



MIKADOWEB

innovative lightweight building system

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Point of departure



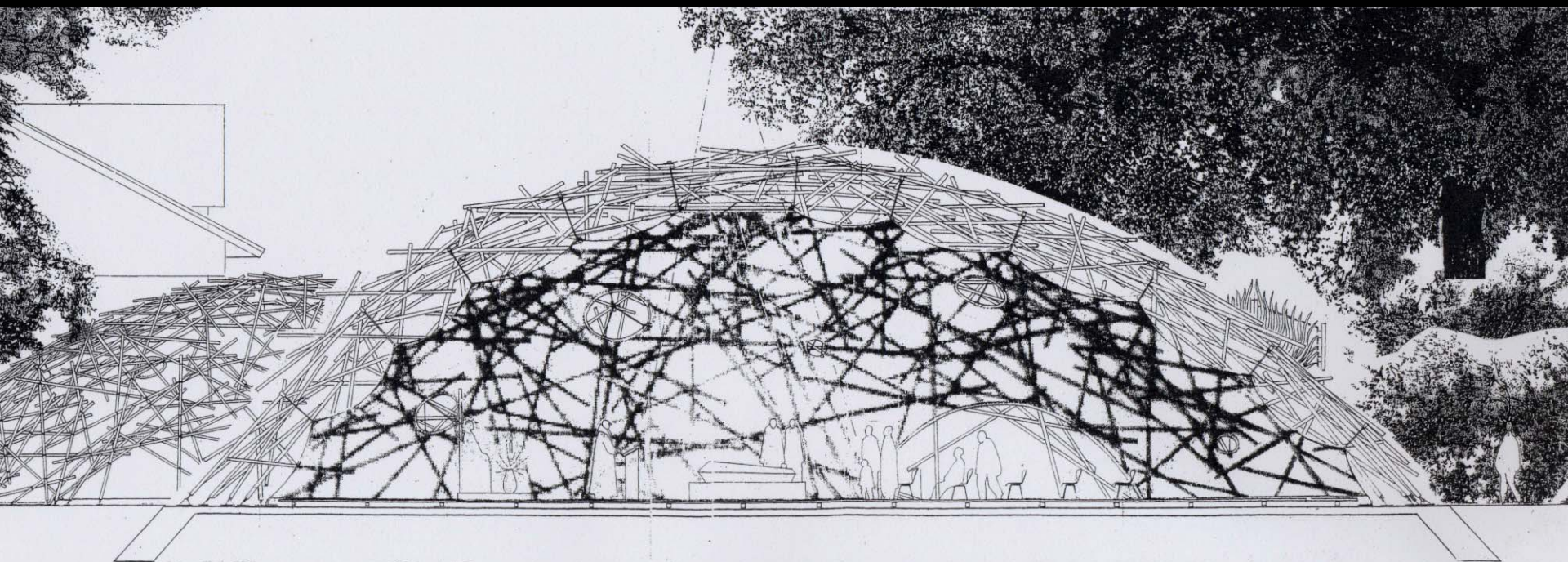
german/english, jovis, Berlin, 2006
based on PhD 2002

investigation into design tools conveying strong connections between man and environment
based on traditional Japanese architecture

Initial design idea

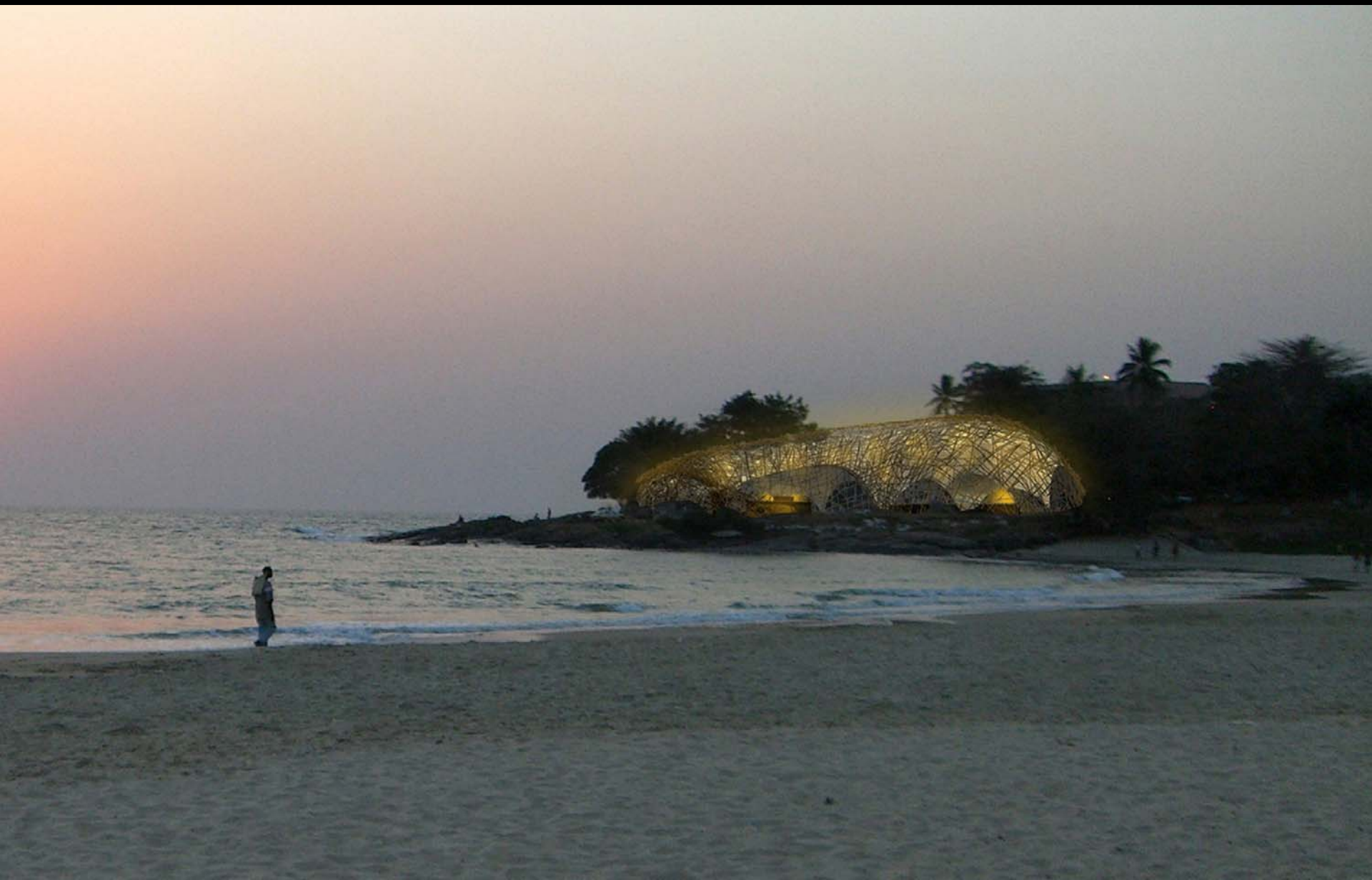
Funeral parlour, Kufstein, Austria, 2003,

