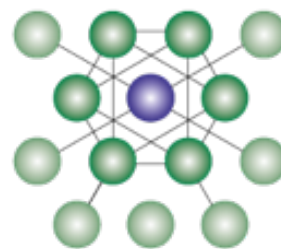


Retrofit Future-Proof Project

GBE



Green Building Encyclopaedia

Notes following TGR BiteSize event at PTEa

Hear Audio Recording: Peter Rickaby PAS 2035 181114_0187.WMA

NB anything the speaker says or GBE interpretation is all subject to awaiting the final issue of PAS 2030 update and new PAS 2035

These are running late on their issue programme.

Intended May 2019 now not before end of public consultation ending 19th September 2019

Speaker: Dr. Peter Rickaby

Representing:

- Each Home Counts Implementation Board
- BSI Retrofit Standards Task Groups (PR is Chair) authors of PAS 2035
- UKCBM

Speaker: Dan

Representing: The Green Register and Bristol Open Doors

Reference Publications/Actions:

- 'Each home counts' Bonfield Review
 - <http://www.eachhomecounts.com/>
- Trustmark
 - <https://www.trustmark.org.uk/>
 - Expanding its remit to include Repair Maintenance Improvement (RMI)
- PAS 2030 Specification for the installation of energy efficiency measures (EEM) in existing buildings and insulation in residential park homes
- PAS 2035 Retrofitting Dwellings for Improved Energy Efficiency: Specification and Guidance
 - Both have now been issued for public comment, with a closing date of 19th September 2019.
 - For link to PAS2035: <http://drafts.bsigroup.com/Home/Search?searchText=pas+2030>

Fight for the Standards

- Domestic Retrofit **Ailores**
- Milestones
- Errors

BSI Retrofit Standards Framework

<http://files.site-fusion.co.uk/f0/77/f077957c-4fa1-4ffa-b341-f290e5526f9c.pdf>

- Objectives
 - Improve functionality and durability of buildings
 - Improve the comfort and well-being of occupants
 - Improve energy efficiency
 - Reduce environmental impact
 - Protect and enhance architectural heritage
 - Minimise the 'performance gap'
 - Avoid unintended consequences
- Principles
 - Focus on materials, workmanship and processes
 - Make retrofit standards accessible (online portal)

- Combine technical standards with guidance

Issue to address:

- Climate Change, Adaptation, Mitigation
 - Carbon Reduction
- Fuel Poverty one of biggest complications to contend with
 - Families trying to keep warm, no focus on Carbon
 - **1990's failures**
 - **Government modified counting methods to look better**
 - Rises in Fuel Price wiped out savings,
 - Price increases ongoing
 - **More Fuel Poverty not less**
 - **Choices between heating and food**
 - **People being imprisoned for failure to pay bills**
- **Fabric First Approach?**
 - **except 'no insulation without ventilation'**

Scope:

- **3 m households today**
- 27 m total homes
- 4 m homes in social sector housing
- 68% in private ownership
- 25-30% of total emissions
- 80% of buildings will still be standing in 2050
- 20-25 m homes to retrofit by 2050
- Current new Part L compliant buildings
 - Will be added to retrofit program later
 - **Which year Part L are they built too (applications prior to building)**
 - **Even current Part L is inadequate**
 - **Performance Gap leave them inadequate**

Programme:

10-year-old data:

- ~~2010-2050 40 years x 50 working weeks = 2,000 working weeks~~
- ~~20m/2,000 = 10,000 completions per week~~
- ~~25m/2,000 = 12,500 completions per week~~
- ~~10,000 No. * £25,000 = £250 m/week expenditure~~
- ~~12,500 No. * £25,000 = £312.5 m/week expenditure~~
- ~~£250 m/week expenditure x 50 weeks = £1.250 bn/year~~
- ~~£312.5 m/week expenditure x 50 weeks = £1.56 bn/year~~

Current data:

