Plybamboo wallpanels for housing

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Content

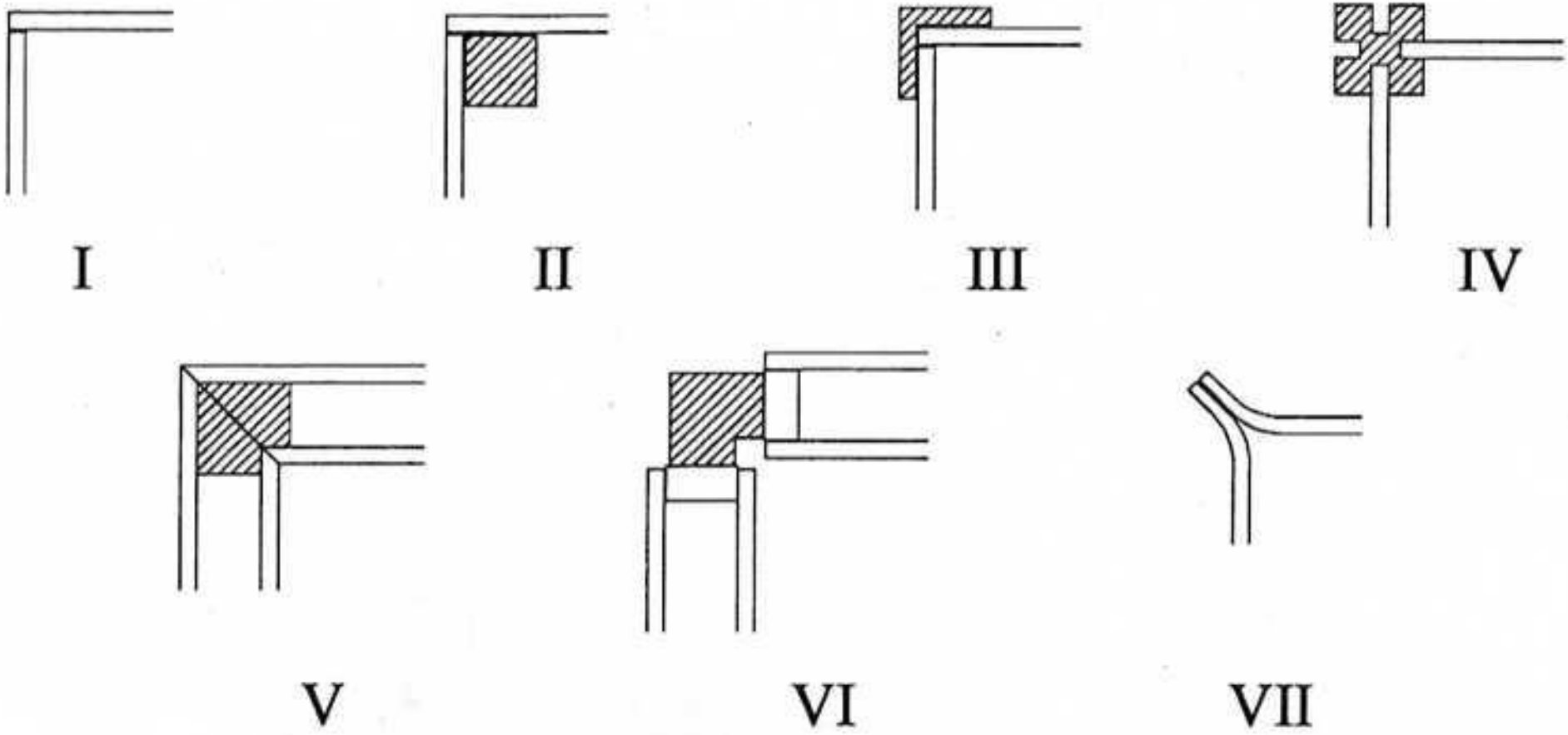
- 1. Research on plybamboo panels for housing (Dr. Guillermo Gonzalez)
- 2. Bamboo and wood based panels in Europe.

