



CULLEN
CONSERVATION

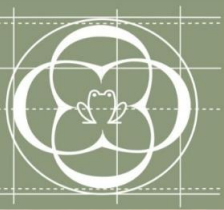


Best Practice Energy Efficiency in Historic Buildings

*Presentation for the Hofburg 8th European Congress
on the Use, Management & Conservation of Buildings of
Historical Value*

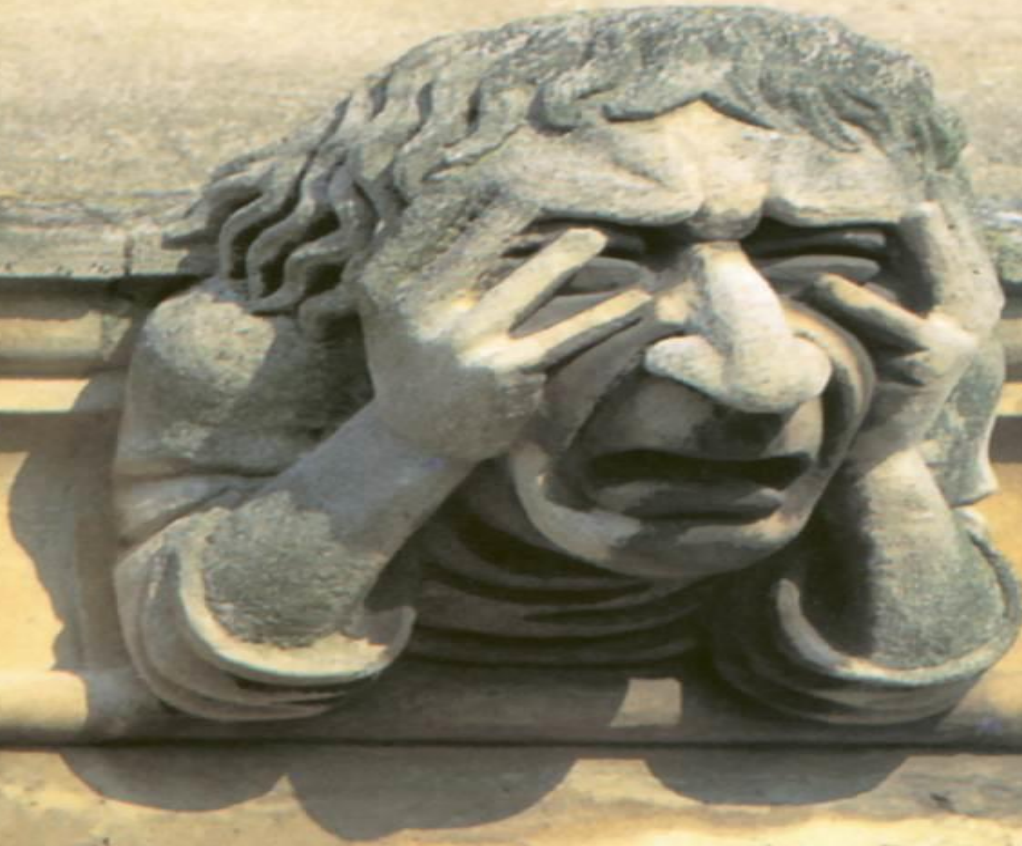
Wednesday 16th October 2019

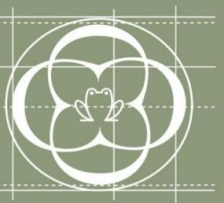
**Rory Cullen MSc (Bldg Cons), IHBC, FCIQB, Certified Heritage Expert
Director, Cullen Conservation**



CULLEN
CONSERVATION

Is it *really* as hard as this?