- 2020-2050 30 years x 50 working weeks = 1,500 working weeks
- 20m/1,500 = 13,333 completions per week
- 25 m/1,500 = 16,667 completions per week
- 13,333 No. * £25,000 = £333.3 m/week expenditure
- 16,667 No. * £25,000 = £416.7m/week expenditure
- £333.3 m/week expenditure x 50 weeks = £1.666 bn/year
- £416.7 m/week expenditure x 50 weeks = £2.32 bn/year

Totals:

- 25m x £25,000 = £625,000 m (£625 billion) total expenditure
- 10,000 homes per week
- 7 x 24 x 60 = 10,080 minutes per week
- 1 retrofit completion per minute

Comparison:

- 'Quantitative easing' of 2008 banking crisis: £1,500bn
 - in one go, not spread over 30 years
- **BAIS busy now on other things: BREXIT?**

Every Home is Different,

- Russell Smith ex Parity Projects
- Pie chart image (all in the same S London estate)
- Size of Pie = Consumption level
- Size of Sector = Different energy use breakdown
- **Buildings of different eras building types are different,**

- The overlay different occupant life style consumptions

Failures:

- Glasgow 2014: 4 tonnes of EWI fell from top floor of tower due to extra wind loads at 14 stories
- Oxbang School 2014: Gable wall EWI + Brick slips fell due to wind loadings
- Preston Estate 300 No. homes in private ownership
 - Kate Selincourt wrote in Passivehouse+ magazine
 - LA persuaded house owners to join
 - Funding under CESP Scheme
 - No Design, poor labour = Bad installation
 - Rain penetration around terrible details
 - Walls behind saturated, mould growth and uninhabitable
 - Getting fixes is proving difficult
 - Confronted Insulation Industry with this example
 - Each Home Counts: Challenged
- Grenfell over 18 m tower block
 - 72 dead
 - Rainscreen cladding air gap
 - Fire and bad fire stopping
- Hackett Inquiry Report:
 - Specification race to the bottom
 - Slow response to correct corner cutting culture or profit culture
- Many other failures:
 - Mostly Cavity wall insulation used where walls are too exposed
 - EWI put on badly
 - BEIS tired of letters from owners about failures
 - Not just wet insulation but saturated buildings unlivable buildings
- Most CITB approved Skills courses are for new build not Retrofit
 - Needs to expand its remit to include Repair Maintenance Improvement (RMI)
 - Whole new work force needed
 - Skills is not enough, Competence and Care are essential
 - Profit motivated management do not allow time to Care

Zoey Conway Radio 4 Today Programme

- Poor insulation
- Wet buildings
- Life Changing
- Unable to sell
- Mostly carried out as part of ECO programme
- See Also
 - GBE Issue Paper: External Wall Insulation

How did we get here?

- Retrofit for a Future Programme
 - 86 projects, 115 HA Homes
 - Down to EnerPHit standard
 - Target: 17 kg/CO₂/m²/year
 - Naively set and challenging
 - 25% met the target
 - Budget: £90,000
 - Assessment by extendedSAP or PHPP
 - PCR Post Completion Report to 40 units (by PR)
 - POE Post Occupancy Evaluation x2
 - 2 years of monitoring by EST
 - Expert review panel
 - Catapult Website
 - Book of 20 Case studies
 - Lessons Learned more about failures
 - Now think £25,000 per home if done at scale
- See Also
 - GBE Peterborough Project
 - GBE Book of case studies

Where does it go wrong?

