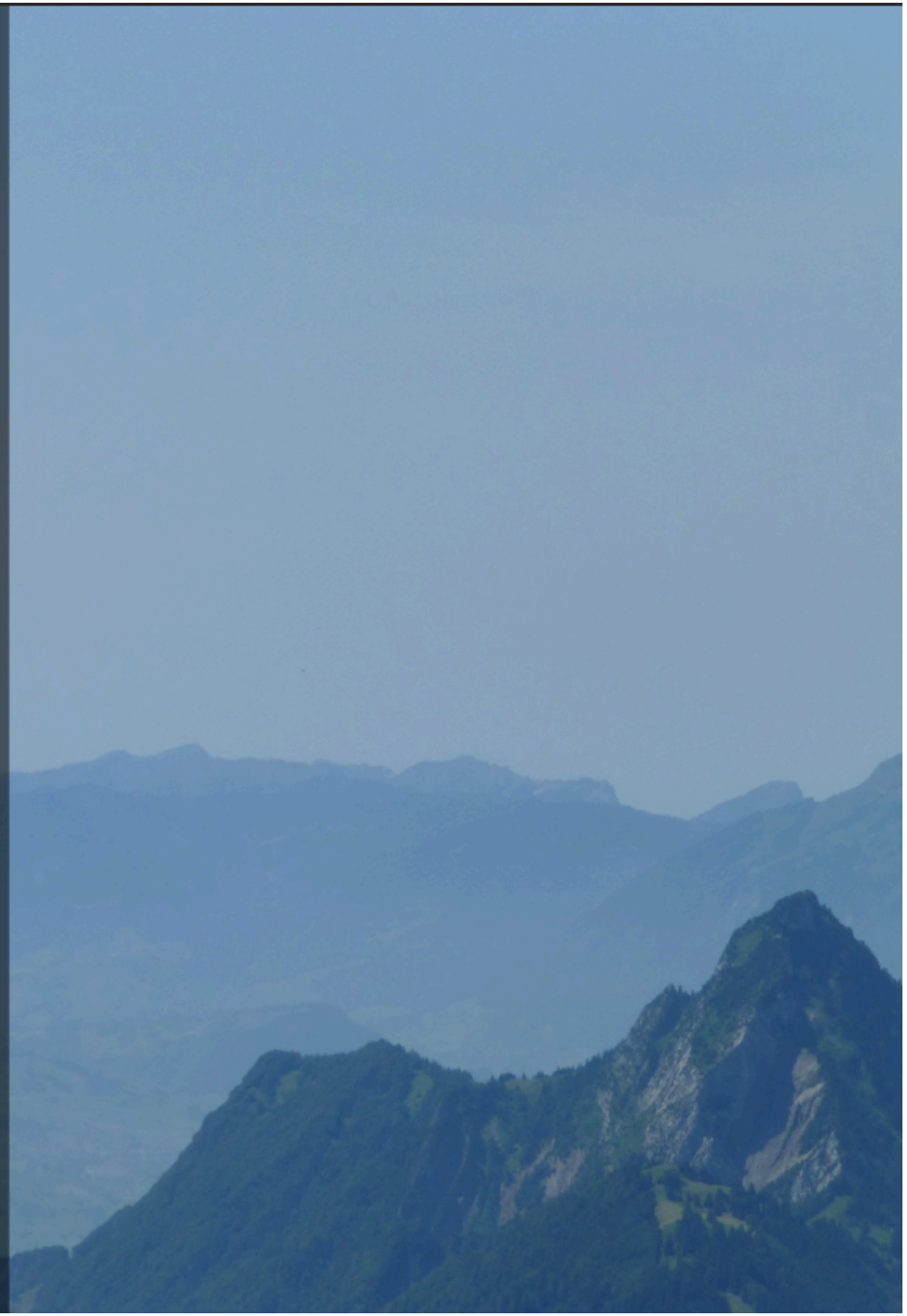
Chapter 10

System: Territory

The territory forms a system of its own. It is composed of urban systems and their hinterlands, which in turn consist of building systems and their infrastructure. The territorial system is made of natural and man-made components. It is an intellectual system that changes its character and boundaries over time. The information territory is the metaphor that connects it information architecture and the information city.



sys·tem (sĭs'təm)

n.

1. A group of interacting, interrelated, or interdependent elements forming a complex whole.
2. A functionally related group of elements, especially:
   a. The human body regarded as a functional physiological unit.
   b. An organism as a whole, especially with regard to its vital processes or functions.
   c. A group of physiologically or anatomically complementary organs or parts: *the nervous system; the skeletal system.*
   d. A group of interacting mechanical or electrical components.
   e. A network of structures and channels, as for communication, travel, or distribution.
   f. A network of related computer software, hardware, and data transmission devices.
3. An organized set of interrelated ideas or principles.
4. A social, economic, or political organizational form.
5. A naturally occurring group of objects or phenomena: *the solar system.*
6. A set of objects or phenomena grouped together for classification or analysis.
7. A condition of harmonious, orderly interaction.
8. An organized and coordinated method; a procedure. See Synonyms at method.
9. The prevailing social order; the establishment. Used with *the*: *You can't beat the system.*

[Late Latin systēma, systēmat-, from Greek sustēma, from sunistanai, *to combine* : sun-, *syn-* + histanai, *set up, establish*; see stā- in Indo-European roots.]

ter·ri·to·ry (tĕr'ĭ-tôr'ē, -tōr'ē)

n. pl. **ter·ri·to·ries**

1. An area of land; a region.

2. The land and waters under the jurisdiction of a government.

3.

a. A political subdivision of a country.

b. A geographic region, such as a colonial possession, that is dependent on an external government: *the territories of the Holy Roman Empire.*

4. often **Territory**

a. A subdivision of the United States that is not a state and is administered by an appointed or elected governor and elected legislature.

b. A similarly organized political subdivision of Canada or Australia.

5. An area for which a person is responsible as a representative or agent: *a salesperson's territory.*

6. *Sports* The area of a field defended by a specified team: *punted the ball deep into the opponent's territory.*

7. *Biology* An area occupied by a single animal, mating pair, or group and often vigorously defended against intruders, especially those of the same species.

8. A sphere of action or interest; a province. See Synonyms at field.

[Middle English, from Latin `territōrium`, from `terra`, *earth*; see `ters-` in Indo-European roots.]

Chapter 10

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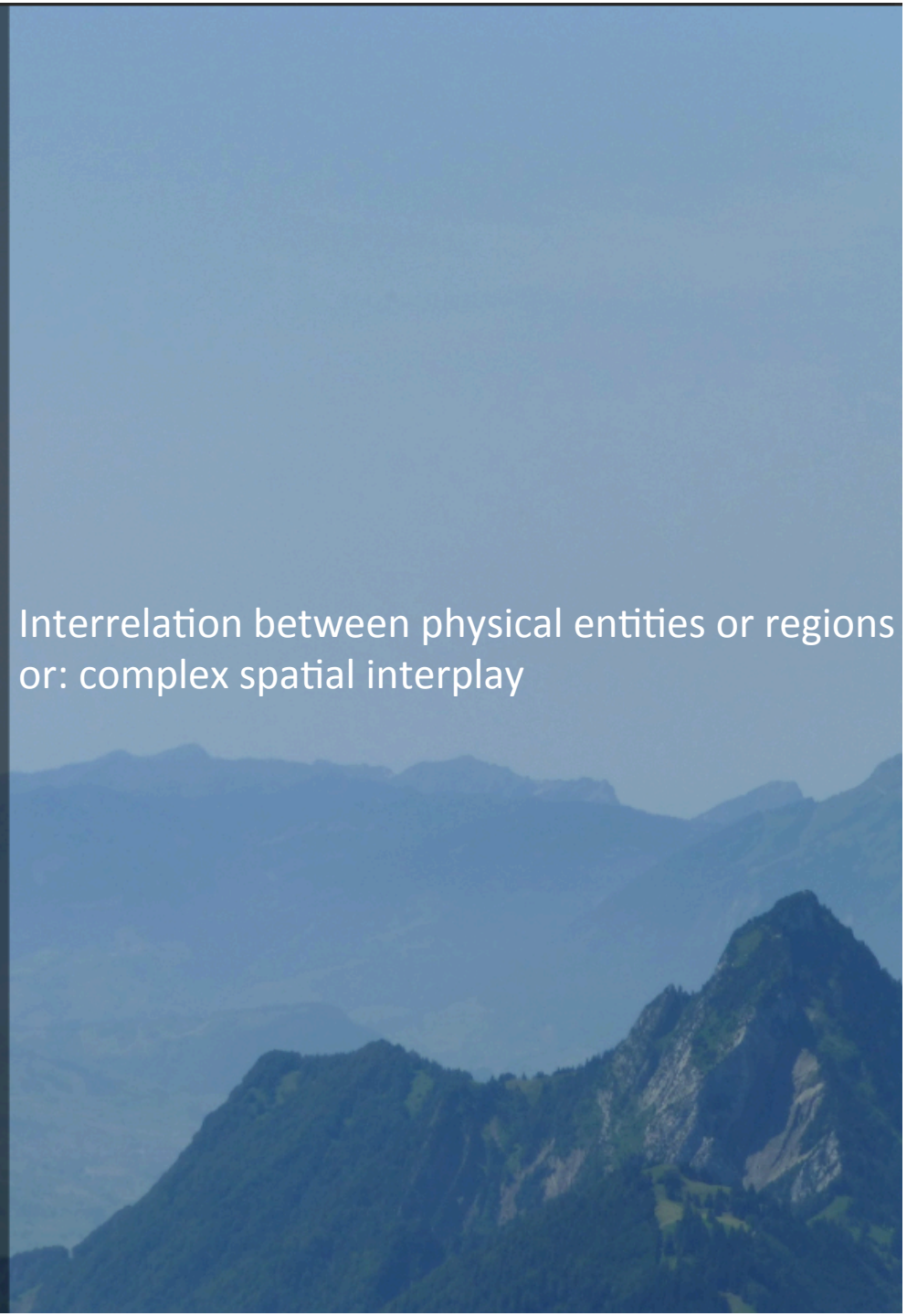
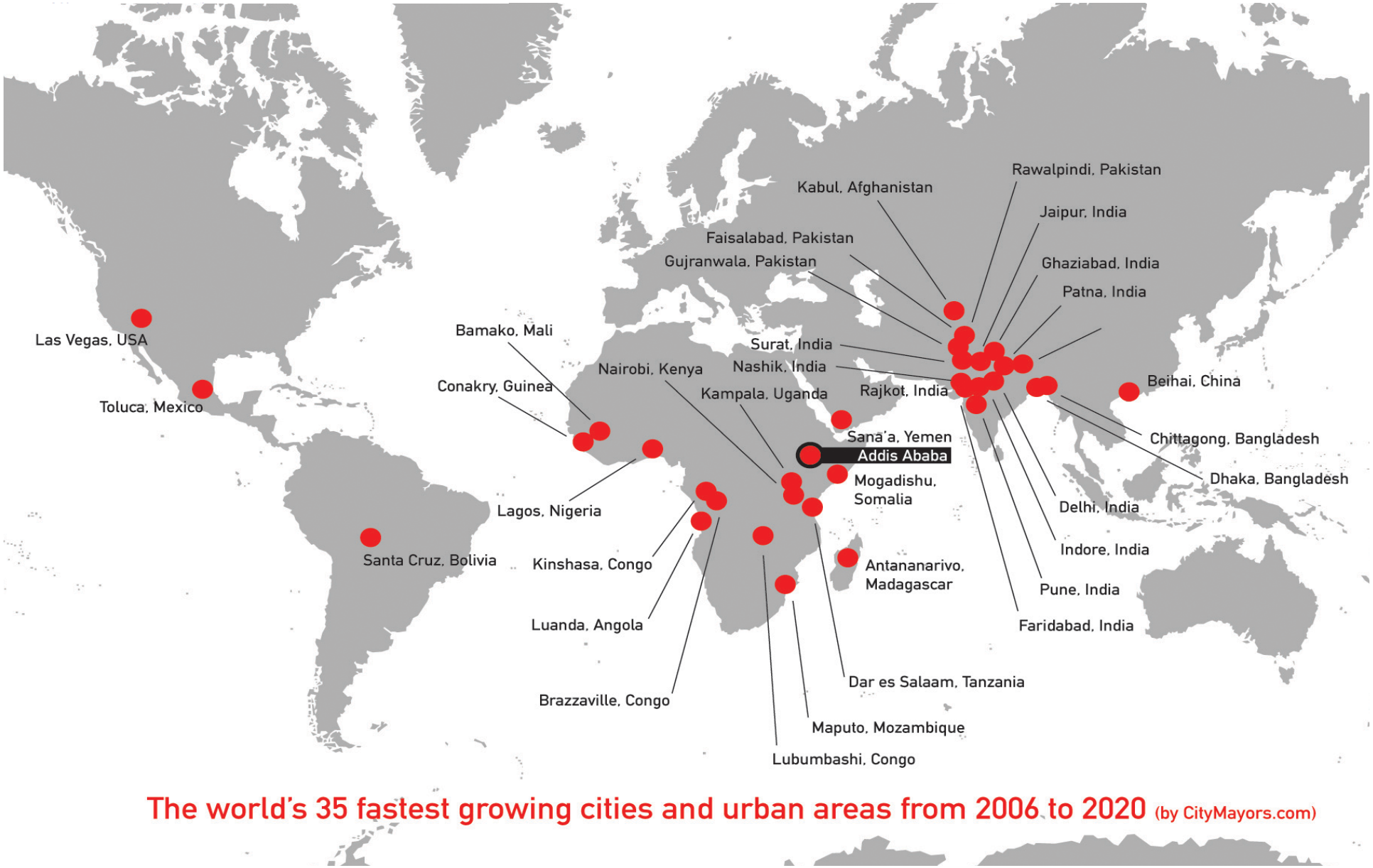
The territory forms a system of its own. It is composed of urban systems and their hinterlands, which in turn consist of building systems and their infrastructure. The territorial system is made of natural and man-made components. It is an intellectual system that changes its character and boundaries over time. The information territory is the metaphor that connects it information architecture and the information city.

Interrelation between physical entities or regions
or: complex spatial interplay

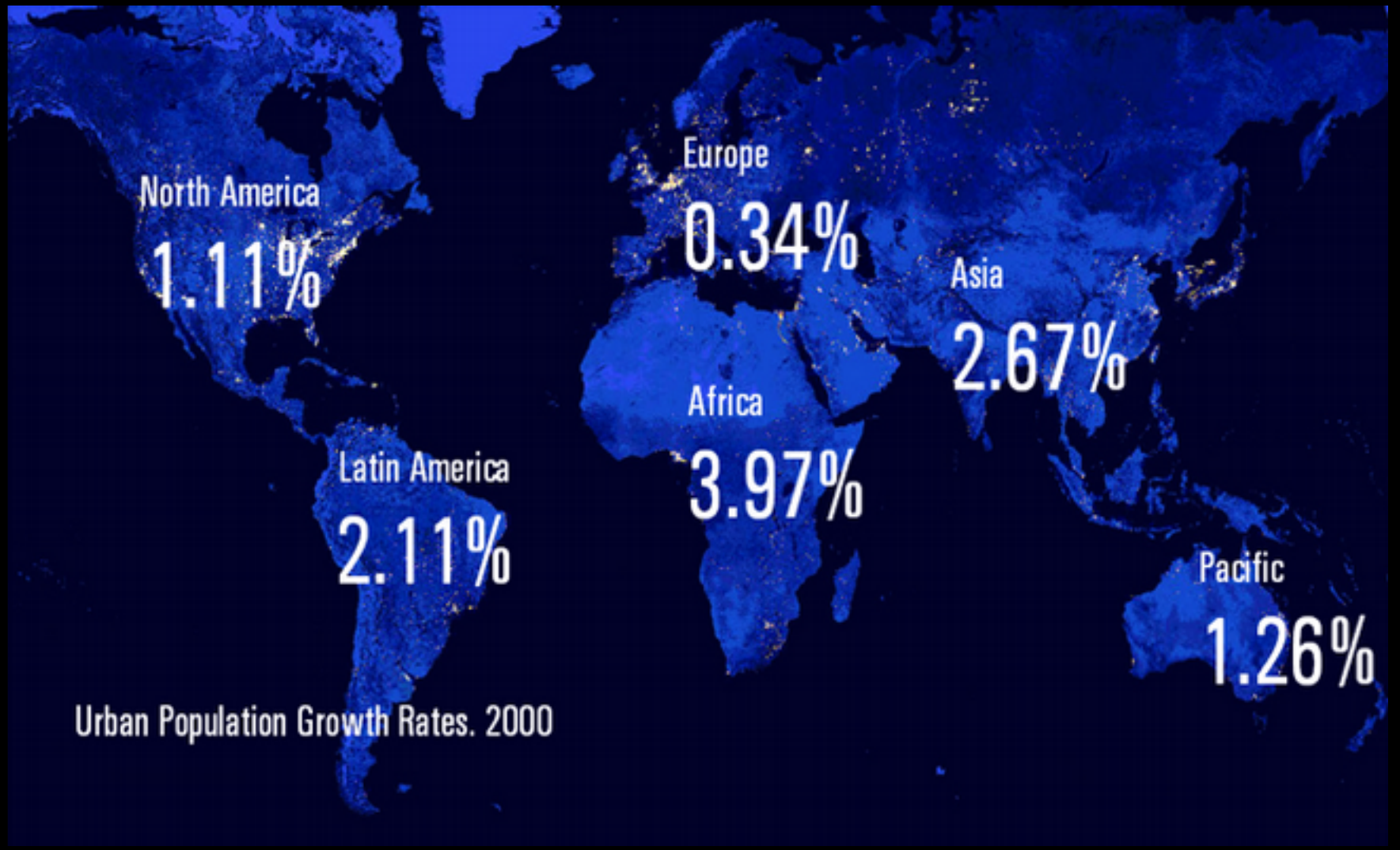


24 October 2007: Africa now has a larger urban population than North America and has 25 of the world's fastest growing large cities. Half of the world's urban population now lives in Asia, which also has half of the world's largest cities and fastest growing large cities. Europe's share of the world's 100 largest cities has fallen from more than half to under ten per cent in the past century. It now has none of the world's 100 fastest growing cities and most of its declining ones.

