




# Retrofitting Practical Toolkit for Architects

Rev 7 %%%  
RIBA South/South East, SusCon, SEEDA, ESF, BSSP; GreenSpec and ech<sub>2</sub>o  
2010 Programme Sustainable Construction

This & contained presentations

- Scribd: [www.scribd.com/brianspecman](http://www.scribd.com/brianspecman) > collection > SusCon Retrofitting
- [http://www.scribd.com/document\\_collections/2401889](http://www.scribd.com/document_collections/2401889)



# 1-6 Retrofitting Practical Toolkit for Architects

RIBA South/South East, SusCon, SEEDA, ESF, BSSP; GreenSpec and ech<sub>2</sub>o

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# 5 Retrofitting on a Larger Scale

Sustainable mass retrofit for dwellings  
Autumn  
Brian Murphy of GreenSpec  
Cath Hassell of Ech<sub>2</sub>O

## Topics

- Learning Lessons
  - from past & current projects
- Resource Efficiency
- Community issues
  - reinforced by recent government activity
- Recent Refurbishment & Retrofit
- Blue Sky Or Green Façade Thinking
- Case Studies

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# Refurbishment Eco-Retrofit Failings

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## Past Inheritance v bad refurbishment

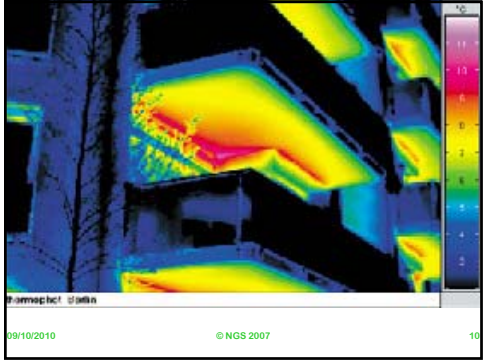
- 70's and 80's grant driven refurbishment
- Inadequate Energy saving insulation to attics
- Inappropriate inadequate windows removing good sashes and destroying building appearance
- Cement renders to cover up botched walls to help destroy the lime mortar brickwork integrity
- Heavy concrete roofing tiles to replace adequate roofing slates overloading roof timbers
- Damp Proof Courses injected and membranes added to ground floor, modifying the moisture permeability and destroying great floors

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## Past Mistakes

- Major redevelopments from streets to estates
- New building construction methods
  - Precast loadbearing concrete panels
    - Unskilled, uninformed, hurried labour
    - Inadequate supervision and inspection
    - Led to failures, some catastrophic
- Bad building design
  - Concrete framed
    - Inadequate insulation/thermal bridges, inappropriate cheap heating adopted, condensation, mould, ill-health

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### Modern Movement Refurbishment

- '60s Skyscraper '90's Over-cladding
- '70s Ground scraper '00s Eco Refurb.
- '60s Skyscraper 21st C Sustainable Refurb.

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### Recent Solutions

- Rainscreen Overcladding & good windows
- Or insulated render overcladding & windows
- Extended details at edges and openings
- Weather protection for the building fabric
- Wrap up the thermal bridges with generous thermal insulation
- Minimise the cladding fixing thermal bridges
- Expose the thermal mass internally
- Thermal stability
- Low cost heating

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### Refurbishment: Decent Homes

Government disajointed thinking again  
No etiolka nor carrots  
Missed opportunity?  
1m sustainable refurbished homes by 2010?  
Waste generated diverted from landfill?  
Reclaim and reuse or resale or recycling?

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### Past Inheritance > Decent Homes

- Old fashioned kitchens and bathrooms
- Old inefficient boilers,
  - probably adequate heating systems
- Competent old or inadequate new windows and doors
- Competent but old un-guarantee-able roofing tiles/slates
- Mostly sent to landfill
  - Some segregated and recycled
- Mostly replaced with new
- Little or no insulation:
  - Improved (optional v efficient boiler)
- 1m properties: made decent not sustainable  
Completing: 2010

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### Checklists

- Its critical to avoid unnecessary waste
- Take every property on its own account
- Only replace if necessary
- Formalise it and manage it
- Use tiles from one roof to repair 100 roofs
- Don't remove whole roof for the sake of two broken tiles
- No guarantee for an old roof should never be an excuse to strip the roof

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### Sustainability Checklists

What are they?  
Where do they exist?  
What can they do for you?

