



LISI – THE HOUSE

LIVING INSPIRED BY SUSTAINABLE INNOVATION

COMPETITING PROJECT OF TEAM AUSTRIA FOR THE SOLAR DECATHLON 2013

IN IRVINE / LOS ANGELES / CALIFORNIA

KARIN STIELDORF, TU WIEN, FH SALZBURG, FH ST. PÖLTEN, AIT

THE INTERNATIONAL COMPETITION „SOLAR DECATHLON“



- is the most important and challenging competition in the field of solar architecture between universities worldwide
- 130 applications
- 20 teams selected
- 2 teams from Europe

INVITED BY

the US-Department of Energy (DOE)

ORGANIZED BY

the National Renewable Energies Laboratory (NREL)

THE INTERNATIONAL COMPETITION „SOLAR DECATHLON“



TARGET

Development of an innovative and experimental prototype of a home

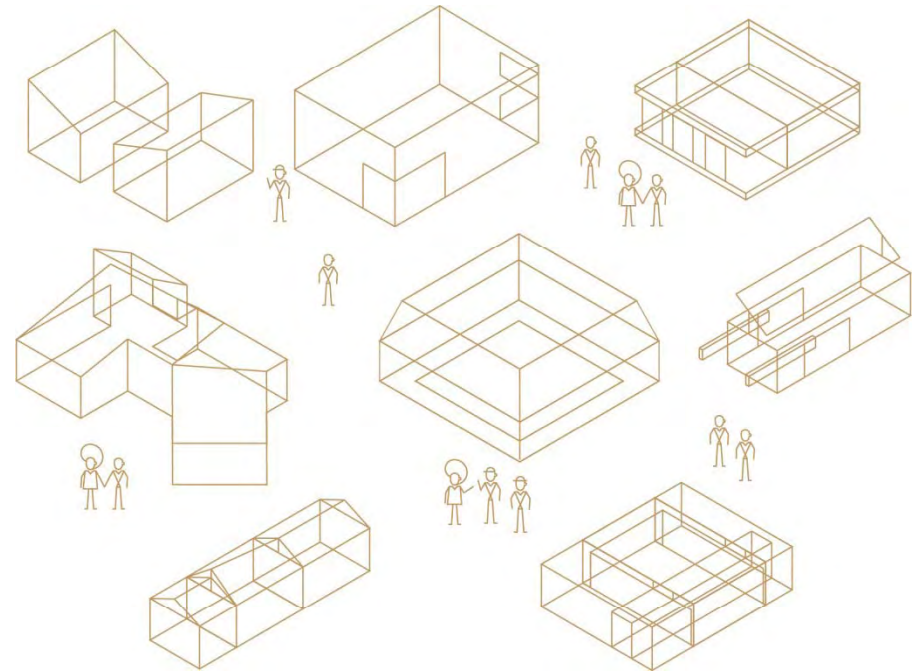
- with surplus energy (energy-plus) standard
- that is cost-efficient, energy-efficient and attractive

The winner of the competition will be the team that combines best affordability, market appeal and excellent design with optimized energy production and maximum efficiency.



PARTICIPATING STUDENTS

- Are involved in planning and realization;
- Duration of preparations: two years
- Beside energy-efficiency and design, organization and financing of the project play a major role.
- The competition ends with two-week public finals of the best 20 teams in Irvine, Kalifornien
- Here in Irvine, the participating colleges and universities compete against each other with their solar-powered homes in 10 categories



10 CONTESTS



- **Architecture Contest (juried)**
- **Market Appeal Contest (juried)**
- **Engineering Contest (juried)**
- **Communications Contest (juried)**
- **Affordability Contest (juried)**
- **Comfort Zone Contest (measured)**
- **Hot Water Contest (measured)**
- **Appliances Contest (measured)**
- **Energy Balance Contest (measured)**
- **Home Entertainment Contest (meas. and jur.)**

www.solardecathlon.gov/contests.html

Appliances Contest (100 points)

The U.S. Department of Energy Solar Decathlon 2013 Appliances Contest is designed to mimic the appliance use of an average U.S. home.

Teams earn points for refrigerating and freezing food, washing and drying laundry, and running the dishwasher. Points are awarded for:

- Maintaining the refrigerator temperature between 34°F (1.11°C) and 40°F (4.44°C)
- Keeping the freezer temperature between -20°F (-28.9°C) and 5°F (-1.5°C)
- Washing a load of laundry within a specified period of time
- Returning a load of laundry to a total weight less than or equal to the load's total weight before washing using active or passive drying methods
- Running the dishwasher through a complete, uninterrupted cycle, at some point during which a temperature sensor placed in the dishwasher has to reach 120°F (48.9°C).

