

# Lecture: Design & Detailing to Perform

Advanced Technology

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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  - are seriously out of date, get up to date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

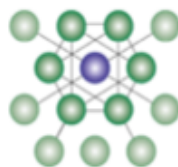
- So I am providing links to other information if you want to know more
- Question Everything
  - Use what you know, join up your thinking, keep learning and refining what you know
- Don't assume that I know everything
  - (I know a lot but not everything)
- Don't assume I have cherry picked the best 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>
- Find related image folders on Pinterest
  - <https://www.pinterest.co.uk/bmurphy1390/>
- Schedule of related pages:
  - <https://GreenBuildingEcyclopaedia.uk/?P=17699>

# UofH Part 1 Year 2 Schedule

# GBE




## Green Building Encyclopaedia

<https://greenbuildingencyclopaedia.uk/?P=17699>

Task	Topic	Lecture/CPD	Books	GBE Website pages
0	The Whole Year	Principles of Element Design (Lecture)	Architects Pocket Book	G#17699 (this page)
		Fixings Fastenings	Environmental Design Pocket Book (Book)	Pinterest Z20 Connectivity (folders)
		Adopt a material (Lecture)	Principles of Element Design (Book)	
		Future Systems	Designed to perform (Book)	
1	Site Survey	Site / Existing Building Survey Test Analysis (CPD/Lecture)	Survey Site Analysis (Navigation)	
2	Sustainable Strategy	HERACEY® (Jargon-Buster CPD)	TBH Designer's Handbook	HERACEY® (Jargon-Buster)
		Matrix (Navigation)	Building Regulations AD L- Conservation of fuel and power	Healthy (Jargon-Buster)
			PHPP Passivhaus & EnerPHit	Environmental (Jargon-Buster)
			AECB Carbon Lite & Retrofit	Resourceful (Jargon-Buster)
			CIBSE TM60 2018 Good Practice in the Design of Homes (Book)	Appropriate (Jargon-Buster)
				Competent (Jargon-Buster)
				Effective (Jargon-Buster)
				Yardstick (Jargon-Buster)
3	External walls and openings	Timber External walls External wall Opening Window Door (Lecture)	Principles of Element Design (Lecture)	Calculators (Navigation)
		Masonry External walls External wall Opening Window Door (Lecture)	IBO Passive Houses New Build	Elemental Building U value calculator
		Glass External walls External wall Opening Window Door (Lecture)	Designed to perform (Book)	Elemental Assemblies Spreadsheet
		Other External walls	Building Regulations	Windows (Checklist)

		External wall Opening Window Door (Lecture)	AD L- Conservation of fuel and power	
		Windows External wall Opening Window Door (Lecture)		Rooflights (Checklist)
		Doors External wall Opening Window Door (Lecture)		
		Rooflights		
		Solar Shading (CPD)		
4	Roof & Floor	Pitched Roof	Principles of Element Design (Lecture)	Calculators (Navigation)
		Flat Roof	IBO Passive Houses New Build	Elemental U value calculator
		Ground Floor	Designed to perform (Book)	Elemental Assemblies Spreadsheet
		Upper Floor	Building Regulations AD L- Conservation of fuel and power	
5	Access Stairs	Stairs Ramps Lifts Escalators (Lecture)	Building Regulations AD K	Checklist (Navigation)
	Stairs Ramps Balustrades Walkways	Stairs Ramps Lifts Escalators (Lecture)	Building Regulations AD K	
	Lifts Escalators	Stairs Ramps Lifts Escalators (Lecture)		
6	Internal Linings Elevations and Reflected ceiling Plans	(22) Internal partitions	Principles of Element Design (Lecture)	
		(23) Upper Floors	IBO Passive Houses New Build	
		Interior Linings	Designed to perform (Book)	
		(40) Finishes (CPD/Lectures)		
7	Axo, Build ups, thicknesses	Principles of Element Design (Lecture)	Principles of Element Design (Lecture)	Calculators (Navigation)
			IBO Passive Houses New Build	Elemental Building U value calculator
			Designed to perform (Book)	
8	Drawings + Model			Calculators (Navigation)
				Whole Building U value calculator
9	3D Design	Intro to BIM	BIM A Spec Writers Perspective (Shop)	GBE BIM (Jargon-Buster)
10	Wall Roof Junctions	Principles of Element Design (Lecture)	IBO Passive Houses New Build	Calculators (Navigation)
			Designed to perform (Book)	Psi value calculator
11	Wall Floor Foundation Junctions	(16.4) Foundation (Lecture)	Principles of Element Design (Lecture)	Calculators (Navigation)
		(16.4) Groundworks RC Raft Foundation (Lecture) G#2114	IBO Passive Houses New Build	Psi value calculator
			Designed to perform (Book)	
12	Model			



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**Glass External Walls**

(21.4) Curtain Walls

Another GBS CPD/Lecture file to download  
[www.greenbuildingencyclopedia.uk](http://www.greenbuildingencyclopedia.uk)



**(21) Timber External Walls**

CI/SfB (21.1) Load-bearing  
(21.3) Non Load-bearing






**(66) Transport Systems**

Mechanical vertical and diagonal movement



**(21) Masonry External Walls**

CI/SfB: (21.1) Load-bearing  
(21.3) Non Load-bearing



**(21) Masonry External Walls**

CI/SfB: (21.1) Load-bearing  
(21.3) Non Load-bearing

**(21) Timber Frame**

Construction Critique

**(21) Timber Frame**

Construction Critique




**(21) Other External Walls**

CI/SfB (21.1) Load-bearing  
(21.3) Non Load-bearing




**(21) Other External Walls**

CI/SfB (21.1) Load-bearing  
(21.3) Non Load-bearing




**BDA Illustrated Introduction to Brickwork Design**

© Brick Development Association 1975  
TL Knight AADipl RIBA  
A shining example of how to communicate with Architects






**BDA Illustrated Introduction to Brickwork Design**

© Brick Development Association 1975  
TL Knight AADipl RIBA  
A shining example of how to communicate with Architects




**(24) Stairs Ramps +Slides**

Diagonal circulation

**(22) Internal Partitions**

G14 Light steel frame • G20 Light Timber framed •  
K10 Plasterboard  
• K30 Panel Partitions • K32 Cubicle Partitions




**GBE GBS H21 Timber Cladding**

Issues: Designers, Stewardship, Market  
Solutions: Expert system, Design Guide, Certification scheme, Definitive Specification




**GBE GBS H21 Timber Cladding**

Issues: Designers, Stewardship, Market  
Solutions: Expert system, Design Guide, Certification scheme, Definitive Specification



# 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



# Key Building Regulations

Legal minimum > But 'the Performance Gap' suggests we don't meet this minimum very often

The Building Regulations 2010

## Fire safety

### APPROVED DOCUMENT

**B**

#### VOLUME 1 – DWELLINGHOUSES

- B1** Means of warning and escape
- B2** Internal fire spread (linings)
- B3** Internal fire spread (structure)

The Building Regulations 2010

## Site preparation and resistance to contaminants and moisture

### APPROVED DOCUMENT

**C**

- C1** Site preparation and resistance to contaminants
- C2** Resistance to moisture

The Building Regulations 2010  
The Building (Approved Inspections etc) Regulations 2010

## Resistance to the passage of sound

### APPROVED DOCUMENT

**E**

- E1** Protection against sound from other parts of the building and adjoining buildings
- E2** Protection against sound within a dwelling-house etc

The Building Regulations 2010

## Conservation of fuel and power

### APPROVED DOCUMENT

**L1A**

L1A Conservation of fuel and power  
... ..

THIRD EDITION

# PRINCIPLES OF element design



Peter Rich &  
Yvonne Dean



ARCHITECTURE/DESIGN

# PRINCIPLES OF element design

THIRD EDITION

Peter Rich & Yvonne Dean



- Unique in its approach to detail design
- Invaluable for both students and practising architects, builders and surveyors
- Completely updated in a convenient reference sheet format

The construction of buildings is learnt through experience and the inheritance of a tradition in forming buildings over several thousand years. Successful construction learns from this experience which becomes embodied in principles of application. Though materials and techniques change, various elements have to perform the same function. **Principles of Element Design** identifies all the relevant elements and then breaks these elements down into all their basic constituents, making it possible for students to fully understand the given theory and principles behind each part. As all building projects are subject to guidance through the Building Regulations and British Standards, this book gives an immediate reference back to relevant information to help practitioners and contractors identify key documents needed.

