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# Future-Proofing my Fuel Bills

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Grand Design Live 2023 @ Hii Guru E125  
Ask an expert - All year round - Zoom calls



# Need some expert advice?

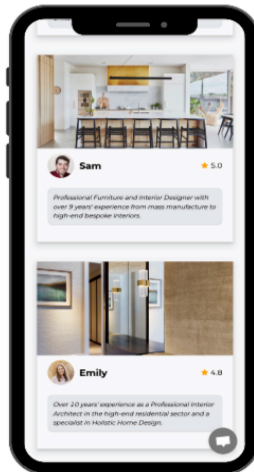
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# Brian Murphy

- **ONC & HNC Construction**
- **BSc Degree Architecture (Honours)**
- **PG Diploma Architecture (Distinction)**
- **Technician and Architect by training**
- **Specification Writer by choice (e.g. British Library)**
- **Environmentalist by action**
- **Educator by calling**
- **Carbon Counter by necessity**
- **Building Tour Guide for Fun (E.g. British Library)**
- **45 Years of experience in construction**
- **39 years in specification (£2420m specified, not earned!)**
- **23 years in environmental**
- **15 years in education**
- **11 years building carbon calculators**
- **Pensioned off but not finished (50 more calculators planned)**

**British Library  
£511m**

**1<sup>st</sup> Freelance  
commission**

**Contract  
Specification  
writing**

**11/05/23 8 years**



# Aberystwyth University Arts centre & Dance School extensions: Specifications




**BCT & RSPB  
RIBA Publishing  
1<sup>st</sup> & 2<sup>nd</sup> editions  
BRM Wrote 50%  
of book  
10 Future proof  
construction  
methods  
3D cutaways  
2D Sections  
Details and  
Specifications  
Product Critique**

# Biodiversity for Low and Zero Carbon Buildings

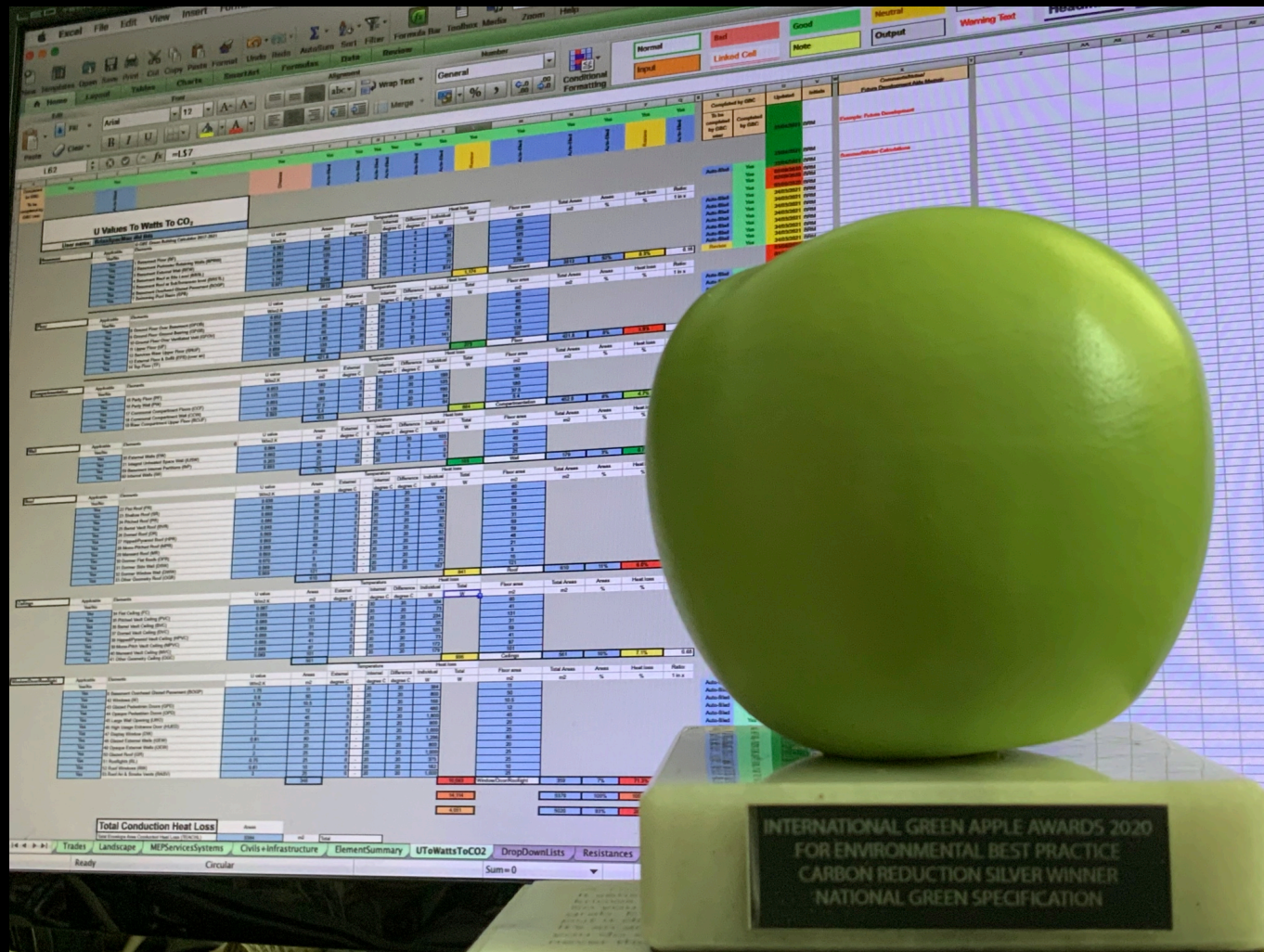
Dr Carol Williams of the Bat Conservation Trust