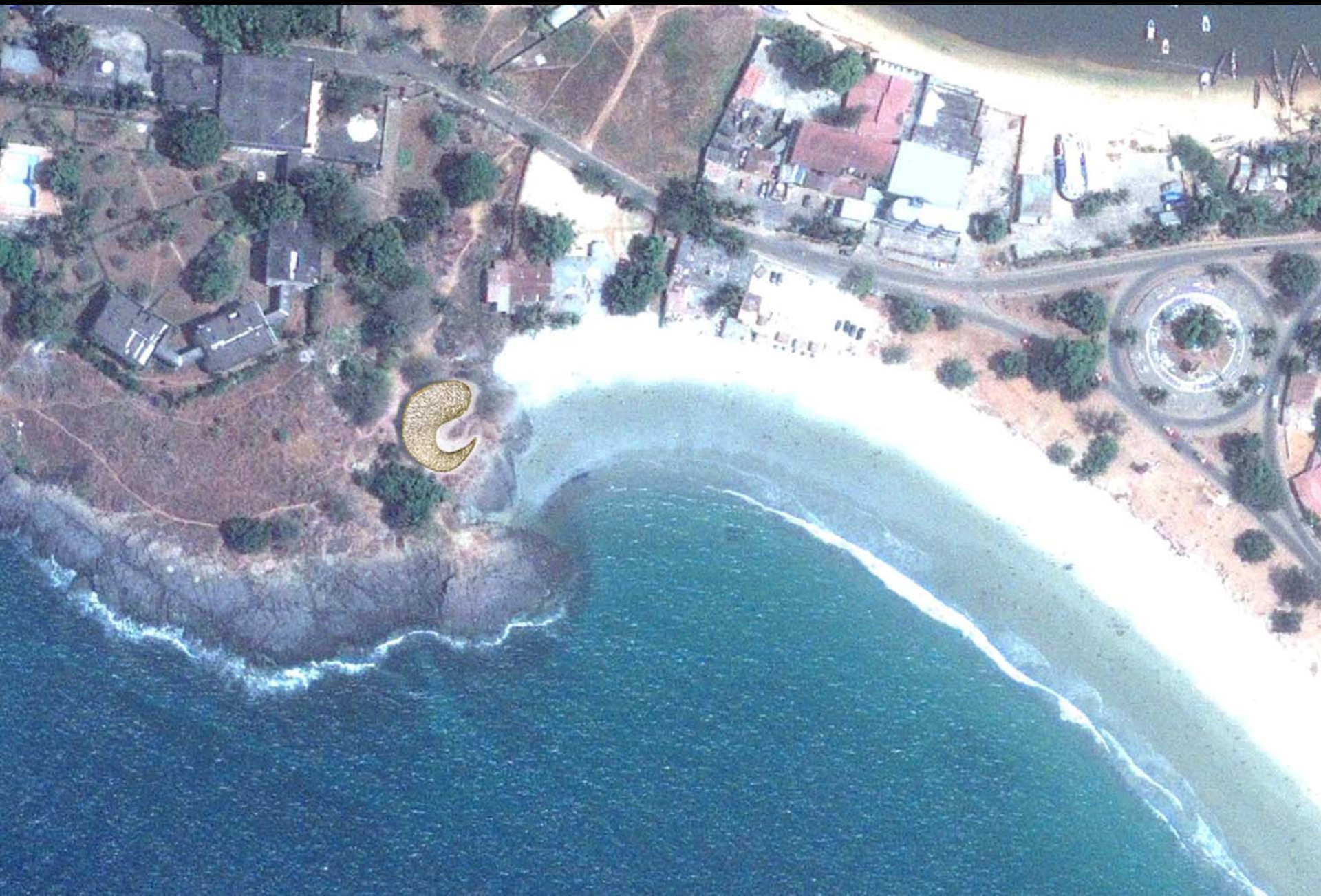
design tools from „open house“ applied to create a space with multiple connections between man and environment

