Sally Starbuck: Gaïa Ecotecture

AECB building knowledge

THE ROYAL INSTITUTE OF THE ARCHITECTS OF IRELAND FOUNDED 1839

- ***"The Stone Age did not end because we humans ran out of stones. It also follows that the Oil Age will not end because we ran out of oil." Paul Hawken***

<u>Which technique will go on to define our epoch?</u>

Ecology shows, it is healthy for any system to foster <u>diversity</u>

"You never change things by fighting the existing reality.

To change something, build a new model that makes the existing model obsolete."

Buckminster Fuller

Ecotecture - ***balances powerful, often conflicting, elements including energy conservation***
- transfiguration of the brief, to excite and motivate.
- low-energy/ low carbon, robust, resilient (low maintenance) systems.
- to optimise in accordance with the brief & site, the energy use, daylighting, natural ventilation, healthy materials for indoor air quality, colour theory.

Min. environmental impact by buildings, transport, water & wastewater treatment (very high energy consumption).

Gaïa ethos is informing, without relying on any dogma

Affordability - capital costs,
- primary energy/ running costs. NETT!

Transition from - petrochemically derived raw materials,
- rare earth minerals
- fossil fuels

IAQ

Fine control of humidity, air temperature, CO2, reduction of outside noise and draughts for the user, with security - hardware to suit- optimal aperture within the first 50mm of opening

Internal finishes

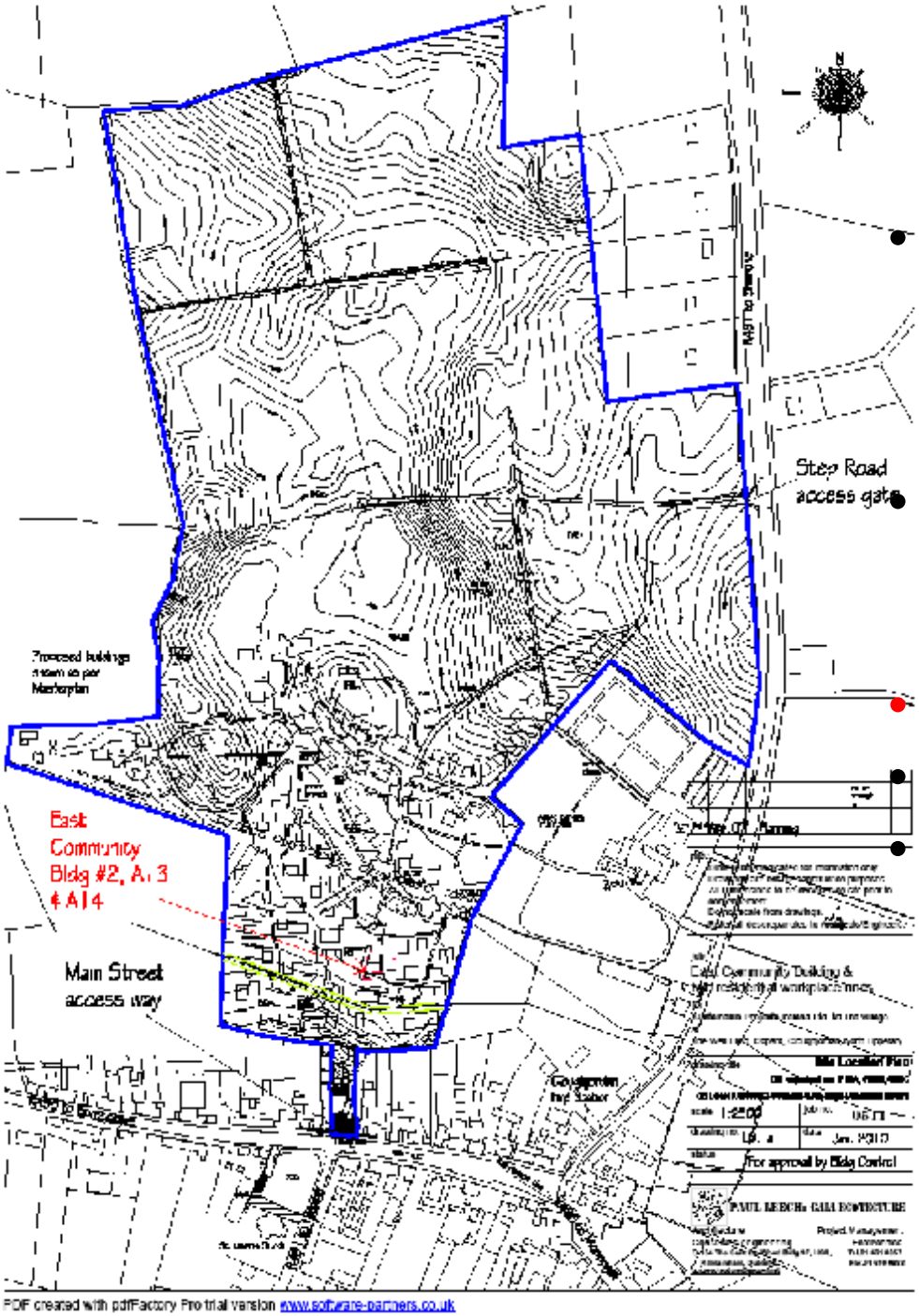
- ***Capacity of building … materials to absorb and release moisture has a significant effect on indoor humidity fluctuations … (with) consequences for moisture damage and dampness.***
- ***Moisture buffering effects are especially strong at low ventilation rates (Kurnitski et al., 2007)***
- ***… recent general trend has been towards buildings with significantly lower moisture capacity, …, together with generally reduced ventilation rates…prevalence of…problems***