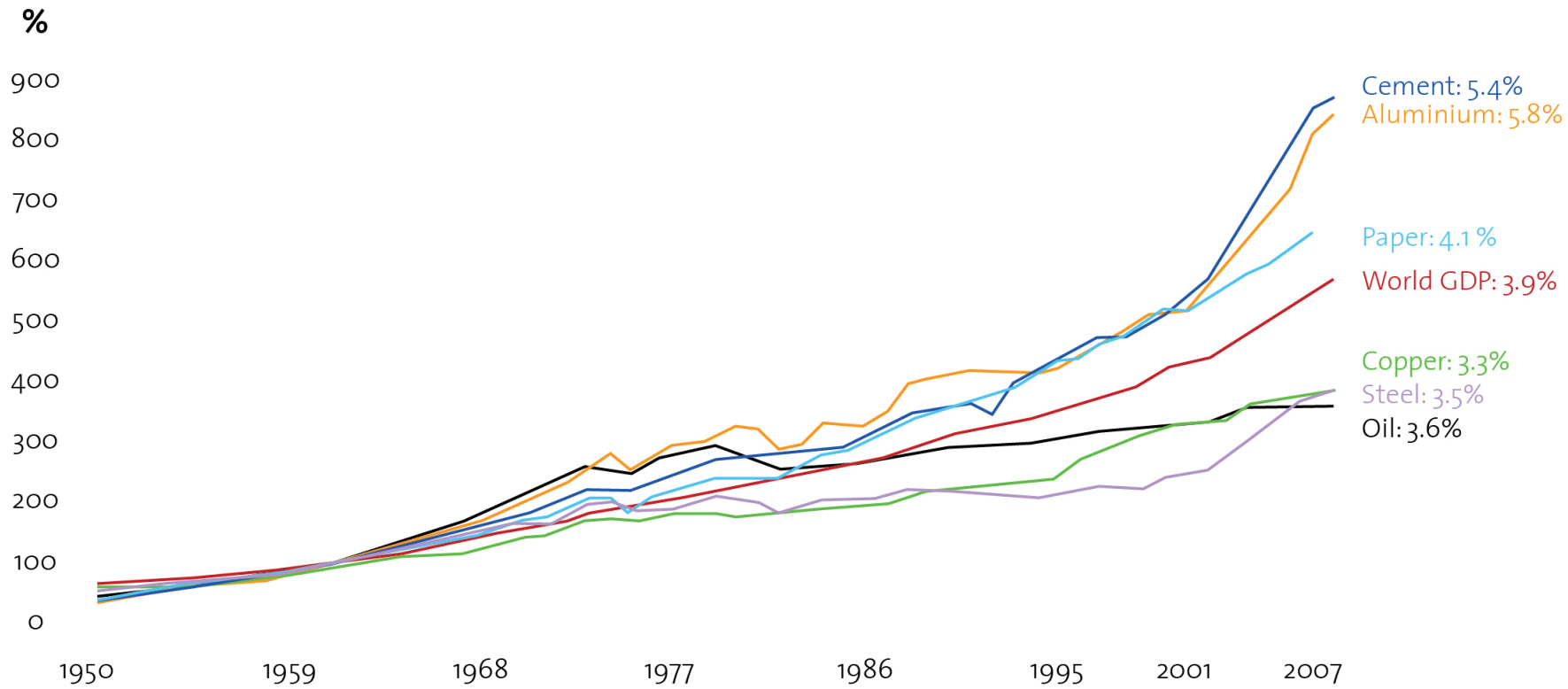


The world's 35 fastest growing cities and urban areas from 2006 to 2020 (by CityMayors.com)

DEVELOPMENT



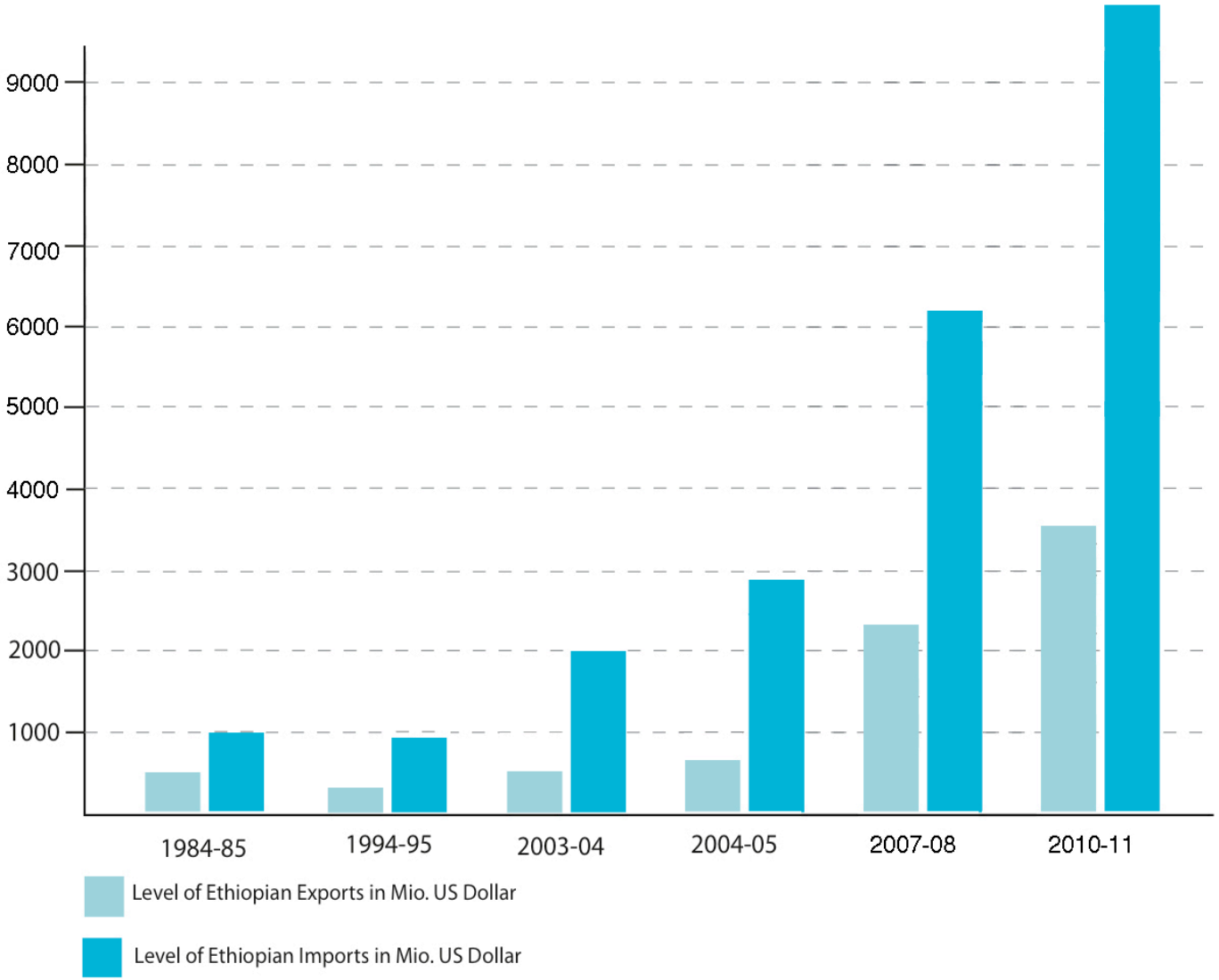

FRIENDSHIP
FRIENDSHIP CITY CENTER
IMNAY'S BRIDAL



Basic Materials Consumption World

Maddison database, BP, US Geological Survey, ICR, Cembureau 2011

Level of Ethiopian Exports and Imports in Mio. US Dollar



CoRe SING

Constructions Research Singapore
Assistant Professorship of Architecture and Construction
Future Cities Laboratory - SEC Singapore ETH Centre

Search

Cities as proto-typologies

July 10, 2012 | Edit

Public lecture by Prof. Dirk E. Hebel at the 2012 Academia Engelberg Congress in Switzerland on September 14, 2012. The 11th Dialogue on Science will focus on the issue of rapid urbanization and its consequences for everyday life in cities around the world. With this congress the Academia Engelberg Foundation asks how might the disciplines of architecture, urbanism and the built environment sciences respond to the challenges of rapid urbanization?

The Chair of Architecture and Construction at the Future Cities Laboratory in Singapore concentrates its research on 'alternative modern' construction materials. The 'alternative' aspect of this focus emerges from an exploration of the possibility of knowledge transfer, which could change the way we think about vernacular or traditional building materials. One material, maybe the most neglected building material in the world so far, has the chance to change our perspective: Bamboo, "the next super-material" as it was called out in a recent BBC documentary. It is growing exactly in those regions around the equator belt, where most developing territories are to be found today. Bamboo is a very fast growing and affordable natural resource, which has outstanding constructive qualities, superior to wood and, looking at tensile capacities, even to steel.

Re-inventing and overcoming its role as a old fashioned vernacular building material of the South, it could start to establish a knowledge transfer from South-to-South or South-to-North and reverse the traditional model. The talk will argue, that through knowledge transfer, there is a chance to combine and therefore revaluate globally applied building materials with local available substances and knowledge from the South. It is proposing the possibility for a 'reverse' or 'alternative modernism', whereby developed countries might start to learn and gain from a knowledge developed in the 'South'.

Constructing Alternatives

July 9, 2012 | Edit

ADDIS 2050 – International Workshop at FCL Singapore

August 3, 2012 | Edit

The Chair of Architecture and Construction Dirk E. Hebel at FCL Singapore together with Heinrich Boell Foundation and the Ethiopian Institute of Architecture, Building Construction and City Development is organizing an international workshop to develope a vision for Addis Ababa in the year 2050. The African population is growing fast and urbanization will shape the coming decades. Existing cities are changing rapidly and new infrastructures and buildings are constructed at an enormous speed, ambitious plans are in place to create dozens of new cities from scratch. Currently, the focus of this development seems to be "catching up" with developed or emerging economies. In many cases, a 'copy/paste' mentality to urban development includes a repetition of the mistakes made elsewhere: expensive imported construction materials such as cement, glass and steel are preferred over locally available and more sustainable solutions, public spaces are diminishing, an increasing separation of working and living quarters enlarges transportation needs and traffic concepts concentrate on cars and individual rather than public transportation.

Building with Earth Workshop

August 1, 2012 | Edit

STRAW

Straw belongs to the family of grasses. Grasses are plants, which typically have one seed leaf and continue to grow with narrow leaves from their base. The family includes “true grasses”, sedges and rushes. The Chair of Architecture and Construction at FCL is mostly interested in true grasses such as bamboo and cerials, since their characteristics show a high potential for taking tensile stress.

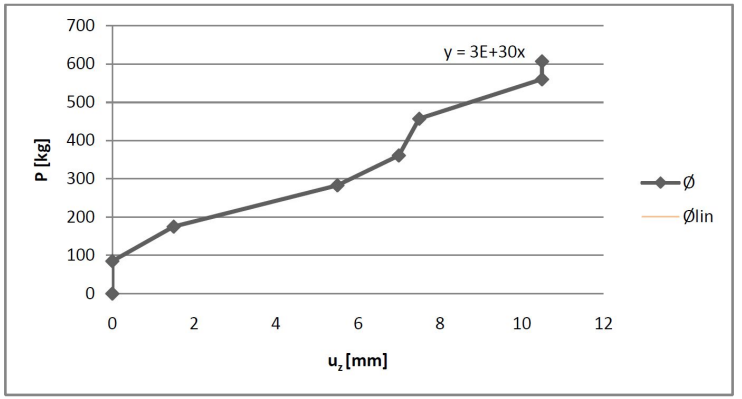

TESCON Vana
pro clima


ARB
Photograph: Dirk Donath

OBJECT: SLAB TYPE A
MEASURING POINT: **Shorter**

load width 0,8 [m] m 55,9

load ramp	P				z		Δu_z			Ø_lin	E_ref,req
	left	right	total		P1	P2	P1	P2	Ø		
	[kg]	[kg]	[kg]	[kN/m]	[cm]	[cm]	[cm]	[cm]	[mm]	[mm]	[kN/cm²]
0	0 0	0 0	0	0,00	28,3	48,7	0	0	0	0,0	
1	18 25	18 24	85	1,06	28,3	48,7	0	0	0	1,5	5,2
2	23 26	16 25	175	2,19	28,2	48,5	0,1	0,2	1,5	3,1	5,2
3	30 28	23 27	283	3,54	27,8	48,1	0,5	0,6	5,5	5,1	5,1
4	23 16	22 17	361	4,51	27,6	48	0,7	0,7	7	6,5	5,1
5	23 21	22 30	457	5,71	27,6	47,9	0,7	0,8	7,5	8,2	5,1
6	22 33	21 27	560	7,00	27,3	47,6	1	1,1	10,5	10,0	5,2
7	24 0	23 0	607	7,59	27,3	47,6	1	1,1	10,5	10,9	5,1
									Ø		5,1



Sections, individual

Deck top (1)

Material	[/]	SB 90,c
fibers perpendicular to span, c		
ρ_1	[kg/m³]	379
E_1	[kN/cm²]	2,27
μ_1	[/]	1,000
$\gamma_{M,tot}$	[/]	1,00
$f_{d,1}$	[kN/cm²]	0,11
b_1	[cm]	60
t_1	[cm]	6
A_1	[cm²]	360
$I_{y,1}$	[cm⁴]	1080
$z_{s,1}$	[cm]	3
g_1	[kN/m]	0,136
$A_{1,i}$	[cm²]	360
$I_{y,1,i}$	[cm⁴]	1080
$A_{1,i}(z_{s,1}-z_{s,i})^2$	[cm⁴]	116640

Web A (2)

Material	[/]	SB 90,m
fibers perpendicular to span, m		
ρ_2	[kg/m³]	379
E_2	[kN/cm²]	12,5
μ_2	[/]	5,507
$\gamma_{M,tot}$	[/]	1,00
$f_{d,2}$	[kN/cm²]	0,05
n_2	[/]	2
h_2	[cm]	30
t_2	[cm]	6
A_2	[cm²]	360
$I_{y,2}$	[cm⁴]	27000
$z_{s,2}$	[cm]	21
g_2	[kN/m]	0,136
$A_{2,i}$	[cm²]	1982
$I_{y,2,i}$	[cm⁴]	148678
$A_{2,i}(z_{s,2}-z_{s,i})^2$	[cm⁴]	0

Web B (3)

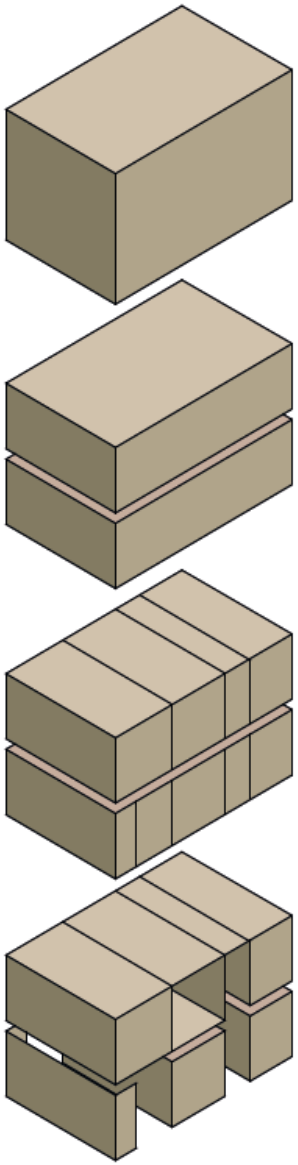
Material	[/]	SB 90,m
fibers perpendicular to span, m		
ρ_3	[kg/m³]	379
E_3	[kN/cm²]	12,5
μ_3	[/]	5,507
$\gamma_{M,tot}$	[/]	1,00
$f_{d,3}$	[kN/cm²]	0,05
n_3	[/]	0
h_3	[cm]	30
t_3	[cm]	1,2
A_3	[cm²]	0
$I_{y,3}$	[cm⁴]	0
$z_{s,3}$	[cm]	21
g_3	[kN/m]	0,000
$A_{3,i}$	[cm²]	0
$I_{y,3,i}$	[cm⁴]	0
$A_{3,i}(z_{s,3}-z_{s,i})^2$	[cm⁴]	0

Deck bottom (4)

Material	[/]	SB 90,t
fibers perpendicular to span, t		
ρ_4	[kg/m³]	379
E_4	[kN/cm²]	2,27
μ_4	[/]	1,000
$\gamma_{M,tot}$	[/]	1,00
$f_{d,4}$	[kN/cm²]	0,11
b_4	[cm]	60
t_4	[cm]	6
A_4	[cm²]	360
$I_{y,4}$	[cm⁴]	1080
$z_{s,4}$	[cm]	39
g_4	[kN/m]	0,136
$A_{4,i}$	[cm²]	360
$I_{y,4,i}$	[cm⁴]	1080
$A_{4,i}(z_{s,4}-z_{s,i})^2$	[cm⁴]	116640

Section, combined

E_{ref}	[kN/cm²]	2,27
h_{tot}	[cm]	42
A_i	[cm²]	2702
$A_{i,w}$	[cm²]	1982
$z_{s,i}$	[cm]	21,00
$I_{y,i}$	[cm⁴]	384118
$z_{1,top}$	[cm]	-21,0
$z_{1,bottom}$	[cm]	-15,0
$z_{2,top}$	[cm]	-15,0
$z_{2,bottom}$	[cm]	15,0
$z_{3,top}$	[cm]	0,0
$z_{3,bottom}$	[cm]	0,0
$z_{4,top}$	[cm]	15,0
$z_{4,bottom}$	[cm]	21,0
g_{tot}	[kN/m]	0,409



A BLOCK

A SUSTAINABLE EMERGING CITY UNIT IS TO BE CONSTRUCTED WITH A FOOTPRINT OF 8.69*6m² RELATIVELY BASIC GEOMETERY.

