

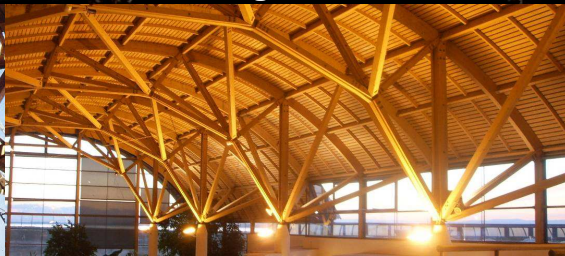


INSTITUT FÜR KONSTRUKTION UND MATERIALWISSENSCHAFTEN
INSTITUT FÜR INFRASTRUKTUR
INSTITUT FÜR ARCHITEKTUR UND RAUMPLANUNG
INSTITUT FÜR SOZIOLOGIE



INTENSYS

INTegrated designed high efficient **EN**ergy- and societal **SY**stemes for sustainable housing in the future



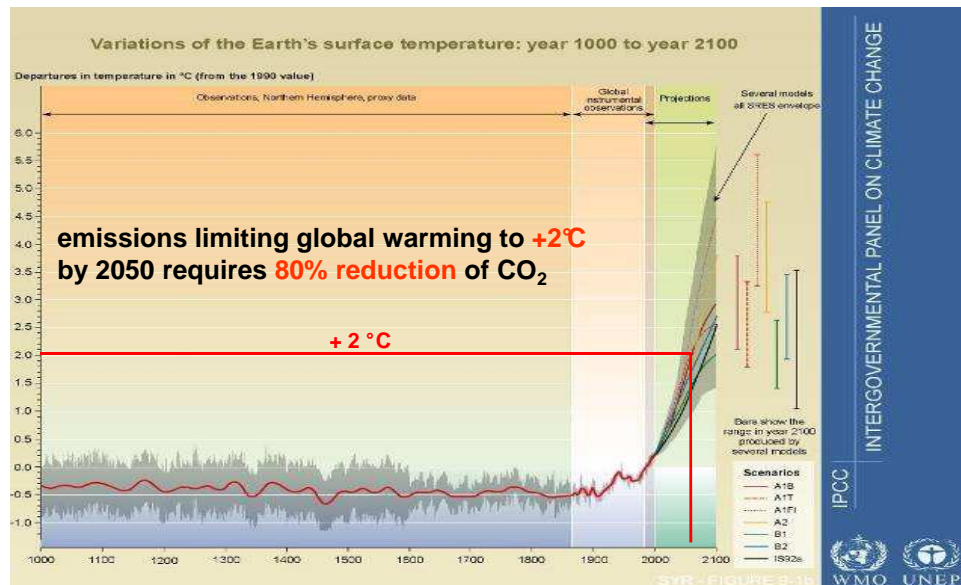
Overview

INTegrated designed high efficient **EN**ergy- and societal **SY**stemes for sustainable housing in the future

- **CONTEXT OF THE PROJECT**
- **SMART CITY INITIATIVE**
- **ASPECTS OF ENERGY EFFICIENCY**
- **ASPECTS OF SUSTAINABILITY**
- **CLIMATE CHANGE ADEQUATE HOUSING**
- **BUILDING COMPONENTS**
- **FLEXIBLE SPACE CONCEPT**
- **CONCLUSIONS**

context of the project

INTegrated designed high efficient ENERGY- and societal
SYStemes for sustainable housing in the future



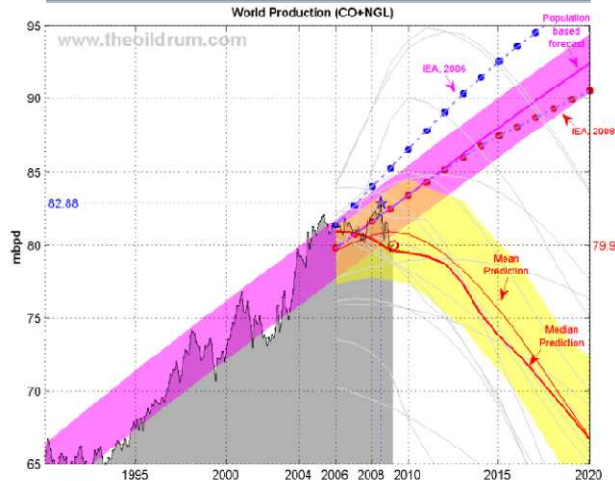
context of the project

INTegrated designed high efficient ENERGY- and societal
SYStemes for sustainable housing in the future



context of the project

INTegrated designed high efficient ENERGY- and societal
SYSTEMS for sustainable housing in the future



achievement of
Peak Oils according
to SFT 21

oil is limited !

Peak Oil is the maximal
delivery of oil

happens between
2010 – 2025

tipping point arrived yet

picture: Peak-Oil-prognostics
source www.theoilrum.com

integrated designed urban development for energy self-sufficiency of the city of Wörgl, Tyrol, Austria

Energy Efficiency – The Smart Cities Initiative

Aims

The Smart Cities Initiative aims to
improve energy efficiency and to
step up the development of renew-
able energy in cities going even
further than levels foreseen in the
EU energy and climate change
policy.

