

UKCMB
UK CENTRE FOR
MOISTURE
IN BUILDINGS

European Congress on the Use, Management
and Conservation of Buildings of Historical Value

PAS 2035: Driving Retrofit Quality in the UK

Dr Peter Rickaby

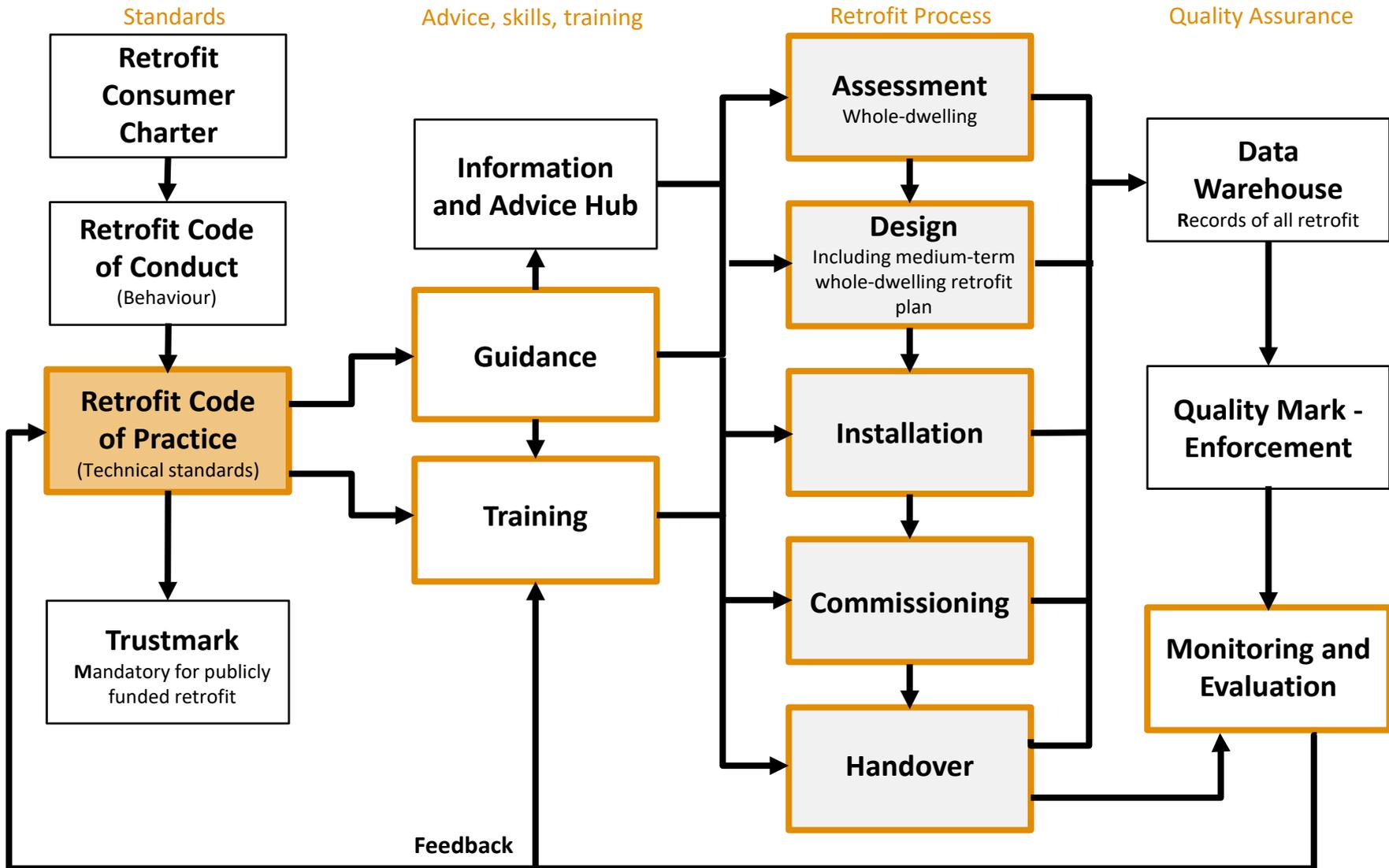
BSI Retrofit Standards Task Group and
UK Centre for Moisture in Buildings, UCL

Valentina Marincioni

University College London
UK Centre for Moisture in Buildings, UCL

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Each Home Counts: technical standards



