Lecture: Design & Detailing to Perform

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Quotes for the Day

- Most standard Text books
  - are seriously out of date, get up to date
  - 50 mm of insulation is not enough (don't draw 50 mm or you will fail)
  - 300 mm is not uncommon
- Insulation Insulation Insulation:
  - Fabric First, Eco Bling last
- Thermal bridges:
  - Let heat out, let cold in
  - enables interstitial condensation
    - > **mould** > asthma > toxic **mould** > death
  - Enables rot in embedded timbers > structural failure
  - Enables frost damage of cold damp masonry
- Airtightness:
  - Build Tight, Ventilate Right
  - No insulation, without ventilation (PAS 2035)
- Overheating:
  - © GBE: Build Light, Insulate Right, Solar Tight
- Attic Insulation:
  - © GBE: Stuffed Loft, Squashed Insulation, Raise Your Loft Stuff

>40 years into 1 Hour won't go

- So I am providing links to other information if you want to know more
- Question Everything
  - Use what you know, join up your thinking, keep learning and refining what you know
- Don't assume that I know everything
  - (I know a lot but not everything)
- Don't assume I have cherry picked the best bits
  - (new stuff keeps appearing)
- Don't assume what your being told is the whole story
  - Some will hide what they don't want you to know
  - And tell greenwash porkies
- Do your best with what you know
- When you know better
- Do better

This Presentation on GBE:

- Find this file on GBE website at:
- https://GreenBuildingEcyclopaedia.uk/?P=20475
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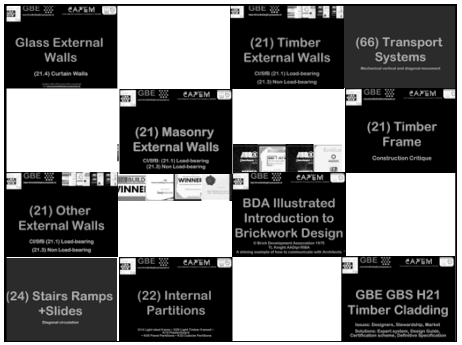
- Schedule of related pages:
- https://GreenBuildingEcyclopaedia.uk/?P=17699

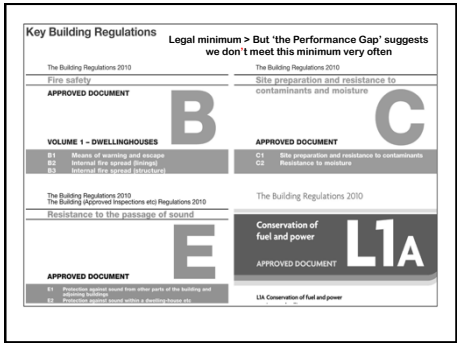


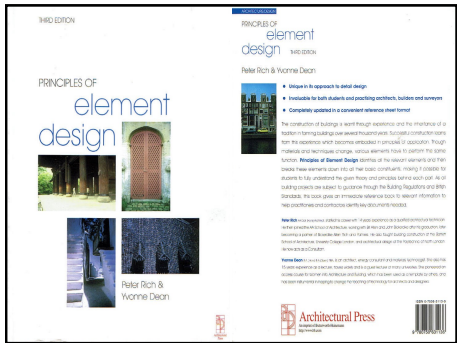
Today's Lecture

- Design & Detailing to Perform
- Principles of Element Design
- Briefing and Design Guidance
- Energy standards and Calculators
- Construction & Retrofit Guidance

Design & Detail Guidance

- Building Regulations (legal minimum)
- Principles of Element Design
  - Performance (ignore thicknesses)
- Zero Carbon Hub/The Buildings Hub
  - Briefing Design & Detailing Failures/Guidance
  - Tom Dollard Book: Design to Perform an illustrated guide to delivering Energy Efficient homes
- Energy Standards
  - GBE Whole Building Calculators
- Construction Guidance
- Retrofit Guidance





Zero Carbon Hub ZCH/ The Buildings Hub TBH

- Performance Gap and Overheating
  - 10 years of Gov. funding: surveys and guidance
  - But never really understood the main cause of overheating
  - Briefing Design & Detailing Failures/Guidance
- Free to download PDFs
  - ZCH Builders' Book
  - ZCH Thermal Bridge Guide
  - ZCH Services Guide
  - ZCH SAP untangled
  - TBH Designer's Handbook
- www.zerocarbonhub.org
- www.thebuildingshub.org

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Tom Dollard Book:

- Design to Perform an illustrated guide to delivering Energy Efficient Homes
  - RIBA Publishing
  - ISBN 978-1-8946-996-5
- Brian Murphy proof read early draft
- Builds on the work of ZCH
- The Performance Gap: how to reduce it
- How to Detail thermally efficient envelopes
- Addresses services failures too

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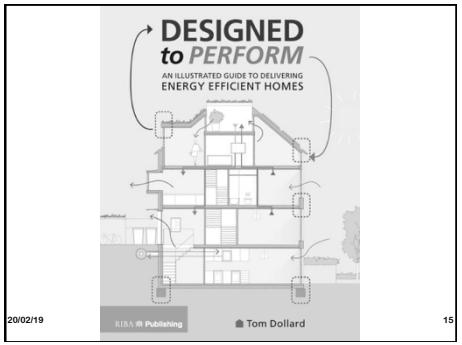

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Energy and related design standards

- Building Regulations Approved Document L
  - Will eventually meet carbon targets but not now
  - Most new buildings will need to be retrofit by 2030-2050
- Energy (exceeding Building Regulations)
  - AECB Bronze, Silver, Gold and Platinum Standard
  - Super E (Canadian; means to sell their softwood)
  - Passivhaus (German) PHPP Software
    - Indoor Air Quality and Thermal Comfort conditions driven
    - Mimimise air leakage, minimise thermal bridges
    - EnerPHit (Passivhaus Retrofit)
  - Minergie (Swiss)
  - Carbon Lite (UK AECB)
    - Passivhaus interpretation for UK climate and energy mix
    - Carbon Lite Retrofit (CLR)

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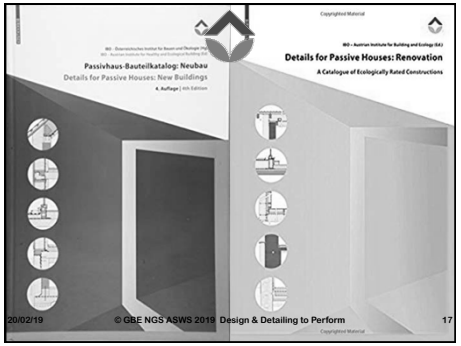

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Energy Driven Details

- Passivhaus PHPP in previous seminar
- Passivhaus & Eco Materials Detailing
  - Encyclopaedia information on materials and methods
- Passivhaus U values and Thermal break detailing
- Authors/Editors:
  - IBO Austrian Institute for Building & Ecology
- ISBN:
  - New build 130 cross sections x 2 specifications
    - 978-3-211-29763-6
  - Retrofit: 5 eras of construction types, 152 Details
    - 978-3-0356-0953-0

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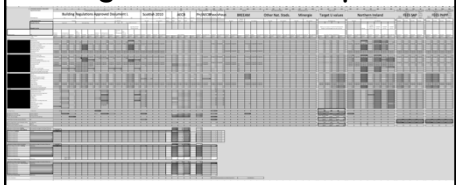
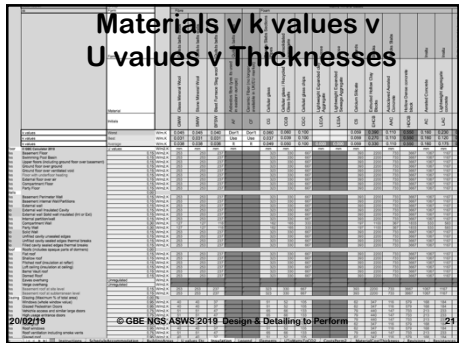
GBE Whole Building Calculators

- GBE Green Building Encyclopaedia
- GBE Calculator
- Building Size: Lengths Areas Volumes
- Regulations/Design standards:
  - U value Set Selection
- Winter Thermal Insulation Material Choices
  - K values v U values = Thicknesses
- But don't forget Decrement Delay
  - to avoid summer overheating
- And acoustics, fire, moisture management, etc.