Linking rural sustainability to local economy

Sustainable rural development in scenic areas:

eg. ecological architecture for The Village project, Cloughjordan, Co. Tipperary, Ireland.

<www.thevillage.ie>



Gaïa ecotecture

The Village project
Sustainable Projects Ireland Ltd,

Cloughjordan, Co Tipperary

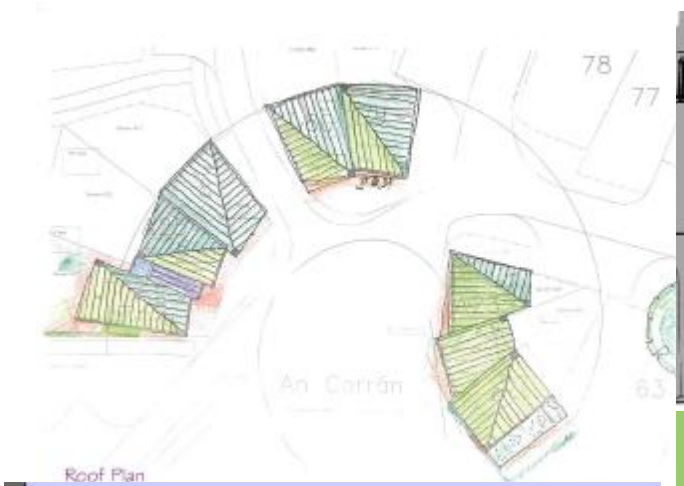
Community Building,
10 no Live-Work
& 3 no residential units

Paul Leech: Gaïa ecotecture

- ***Timber frame, post & beam***
- ***3-storey***
- ***Hemp-lime stair detail approved for Fire Safety certificate.***
- ***Material of LIMITED Combustibility***

Community Building & 2 live-work units

Paul Leech: Gaïa ecotecture



- ***Site specific design, local conditions and micro-climate…***
- ***digital modeling, software…***
- ***Solar orientation,/ occupancy patterns,***
- ***Wind shelter,***
- ***Noise & Acoustics,***
- ***Activity***

An Corran, 8 Live-work units & 2 apartments

Paul Leech: GAIA ecotecture

- ***Timber frame***
- ***Render finishes***
- ***Hemplime walling for workshops on Ground floor level***
- ***3 bed residential unit on 2 upper floors***
- ***IAQ, vapour control, Fire resistance, energy performance, Noise-transfer & Acoustics,***
- ***Micro-brewery emits Carbon Dioxide needed to cure hempcrete***

An Corran orient; 2 Live-work units & 1 architects' abode!