- Edges, Junctions, Interfaces, Corners,

- Services Interfaces, Controls, Occupant interaction
- Ventilation is the biggest Problem
 - UK has not needed it and has no experience or know-how

GreenDeal (Milestone)

- PAYS Pay as You Save
 - Principle established in Bristol Project
- PAYS via GDP Green Deal Providers
 - Sainsbury's, M&S, B&Q, etc.
- Ministers: 'Cowboy Builders Paranoia'
 - Of their own making, not allowing regulated control of builders
- PAS 2030 Installation Standard
- Golden Rule
 - Each system has to pay for itself within 25 years
 - Encouraged single system approach unless payback was slow
 - Insulation usually quickest
 - But insulation without ventilation can be problematic
 - Boilers without insulation did not make sense
 - Airtightness without ventilation is a problem
 - Then combinations could work together
 - Window and PVs slowest
 - But FIT and RHI payments complicated this

Failed:

- High Interest Rate (?Due to High Risk?)
- No Promotion by Government
- Underfunded assessment
- No Design
- Lack of Trust in the industry by consumers

ECO Energy Company Obligation

- Threat of regulation and taxation
- Following: Warm Front, CERT and CESP
- Measures based system, one system at a time
- Quotas encouraged mass single solution without consumer choice
- Wrong Insulation: EWI whether you need it or not
- SAP Standard Assessment Procedure
- Keeping warm not reducing carbon
- 'Deemed Savings': Criteria
- The_____ECs
- Measures Based
- 3 years completed 3 more to go
- Move away from individual measure towards whole house approach

CoRE

- ERDF Funded
- Stoke on Trent Technical Hub
- CoRE fellowship
- Ran Seminars and Conferences
- Developed role of Retrofit Coordinator (RC)
- Training Programme for RC
- ~~Each Home Counts~~
- 2015 Local government changed parties, funding cut
- Now Retrofit Academy picked up the pieces

ReNew

- GLA
- **EIB** Funded London Retrofit Support Programme
- EU funding
- Developed Risk management tools
- London Homes Energy Efficiency Programme LHEEP
- Tenders in to do £3m of work

STBA Sustainable Traditional Building Alliance

- Neil May RIP founded it,
- DECC loan Funded
- Res_____ and Guidance
- Report: Responsible Retrofit of Traditional Building
- Solid wall construction
- Online: Guidance Wheel

See Also:

- GBE CPD GreenDeal & ECO
- STBA
- Retrofit Guidance Wheel

Centre for Moisture in Building

- Set up by Neil May RIP
- Peter Rickaby (speaker) is now Chair
- Tools

Retrofit Process: GreenDeal and ECO

- BEIS definition of the 'Customer Journey' (marketing jargon)
 - Assessment > **Design** > Installation > Operation
 - Installers have no design skills
- QA system based on PAS 2030 (Installation)
 - Aggregation of Industry based training
 - PAS 2030:2011 to 2014 not fit for purpose
 - Concerned with individual systems
 - Accrediting installers does not guarantee quality installation
 - Preserved high fragmentation of Supply Chain
 - 2017 extensive update to try to put it right
 - Ensure Design
 - Attend to interfaces between fabric and systems/measures
 - Address Ventilation: "No Insulation without Ventilation"

TGR Project (more later)

- Focus in **detail distributed** elements no interface

Managing Risk in Retrofit

- What are they and how to avoid them
- Put design back
- Technical Risks
 - Putting the correct package of improvements in place
 - Right Insulation for the house
 - **Not EWI on a ventilated cavity wall**
 - Managing the Interaction between measures
 - Managing moisture
 - Managing Indoor Air Quality (IAQ)
 - Managing and delivering Ventilation
 - Avoiding unintended consequences
 - E.g. stuff falling off
 - **E.g. Insulation wrong materials causing overheating**
- Process Risks
 - Assigning tasks to right and competent people
 - Ensuring Appropriate Qualifications, Skills, competence & Tools
 - Auditing and Inspections of work
 - Based on Risk Assessments
 - Feedback loops in process for improvement
 - In the Spirit of Safety