Useful References

STBA

SUSTAINABLE TRADITIONAL BUILDINGS ALLIANCE

Created to promote a better understanding and more informed approach to traditional buildings by both mainstream and heritage crafts and professions

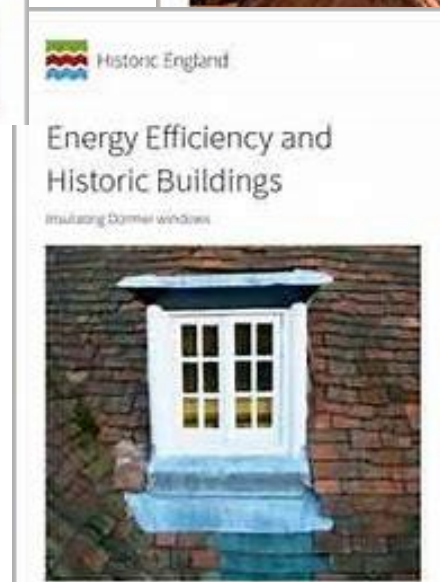
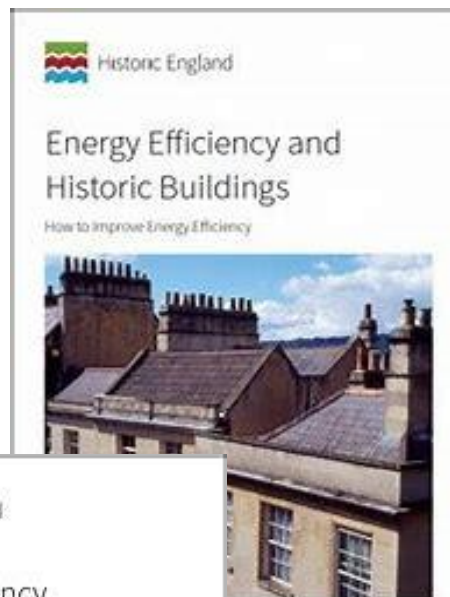
Aims:

- To identify what knowledge exists
- To assess knowledge quality
- To undertake a gap analysis & to identify actions needed to fill gaps/ uplift quality
- To recommend a risk analysis approach

www.retrofitbuildings.com



Useful References





Energy Efficiency

- Energy saving should be promoted in everyday activities
- Consider the simple 'quick wins' first
- Wherever possible, fossil fuels should be replaced with cleaner or renewable sources such as hydro, solar & wood fuel





Sustainability Principles

- Sustain the cause - sustain the assets - *forever, for everyone*
- Live frugally, enjoy life but within our planet's means
- Do as you would be done by - be ethical, responsible, accountable
- Live off the interest, not off the capital (natural, human, social, cultural, financial)
- Light on your feet - be innovative & creative, adaptive & responsive, fit for the future
- Learn from the past



CULLEN
CONSERVATION

It's a Conservation Balance

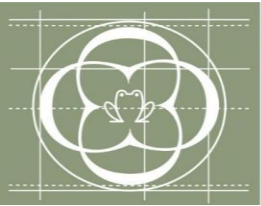
The Society for the Protection of Ancient Buildings (SPAB)

Founded by William Morris in 1877 to counteract the highly destructive 'restoration' of medieval buildings by Victorian Architects.

Guided by the following principles:

- Repair not restore
- Respect for age
- Complement not imitate
- Fit new to old
- Essential works only
- Integrity
- Workmanship & use of traditional materials
- Regular maintenance
- Documentation

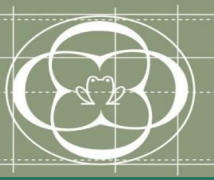




CULLEN
CONSERVATION

How to get it wrong....