**Peter Rich** AIA, BSc, Architect, started his career with 14 years' experience as a qualified architectural technician. He then joined the AA School of Architecture, working with Bill Allen and John Bickerdike after his graduation, later becoming a partner of Bickerdike Allen Rich and Partners. He also taught building construction at the Bartlett School of Architecture, University College London, and architectural design at the Polytechnic of North London. He now acts as a Consultant.

**Yvonne Dean** BA, (Hons) BA (Hons) BSc, is an architect, energy consultant and materials technologist. She also has 15 years' experience as a lecturer, travels widely and is a guest lecturer at many universities. She pioneered an access course for Women into Architecture and Building, which has been used as a template by others, and has been instrumental in helping to change the teaching of technology for architects and designers.



**Architectural Press**

An imprint of Butterworth-Heinemann  
<http://www.bh.com>

ISBN 0-7506-3113-9



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# 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](http://www.zerocarbonhub.org)
- [www.thebuildingshub.org](http://www.thebuildingshub.org)



## BUILDERS' BOOK



An illustrated guide to building energy efficient homes



### ZERO CARBON HUB BUILDERS' BOOK

#### DOOR THRESHOLD

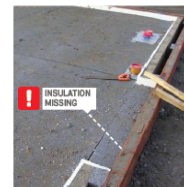


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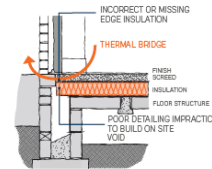


#### PROBLEM TO AVOID

#### MISSING EDGE INSULATION



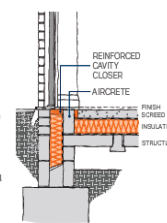
SCREED BRIDGING THRESHOLD



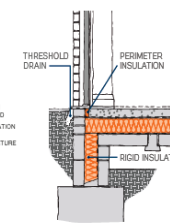
#### WHAT TO DO?

- Follow the detail drawing or speak with Architect / technical team
- Install a thermal break at the threshold – at least 25mm high performance insulation
- Install damp proof membrane, gas membranes and separating layer as necessary
- Overlap door with cavity by at least 50mm
- Ensure airtight seal under door

#### OPTION 1 REINFORCED CAVITY CLOSER



#### OPTION 2 INSULATION AT DOOR THRESHOLD



#### GOOD PRACTICE

50mm thick insulation at door threshold or reinforced cavity closer

Please print and use in your site office, for further information [www.zerocarbonhub.org](http://www.zerocarbonhub.org)



## SERVICES GUIDE

An illustrated guide to building services in new homes



## THERMAL BRIDGING GUIDE

An introductory guide to thermal bridging in homes



## COST EFFICIENCY GUIDE

A step-by-step guide for SME housebuilders on building energy efficient homes cost effectively



## SAP UNTANGLED GUIDE

An introductory guide to SAP for new homes



## VENTILATION IN NEW HOMES

A report of site visit findings







# DESIGNER'S HANDBOOK

Designing comfortable  
low energy homes  
that perform as intended

20/02/19



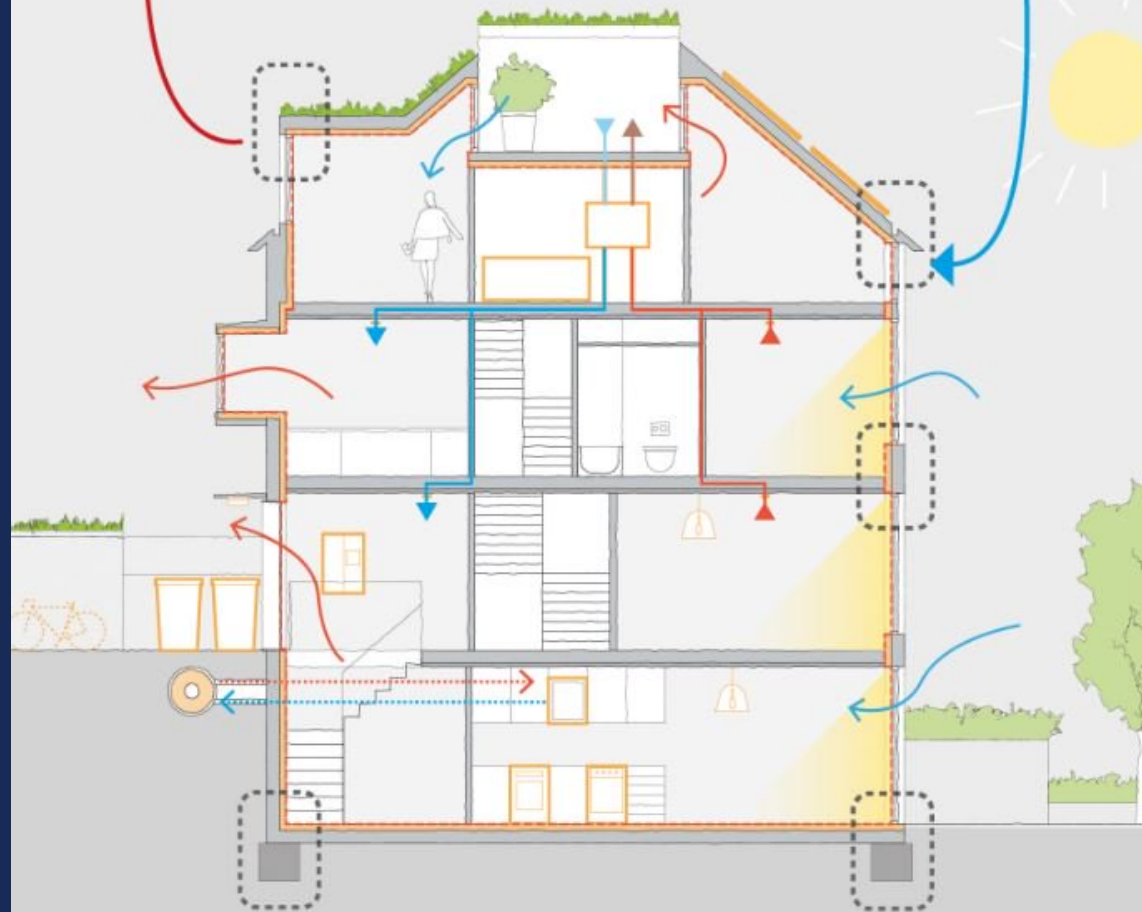
# Tom Dollard Book:

- 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



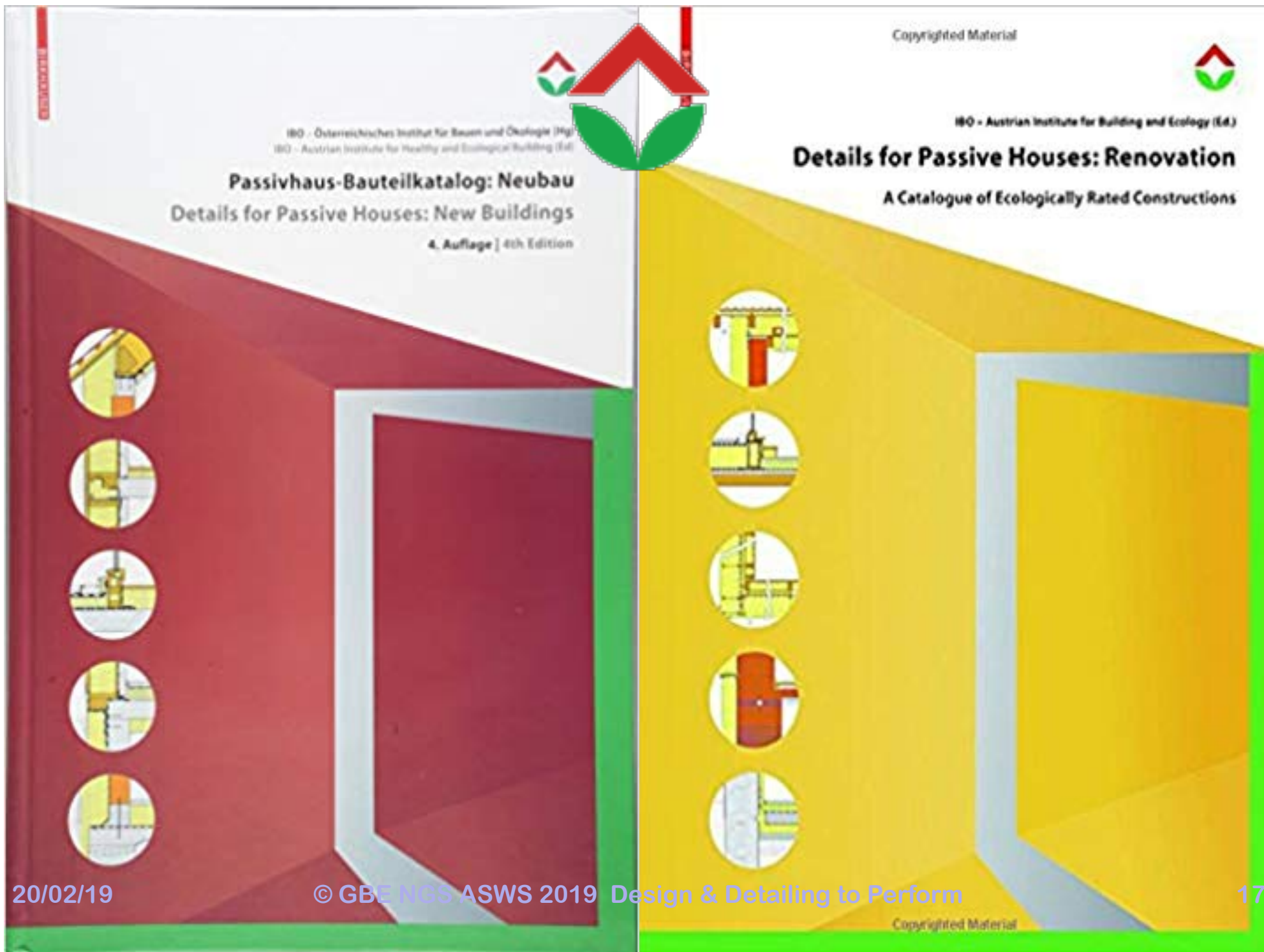
# DESIGNED *to* **PERFORM**

AN ILLUSTRATED GUIDE TO DELIVERING  
ENERGY EFFICIENT HOMES



# 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
    - Minimise 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)



# 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

# 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

[illegible]



# Materials v k values v U values v Thicknesses

Chosen column:		Group	Mainly mineral based																	
AB		Form	Fibre				Foam													
			Quilts batts slabs	Quilts batts slabs	Quilts batts slabs	Quilts batts slabs	Slabs Sections	Consolidated aggregate	Expanded clay	Expanded perlite	Expanded vermiculite	Calcium Silicate	Extruded Hollow Clay Blocks	Autoclaved Aerated Concrete	Hollow Dense concrete block	Aerated Concrete	Lightweight aggregate concrete	Other insulation in boards		
		Material	Glass Mineral Wool	Stone Mineral Wool	Blast Furnace Slag wool	Asbestos fibre (yes its used in eastern europe)	Ceramic Fiber (no longer available in UK/EU market)	Cellular glass	Cellular glass / Recycled Glass balls	Cellulat glass chips	Lightweight Expanded clay Aggregate	Lightweight Expanded Sewage Aggregate	Calcium Silicate	Extruded Hollow Clay Blocks	Autoclaved Aerated Concrete	Hollow Dense concrete block	Aerated Concrete	Lightweight aggregate concrete		
		Initials	GMW	SMW	BFSW	AF	CF	CG	CGB	CGC	LECA	LESA	CS	EHCB	AAC	HDCB	AC	LAC		
k values		Worst	W/m.K	0.045	0.045	0.040	Don't	Don't	0.060	0.060	0.100		0.059	0.390	0.110	0.550	0.160	0.230	0	
k values		Best	W/m.K	0.031	0.031	0.031	Use	Use	0.037	0.039	0.100		0.059	0.270	0.110	0.550	0.160	0.120	0	
k values		Average	W/m.K	0.038	0.038	0.036	It	It	0.049	0.050	0.100	0.000	0.000	0.059	0.330	0.110	0.550	0.160	0.175	0
U values		W/m2.K	mm	mm	mm	mm		mm	mm		mm	mm	mm		mm		mm	mm		
Floor	© GBE Calculator 2018	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Basement Floor	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Swimming Pool Basin	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Upper floors (including ground floor over basement)	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Ground floor over ground	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Ground floor over ventilated void	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Floor with underfloor heating	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	External floor over air	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Compartment Floor	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Party Floor	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Walls		0.00																		
Yes	Basement Perimeter Wall	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Basement internal Wall/Partitions	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	External wall	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
No	External wall Insulated Cavity	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
No	External wall Solid wall insulated (Int or Ext)	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Internal partition/wall	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Compartment Wall	0.30	W/m2.K	127	127	118		162	165	333			197	1100	367	1833	533	583		
Yes	Party Wall	0.30	W/m2.K	127	127	118		162	165	333			197	1100	367	1833	533	583		
No	Solid Wall	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
No	Unfilled cavity unsealed edges	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
No	Unfilled cavity sealed edges thermal breaks	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
No	Filled cavity sealed edges thermal breaks	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Roof	Roofs (includes opaque parts of dormers)	0.00																		
Yes	Flat roof	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Shallow roof	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Pitched roof (insulation at rafter)	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Loft ceiling (insulation at ceiling)	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Barrel Vault roof	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Domed Roof	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Eaves overhang	Unregulated	W/m2.K																	
Yes	Verge overhang	Unregulated	W/m2.K																	
Yes	Basement roof at site level	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Yes	Basement roof at subterranean level	0.15	W/m2.K	253	253	237		323	330	667			393	2200	733	3667	1067	1167		
Glazing	Glazing (Maximum % of total area)	0.00	%																	
Yes	Windows (whole window value)	0.95	W/m2.K	40	40	37		51	52	105			62	347	116	579	168	184		
Yes	Glazed Pedestrian Doors	0.95	W/m2.K	40	40	37		51	52	105			62	347	116	579	168	184		
Yes	Vehicle access and similar large doors	0.75	W/m2.K	51	51	47		65	66	133			79	440	147	733	213	233		
Yes	High usage entrance doors	0.75	W/m2.K	51	51	47		65	66	133			79	440	147	733	213	233		
Yes	Roof windows	0.95	W/m2.K	40	40	37		51	52	105			62	347	116	579	168	184		
Yes	Roof windows	0.95	W/m2.K	40	40	37		51	52	105			62	347	116	579	168	184		
Yes	Roof ventilation including smoke vents	0.75	W/m2.K	51	51	47		65	66	133			79	440	147	733	213	233		
Yes	Glazed roof	0.95	W/m2.K	40	40	37		51	52	105			62	347	116	579	168	184		

20/09/2019

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Design & Detailing to Perform