This Initiative will support cities
and regions that take pioneering
measures to progress towards a
radical reduction of green-house
gas emissions through the
sustainable use and production of
energy. low-carbon economy.



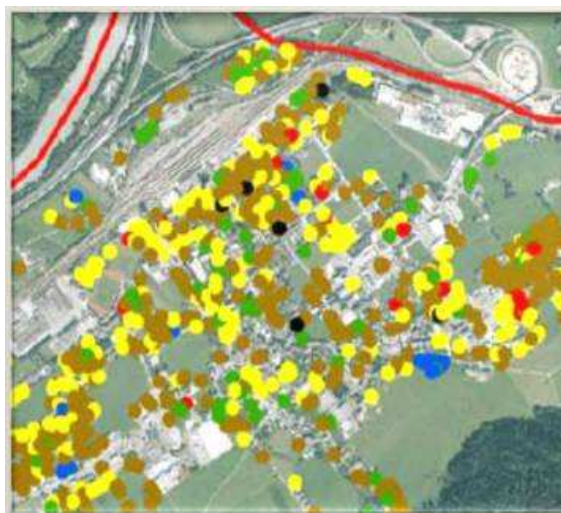
Smart City Initiative: aims and targets



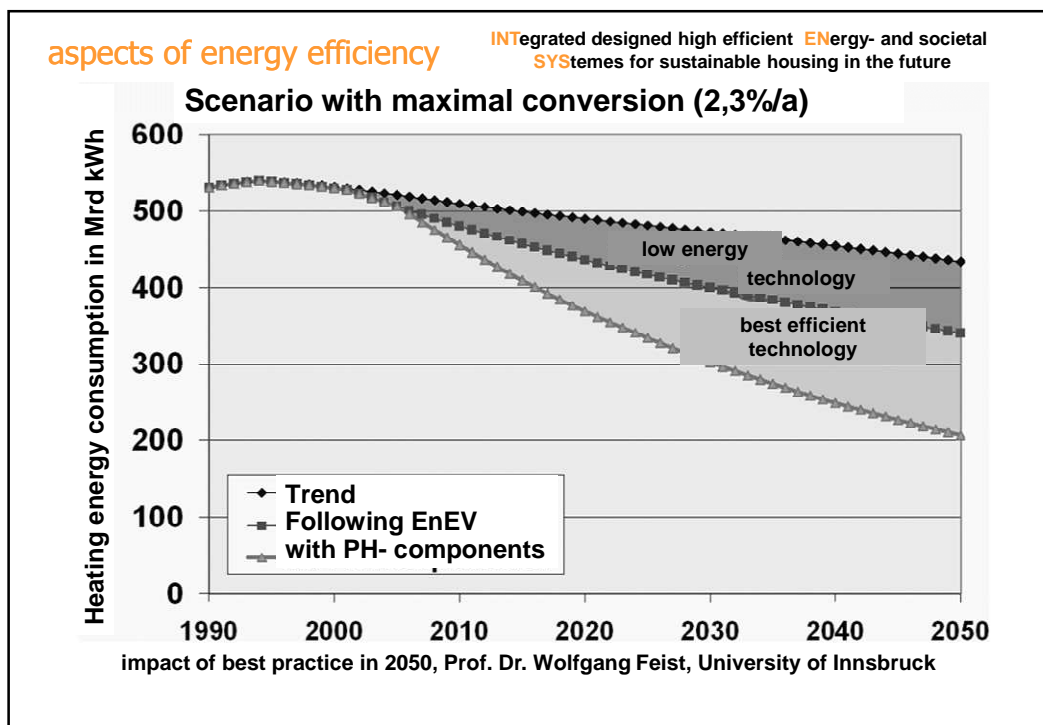
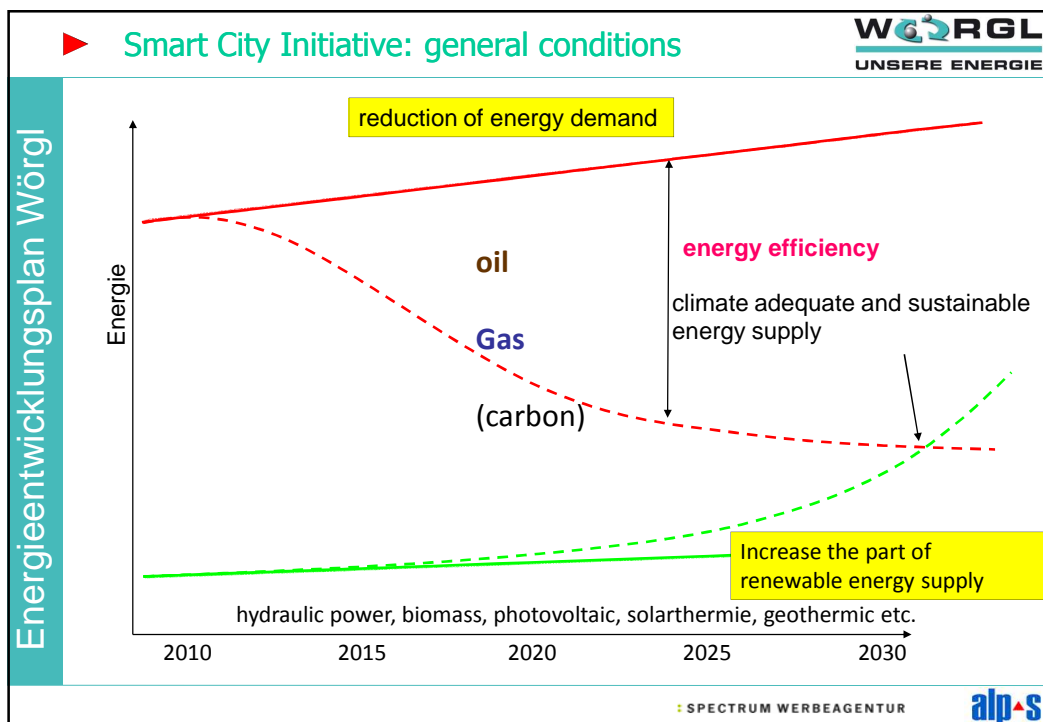
Wörgl launched the initiative "Wörgl our Energy" to reach **energy self-sufficiency until the year 2025**. This includes the regeneration of the district "Südtiroler Siedlung". The project forms the basis for a roadmap containing a master plan for urban planning and measures for buildings, energy supply, transportation, industry and social aspects to increase energy efficiency and renewable energy use. It is coordinated among all stakeholders.