Many Energy Regulations and Design Standards compared



Materials v k values v U values v Thicknesses



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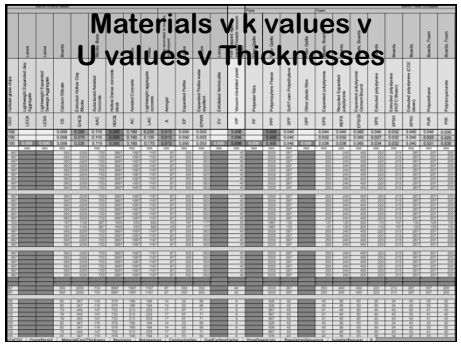
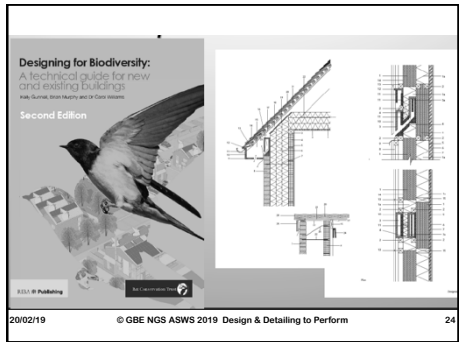
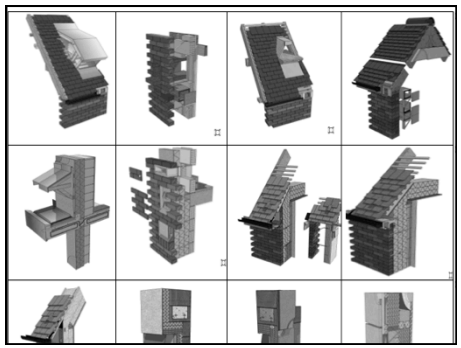
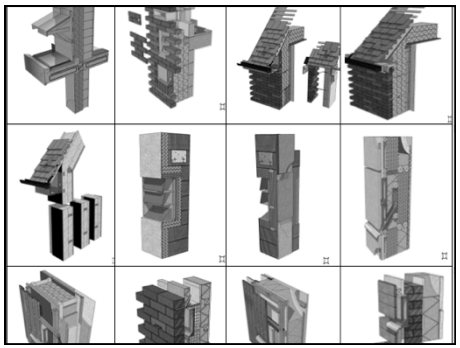


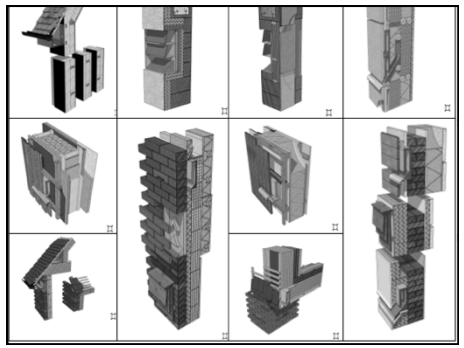
Biodiversity Design & Details

- BCT RSPB RIBA Book Biodiversity & Building
  - Brian Murphy: produced 50% of book content
  - 1st Edition: Biodiversity for Low and Zero carbon Buildings: A Technical Guide for New Buildings
    - 2D Sections and Elevations
    - Accommodating roots without compromising building envelope integrity (Thermal, acoustic, moisture)
  - 2nd Edition: Added refurbishment and Green Infrastructure ISBN: 9-781859-463536
    - 3D Cutaways
  - 3rd Edition: being discussed now: MMC to add



