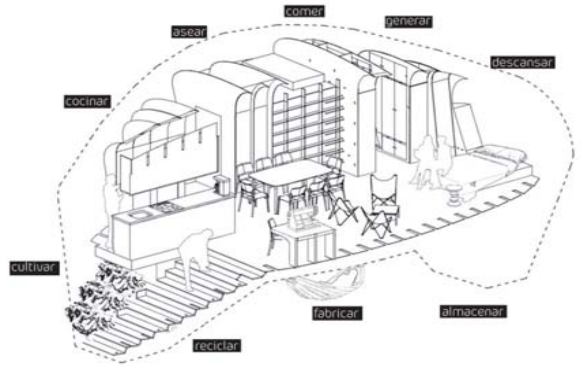
Solar decathlon. Student teams compete to design, build and operate **an highly efficient completely solar powered house** able to generate enough electricity for:

- Thermal comfort
- Lighting
- Cooking
- Washing clothes/dishes
- Hot Water
- Transportation
- Home/Office electronics

FabLab, IAAC - Barcelona



In the word **DECATHLON** is implicit a wide range of skills and abilities (design, organization, construction …)

FabLab, IAAC - Barcelona

Objectives of the competition:

- To generate knowledge
- To make both students and general public aware of the environmental and sustainability issues
- To stimulate accelerated research and development of renewable energy

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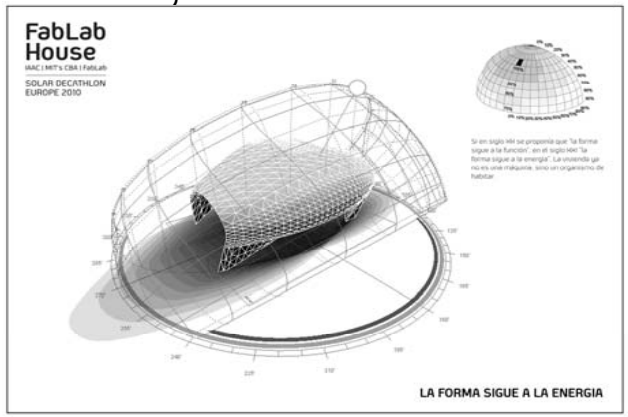
BIPV – integrated photovoltaics

- Only source is the renewable energy incident upon the specified space that the house will occupy during the competition

- Integration of photovoltaic aims at solving the post-industrial problem of the increased energy demand for commodity and delight.
- The building industry strives to integrate existing ideas and technologies
- Involvement of industries in the competition should be collaborative and not a lower-tier subcontract

Darmstadt Univ. SD2009

FabLab, IAAC - Barcelona



Contest week and Solar Village

- During the context week the groups will perform domestic tasks that require the operation of appliances and electronics

- The 10 contexts under which the project will be judged include quantitative and qualitative analyses

The 2007SD solar village

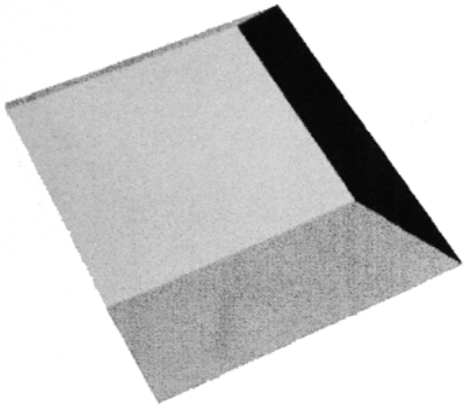
Assembly and disassembly

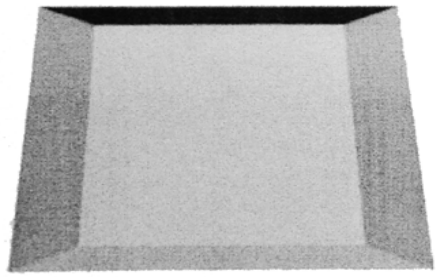
- Teams shall be responsible for the transport of their houses, the houses contents, electric vehicles, and all equipment and tools necessary for the Event
- Houses will be assembled in 4 days

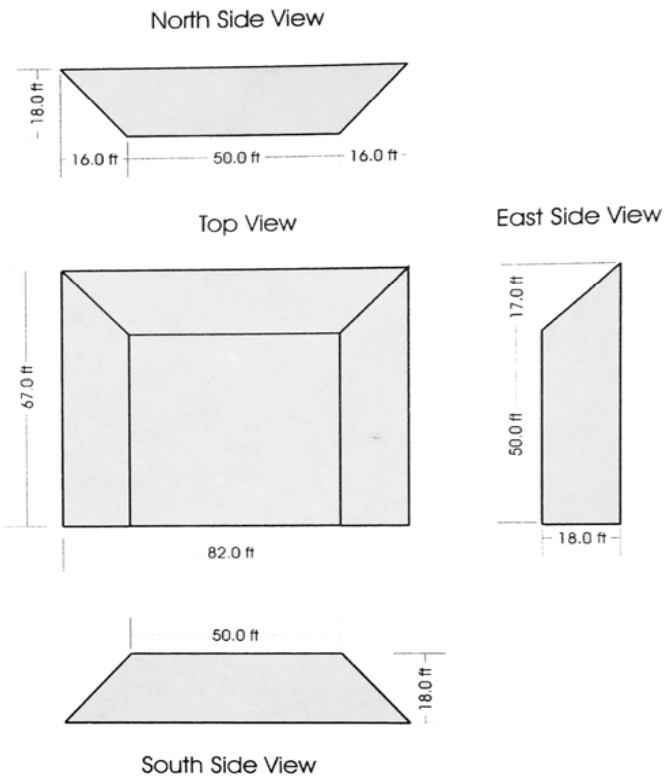
- Dimension of the module is not specified but can derive from the dimensions of the container used for transportation (an entire piece either different modules, etc.)