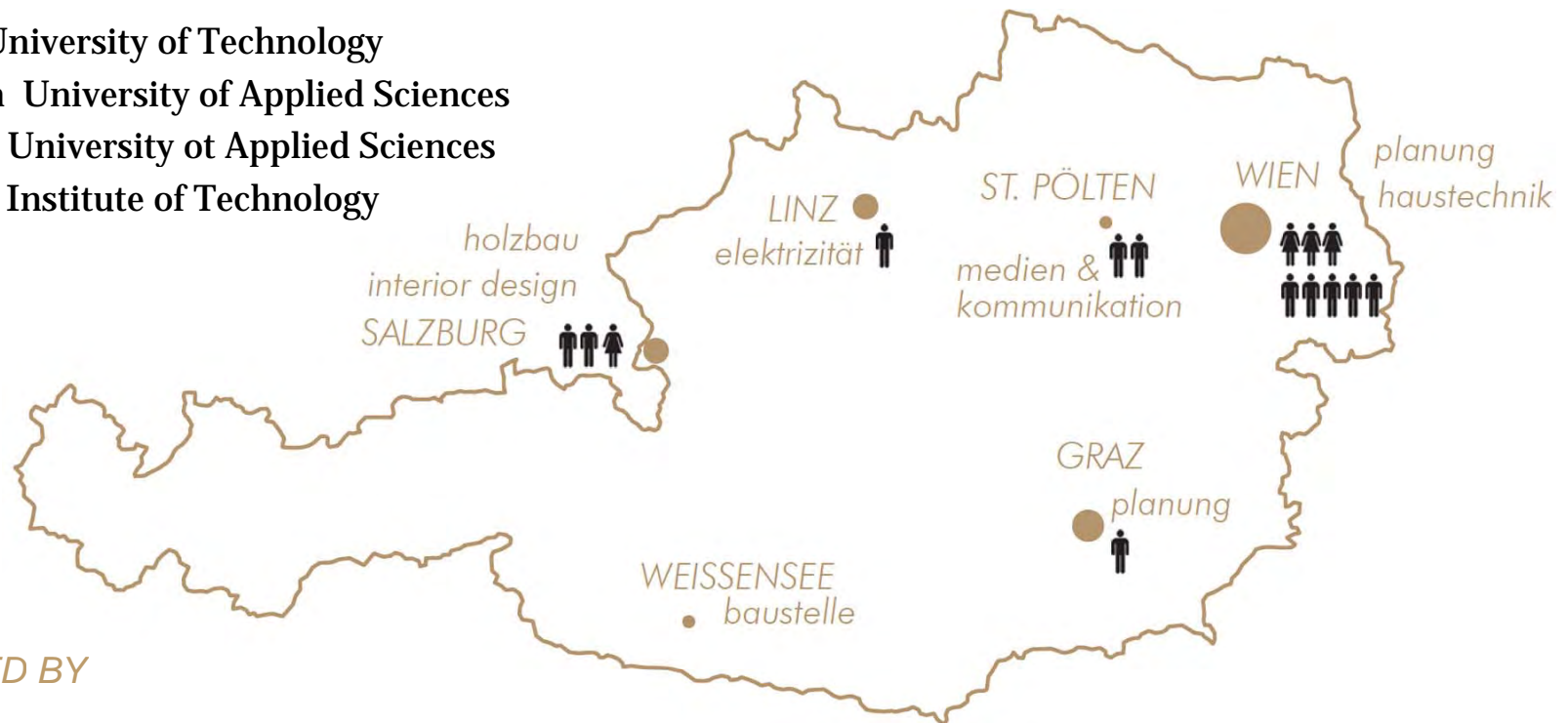
TEAM AUSTRIA





TEAM AUSTRIA

- Vienna University of Technology
- St.Pölten University of Applied Sciences
- Salzburg University of Applied Sciences
- Austrian Institute of Technology



SUPPORTED BY

- Austrian Federal Ministry for Traffic, Innovation and Technology
- Austrian Embassy & OSTINA in Washington
- Consul general in Los Angeles



CONCEPT

IT ALL BEGAN WITH A TREE

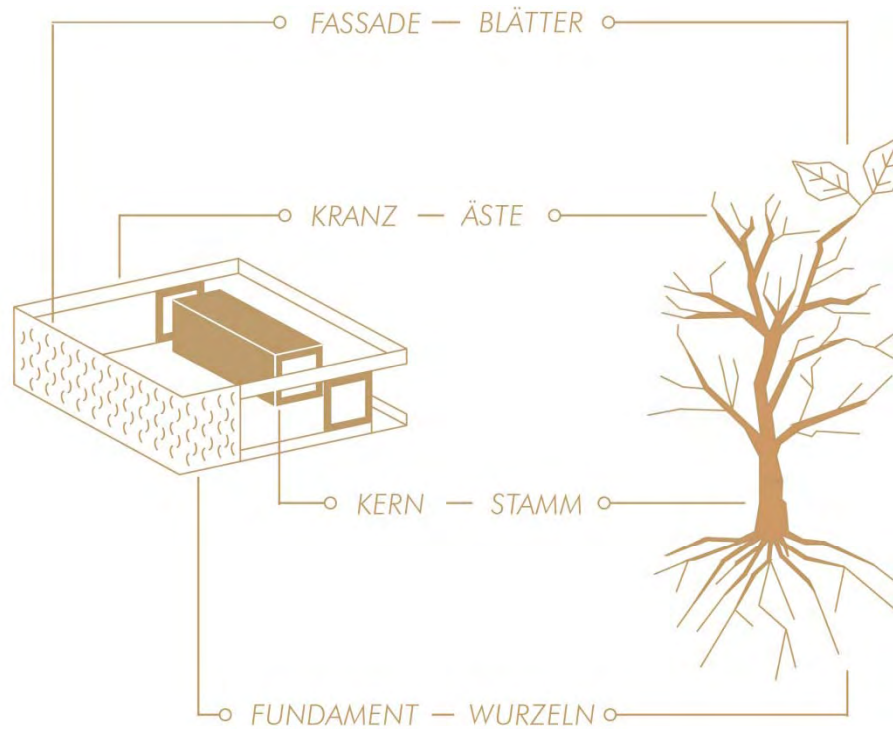
- **Ecologic materials**
- **Renewable energies**
- **Sustainable design**



DESIGN PHILOSOPHY



ECOLOGIC MATERIALS



Bark



Cut wood



Sägespäne

Our design originates from a tree.

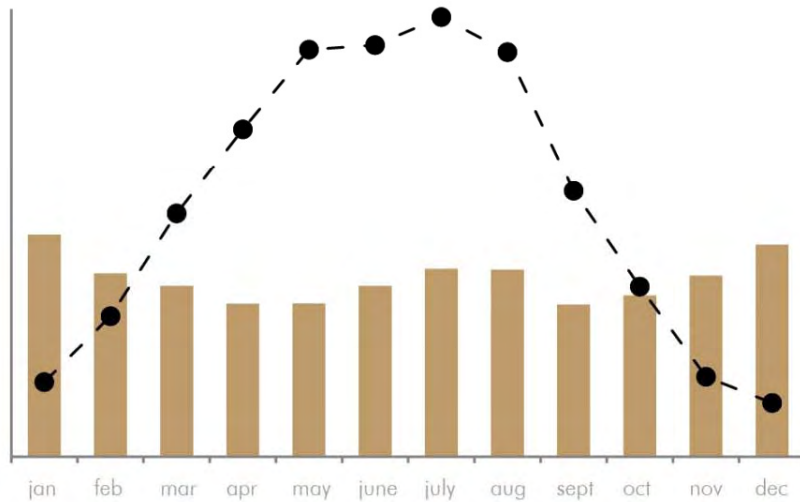
The tree as a whole is being used.