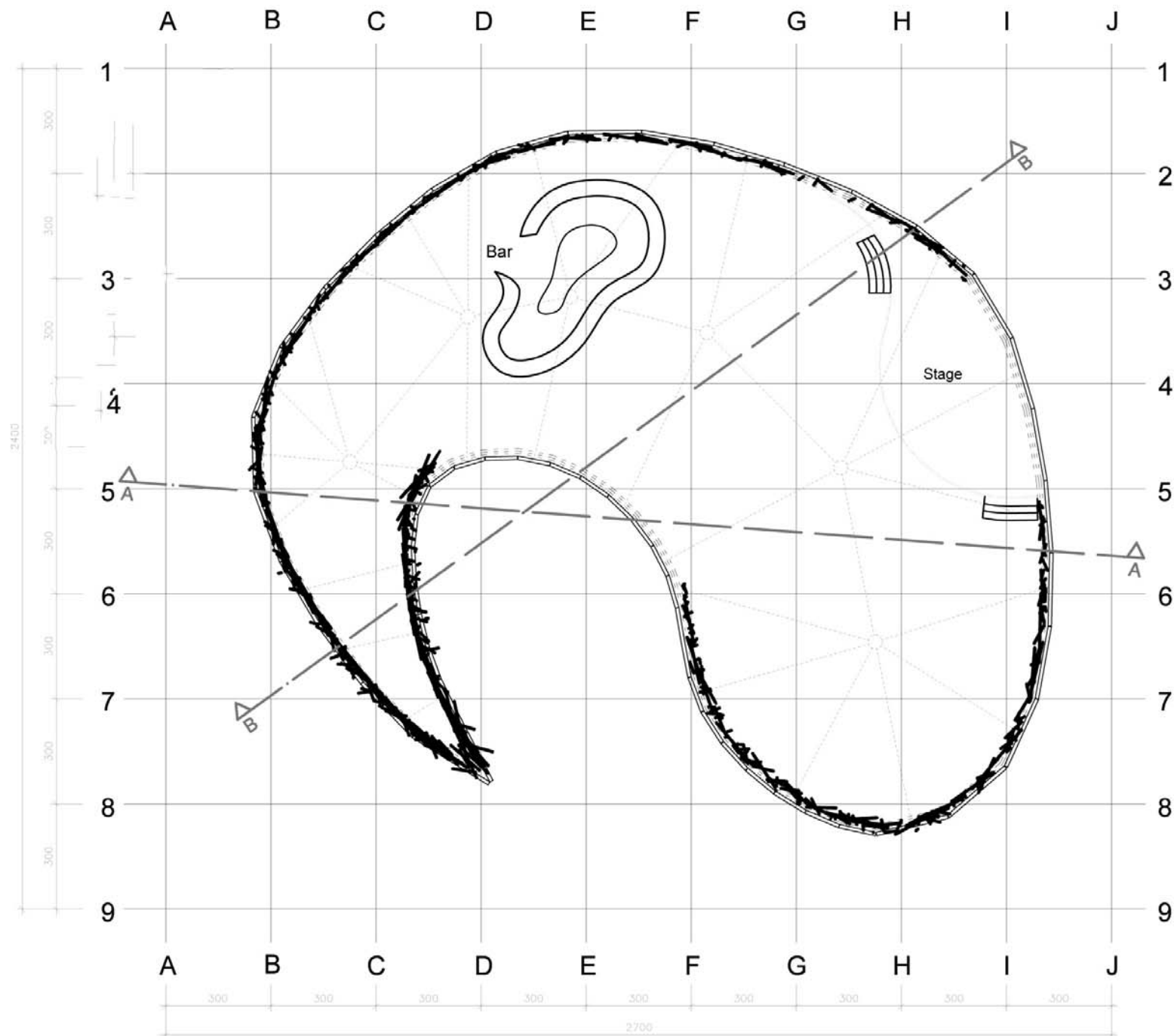


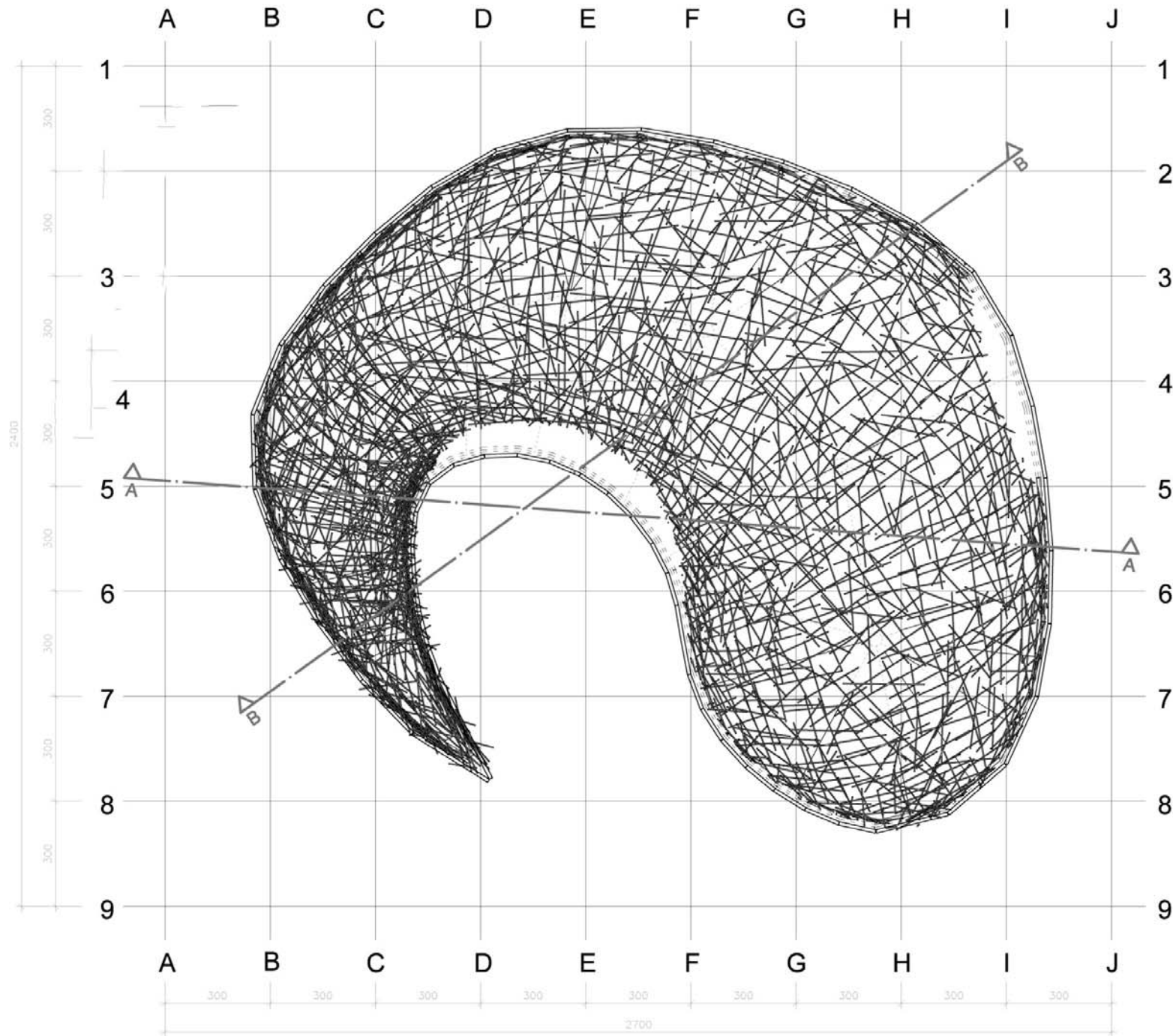
Project description

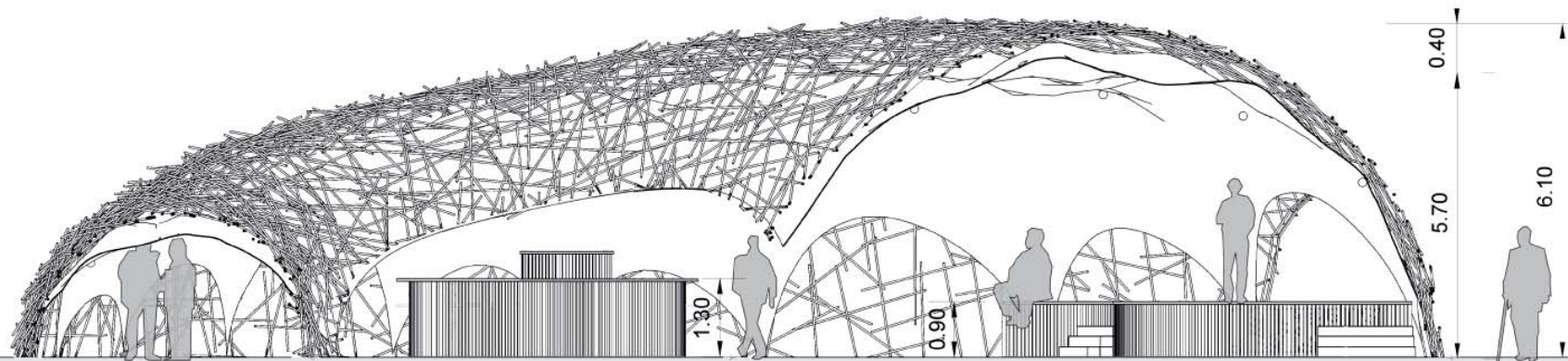
- MIKADOWEB
new method for erecting a freeform shell from short rods
suspended by a membrane
- significant high tech structure using low tech material and
connections
- bamboo as light weight widespread building material
ideal for this ecologically, economically sustainable building
system
- current design
„Dreampavilion“, Community Centre,
Freetown Peninsula, Sierra Leone, West Africa