BSI Retrofit Standards Task Group

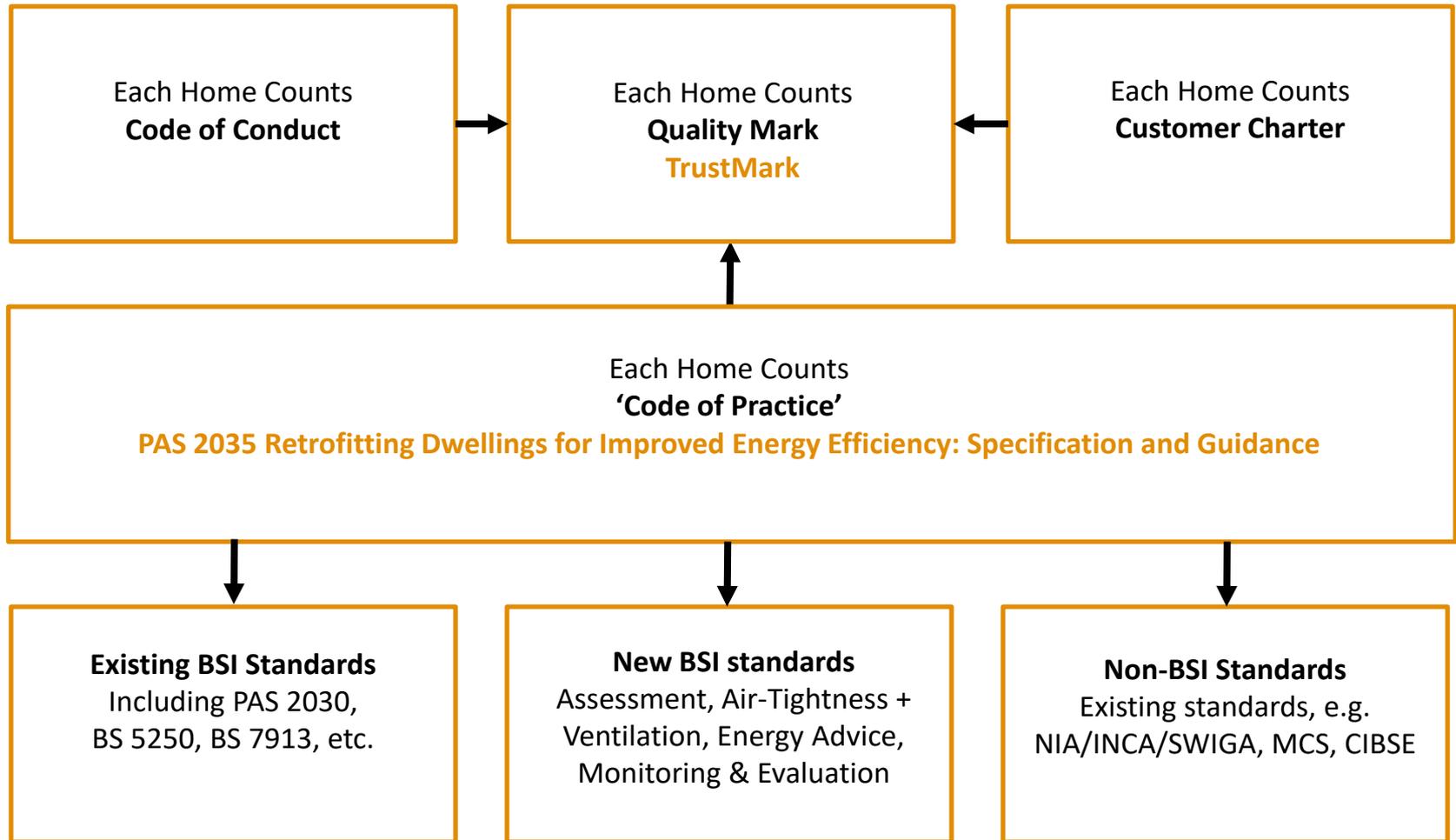
Objectives

- 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

The BSI Retrofit Standards Framework



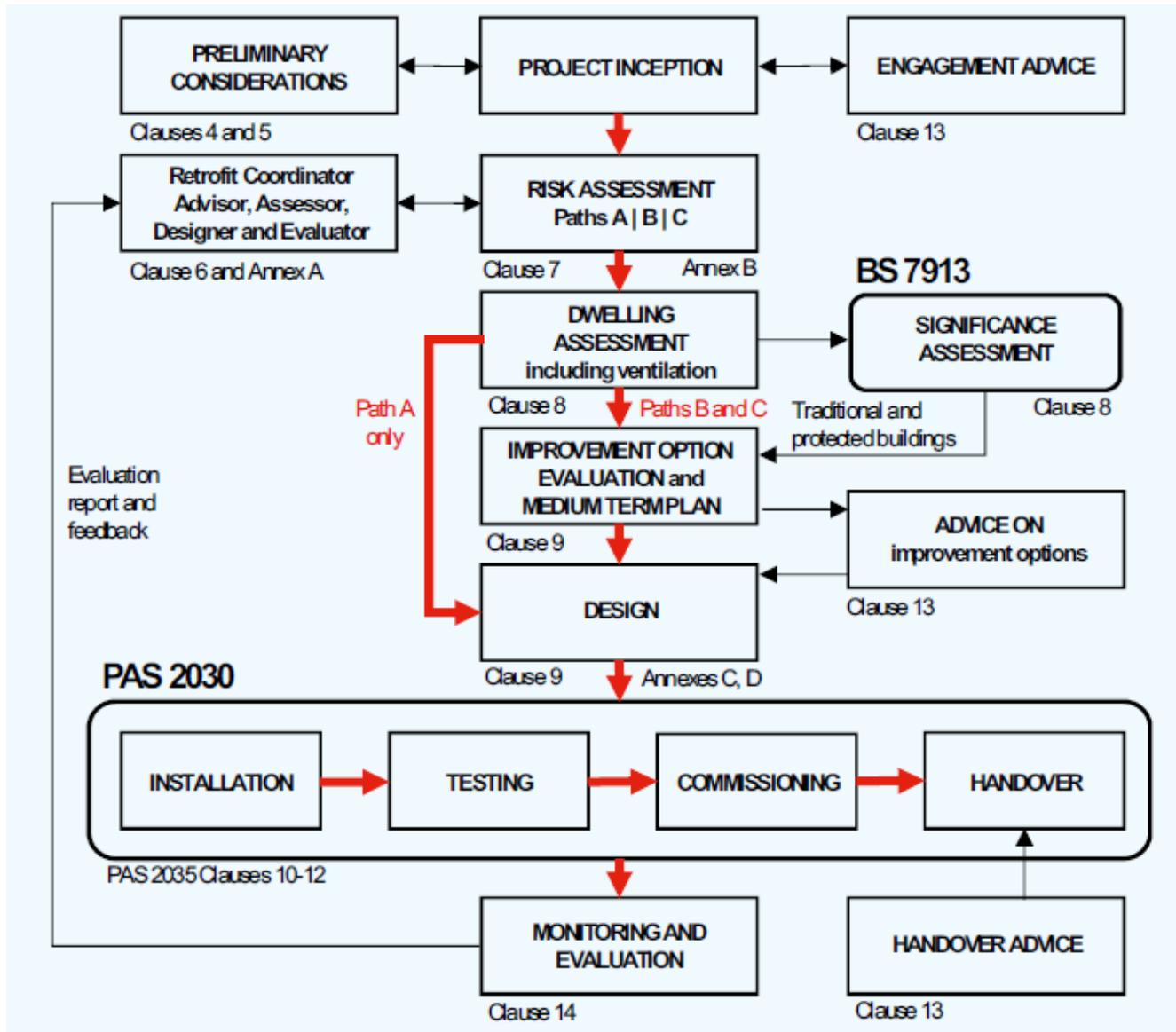
PAS 2035 Key Points

Application

- Any domestic retrofit project (not just ECO)
- Must be used in conjunction with PAS 2030: 2019