RIBA  Publishing



# Green Apple Award 2020 International Silver for Carbon Reduction



11/05/23

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# Fuel Poverty:

- **Rent Poverty, let alone Bed Poverty, etc.**
- **Government pays winter heating allowance every year**
- **Grannies pay for Christmas presents and still go cold**
- **A better approach is to insulate well once, no more bills, no more annual pay outs**
- **ECO Energy Company Obligations insulate the poorest homes, cheaply with incompetent external insulation installations**
- **Green Deal came to nothing**
- **Recent funding was withdrawn before it got started**
  -
- **Current policies with take 100 years to meet carbon targets we had 10 years left a few years ago**
- **Current policies with take 300 years to wipe out fuel poverty**

# Fuel Costs:

- Putler war with Ukraine, Greedy Shareholders, Inept Government
- Becoming unaffordable for many
- Electric is highest and **Renewable Energy from PV or wind** should be lowest
- Government pay homeowners to pay energy providers to pay shareholders, pay taxes and their lobbying bills and bribes to keep letting prices rise
- Will the Government pay homeowners every year to pay energy providers?
- Unlikely?

# One Planet Lifestyle

- 
- 
- **Planet Lifestyle**
- **We lived a one planet lifestyle in 1972 Star wars, 1973 Tubular bells, 1976 Heatwave,**
- **No computers, no laptops, no mobile phone no smart pad, no flat screen TV (CRT TV)**
- **No Jacuzzis, Hot tubs, saunas, Power Showers, patio heaters**
- **One car families**
- **No Microwaves**

# 80-90% Reduction Is Easy

- - (not in equivalent percentages)
- 
- - $\frac{1}{2}$  50% reduction in energy demands = 50% (this is easy & cheap)
  - $\frac{1}{2}$  25% increase in efficiency = 75% (better controls)
  - $\frac{1}{2}$  12.5% carbon reduction in supply = 87.5% (expensive kit)
  - $\frac{1}{2}$  6.25% let the school kids run the country = 93.75% (free)

# Voltage Optimisation

- troughs by the varying levels of input and output in the mains these are non-cyclical peaks and troughs.
- Anything above the demand of the appliances on the circuit is wasted.
- They cost you money
- VO can be fitted on the incoming mains before the meters/consumer unit
- You do not pay for the peaks that no longer reach your system.
- You can also do VO at the 13 amp socket
- It's a bit like spike protection devices on 13 amp sockets
- VO works for Fridges and Freezers (one of the biggest long term background consumptions in a house)
- VO works on Air conditioning (Big energy demand and bad for the planet)
- And landline wireless phones
- Most other kit needing VO has it own built in VO
- Some speculative housing developers fit VO as standard.



