Kent Housing Group

PAS 2035 – What's it all about?

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Retrofit for the Future *2010-2014*

- £17 million Technology Strategy Board (Innovate UK) deep retrofit pilot programme for housing associations
- 115 houses (86 projects) retrofitted (target 17 $kgCO_2/m^2yr$) with grants of £150k each
- Typical project cost £90k, about one third achieved the performance target, but many successful and informative projects
- Two-years post-occupancy monitoring and one year of analysis by technical panel (data publicly available)
- Results published in *Reducing energy use in existing homes: a guide to making retrofit work* (TSB 2014)

Retrofit for the Future

Key Lessons

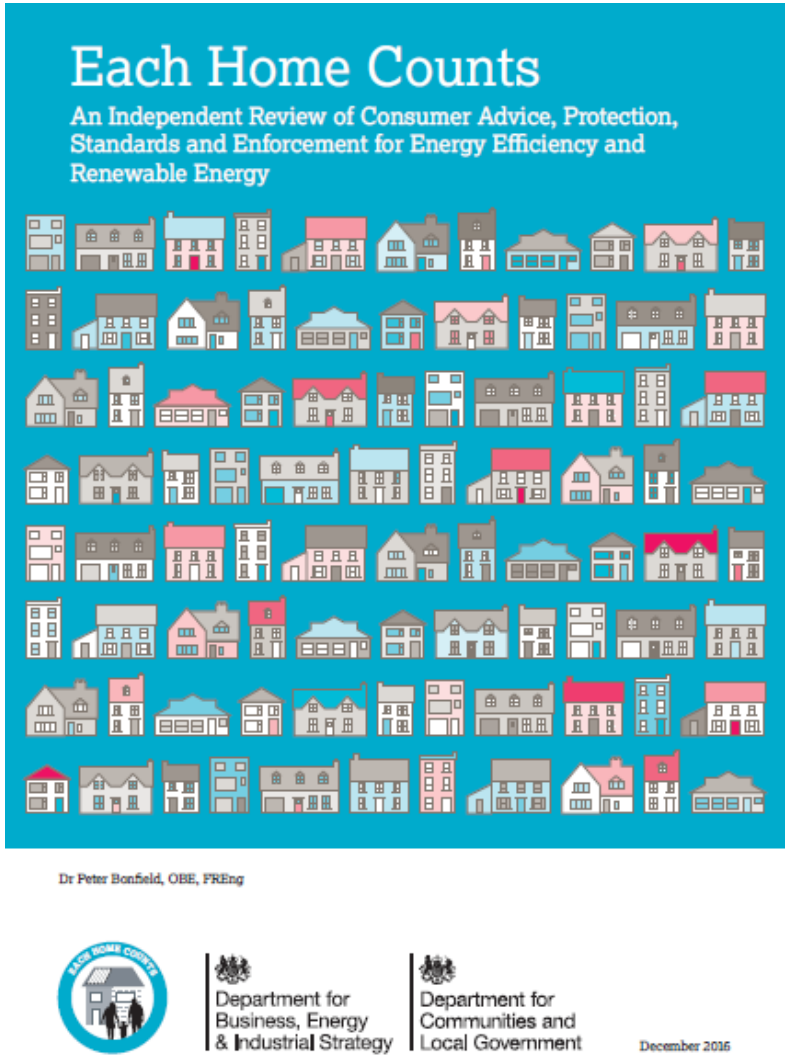
- Coherent integration of improvements into whole-dwelling packages (fabric + services)
  - Pay attention to corners, junctions, edges and interfaces
  - Most technical risks are moisture-related
- Critical role of ventilation
  - Critical to integrity of building fabric and health of occupants
  - Poor strategies, specifications, installation and commissioning
  - Many systems not matched to fabric and did not fit
- Importance of commissioning, handover and advice
  - Occupants and maintenance staff must be engaged

"Retrofit is not rocket science – but it is complicated"
Rick Holland, Innovate UK