- Requires the use of many other framework standards
 - PAS 2030, BS 5250, BS 7913, MCS standards, etc.

Compliance

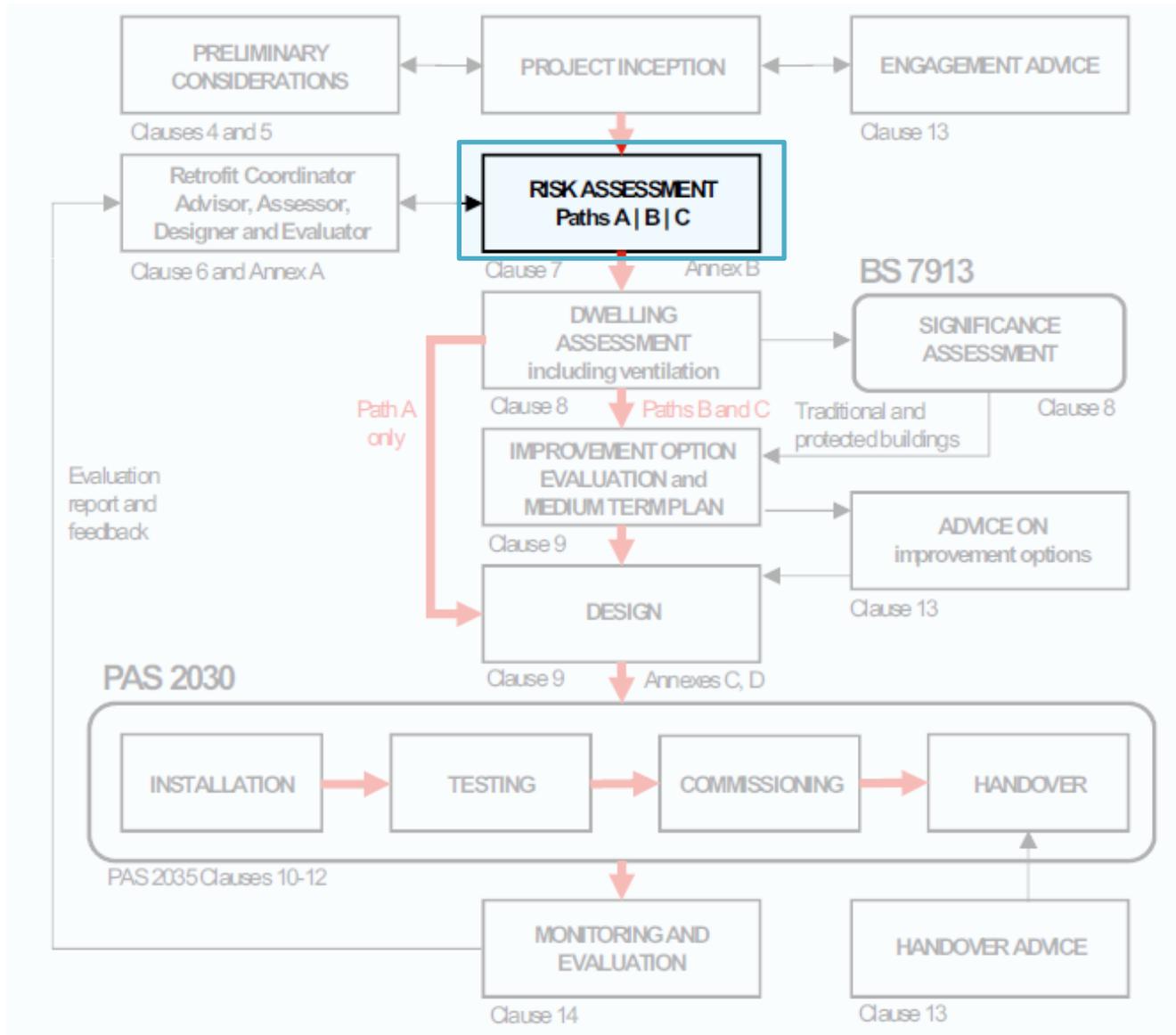
- Every retrofit project must have a Retrofit Coordinator
- Retrofit Coordinator is responsible for ensuring PAS 2035 compliance, and for protecting the client's interest and the public interest