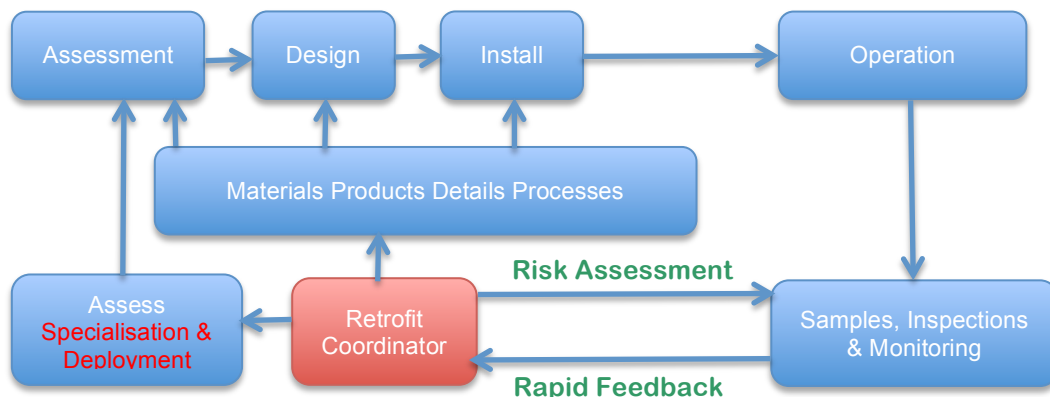
Retrofit Coordinator role

- Responsibility to see retrofit project is done right
- Essentially a Project Manager (perceived as less expensive)
- Identical role to Architects (perceived as expensive)
- Cannot afford not to have this role
- CoRE developed the role and the training
- RC look after a library of Materials, Products, Details, Processes used in any given Retrofit
- Ensure the right people are assigned to a Retrofit
 - Assessors doing Assessment

- Feeding assessment into Design and Installation
- Risk Assessments helps know what could go wrong
- Target their Monitoring and Inspections during installation and after
- Most importantly use a rapid feedback loop to learn quickly and change

New Risks

- New materials appropriate to retrofit
- Not new-build materials in a Retrofit project
- A self-learning QA system for things we do not know yet



New Technical Risk Matrix

- Lisa Pasquale developed
- Measure against measures
- Blue inherent technical risk of measures
- Risk of Measures
- Risk of Interactions of measures or systems
- Every permutation of systems have their own risk score
- Like STBA Guidance Wheel
 - (translated to 3 languages already)

Q&A

- Risk in funding and failure of Green Deal
- Having done the risk Assessments have you approached Financial world
- Interest Rate of 7% was average over period compared with 3% mortgage
- Too many other failures too complicated to assign one cause

GreenDeal Community Scheme did well

- Private individuals in Cambridge
- Landlords not interested
- Provision for Tenant Cooperatives to take over **social (communal)** part of blocks of flats

Architect's Training

- Retrofit Coordinator developed with RIBA involvement
- Perfect for small practices who do this type of work already but now with different funding scheme
- **Further obligations**
- Value Added Service

Drivers to make things happen

- Barrier: High cost
- Carrots and Sticks at same time
- Sticks: Building Regulations
- Carrots: Funding
- Liberal Democrats
- Greta Thunberg from Davos 'behave as if your House is on Fire'
- Selling Private house
- Obligation

EPC Energy Performance Certificate

- D towards A
- Obligation on Private landlords C by 2030

- Government Owned and Endorsed quality scheme
- TrustMark operates within a Master Licence Agreement issued by the Government's Department for Business, Energy and Industrial Strategy (BEIS)
 - 3 cornerstones of quality
 - Technical Competence
 - Good Customer Service
 - Good Trading Practices
- Working alongside MCS Micro-generation Certification Scheme (Renewables)
- Trustmark and Retrofit members must adhere to Consumer Charter and Code of Conduct
- ECO installers must be members of TM
- TM & OFGEM require compliance with standards
- Trying to persuade BEIS to expand scope beyond retrofit to HA, ALMO, etc.
- Sanctions: Loss of Trustmark, no more work