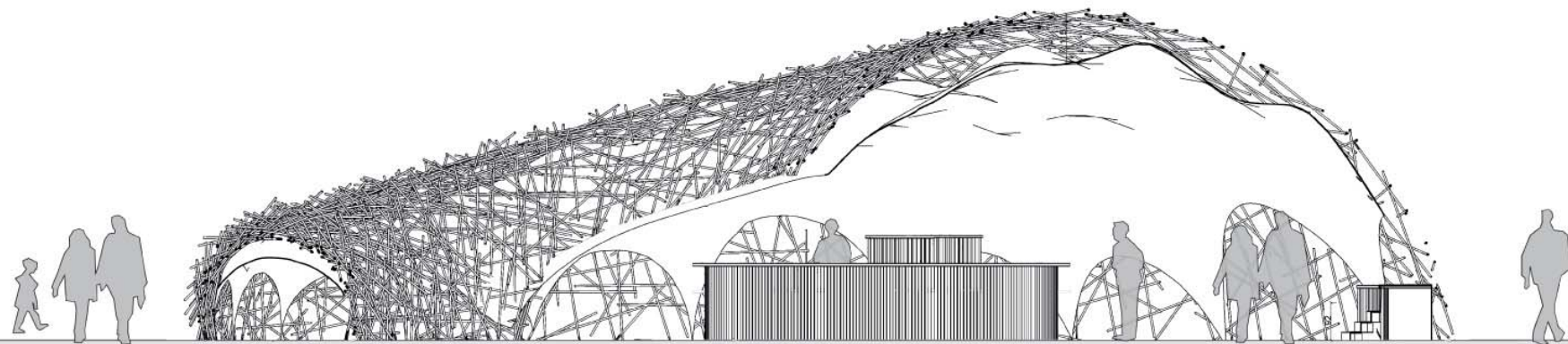




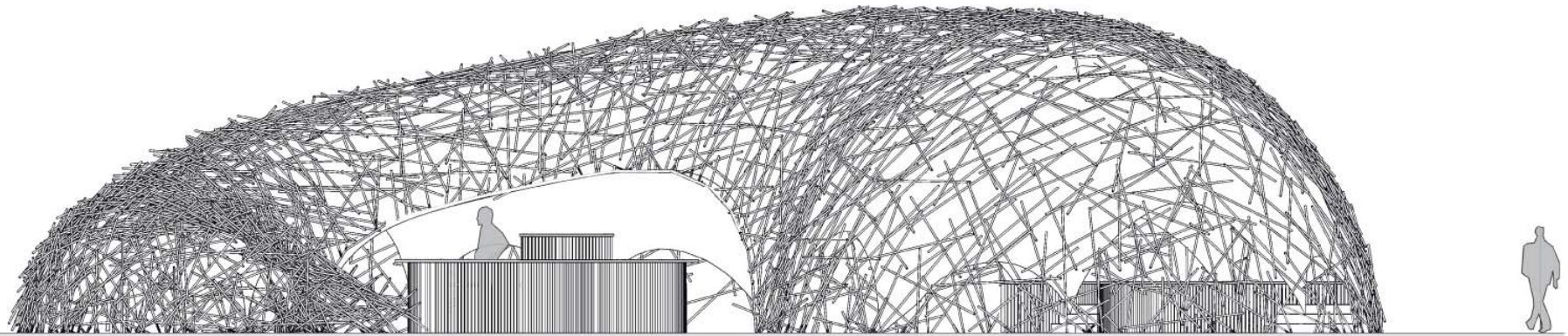




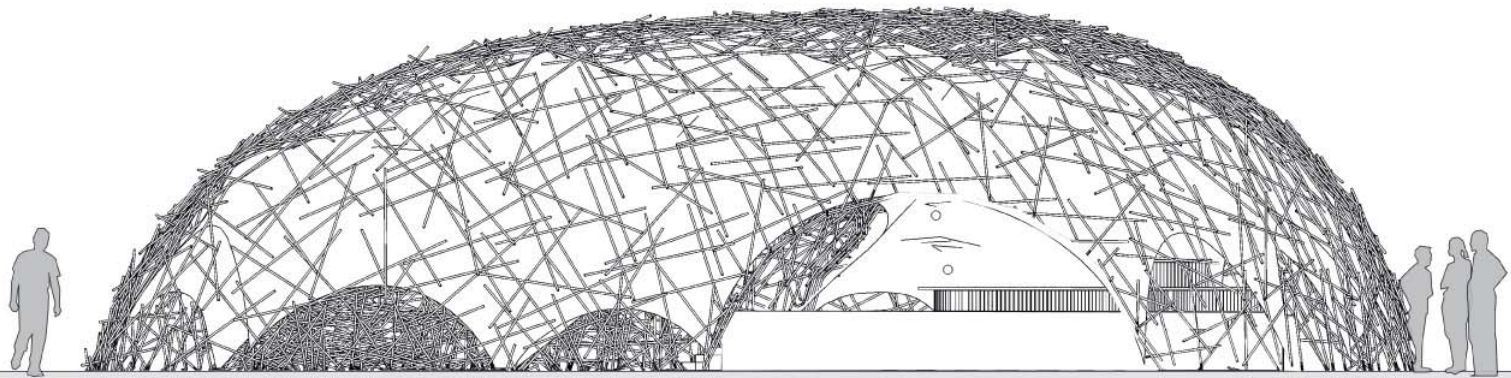
Section A-A
M: 1/50



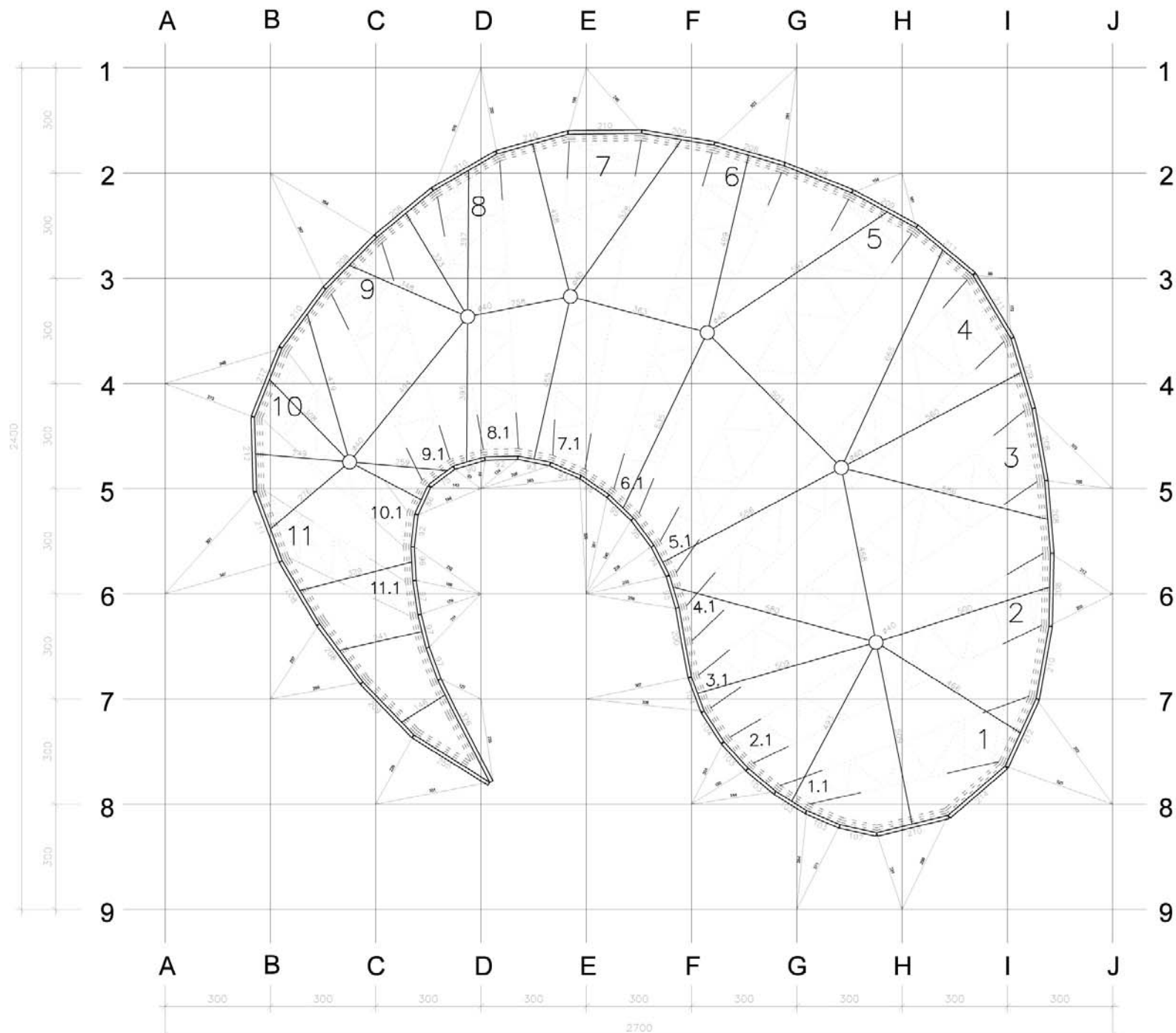
Section B-B
M: 1/50



Front view
M: 1/50

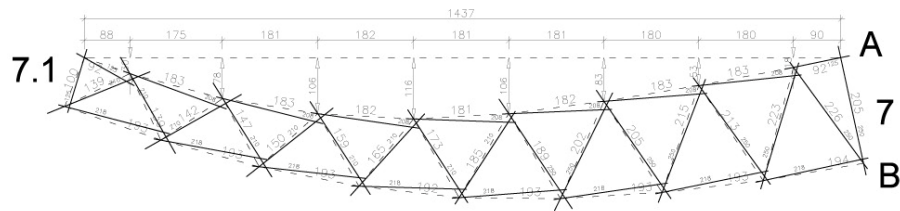
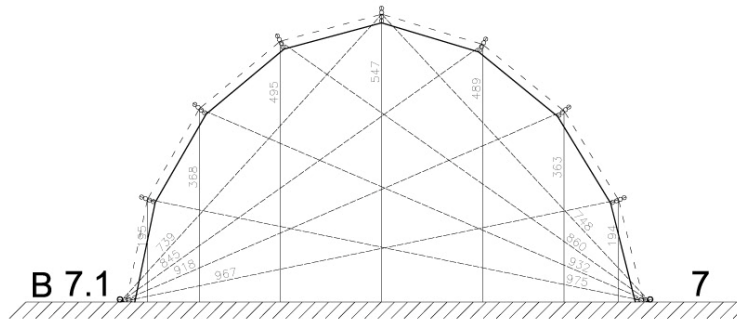
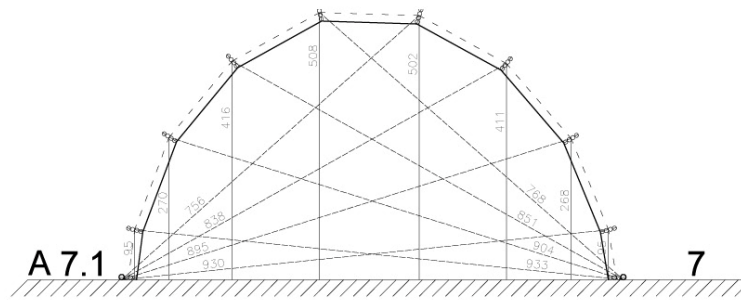


Side view (right)
M: 1/50

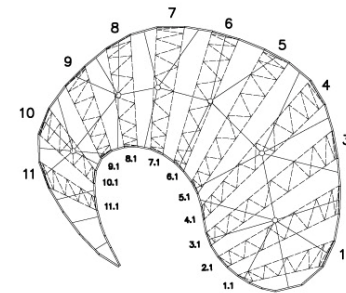


Bamboo lenght :

9x 208cm	2x 82cm
4x 208cm	1x 86cm
3x 211cm	1x 75cm
3x 212cm	1x 90cm
6x 210cm	2x 83cm
1x 214cm	2x 94cm
1x 255cm	3x 95cm
1x 326cm	2x 104cm
1x 200cm	4x 103cm
3x 97cm	1x 107cm
1x 96cm	