PAS 2035 Establishing Intended Outcomes

Intended outcomes must be agreed with the Client and may include one or more of:

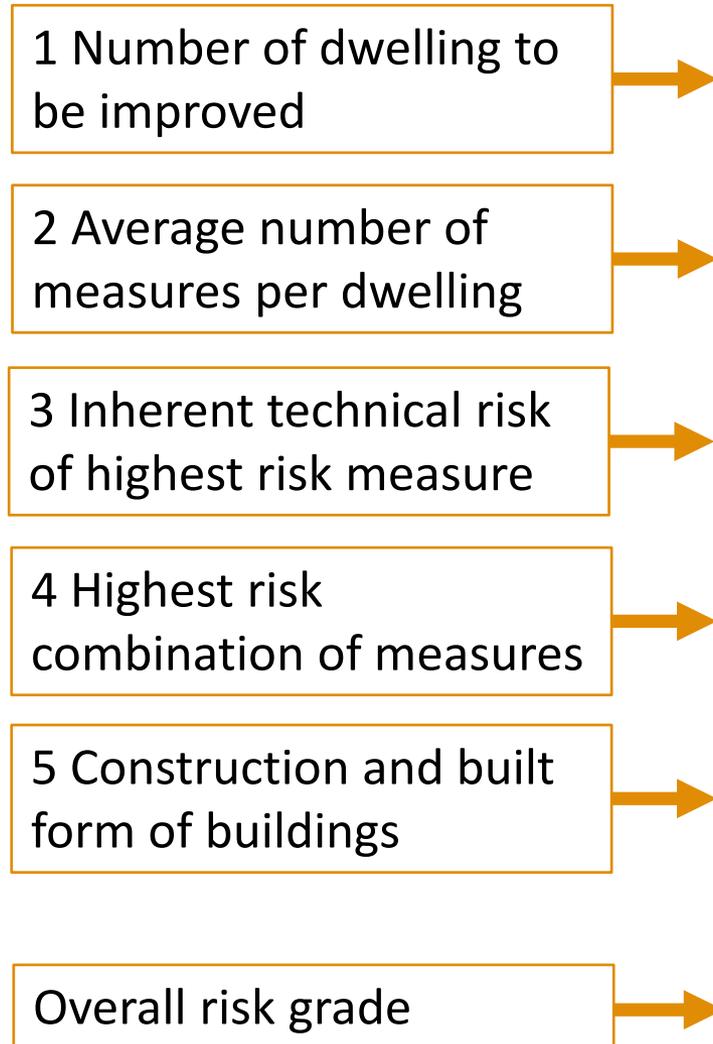
- Reductions in energy use
- Reductions in energy costs and/or alleviation of fuel poverty
- Reductions in emissions associated with energy use
- Improvement in internal comfort
- Improvement of internal air quality (IAQ)
- Elimination of condensation, damp and mould
- Reducing the risk of overheating
- Improvement in energy rating
- Meeting a performance standard (e.g. NZEB or Passive House EnerPHit)
- Protecting the building against decay or deterioration
- Improving resistance to water penetration and resilience against flood risk
- Protection or enhancement of architectural heritage
- Improving the usefulness or sustainability of the building



PAS 2035 Risk Assessment

- 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 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 Annex B: Risk Assessment Criteria