Dimensions

- **75 m2 modular structure**
- Included in a lot of **25x20.4m** north to south
- No basement . Not disturb the ground where it sits
- All volumes should be included inside the **Solar envelope** in order to protect neighbour's right to the sun







Dimensions of the solar envelope

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1st stage - Proposal

- Cover letter x1
- **Technical proposal** x5
- Registration form x1
- Statement of work x1

- Concept/Main objectives
- Technical innovation and design
- Flexibility
- Assembly and disassembly
- Relation with ongoing research projects in the faculty – ZEB, etc.

- **Price proposal form** x5

- Computation of materials (Raw materials should be identified separately)
- Relation with the industries and market availability / prices of products adopted

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Evaluation

- 25%. **Technical innovation and design**. integration of photovoltaic, soundness of analyses, adequate components and materials. A substantially new project. Industrialization and marketability of the prototype. Assembly and disassembly. Materials, etc.

- 25%. **Fund raising and team support**. Clear understanding of the costs and need for fund raising. Industry involvement.

- 25%. **Curriculum integration and special considerations**, R&D, maximize educational benefits.

- 25%. **Organization & project planning**. Activities involved in the project. How the house will be transported, assembled and disassembled.

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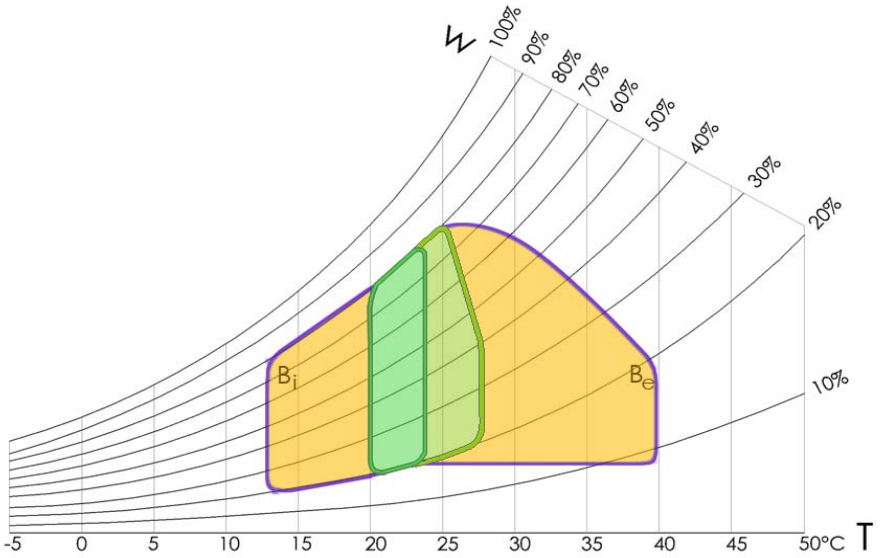
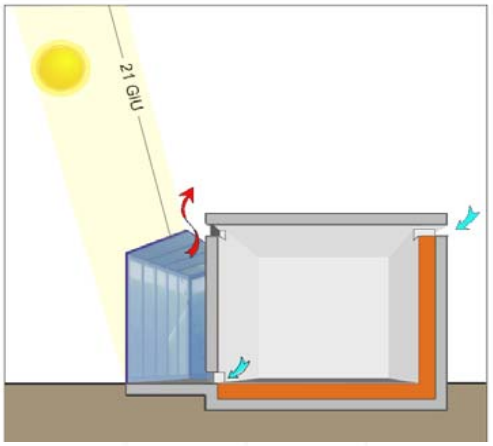
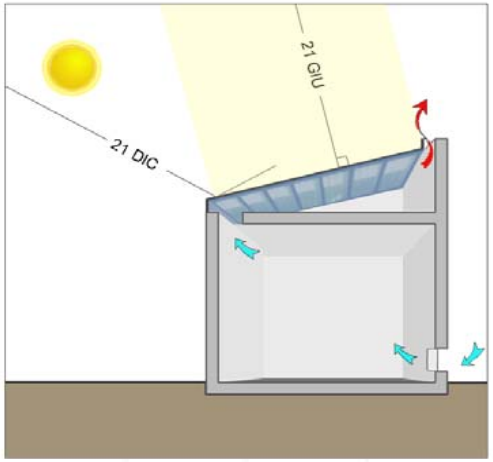
Passive strategies – Red. thermal demand