Bamboo lenght 7:
 3x 125cm Start & End
 8x 250cm Diagonal & Start
 9x 210cm Diagonal
 7x 208cm Inside
 8x 218cm Outside



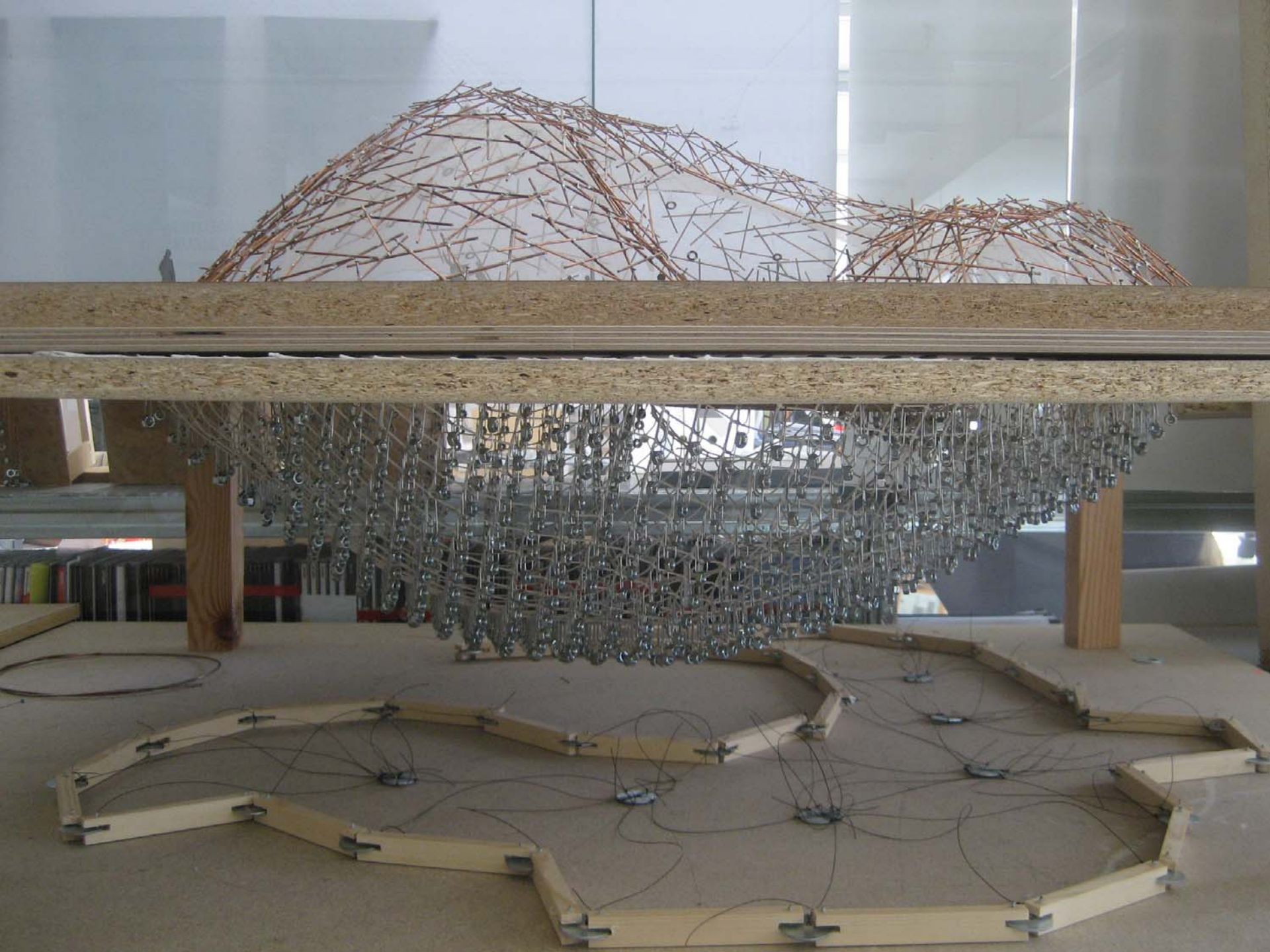
Development

model development, build up system and experimental structure

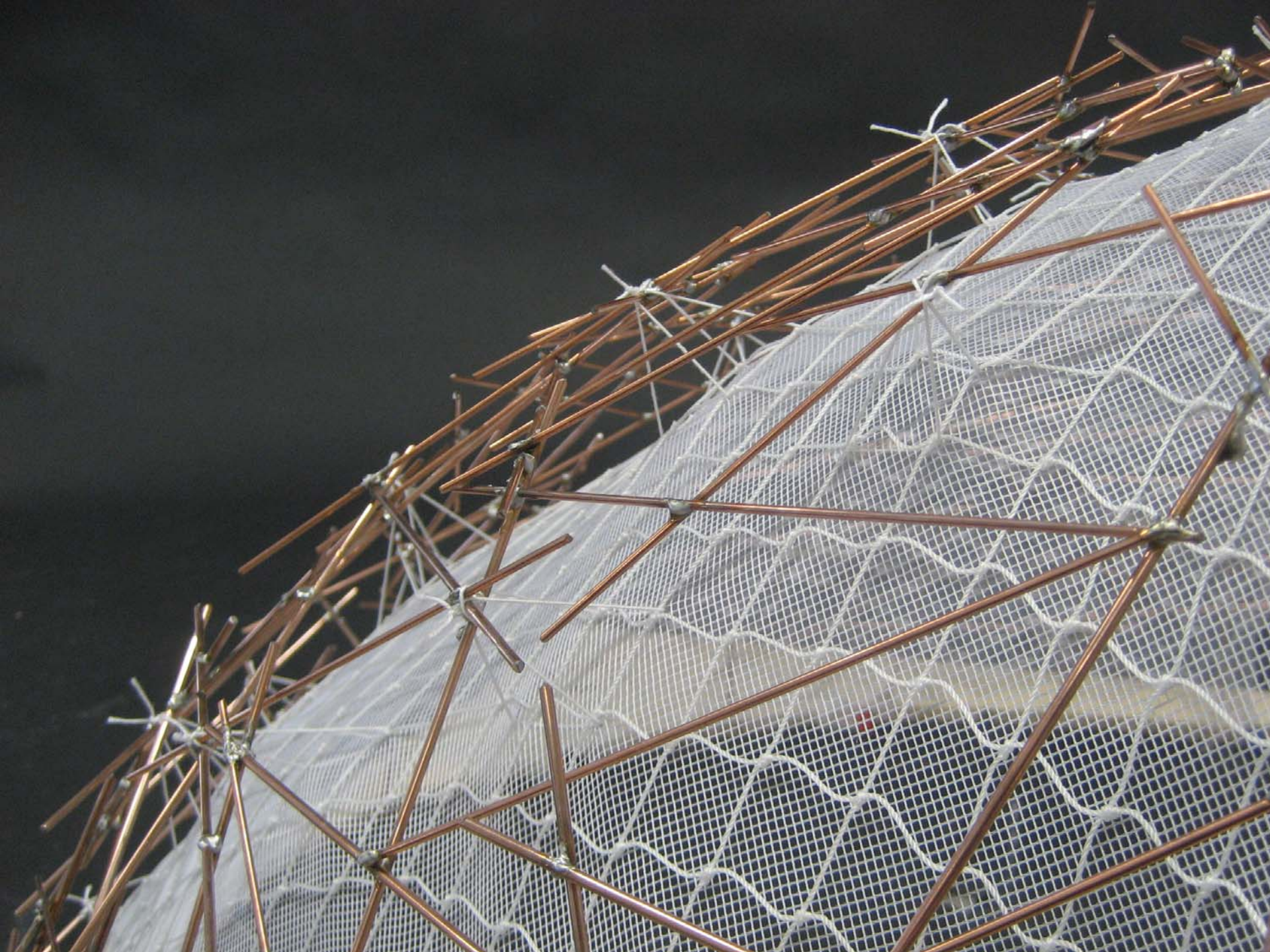
in cooperation with Prof. Dr. Ing. Eda Schaur, Institute for
Structure and Design, University of Innsbruck, Austria