BSI Retrofit Standard Task Group

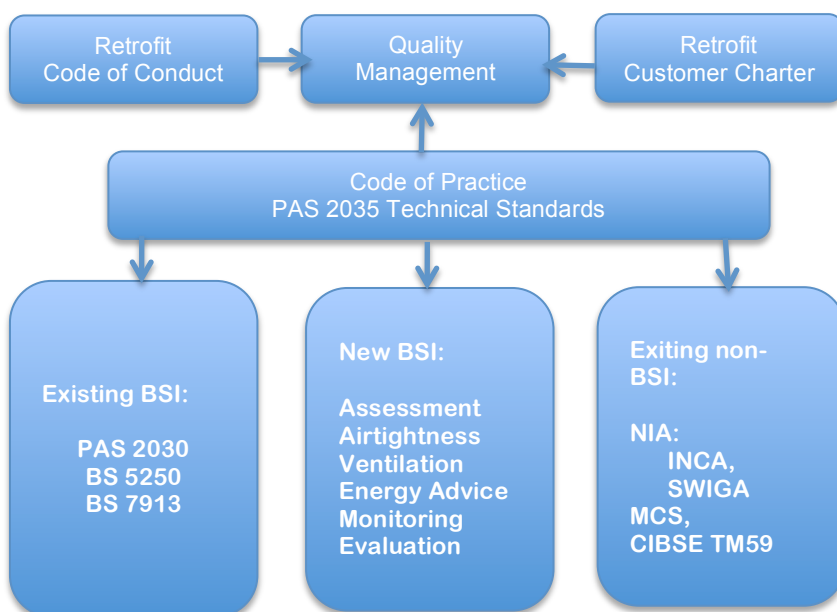
- Chaired by Dr. Peter Rickaby
- Review 100s of standards that apply and deliver updates
- Retrofit Technical Standards (renamed Code of Practice)
- Feeds into training, specified products
- NB: Certify the retrofit work done to buildings, not the Installer
 - Alternative has no effect on results
- Underfunding erodes trained installers

Objectives

- Energy Efficiency
- Maintain Buildings and heritage for our society
- Looking after Occupants/Owners
- Avoiding unintended consequences
- Performance gap (misnomer)
 - Failing to meet savings claimed
 - Lack of attention to detail
- EnerPHit + PHPP (Passive House Planning Package) addresses the details
 - Tells you which details to get right and how

Principles

- Plain English
- Focus on the materials, workmanship and process
- Standards on line accessible by smart phone
- Combine Tech standards and guidance
- PAS 2035 >



PAS 2035: 2019

Application:

- Any Domestic Retrofit

- PAS Public anybody can use it: LA, HA, Individuals, designers, Cities (e.g. Bristol, London)
- PAS 2030 must be in conjunction with requirements
- Must have a design
- Must also comply (where applicable) with: PAS 2030, BS 5250, BS 7913, MCS,

Compliance:

- Energy Retrofit Project must have a Retrofit Coordinator (RC)
- RC NVQ National Vocational Qualification on OFFQUAL website
- Retrofit Coordinator RC is responsible for ensuring PAS 2035 compliance
- Agreement with client
 - What are their objectives
 - Save energy or carbon
 - Have they achieved it
- RC independence
 - Within installers doing design
 - In Architectural Practices
- Responsibility:
 - Not design but can be
 - Might need PII (but difficult now)
 - PII is new so getting insured may be difficult
 - Architects already have PII

Exponential Curve

- 60% £90,000 (includes risk factors)
- 50% Reduction is good enough
- Lots in fabric cost
- 30-40% underfunded
- Doing it properly needs 2 x the money or half the work
- BEIS long discussions:
 - Cost of not doing it properly is huge:
 - Clawbacks, legal cases, insurance, remedial works, loss of progress and loss of faith

PAS 2035 (Risk assessment private no disclosure)

- Flow charts
- Content Diagram
- Specification & Guidance
- 60 Pages +
- Risk Assessment
 - Assessed risk determines the Path
- 3 Processes = 3 Paths = 3 Routes
- 3 Risk levels: A low risk B mid risk C high risk
- Qualifications of people to suit each route