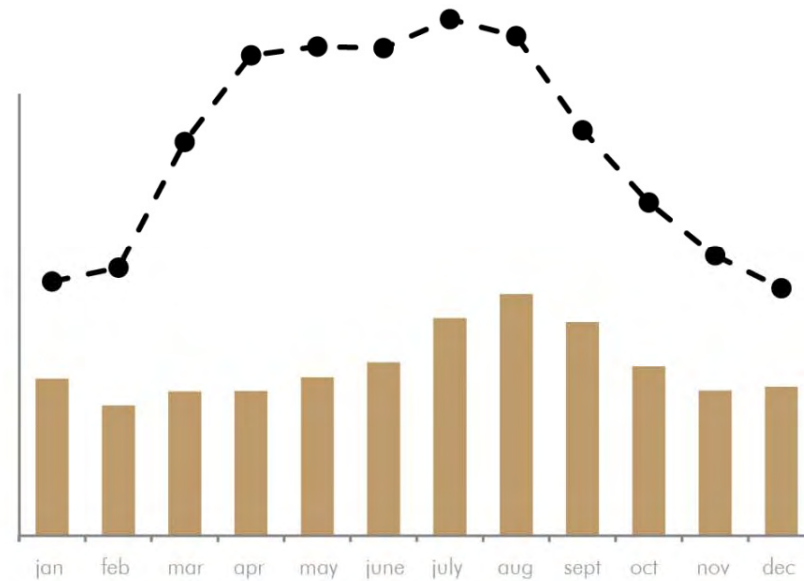
DESIGN PHILOSOPHY

RENEWABLE ENERGIES – SURPLUS-ENERGY CONCEPT

VIENNA, AUSTRIA



IRVINE, CALIFORNIA



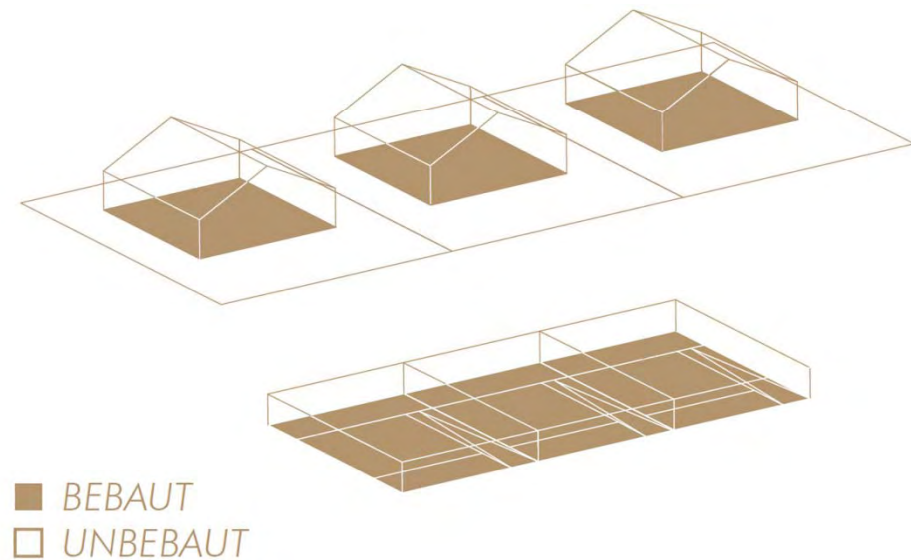
■ ENERGY DEMAND
● PV PRODUCTION



DESIGN PHILOSOPHY

HORIZONTAL DENSIFICATION OF RESIDENTIAL AREAS BY ATRIUM-CONCEPT

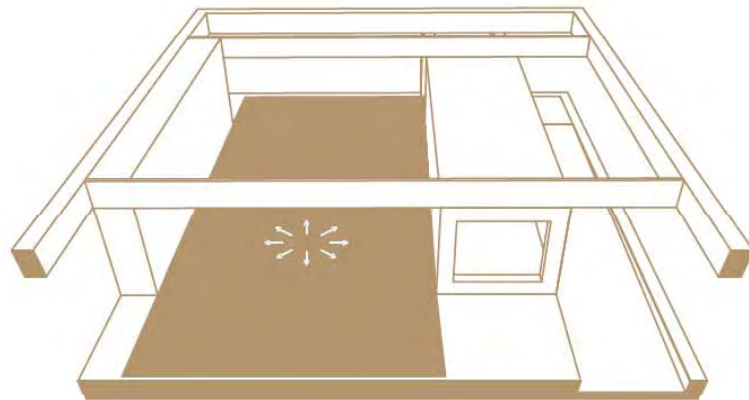
- **Horizontal addition of buildings**
- **Small consumption of residential areas**
- **Improved energy-efficiency**