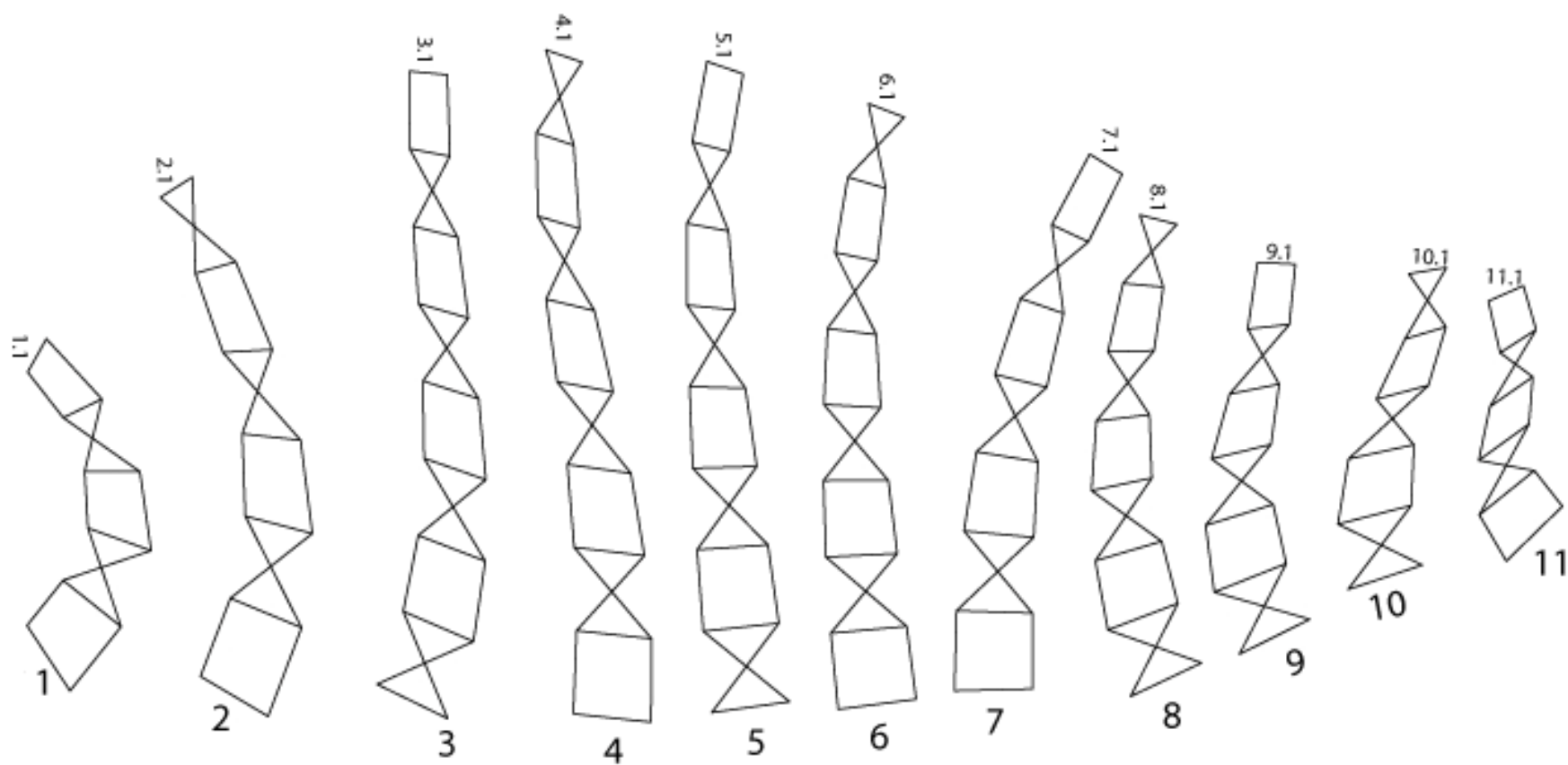


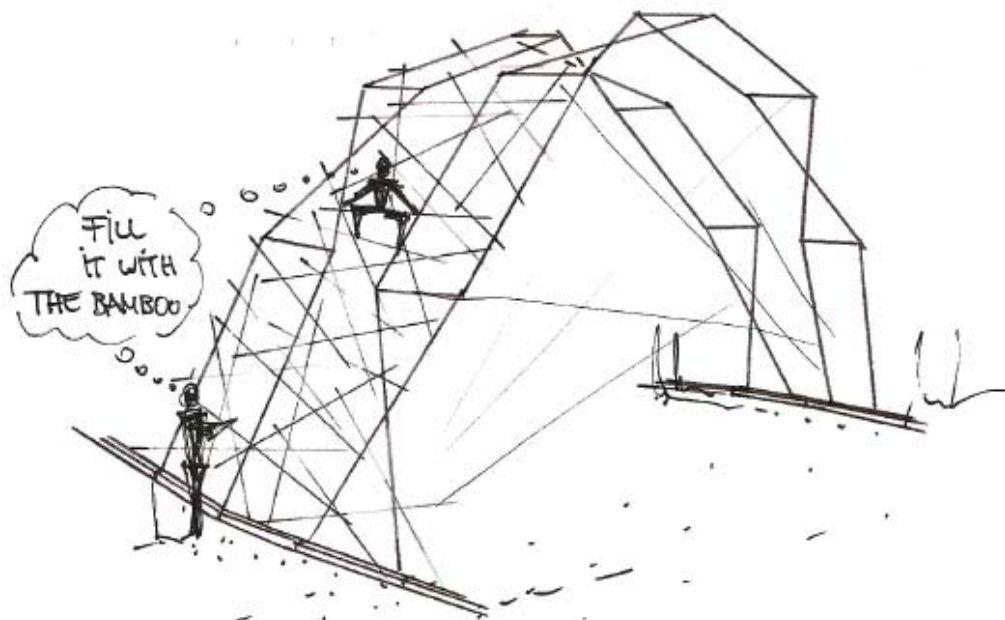
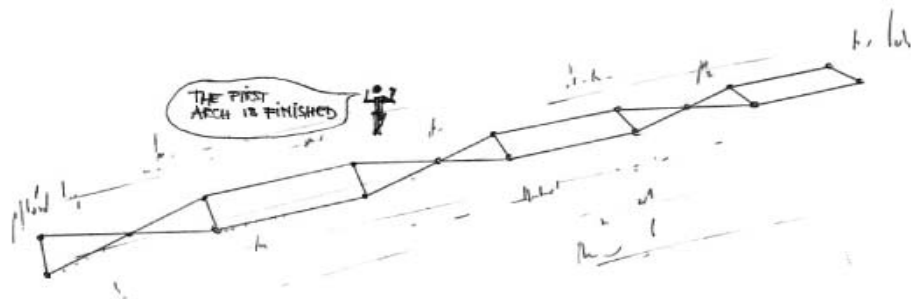