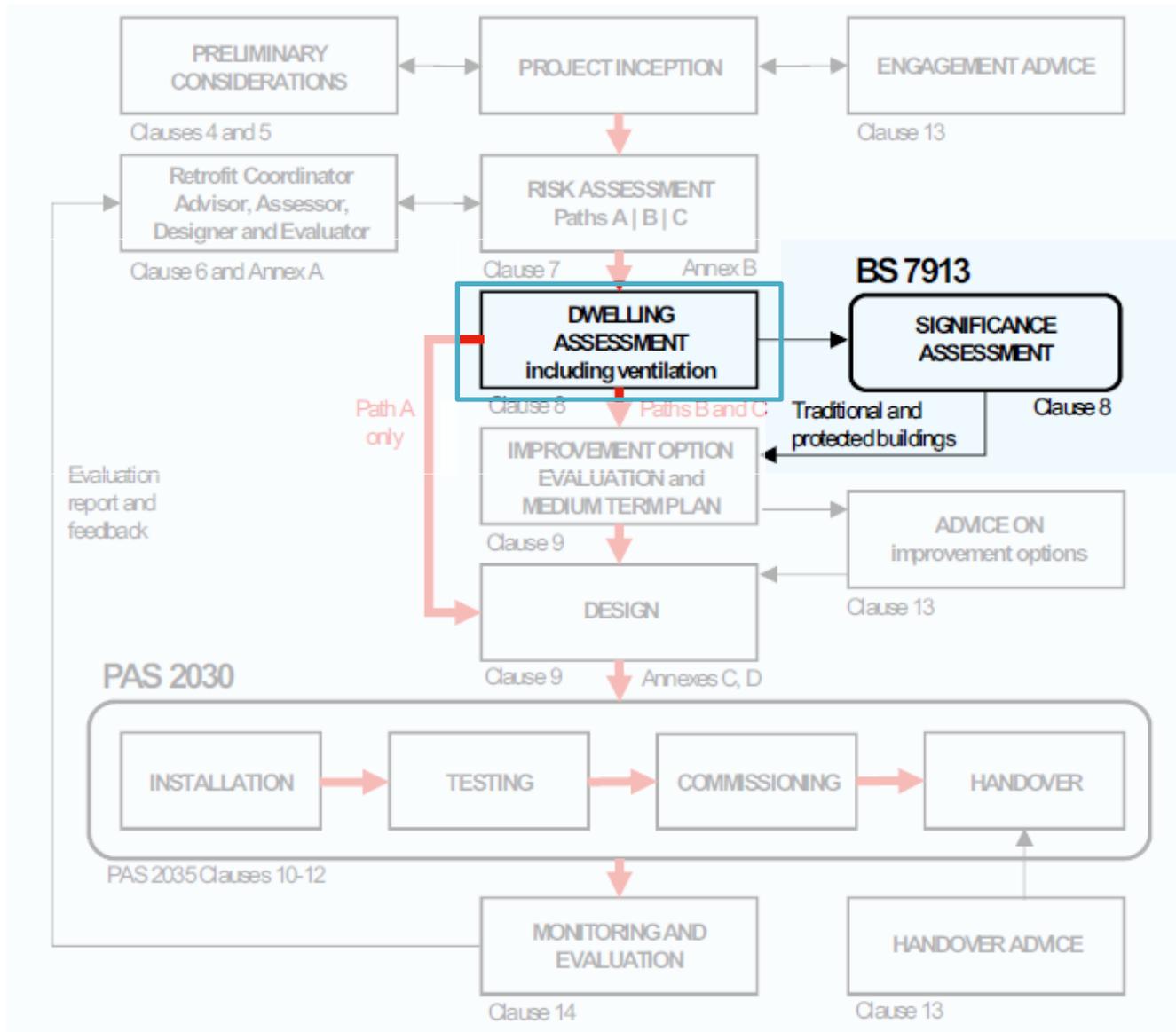


Criterion 1: Number of dwellings in the project		
The number of dwellings to be improved	Risk grade	Assessed grade
1-10	A	
11-30	B	
More than 30	C	
Criterion 2: Number of measures per dwelling ^a		
The average number of improvement measures per dwelling	Risk grade	Assessed grade
1-2	A	
3-5	B	
More than 5	C	
Criterion 3: Measures proposed		
The inherent technical risk of the highest risk measure (from Table B.2)	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 ^b , not high-rise, not protected ^c	A	
Traditional ^b , not protected ^c	B	
System-built ^b , not high-rise, not protected ^c	B	
High rise ^b , any construction	C	
Protected ^c , 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 Annex B: Risk Assessment