Instructions

ScheduleAccommodation

BuildingAreas

U values Etc

Insulation

Legend

Elements

UToWattsToCO2

CostsPerm2

MaterialCostThickness

Revisions

Resistances

Mainly mineral based													Fibre	Foam										Mainly Fossil Oil-based			
Cellulat	Loose	Loose	Boards	Blocks	Blocks	Blocks	Blocks	Blocks	Blocks	Loose	Loose	Loose		Fiber Quilts	Fiber Quilts	Fiber Quilts	Boards, Boards	Boards	Boards, Boards	Boards	Boards	Boards	Boards	Boards, Foam	Boards, Foam		
CGC	LECA	LESA	CS	EHC	AAC	HDCB	AC	LAC	A	EP	EPWR	EV	VIP	PF	PPF	SPF	OPF	EPS	REPS	EPSCB	XPS	XPSH	XPC	PUR	PIR		
1.100			0.059	0.390	0.110	0.550	0.160	0.230	0.013	0.050	0.053		0.006		0.500	0.040		0.044	0.040	0.060	0.040	0.032	0.040	0.040	0.035		
1.100			0.059	0.270	0.110	0.550	0.160	0.120	0.013	0.050	0.053		0.006		0.500	0.040		0.032	0.032	0.060	0.027	0.032	0.040	0.022	0.025		
1.100	0.000	0.000	0.059	0.330	0.110	0.550	0.160	0.175	0.013	0.050	0.053	0.000	0.006	0.000	0.500	0.040	0.000	0.038	0.036	0.060	0.034	0.032	0.040	0.031	0.030		
667			393	2200	733	3667	1067	1167	87	333	353		40		3333	267		253	240	400	223	213	267	207	200		
667			393	2200	733	3667	1067	1167	87	333	353		40		3333	267		253	240	400	223	213	267	207	200		
667			393	2200	733	3667	1067	1167	87	333	353		40		3333	267		253	240	400	223	213	267	207	200		
667			393	2200	733	3667	1067	1167	87	333	353		40		3333	267		253	240	400	223	213	267	207	200		
667			393	2200	733	3667	1067	1167	87	333	353		40		3333	267		253	240	400	223	213	267	207	200		
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667			393	2200	733	3667	1067	1167	87	333	353		40		3333	267		253	240	400	223	213	267	207	200		
667			393	2200	733	3667	1067	1167	87	333	353		40		3333	2											

# Biodiversity Design & Details

- **BCT RSPB RIBA Book Biodiversity & Building**
  - Brian Murphy: produced 50% of book content
  - **1<sup>st</sup> 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)
  - **2<sup>nd</sup> Edition: Added refurbishment and Green Infrastructure ISBN: 9-781859-463536**
    - 3D Cutaways
  - **3<sup>rd</sup> Edition: being discussed now: MMC to add**



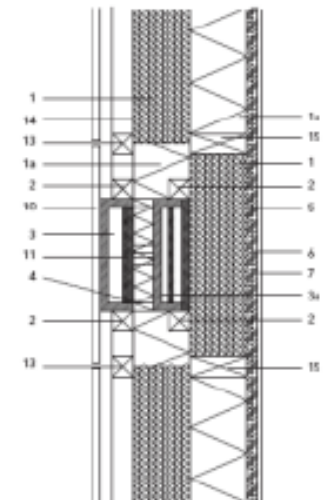
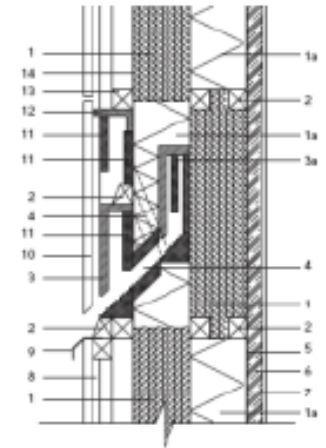
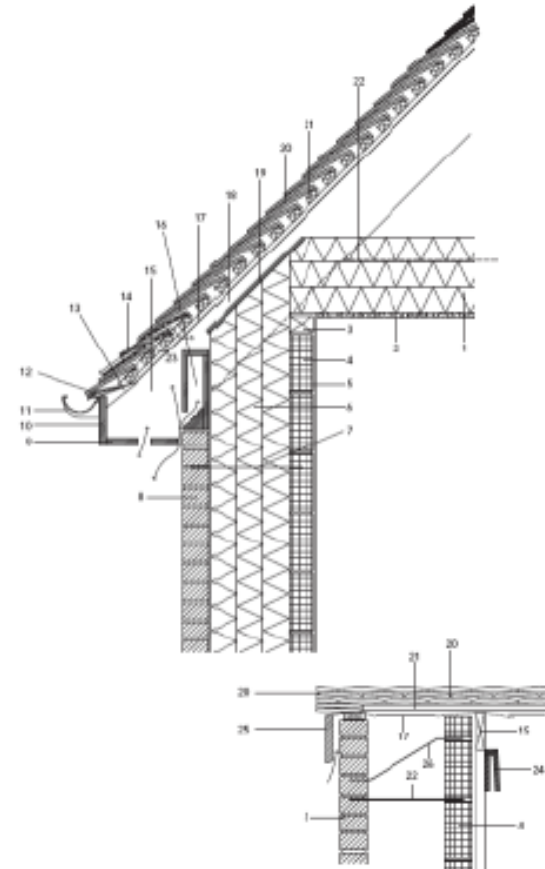
# Designing for Biodiversity: A technical guide for new and existing buildings