PAS 2035 Role of RC

- Full list in document
- Predates D&B Design & Build
- Its what Architects do
- Its not rocket science but it is complicated
- That's why we have a Retrofit Coordinator
- Establish intended outcomes
 - Energy Efficiency
 - Cost cutting
 - Cutting CO2 emissions
 - Fuel saving
 - Fuel Poverty
 - Eliminating CBM?
 - Dealing with overheating
 - Better Internal Comfort
 - Improving SAP Rating
 - PHPP
 - Meeting EnerPHit
 - AECB Carbonlite Retrofit
 - Bio-based materials
 - Reduce VOCs in indoor air

- RC Discuss with client
 - Select outcomes
 - Agree outcomes
 - Put numbers to it if
 - Do what was agreed and check it

PAS 2035 Risk Assessment

- Carried out by RC
- RC to organise Good advice
- Before Survey
- Pre-assessment (=Triage)
- Annex B Pro-former A B or C based on 5 criteria
 - How many dwellings
 - Numbers of Buildings
 - Number of improvement measures/dwelling (more interactions between measures)
 - Type of construction
 - Built form: E.g. High rise
- Measures have their own inherent technical risks
 - E.g. Internal wall insulation higher risk than cavity wall insulation
 - E.g. HP heat pumps more risk than a boiler
- Highest risk Combination of measures
- Construction of built form criteria
 - Conventional Construction = A
 - Low rise = A
 - High rise = C
- Overall Risk Grade:
 - Best scores A, Worst score C, total project score = C = Path C

ITR Inherent Technical Risk of the measures

- 1-4 (none have no risk)
- **High Rise 3**
- Flat roof Insulation 3
- Room in Roof Insulation 3
- Micro CHP 3
- ASHP 3
- MVHR 3
- PIV 3
- **Insulation 1**
- **Airtightness 1**

Modifications:

- If Industry sector has good QA scheme – 1
- Good details available – 1

Matrix of measures interactions

- Green: No connection
 - Retrofit Designer: No other actions
- Yellow: Physical interaction Junction Needs a detail
 - Retrofit Designer: Need to do detail
- Amber: non-physical interaction
 - Heating & boiler needs complimentary specifications
 - Retrofit Designer: Need to write the specification
- Red: do not do together
 - Retrofit Designer: Check design avoids these
- Crude, but better than nothing

Source of detail does not matter

- E.g. Jonny Baker of Red Carp in Manchester
- Best Practice details
- Minimise thermal bridges
- Maintain airtightness

Whole Dwelling Assessment

- What the assessor needs to look at
- Assessors:

- **DEA Domestic Energy Assessor/Advisor**
- Not just rdSAP reduced data Standard Assessment Procedure
- Other stuff:
 - Full scale whole assessment of building
 - Site Constraints
 - Heritage Architecture
 - Age of building
 - Building Condition what is wrong than needs putting right
 - Building Problems
 - Anything you will need for a SAP assessment
- Granulated WDA according to Path A B or C
- **To be uploaded to the data Warehouse**

Path A B or C separate

- Path A does not need SAP or PHPP (optional)
- ECO programme OFGEM dropped SAP
 - Used 'Deemed scores'
 - Dumbed down assessment
 - BSI RSTG Argued with OFGEM
 - SAP is back in here
- Suggests EPC needed at end to reassess
 - Improvement options is useful
- **LIB+**
- Full SAP not rdSAP
- SAP has many very Conservative Assessment
- Design wants more details
- IOE Improvement option evaluations useful
- Need to add in Psi values
- **Needs a thorough survey to determine Psi values**

BS 7913 Historic Significance Assessment

- Process: very simple
- Traditional Constructed
 - Pre-1919 (solid walls)
- Protected:
 - Listed Building
 - Conservation Area
 - ANOB Area of Outstanding Natural Beauty
 - WHS World Heritage Site
 - **Planning restriction imposed for other reasons**
 - **Urban context contribution**
- If any of these:
 - Assessment of Significance
 - To Retrofit Designer via RC to inform the design