Smart City Initiative : baseline and targets



Baseline study Inventory of energy consumption in Wörgl

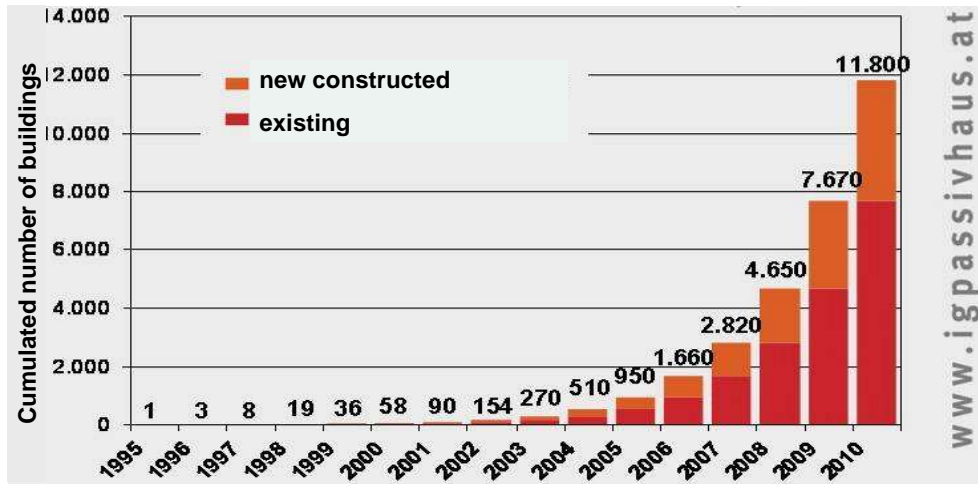


aspects of energy efficiency

INTegrated designed high efficient ENergy- and societal
SYStemes for sustainable housing in the future

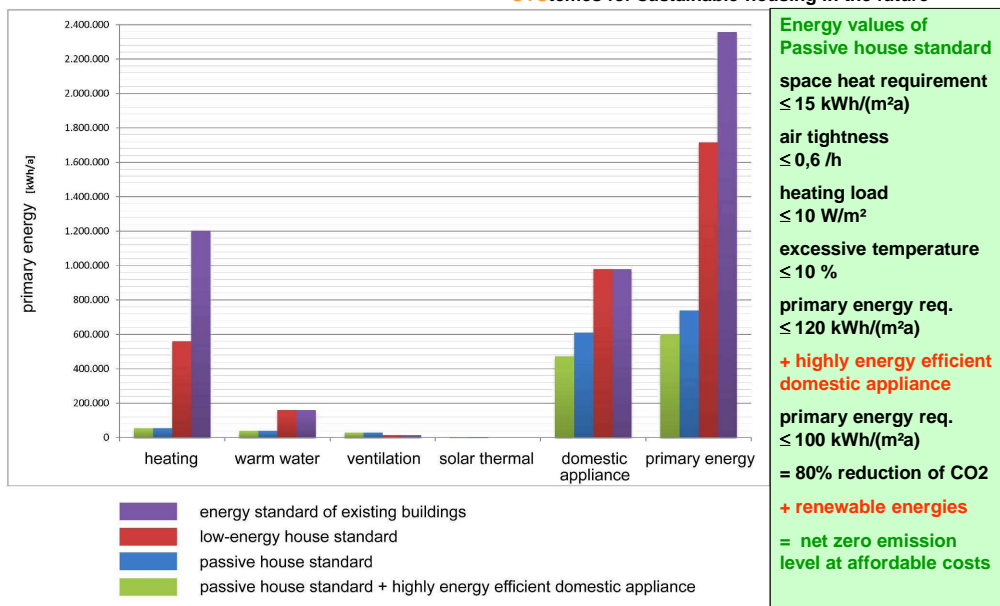
development of passive houses in Austria