Kelly Gunnell, Brian Murphy and Dr Carol Williams

Second Edition

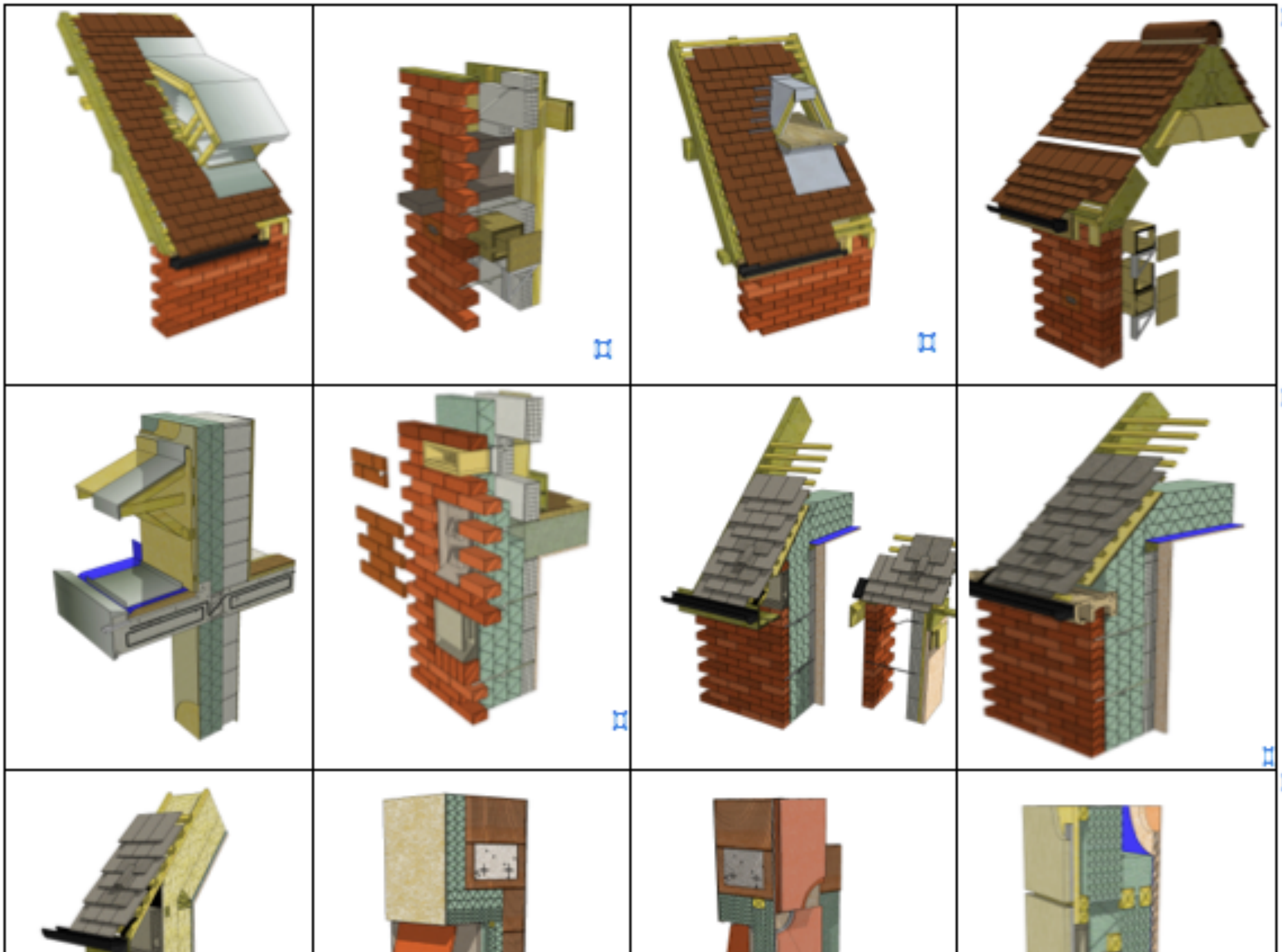
RIBA Publishing

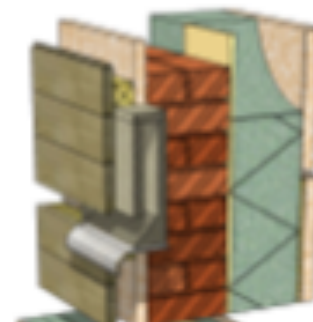
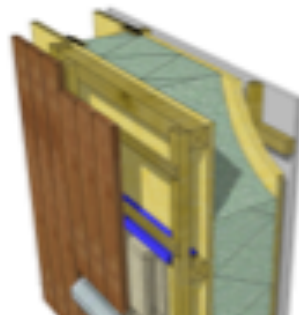
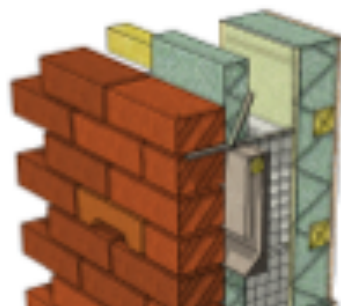
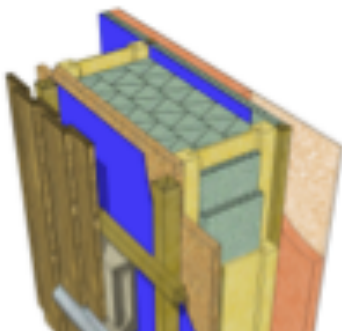
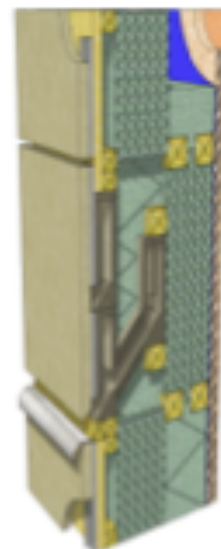
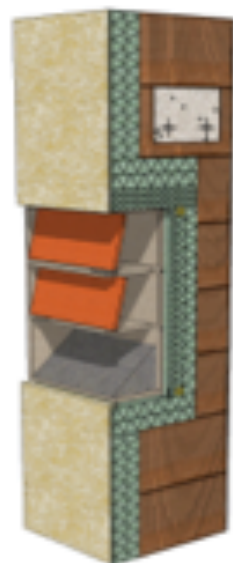
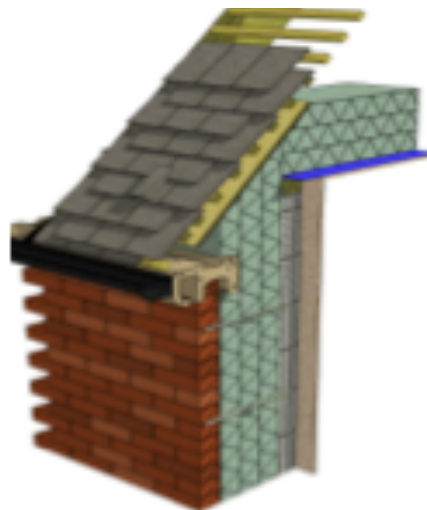
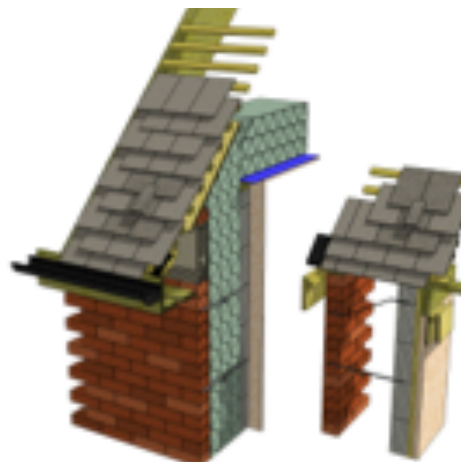
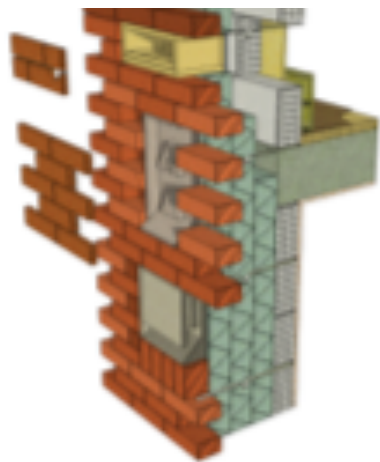
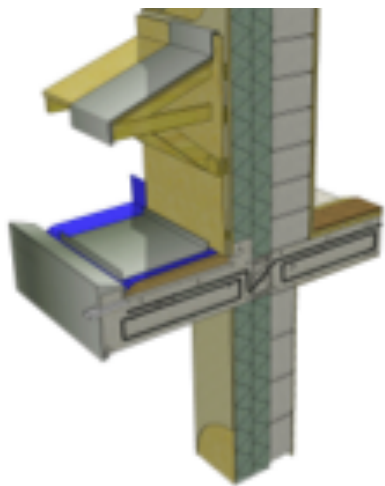
Bat Conservation Trust