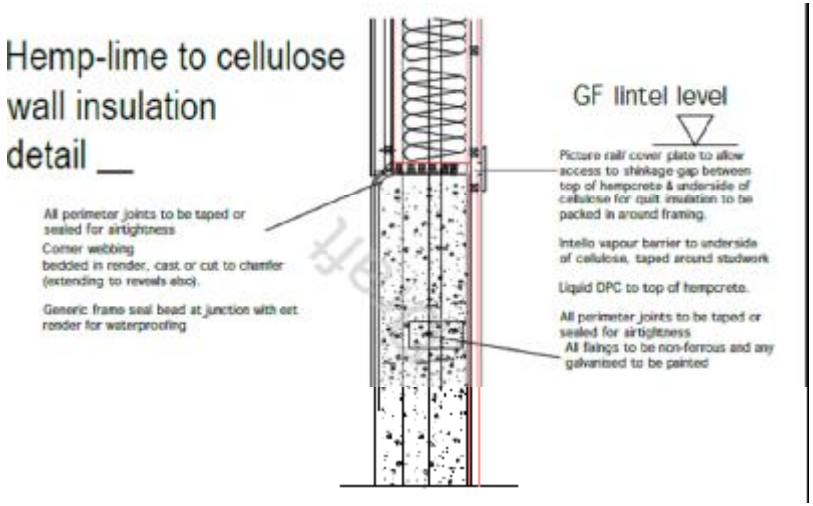
Casting Hemp-limecrete, Mar.'13

" Hemp-limecrete wall infill is not affected detrimentally by frosty conditions during curing

(< 5 degrees C & -5 overnight)***:***

- ***Material will remain firm, solid & surface dry by the wind.***
- ***Low temperatures will not affect the resistive integrity of the material.***
- ***The inner core will be as the day it was cast, unchanged.***
- ***Tap surface to test the walling has not suffered damage."***

Hemp-lime scratch coat & lime render Sept.'13



Structural ope cut in June to template of window frame.

"At DPC level expanded metal lath or a trowel full of scratch hemplime plaster would solve any rigidity issues and is very little extra work.

Top of the hemplime wall at interface with the cellulose:

- ***2-3 mm of ordinary hydrated lime as an interface desiccant & sterilant or vermiculite.***

Paul Leech: Gaïa ecotecture

East side more sheltered,
to be painted this Summer;
curing/ drying slower……

…cue, snail

@ end Aug. darker still 34% MC within 15mm of surface on the N & NW-facing (most sheltered) walls.

West side, dry, white and friable before rendering.

Paul Leech: Gaïa ecotecture

North and west facades – exposed,

Deterioration with splashback off gravel surfaces (level to be reduced)

Target < 70 KW/hrs/m2/yr Delivered Energy

Paul Leech: Gaïa ecotecture

West side – exposed

surface scratched by Holly

160sqm each over 3 storeys
External Walls 0.18 U-value

Paul Leech: Gaïa ecotecture

West side – exposed surface damaged by hail stones

To be rubbed-up again in better weather ,
then painted this Summer;

- ***To allow everything to be well carbonated***

before the Keim is applied... **…. Charcoal colour TBC**

Case study

Five other hemp buildings at The Village Cloughjordan, Co. Tipperary

i) Semi-detached site facing south:

West side, timber frame with hemplime render [needing limewash!]

East side, hemplime walling...

Case study

Five other hemp buildings at The Village Cloughjordan, Co. Tipperary

i)East façade relatively sheltered. Outside painted at end of summer, in best condition on most exposed facades

Case study

Five other hemp buildings at The Village Cloughjordan, Co. Tipperary

i) Casting of hemplime walling with electrical conduit cast in on permananent shuttering....

successful... no mice, unlike nextdoor!

Case study

Five other hemp buildings at The Village Cloughjordan, Co. Tipperary

i) Clay hemp mix internal plaster on permanent shuttering, some peeling where painted too quickly inside.

Case study

Five other hemp buildings at The Village Cloughjordan, Co. Tipperary

ii) Hemplime walling to 3 storey house
Mix wetted too much but not well-compacted either; huge shrinkage at all interfaces
Wallplate left exposed by ~ 100mm.
Poor airtightness performance for MVHR

Case study

Five other hemp buildings at The Village Cloughjordan, Co. Tipperary

ii) Hemplime walling
Painted too soon?

[Other Lime Cob hemp render mixes' problems with mineral stains need a good breathable paint.]

Case study

Five other hemp buildings at The Village Cloughjordan, Co. Tipperary

ii) Detached house, 2 storey, 4 bedrooms, total floor area of 170m2

300mm thick hemcrete walls cast using lightweight plastic shuttering took 2 weeks to complete

U-Value 0.22 W/sqm.k

Air Tightness Test on the House achieved a value of 1.12m3(m2.hr)

41.5 KW/hrs/m2/yr Delivered Energy

67.25 KW/hrs/m2/yr Primary energy

Case study

Five other hemp buildings at The Village Cloughjordan, Co. Tipperary

iii) Timber frame with hemp-limecrete, unpainted Self built.

[iv) Neighbour was cast too quickly so mineral leaching a problem]

Expression

ECO-TECTURE

a new 'vernacular',

will look different...

eg. Unite D'habiaition, Marseille,

by Le Corbusier

Form language /
Timely way of building...