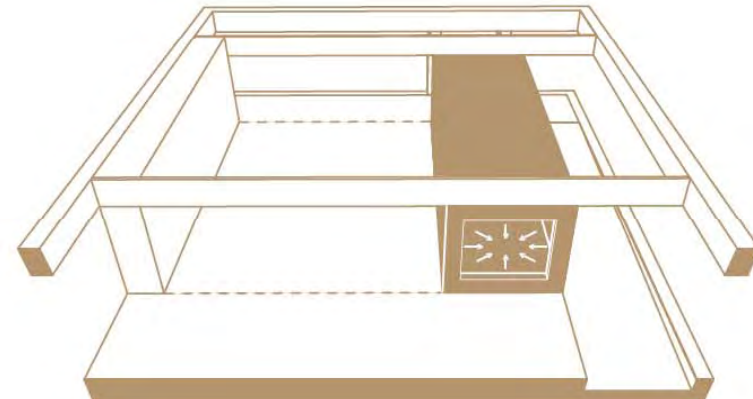
DESIGN PHILOSOPHY



LIVING AREA ORIENTED OUTSIDE



RETREAT AREA ORIENTED INSIDE

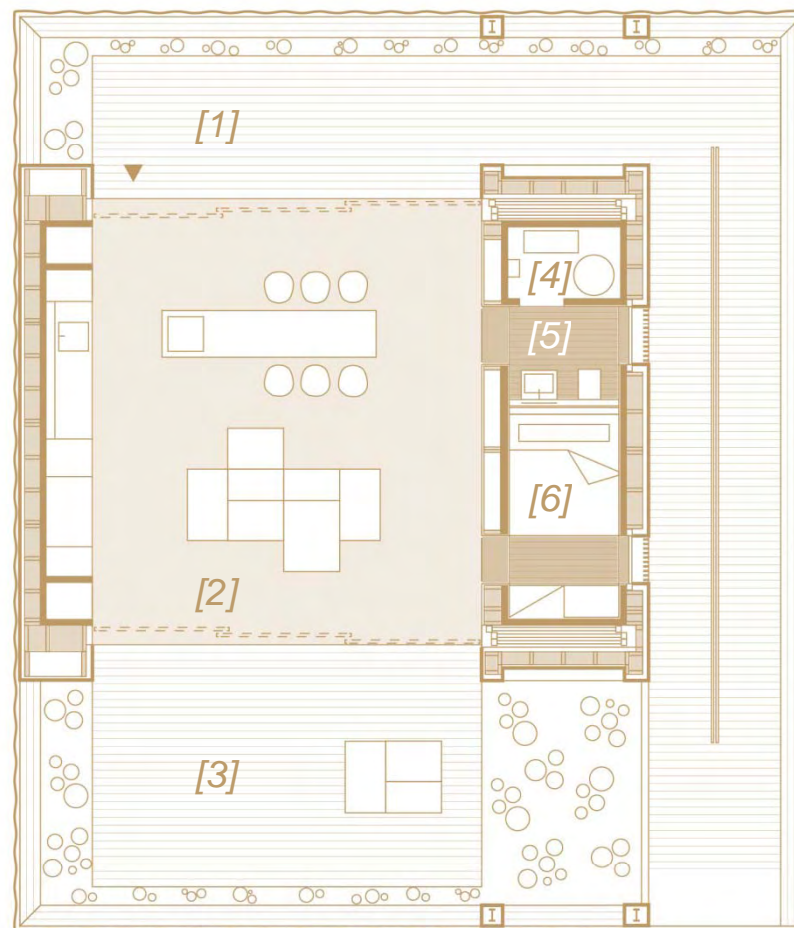




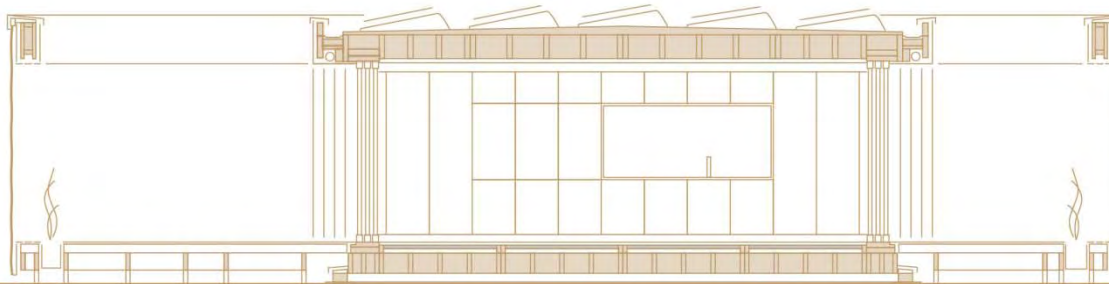
GROUND FLOOR PLAN

Net living area: 58.68 m² = 630.0 ft²
Total interior area: 60.96 m² = 655.0 ft²
Gross built area: 84 m² = 904.2 ft²
Total area of build.: 201 m² = 2163.5 ft²

[1] patio: 172 ft² / 16 m²
[2] living room: 531ft² / 50 m²
[3] patio: 290 ft² / 27 m²
[4] technical room 25 ft² / 2,28 m²
[5] bathroom: 31 ft² / 2,58 m²
[6] sleeping room: 68 ft² / 6 m²



SECTIONS



SECTION SOUTH-NORTH



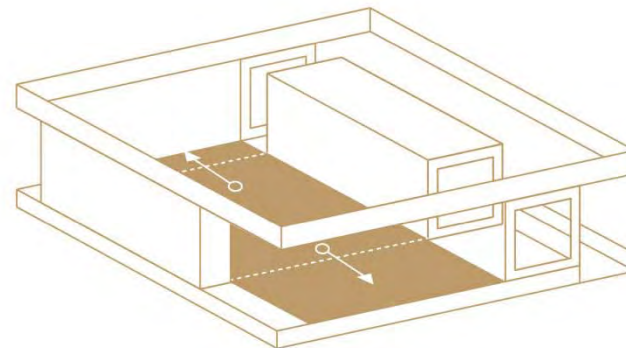
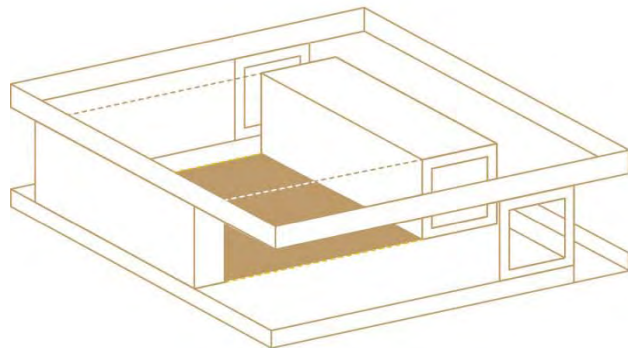
SECTION WEST-EAST

DESIGN



3 zones, extendable living area

- **The living room is situated in the center.**
- **It can be extended to the North and South to the patios by moving the sliding doors.**
- **Such the living area can be doubled**

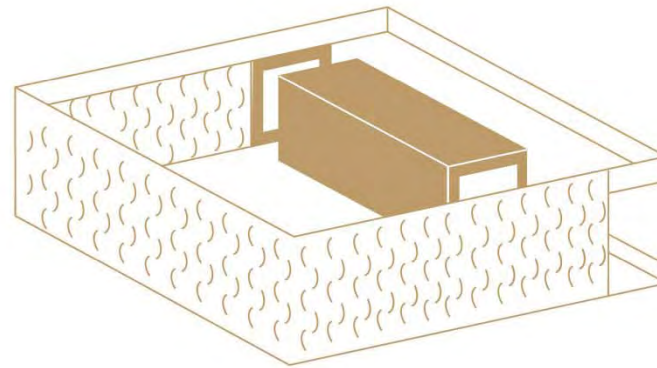
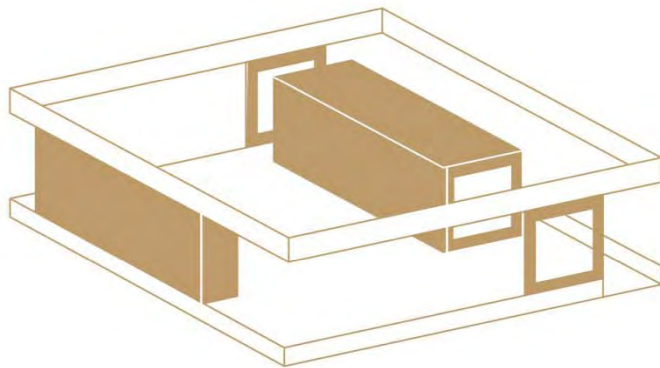


DESIGN



VARIABILITY AND PRIVACY

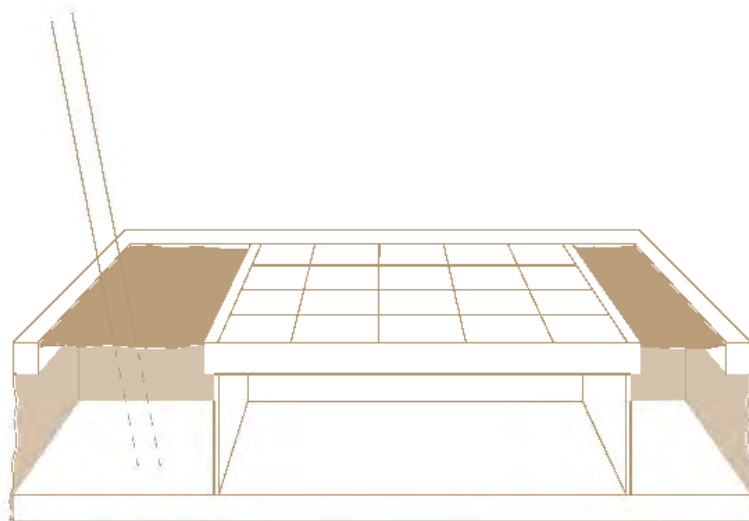
- Diverse architectural layers
- Transparency and privacy can be altered