Retrofit Failures

- Preston *2013*
  - Nearly three hundred houses rendered damp and unsaleable by badly installed EWI
- Wales *2013*
  - Damp and mould in many village homes caused by badly installed EWI
- Glasgow *2014*
  - Four tonnes of EWI fell off the top storey of a residential tower
- Edinburgh *2014*
  - The outer leaf fell off the insulated gable wall of a school
- Grenfell Tower *2017*
  - 72 dead after fire spread via new insulated external cladding
- Numerous insulation failures *2010-2020*
  - Mostly following poor or inappropriate installation of CWI or EWI

Each Home Counts



Industry-led review

- Sponsored by BEIS and MHCLG
- Led by Peter Bonfield (BRE)
- Multiple work-streams
- Hundreds of people involved

Twenty-seven recommendations

- Consumer protection
- Advice and guidance
- Quality and standards
- Skills and Training
- Compliance and Enforcement
- Insulation and building fabric
- Smart meters
- Home energy technologies
- Social housing

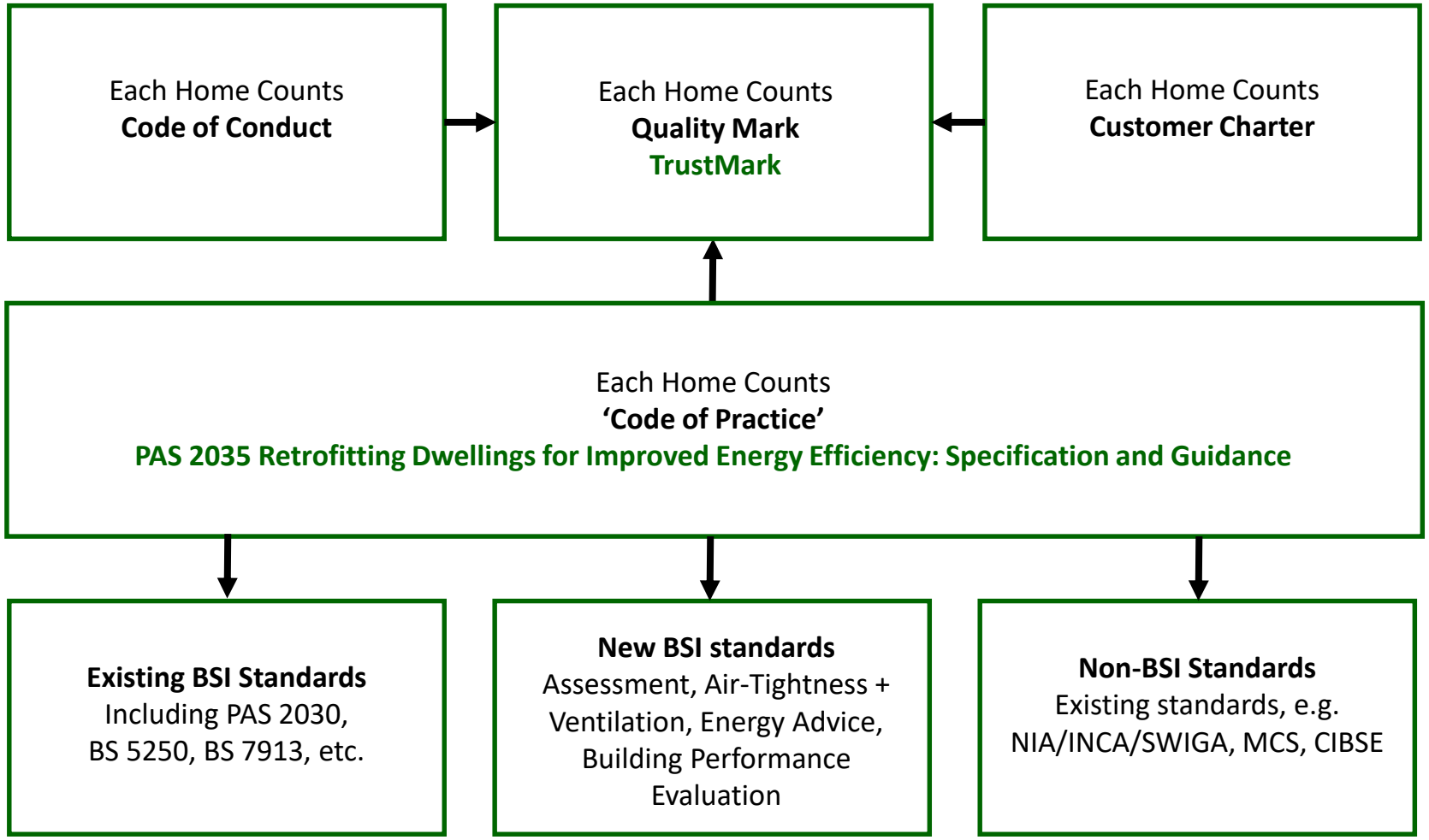
Implementation

- Coordinated by a cross-industry Implementation Board
- BEIS support > £3 million

Retrofit QA - Each Home Counts

- Two strategic objectives
  - Boost demand for retrofit by restoring trust in the industry
  - Reduce risks to finance bodies, to encourage funding
- Establishes a QA framework to support the industry
  - TrustMark plus the BSI Retrofit Standards Framework
- Promotes consolidation of fragmented industry
  - Encourage adoption of business models for whole-dwelling retrofit

BSI Retrofit Standards Framework



PAS 2035

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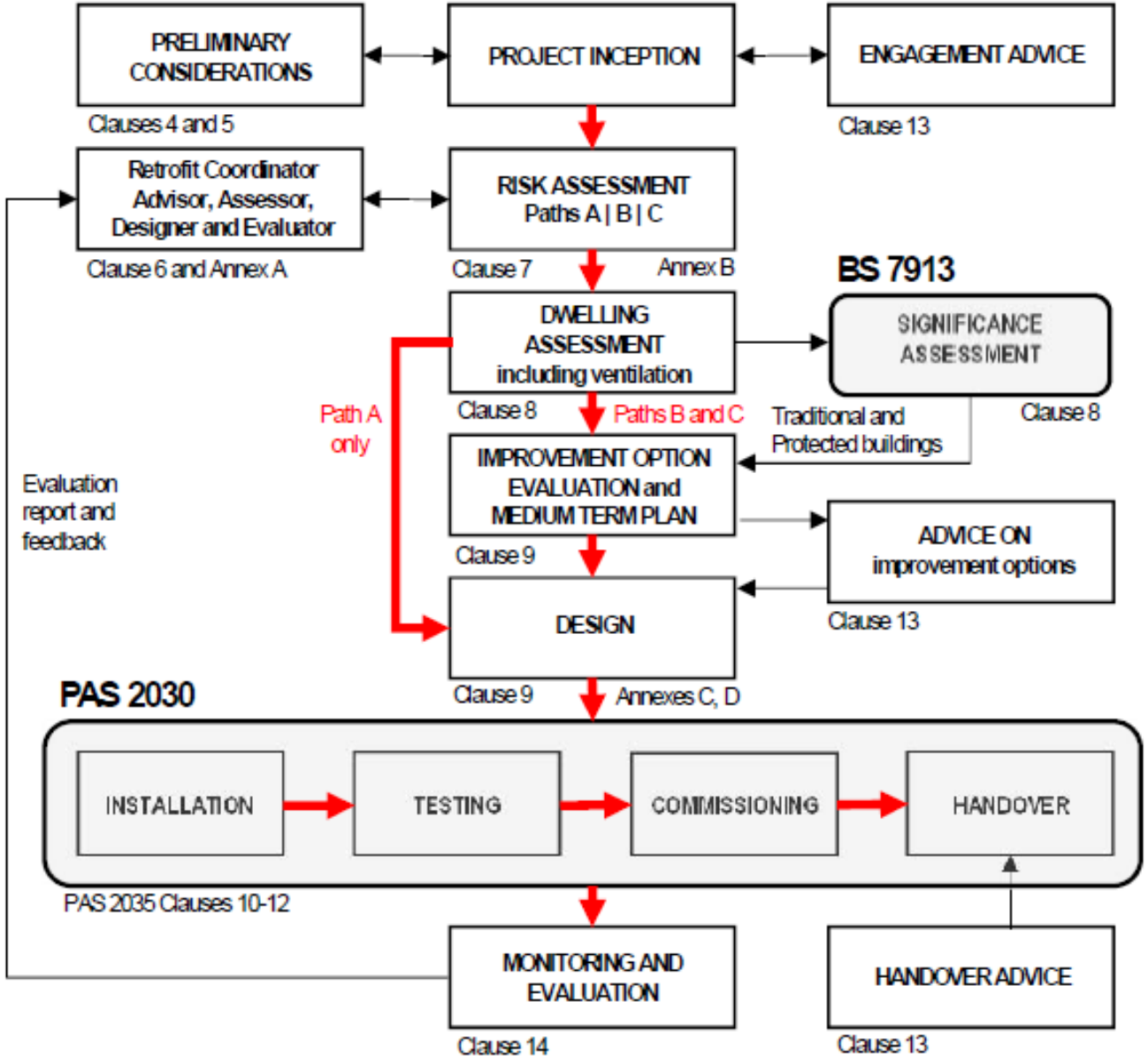