Housing design method

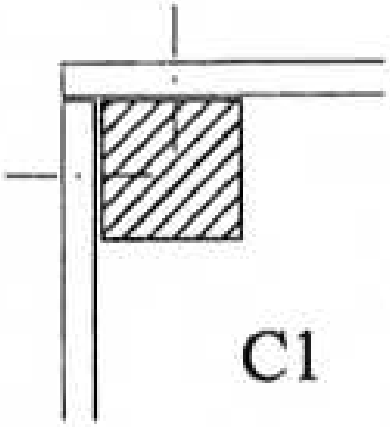
- A theoretical framework, taking into account a.o.:
- Hurricanes, earthquake, impact;
- Sun, airflow, heat, rain, sound, fire;
- Termites, fungus, etc.;
- Durability, maintenance;
- Each gets a weight in the decision process.

Selection of joints

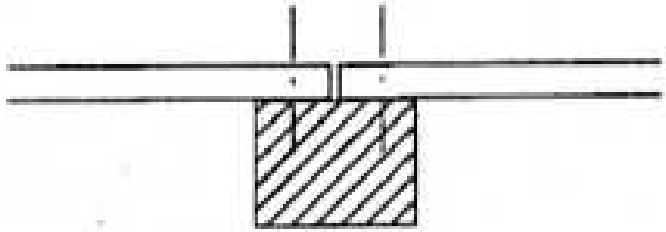
- Many joints from literature selected. How to join flat sheets or boards in corner joints, T-joints or parallel?


I
II
III
IV
V
VI
VII

- Using the design method, and adding a weight for each factor, three joints have been selected, of which one became the first:



C1



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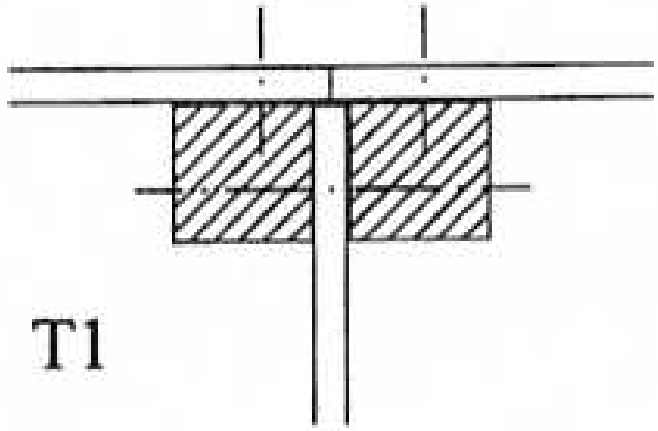
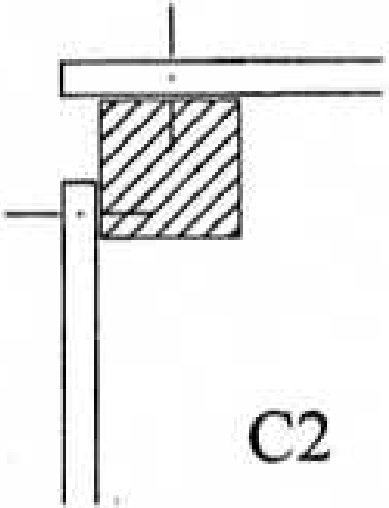
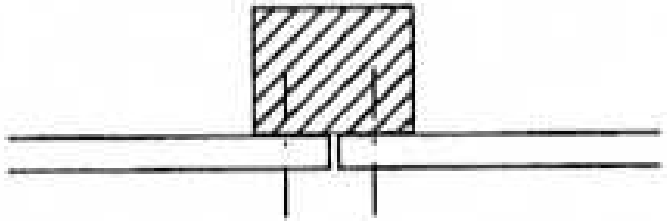