# Stop Any Damp raising your bills

- Wet construction takes energy to evaporate water
  - 
  - Surface or interstitial
  - 
  - 
  -
- IRT Infrared thermography surveys will detect thermal bridges and damp anomalies

# Stop The Air & Heat Leakage

- Weather stripping at windows
- Weather stripping at external doors
- Weather porches or internal lobbies at doors
- Conservatory
  - 
  -
- Retreat to a cosy building
- Include doors or windows between house and conservatory
- Insulated and closed doors back to house
- SunSpace, Solar heat gains, winter additional out side space, preheat your house

# Reduce Heat Losses

- Move radiators from external walls to internal partitions
- Move radiators away from below air leaky windows
- Improve window performances
- Insulate domestic hot water pipes and  
Insulate heating pipes in all cavities and  
where accessible and where not accessible
- Insulate hot water cylinders very well and all  
pipes to and from them

# Improve Heat Inputs

- Thermostatic radiator valves
- Fans on top of radiators that direct the heat flow and dilute the heat gradient in the room
- Ceiling Fans that stir up the heat flow and dilute the heat gradient in the room
- Push heat down from high spaces to warm the people at the floor

# Approaches: Heat

- Heat the sky  
—
- Heat the building  
—
- Heat the rooms  
—
- Heat the person  
—

# Approaches: Insulate

- -
- - 
  - some rooms)
- - walls
    - to control where overheating can move to
    - Also allows anybody to keep their room at their preferred temperature.
  - Insulate the person
    - (clothes = lifestyle, challenging to change lifestyles)

# Strive For Thermal Comfort In The Building

- **Most Insulation reduces heat loss to varying degrees**
  - Gappy insulation fails miserably and exacerbates condensation mould rot frost damage
  - Wrong insulation can exacerbate overheating
- **Internal Surfaces temperatures**
  - 
  - 
  - as possible
  - Or you reach for the thermostat
  - Triple glazing is about thermal comfort

## Performance Of Existing Building Fabric:

- Deliberately air leaky construction:
- Deliberate ventilation to all rooms and voids
- Ventilated cavity behind wattle and daub independent lining, from below ground floor to attic (Scotland)
- Occupants heated by radiant heat from open fires
- Radiant heat from Cooking hearth



## Existing Materials And Methods

- Thick Brick walls 215 mm and thicker
- Thick Stone walls 200 mm down south-east to 800 mm up north-west
- Lime Plaster on the hard
- Lath and lime plaster Drylining on ventilation cavity behind
- Airbricks in every room
- Suspended timber floors on honeycomb sleeper walls, perimeter air bricks and cross ventilation
- Suspended timber floors embedded in external walls
- Softwood timber roofs eaves ventilation, with and without bitumen roofing underlay (England) or softwood sarking boards (Scotland)
- External Toilet, Back boiler for hot water

## Previous Interventions:

- Fitted bathrooms and Kitchens
- Domestic hot and cold water,
- Insulated hot water cylinder (in sufficient insulation)
- Uninsulated pipes in construction cavities
- Central heating with radiators on external walls,
- pipes buried in screeds and uninsulated floors

## Risk Of Choice Of Additional Incompatible Materials

- Foamed Plastic thermal insulation:
  - Incompatible with timber framing
    -
  - Incompatible with masonry walls
    - 
    - zone)
- Glass or Stone wool thermal insulation:
  - incompatible with timber framing
    - (Moisture permeable, Hydrophobic places moisture at timbers)
  - incompatible with timber and slate roofing
  - No solar heat gain resistance, conductivity resistance traps heat, exacerbates overheating
  - incompatible with moisture permeable masonry walls
    - (insulation potentially kept damp and ineffective)

# Performance Of Existing Windows:

- Deliberately Air leaky
- Top and bottom passive ventilation
- High windows good daylight penetration
- Single glazed: thermal discomfort
- Improvement In Performance By Upgrading In Steps
- Conservation Officer permitting

## Vertical Sliding Sash Single Glazed:

- Joinery repairs
- Weather stripping
- Double Glazing (thin profile, Vacuum glazing)
- Blinds
- Reflective Blinds
- Thick Curtains
- Secondary Glazing
- Timber Shutters