from built 30.000 passive houses world wide, every third is in Austria



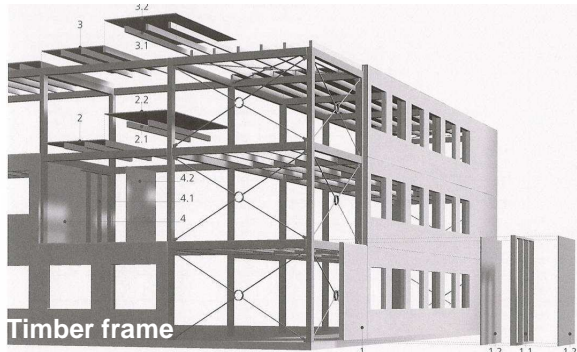
aspects of energy efficiency

INTegrated designed high efficient ENergy- and societal
SYStemes for sustainable housing in the future

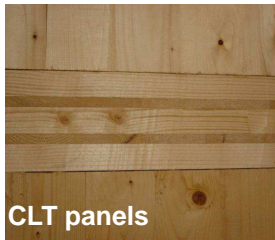


aspects of sustainability

INTegrated designed high efficient ENERGY- and societal
SYStemes for sustainable housing in the future



Timber frame



CLT panels



Wood is:

- a **renewable** resource
- a locally **available** resource
- a suitable **building material**
- perfect for **passive houses**
- **local value added** product
- good for indoor **healthiness**
- evident for **sustainable habitat**

aspects of sustainability

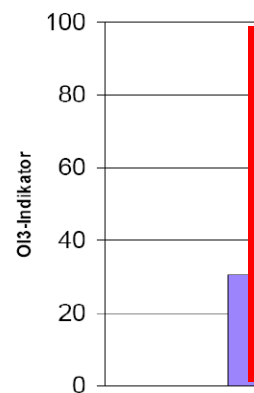
INTegrated designed high efficient ENERGY- and societal
SYStemes for sustainable housing in the future

Multi-criteria analyze checklist for building materials																															
grading key		ASSESSMENT CRITERIA										GRADE																			
0	grave deficiency, refusal	a	natural building material	b	thermal properties	c	humidity property/absorption capacity	d	water vapor diffusion (μ)	e	toxic exhalations and gases		f	odor	g	electrobiology	h	radioactivity	i	ecological problems	j	energy demand	k	fire behavior	l	protection against airborne noise	m	protection against impact noise	n	long term prove	o
building material																															
raw materials (partly finishings)																															
1	solid wood	3	3	3	3	2	3	3	2	3	3	3	2	3	3	3	2	2	1	3	3	2	2	2	1	3	3	2	2	2.6	
2	clay materials	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.7	
7	reinforced concrete	1	0	0	0	2	2	1	2	1	2	1	0	1	2	1	0	1	2	3	0	2	2	3	0	2	2	1	3	2	1.2
mortar / plaster																															
8	lime mortar and -plaster	2	1	2	3	3	3	3	3	3	2	2	3	3	0	3	2	3	3	0	3	2	2	3	0	3	2	2	2	2.3	
9	cement mortar and rendering	1	1	1	2	3	2	3	2	2	2	2	3	3	0	3	2	2	2	3	0	3	2	2	3	0	3	2	2	2.0	
10	synthetic resin plaster	0	1	0	0	1	1	2	4	0	1	2	3	0	1	2	3	0	2	1	1	1	2	1	2	1	1	1	1	1.1	
thermal insulating materials																															
13	mineral rock- and glass wool	0	2	0	3	1	0	2	2	0	1	2	0	1	2	0	3	1	1	1	1	1	2	0	3	1	1	1	1	1.2	
14	sheep wool	2	2	2	3	2	2	2	2	2	3	2	3	1	0	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1.9	
16	cellulose	1	2	2	3	2	3	3	3	3	3	3	3	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.2	
17	soft wood fibers	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.5	
finishing boards																															
27	chipboard (cement bound)	2	2	1	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2.2	
29	oriented strand board	1	3	1	0	1	2	3	3	3	1	1	1	2	1	1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1.6
30	natural gypsum board	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2.3

Origin: IBN-Neubeuern 10/2008 (Diagram: Trojer, T.)