T1



C2



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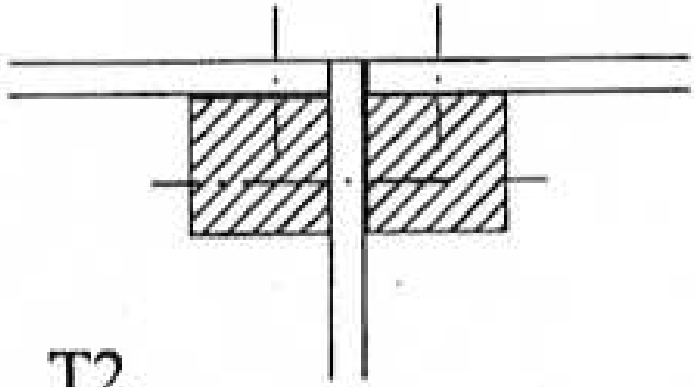
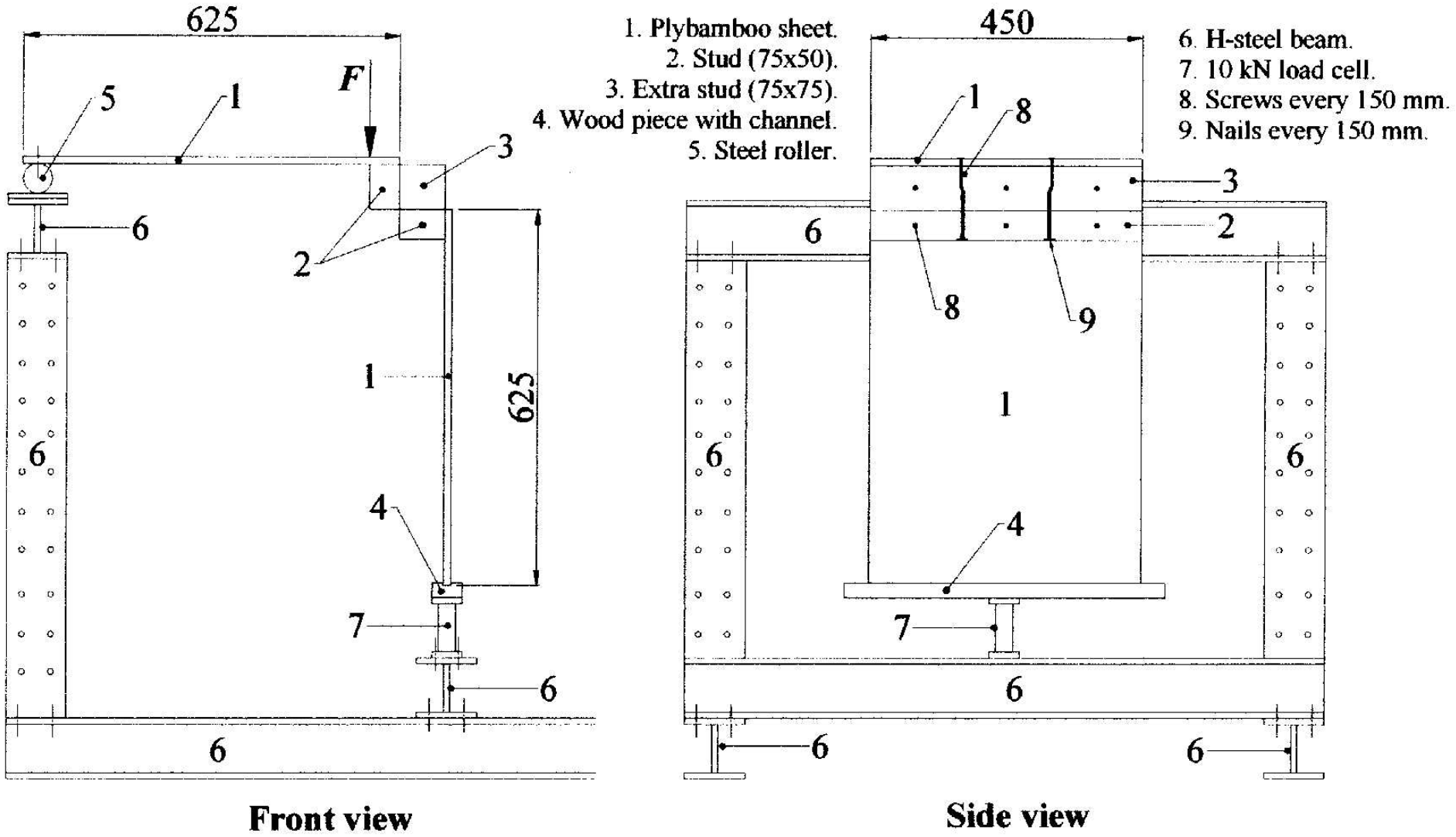
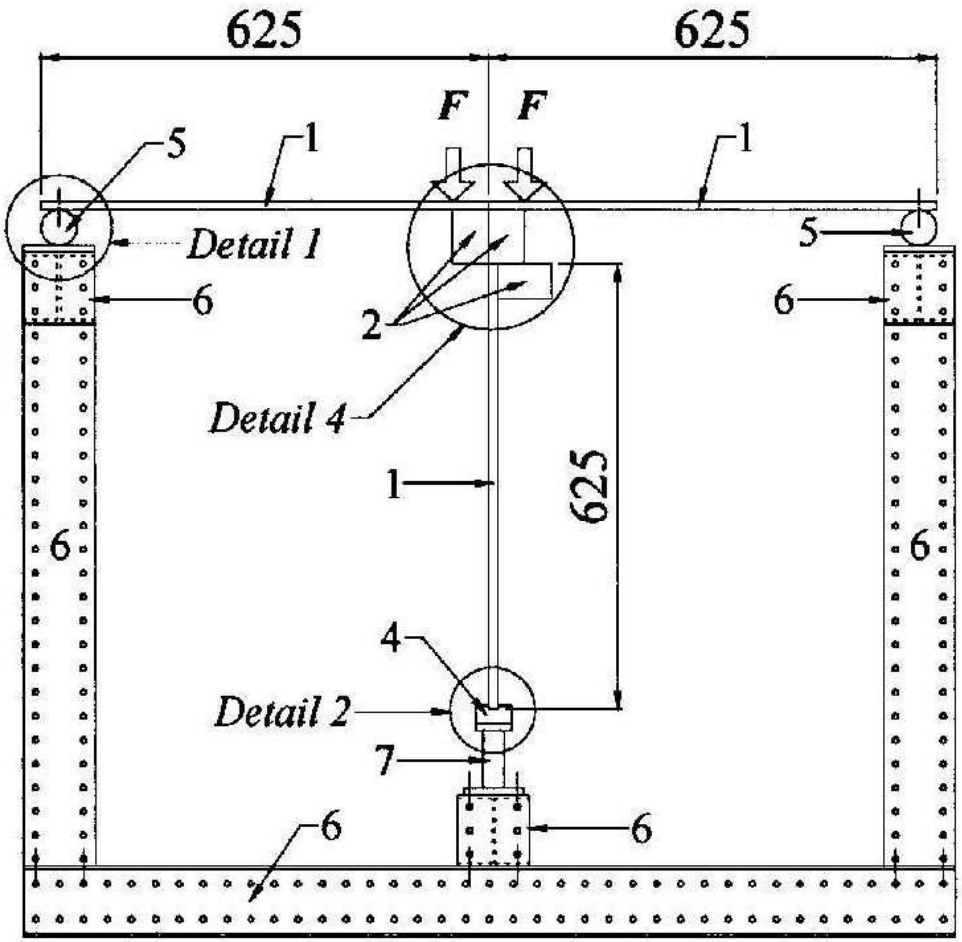