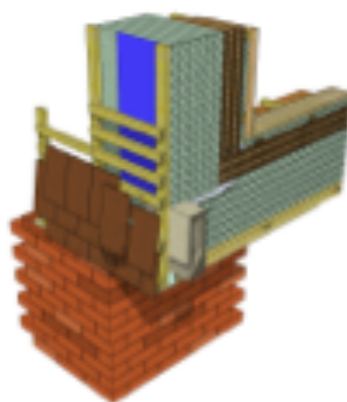
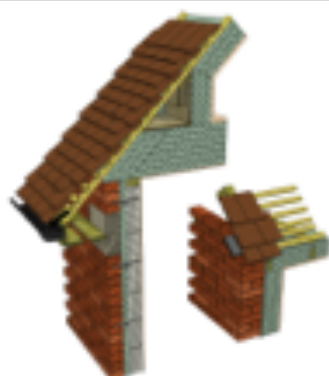
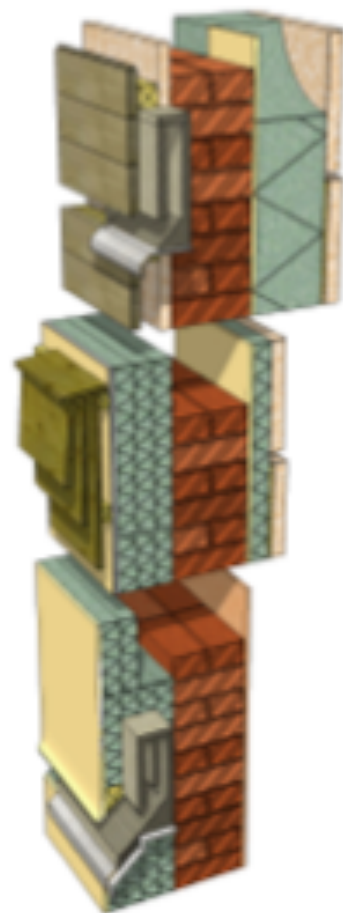
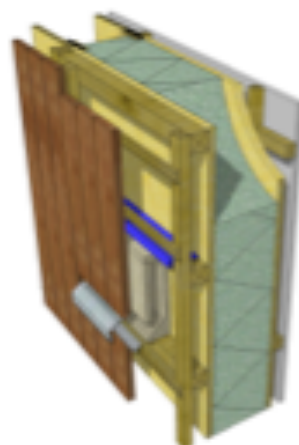
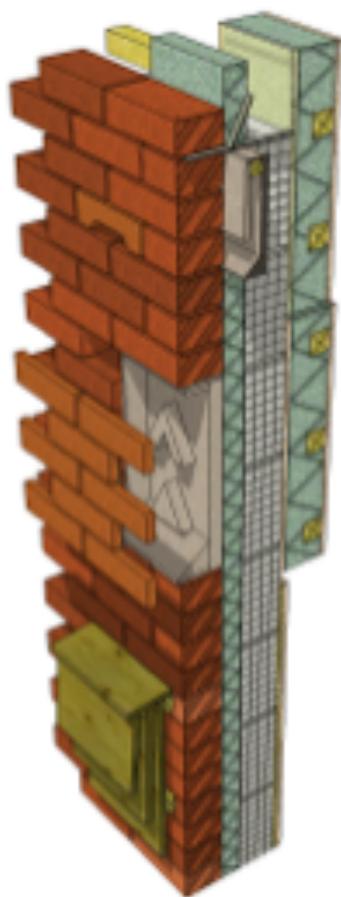
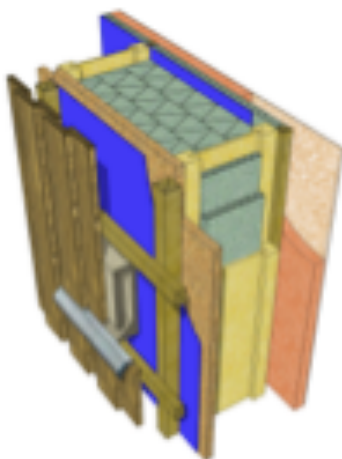
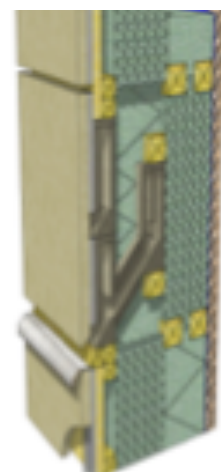
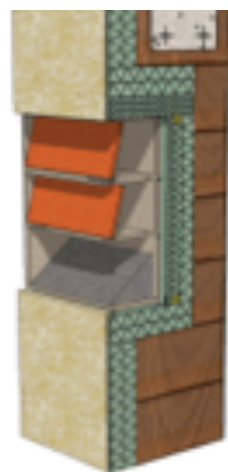
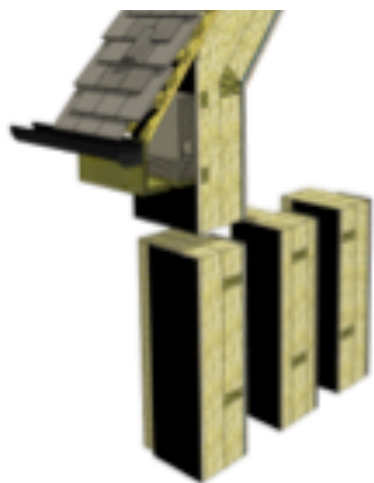
Plan

Designing









# Retrofit Design & Detailing

- **TSB Retrofit for the Future:**
  - funded 85 buildings 80% Carbon reduction 17kgCO<sub>2</sub>/m<sup>2</sup>/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)



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IBO - Austrian Institute for Building and Ecology (Ed.)

## Details for Passive Houses: Renovation

A Catalogue of Ecologically Rated Constructions



20/02/19

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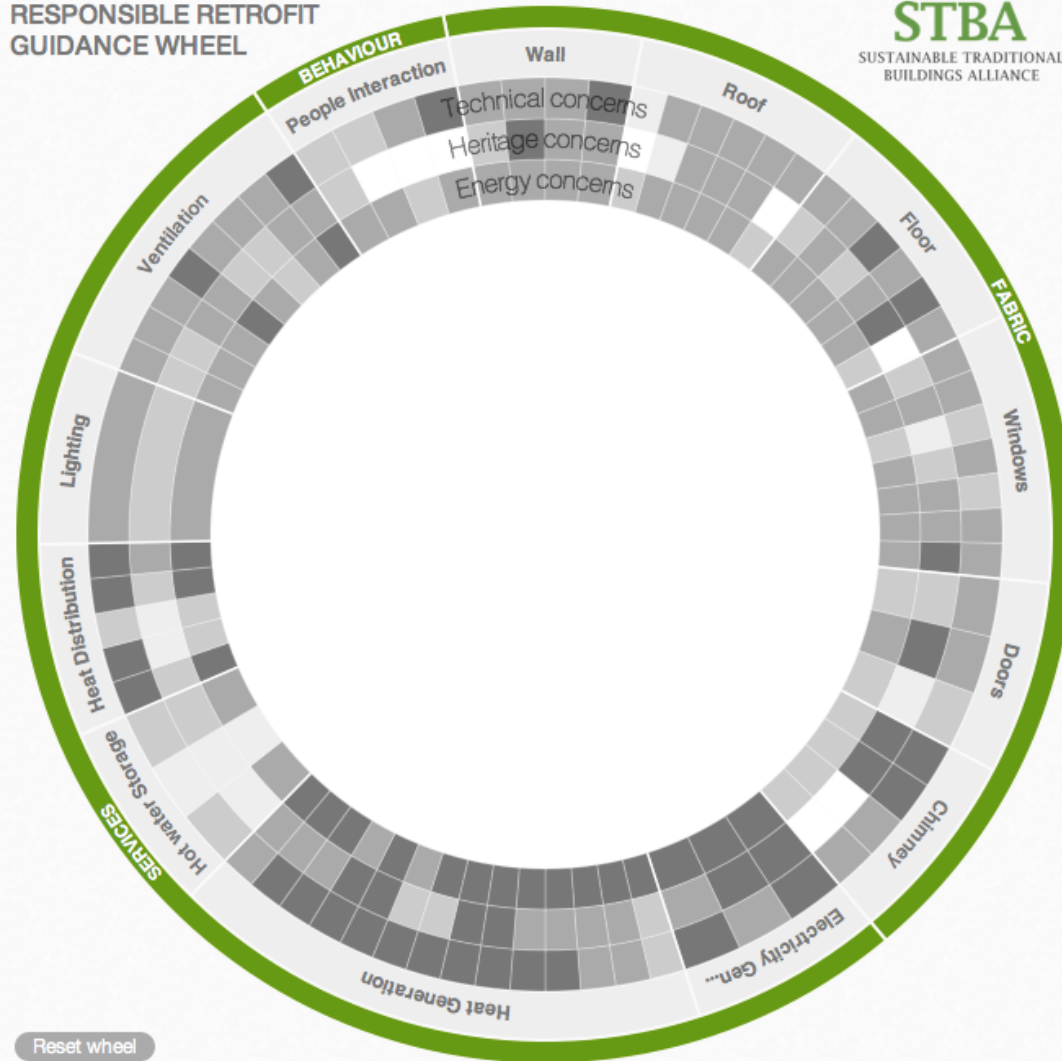
Type search here ...