PAS 2035 Risk Assessment *Clause 7*

- Carried out by Retrofit Coordinator
  - Based on pre-assessment (triage) data
  - Before whole-dwelling and ventilation assessments
- Risk assessed as A, B or C
  - Depending on five criteria
    - Number of dwellings and measures, construction, built form
    - High rise and protected historic buildings are always risk C
- Assessed risk determines minimum required qualifications
  - Retrofit Assessor | Retrofit Designer
- Assessed risk determines Path through the PAS
  - Path A: Simple requirements
  - Path B: More onerous requirements
  - Path C: Much more onerous requirements

PAS 2035 Risk Assessment *Clause 7*

1 Number of dwelling to be improved

2 Average number of measures per dwelling

3 Inherent technical risk of highest risk measure

4 Highest risk combination of measures

5 Construction and built form of buildings

Overall risk grade

Criterion 1: Number of dwellings in the project

The number of dwellings to be improved	Risk grade	Assessed grade
1-10	A	
11-30	B	
More than 30	C	

Criterion 2: Number of measures per dwelling[1]

The average number of improvement measures per dwelling	Risk grade	Assessed grade
1-2	A	
3-5	B	
More than 5	C	

Criterion 3: Measures proposed

The inherent technical risk of the highest-risk measure (from Table B2)	Risk Grade	Assessed grade
1	A	
2	B	
3	B	

Criterion 4: Combination of measures

The highest-risk combination of measures (from the Measures Interaction Matrix, Figure D1)	Risk Grade	Assessed grade
GREEN	A	
ORANGE	B	
YELLOW	B	

Criterion 5: Construction and Built Form

Construction and built form of buildings	Risk Grade	Assessed grade
Conventional[2], not high-rise, not protected[3]	A	
Traditional[4], not protected[3]	B	
System-built[5], not high-rise, not protected[3]	B	
High rise[6], any construction	C	
Protected[3], any construction or built form	C	

Overall Risk Grade

Highest assessed grade (from Criteria 1 to 5 above)	PAS 2035 Path	Assessed Path
A	A	
B	B	
C	C	

PAS 2035 Whole Dwelling Assessment *Clause 8*

- Wider scope than EPC or ECO assessments
  - Context
    - Setting, planning status, exposure, etc.
  - Condition
    - Structural issues, damp, mould, rot, etc
  - Occupancy
    - Including identification of vulnerable occupants
  - Energy performance
    - Collection of Full SAP or PHPP data for IOE
  - Ventilation assessment
    - To determine whether an upgrade is required
  - Significance
    - BS 7913 assessment if traditionally constructed or protected building

PAS 2035 Ventilation *Annex C*

Assessment

- Existing ventilation is inadequate if
  - Evidence of condensation or mould
  - No working ventilation system present
  - Ventilation present but incomplete (including air inlets)