Inherent technical risks of measures

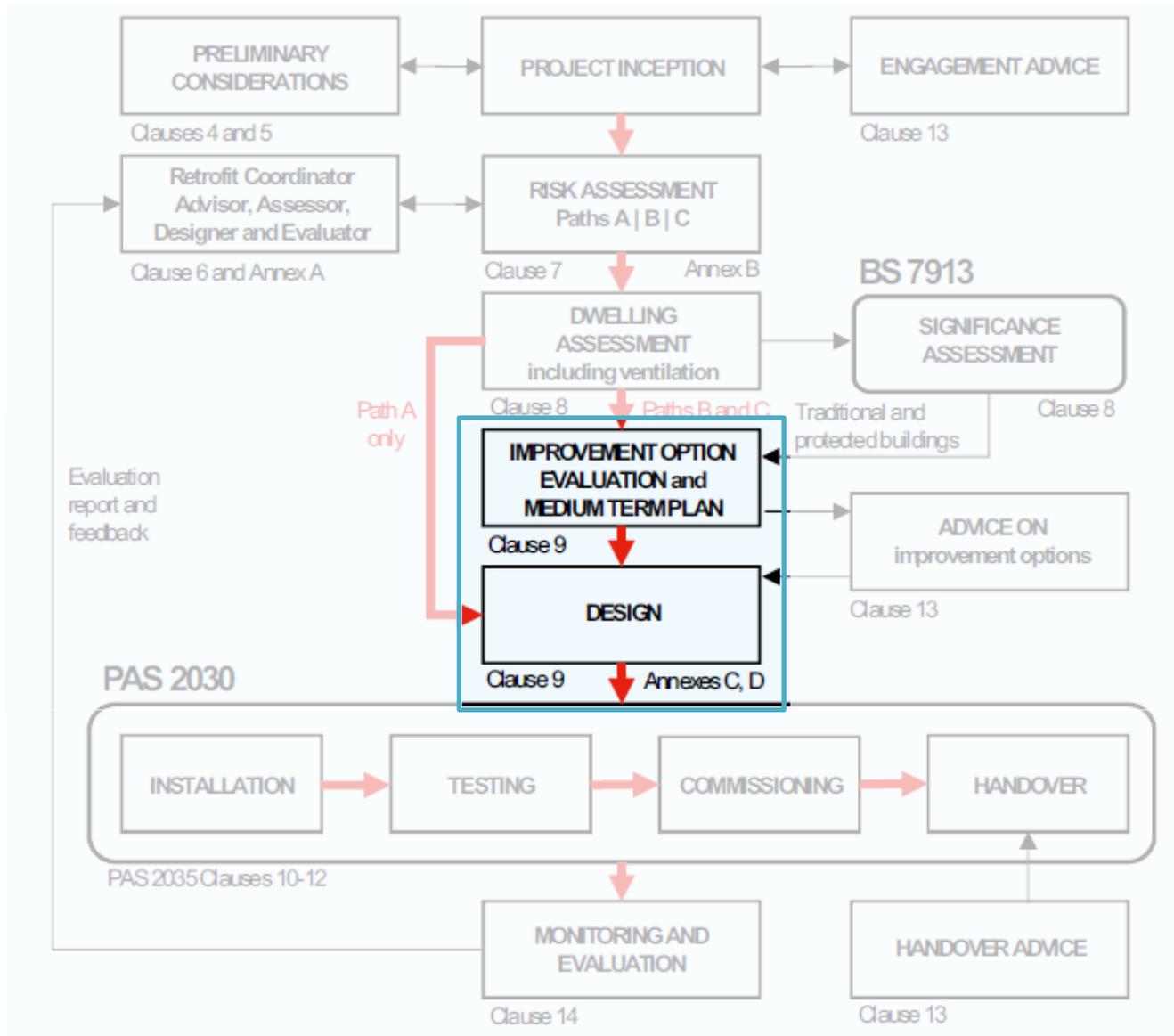
Measure	IHT	Measure	IHT
Internal solid wall Insulation (IWI)	3	Passive stack ventilation	2
External solid wall Insulation (EWI)	2	Single-room heat recovery ventilators	1
Cavity wall Insulation	2	Decentralized mechanical extract ventilation	2
Party cavity wall Insulation	2	Centralized mechanical extract ventilation	2
Loft Insulation (between and over joists)	2	Positive Input ventilation	3
Loft Insulation between/under/over rafters	2	Mechanical ventilation with heat recovery	3
Flat roof Insulation	3	Radiator reflector panels	1
Room in roof Insulation (all elements)	3	District / communal heating – connection	3
Floor Insulation (solid or suspended)	3	District / communal heating – heat meters	1
Hot water cylinder Insulation	1	Air source heat pump	3
Primary pipework Insulation	1	Ground source heat pump	3
Draught-proofing / air-tightness measures	1	Biomass boiler	2
New or replacement windows	1	Micro combined heat and power	3
New or replacement external doors	1	Solar photovoltaics	2
Boiler replacement	2	Micro wind-power	2
New central heating system	2	Micro hydro-power	3
Replacement of electric storage heaters	1	Solar water heating	2



PAS 2035 Whole-Dwelling Assessment

The assessment must include:

- An appraisal of the dwelling's heritage, architectural features, structure, construction and condition and building services in sufficient detail to establish its suitability for improvement.
- Identification of constraints imposed by the site, e.g. exposure, access, party walls, rights of light, consideration of adjoining properties, etc.
- Identification of any constraints imposed by the local planning authority.
- Identification of the location and severity of any construction defects or structural defects or leaks, and of any condensation or mould growth.
- Identification of energy efficiency measures already installed or proposed.
- A measured survey to establish the overall dimensions of the heat loss envelope, the dimensions of building elements and openings.
- An appraisal of the construction in sufficient detail to establish the U-values and moisture properties of the main building elements.
- identification of the installed building services and controls.
- An occupancy assessment (number and any vulnerability of occupants)
- An estimate of annual fuel use, fuel cost and carbon dioxide emissions made from fuel bills or by using SAP or PHPP.