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### Eco Refurbishment Checklist

- Decent Homes: Sustainability cop-out
- GreenSpec Reaction to it
- What can be done
- 2004-2007
- Other issues need to be added
  - TSB Retrofit Programme learning
- Will be added to Downloads soon

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The 50+ GreenSpec CPD file to download soon...  
 GreenSpec CPD file to download soon  
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### Educate to Change Perception

- The day I saw those roofs I attended the Gateshead CC and ran a workshop on resource efficiency
- This catalysed a change in culture of the whole business and now all departments work as one
- Every arising finds a reuse or a recycling opportunity
- Gateshead speak of their transformation at public events

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**Resource Recovery**  
**New Goods in**  
**Waste Segregation**  
**Distribution Centres**

Receiving recovered resources from projects  
 Sorting materials for site's daily requirements  
 Feeding Site(s) with resources, collecting waste

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### Logistics: Materials & Waste

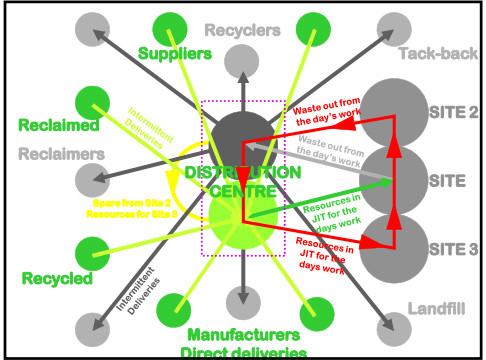
- 10 to 100,000 unit contracts
- Materials arising x 10 to 100,000
- Set up transfer stations for materials in and waste out and materials in again
- Consolidation centre: materials arrive off site
- Opportunity for no packaging
- Requests for materials for days work, in advance
- Pallets for each tradesmen/team
- Delivered by 'milk round' to within 5m of team/space

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### Combine alternative approaches

- One temporary or permanent site and/or warehouse building
- Combine resource storage, sorting for delivery and waste segregation/bulking
- Daily round trips to site(s) with JIT goods
- And daily waste and packaging collection on same trip
- Facilitates 'take-back' 'return-to-stock' 'use or return'
- 'Surplus to requirements' held for next site
- 'minimising 'over ordered never needed'

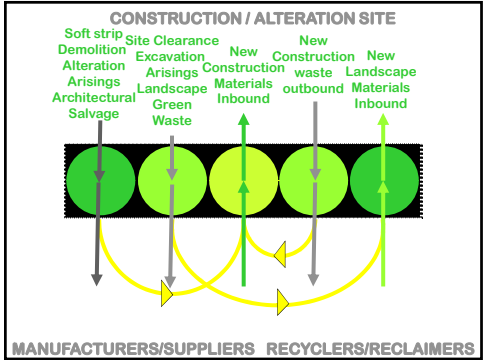




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### Excavation and Landscape

- Site clearance: turf & topsoil stockpile
- Green waste trimmings: Composting
- Excavates subsoil: stockpiles
- Hard landscape, sub-bases, drain/service bedding/backfill: stockpile
- Subsoil & compost: Topsoil manufacture



### Waste in Refurbishment

Decent Homes PFI projects  
 Waste generated: Reuse opportunities  
 Retrofit for a Future: possible programme

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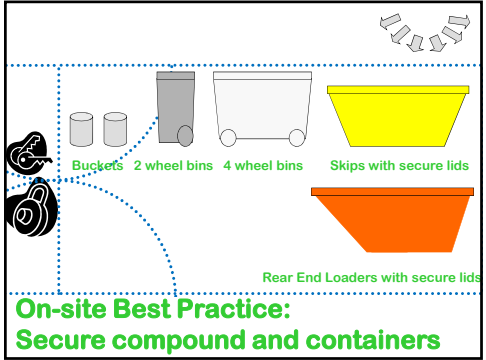
### Avoidance of bad Practice

- Place dedicated skips local at place of generation
- But not too close
- Window Deconstruction:
- Glass skip a few paces away
- Metal fixings/ironmongery, rubber/EPDM gasket, plastic, bins closest
- or all will go in the glass skip



### Avoidance of bad Practice

- Secure Compound for skips
- Prevent fly-tipping on site by others
- Prevent contamination of Segregation skips