TWO FLOORS

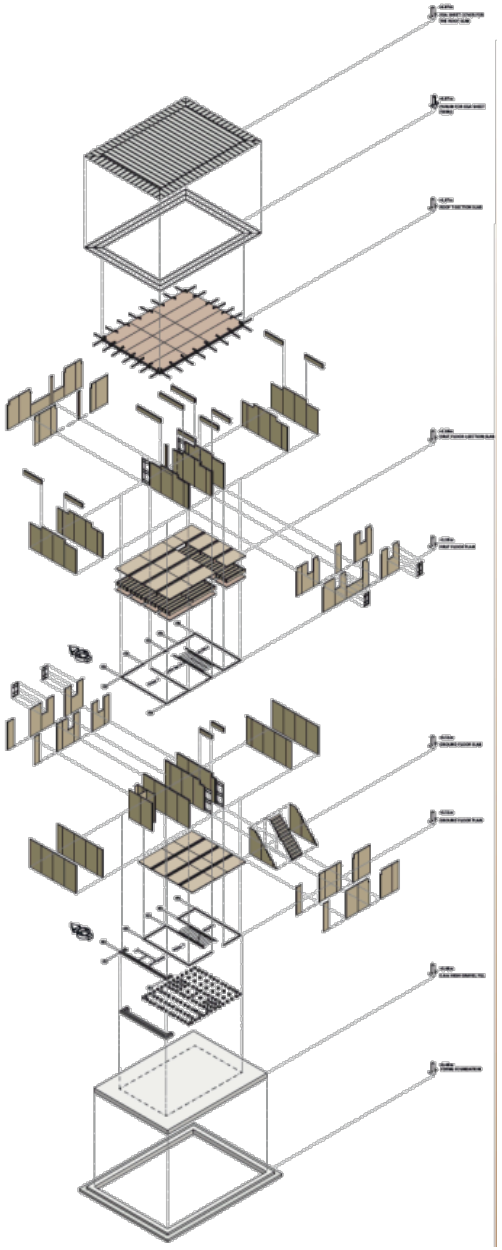
LINEAR AND VERTICAL ALIGNMENT OF THE 8.69*6*2.5m³ VOLUMES EACH

MODULAR DIVISION OF THE BLOCK

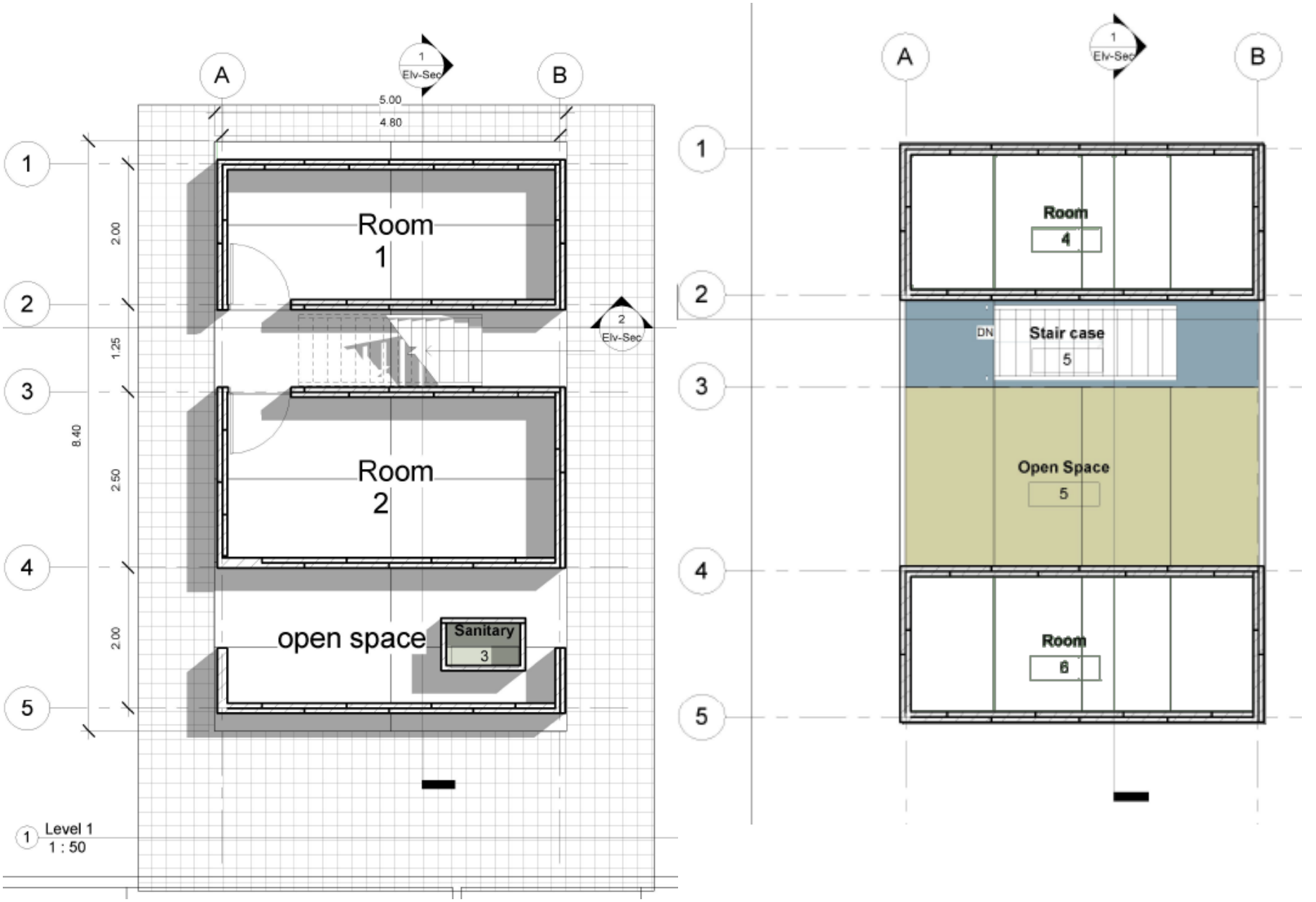
MODULAR DIVISION OF THE VOLUME BASED ON THE SIZE OF THE STRAW BOARD i.e. 1.2*2.5m² WITH A THICKNESS OF 0.06m.

SPACES WITH MODULAR SIZE

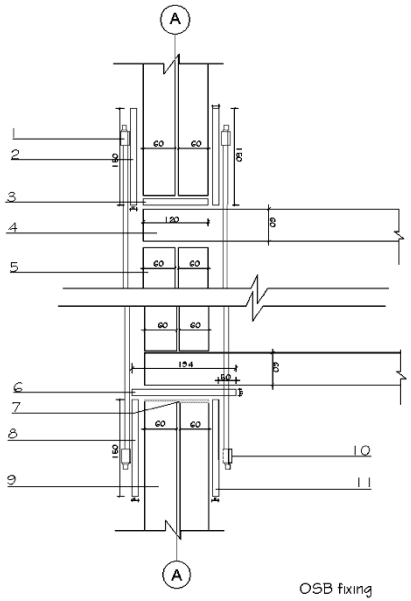
MANIPULATION OF SPACES INCLUDING THE CIRCULATION SPACE, THE FOUR ROOMS AND THE OPEN SPACES BASED ON THE SIZE OF THE STRAWBOARD AND ERGONOMICS.



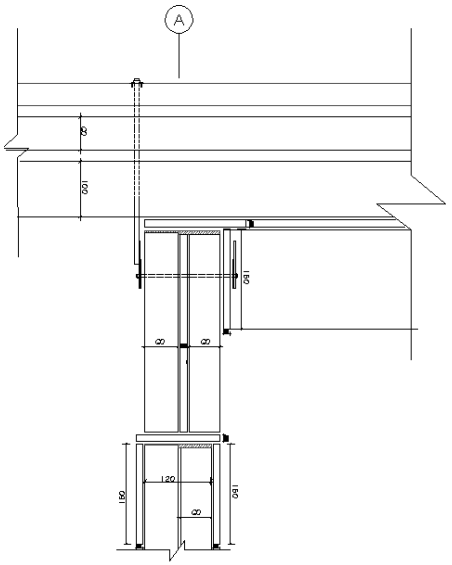
Drawings and Design: Dirk Donath

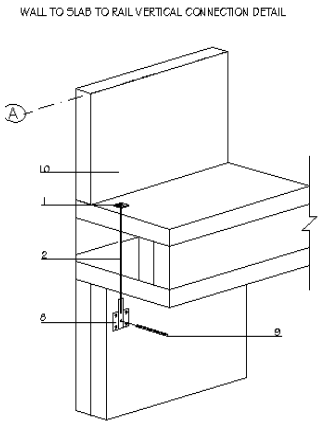


Drawings and Design: Dirk Donath

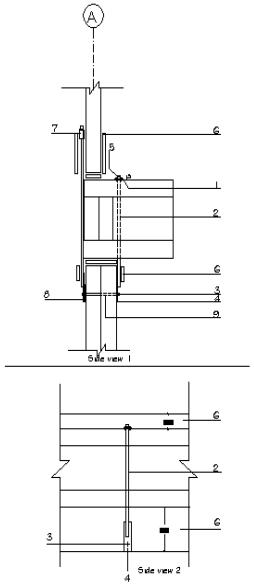


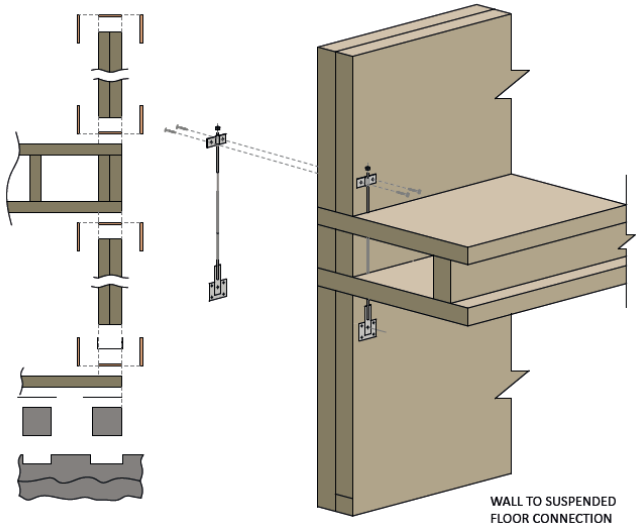
OSB fixing



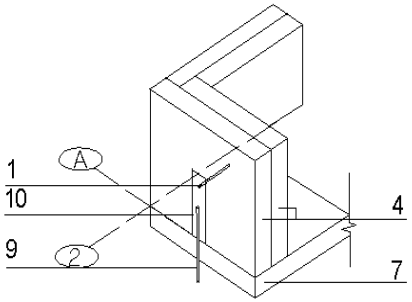


WALL TO SLAB TO RAIL VERTICAL CONNECTION DETAIL

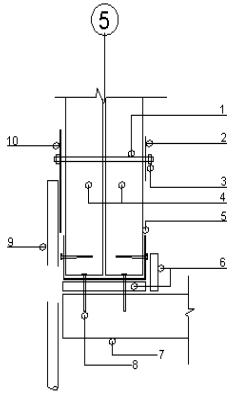




WALL TO SUSPENDED
FLOOR CONNECTION



Foundation to wall



Section

Drawings and Design: Dirk Donath

Photograph: Dirk Donath

Photograph: Dirk Donath

SOIL

Soil is a natural body consisting of layers (soil horizons) of primarily mineral constituents of variable thicknesses, which differ from the parent materials in their texture, structure, consistence, color, chemical, biological and other physical characteristics.

GLOBAL DISTRIBUTION OF EARTHEN MASONRY CONSTRUCTION:

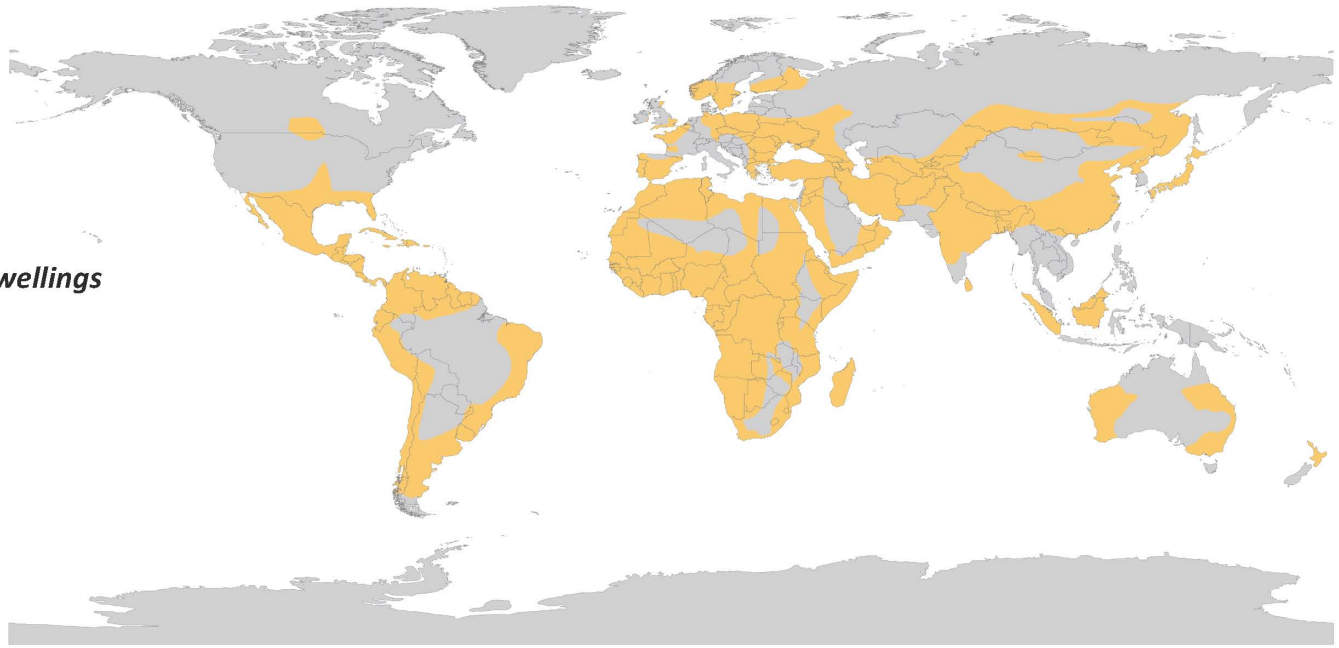
40%

World Population

Lives in Earthen Dwellings

(UNCHS)

Area of earthen construction



Drawing After: Gandreau and Delboy, 2010

SOIL AS A BUILDING MATERIAL

- Almost all soils can be adapted for construction
- Locally available & abundant
- Inexpensive
- Low Carbon footprint
- Reduces use of imported materials
- Invests capital in local production & labor economies

Image Credit: Lara Davis

SOIL AS A RAW MATERIAL: GLOBAL DISTRIBUTION

FAO-UNESCO Digital Soil Map

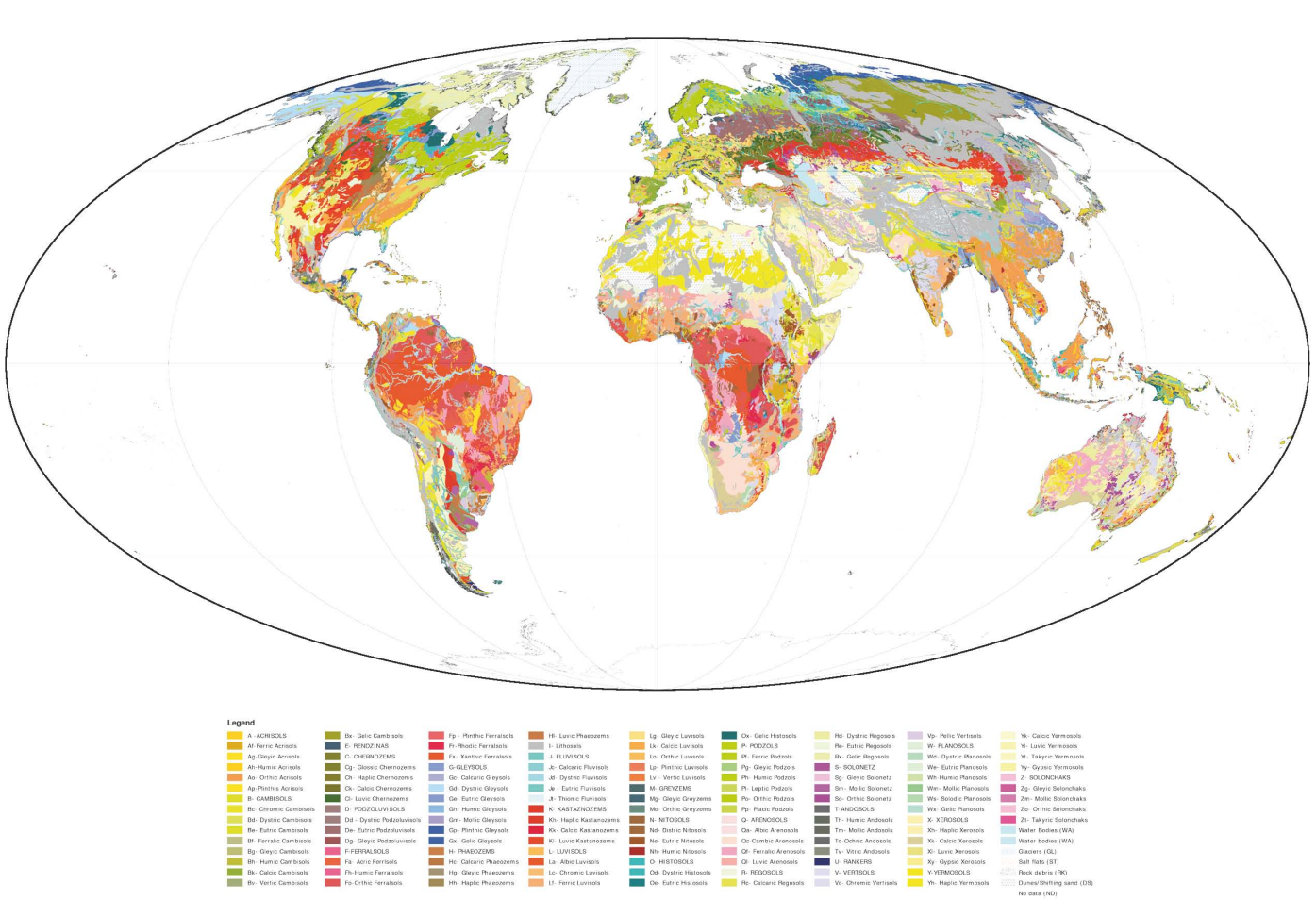


Image Credit: Lara Davis

SOIL DIVERSITY – VARIATION FOUND WITHIN A 10 KM RADIUS
Gubrie, Ethiopia

GRAVELY SOILS

Selected soils

SANDY SOILS

CLAYEY SOILS

Black cotton soils

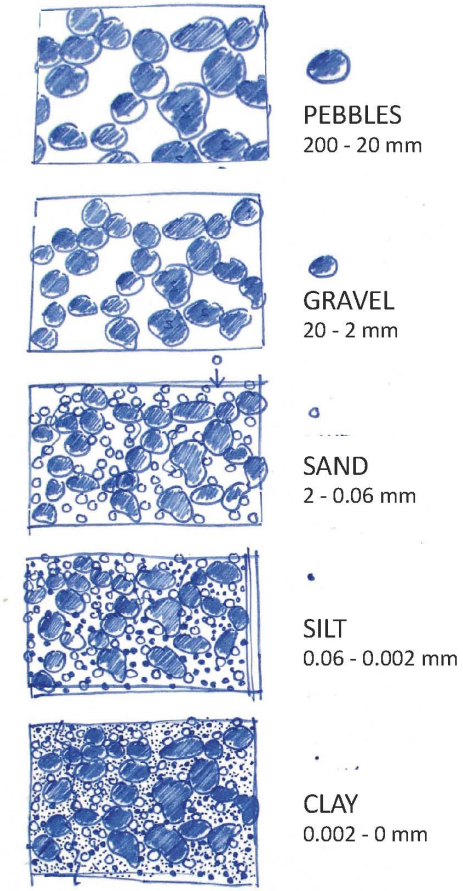
Undetermined soils

Red soils

Organic soils

Image Credit: Lara Davis

SOIL COMPONENTS & PROPERTIES



Drawing: B.Staehli
Classified according to grain sizes (ISO 14688).

