

PAS 2035: A New Standard for Domestic Retrofit

Dr Peter Rickaby

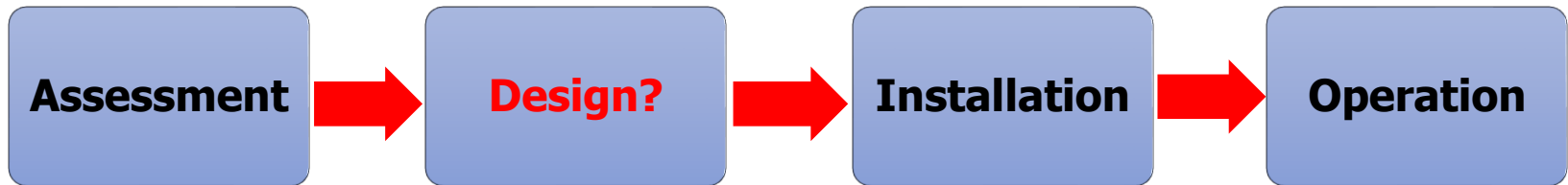
Each Home Counts Implementation Board
Chair, BSI Retrofit Standards Task Group

It's not just Grenfell Tower...

- Glasgow
 - Four tonnes of EWI fell off the top of a residential tower
- Edinburgh
 - All the EWI fell off a gable wall of Oxfords School
- Preston
 - Over 300 homes made uninhabitable by EWI
- Grenfell Tower
 - 71 dead after fire spread via insulated external cladding
- Numerous other CWI and EWI failures
 - Mostly inappropriate or incompetent installations

Retrofit Process?

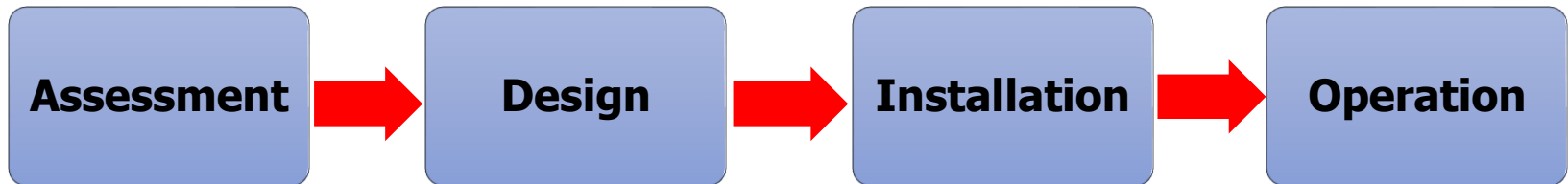
(Green Deal and ECO)