### Avoidance of bad Practice

- Skips with secure lockable lids
- Prevent fly-tipping on site by others
- Prevent contamination of Segregation skips
- Locks only available to Site Champion and Transfer station site staff
- Prevent off-site fly-tipping

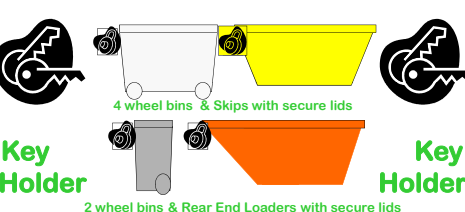
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### Lockable lids on skips



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### Building Site Secure Transport Transfer station



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### Duty of Care

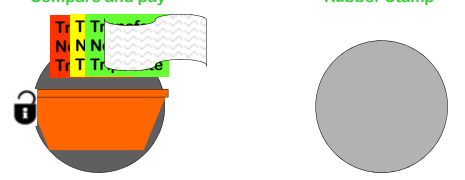
- Extends beyond site gate
- Follow the waste vehicles occasionally
- Check where the waste goes
- Ensure it reaches the destination
- Only pay when proof is provided
- 3 part WTN 1 for site 1 for LO/TS/RS 1 to return to site/accounts dept to check

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### Waste Transfer Notes

To EA

Compare and pay Rubber Stamp



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### Websites

- [www.greenstreet.org.uk](http://www.greenstreet.org.uk)
- [www.sustainingtowers.org](http://www.sustainingtowers.org)
- [www.parityprojects.com](http://www.parityprojects.com)
- [www.greenspec.co.uk/housing-refurb-retrofit.php](http://www.greenspec.co.uk/housing-refurb-retrofit.php)
- [www.generationhomes.org.uk](http://www.generationhomes.org.uk)
- [www.existinghomesalliance.org](http://www.existinghomesalliance.org)
- [www.tzero.org.uk](http://www.tzero.org.uk)
- [www.rethinkinghousingrefurbishment.co.uk](http://www.rethinkinghousingrefurbishment.co.uk)
- [www.generationhomes.org.uk](http://www.generationhomes.org.uk)

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### Past Inheritance & Information sources

- Eco/Sustainable Refurbishment
- All refurbishment issues with a green flavour
- Addresses many era of social housing and building construction types
- Looks at solutions for each
- Sustainable Homes/Hastoe

[www.greenstreet.org.uk](http://www.greenstreet.org.uk)

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### Past inheritances v Current demands

- Mild wet climate
- Victorian healthy living:
  - air leaky approach to building
- Current increasing carbon reduction & energy efficiency demands
  - requires airtightness
- Modern lifestyles
  - Increasing water consumption, bathing, showers, cooking, clothes and dish washing, cloths drying
  - Requires moisture permeability/ventilation

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### BRE EcoHomes XB eExisting Buildings

- Focussed on Stock renewal for RSLs
- Came about during Decent Homes programme as a late reaction to it
- Failed to make much of a dent
- Contracts already let
- Expensive add on
- Suffers from all that BRE out puts do

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# Community & Individual Issues

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## Past Inheritance v Pathfinder Programme

- Old streets: accessible, understandable, visible, congested parking
- Old housing stock: competent/inadequate, adaptable, refurbish able, upgradable, extendable
- Feral un-policed youth
  - Police finally admitting to failings
- Communities encouraged to take back their patch
- Major redevelopment programmes
- Repeating the 60's?
- established communities, settled families

Designers fighting back with reuse proposals

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## Past Inheritance for Inhabitants

- Old people (non-gardeners) choose towers
  - For security, avoidance of conflict with youth
- Young couples choose towers
  - No time for gardens
- Young or multiple occupancy choose towers
- Avoid unrelated Young and Old in same building
  - one will overrun the other

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## Past Inheritance v Inhabitants

- Most LA, HA, RSL & ALMO tenants have towers thrust upon them.
- Tower block living is not for young families
  - Too remote from safe supervised play
  - Balconies too small, windy and dangerous
- Mothers, babies, children, prams and shopping are difficult
  - impossible without working lifts

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## Community Consultation & Participation

The Good, the Bad and the Ugly  
And now the Government T&CP laws

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## Community Issues:

- Community engagement:
  - Don't be scared bite the bullet
  - There a techniques to avoid the loudest having the only say
  - 80's experience says this has a limit before designers are burnt out

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## Community refurbishment:

- Train the community in new skills
- Low skill labour intensive activity
- Le them own the work
- Take kids off the street
- Apprentice scheme (Kier Sheffield)
- Earn your time on the nail gun
- 10 hours of labour for 1 hour on nail gun

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## Communal activity: Facilitate it

- Communal land and activity
- Communal Allotments,
  - waste and composting
  - Tower and slab estates interior green space
  - Sheffield and London East End
  - Food growing
- Communal Food: break down barriers
- Communal space: to engage: up to 24 hours

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## Community Support low carbon lifestyles

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### Community Services

- Community funding: Lots available (until recently?)
- Communal energy: buy into RE (FIT and RHI?)
- Community discounts: to anything
- Community help & finance: LETS & Acorns
- Communal water: ?
- Communal Heating (District Heating) CH&P, CCHP
- ESCOs & MUSCOs: avoid squandering incentive

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### Metering & monitoring to drive down waste

- Past District heating in the UK
- Pimlico waste heat from Battersea Power Station until it closed
- Peterborough DHS many thousands of properties, many poor tenants
- Insulated inadequately, unmetered, heat on full and windows open
- Disbanded as uneconomical
- Today with smart metering this could be very different.

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### Community & inhabitants

- People live where they do by choice or by chance
- They access local schools, shops, services
- They develop family and support networks around them
- They do their own thing in gardens, grow trees plants, bury past pets
- Decanting them from their home to refurbish must acknowledge this
- Local decanting not remote decanting:
  - to maintain some normality for all involved
- Return them to their home: not just same street
- They need connection with their past and not have other dig it up

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### Decent Homes

- Residents retreat
- A room with kitchen, dining, WC and lounge with radio and TV
- Escape from the noise and the dust
- Allow the labour team to refurbish a whole room in a day

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### Community low carbon lifestyles

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### Recent Retrofit

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### 21st C Refurb

1NTEGER Intelligent and Green 1960's Tower

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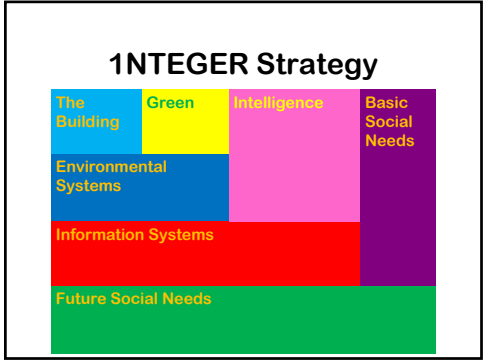
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### 1NTEGER Intelligent & Green

- Radical rethink of housing provision
- London Tower Block refurbishment example
- Windy conditions at ground level and at height
- Inadequate U value
- Flats in towers suffer from orientation
  - Lack of sun, or too much
  - Lack of access to satellite and/or TV signal
- Aging population needing healthcare
- Lack of security to stairs and lifts

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### 1NTEGER Strategy



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### 1NTEGER Solutions


- Roof & ground level communal services & spaces
  - Concierge access control
  - Health centre in ground floor
  - Internet food delivery storage
  - Communal sky space
- Wind canopies at low level
- Cable TV to all flats
- Broadband & ITC to all flats
- Glazed in balcony sun space (openable)
- Intelligent waste segregation chutes
- External insulation exposes thermal mass inside

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### 1NTEGER Approach

- Showroom at ground floor on proposals
- No tenants need leave building during work
- Empty units refurbished as show flats
- Tenants to be decanted to show flats
  - Own flat refurbished
  - Return to own flat
  - Free up show flat for next tenant

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### Balcony Enclosure

- Balcony Enclosure
- Wind protection
- Sliding concertina glazing
- Winter Solar space
  - Solar gain
- Summer ventilation
  - Passive Cooling

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### Sustaining Towers

[www.SustainingTowers.org](http://www.SustainingTowers.org)

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### Sustaining Towers

DESIGN GUIDE TO SUSTAINABLE REFURBISHMENT

Welcome to Sustaining Towers, an interactive web site which can provide you with practical advice on refurbishing tower blocks.

Our aim is to facilitate the regeneration of the 3000+ residential high rise blocks in the UK with proposals for sustainable solutions integrating environmental, social and economic criteria.