Upgrade

- If insulation and/or air tightness measures are proposed, and the existing ventilation is inadequate, then
- Ventilation must be upgraded
  - If leaky (intended $Q_{50} > 5\ m^3/m^2h$) then IEV or PSV required
  - If airtight (intended $Q_{50} < 5\ m^3/m^2h$) then MEV, MVHR or PIV required
  - System capacity must be based on full occupancy
  - Demand control required to ensure energy efficiency

Establishing Intended Outcomes *Clause 9 (Paths B and C)*

Improvement Option Evaluation

- Identifies measures required
  - To improve dwelling for 2050
- Compares cost effectiveness
  - Using Full SAP or PHPP
- Tabular summary of options
  - Estimated capital costs
  - Cost effectiveness
  - Carbon cost effectiveness
- Basis of advice to client
  - Which measures to install?

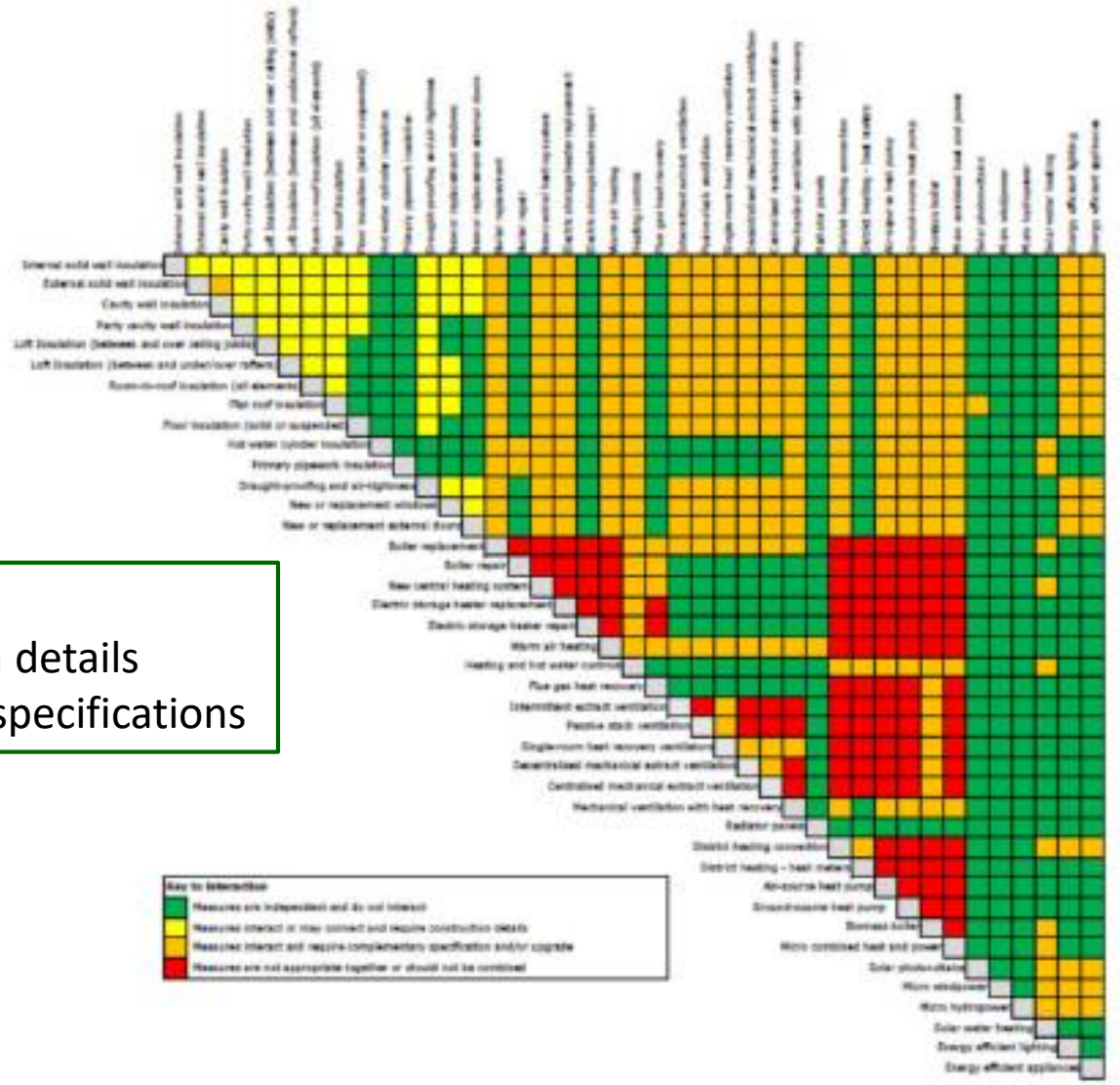
Medium-Term Improvement Plan

- Recognises budget constraints
  - 2050 measures unaffordable
  - Work needs to be staged
- Plan for 20-30 years
  - Prioritises measures in stages
  - Usually ‘fabric first’ approach
  - Identifies compatibilities
  - Preserves opportunities
- Summarises intended outcomes
  - And how to get there
  - Agreed with the client

PAS 2035 Design *Clause 9*

- The scope of the retrofit design depends on the risk Path
- Irrespective of Path, all designs must:
  - Provide for the outcomes agreed with the Client
  - Be based on the whole-dwelling assessment
  - Take account of the architectural and heritage context
  - Take account of planning and building control requirements
  - Allow for the management of moisture in the building
  - Include construction details (corners, junctions and edges)
  - Consider interfaces between fabric, systems and occupants
  - Include a ventilation upgrade if required
  - Specify testing, commissioning and handover requirements
  - Specify required guarantees and warranties

PAS 2035 Measures Interaction Matrix *Annex D*



- Used in risk assessment and design
- Identifies where design must include construction details
- Identifies where design must include compatible specifications

Installation *Clauses 10-12*

- Installation of retrofit measures must comply with PAS 2030: 2019
- The PAS 2030 Retrofit Installer must work to a design that is compliant with PAS 2035
- PAS 2030 includes requirements for
  - Validating the design and preparing a method statement
  - Qualification or competence of operatives
  - Pre-installation building inspections
  - The installation process (measure-specific requirements)
  - Testing, commissioning and handover
  - Provision of guarantees and warranties
  - Record keeping

PAS 2035 Advice *Clause 13*

- Energy advice must be provided at
  - Inception
  - After improvement option evaluation (agree retrofit plan)
  - At handover
- Delivery formats
  - Inception advice may be online and generic
  - Advice after IOE delivered by Retrofit Coordinator
  - Advice at handover delivered by installer(s)