Annex C Ventilation Assessment

- A B or C all need this
- "No Insulation without Ventilation"
- Assessment:
 - Is the existing ventilation is adequate: yes or no
 - Condensation or mould existing: yes or no
 - No working ventilation present: none or not working
 - Present but incomplete or partial or inadequate design (including air vents)
 - Airtightness may be inadequate
 - Upgrade the ventilation system
- Upgrade: if it is or it might become because of what we are doing....
 - $Q_{50} > 5\text{m}^2/\text{m}^2\text{h}$ then
 - **IEV Inter E Ventilation**
 - PSV Passive Stack Ventilation
 - $Q_{50} < 5\text{m}^2/\text{m}^2\text{h}$ then
 - **CMV Continuous Mechanical Ventilation**
 - **MEV Mechanical Extract Ventilation**
 - MVHR Mechanical Ventilation with Heat Recovery
 - PIV Positive Inward Ventilation
- PIV Positive Inward ventilation

- Pushes moisture into construction
- (tried to get them out)
- Calculations to acknowledge number of beds
 - Has to assume full occupation numbers of bedrooms or beds
 - BRAD F allows minimum occupation capacity
 - Greater occupation level, intensive occupation
 - Higher moisture levels in the air from breathing
 - Tend to have condensation and mould
- Over provision
 - More ventilation
 - More fan power
 - More energy
 - More Noise
- Demand Control room by room
 - So only matches demand to actual occupation level
 - Only ventilates where it is needed
- To be uploaded to the data Warehouse

PAS 2035 Design

- Designer to Design
 - Irrespective of path
- Take account of:
 - Deliver the Client outcomes
 - Whole Dwelling assessment
 - Architectural Heritage context
 - Planning and Building Control constraints
 - Moistures management
 - Construction Details: cores, Junctions and edges
 - Interface between fabric, systems and occupants
 - Ventilation upgrade if required
 - Specify the testing and commissioning handover requirements
 - Specify Warranties Guarantees maintenance documents for all products are submitted
- Design
 - A proper job
 - To be uploaded to the data Warehouse
 - Inspected by the Trust Mark assessor
 - Occupier Access

Path A

- Single measure based on a systems
 - E.g. EWI, by manufacturer/installer
 - E.g. MVHR by engineer
 - Can be designed by specialist designer or engineer
 - Designer subject to approval by the RC
 - Check it fits the rest of the building and interacts with other parts
 - Avoid risk of standard product off shelf applied without consideration

Path B or C: also requires

- IOE Improvement Option Evaluation
- Based on SAP or PHPP
 - Look at effects of improvement measures
 - Provide Simple payback
 - **Prior**
- Discuss with the client
 - This house, this budget, these measures
 - Agree with client
 - This become the retrofit-plan
- Medium-term retro-improvement-plan
 - Future proofing up to 2050
 - If it can't be done now
 - Plan what is next and when
- Logged onto Data warehouse
 - Coexists with house
 - For owner/occupier and future owner/occupier access
 - Avoid doing things twice
 - **Plays same role as HIP Home Information Pack**

- Previously dropped by government

Path C also requires:

- = RIBA Conservation Qualification
- = CIBSE List
- = RICS List
- = CITB List, etc,
- Right people for the design, who know what they are doing

Installation

- Must comply with PAS 2030:2019
- Retrofit Installer must work to a design to PAS 2035:2019
 - Both locked into each other both ways
- ?**Validate** the design: does it make sense
- Qualification or competence of operatives
- Method statement for works
- Pre-installation Building Inspection
- Purpose of the installation
- Testing Commissioning and handover in accordance with the design and specification
- Provision of Documents
- Uploading to Data warehouse

Moisture Evaluation

- Objective
- Basic Monitoring
 - Every project
 - Within 3-6 months
 - But some may emerge later
 - CO2 measures outcomes difficult
- Intermediate Monitoring
 - To get to the bottom of the problem
 - Investigates