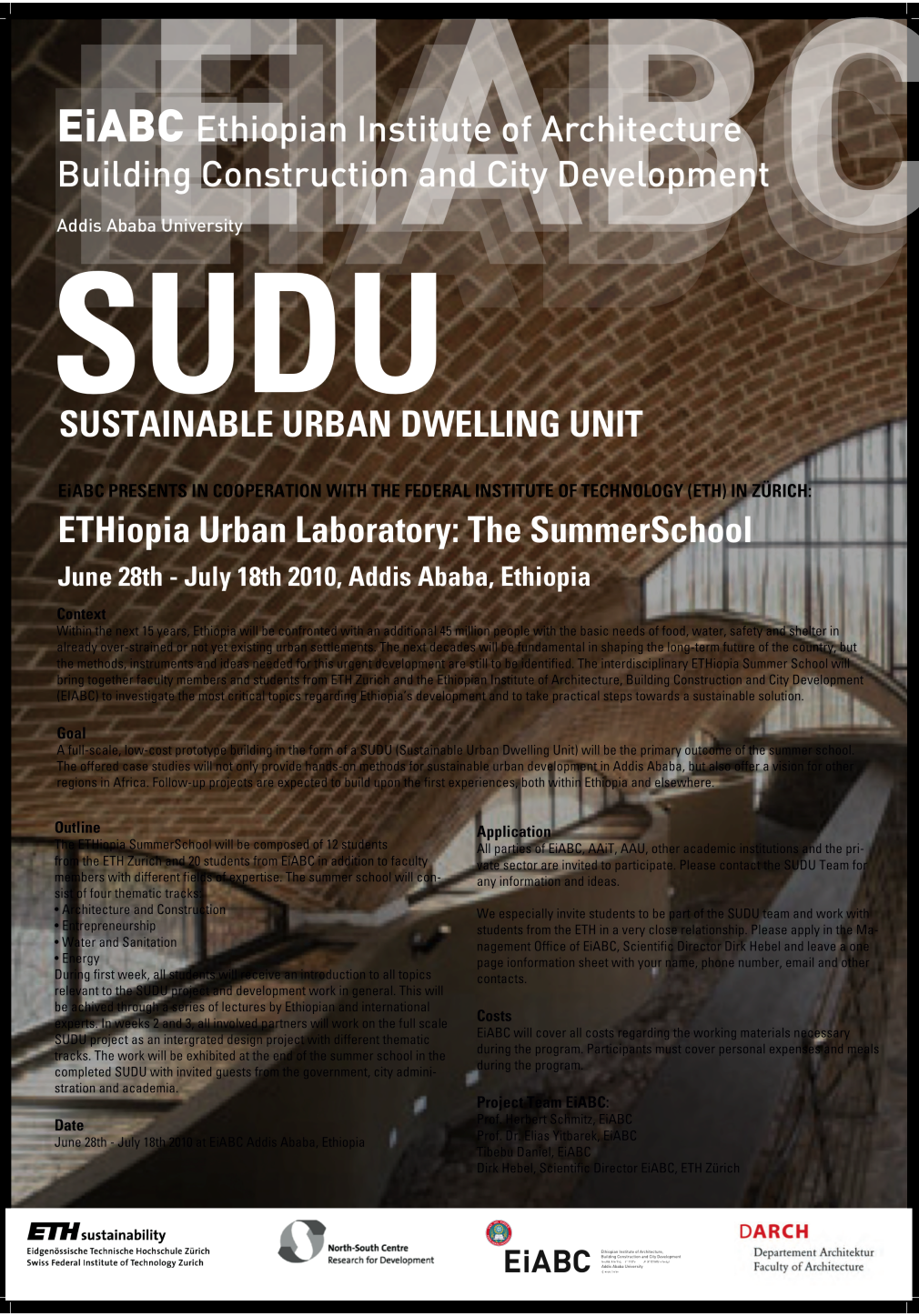
PROPERTIES:

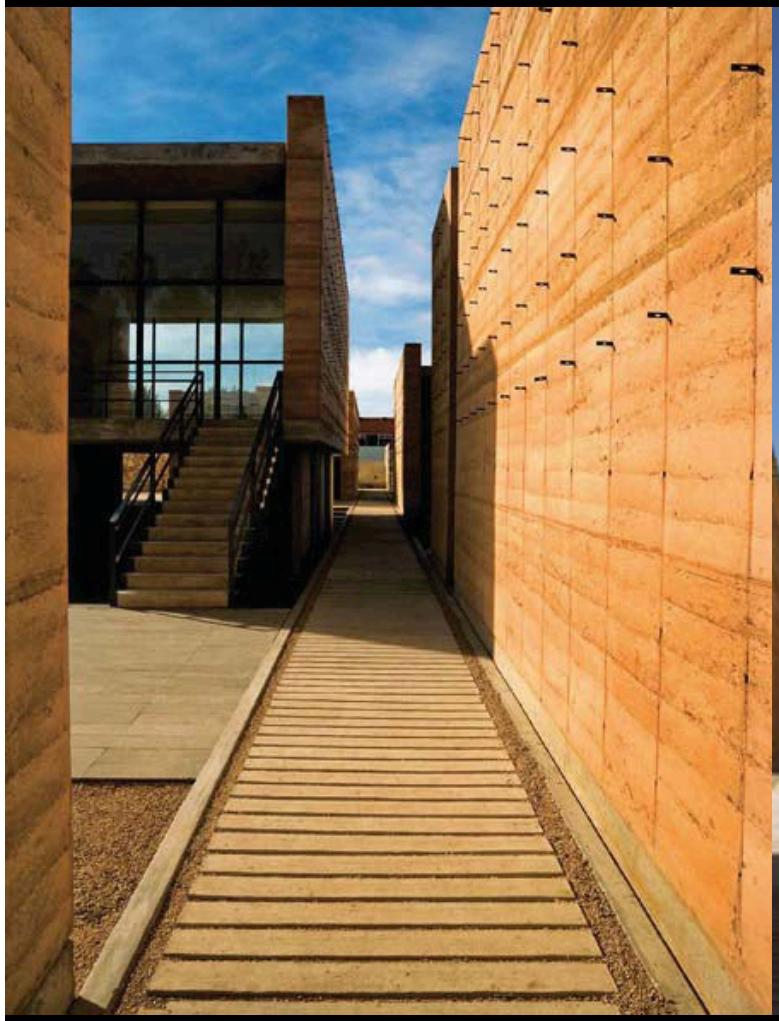
- Gradation (Grain size distribution by weight)
- Compressibility (Energy of compaction/ Optimal moisture content)
- Plasticity (Shrinking/ swelling behavior of silts and clays)
- Cohesion (Capillarity/ Cation exchange)

Image Credit: Lara Davis

STABILIZED SOIL AS A BUILDING MATERIAL (CSEB)

Image Credit: AVEI


EiABC
EiABC Ethiopian Institute of Architecture
Building Construction and City Development
Addis Ababa University
SUDU
SUSTAINABLE URBAN DWELLING UNIT
EiABC PRESENTS IN COOPERATION WITH THE FEDERAL INSTITUTE OF TECHNOLOGY (ETH) IN ZÜRICH:
ETHiopia Urban Laboratory: The SummerSchool
June 28th - July 18th 2010, Addis Ababa, Ethiopia
Context
Within the next 15 years, Ethiopia will be confronted with an additional 45 million people with the basic needs of food, water, safety and shelter in already over-strained or not yet existing urban settlements. The next decades will be fundamental in shaping the long-term future of the country, but the methods, instruments and ideas needed for this urgent development are still to be identified. The interdisciplinary ETHiopia Summer School will bring together faculty members and students from ETH Zürich and the Ethiopian Institute of Architecture, Building Construction and City Development (EiABC) to investigate the most critical topics regarding Ethiopia's development and to take practical steps towards a sustainable solution.
Goal
A full-scale, low-cost prototype building in the form of a SUDU (Sustainable Urban Dwelling Unit) will be the primary outcome of the summer school. The offered case studies will not only provide hands-on methods for sustainable urban development in Addis Ababa, but also offer a vision for other regions in Africa. Follow-up projects are expected to build upon the first experiences, both within Ethiopia and elsewhere.
Outline
The ETHiopia SummerSchool will be composed of 12 students from the ETH Zürich and 20 students from EiABC in addition to faculty members with different fields of expertise. The summer school will consist of four thematic tracks:
• Architecture and Construction
• Entrepreneurship
• Water and Sanitation
• Energy
During first week, all students will receive an introduction to all topics relevant to the SUDU project and development work in general. This will be achived through a series of lectures by Ethiopian and international experts. In weeks 2 and 3, all involved partners will work on the full scale SUDU project as an intergrated design project with different thematic tracks. The work will be exhibited at the end of the summer school in the completed SUDU with invited guests from the government, city administration and academia.
Date
June 28th - July 18th 2010 at EiABC Addis Ababa, Ethiopia
Application
All parties of EiABC, AAiT, AAU, other academic institutions and the private sector are invited to participate. Please contact the SUDU Team for any information and ideas.
We especially invite students to be part of the SUDU team and work with students from the ETH in a very close relationship. Please apply in the Management Office of EiABC, Scientific Director Dirk Hebel and leave a one page ionformation sheet with your name, phone number, email and other contacts.
Costs
EiABC will cover all costs regarding the working materials necessary during the program. Participants must cover personal expenses and meals during the program.
Project Team EiABC:
Prof. Herbert Schmitz, EiABC
Prof. Dr. Elias Yitbarek, EiABC
Tibebu Daniel, EiABC
Dirk Hebel, Scientific Director EiABC, ETH Zürich
ETH sustainability
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich
North-South Centre
Research for Development
EiABC
DARCH
Departement Architektur
Faculty of Architecture



UNDERSTANDING THE PAST / DESIGNING THE FUTURE

NEW SUSTAINABLE, LOW-COST BUILDING SOLUTIONS

PHILIPPE BLOCK, PhD

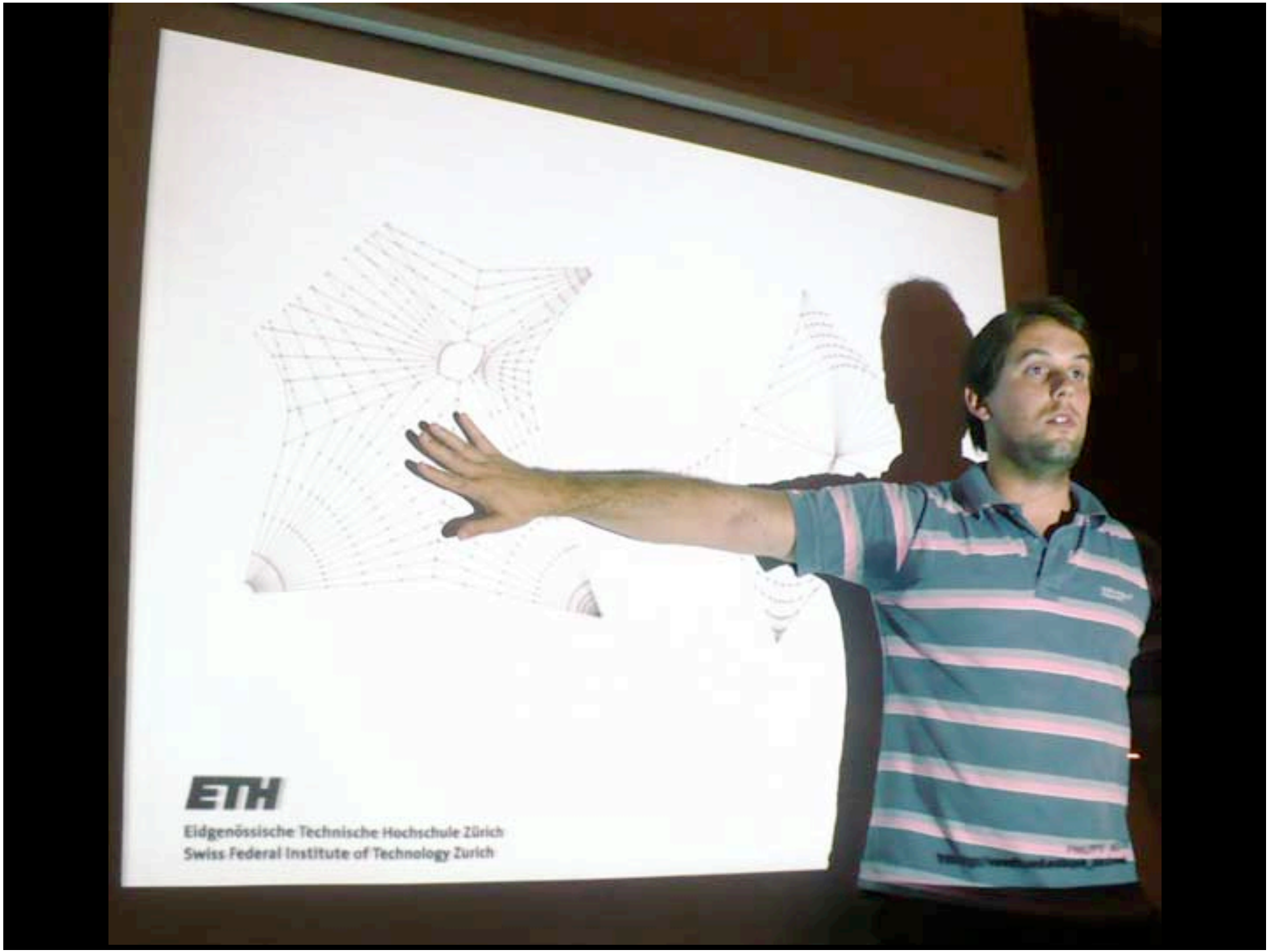
ASSSISTANT PROFESSOR IN BUILDING STRUCTURE

INSTITUTE OF TECHNOLOGY IN ARCHITECTURE

DARCH

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich


ETH
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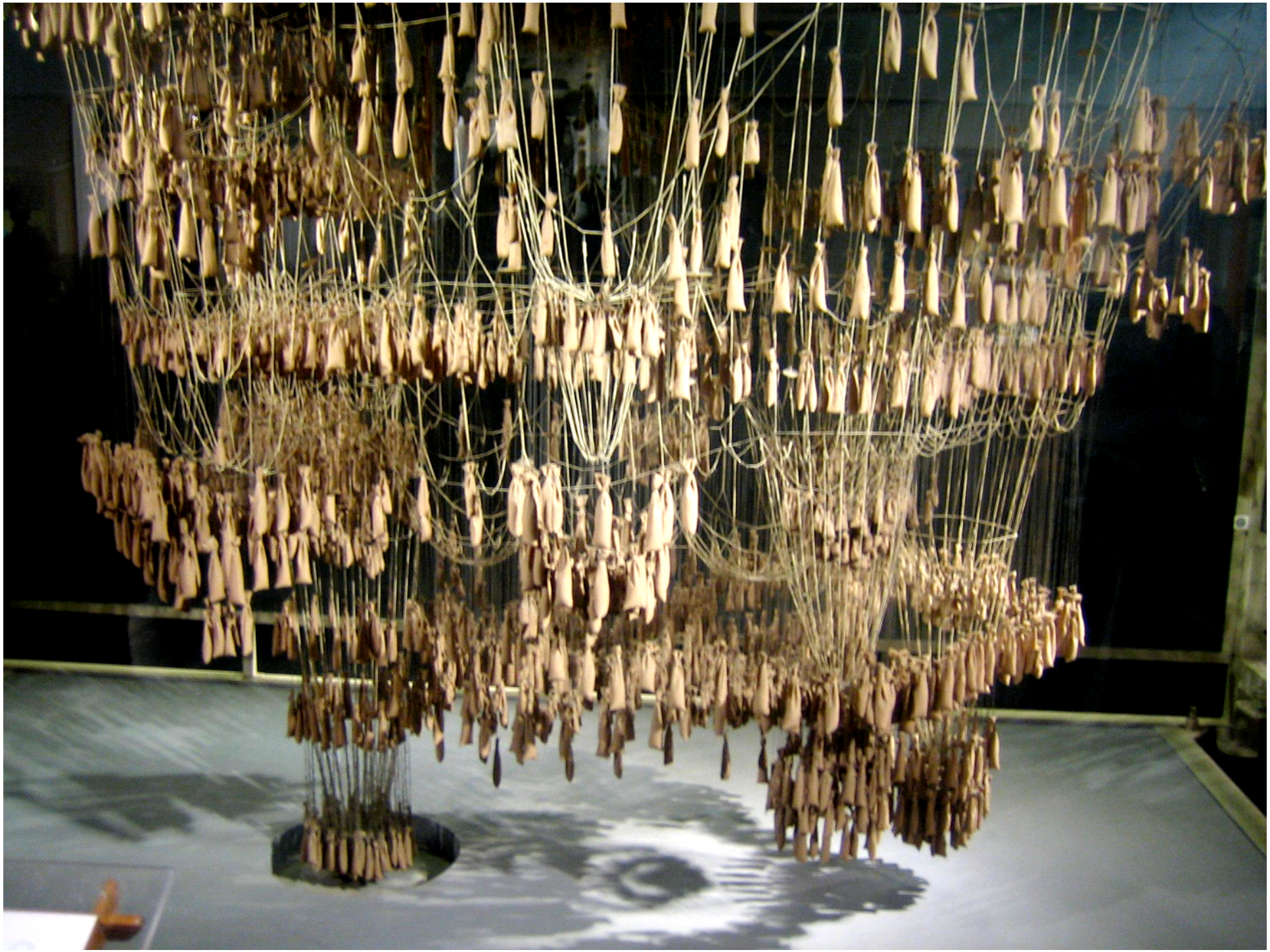
Swiss Federal Institute of Technology Zurich

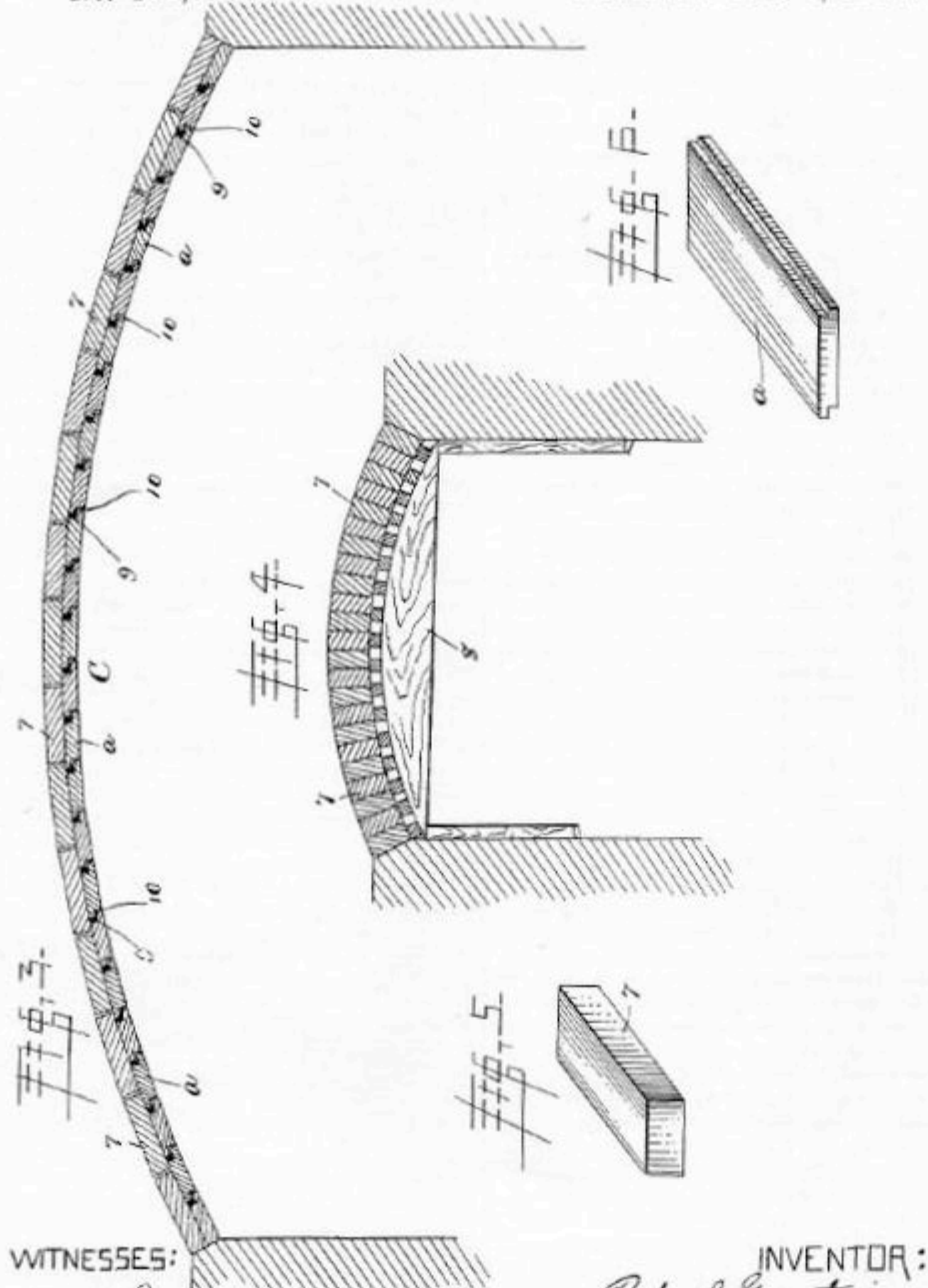


(No Model.) 2 Sheets—Sheet 2.