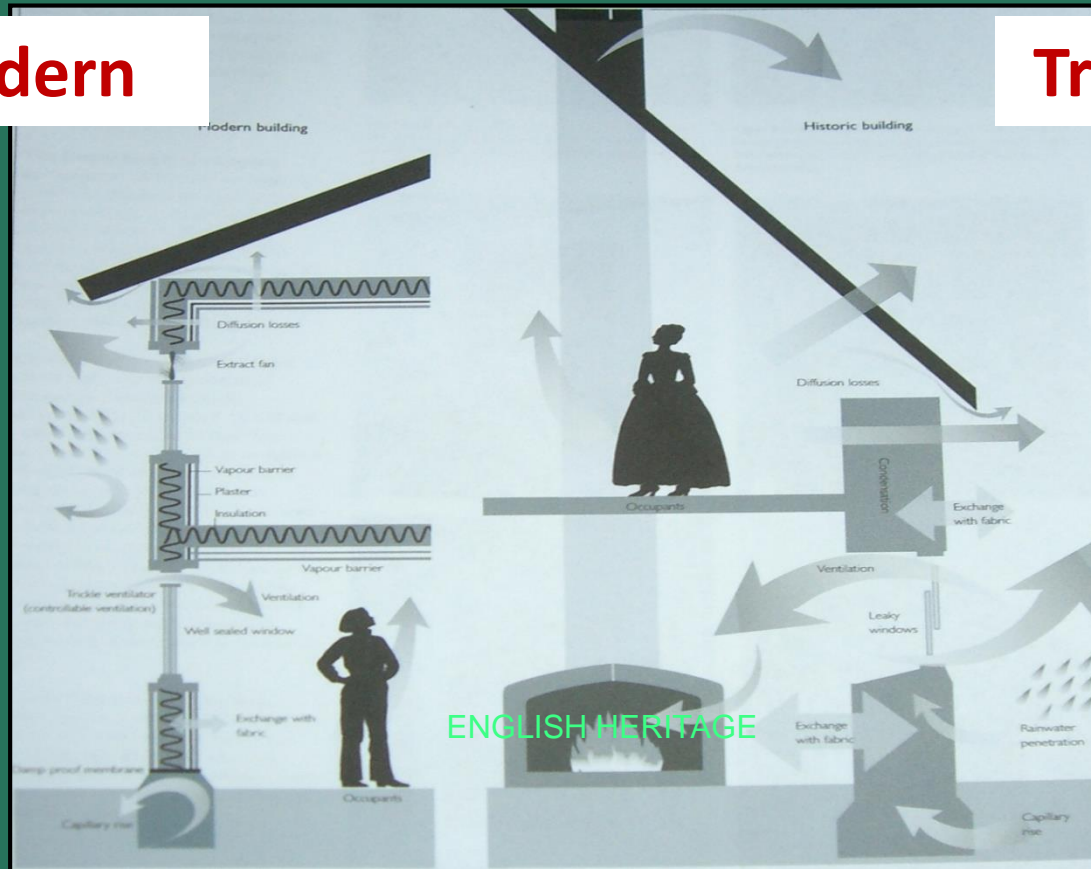




The issue - understanding how buildings perform

Modern

Traditional



but this is not understood by most people, even Contractors



National Trust 'Bronze Standards'

Reduction of carbon emissions by improving the environmental performance of traditional buildings

- **Low cost, relatively unobtrusive & therefore feasible for most existing buildings**
- **Incorporated into buildings during repainting/ refurbishment works & Short Term Cyclical (STC) programmes over the course of five years**
- **Many buildings will already have some of these measures in place**



Priority 1

- Maximum roof insulation
- Draught proofing

Priority 2

- Water-saving measures (eg water meters, flow controllers, leakage prevention, low-flow taps, low-volume flush cisterns, and low-water use showers)
- Rainwater storage, re-use of underground cisterns etc

Priority 3

- Efficient boilers
- Heating controls (eg Thermostatic Radiator Valves)
- Efficient lighting systems (eg. passive infrared (PIR) controlled, low energy, zoned, etc.)
- Wood burning stoves
- Standards specific to retail/ catering outlets (eg ventilation systems with heat recycling units, smaller dish washers, efficient energy rated appliances etc)



Draught Proofing

DRAUGHT PROOFING SASH WINDOWS

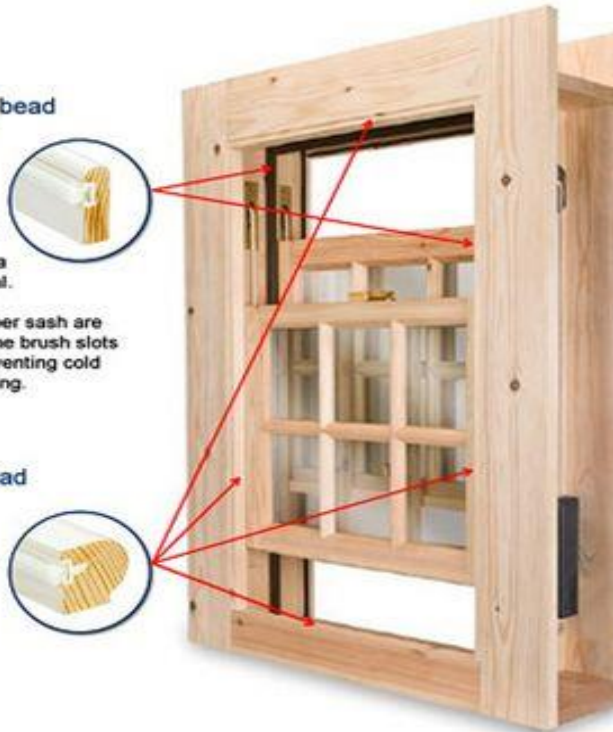
Timber Parting bead with pile

The parting bead prevents lower and upper sash from touching and forms a draught proofing seal.