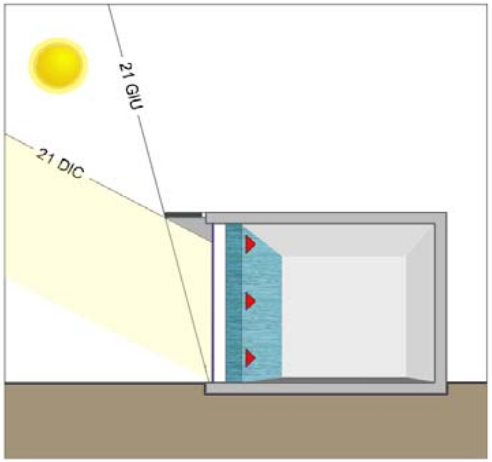
- Passive solar heating
- Natural ventilation strategy
- Shading/day lighting
- Thermal storage
- Humidification
- Evaporative cooling

- Weather adaptability
- Shape, orientation









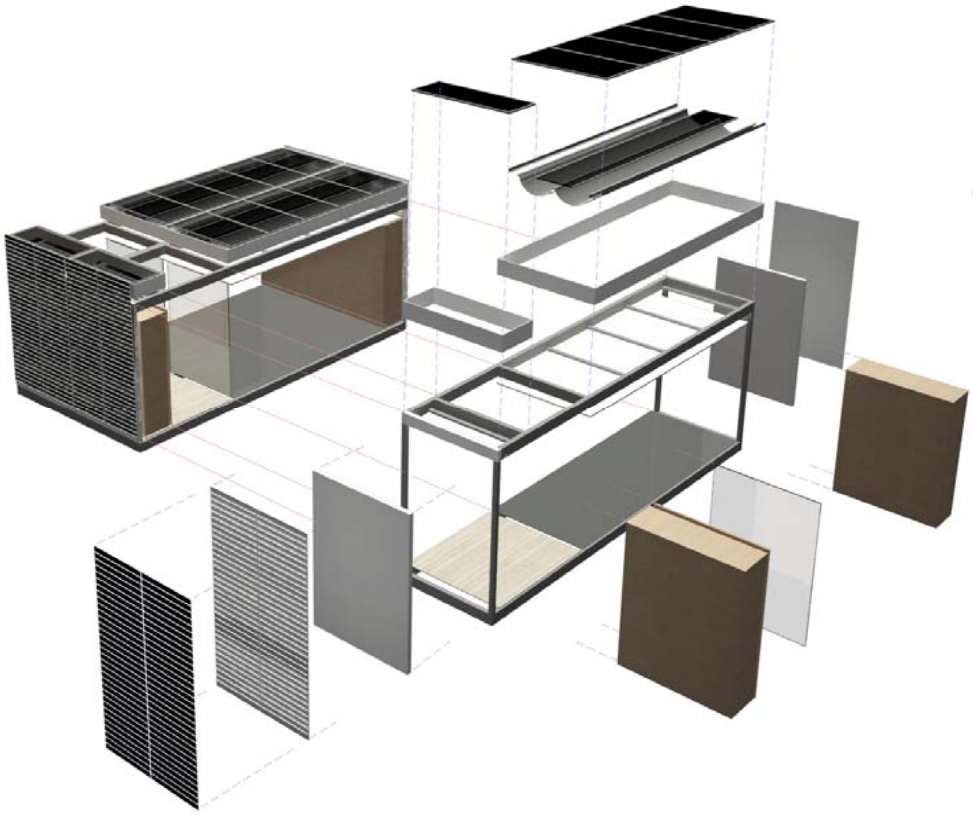
Active strategies – Energy production

- Solar angle PV
- Photovoltaic array surface, area
- Collection/Storage/Distribution