OI3 Indicator

1. Primary energy supply
2. Carbon emission
3. Acidification



aspects of sustainability

INTegrated designed high efficient ENERGY- and societal
SYStemes for sustainable housing in the future



aspects of sustainability

INTegrated designed high efficient ENERGY- and societal
SYStemes for sustainable housing in the future



problems of condensed apartment buildings:

social isolation, ghettos and **not adapted** for :

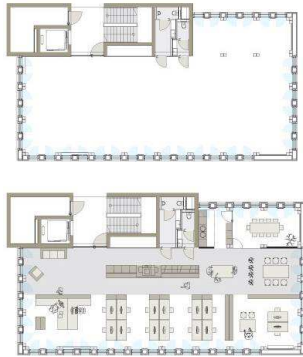
- life phases of inhabitants
- changing of job and family situation
- care and invalidity of older people
- community for children and young people
- social integration
- high living quality
- timber building



How many stores are sustainable?

Life Cycle Tower

INTegrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future



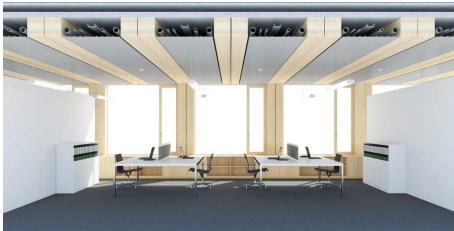
LCT ONE in Dornbirn

8 storeys, height 27 m,
broadness 13 m, length 24 m



Life Cycle Tower

INTegrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future



LCT ONE in Dornbirn

8 storeys, height 27 m,
broadness 13 m, length 24 m

Challenge !

between single family houses and condensed buildings,
there must be adequate habitations, which are
sustainable and affordable

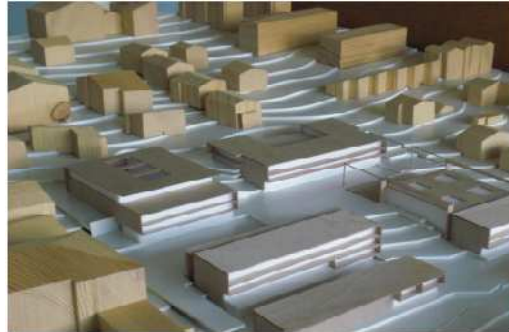


general approach

- funded research project with a cross linked interdisciplinary research team
- top down project.
- inspirations are coming from best practice examples of existing projects
- demonstration project on an appropriate site
- integration of society - and environment relevant aspects

climate change adequate housing

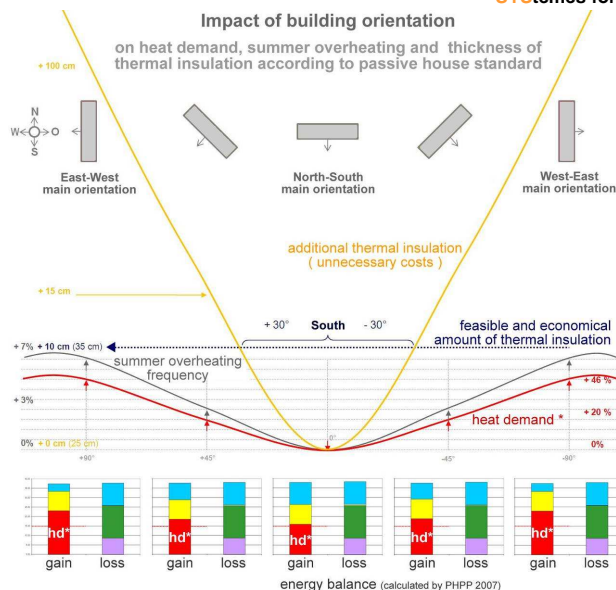
INTegrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future



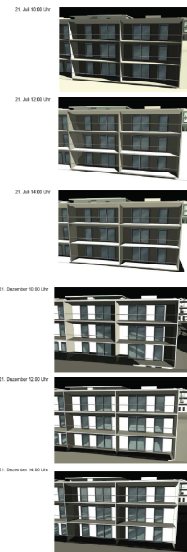
climate change adequate housing

INTegrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future

sun radiation and shading in



influence of orientation on thermal insulation, Harald K. Malzer



summer

winter

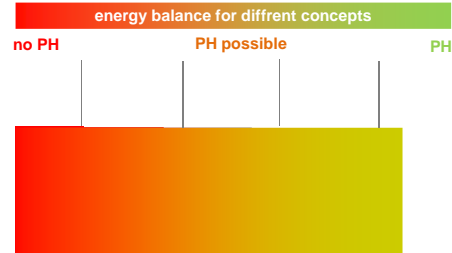
climate change adequate housing

INTEgrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future

building physical investigations by Univ.- Prof. Wolfgang Feist,
Rainer Pfluger, Rainer Valentin and Harald Malzer



concept 102 - stage April 2009



P2 - stage July 2009 - AP 1-4

Simulation calculations and estimation of the optimisation potential

building components

INTEgrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future

Institut für Konstruktion und Materialwissenschaften
Arbeitsbereich Holzbau
Univ.-Prof. Dipl.-Ing. Michael Flach

Universität Innsbruck
Fakultät für Bauingenieurwissenschaften
Technikerstraße 13 - 6020 Innsbruck
Telefon: +43 (0) 512 507 3800
Fax: +43 (0) 512 507 3804
E-Mail: holzbaulehrstuhl@tirol.at
Internet: www.uibk.at/holzbaulehrstuhl

holzbaulehrstuhl

Vorabzug, Stand 18.08.2010 (Zusammenstellung 30.09.10 ff.) - nur für den internen Gebrauch!

