Can prefabricated methods help enable natural construction materials to go mainstream in Ireland?

IGBC Presentation

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WHO AM I?

WHAT IS MY RESEARCH?

- Irish commitments for energy performance of buildings and CO2 emissions reduction
- Current state of natural building in Ireland
- Barriers to be overcome to enable natural building to develop on a large MAINSTREAM scale
- Whether prefabricated methods could help increase the use of natural materials

WHY AM I DOING THIS?

- Energy performance requirements increasingly stringent throughout Europe
- Current construction sector is dominated by mainstream approach

BUT WITH ENVIRONMENTAL IMPLICATIONS

THE ALTERNATIVE?

Building with natural materials, products & systems in construction

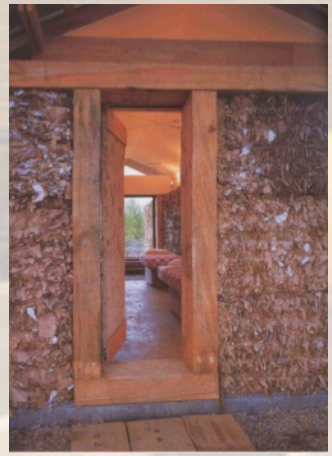
- natural materials: what is the definition? From biological sources, no or very low environmental impact, carbon neutral or negative, Production/processing is low energy, little or no pollution, ideally from renewable sources

- Also may have material properties for regulating moisture and temperature : healthier indoor air environments

- Includes: strawbale, hemplime/hempcrete, cob, earth shelter, woodfibre, hemp fibre, flax, sheep's wool, bamboo, cork, timber, clay, cellulose (& maybe bioplastics?)

A FEW EXAMPLES

Hemp wall



Timber frame w
Recyled fibre infill

Cob wall

Timber frame w
Strawbale infill

Bamboo structure

BUT…natural building is a fringe market

PREFABRICATED METHODS WITH NATURAL MATERIALS

WHY IS IT A FRINGE MARKET?

For a variety of reasons including

- Cost
- Availability of materials
- Skill & expertise within construction industry
- Certification of products

But the main reason? PERCEPTION & UNDERSTANDING

- Historical mistrust
- Lack of or inhibitive government policy
- Lack of specification guidelines
- Incorrect application methods: Negative experiences on site and post-occupancy
- bad press

IS THERE A SOLUTION?

Prefabrication might work here:

Reasons

- Efficiency in production & installation
- Off-site factory conditions mean Quality control
- Advances Thermal performance with closed panel Systems
- Encouragement of local sourcing/local industry – reducing import of materials & products

Reasons Particular to Ireland:

- Would facilitate large scale production to meet housing need
- Would promote development of green industry
- Would achieve cost-optimisation of building systems through design & construction
- Would promote new areas of industry = create jobs

R & D: natural & prefab worldwide on strawbale & hemplime

Previous Supporting research and development

- BRE Centre for Innovative Construction Materials (Univ of Bath) - PSB & PHL and low carbon materials/systems
- Chris Magwood/Naturebuilt (Canada) - PSB
- Tom Woolley – independent research on low impact building, natural materials partic hempcrete
- Ian Pritchett/Greencore – Hemplime construction
- Jim Carfrae (Univ of Plymouth) - strawbale construction
- ARCO$_2$ – architects specialising in PSB
- White Design - architects specialising in PSB
- Make Design - PSB
- Michelle Kaufman Architects (US) – green prefab

Industry examples:

- Modcell, Ecofab, Greencore + Naturebuilt (CA), Strobouw (NL), Huff&Puff (AUS)
- HempSec Ltd - PHL
- Herbert Gruber – PSB (AS)
- Niall Crosson (IR)- natural materials supplier (Ecological Building Systems)
- Chris Brookman (UK) – natural materials supplier (Back to Earth)
- R&D in other european countries and US, Canada & China,
- Design/build Case studies

EXAMPLES of natural prefab strawbale UK

Lilac housing Leeds by Modcell

Modcell panel in factory

Nottingham University Gateway building
by Make Architects & Modcell

Site construction of school by Ecofab

EXAMPLES of natural prefab hemplime UK

Wine society building Stevenage
By Lime Technology/Tradical

Hemline panel by Lime technology

M & S panel installation

M & S on site

M & S in Cheshire by Lime Technology

EXAMPLES of natural prefab worldwide

Endeavor centre prefab strawbale by Naturebuilt, Ontario

Rotterdam house by Stroubouw

Sit-ups prefab strawbale construction by Huff & Puff, Australia

Hempcrete block winery, France

PREFABRICATED METHODS WITH NATURAL MATERIALS

EXAMPLES of natural prefab in Ireland

Contractors making timber frame prefab:
Shoalwater Timber frame
Timbertech Homes

Architects specifying natural prefab:
Solearth Donaghy Dimond
Helena Fitzgerald Sheehan & Barry

Examples courtesy of Niall Crosson, Ecological Building systems

NEVERTHELESS, THERE IS STILL A PROBLEM…

It's STILL a niche market!

- Still No CE Certification (although it has BM Trada and Passivhaus certification)
- Lack of Investment in research & development
- No standardisation and limited guidance on specification
- Building regs: no approved technical details

WHAT ARE THE BARRIERS TO NATURAL PREFAB HERE? CAN THEY BE OVERCOME?

- Perception of natural materials by industry and public
- Design community attitudes & priorities
- Policy influence
- Infrastructural challenges facing a new industry
- challenges to acquire Insurance cover & mortgage lending for natural builders/ developers
- Further research needed:
  - To investigate Supply chain of natural materials in prefab systems
  - To analyse manufacturing processes: limitations & improvements for this type of system
  - To develop better design details and establish DfD strategies

MY RESEARCH APPROACH

criteria of assessment of natural and natural prefab construction : 10 Questions

1. Usability – how complex is the building method?

2. Technical feasibility – how much infrastructure is required? What is available already?

3. Resources – what do we have? What do we need? How can we establish local sources?

4. Know how – is there a skilled workforce? What knowledge/expertise is lacking? How to increase expertise? for designers and builders?

5. Economics – is the building method financially feasible? What investment required?

6. Cost – is the building method affordable for clients?

7. Longevity – what is the life expectancy of the building method? Is it reparable?

8. Adaptability – is there potential for “Design for Deconstruction” and re-use?

9. public awareness & perception – what are the problems? How difficult to overcome?

10. Policies, Regulations & certification – what policies encourage and what discourage the use of the building method? What changes are required?

FEEDBACK & SUGGESTIONS?

What are the potential scenarios for natural building in Ireland?

Will prefabricated construction provide the best route to large scale natural building?

I will be conducting a survey about these issues as part of my research and would gratefully appreciate participation – please let me know if I can contact you!

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THANK YOU