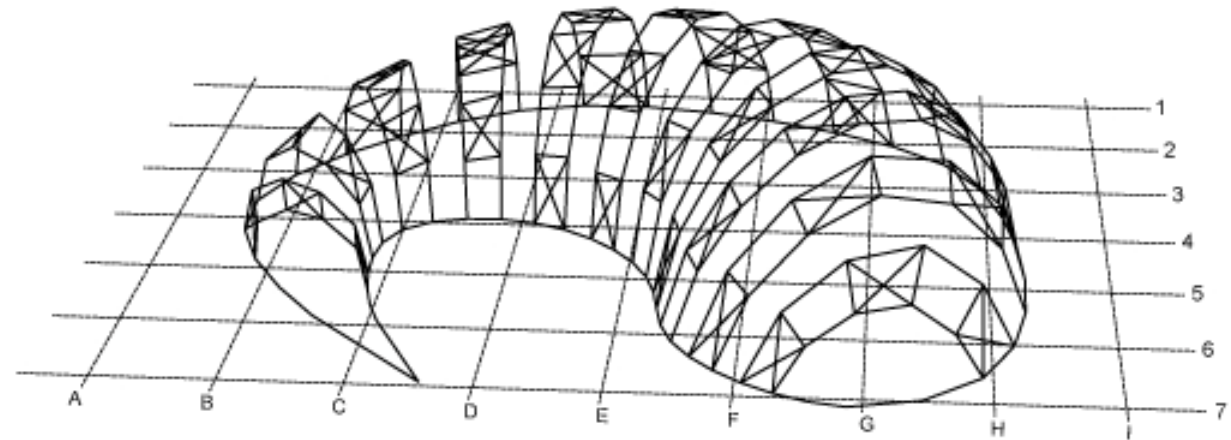
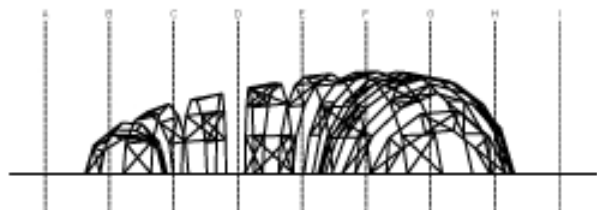
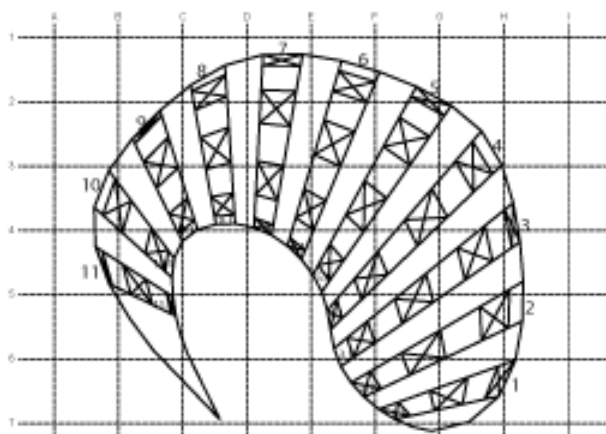


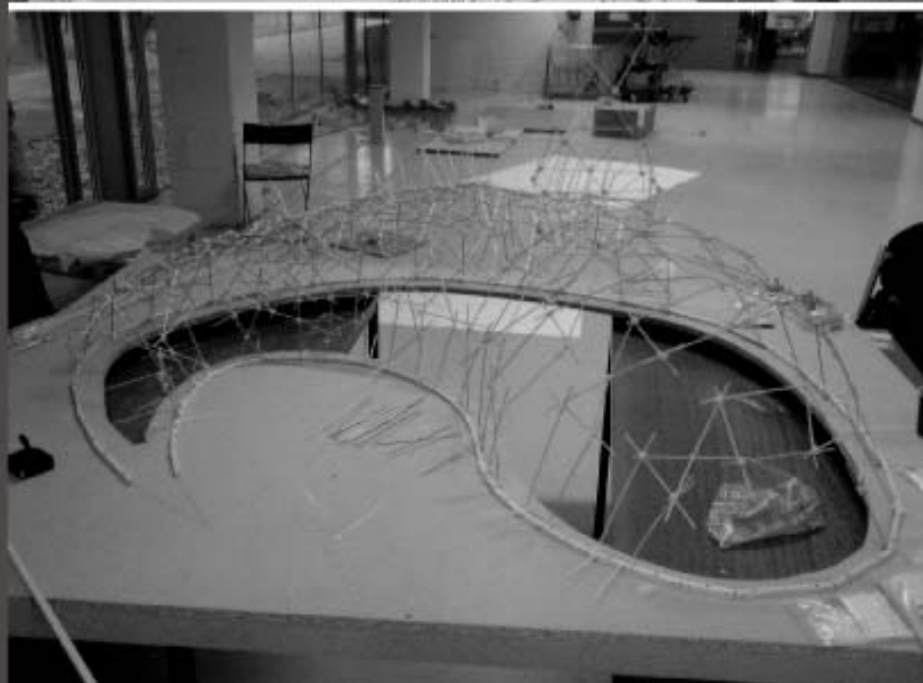


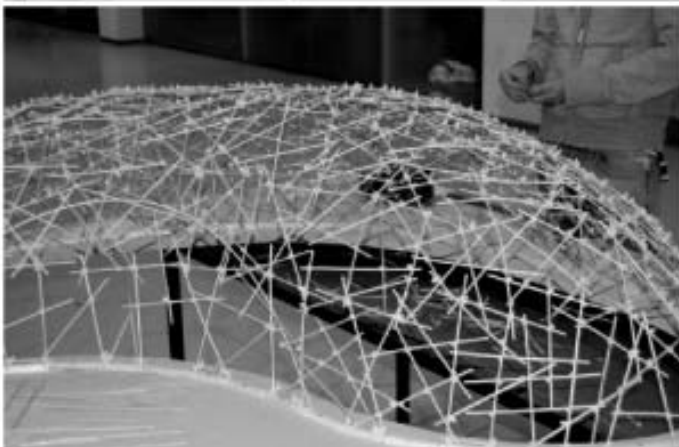
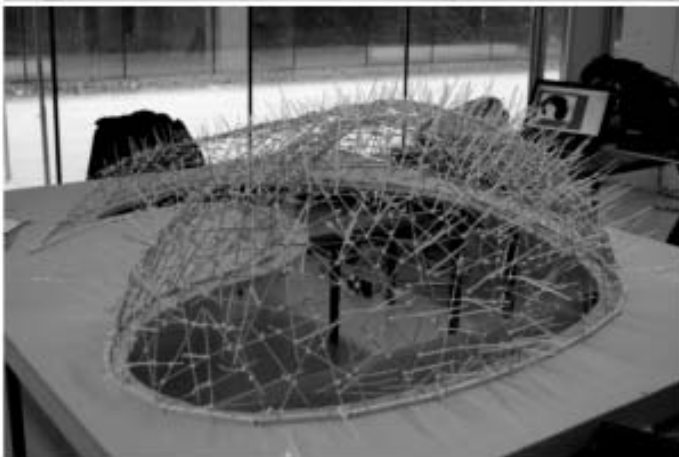
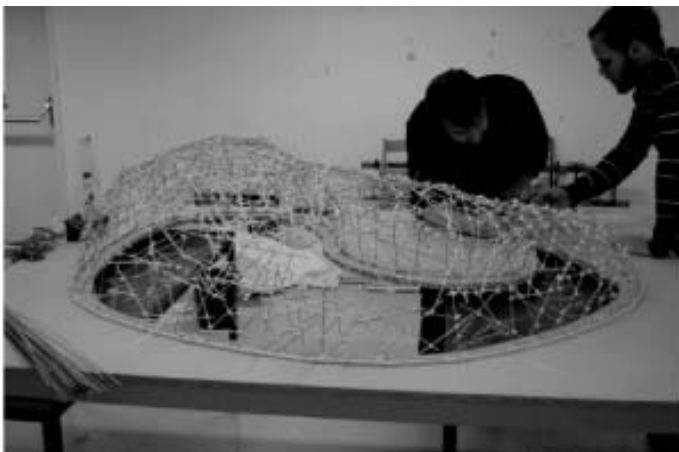
ABWICKLUNG - BÖGEN















Erection method

- installation of groundring on site
- arches prefabricated flat on the ground
- arches pushed into position on groundring, held by cables
- connection of arches with rod structure
- densification of rod structure until climbable
- montage of membrane
- adjusting high- and lowpoints of membrane
- suspension of membrane
- cleaning edges of membrane



































Use of Bamboo

- local bamboo (bambusa spec. in Sierra Leone),
3-5 year old
- cut at end of rain season, treated green, dried carefully
- bamboo treatment: “Vertical Soak Diffusion Method”,
Environmental Bamboo Foundation, Bali, Prof. W. Liese
with copper-chrome-boride-solution



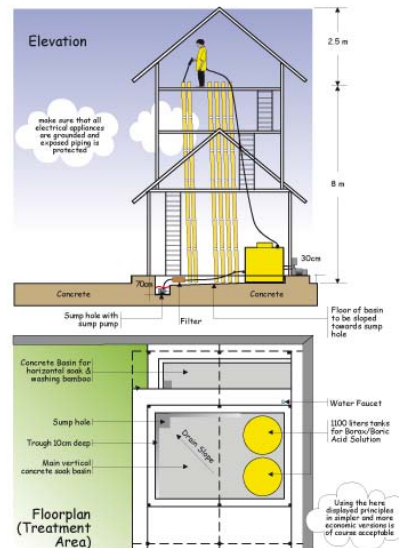
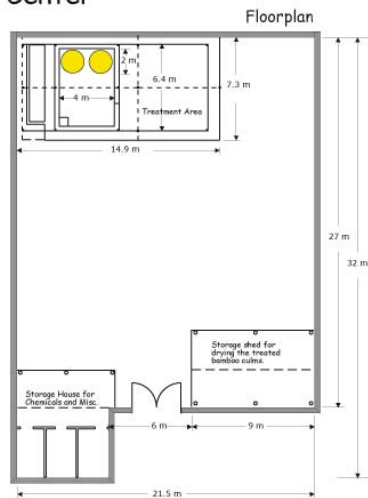
Vertical Soak Diffusion

for BAMBOO Preservation



ENVIRONMENTAL BAMBOO FOUNDATION

Planning a Treatment Center



Harvesting Bamboo



Wet Season



Dry Season

Harvest bamboo during the dry season

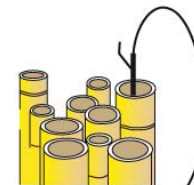
The best season for harvesting is after the rainy season when starch content in the bamboo sap is low. Starch is the favorite food for pests. Don't harvest during shooting season! Cut bamboo that is 3-5 years old. Bamboo older than 5 years is harder and the inner culm wall becomes impermeable to the BORAX BORIC ACID Solution.