INTENSYS

Neue Energien 2020

Integriert geplante hochleistungs-ENERGIE- und
GesellschaftsSYStemes für nachhaltige
Lebensformen der Zukunft

Bauteilkatalog
Bauteiloptimierung

Stand Beschreibung 18.08.2010
Abgabe

Verfasser: DI Georg Weiland | Stand: August 2010



Programmanforderung:
Klima- und Energiefonds
Programmmanagement:
Österreichische Forschungsförderungsgesellschaft mbH (FFG)



Der Holzbaulehrstuhl wird unterstützt von der Tiroler Forst- und Holzindustrie, dem Tiroler Zukunftsforum.

INHALT

Skizze	Bauteil	Funktion Beschreibung	Seite
WÄNDE			
	Außenwand	Nicht tragend, Putzfassade, ohne Vorsatzschale	3
	Außenwand	Nicht tragend, Holzfassade hinterlüftet, mit Vorsatzschale	8
	Außenwand	Tragend, Holzfassade hinterlüftet, mit Vorsatzschale, Massivholz	12
	Innenwand	Nicht tragend	17
	Wohnungstrennwand	Tragend, mit Vorsatzschale, Massivholz	21
DECKEN			
	Trenndecke	Tragend, Massivholz, mit abgehängter Decke	24
	Trenndecke	Tragend, Holzwerkverbunddecke, ohne abgehängter Decke	27
DÄCHER			
	Flachdach	Balkendach, begrünt, mit abgehängter Decke	30
	Flachdach	Breitlappendecke, begrünt, mit abgehängter Decke	33
	Flachdach	Holzkastendach, begrünt, ohne abgehängter Decke	38
	Flachdach	Kalldach, begrünt, ohne abgehängter Decke, hinterlüftet	40

INTENSYS, Bauteilkatalog, Stand 18.08.2010 WEILAND Georg - Abgabe

2 / 43

Catalog of passive house building components

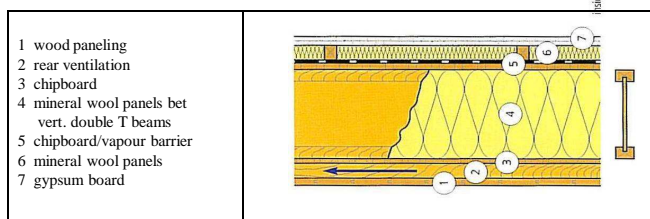
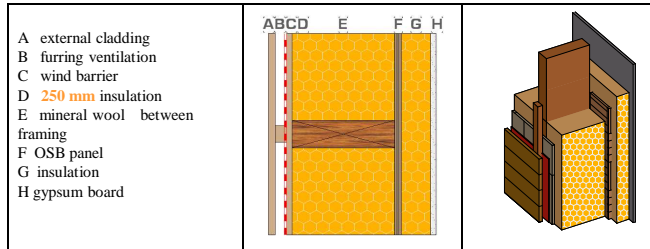
building components

INTEgrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future

Assessment criterion

category	weighting in %
thickness	25,5
Ecology	22,5
Cost	40,0
healthiness	12,0
total	100,0

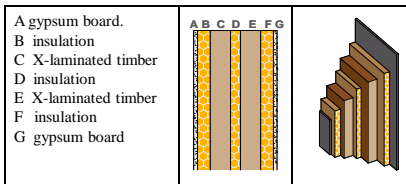
component	global assessment
Ext. wall: "AW n trag.in.4"	5,0 von max 8,5