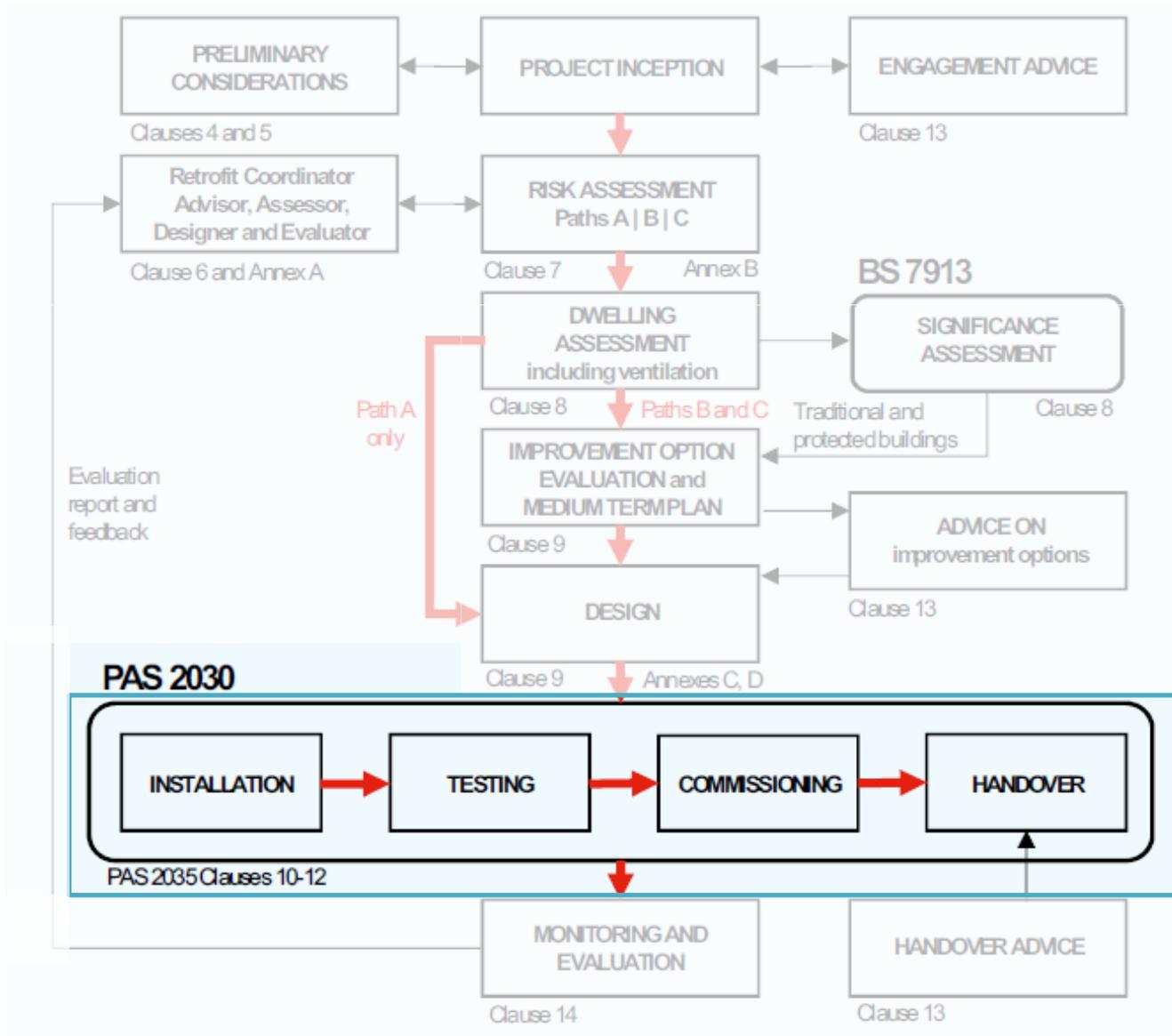


PAS 2035 Design

- 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

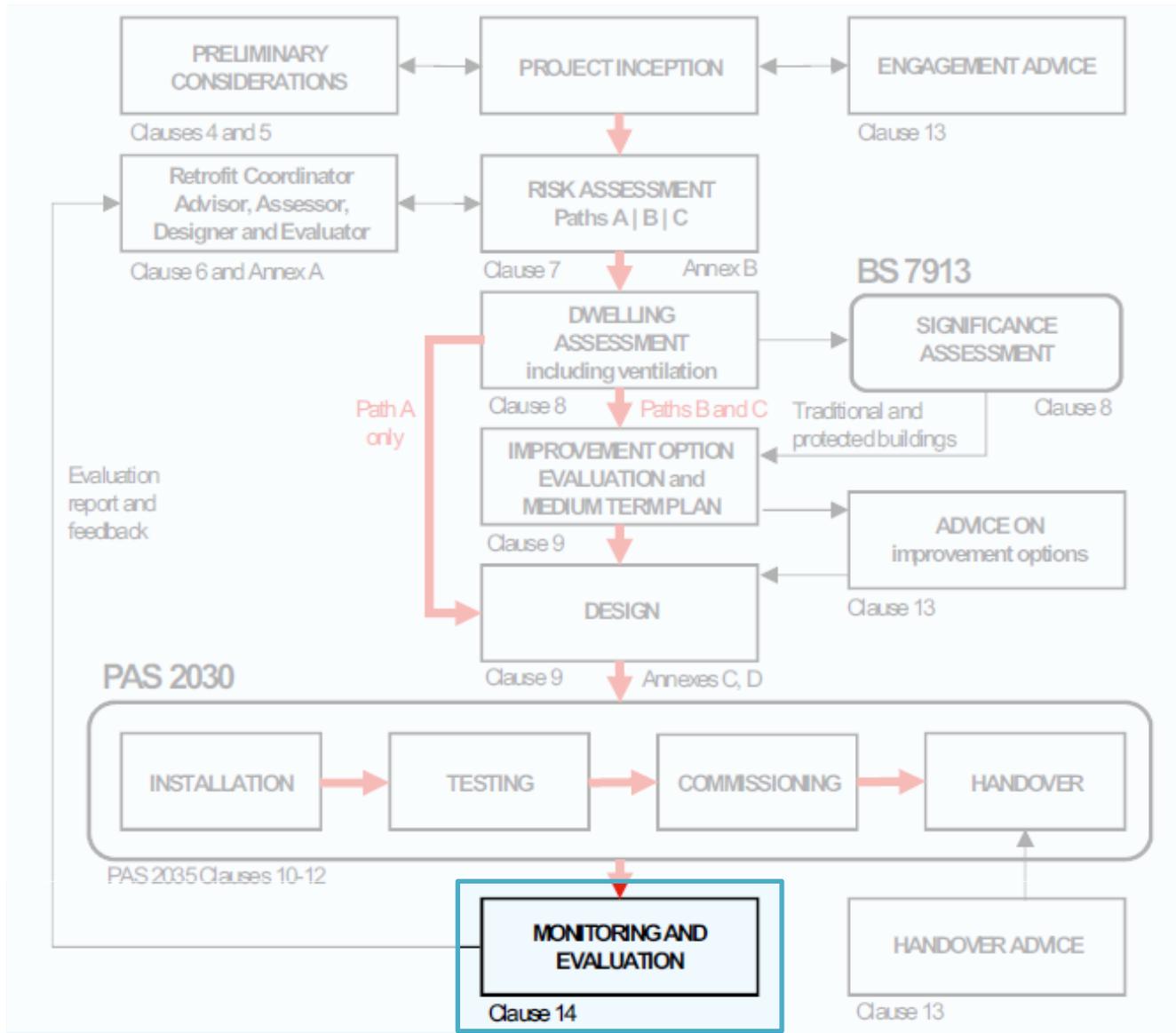
PAS 2035 Design

- Path A allows
 - Design of single-measure system improvements by specialists
 - Subject to review of the design by the Retrofit Coordinator
- Paths B and C also require
 - An improvement option evaluation to determine the appropriate package of measures for the dwelling(s)
 - Based on a SAP or PHPP assessment
 - A medium-term retrofit plan to identify and prioritise the improvements the dwelling needs by 2050
 - Even if they cannot all be implemented immediately
- Path C also requires
 - Specialist expertise when traditionally constructed or protected buildings are to be improved



Installation

- 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 Monitoring and Evaluation

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

PAS 2035 Annex A: Qualifications

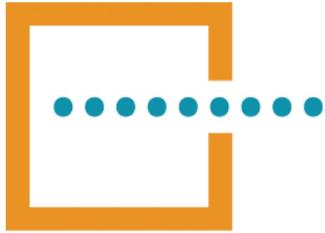
- Retrofit Advisor
 - City & Guilds *Energy Awareness and Energy Advice* or
 - Green Deal Advisor or
 - Retrofit Coordinator
- Retrofit Assessor
 - Path A: Retrofit Coordinator
 - Path B: Domestic Energy Assessor
 - Path C: DEA with RICS residential surveys competence
 - Additional requirements for traditionally constructed and protected buildings
- Retrofit Coordinator
 - Level 5 Diploma in Retrofit Coordination and Risk Management
- Retrofit Designer
 - Path A (specialist system): specialist designer - design reviewed by Retrofit Coordinator
 - Path A: Retrofit Coordinator or Architectural Technologist
 - Path B: Architectural Technologist, Architect or professional member of CIOB
 - Path C: Architectural Technologist, Architect or professional member of CIBSE or CIOB