T2

Materials and tests

- Materials: bamboo mat board (India) and bamboo strip board (China); material properties tested.
- Joints: tests on corner and T joints on strength and deformation.


1. Plybamboo sheet.
2. Stud (75x50).
3. Extra stud (75x75).
4. Wood piece with channel.
5. Steel roller.
6. H-steel beam.
7. 10 kN load cell.
8. Screws every 150 mm.
9. Nails every 150 mm.
625
F
450
625
Front view
Side view

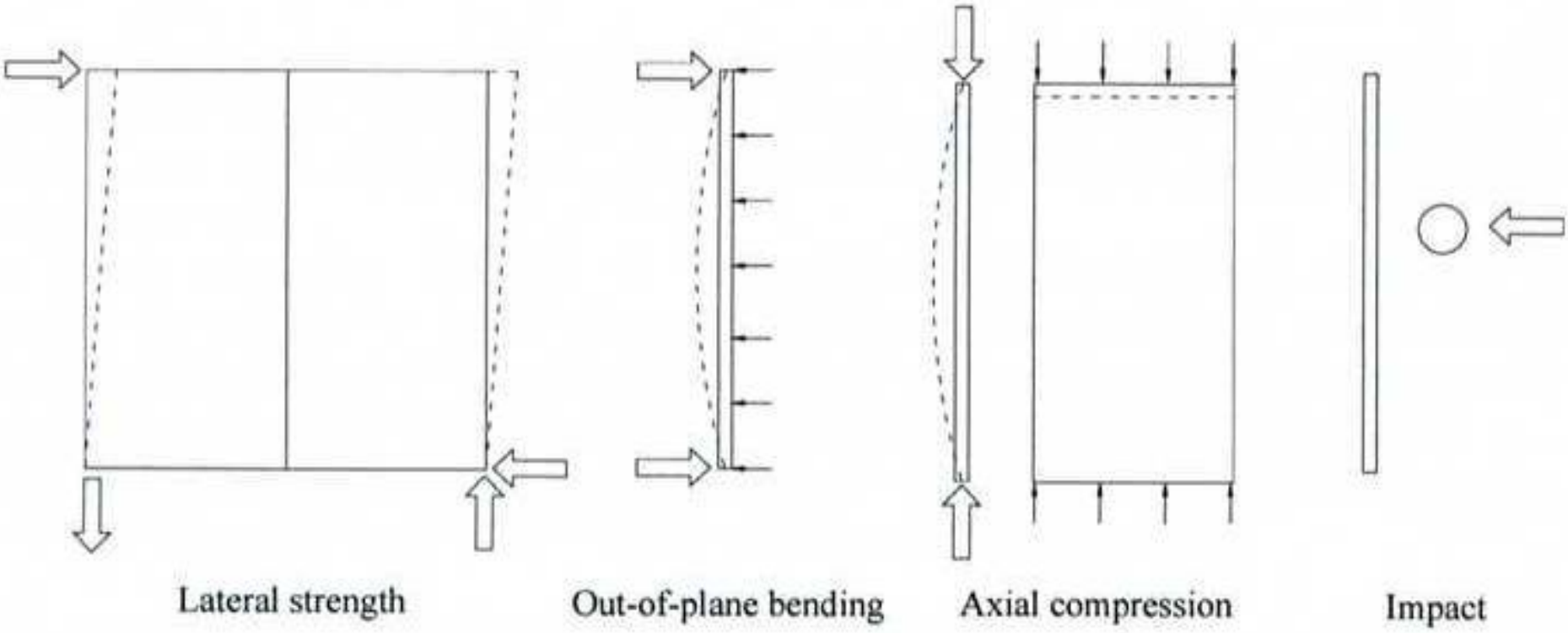