When lower and upper sash are in closed position, the brush slots into the groove, preventing cold draughts from entering.

Timber Staff bead with pile

The staff bead also prevents draughts

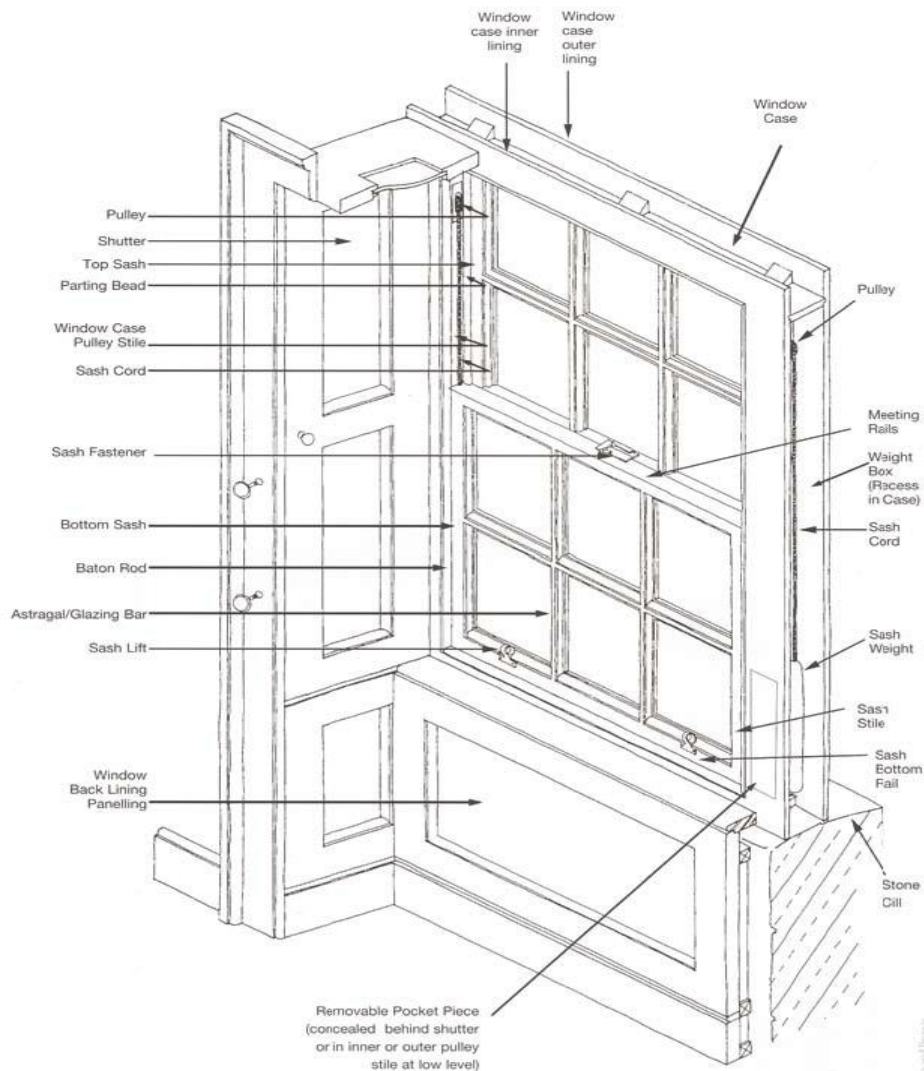




But understand how it works first.....



Sash weight exposed after removal of 'pocket piece'



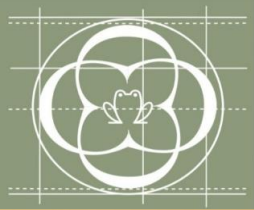


CULLEN
CONSERVATION

Energy Saving Lights



Value the aesthetics

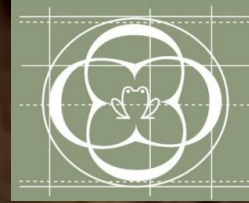


CULLEN
CONSERVATION

Internal insulation

The Devil is in the detail.....