R. GUASTAVINO.

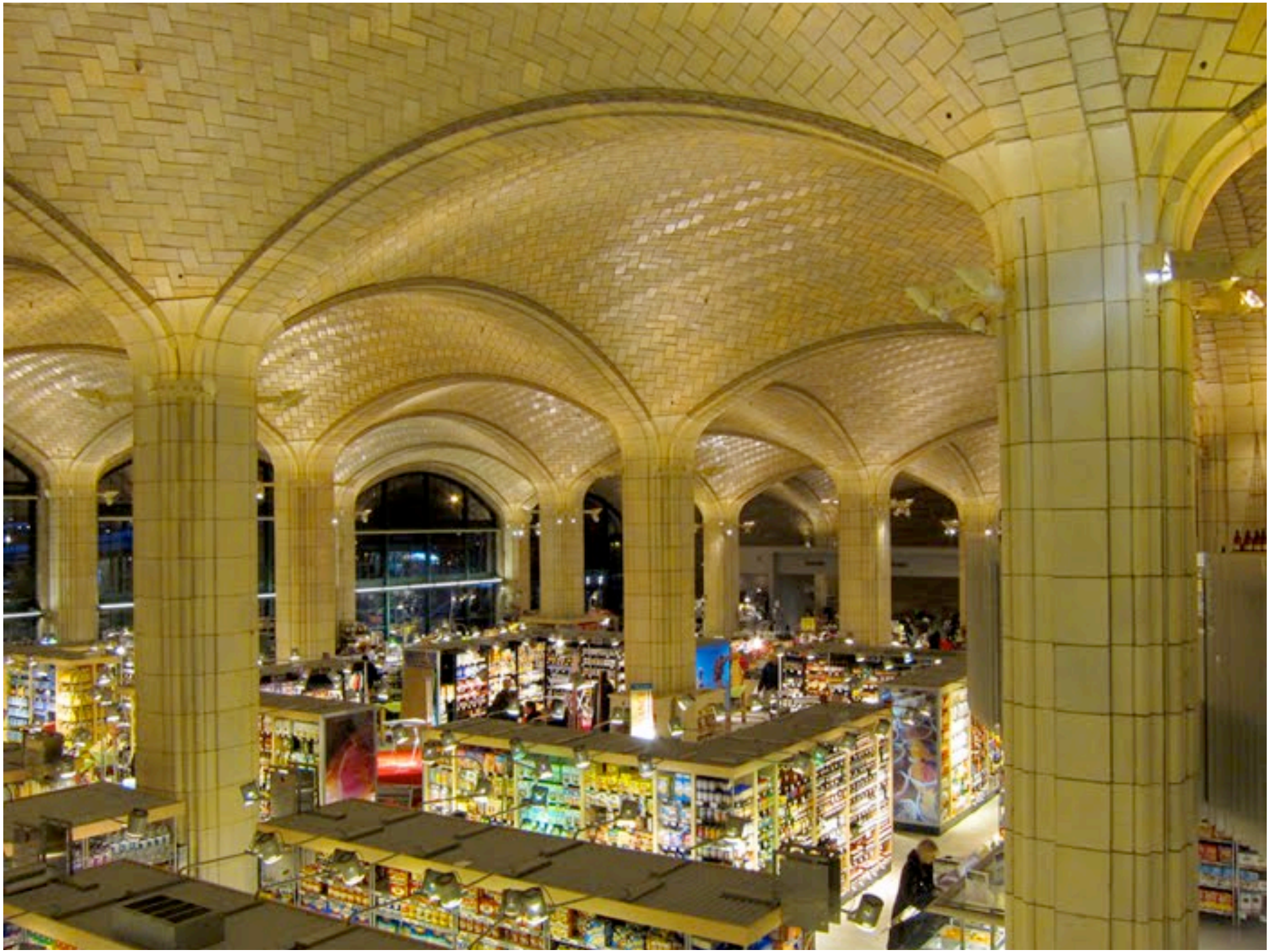
CONSTRUCTION OF BUILDINGS.

No. 464,562. Patented Dec. 8, 1891.



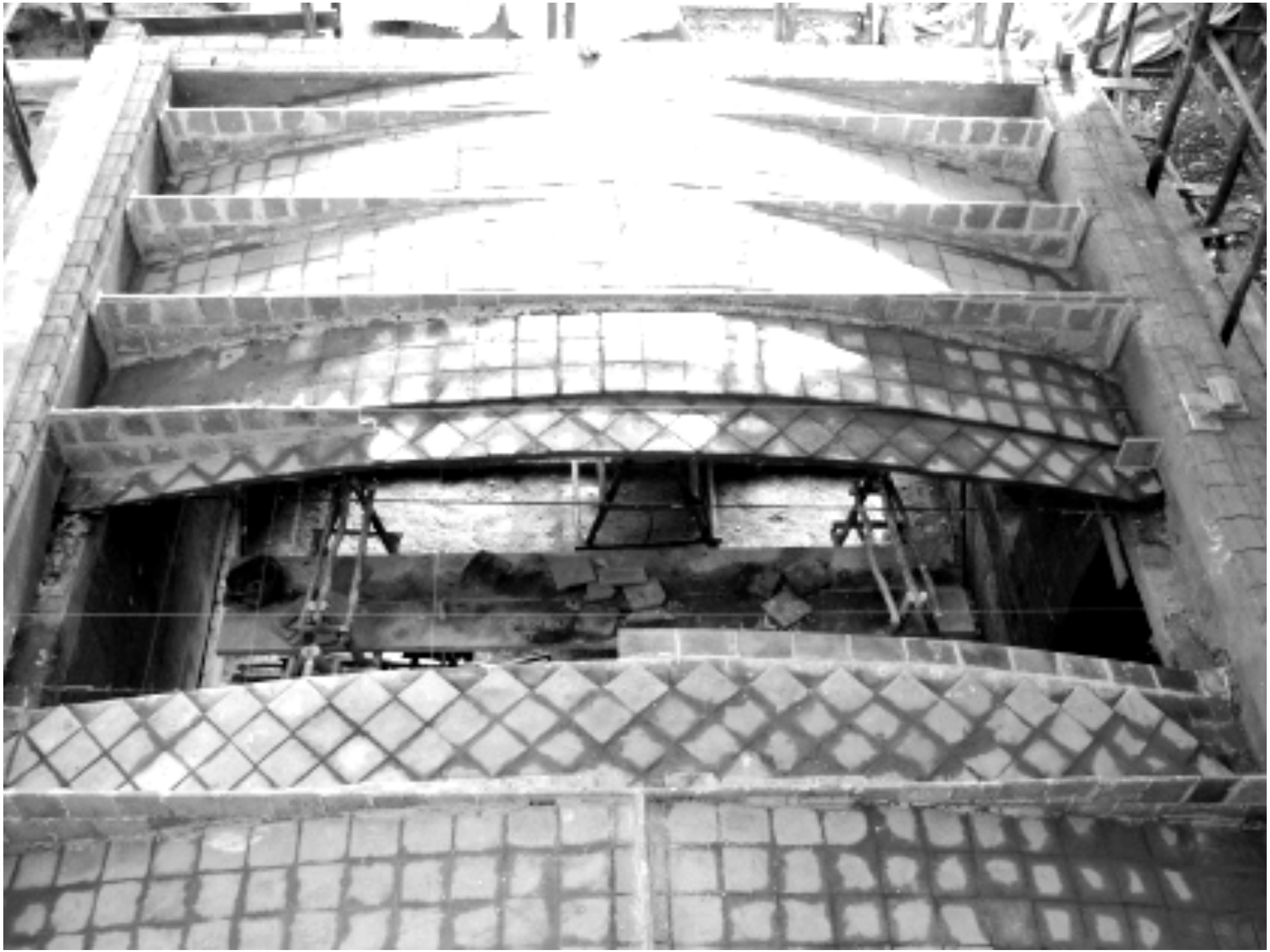
WITNESSES:
W. E. Bowen,
Benj. Miller

INVENTOR:
Rafael Guastavino,
By J. E. M. Bowen
Attorney.

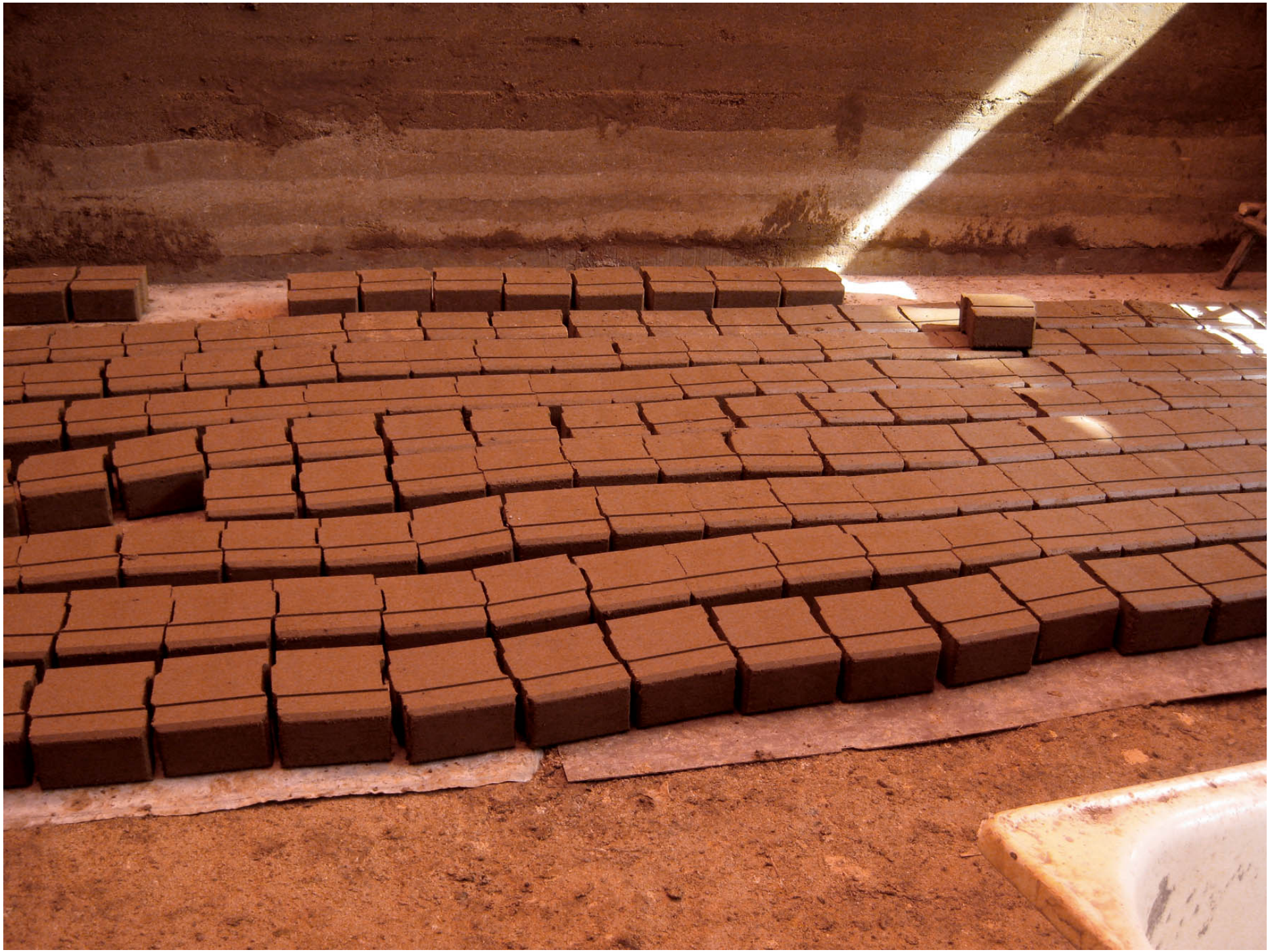


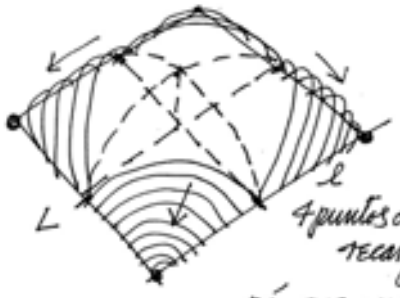
Mapungubwe Museum, South Africa, 2008-2009

Peter Rich, Henry Fagan (architects)
John Ochsendorf, Michael Ramage, Philippe Block (structural design)



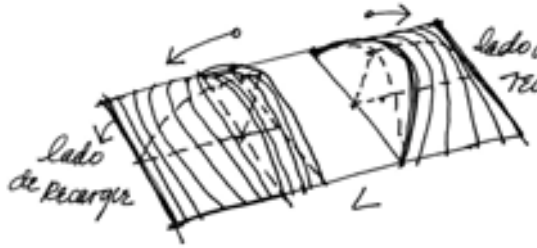

.hydraform.co



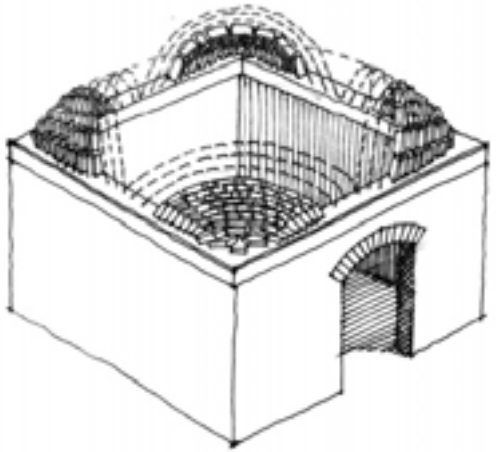


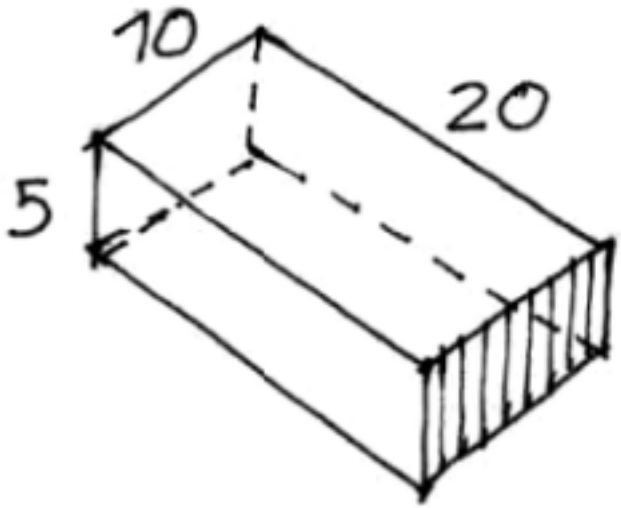
cuando:
4 puntos de recargue $L/l \leq 1{,}5$

BÓVEDAS MEXICANAS



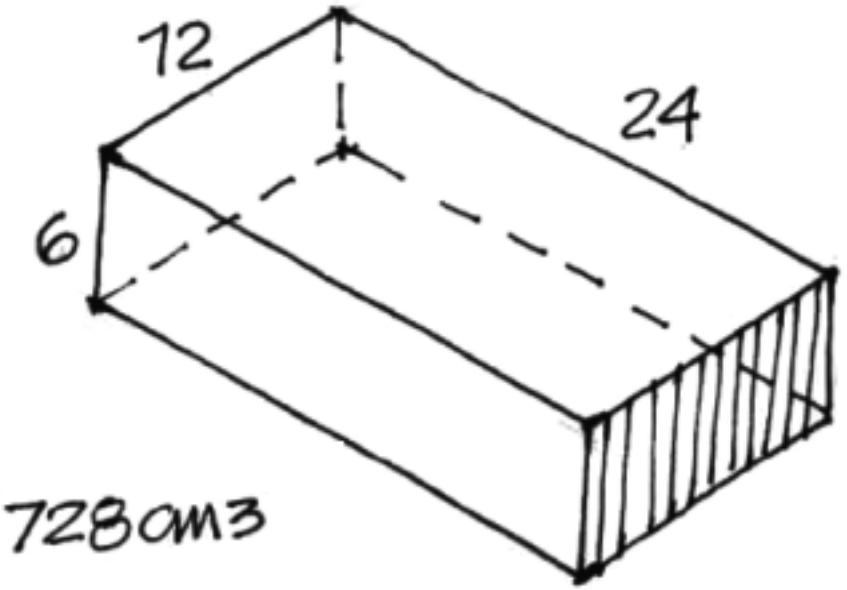
cuando $L/l > 1{,}5$





1000 cm3

peso ≈ 1.5 kg.