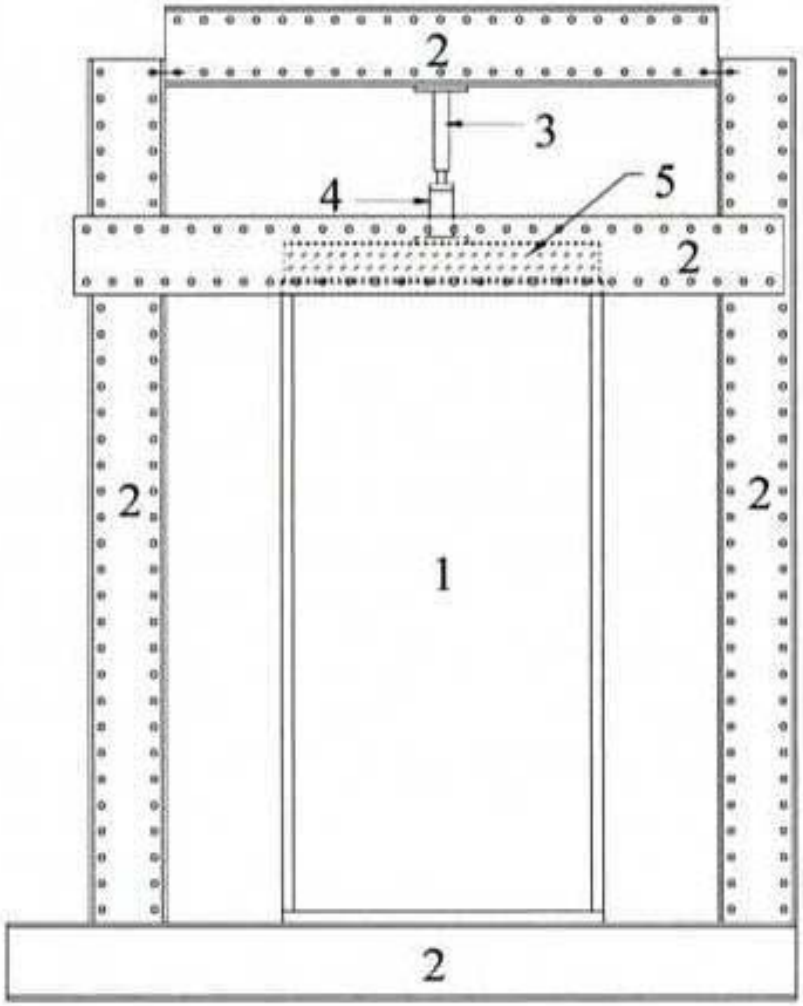
(a) Front view

1. Plybamboo sheet.
2. Stud (75×50 mm).
4. Wood piece.
5. Steel roller.
6. HE 300.
7. Load cell (10 kN).
8. Screws (5×50 mm), spaced at 150 mm on center.
9. Nails (4×90 mm), spaced at 150 mm on center.
12. Loading steel plate.
13. Steel tube, 5 mm thickness, 50 mm external diameter.

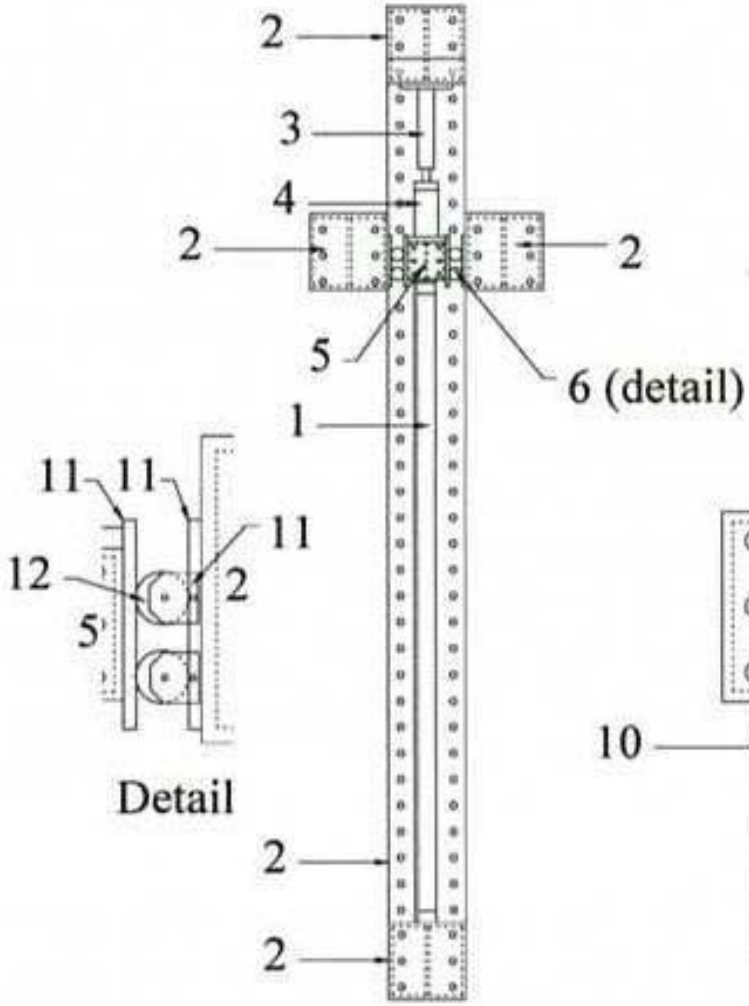
Detail 1, 2 and side view, see Figure 5-1.