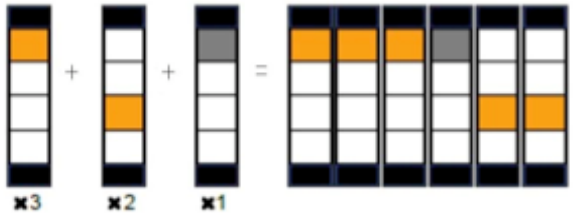
- Core location

- Mechanical systems layout (HVAC)
- Active heating
- Active cooling

- Hot water system



Technical proposal



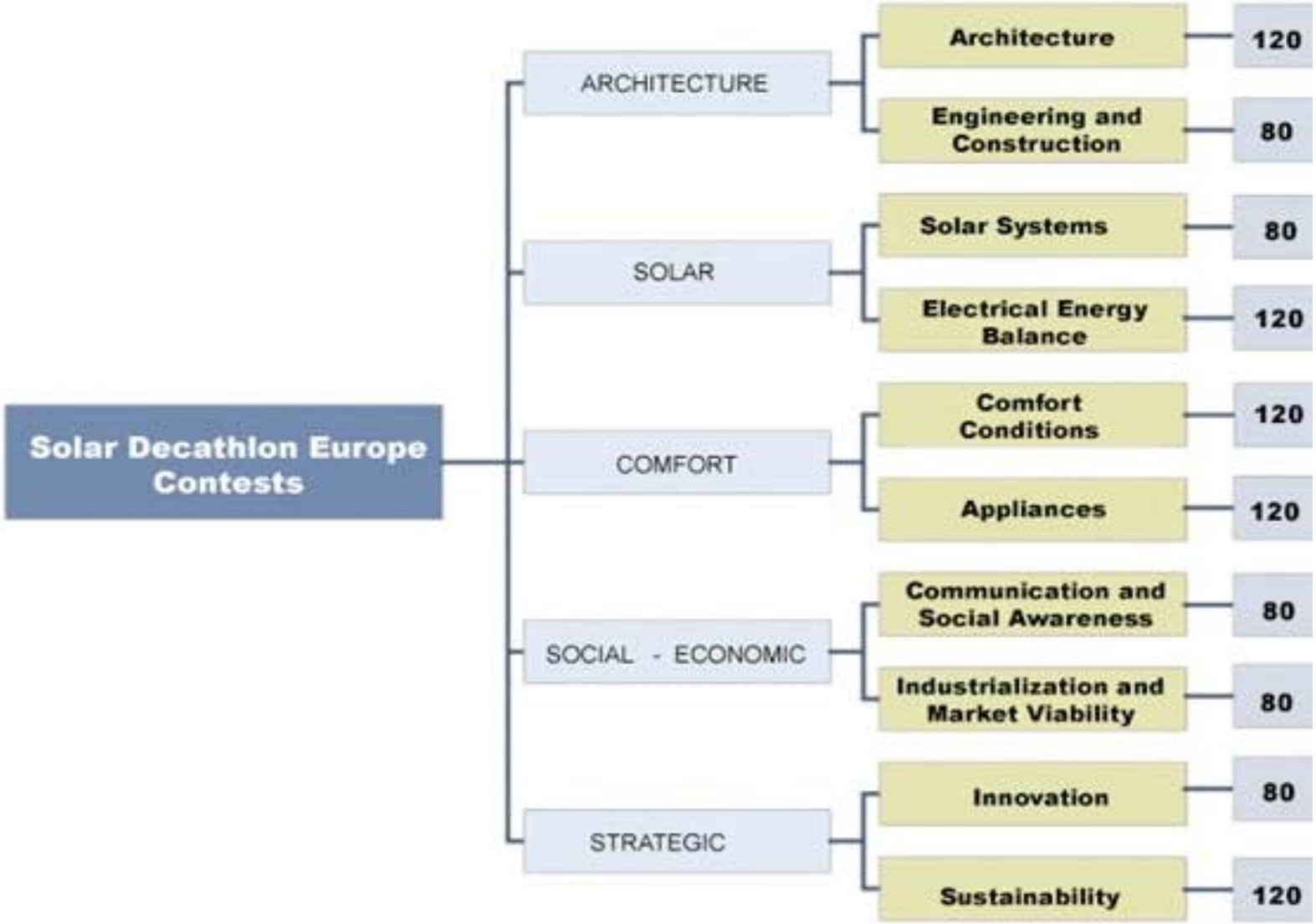
Drawings showing:

- The house concept and its components
- Technical content (photovoltaic, constructability, flexibility)
- Passive and active strategies

A brief **essay** telling about:

- Climate analysis report
- Energy performance expectations / preliminary analyses
- Potential for industrialization and market viability
- Computation of materials and construction costs in a standard format

The contexts – ranking. Max score 1000 points.



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The contexts – Qualitative 360p.

- Up to 120p. **Architecture** – Architectural quality, consistency, flexibility of space, use of bioclimatic strategy

- Up to 80p**.** **Engineering and construction** – Evaluation of principles of construction with a special focus on functionality, performance, safety and technology

- Up to 80p. **Industrialization and market viability** – Show that the house is ready for the market