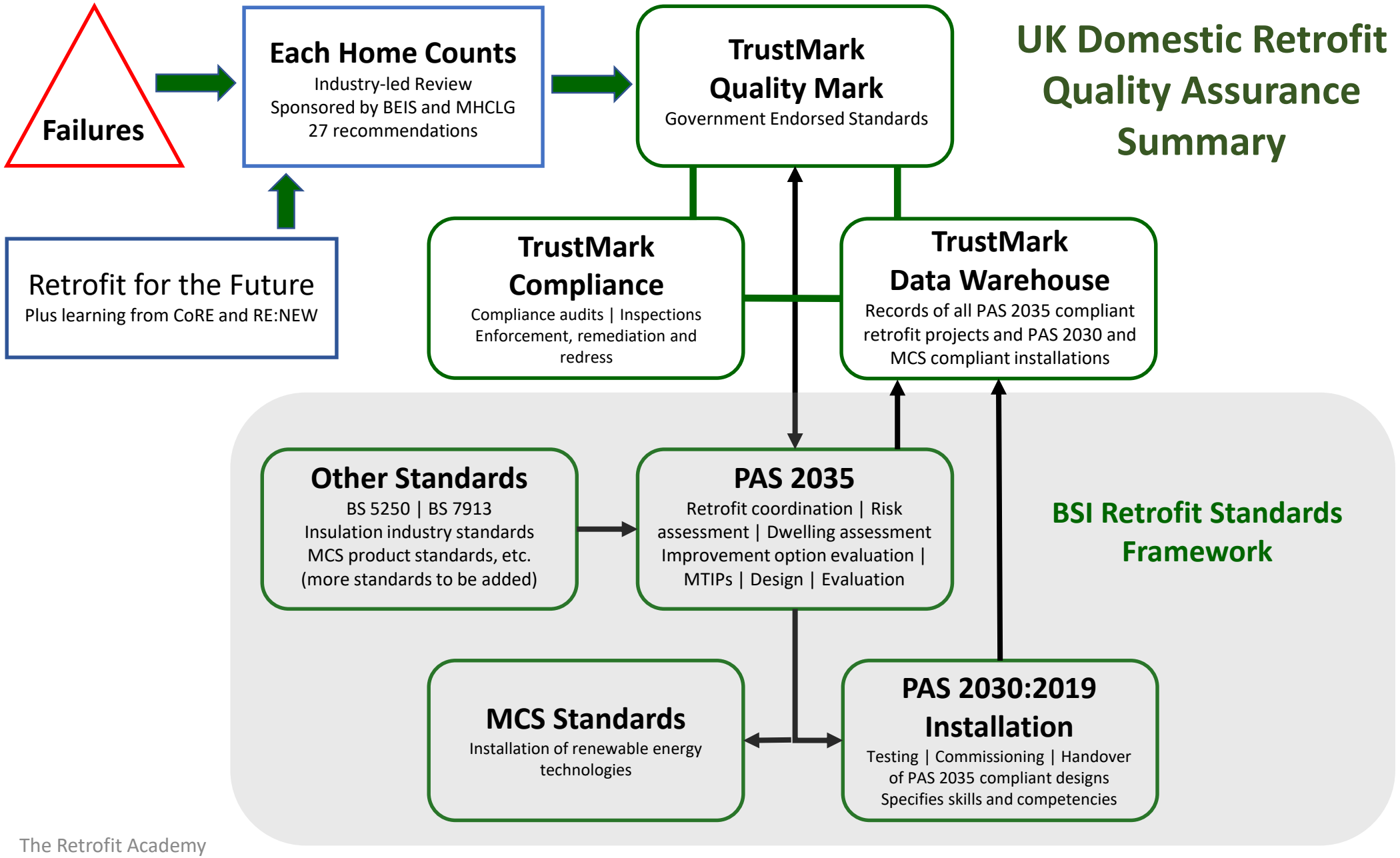
PAS 2035 Evaluation *Clause 14*

- Objectives
  - To confirm that intended outcomes have been achieved
  - To identify any unintended consequences
- Basic evaluation
  - Applies to every project (questionnaire)
  - Confirms outcomes and customer satisfaction
- Intermediate evaluation
  - Investigates poor outcomes, unintended consequences
- Advanced evaluation
  - Further investigation to understand and resolve discrepancies between predicted and actual outcomes

PAS 2035 Summary

- Retrofit Coordinator
  - Required for every project: protects customer's interests and the public interest
  - Agrees intended outcomes with client, coordinates work, ensures and claims compliance
- Risk assessment
  - Based on pre-assessment (triage) data
  - Determines the Path (A-C) through the PAS
  - Determines required qualifications for Retrofit Assessor and Retrofit Designer
- Whole-dwelling assessment
  - Includes context, condition, occupancy, energy performance, ventilation and significance
- Improvement option evaluation
  - Basis of medium-term improvement plan (Paths B and C) agreed with client
- Design
  - Requirements depend on the risk Path (A-C)
  - Additional requirements for traditionally constructed and protected buildings
  - Moisture management is integral to the design requirements
  - Ventilation upgrades required if existing is assessed as inadequate
- Installation
  - Must comply with PAS 2030: 2019
  - Includes testing, commissioning and handover
- Evaluation
  - Confirms agreed outcomes, investigates discrepancies and unintended consequences

UK Domestic Retrofit Quality Assurance Summary



Questions?

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