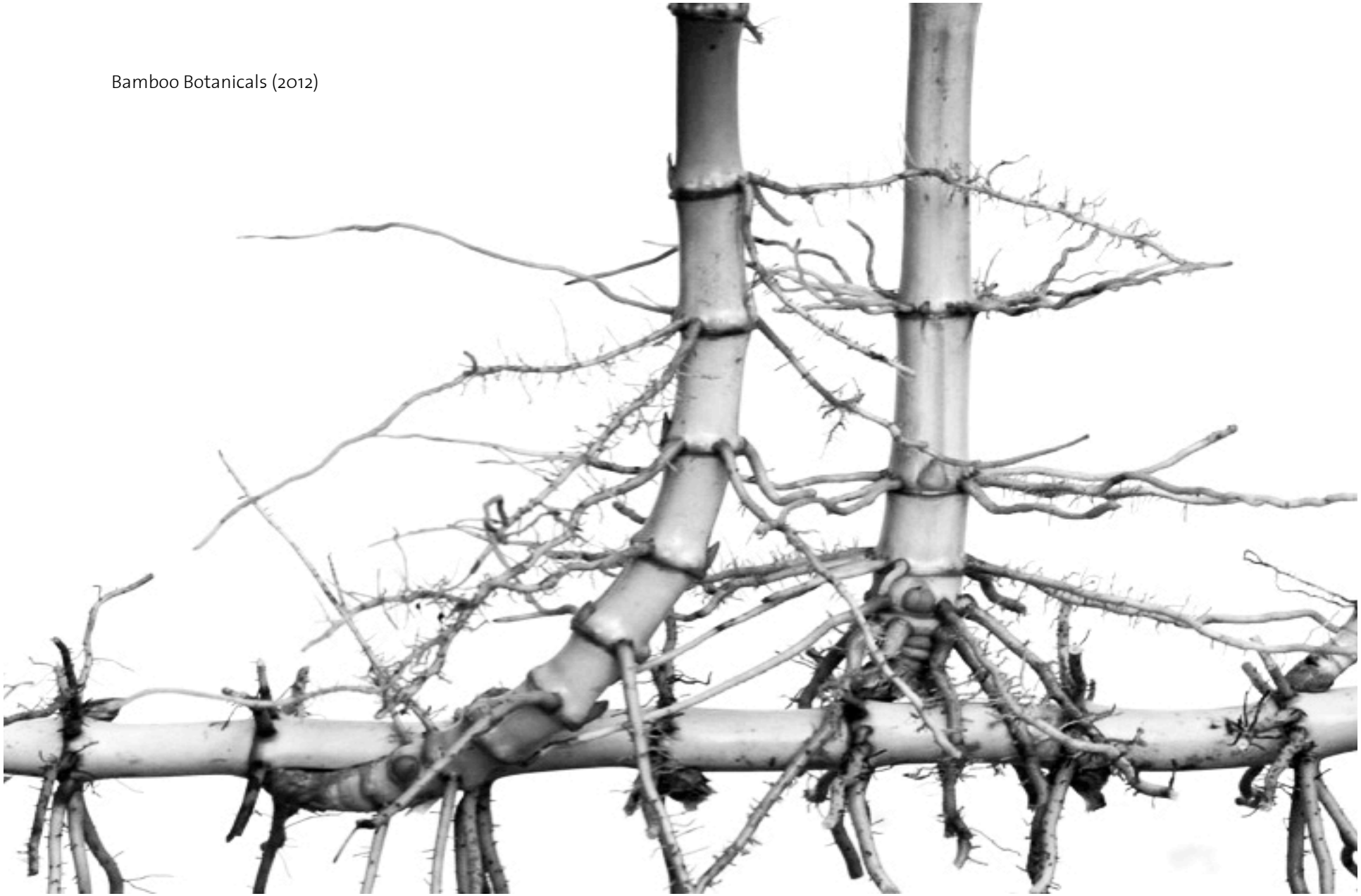
1728 cm3

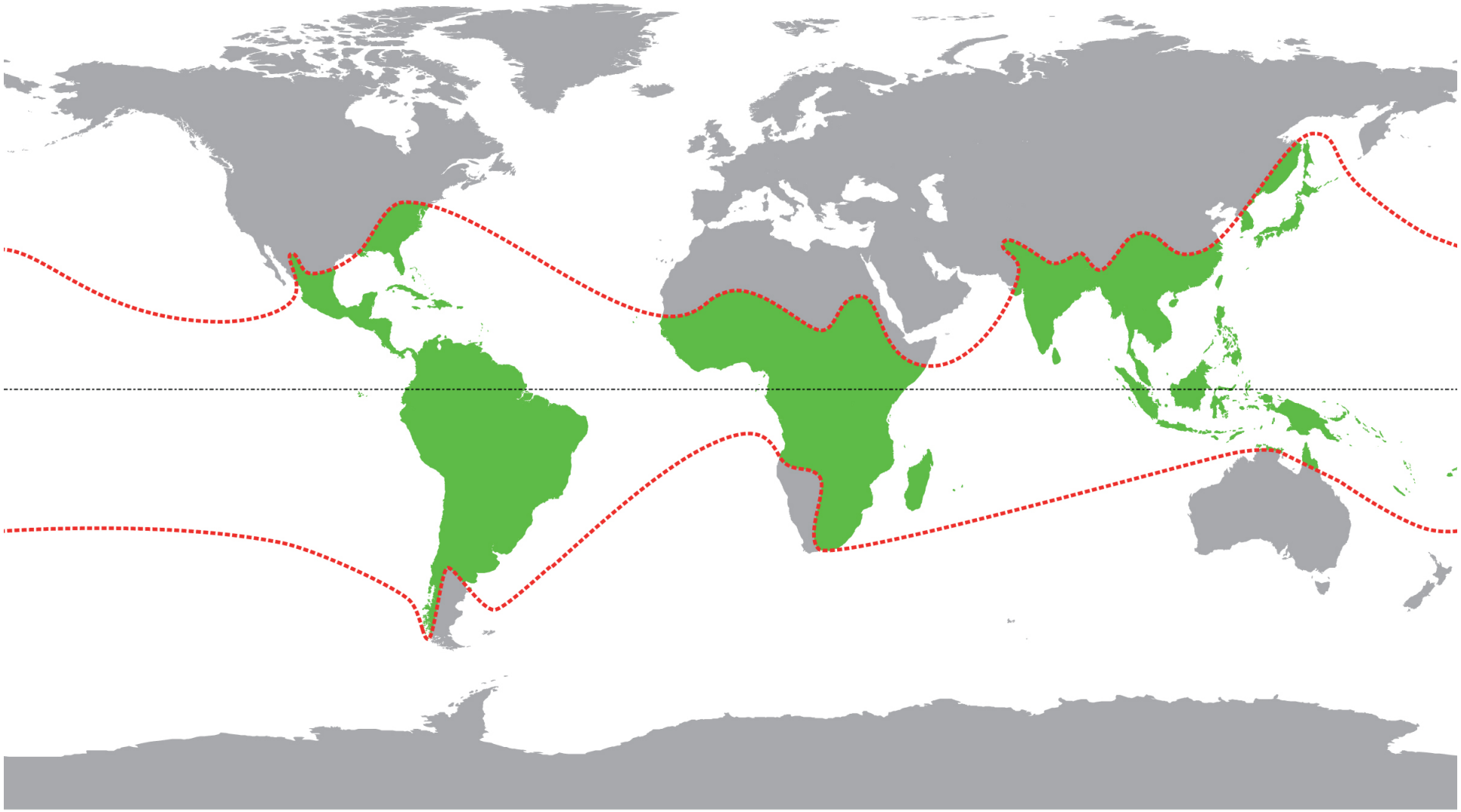
peso ≈ 2.6 kg

Grass

Bamboo belongs to the family of grasses. Grasses are plants, which typically have one seed leaf and continue to grow with narrow leaves from their base. The family includes “true grasses”, sedges and rushes.
The Chair of Architecture and Construction at FCL is mostly interested in true grasses such as bamboo and cerials, since their characteristics show a high potential for taking tensile stress.

Bamboo Botanicals (2012)





Global Natural Bamboo Habitat

National Geographic (1980)

3 April 2012 Last updated at 09:10 GMT

Booming bamboo: The next super-material?

By Mike Wooldridge
BBC News, Nicaragua

Bamboo is being hailed as a new super material, with uses ranging from textiles to construction. It also has the potential to absorb large amounts of carbon dioxide, the biggest greenhouse gas, and provide some of the world's poorest people with cash.

Bamboo's image is undergoing a transformation. Some now call it "the timber of the 21st Century".

Today you can buy a pair of bamboo socks or use it as a fully load-bearing structural beam in your house - and it is said that there are some 1,500 uses for it in between.

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Will being big on Twitter get you a job?

La Barbe: France's bearded feminists

How to live beyond

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Losing Mexico candidate defiant

Protest halts China factory plan NEW

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Colorado fire efforts gain ground

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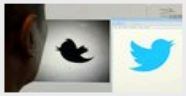
Art underground
Why make art no-one will be able to see?



Twelitism
Will being big on Twitter help you land a good job?

'Eerily quiet'
Why no-one lives in Angola's Chinese-built "ghost towns"

Bridging the divide
Malaysian marketing firms tap into K-Pop power

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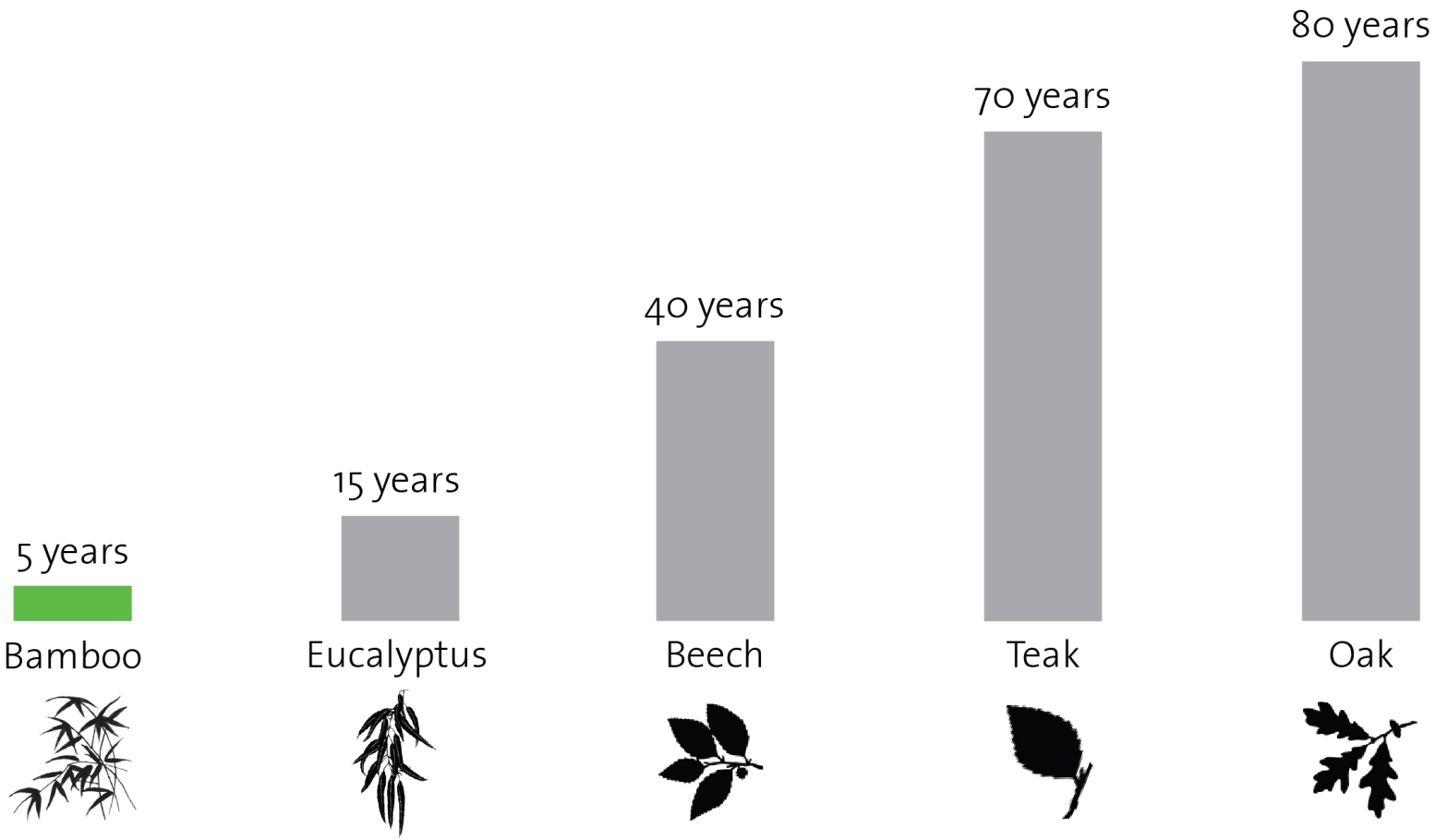


Harvesting Age
Biological Maturity of plant in years
MOSO 2012

Bamboo Growth throughout 6 years

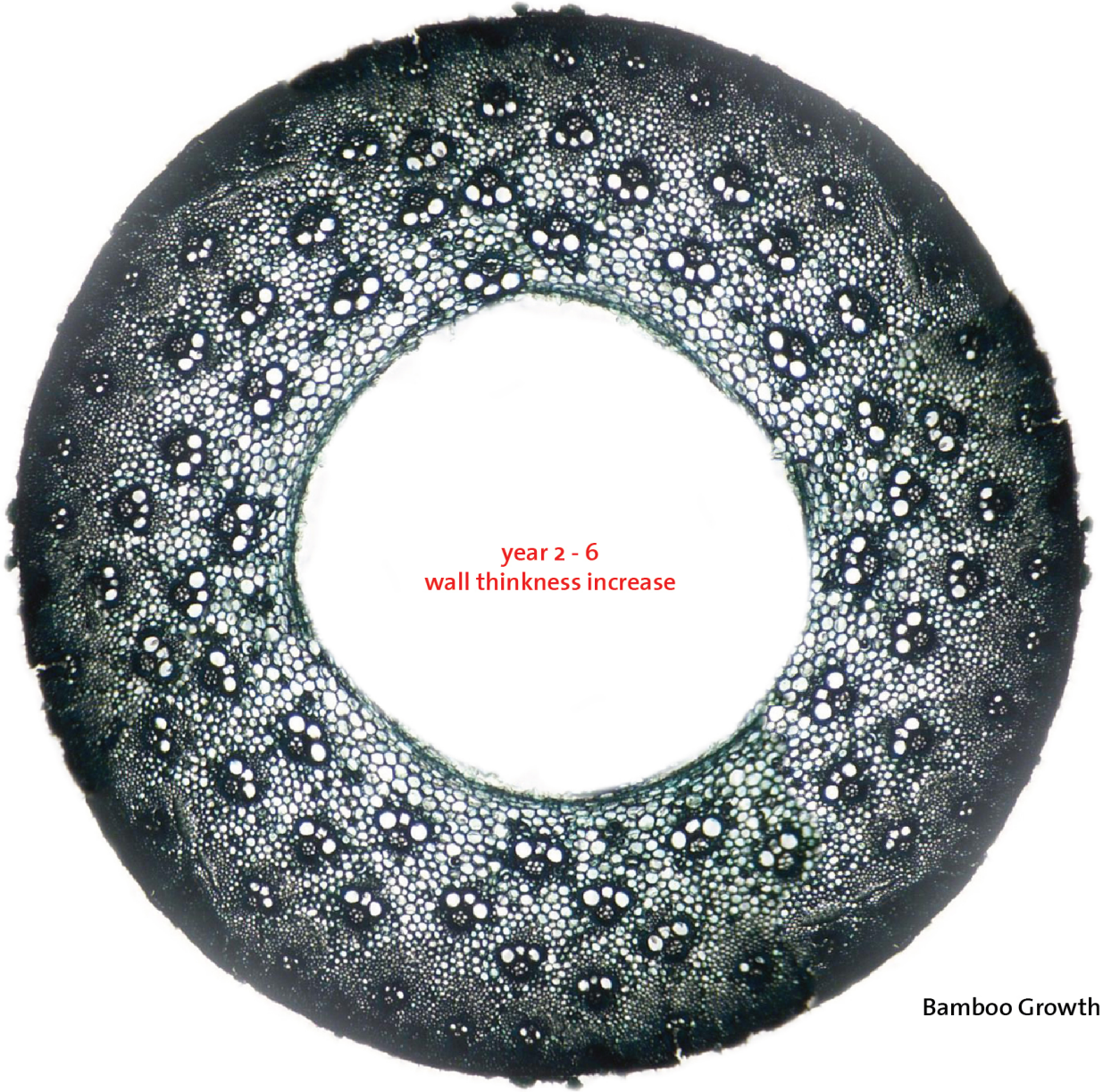
picture: 3dhm (2012)

Bamboo Growth throughout 6 years

picture: 3dhm (2012)

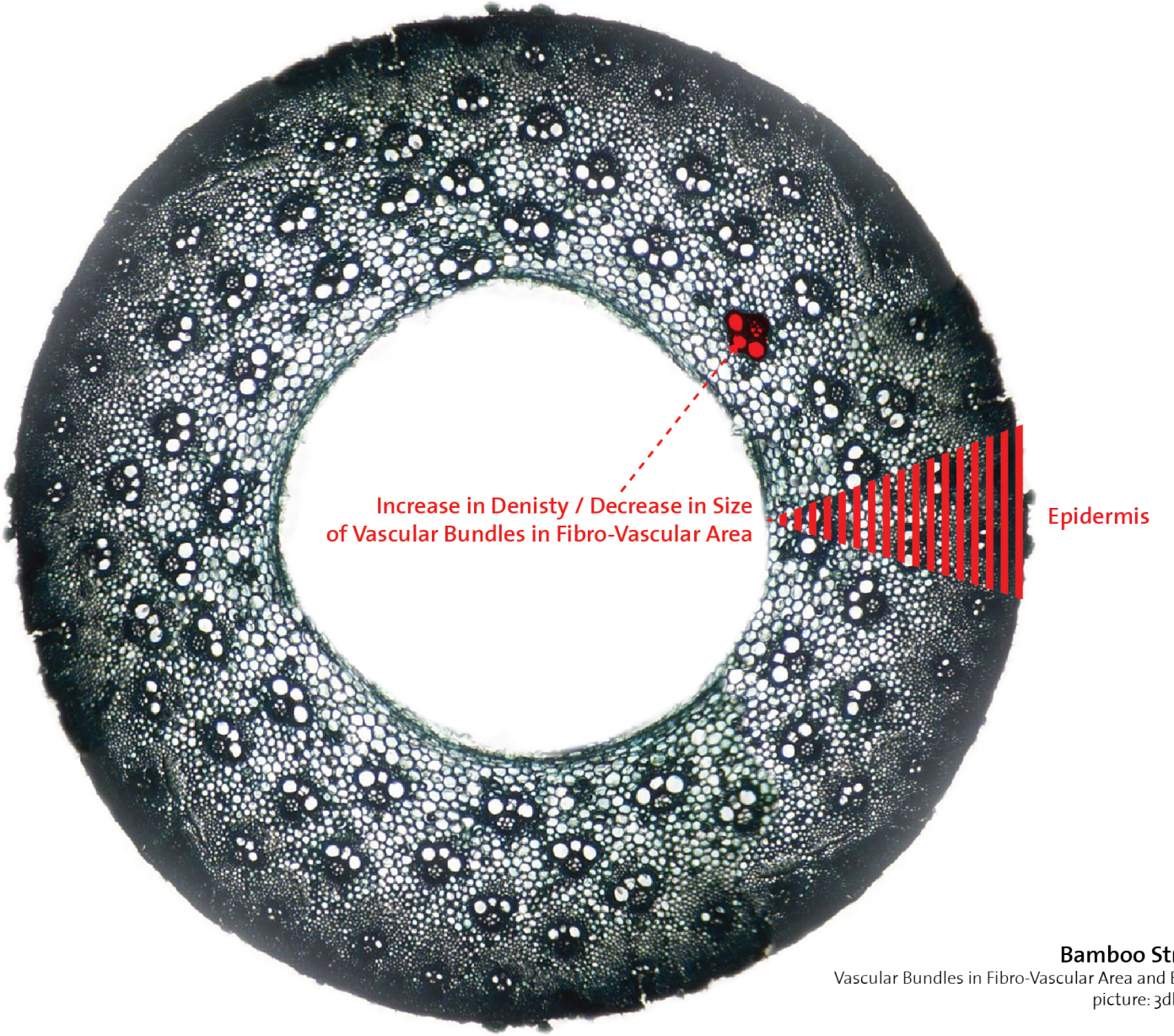
Bamboo Growth throughout 6 years

picture: 3dhm (2012)