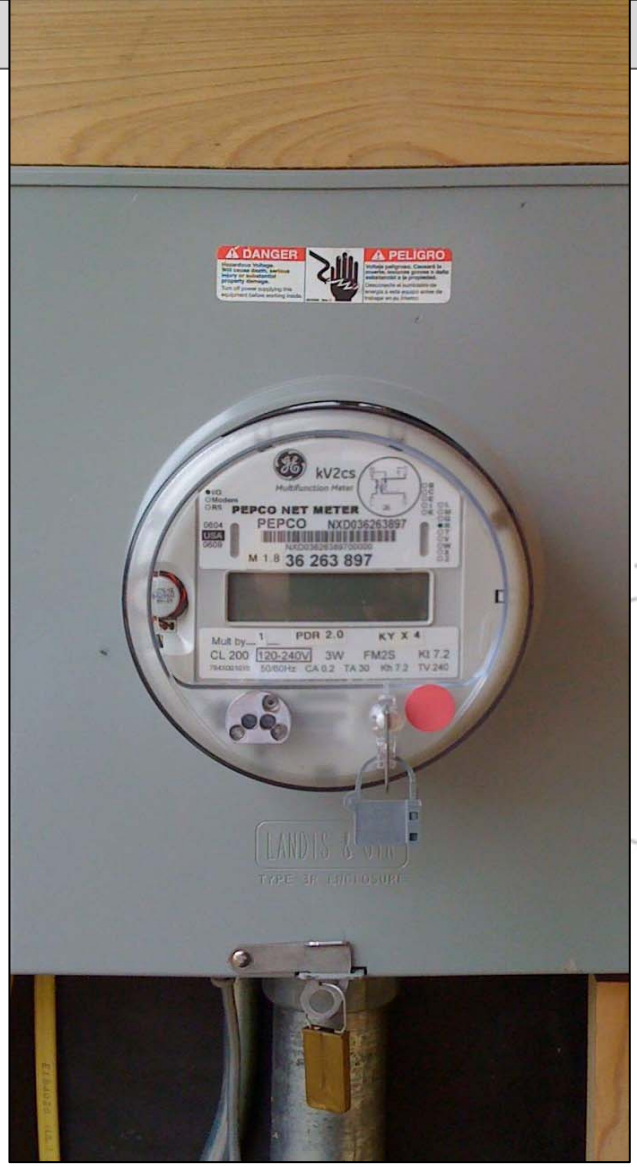
- Up to 80p. **Communication and social awareness** – Testify of the communication and public information on options and benefits of solar energy, energy efficiency, sustainable construction and other issues related to the Solar Decathlon.

Team California. SD2009

FabLab, IAAC – SD2010

The contexts – Quantitative 640

- Up to 120p. **Comfort conditions** – Ability to maintain temperature and relative humidity within prescribed set points.
- Up to 120p. **Appliances** – provide enough energy to run all the different appliances, host a dinner party…
- Up to 80p. **Solar systems** – functionality, efficiency, soundness and economic viability of the system of solar water heaters.
- Up to 80p. **Innovation** – innovative design of the house, its systems and components that increase the value of the house or improve its performance.
- Up to 120p. **Electric energy balance** – Assess the part of energy self sufficiency in electricity and the actual production of solar energy.
- Up to 120p. **Sustainability.** Evaluate the environmental sensitivity of the team to design and build a house that has a low environmental impact on its life cycle.



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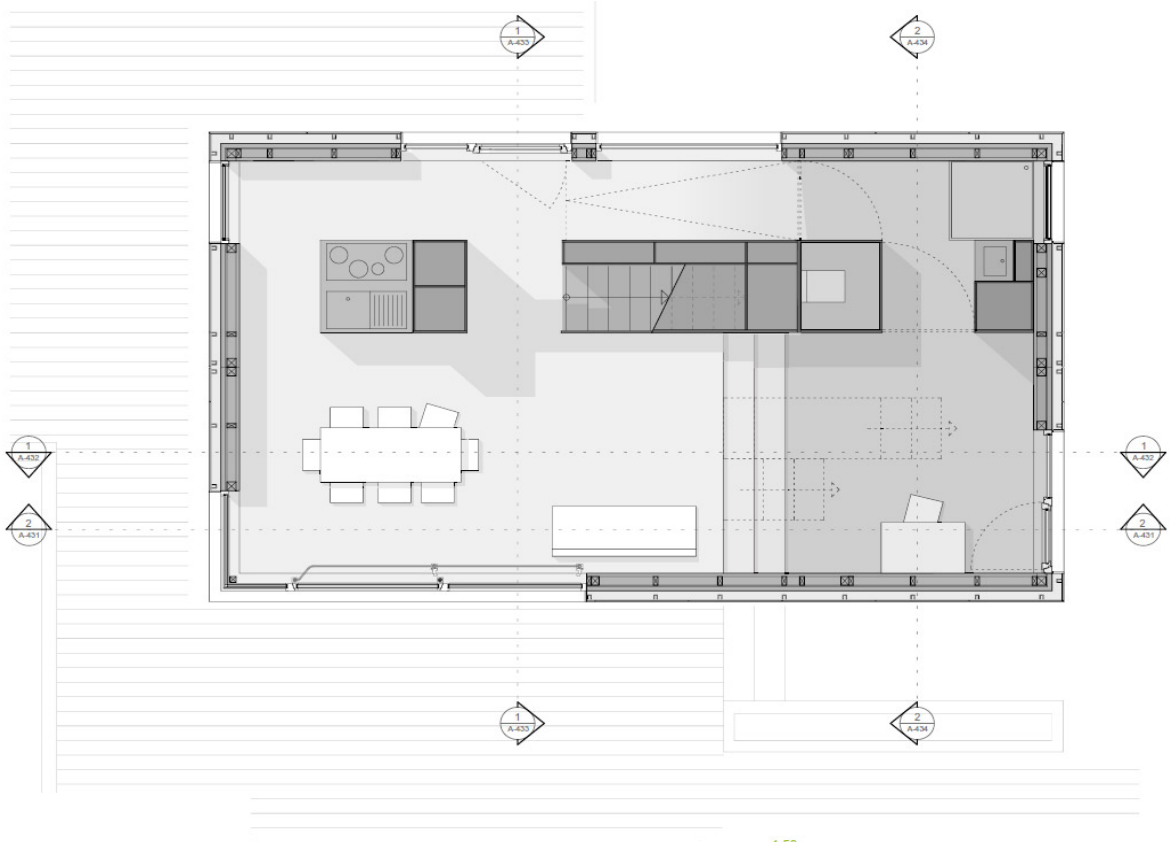
SD2009 winner – Team Germany



