





**European Regional Development Fund** 

# The monitoring





**HUDSON** Architects

## Why monitor?

Many of the main aims of the CobBauge project are to produce homes/buildings that:

- Simple to construct and require little energy in their construction
- Are comfortable over summer and winter periods
- Use little energy in use

Therefore 3 different types of monitoring are necessary to benchmark the performance of the buildings as built and the construction process.

## The monitoring

#### • 3 phases :

- During building construction
- Building use (internal space measurements)
- Energy (for heating and hot water)



Traditional method of cob construction showing mixing, placing material on the wall, compaction by treading and paring back the wall face.

Keefe, L. Devon Earth Building Association



www.shieldguardinspections.com



https://www.haringey.gov.uk/environme nt-and-waste/going-green/energy

### **Building construction monitoring**

Time-lapse videos

→Communication tool
→CobBauge building techniques

Weather station

→ Parameters: wind, rain, temperature, period of sunshine

 $\rightarrow$ Influence on building parameters





### **Building construction monitoring**

#### • Wall moisture

→Parameters: Two mixes, depth
→Influence of weather and wall aspect

#### • Shrinkage

- → Parameters: Two mixes, drying
- $\rightarrow$ Influence of weather and wall aspect







### **Building construction monitoring**

- Feedback from contractors concerning:
  - Quantities of materials used
  - The building methods
  - Any particular issues encountered
  - Feedback concerning costs and ways of making the process more affordable



#### • Inside environment

→Parameters: temperature, relative humidity, air quality (VOCs, particulates)
 →Influence of weather and human activity





#### • Thermal imaging

 $\rightarrow$ Assess the presence of thermal bridges



1900's Solid Stone wall.

1700's Cob on low stone wall.

Measurement of thermal performance of the walls and co-heating test

 $\rightarrow$ Measure the thermal conductivity in situ and amount of overall heat lost





From BSRIA, bsria.co.uk

• Air tightness

 $\rightarrow$  Blower door used to obtain appropriate air infiltration data.

• Acoustic comfort

→ Measurements to BS 8233 – Guidance on sound insulation and noise reduction for buildings, 2014, using appropriate sections





#### How do we use the monitoring data?

All this information and data will enable the CobBauge project to determine:

- The energy "conventional" consumption used in the regulation :
   → Regulations items: heating, cooling, hot water production, lighting and auxiliaries
   → Primary energy
  - →Calculated consumption in climatic conditions, occupancy and use of the conventional building defined by regulations
- The energy estimated consumption to fit to each project :
  - →Climatic conditions adjusted
  - $\rightarrow$ Occupation scenarios
  - →Future users impact
  - →Estimated consumption of "non-regulatory" items

#### How do we use the monitoring data?

All this information and data will enable the CobBauge project to optimise:

- How the designs/material provides buildings with low energy consumption
- The way in which the building provide good thermal comfort
- The relationship between building performance and ensuring that CobBauge meets the requirements of the building regulations

#### How do we use the monitoring data?

All this information and data will enable the CobBauge project to optimise:

- The construction process, in relation to speed, quality assurance and adaptability to different regional demands
- The ability of minimise the cost of these buildings
- The features that any occupants/clients/contractors/designers/engineers agree are important

#### How can we explain the monitoring data?

- Development a laboratory experimental apparatus to measure heat transfer and vapor water diffusion through the optimal cob mix.
- Modelling of Cob building heat transfer and performance under different climate conditions.

#### Experimental set up of heat transfer and water vapor diffusion through cob mix



#### Modelling : water vapor diffusion

- Study the water transfer from the outdoor climate to the indoor cob building.
- Estimate the amount of water absorbed by the cob wall.
- Estimation of cob building annual performance.