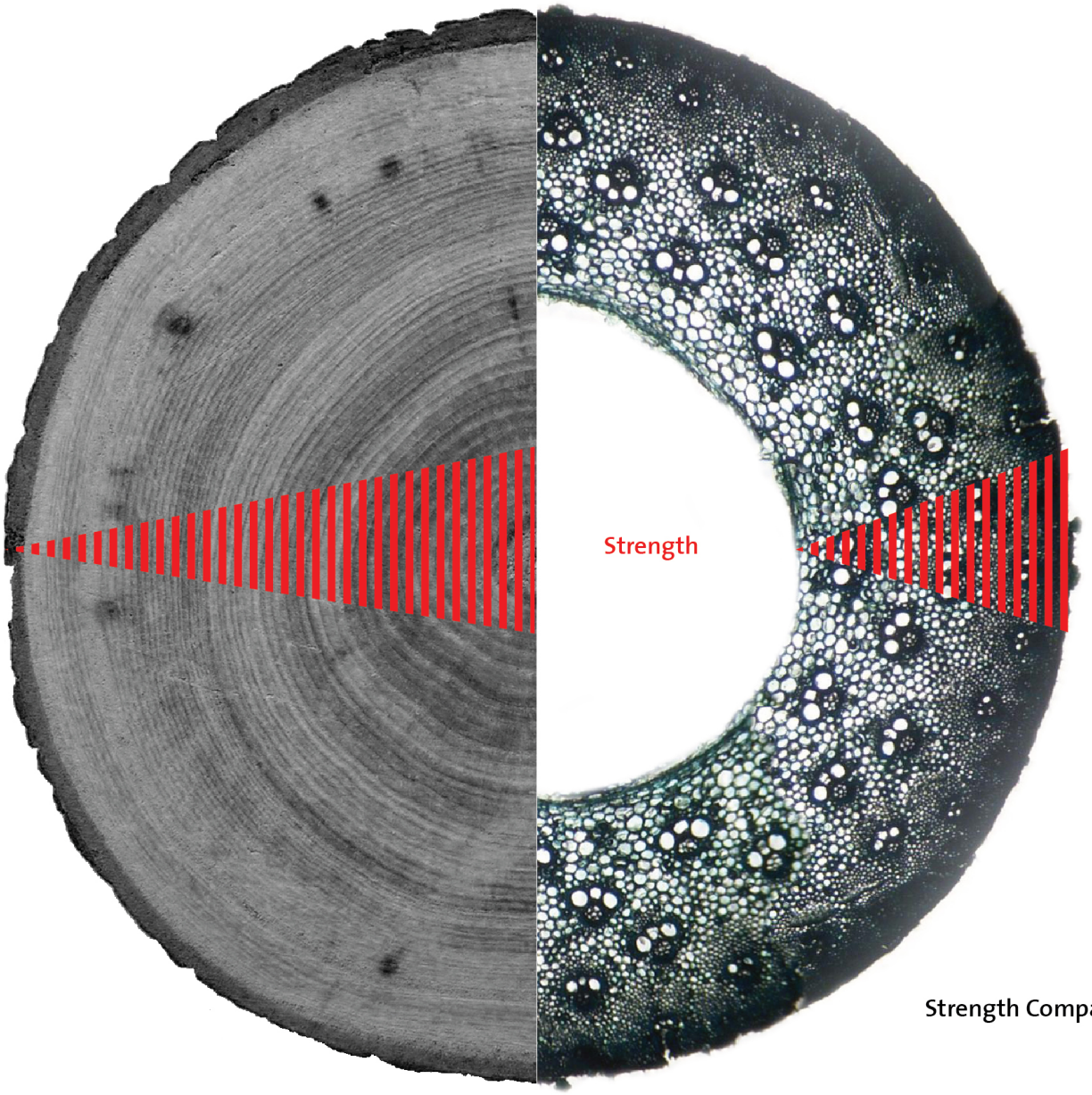


Bamboo Growth throughout 6 years

picture: 3dhm (2012)

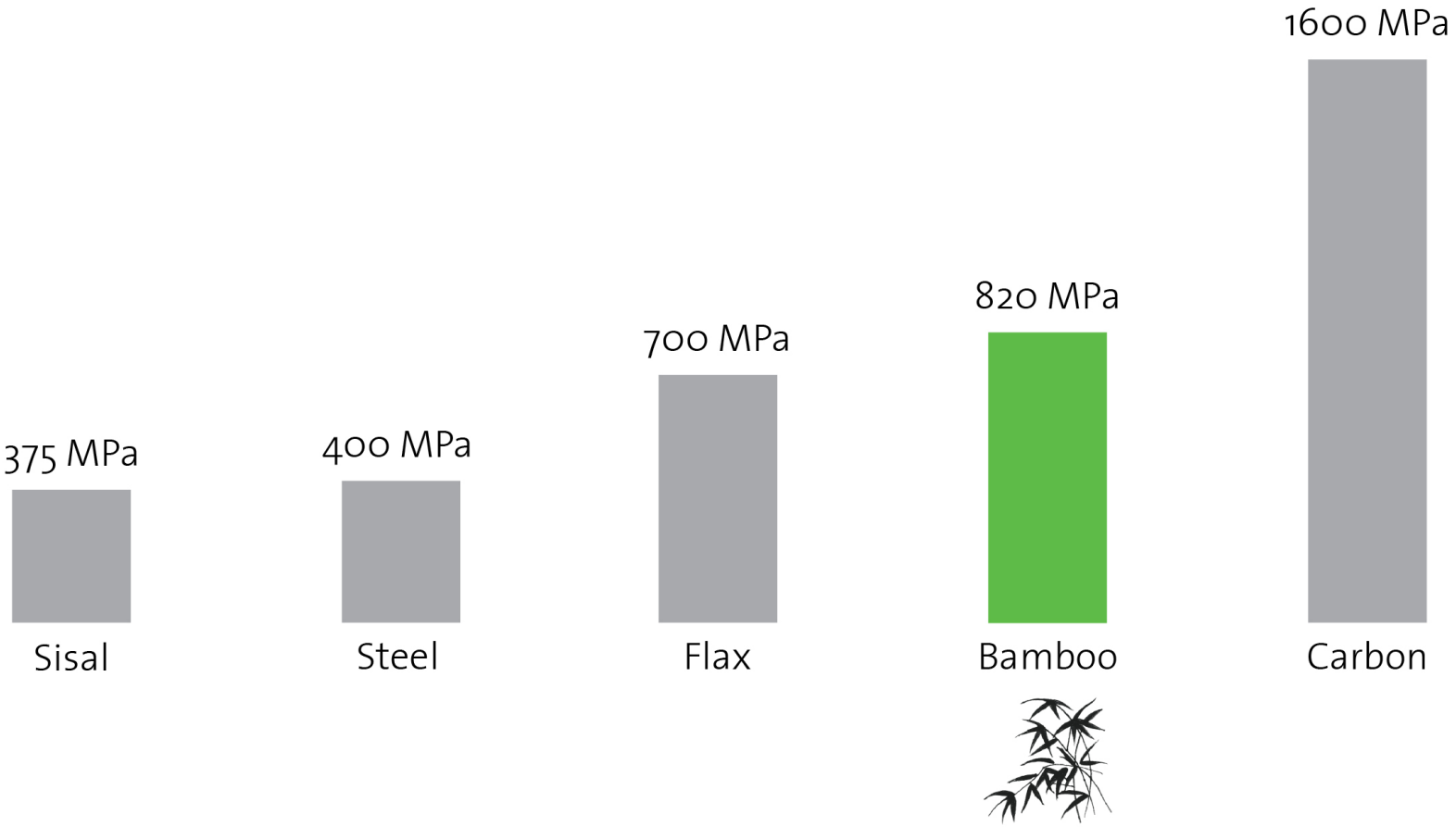


Bamboo Structure
Vascular Bundles in Fibro-Vascular Area and Epidermis
picture: 3dhm (2012)



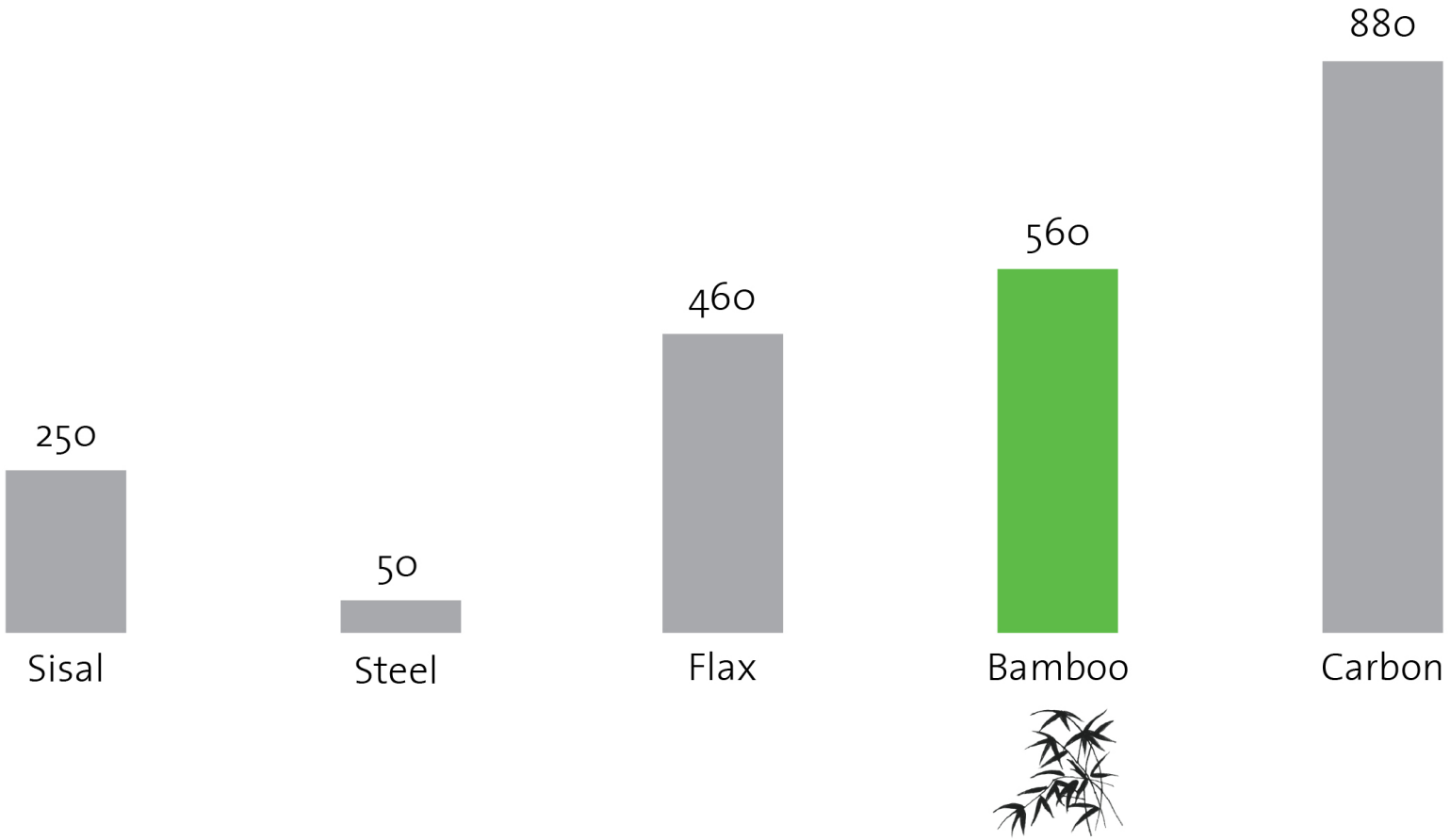
Strength Comparison to Hardwood

picture: 3dhm (2012)



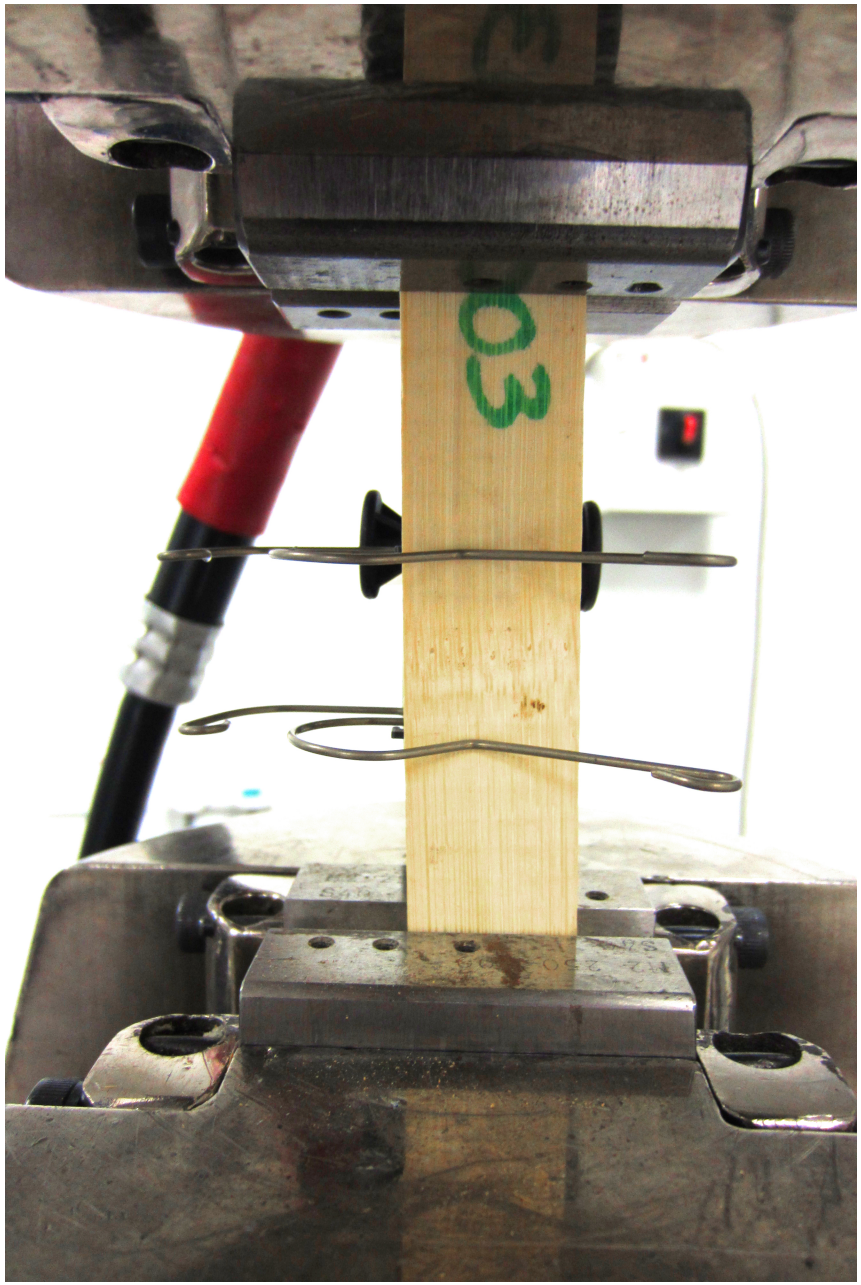
Strength (MPa)
Comparison with other fibres
cmg composite materials group (2012)

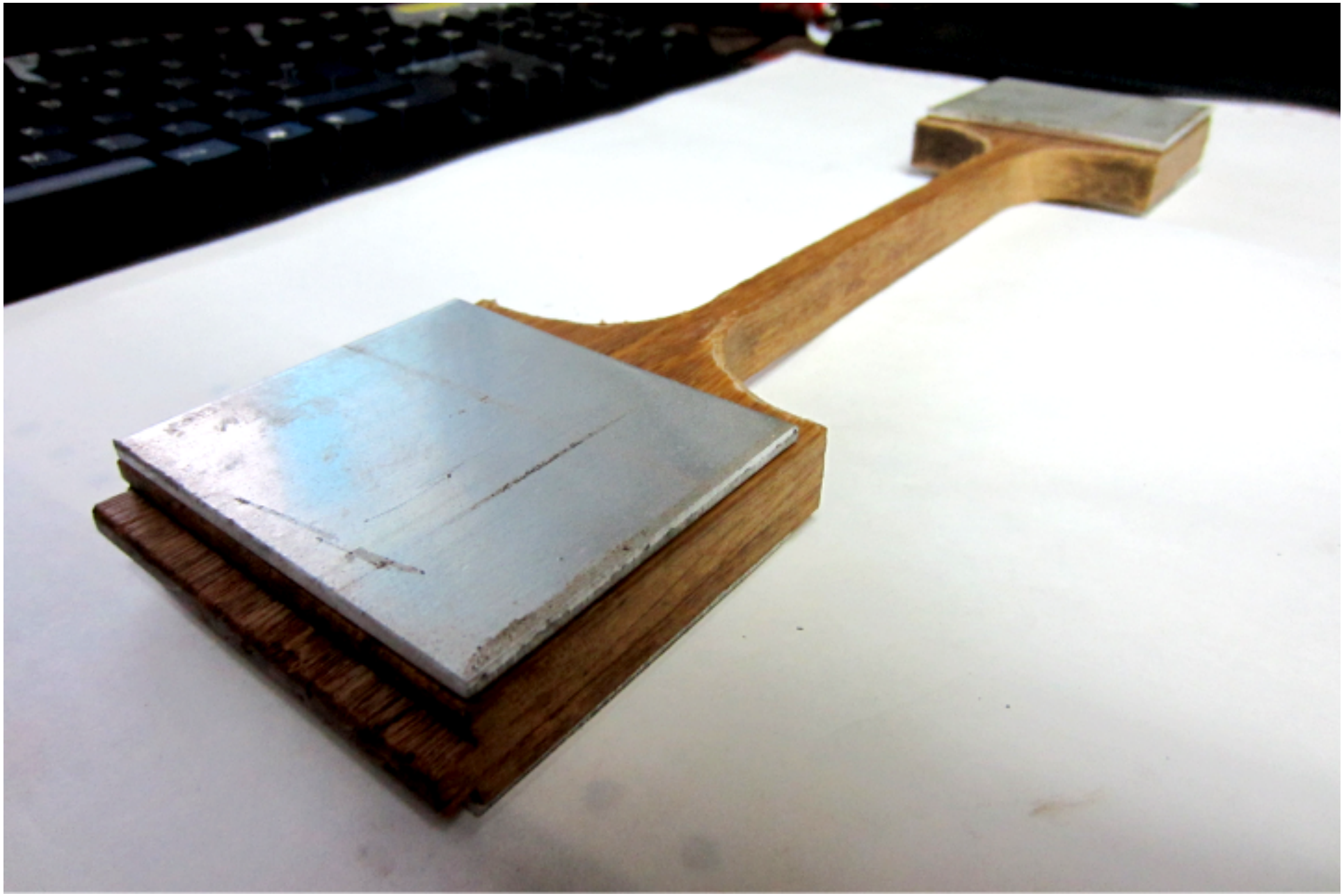
Density (g/cm3)
Comparison with other fibres
cmg Leuven / Wikipedia (2012)