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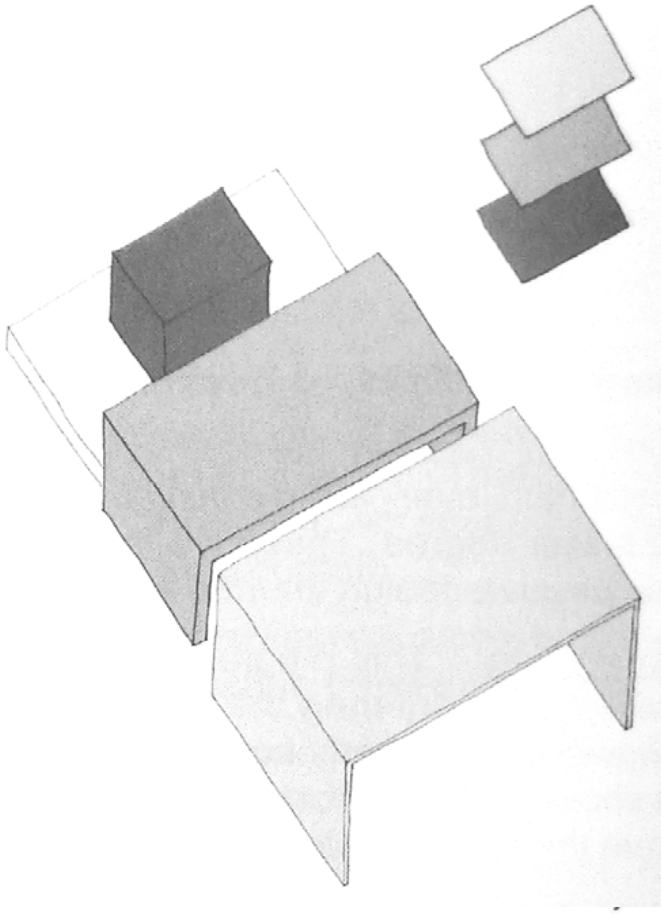
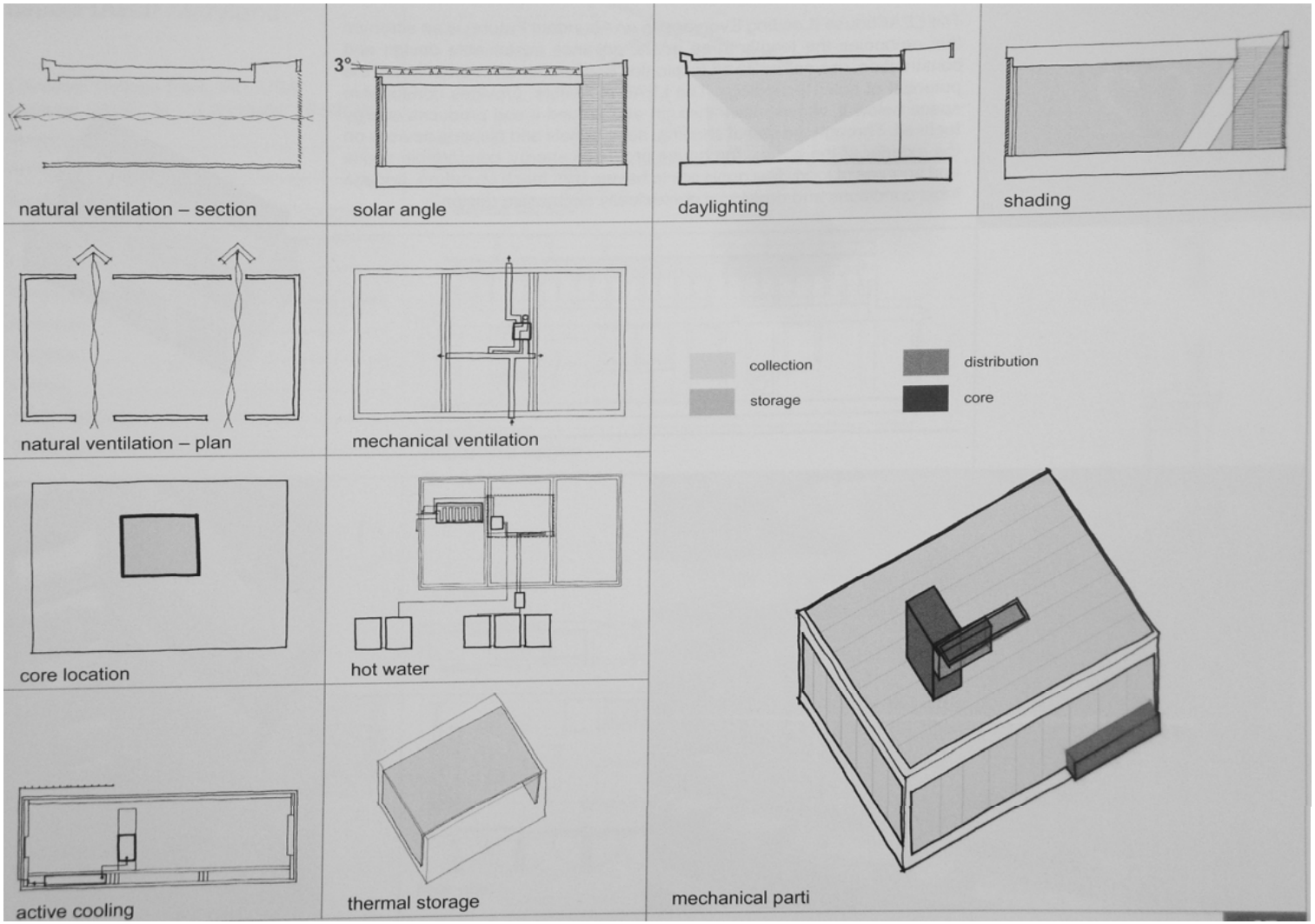
The facade also features constructive moisture protection and technical exhaust ventilation. Furthermore the facade offers a highly effective shading and lighting control system all in one.