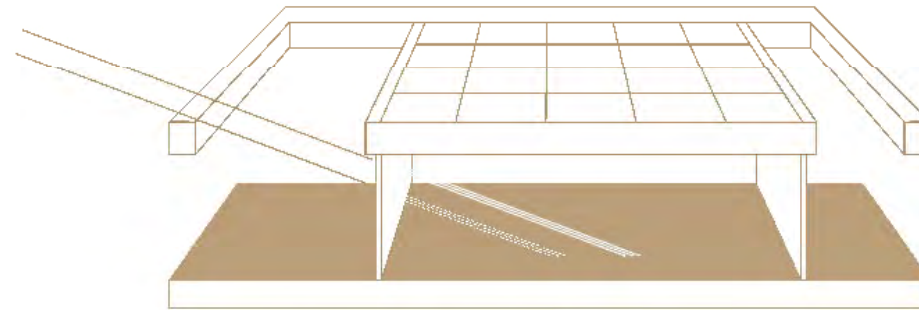


DESIGN

REACTING TO SEASONS



- SHADING IN SUMMER -----



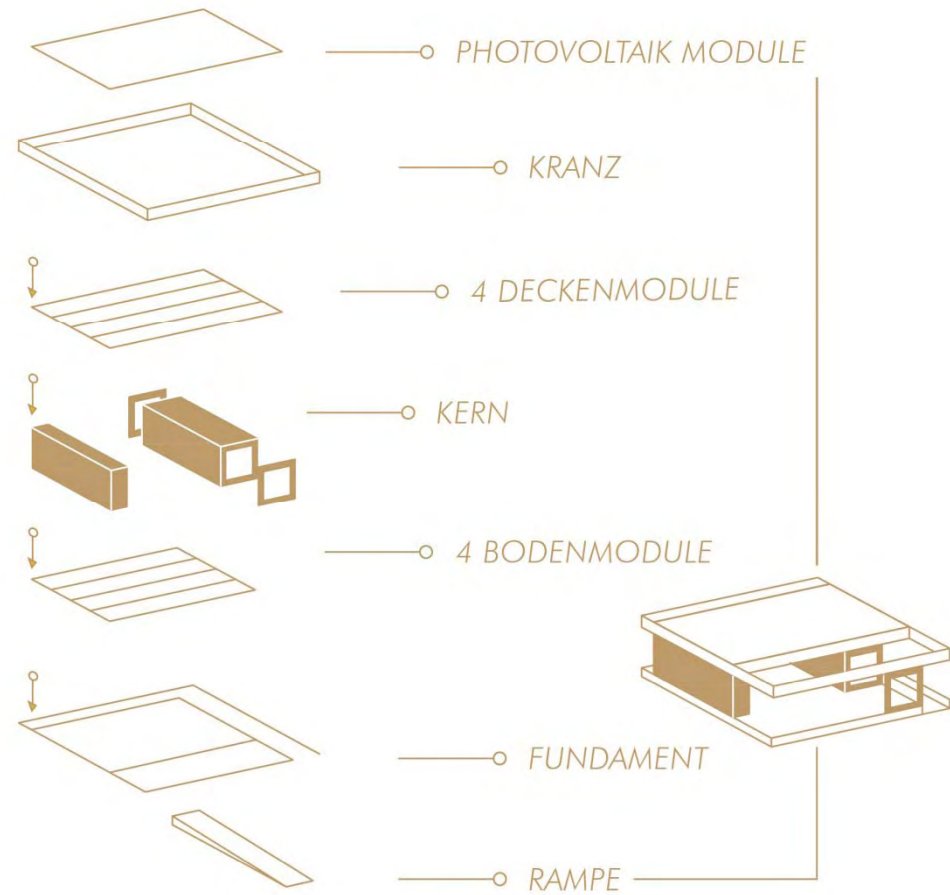
PASSIVE SOLAR GAINS IN WINTER



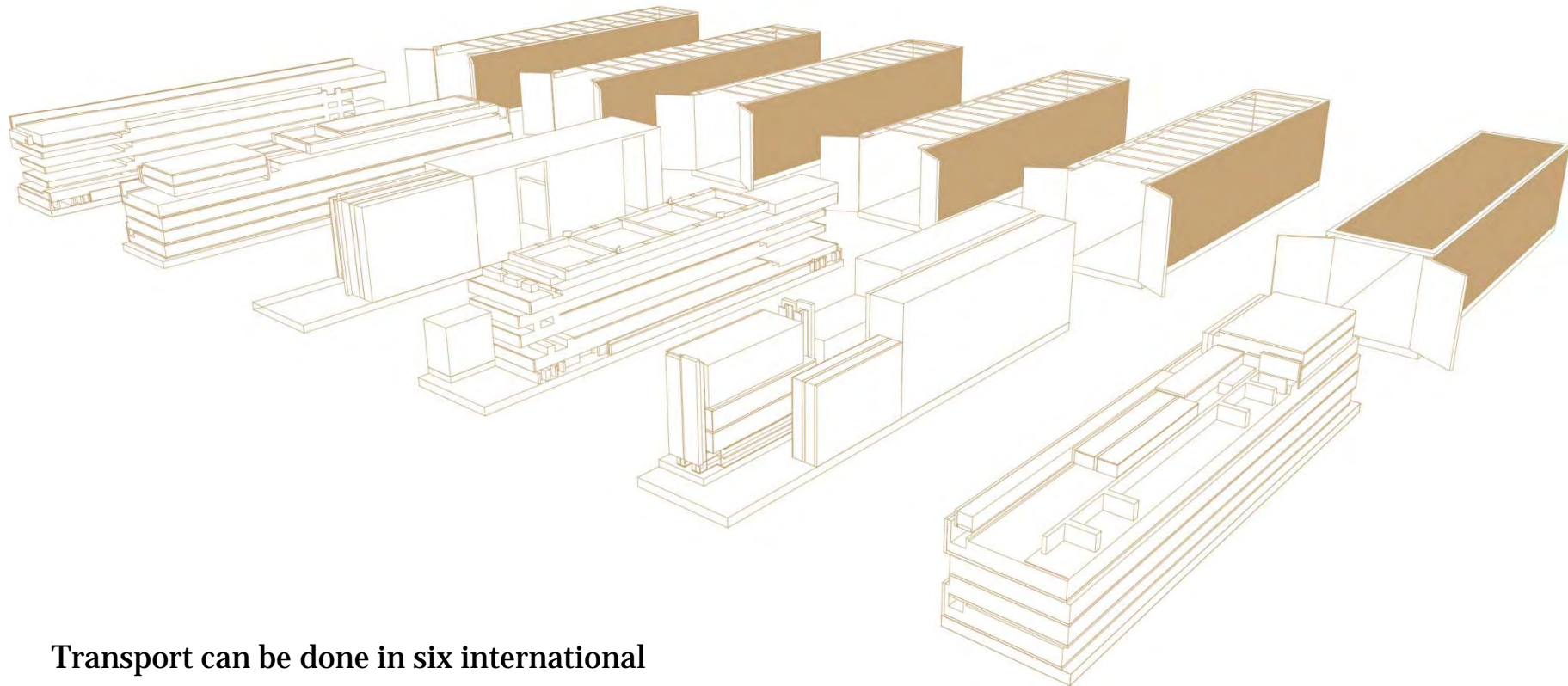
DESIGN

MODULARITY

- pre-fabrication
- modular construction
- lightweight wood construction
- size of modules fit for international shipping containers