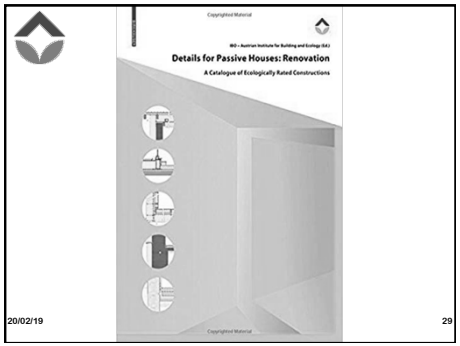


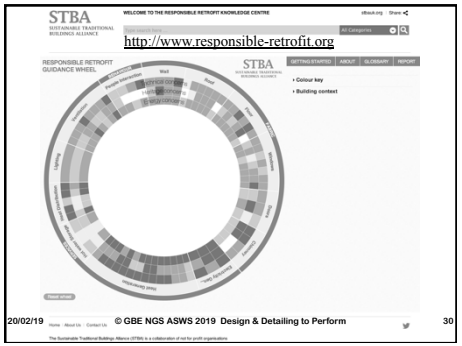




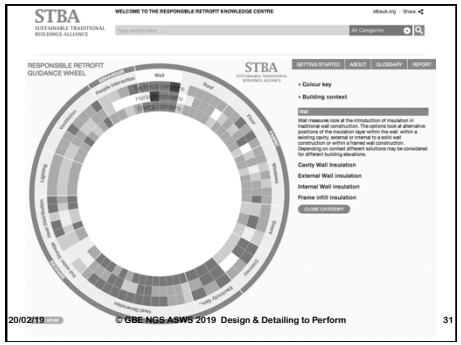
Retrofit Design & Detailing

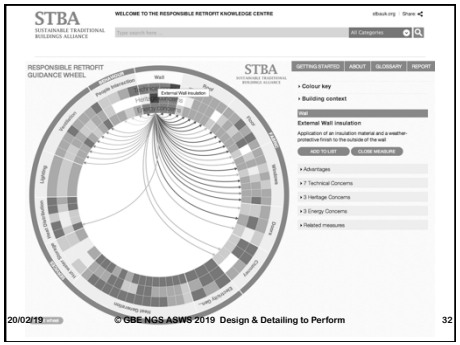
- TSB Retrofit for the Future:
  - funded 85 buildings 80% Carbon reduction 17kgCO2/m2/year
  - EnerPHit Standard Passivhaus Retrofit
  - Website with case studies and EST 2 years of monitoring
  - Residential Retrofit Book 20 Case studies Marion **Baeli**
- Sustainable Traditional Building Alliance (STBA)
  - STBA Guidance Wheel
  - No insulation, without ventilation (PAS 2035)
- Trustmark, Quality Mark, Guarantee scheme
- Risk Assessment: 3 approaches, 3 levels of risk
  - BS 5250 Condensation risk Assessment (Static: inadequate)
  - BS 7913 Historic Significance Assessment
- Publically Available Specification
  - PAS 2030:2019:Installation
  - PAS 2035:2019:Design (publication imminent)

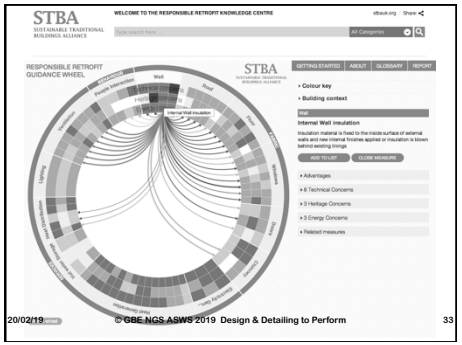




http://www.responsible-retrofit.org







Whole House Plan

- Don't set out to refurbish in stages
  - and then find something you did early has to be undone and redone
  - Boilers and radiators first
    - **Take them off again**
    - **then add internal insulation**
    - **and rehang the boiler and the radiators**

Trigger points:

- if you are re-rendering apply insulated **rendering in one go**
- **If you are repairing a bathroom leak change the sanitryware to low water consumptions and insulate the external wall**

Phased/room by room refurbishment

- **Plan the final layout**
- **Plan the room temporary functions**
- **Plan the decanting of one room to enable the refurbishment of it**
- **Plan the temporary storage of possessions**
- **Plan the reinstatement of possessions into a smaller room**

Future proofing:

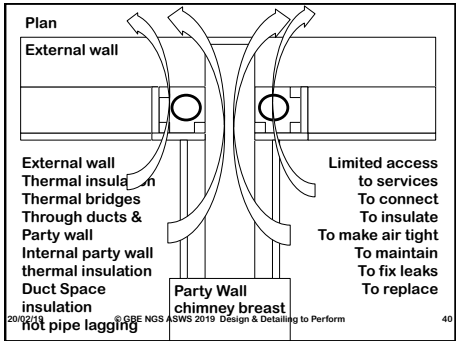
- **Allow for Renewable energy to be fitted later by making provision for it at an early stage**

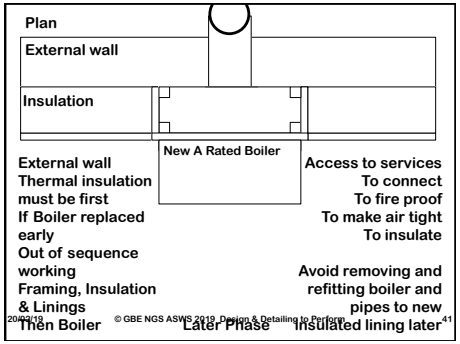
Plan the Journey

- Know your destination
- Then your meanderings all lead to the same destination
- Without detours and dead ends
- Without going round in circles
- Without treading the same path twice

Whole House Plan

- Showing the final insulation regime
- Modify the services installations with the final insulation regime in mind
- Avoid servicing > undoing services > insulating > re-servicing
- Or avoid services and insulation in the same place or insulate first
- Radiators not on the external wall
- Insulate in patches then services
- Insulate wall then boiler
- Insulated underfloor heating and no radiators





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