The Design Guide found on this website is an interactive tool that you can use to obtain sustainable refurbishment solutions tailored to the particular issues of a specific tower block. The design guide also acts as a practical reference to a range of similar issues that arise with tower blocks. The Design Guide offers approximate costs for sustainable strategies, so that you can appreciate the economic benefits and compare the investment cost of varying solutions.

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### Sustaining Towers

- [www.SustainingTowers.org](http://www.SustainingTowers.org)
- DTI funded research
- JV: Price and Myers & Archtype
- Website addressing the sustainable maintenance/upgrading/refurbishment of 1960's tower blocks
- Ran a Conference
- There was a book by Building Centre

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### Waste In Use: Multi Storey



- Waste is a real problem
- Towers: Chutes
- 3 chutes
- 1 chute + sorting kit
- Walk-up/walkway
- 3 Chutes + 3 bins?
- Walk down to bin store
- Multiple segregation bins
- Human engagement needed

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### Recent Inheritance: Inadequate Regulation

- Party walls: Cavity construction
  - Uninsulated (thermally) for acoustic isolation
  - No fire barriers or cavity compartmentation
- No U value requirement,
  - inadequate U value provided
- Cavity acts as chimney for heat loss from rooms to go to attic
- Timber framed need only be insulated one leaf
- Leeds Met Uni Research highlighted issue BRAD L1A to be revised now

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### New science of building performance

- Avoiding Vapour Barriers that tend to fail
  - Unskilled, uninformed labour
  - Split responsibility
  - Inadequate supervision, inspection & sign off
  - Concentrations lead to failures, usually hidden
- Breathing construction: tolerate inadequacy
  - Trained and informed labour
  - Informed & trained inspection & testing
  - Vapour permeable but airtight membranes
  - Wind and airtight assembly of permeable boards

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**TSB Retrofit for a Future**

Project in Development  
Material Choices

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### Retrofit for a Future: Competition

- TSB Technology Strategy Board (was DTI)
- Running programme to research potential for refurbishment of existing housing stock
- Potential Code for Sustainable Domestic Refurbishment & possible upgrades to BRAD L1B
- Started with Competition for teams to design proposals
- £150,000 budget for 80% carbon reduction
- Over 300 entries, 150+ shortlisted 80+ being refurbished now, to be monitored for 2 years

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### Retrofit for a Future: Critique

- AECB Carbon Lite advised TSB
- £150,000 budget is wholly inappropriate
- It encourages EcoBling
- £3,000 would have provided the government with much more appropriate and useful information
- It would have encouraged thermal insulation, thermal bridge avoidance, airtightness, weather tightness, ventilation, etc.
- Encouraged use of analysis tools other than SAP: PHPP was promoted.

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### Retrofit for a Future: Lessons

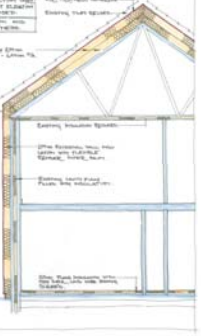
- SAP as suspected fails to address very low energy buildings
- Only looks at building fabric losses, heating and ventilation
- Cannot engage with weatherproof entrance porch, sunspaces and trembe walls
- Cannot address roof, sunspace and party wall labyrinth heat recovery systems
- Cannot see a result for adding insulated roof above an insulated ceiling

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### Retrofit for a Future: Missed

- Most schemes are individual properties
- Many Semi-detached and terrace ends
- Cannot address the party wall adequately
- May actually cause risks at the party wall/external wall junction.
- This project will highlight the inevitable problems and may interpret them badly.