There are 2 different ways to tell the age of bamboo culms:

- 1) Mostly, culms at the inside of a clump are the oldest.
- 2) Label the new shoots, this is the safest method.

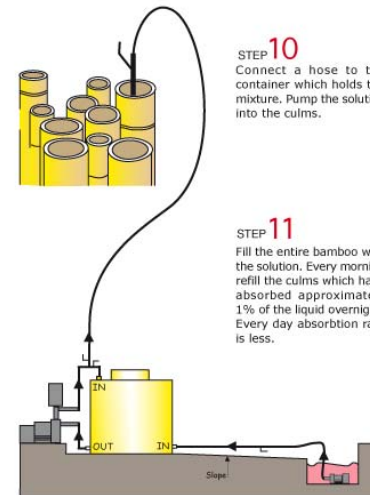


Treatment continued

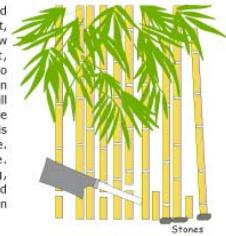


STEP 10
Connect a hose to the container which holds the mixture. Pump the solution into the culms.

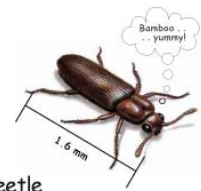
STEP 11
Fill the entire bamboo with the solution. Every morning refill the culms which have absorbed approximately 1% of the liquid overnight. Every day absorption rate is less.



The culms should be treated soon after having been cut, but can be left for a few days standing upright, placed on a stone. Due to the ongoing transpiration by the leaves the culm will lose some of its moisture and also starch, which is the food for the pest, i.e. the Powderpost Beetle. But don't wait too long, since moisture is required for the following diffusion process.



Stored bamboo is endangered by beetle infestation which can be recognized in the form of a talcum-like powder and small holes in the area of the nodes and along the internodes.



The Powderpost Beetle

STEP 12
On Day 13 don't add more solution. Allow the level to go down to avoid overflow when the last node is broken.

Calendar											
Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu
1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31					

NOTE:
The time required for complete penetration depends upon the culm wall thickness and its moisture

STEP 13
On Day 14, test check the culm by sawing off the upper internode. The fabric dye has now penetrated the culm walls sideways and colored them pinkish. Carefully carry the filled culm close to the sump hole and break the last node using a metal punch. Make sure you wear face protection. The diaphragms of large culms should be punctured by using the iron rod. The solution will now flow on the sloped basin floor into the sump hole.

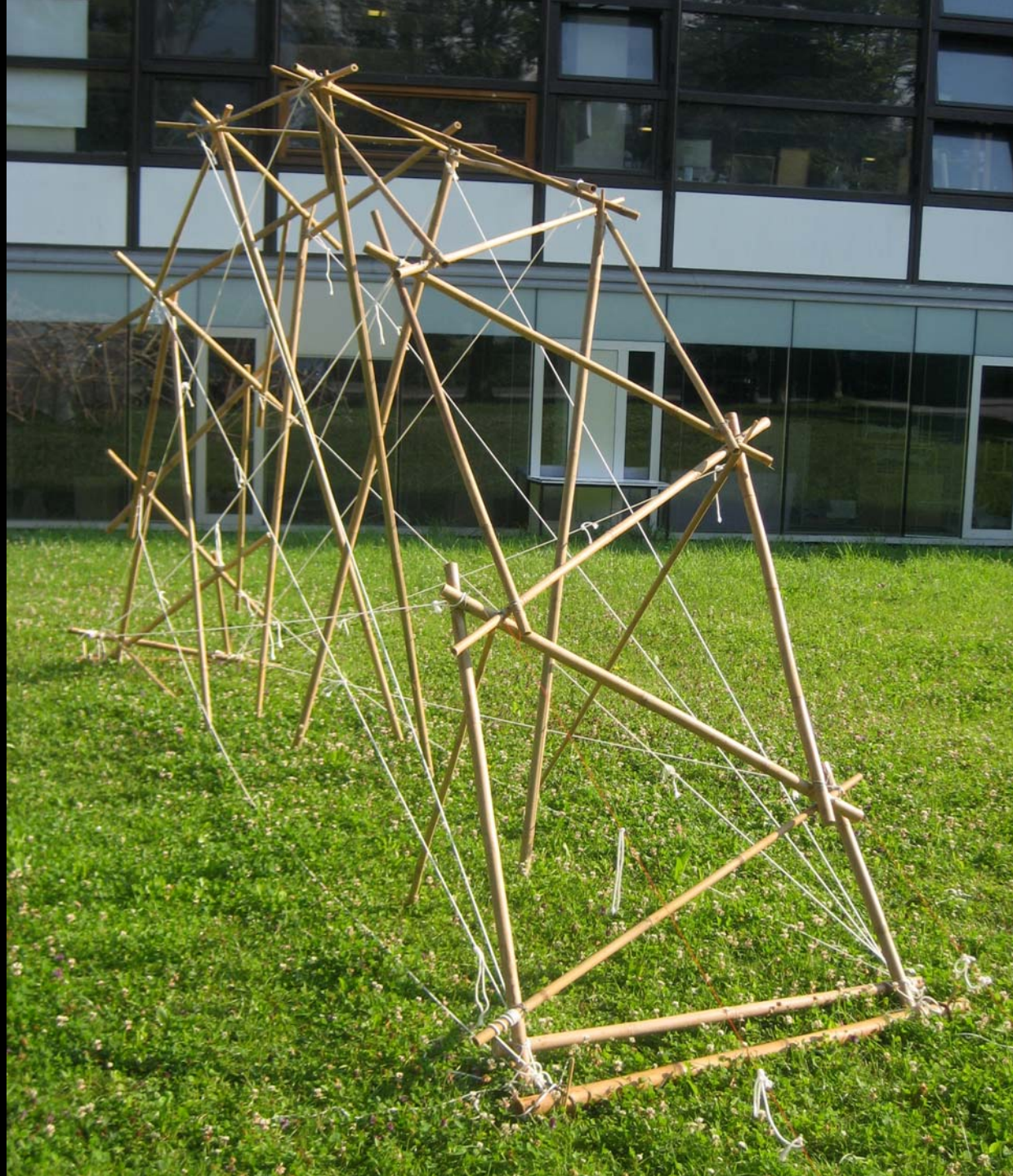




Details

- no contact to soil for bamboo protection
- connection of bamboo with UV-resistant PE-straps
- superelevation added on structure to allow slight sinking of structure
- improvement of arch geometry
- small hitches cut into bamboo at knots of arches to prevent slipping and control shape









Conclusion

- design idea evolving from spacial aspects is structurally sensible solution
- each model study brought new insights, integrated into building system
- build up system developed at scale 1:20 could be tested and improved in experimental structure 1:3
- elaborated experimental structure will erected this year
- preservation and final solution for footpoints will be applied at scale 1:1

Acknowledgements

Tutors

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Nicole Zahner, Dipl.-Bauing. ETH, StudioC, Berlin, Germany

Prof. Dr. Drs. h.c. Walter Liese, Department of Wood Science, University Hamburg, Germany

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