2007 Solar decathlon winner – Darmstadt university



A series of overlapping, situationally responsive layers. The **outer layer** contains all of solar power equipment as well as acting as a breathable skin, providing security and helping to control privacy and transparency. The **second layer** is the thermal envelope, which acts as a weather barrier and the main container for the conditioned living spaces. The **third later** is the mechanical core of the house, which contains the kitchen, bathroom and the building's mechanical systems.



- Passive strategies
- Active strategies

- HVAC systems
- Core location
- Collection/storage/distribution system

Source: Michael Zaretsky, **PRECEDENTS IN ZERO-ENERGY DESIGN** Architecture and passive design in the 2007 solar decathlon, Routledge editions, New york, 2010

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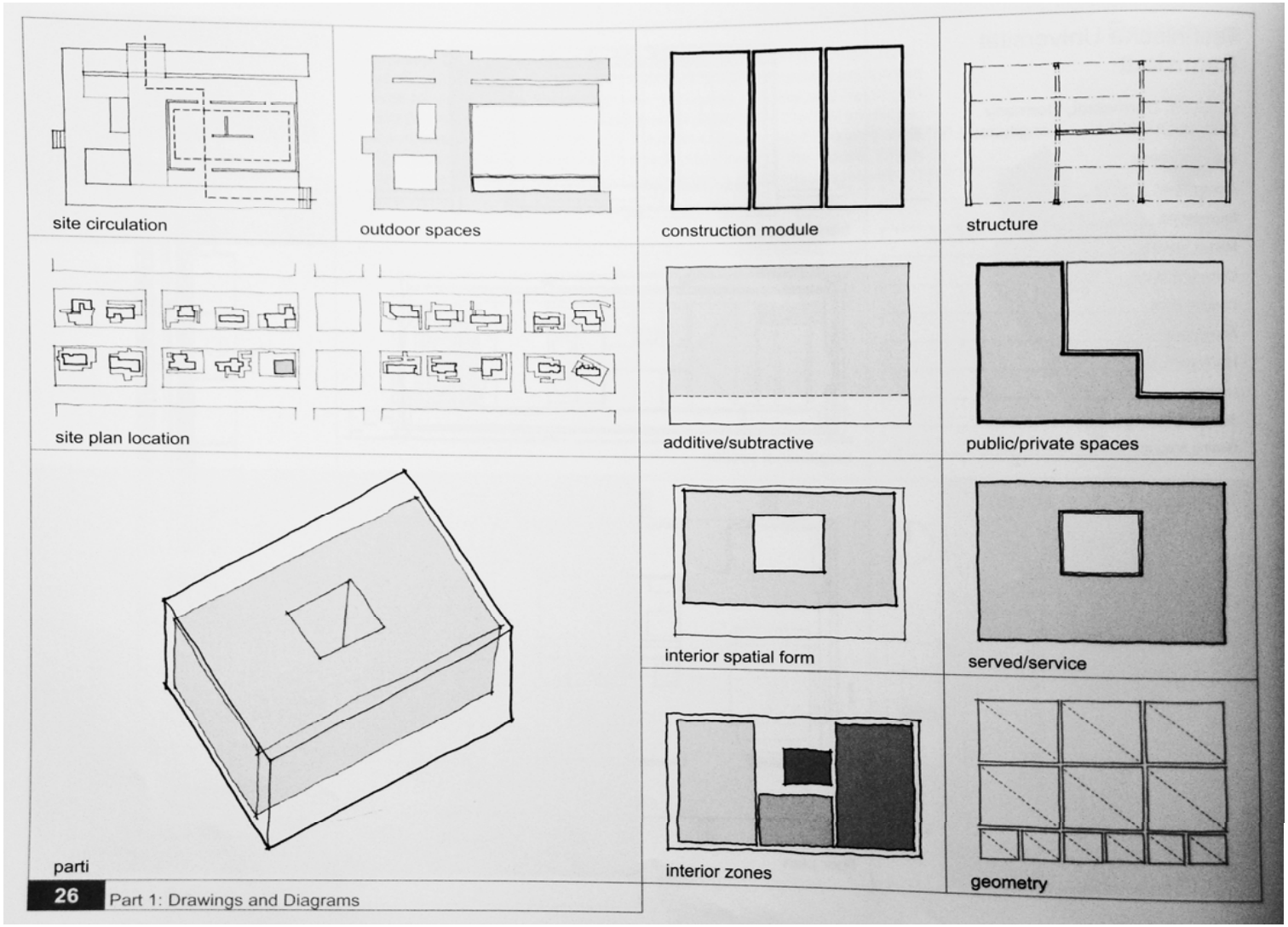