All Categories



<http://www.responsible-retrofit.org>

RESPONSIBLE RETROFIT  
GUIDANCE WHEEL



**STBA**  
SUSTAINABLE TRADITIONAL  
BUILDINGS ALLIANCE

GETTING STARTED

ABOUT

GLOSSARY

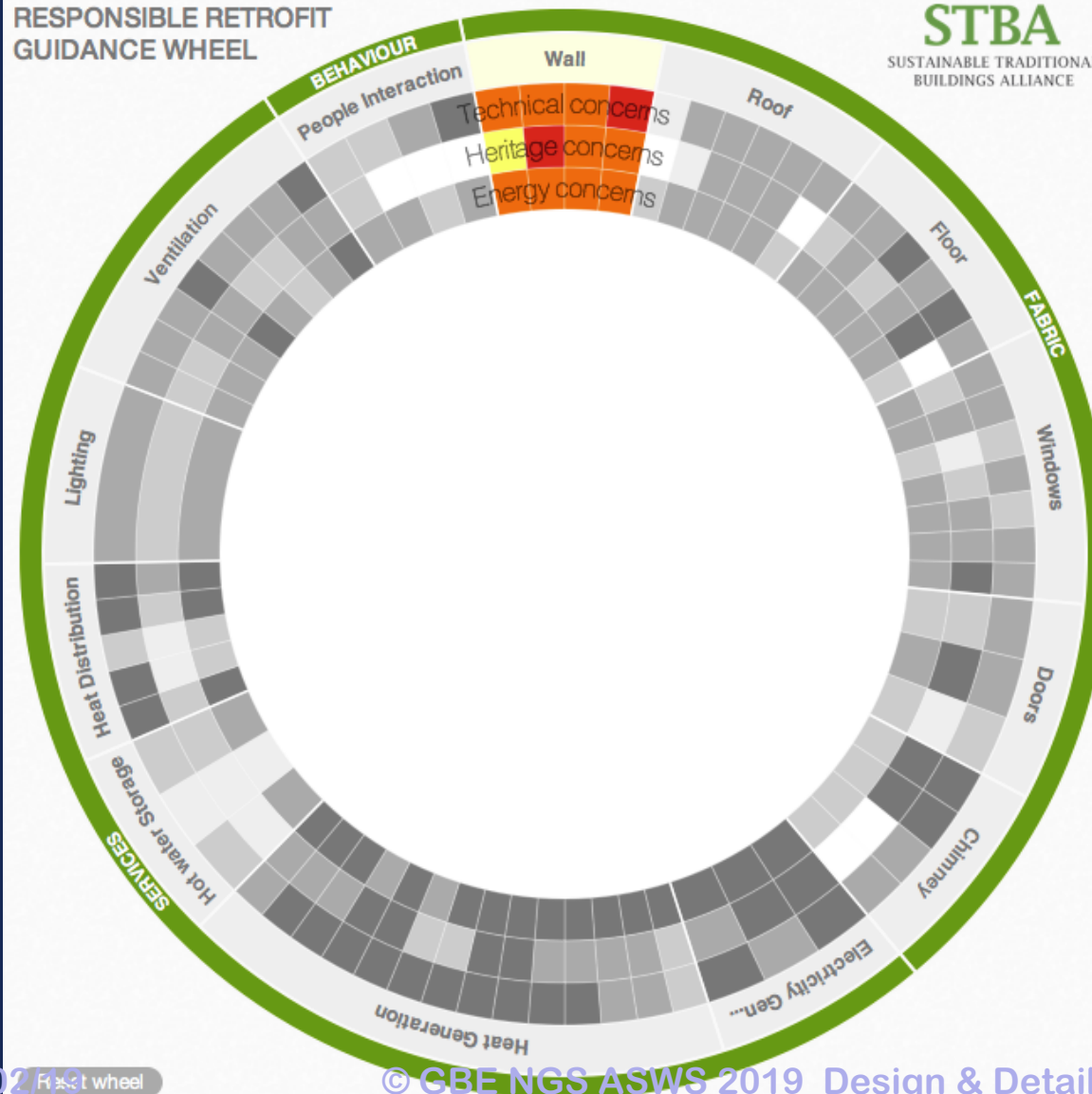
REPORT

► Colour key

► Building context



## RESPONSIBLE RETROFIT GUIDANCE WHEEL



### GETTING STARTED

### ABOUT

### GLOSSARY

### REPORT

#### ► Colour key

#### ► Building context

#### Wall

Wall measures look at the introduction of insulation in traditional wall construction. The options look at alternative positions of the insulation layer within the wall: within a existing cavity, external or internal to a solid wall construction or within a framed wall construction. Depending on context different solutions may be considered for different building elevations.

#### Cavity Wall Insulation

#### External Wall insulation

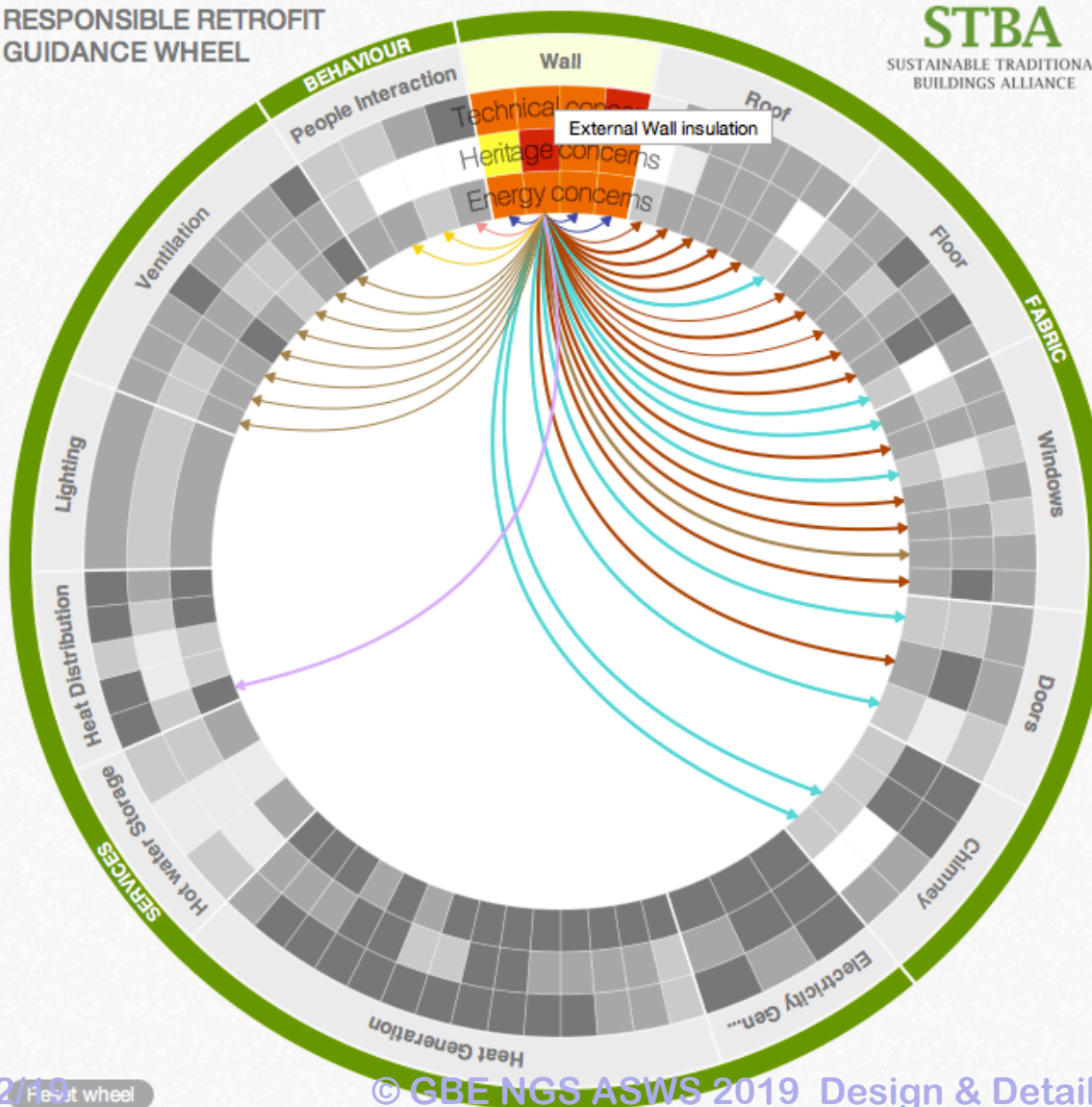
#### Internal Wall insulation

#### Frame infill insulation

CLOSE CATEGORY



## RESPONSIBLE RETROFIT GUIDANCE WHEEL



### ► Colour key

### ► Building context

#### Wall

### External Wall insulation

Application of an insulation material and a weather-protective finish to the outside of the wall