# Upgrading Victorian windows/glazing

Historic Sash window improvements	U value of Glass	reduction in heat loss of glazing only	Temperature of inner most surface degrees C	U value of whole window	reduction in heat loss	Air leakage	Comments
Window as found	5.30	-	12.00	4.30	-	183	
Joinery repaired	5.30	-	12.00	4.30	-	120	Reduced air infiltration by 34%
Joinery repaired and insitu weatherproofing	5.30	-	12.00	4.30		26	
Heavy Curtain	3.30	39%	21.00	2.50	41%	-	
Well-fitting Shutters	2.00	65%	17.00	1.70	58%	-	
Plain Roller Blind	3.4	37%	18	2.7	38%	-	When blind was tightly fitted, U-value fell by about 0.3
Reflective roller blind	1.8	66%	19	1.9		-	Reflective side facing outwards
Insulating Honeycomb Blind	2.10	60%	20.00	2.10	51%	-	Aluminium frame secondary system with spring balances
Low Emissivity Secondary glazing	2.00	63%	19.00	1.80	58%	8	With Both glazing and shutters closed

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# Shower Heat Recovery

- Preheat shower water with heat extracted from shower waste
- No energy input
- Water under pressure and waste water under gravity keeps the water flowing and heat transferring
- Concurrent supply and demand
- In floor and under shower and internal or external adjacent to shower installations
- One of the most effective ways of saving energy

## Cheap Or Free Energy For Hot Water:

- Off peak cheap or free energy
- Internet of tanks, Mixergy (at the GDL London '23 show) domestic Hot water
- DHW cylinders usually have immersion heater at bottom make a lot of warm water that rises to top and
- Immersion heater at top, heat builds up at top and gradually hot water body increases in size, works its way down
- Natural Boundary layer between hot and cold water remains intact
- You demand hot water from the hot top and not from warm top
- Internet connection waits for off peak prices of electricity to fall to low or negative prices
- Takes energy overnight and off peak to heat water



## Cheap Or Free Energy For Other Uses To Balance Mains Demands:

- Numerous Service Providers
- Sign you up to a variable price service
- You are encouraged to allow stuff to be turned off automatically in peak times
- Turn the freezer off for short periods during peak times and back on again shortly after
- Sufficient thermal mass in Fridge and Freezer that no food and your health is at risk
- Top up EV Electric Vehicle off peak overnight (but should be from RE, PV via Battery Pack)

## Coefficient Of Performance (COP) Energy

- Add electricity from mains or renewable to a service that generate more energy output than input.
- Heat Pumps
- Air, Ground or Water sources
- Risk of Thermal Pollution
  - Take heat out makes source cold
  - Risk of changing something that works
- Subsoil over a meter down is constant 11 degrees (In UK) all year round night and day,
- Use electricity to make that 11 degrees hotter = free heat
- Use heat immediately or store the heat in Energy stores
- Low grade heat for hot water and for low temperature radiators
- Turn off in peak periods

## Choice Of Fuel

- If a room is served by more than one fuel
  - (e.g. electric fire and gas central heating)
- Choose the cheaper fuel: Gas over Electricity
- Choose the lower carbon fuel,
- Gas and Electricity on par at the moment,
- electric was worst,
- electric will get better

## Gas is complicated in multi-storey housing,

- Post-Grenfell problems highlighted,
- Gas pipes up escape stairs fire compartment
- Fuel choice for New Houses is being taken away
- by Government's move towards Low carbon Electric Grid
- No more new gas
- Move towards ASHP Air Source Heat Pump
- Essential to Insulate Building well to be effective

# Renewable Energy:

- Includes:
- Wind turbines,
  - (bigger better return on investment)
  - (on shore prevented by Government)
- On shore discouraged by CPRE Centre Protection of Rural England
- On shore discouraged by NIMBY public
  - (Offshore complicated to install and maintain)
- Photovoltaic Solar panels
- Wave
- Tidal

## Renewable Green Tariff service

- Is possible, to encourage more investment in renewables
- 
- 
- farm PV installation
- After initial investment free or very low cost electricity
- Consider a low voltage circuit around the house for USB charging points for IT

## PV To Electric Vehicle or Hybrid Car

- In preference to from mains electricity
- Mains has significant % of carbon in the mix
- PV has little or no Carbon during operation
- Less fuel costs not having to pay for petrol or diesel
- Uninterrupted power back-up in a mains brown out.
- Need two cars one changing one in use?

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- Technician and Architect by Training
- Specification Writer by Choice
- Environmentalist by Actions
- Writer and Educator as a Calling
- Number Cruncher by Necessity

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