Internal insulation



CULLEN
CONSERVATION



Beware of natural fibre insulation (Sheepswool)



CULLEN
CONSERVATION



National
Trust

Sustainable technology case study

- heating system review
- improvements to controls
- natural insulation and draught-proofing



Heating controls

Reducing energy wastage in holiday cottages
November 2009



National
Trust

Sustainable technology
case study

50kW woodchip boiler

Replacement for oil
heating system
2005-06



System details

■ **Woodchip boiler 50kW Binder.**

Woodchip is supplied by the Ysbyty estate and is stored in barns at the back of the buildings. The system is also backed up by a small boiler, which is sometimes used in the summer for its quicker response times and smaller heating requirement.



CULLEN
CONSERVATION



National
Trust

Sustainable technology
case study

Photo Voltaics

PV array installed on the
roof of a Grade I listed
building, 2008



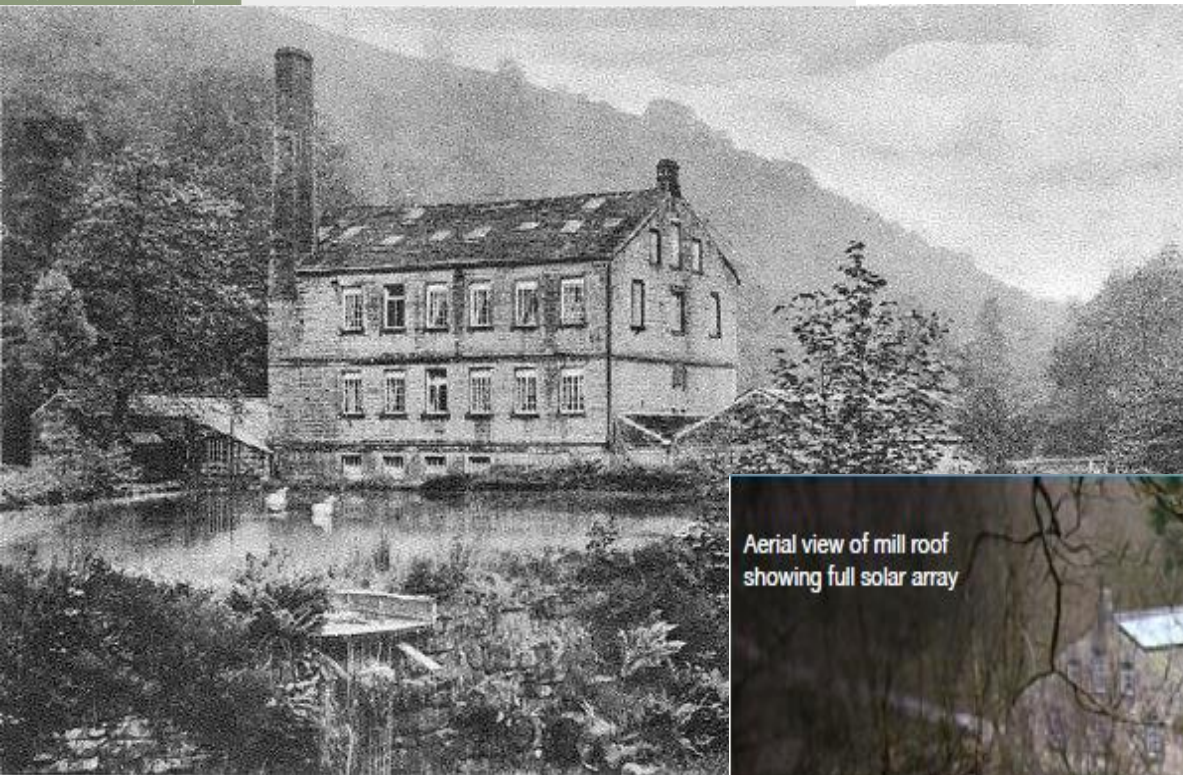
Dunster Castle,
Somerset

System details

- **PV Cells** 24 Sanyo HIP-215NHE5 photo-voltaic panels generating 3,081 kilowatt-hours (kWh) per year. 20 Year performance warranty.
- **Inverter** Fronius IG20 grid connector inverter. Two year warranty.
- **Circuit breaker** 20A Type B miniature circuit breaker.