- After these tests on joints: tests on wallpanels: four load cases:
- lateral strength (shear wall),
- out-of-plane bending (wind),
- axial compression (roof on top),
- impact (burglary).


Lateral strength
Out-of-plane bending
Axial compression
Impact

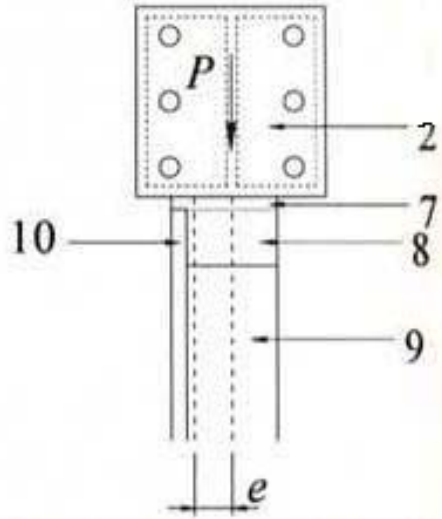


Front view



Side view

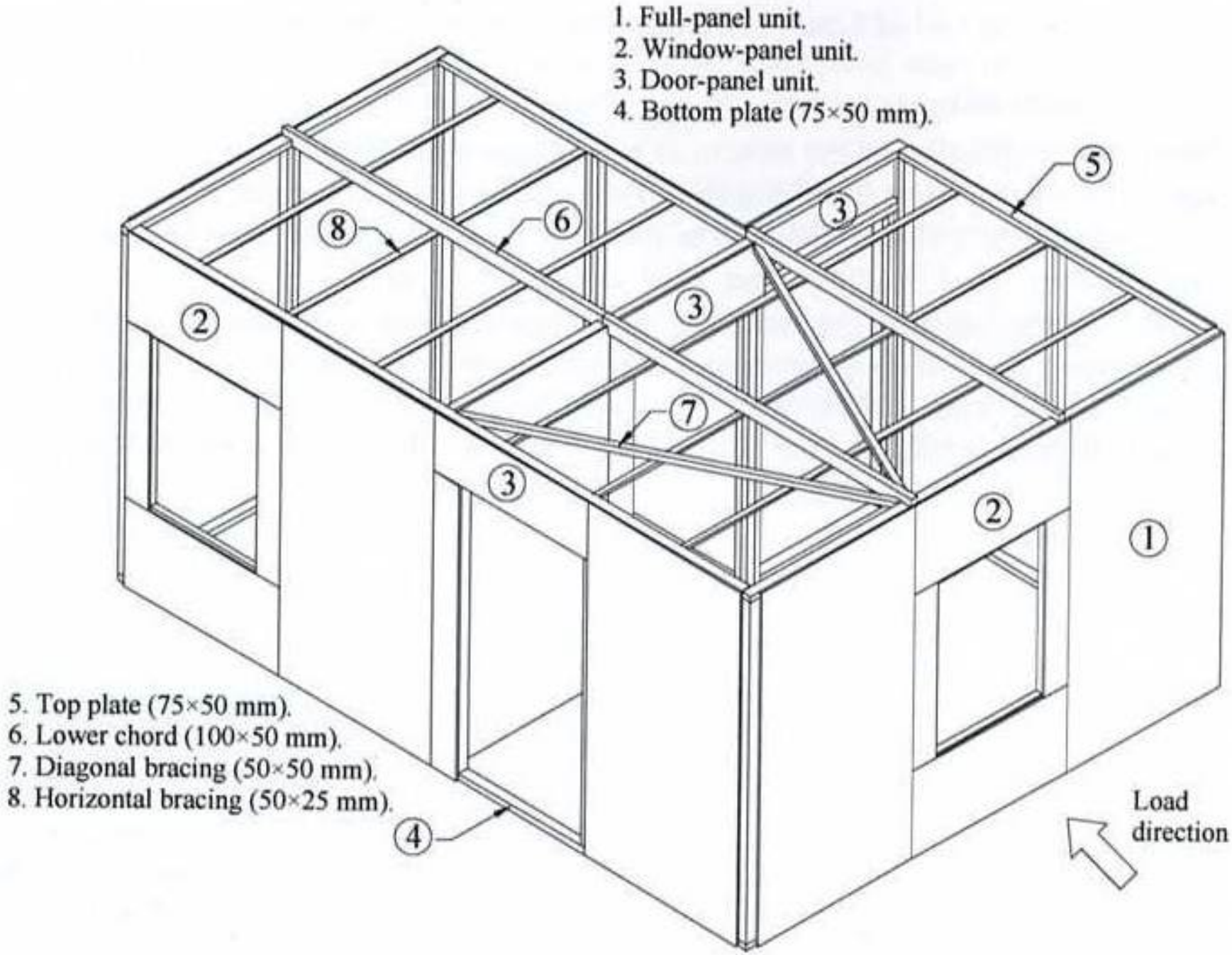
Detail



Detail of eccentric loading

1. Test specimen.
2. HE 300.
3. Hydraulic jack
4. 80 kN load cell
5. HE 160.
6. Steel plate and rollers (see detail).
7. Soft material.
8. Top plate.
9. Stud.
10. Plybamboo sheet.
11. Steel plate
12. Steel roller.

Tests on full house


1. Full-panel unit.
2. Window-panel unit.
3. Door-panel unit.
4. Bottom plate (75×50 mm).
5. Top plate (75×50 mm).
6. Lower chord (100×50 mm).
7. Diagonal bracing (50×50 mm).
8. Horizontal bracing (50×25 mm).
Load direction

Part 2: bamboo and wood based panels in Europe.

- The theme of this symposium is: prefab module housing from bamboo based panels. Even for wood based panels this is a very small market in Europe. I suggest to take two steps: first enter the market for boards and panels for floors and roofs with bamboo based panels, and once this is a success, try prefab housing.

Market data

- Export from The Netherlands, 2004.

Category	in m3	1000 EUR
Plywood	46.800	26.700
Chipboard/OSB	470.000	60.000
Fibreboard	199.200	58.900
Veneer	9.500	11.800

- Total about EUR 157 million!

- Export even to bamboo growing countries: Malaysia, Thailand, Vietnam, Hong Kong, China!Imagine if we could penetrate this market with bamboo, even for a few percent. Countries like Germany have a similar market.

Bamboo is green

- This is a strong argument towards the general public. However we will need a certification system like for tropical hardwood.

Prices to beat

Type	price EUR/m2
for concrete formwork	3.75
OSB	5.15
Plywood 6 mm	6.13
Idem 25 mm	21.11
Chipboard 10 mm	1.82
idem 25 mm	3.78

Standards to meet

- The best way to enter the market with bamboo based products is if they meet the requirements from European standards for wood based products. We have to find a consultant who knows these standards and who can help us to perform the needed tests and no more.

The way to do it

- Germany organizes in October 2005 the “European wood days” in Tokyo and Beijing! They are very active in wood export. Let us learn from them.

Conclusion.

- This second part, how incomplete the data were, did show the potential of the market for wood based panels in Europe, and some ideas how to enter this market with bamboo based panels and boards.

- Thank you.

- this first part was not only a research report, but it was also a complete design methodology, apt for different climates