 - Additional requirements for traditionally constructed and protected buildings
- Retrofit Evaluator
 - Retrofit Coordinator (pending development of a specialist qualification)

PAS 2035 Summary

- Risk assessment
 - Based on pre-assessment (triage)
 - Determines the Path (A-C) through the PAS
- Required qualifications depend on assessed risk
 - All projects must have a Retrofit Coordinator
 - Professional qualification required for other roles
- Design
 - Requirements depend on the risk Path (A-C)
 - Improvement option evaluation and medium term plans required (B, C)
 - Additional requirements for traditionally constructed and protected buildings (C)
- Ventilation
 - Assess existing, upgrade if inadequate or will become inadequate on retrofit
- Measures Interaction Matrix
 - Used in risk assessment (inherent and combined risks)
 - Identifies where retrofit design must consider interfaces
- Monitoring and evaluation
 - Confirms agreed outcomes, investigates discrepancies

Next Steps

- Transition period for ECO
 - PAS 2030: 2019 and PAS 2035: 2019 published June 2019
 - PAS 2031 (certification standard) published July 2019
 - Six-month period for UKAS re-certification of CBs
 - Twelve-month period for CBs to re-certify installers
 - Training of Retrofit Coordinators during transition period
 - ECO will require TrustMark (and PAS 2035) from January 2021
- Promotion of TrustMark
 - TrustMark is required for ECO
 - The next priority is to encourage BEIS and MCHLG to impose TrustMark on other housing sectors
 - Local authorities, ALMOs, housing associations, private landlords



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Thank you
Any questions?

www.ukcmb.org

v.marincioni@ucl.ac.uk



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