ADD TO LIST

CLOSE MEASURE

### ► Advantages

### ► 7 Technical Concerns

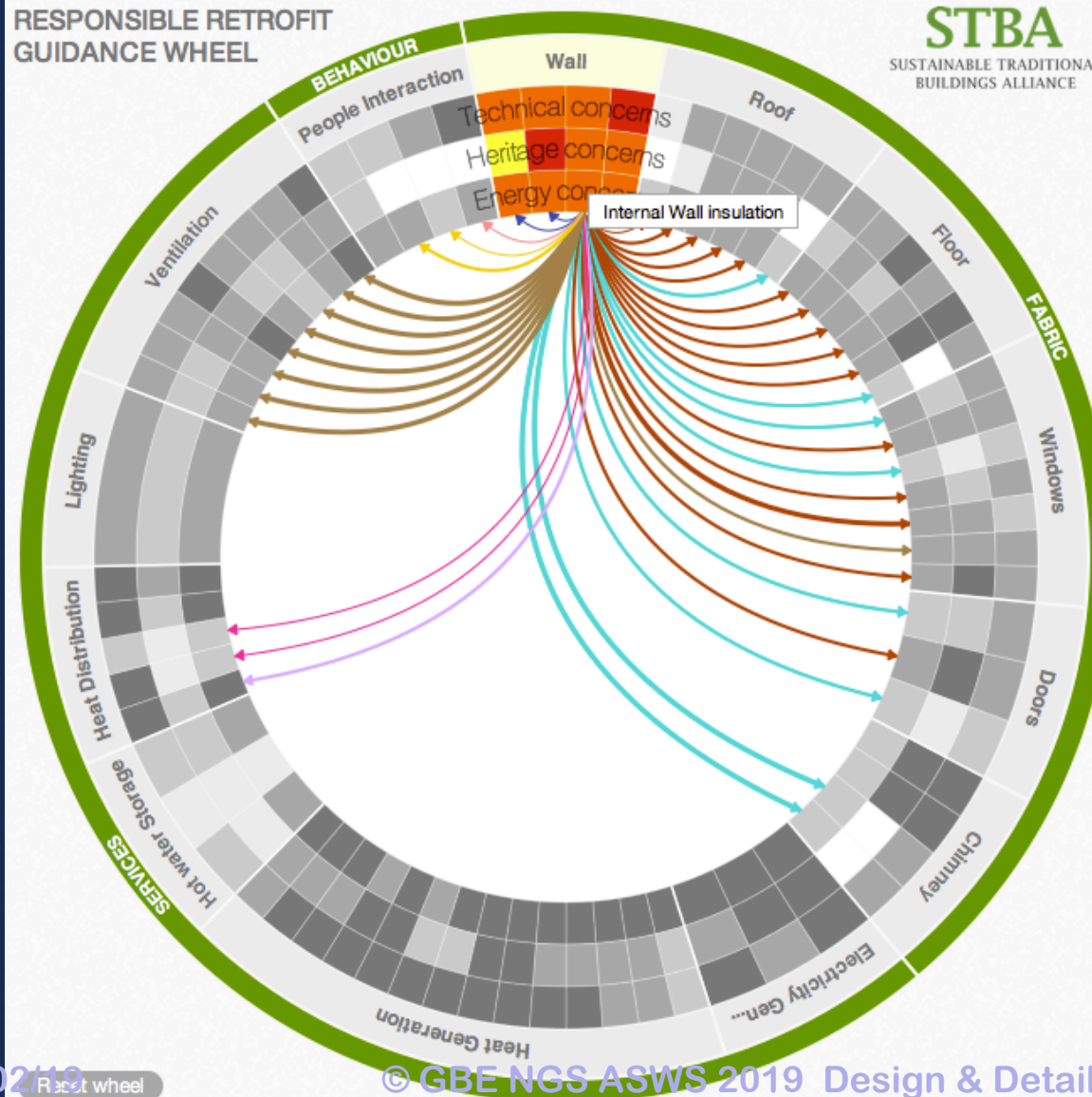
### ► 3 Heritage Concerns

### ► 3 Energy Concerns

### ► Related measures



## RESPONSIBLE RETROFIT GUIDANCE WHEEL



### ► Colour key

### ► Building context

#### Wall

### Internal Wall insulation

Insulation material is fixed to the inside surface of external walls and new internal finishes applied or insulation is blown behind existing linings

ADD TO LIST

CLOSE MEASURE

### ► Advantages

### ► 8 Technical Concerns

### ► 3 Heritage Concerns

### ► 3 Energy Concerns

### ► Related measures

# 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 sanitaryware 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

## Plan

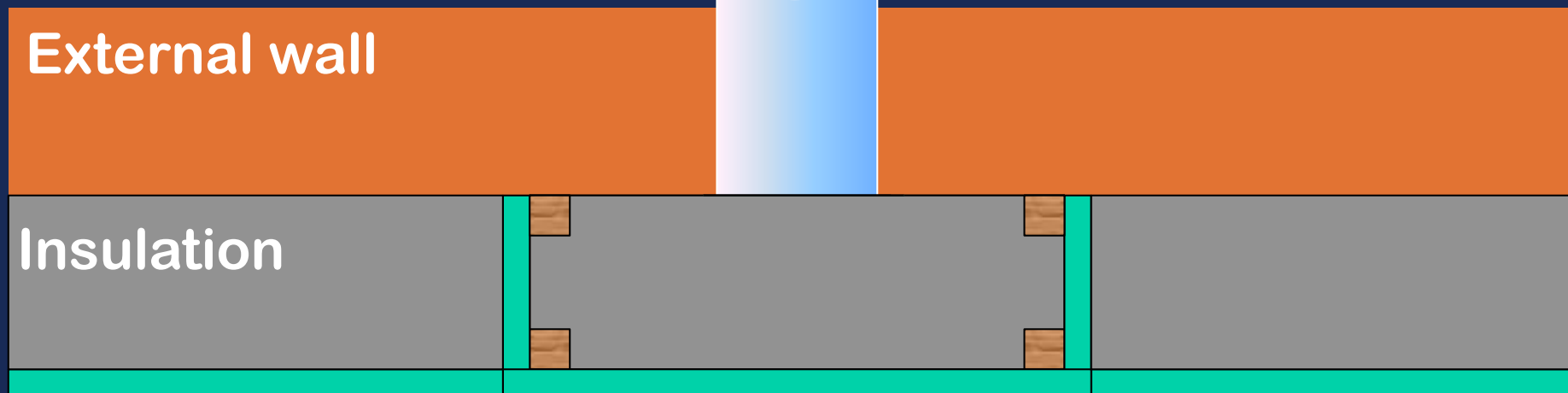
External wall

External wall  
Thermal insulation  
Thermal bridges  
Through ducts &  
Party wall  
Internal party wall  
thermal insulation  
Duct Space  
insulation

Party Wall  
chimney breast

Limited access  
to services  
To connect  
To insulate  
To make air tight  
To maintain  
To fix leaks  
To replace

## Plan



New A Rated Boiler

External wall  
Thermal insulation  
must be first

If Boiler replaced  
early

Out of sequence  
working

Framing, Insulation  
& Linings

Access to services  
To connect  
To fire proof  
To make air tight  
To insulate

Avoid removing and  
refitting boiler and  
pipes to new

insulated lining later

# © GBE 2019

- Brian Murphy BSc Dip Arch (Hons+Dist)
  - Technician and Architect by Training
  - Specification Writer by Choice
  - Environmentalist by Actions
- Greening up my act since 1999
- Founded National Green Specification 2001
- Launched [www.greenspec.co.uk](http://www.greenspec.co.uk) 2003
- Created: GBE at <https://greenbuildingencyclopaedia.uk> 2015
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- CAP'EM Compass <http://www.capemcompass.eu> No longer
- LSBU London South Bank University Faculty and Course website page [Brian Murphy](#)