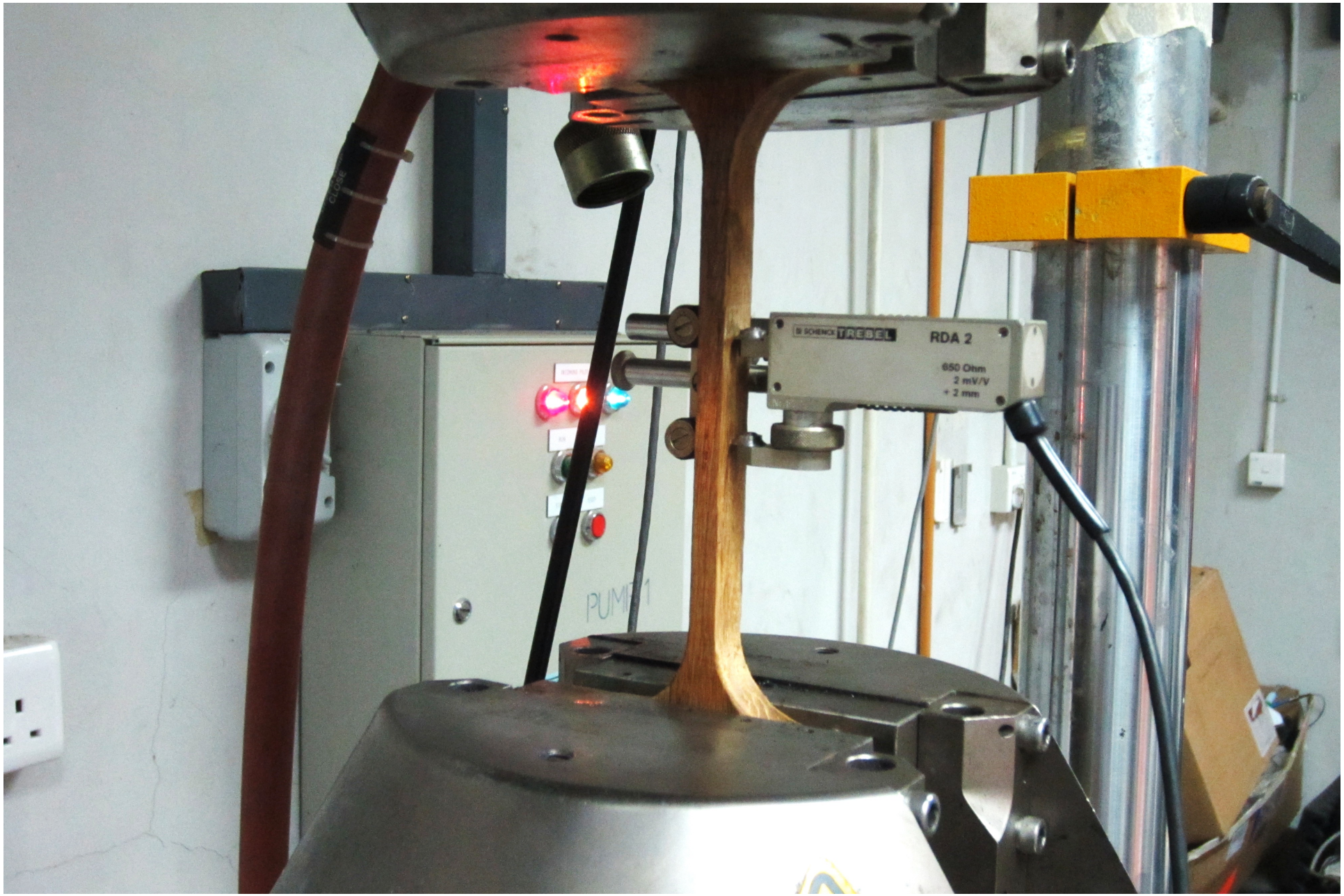


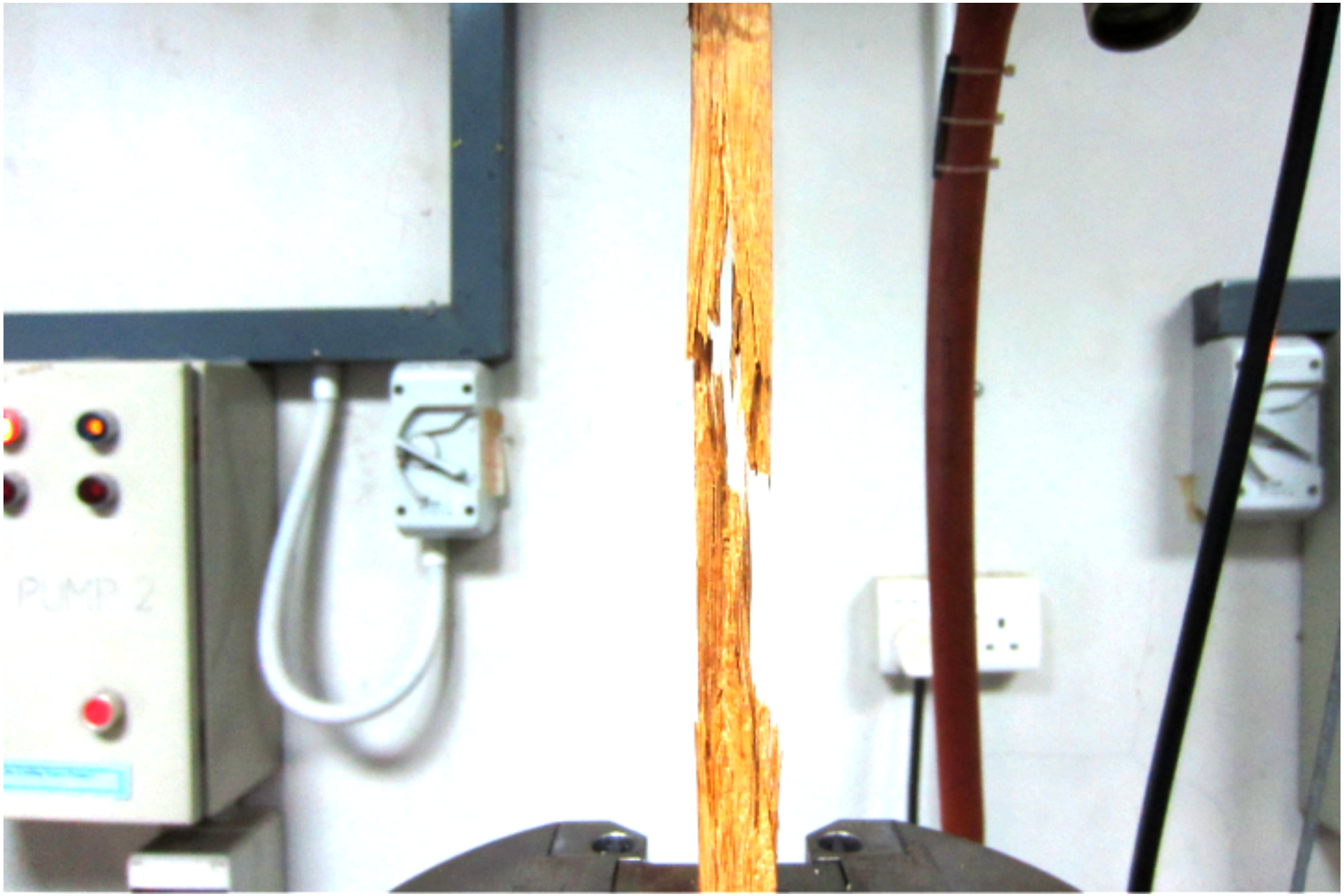
Specific Strenght (Strenght to Weight Ratio in KNm/Kg)
Comparison with other fibres
cmg Leuven / Wikipedia (2012)

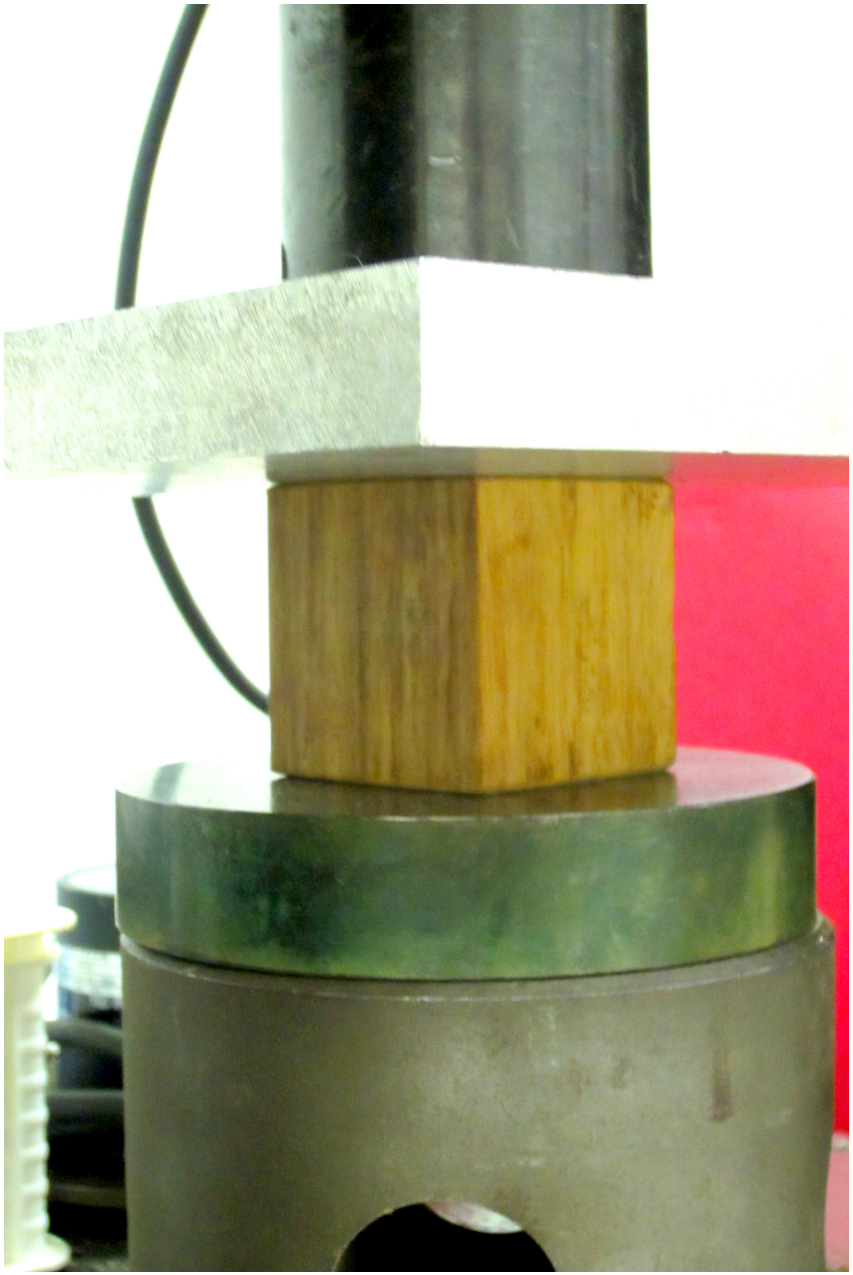

Carbonized Bamboo
Boiled Bamboo
Natural Bamboo

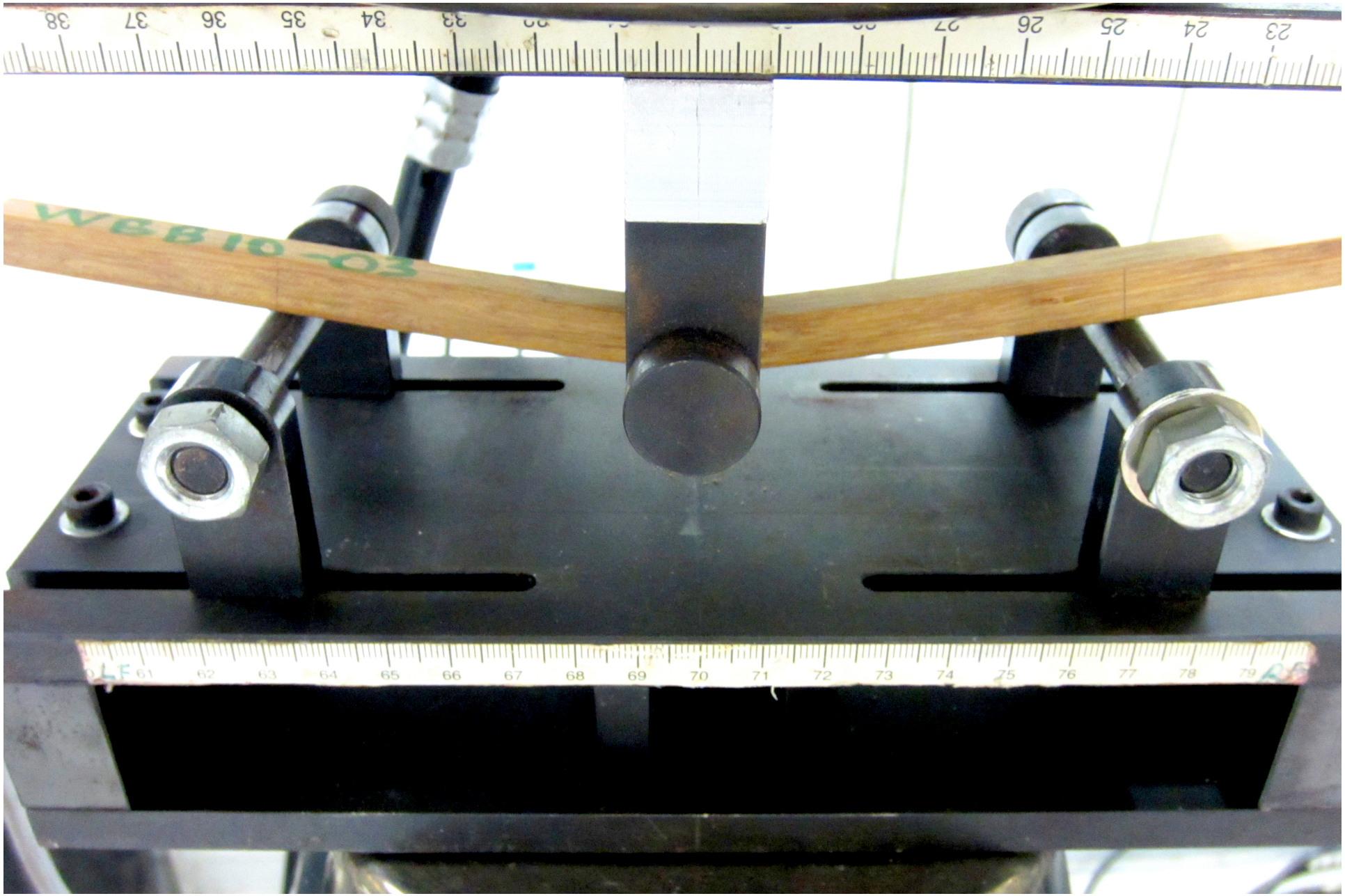

03

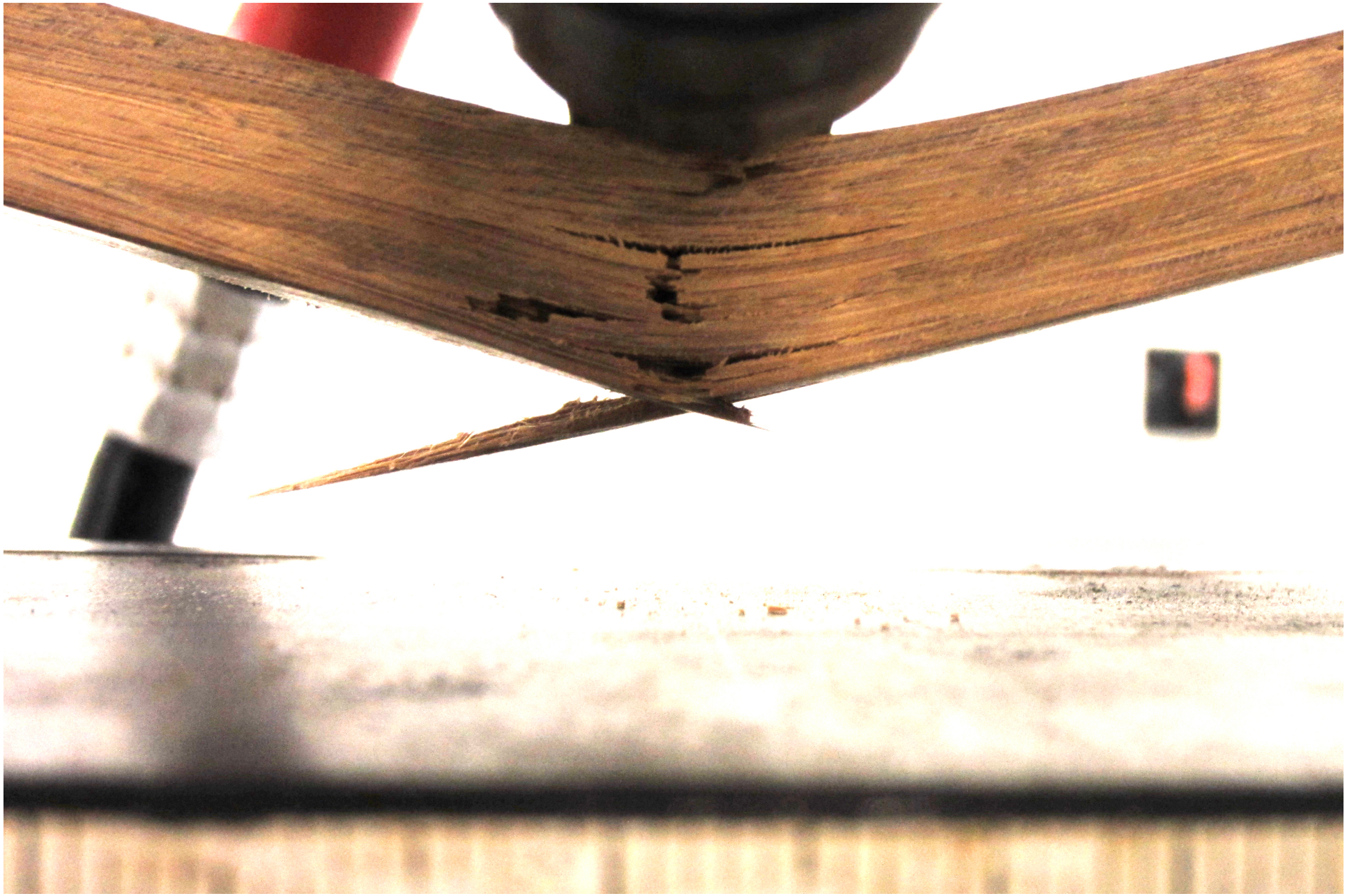



CLOSE
SCHENCK TREBEL
RDA 2
650 Ohm
2 mV/V
± 2 mm


PUMP 2




WEB 10-03




EXIT
EXIT


GUOSEN MACHINERY

www.arch.hebel.ethz.ch