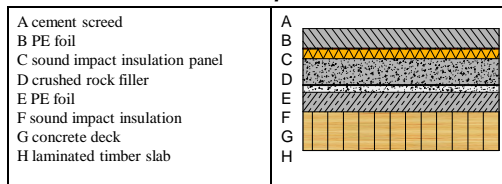
building components

INTEgrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future

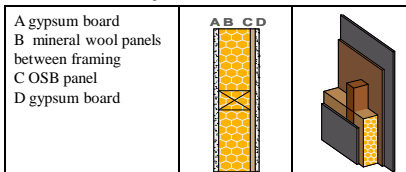
Separation wall



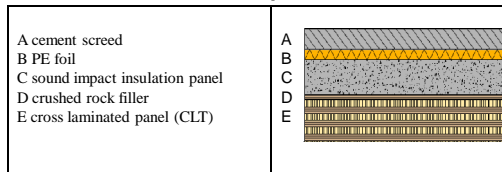
Wood-concrete composite floor



Inner partition wall

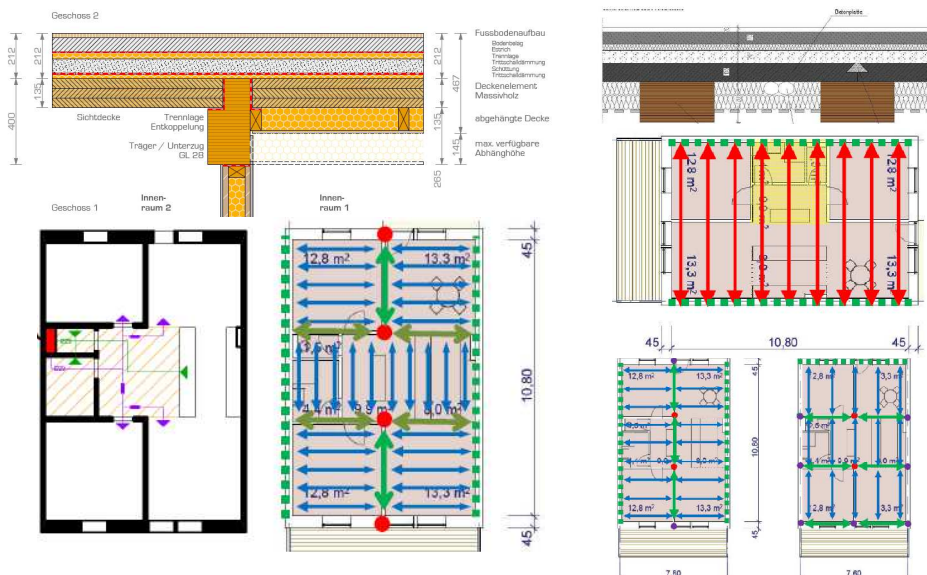


Wood-CLT composite floor



building components

INTegrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future



Optimization and recommendation of floor systems

flexible space concept

INTegrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future

There are cars with transformable seats, foldable baby buggies, but there are no flexible concepts in housing ...?!?

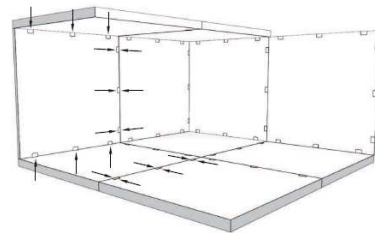
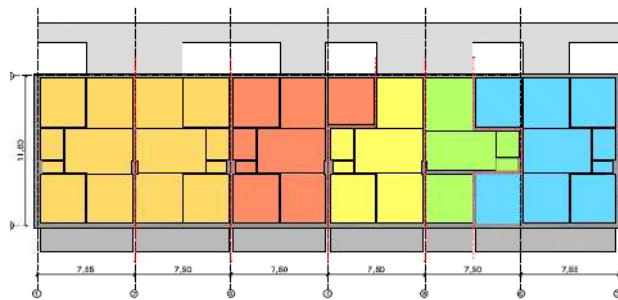


retrofitting for upgrading to PH Standard in Nürnberg Kollwitzstrasse, Germany

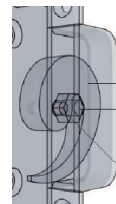
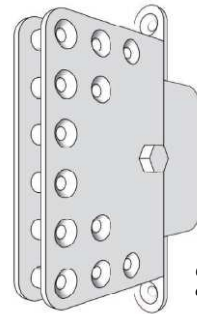
source: Dr. Burkard Schulze Darup Architekt

flexible space concept

INTegrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future



Position of connectors in the CLT panels



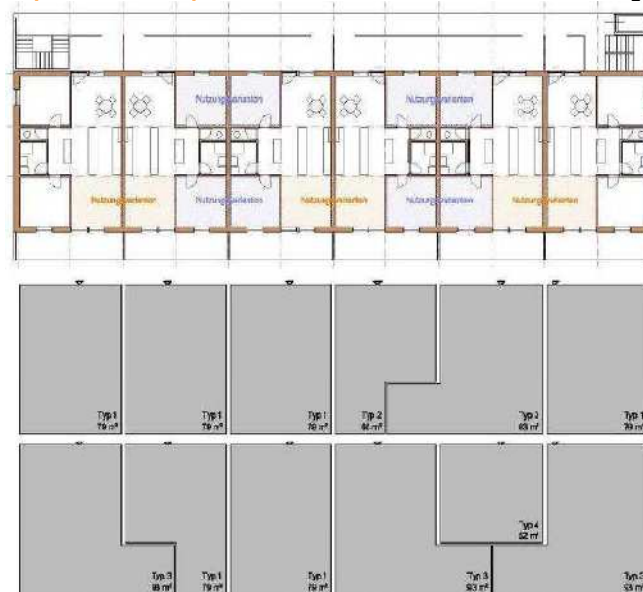
Connector with an eccentric fitting system

Flexible lofts with variable sizes

- regular pattern with overlapping separations
- acoustical decoupling
- prefabricated openings for doorways
- mobile wall elements for inner partition walls