CULLEN
CONSERVATION



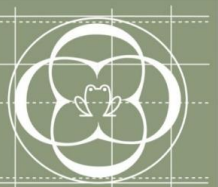
Gibson Mill

Before



Aerial view of mill roof
showing full solar array

After



CULLEN
CONSERVATION

Potential Technologies

Solar Slate Microgeneration at Kynance Cove, West Cornwall



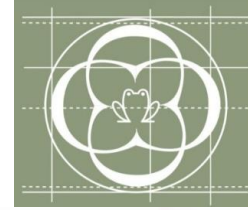
Running costs reduced at remote
Café using renewable technology



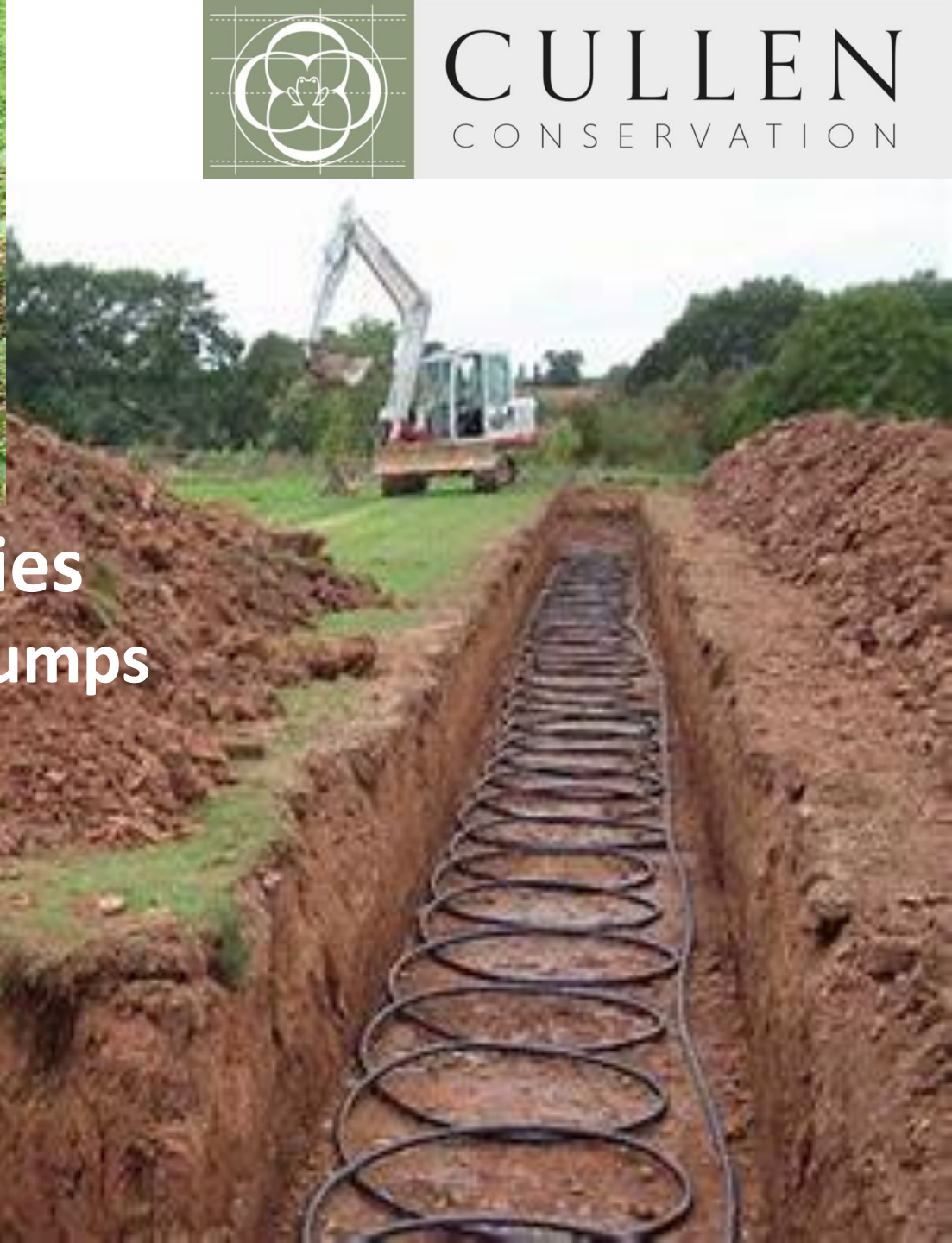


CULLEN
CONSERVATION



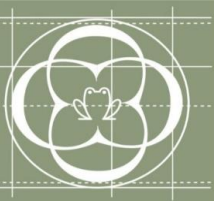


CULLEN
CONSERVATION



Potential Technologies Ground Source Heat Pumps

Consider the Archaeology



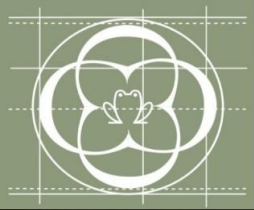
CULLEN
CONSERVATION

Potential Technologies

Air Source Heat Pumps

Consider the aesthetics





CULLEN
CONSERVATION