TRANSPORT



**Transport can be done in six international
standard shipping containers**

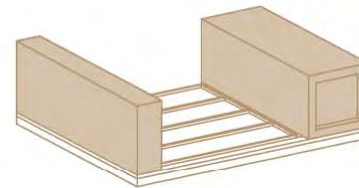
CONSTRUCTION



[1] FOUNDATION



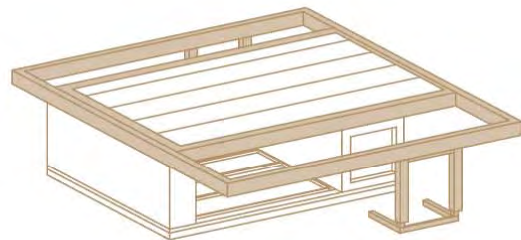
[2] FLOOR MODULES



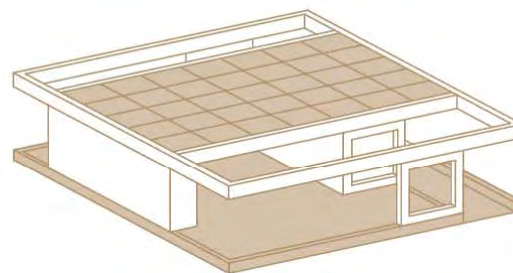
[3] CORES



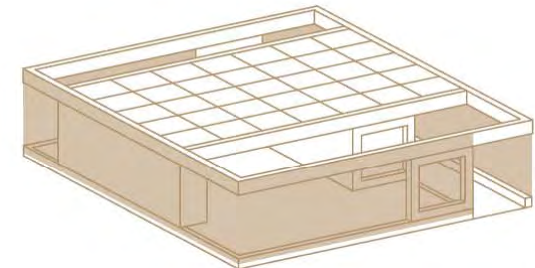
[4] ROOF MODULES



[5] ROOF WREATH



[6] PHOTOVOLTAICS AND FLOOR



[7] FACADE ELEMENTS



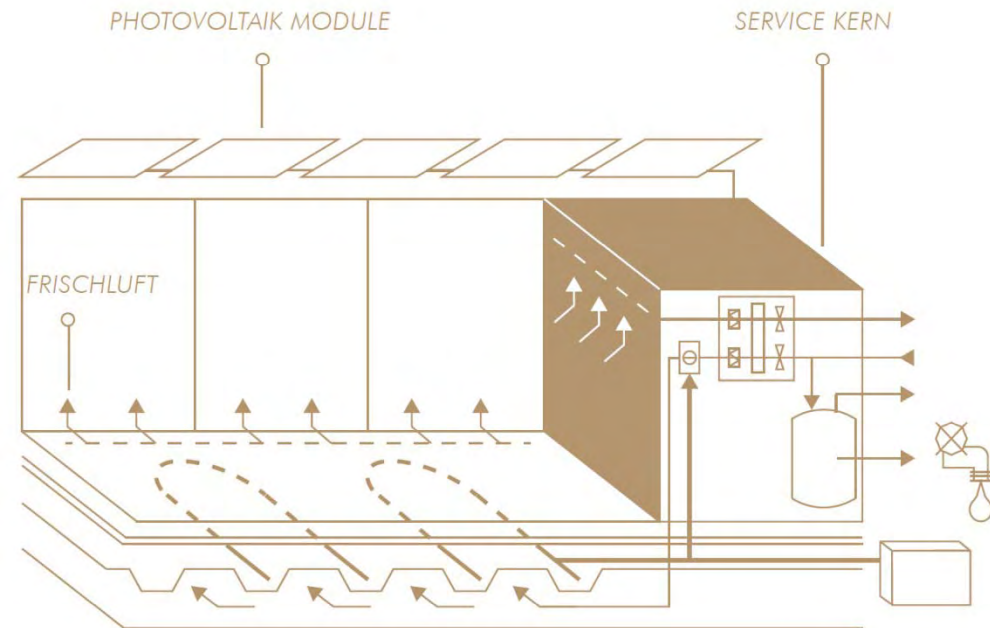
SITE PLAN





BUILDING SERVICES

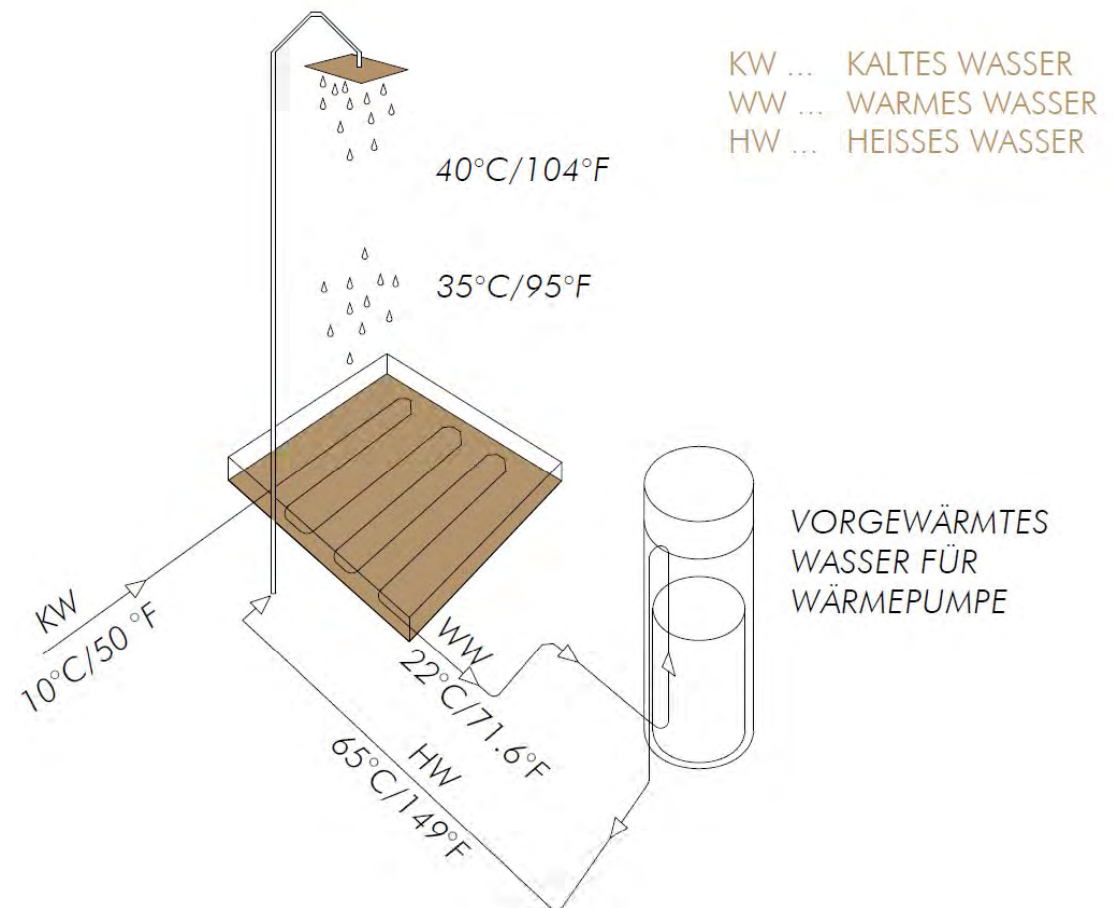
- **Generation of total energy demand by photovoltaics mounted on the roof**
- **Hot and cold water for heating and cooling generated by two air-water-heatpumps**
- **Ventilation unit has integrated heat- and humidity-exchanger**
- **Building is heated and cooled by multi-functional floor; additional supply with fresh air through floor construction**