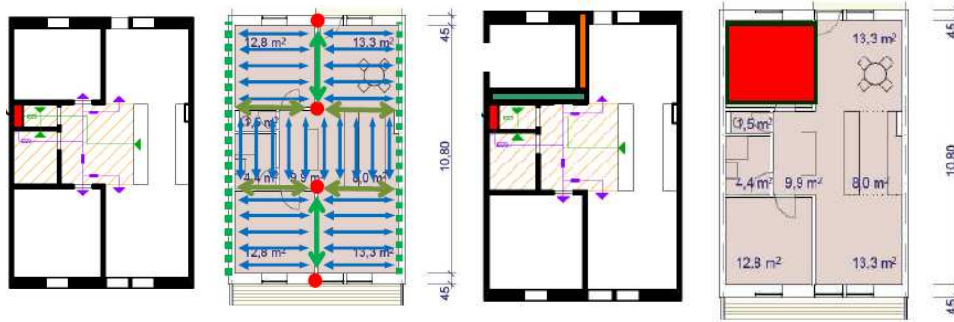
flexible space concept

INTegrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future



flexible space concept

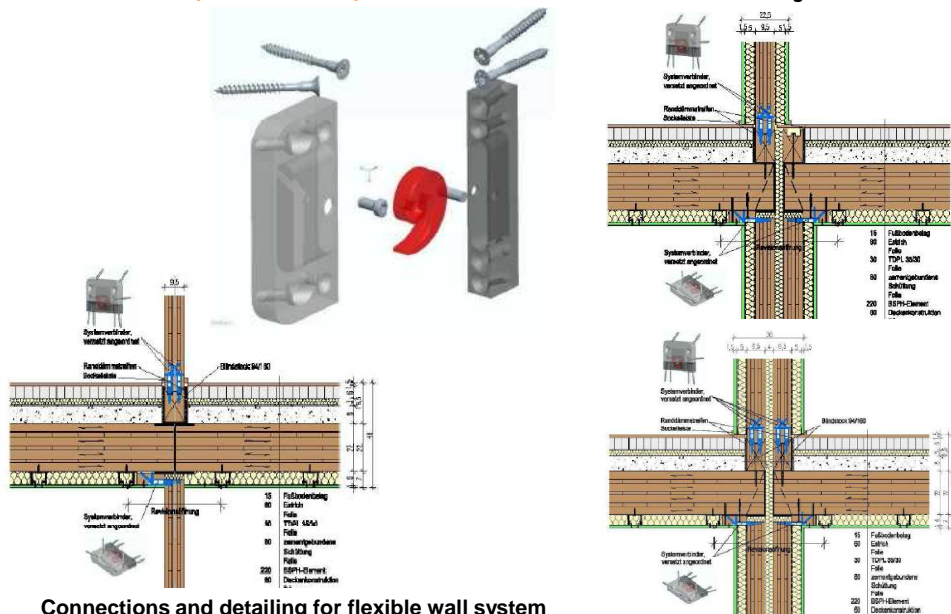
INTegrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future



Flexible wall and ventilation system to relate a room to 2 different apartments

flexible space concept

INTegrated designed high efficient ENERGY- and societal SYStemes for sustainable housing in the future



Connections and detailing for flexible wall system

flexible space concept

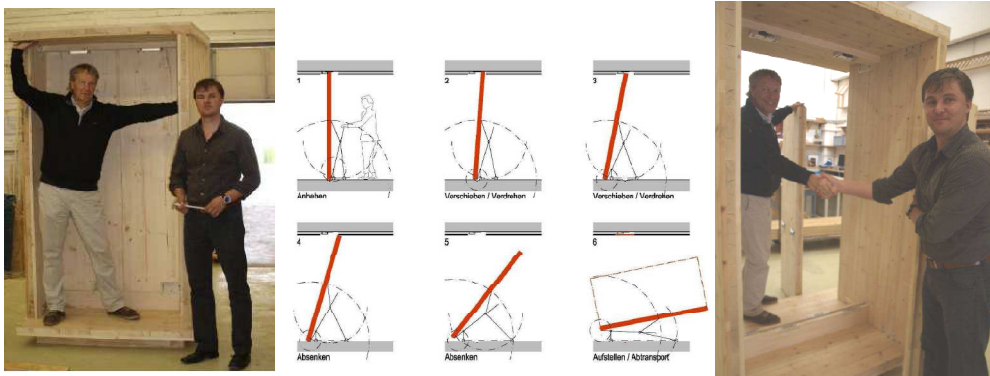
INTegrated designed high efficient ENERGY- and societal
SYSTEMES for sustainable housing in the future



Testing the kinematic feasibility on a 1:1 scale prototype

flexible space concept

INTegrated designed high efficient ENERGY- and societal
SYSTEMES for sustainable housing in the future



Michael and Roland testing the kinematic feasibility on a 1:1 scale prototype

conclusions

INTegrated designed high efficient ENERGY- and societal
SYStemes for sustainable housing in the future

Yes we can:

- reduce carbon emissions by 80 % to fight successfully