Secondary Glazing

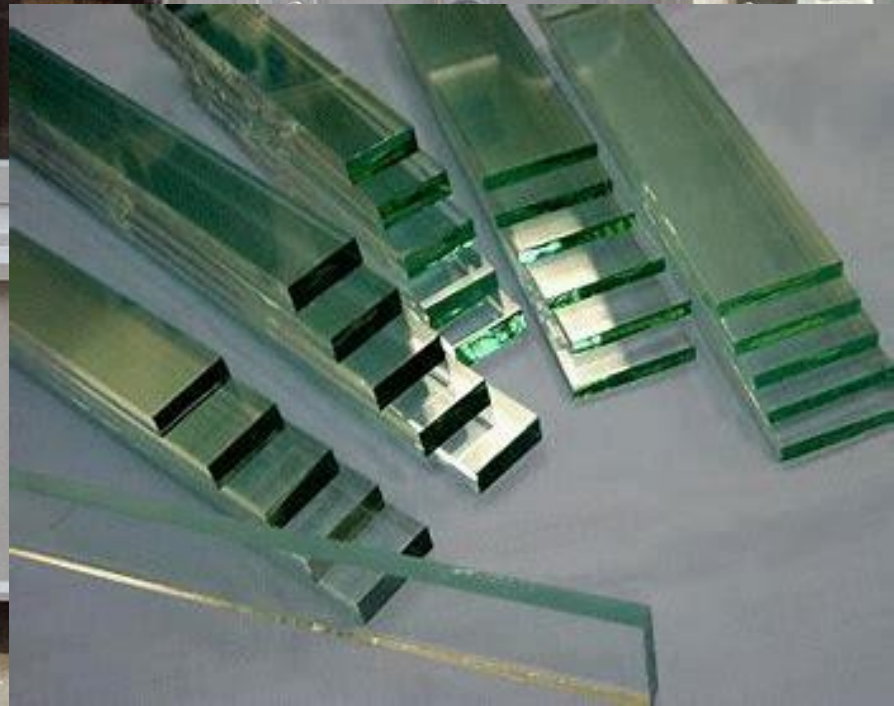
Consider the design

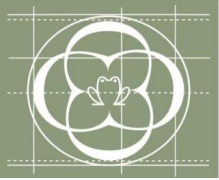


CULLEN
CONSERVATION



Histoglass





Potential Technologies



- Wind turbines
- Hydro
- 'Green' roofs
- Waterless urinals
- Rainwater Harvesting
- District Heating Systems

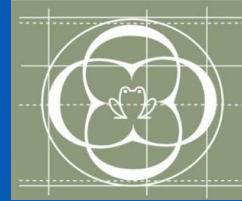


CULLEN
CONSERVATION

External insulation



DON'T DO IT!



Energy Efficiency - Now & in the Future

Opportunities:

- User culture
- Monitoring (smart metering, performance benchmarking etc)
- On-site generation
- Carbon trading
- DO THE SIMPLE THINGS FIRST



CULLEN
CONSERVATION



**Rory Cullen MSc (Bldg Cons), FCIOB, IHBC, CIOB Certified
Building Conservation Specialist (Practitioner), Cert MHA**