Managing Retrofit Risk

Technical Risks

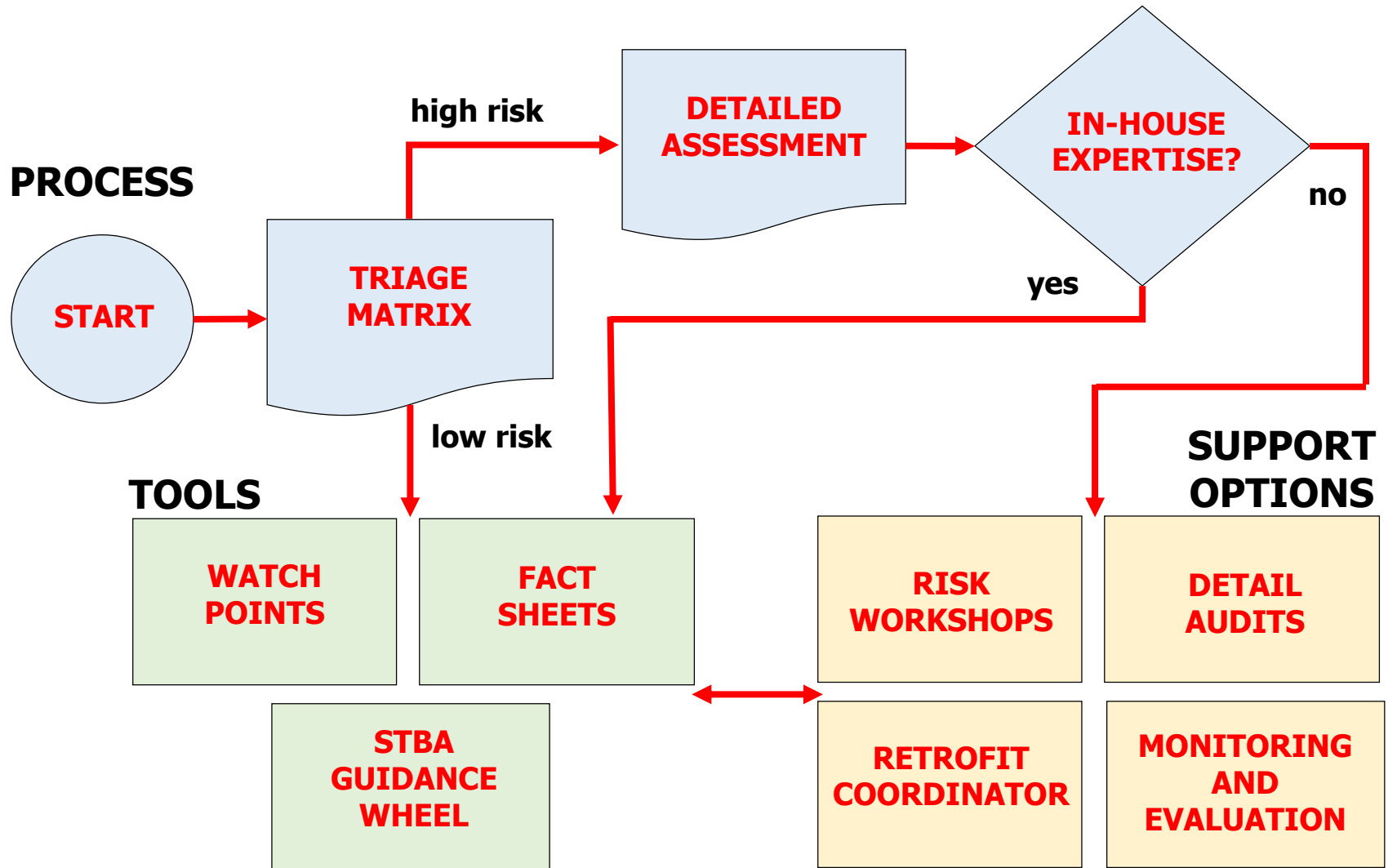
- Putting the correct package of improvements in place
- Managing the interactions between measures
- Managing moisture, IAQ and ventilation
- Avoiding unintended consequences



Process risks

- Assigning tasks to the correct people
- Ensuring appropriate qualifications, skills and tools
- Auditing and inspecting (based on risk assessment)
- Monitoring and evaluation of completed projects
- Feed-back for process improvement

RE:NEW Risk Management Process



RE:NEW Technical Risk Matrix

	IWI	EWI	Cavity Wall	Loft Insulation	Roof Insulation	Underfloor Insulation	Window & Door Upgrades	Chimney balloons/baffles	Draft-proofing	MVHR	Boiler Replacement	Cylinder insulation & Plumbing lagging	Solar Thermal	Heating Controls	Heat Pumps (ASHP/GSHP)	Communal/District Heating	Solar PV
IWI	3	2	2	2	2	2	3	1	2	3	2	1	0	1	2	3	0
EWI	2	2	2	2	2	3	1	2	3	2	1	0	1	2	3	0	0
Cavity Wall	2	2	2	2	2	1	1	3	1	0	0	0	1	2	3	0	0
Loft Insulation	2	0	0	0	0	1	3	1	0	1	1	1	2	3	1	0	0
Roof Insulation	2	0	0	0	0	1	3	1	0	1	1	1	2	3	1	0	0
Underfloor insulation	2	0	0	0	1	2	1	0	0	0	1	2	2	0	0	0	0
Window & door upgrades	2	0	2	1	0	0	0	0	0	0	0	2	1	0	0	0	0
Chimney balloons/baffles	2	0	2	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Draft-proofing	1	2	2	0	0	0	1	2	2	0	0	1	2	2	0	0	0
MVHR	3	0	0	0	0	0	0	0	0	0	0	2	3	0	0	0	0
Boiler replacement	1	0	1	0	-	-	0	0	0	0	0	0	0	0	0	0	0
Cylinder insulation & Plumbing lagging	1	1	0	1	2	0	0	0	0	0	0	1	2	0	0	0	0
Solar Thermal	0	1	1	2	0	0	0	0	0	0	0	1	2	0	0	0	0
Heating controls	0	2	2	0	0	0	0	0	0	0	0	0	2	2	0	0	0
Heat Pumps (ASHP/GSHP)	3	-	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Communal/District Heating	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solar PV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Each Home Counts