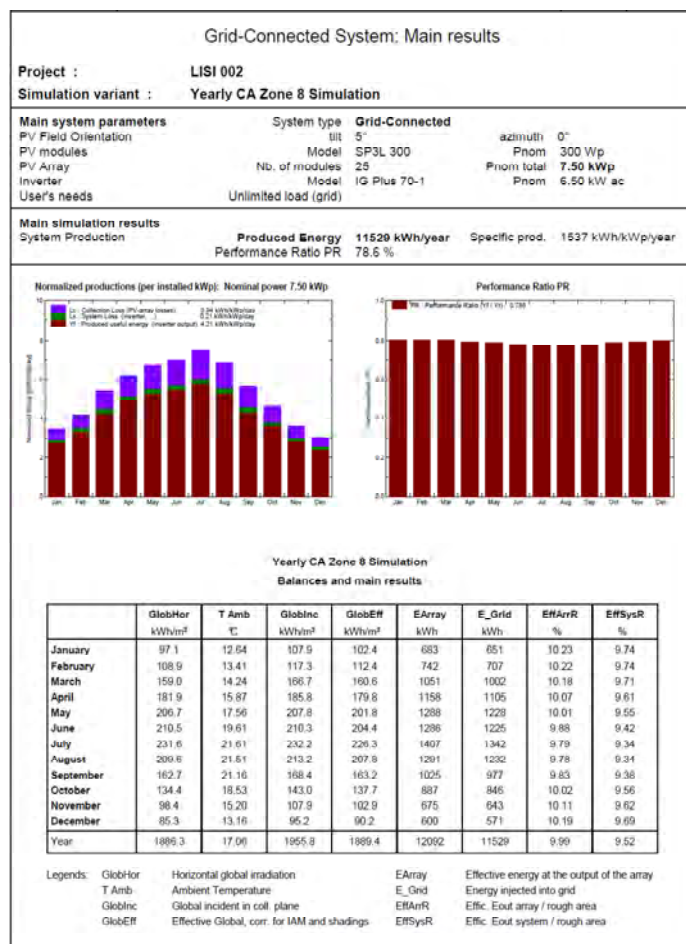
INNOVATIVE SHOWER

- The heat of the waste-water of the shower is recovered by an innovative heat recovery system integrated in the shower-basin
- It reduces the energy demand from showering.





PV-SIMULATION WITH PVSYS



DATA OF SYSTEM INSTALLED

- *8,62 KWp Polycrystalline silicon-modules*
- *Yearly amount of electricity produced: ~ 13000 kWh*
- *Area of active photovoltaics: 57,75 m² = 621.6 ft²*
- *Total roof area: 80 M² = 860 ft²*

SYSTEM PROVIDES

- Heating and cooling
- Hot water supply
- Electricity for the oven
- Electricity for washing and drying machines
- Lighting

ENERGY DEMAND



	WIEN, ÖSTERREICH		IRVINE, KALIFORNIEN
HEATING DEMAND / HEIZUNGSBEDARF	9,7 kWh/m ² per year		2,7 kWh/m ² per year
COOLNG DEMAND / KÜHLUNGSBEDARF	5,6 kWh/m ² per year		10,6 kWh/m ² per year
SETPOINT OF TEMPERATURE SOLLWERT TEMPERATUR	21.7 °C - 24.4 °C	=	72 °F - 76 °F
ENERGY DEMAND / a JÄHRLICHER BEDARF	5722 kWh		5468 kWh
ENERGY PRODUCTION / a JÄHRLICHE PRODUKTION	8104 kWh		12475 kWh