- Exterior form, S/V
- Interior spatial parts
- Served/service

- Construction module
- Structure
- Geometry

- Circulation
- Outdoor spaces,
- public/private

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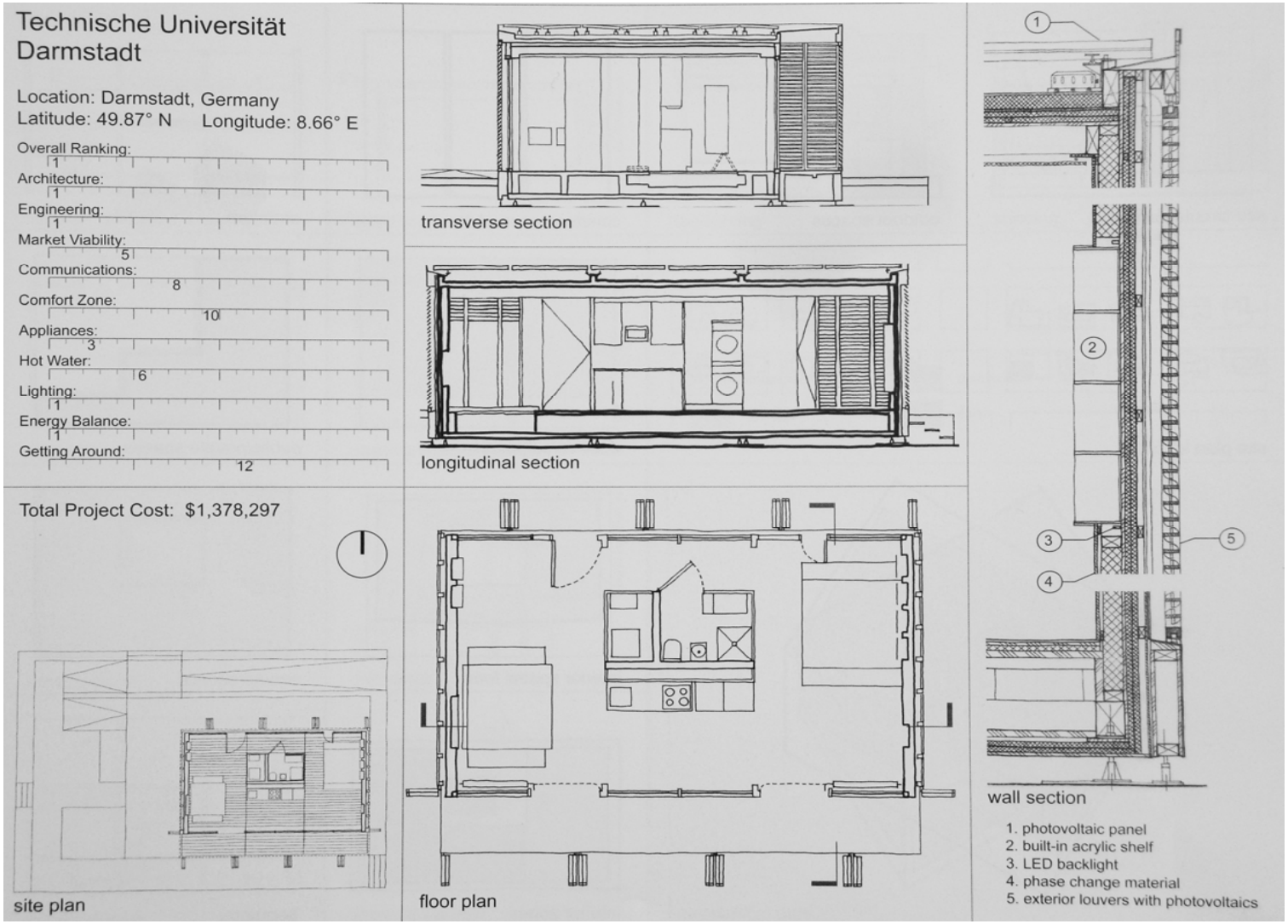
Rankings



- Plans
- Sections
- Details, Skin (conductance, air tightness…)

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