Questionnaire to Client

- Good professional service
- **POE Questionnaire**
- Satisfied with outcomes?
- Unintended Consequences
- **Monetary Evaluation**
- **Provision of documents**
- **Basic monitoring**

Retrofit Evaluator (RE)

- (RC initially, RE Training to follow)
- Advanced Monitoring: up to 1 year
- RE responsible for Report
- Paid for by industry/design team:
 - Deterrent to getting it wrong
 - Get it right first time
- 3 months for most
 - Customer Option for 12 months
 - **Heating needs longer to assess (1 heating season potentially 1.25 year)**
- Customer Satisfaction Difficult
 - Subjective
 - Won't know
 - Satisfaction levels vary
 - Open to misuse by both sides
- Data Warehouse: Public Access for later work
 - GDPR rules apply

Appendix A Qualifications

- RA Retrofit **Energy** Advisor
 - **C&G City and Guilds 6176 Energy Awareness training**
- RA Retrofit Assessor
 - Path A: Can be RC

- Path B: DEA Domestic Energy Advisor
- Path C:
 - DEA and some more ____
 - See RICS Guidance Note 'Surveys of Residential Properties',
 - Historic Building Qualifications
- RC Retrofit Coordinator
 - Level 5 diploma in Retrofit ____ as standard
 - RPEL taken into accounts Rapid process CoRE or Retrofit Academy
 - 6 day training at CoRE or Retrofit Academy or online
 - Path A: qualified construction project management
 - Path B & C: qualified Retrofit coordinator
- RD Retrofit Designer
 - Path A: RC, Architects, Technologist
 - Path B: Architects, Technologist, Professional member of CIOB
 - Path C: +Conservation Course Historic Building Qualifications
- RE Retrofit Evaluators: RC until RE established
- GDA Green Deal Assessor
- RPEL Requires Prior Experience or Learning will apply to most of the above

Data warehouse

- Trustmark™ (TM)
 - Funded to develop the 'Data Warehouse'
 - Government Owned and Endorsed quality scheme
- Data warehouse: Records of all retrofits
 - Used by Trustmark Enforcement team
 - Pinpoint by risk assessment: building or measures to inspect
 - Monitoring and Evaluation
 - Lessons learning
- Whole House Assessment
 - To be uploaded to the data Warehouse
- PAS 2035 Design
 - A proper job
 - To be uploaded to the data Warehouse
 - Inspected by the Trust Mark assessor
- Design Logged onto Data warehouse
 - Coexists with house
 - For owner/occupier and future owner/occupier access
 - Avoid doing things twice
 - Plays same role as HIP Home Information Pack
 - Previously dropped by government
- Ventilation Assessment
 - Uploading to Data warehouse
- Installation:
 - Provision of Documents
 - Uploading to Data warehouse

Summary

- Retrofit Project Risk Assessment
 - Whole dwelling
 - Ventilation
 - Determines Path A B or C
- Qualification to suit Risk Path
- Design essential
- Ventilation essential
 - Assessment of existing
 - Upgrade subject to outcome airtightness
- Measures Interaction Matrix (Inherent and combined risk)
 - Details of interfaces
- Installation
- Documents
- Monitoring & Evaluation
- Data Warehouse
- Trustmark
- Funding
- All the ducks aligned

Next Steps

- Transition Period
- Standards Publish in May 2019
- Certification information June 2019
- 6 months period UKAS recertifying assessment bodies
- 12 months period certification bodies to update
- Takes you to November 2020
- OFGEM to engage ECO Regulations to require Trustmark therefore PAS 2035
- 19 Months to do it
- Interim Pilots underway
 - Bristol and London
- Getting Sectors and regulators engaged and make sure Trustmark is applied
- Promote Trustmark on all housing Sectors
- Require funding sector to adopt Trustmark
- All of us to promote Trustmark