STEERING OF THE BUILDING VIA TABLET



 **LIVING HABITS /**
LEBENSGEWOHNHEITEN

 **ENERGY SAVINGS /**
ENERGIEEINSPARUNG

 **ENERGY CONSUMPTION /**
ENERGIEVERBRAUCH

 **COMFORT /**
KOMFORT

 **LIGHTING SCENARIOS /**
LICHTSZENARIEN

 **ENTERTAINMENT**























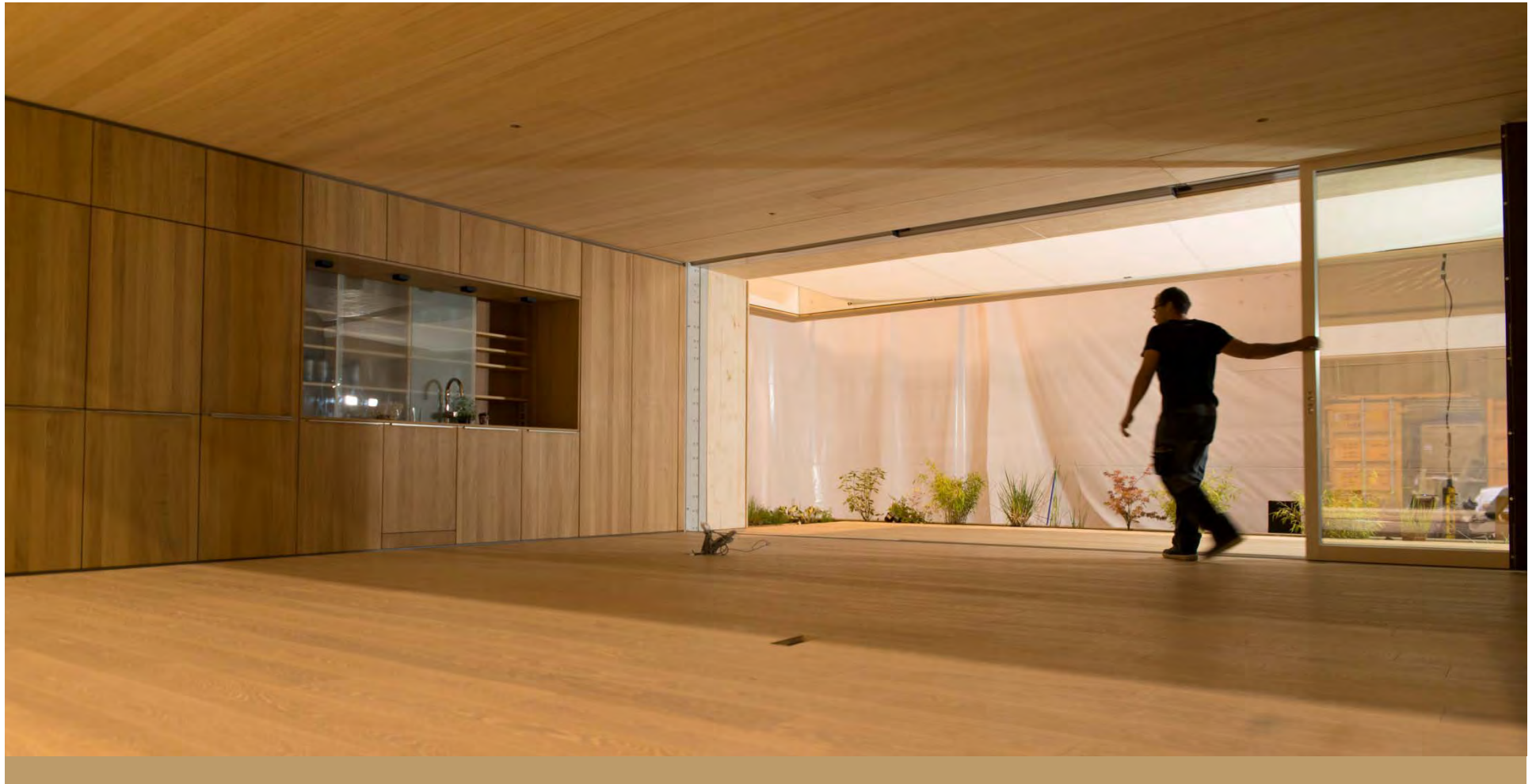














INTERIOR DESIGN KITCHEN & STORING AREA



COMPETITION FIRST DAY



THIRD DAY



FIFTH DAY



7th DAY









ADDITIONAL FEATURES



CLIMALEVEL FLOOR

Cooling, heating, ventilation

LED-Lighting

SHADING by SUNSAIL

WATER COLLECTION

from roof

LOCAL PLANTS

on terraces; in bags made from recycled material (PET-bottles)

CERTIFICATES

LEED, IG Passivhaus, ÖGNB, DGNB

PUBLIC EXHIBIT MATERIALS

Posters, handouts

MODEL 1:6

built for exhibitions

TEAM MEMBERS & CREW



A PROJECT OF THE VIENNA UNIVERSITY OF TECHNOLOGY Architecture, Electrical Engineering



IN CO-OPERATION WITH

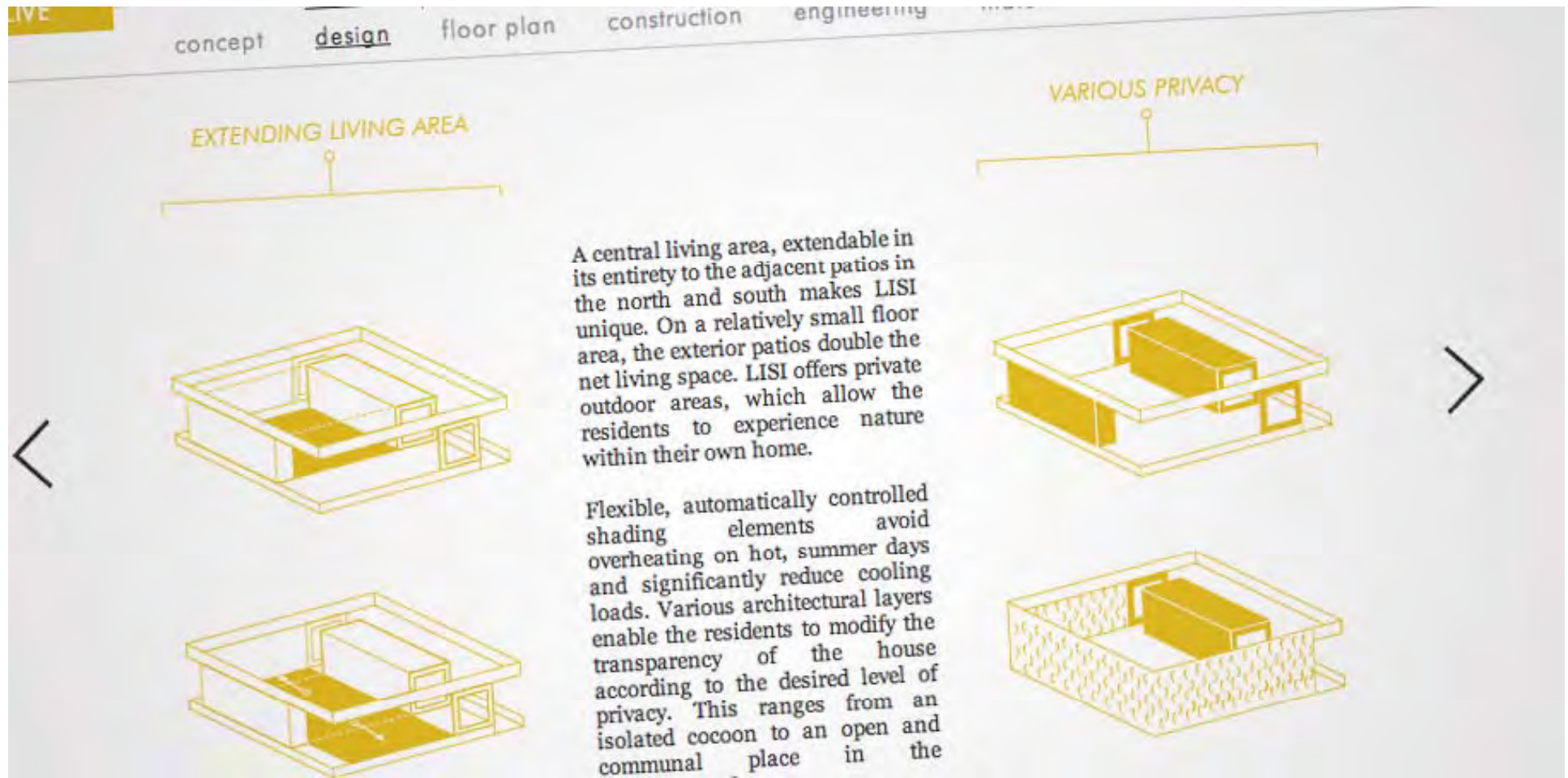
- Austrian Institute of Technology , AIT Building Services
- St. Pölten University of Applied Sciences Creative Media
- Salzburg University of Applied Sciences Wood Technology and Construction
Interior Design & Product management



PROJECT PARTNERS

- Austrian Federal Ministry for Transport, Innovation and Technology
- Austrian Research Promotion Agency (FFG)
- Austrian Embassy in Washington, DC
- IG Passivhaus
- supporting Austrian companies (Weissenseer, Josko,...)





TEAM AUSTRIA



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