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### Outside of building

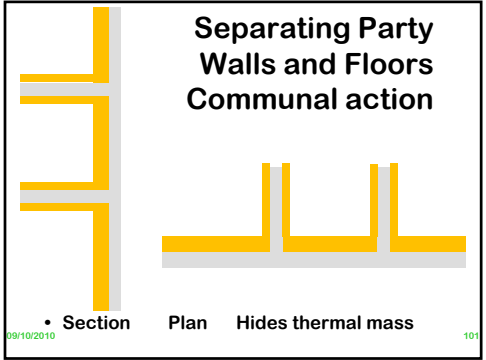
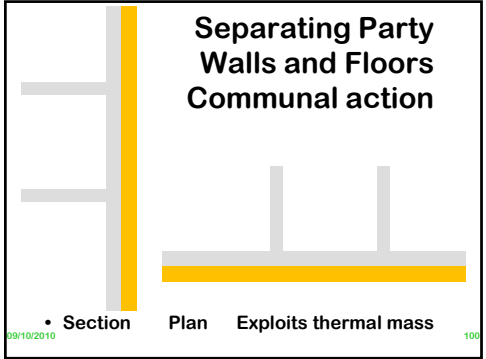
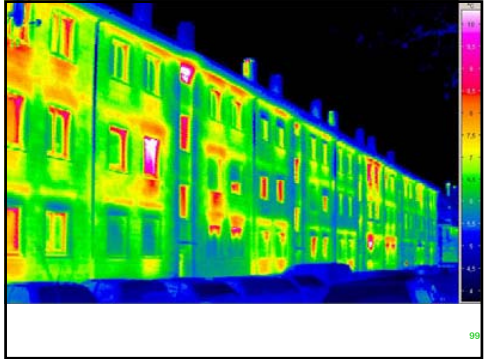
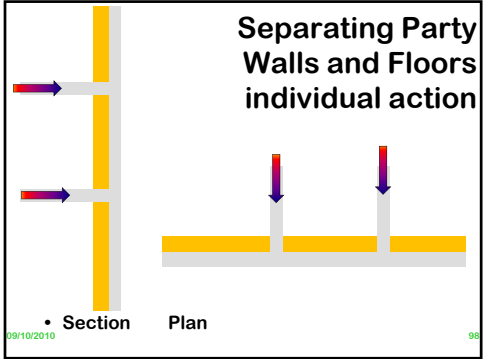
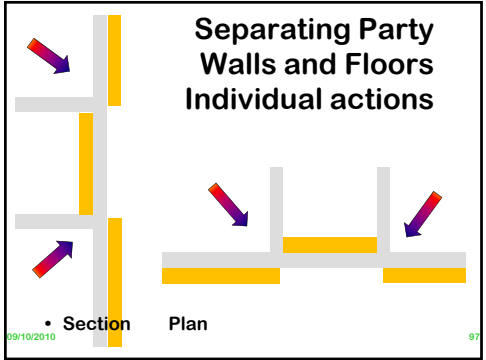
- Concrete tile hanging removed and saved
- Cold bridge projection cut off flush
- Cavity Insulated
- External Insulated render
- Remove existing Insulation
  - cellulose fibre 100 mm.
  - Wood fibre 100 mm.
- 20 mm. Insulation to concrete floor
  - Vacuum Insulating panel
  - Aerogel Insulation quilt
  - High decrement dense wood fibre

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**Terraces: one at a time or many**

- If many people operate independently the interfaces between inconsistent approach will cause thermal bridges and patchy buildings
- Passivhaus refurbishment projects in Germany
- Bulk buying brings the costs down to affordable levels
- PAYS like funding means all can engage



GreenSpec  
www.greenspec.co.uk  
CAPEM  
www.capem.eu

SusCon  
Royal Institute of British Architects

**Blue Sky Or Green Façade Thinking**

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### Interlocks between fabric and services

- This may sound like blue sky thinking but may be possible with large scale projects
- Integrated Building Energy Management Systems IBEMS
- Windows, doors and vents:
  - Contacts link to status indicator
  - Central locking on : just like cars
  - Interlocks: if any is opened the heating, ventilation or cooling is disabled

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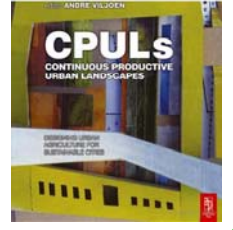
### Green walls, Green roofs

- See Cath's Case Studies

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### CPULs Continuous Productive Urban Landscapes

- Andre Viljoen
- Book
- More Blue Sky or Green Façade thinking!
- Growing food on the building façade
- Up the walls and across the roofs
- Breakfast from your balcony



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## Case Studies

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### Case Study: Holles & Warwick House, Angell Town Sustainable Refurbishment

at

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## Retrofitting Practical Toolkit for Architects

RIBA South/South East, SusCon, SEEDA, ESF, BSSP; GreenSpec and ECH<sub>2</sub>O 2010 Programme Sustainable Construction

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