An Independent Review of Consumer Advice, Protection,
Standards and Enforcement for Energy Efficiency and
Renewable Energy



Dr Peter Bonfield, OBE, FREng

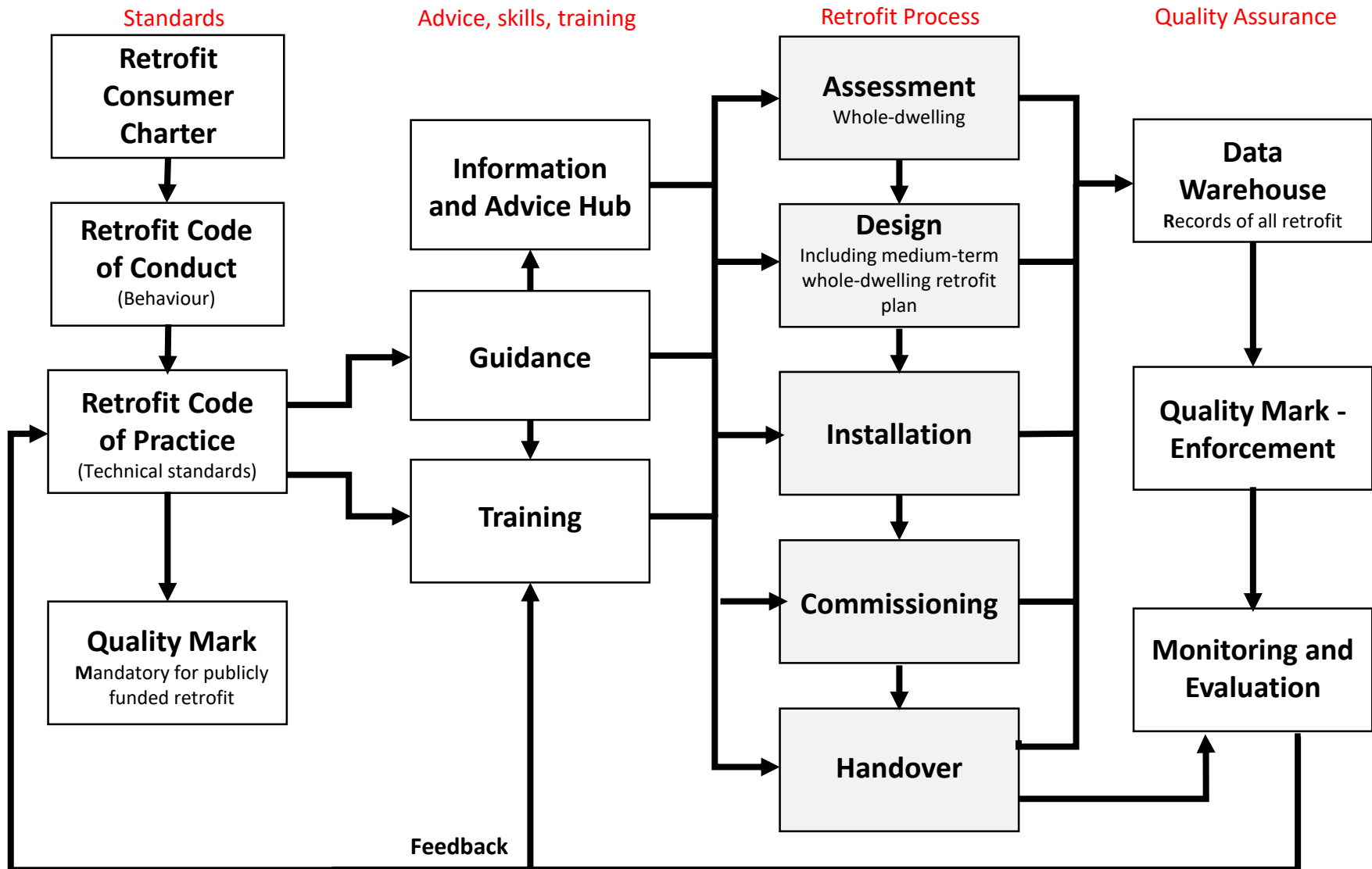



Department for
Business, Energy
& Industrial Strategy

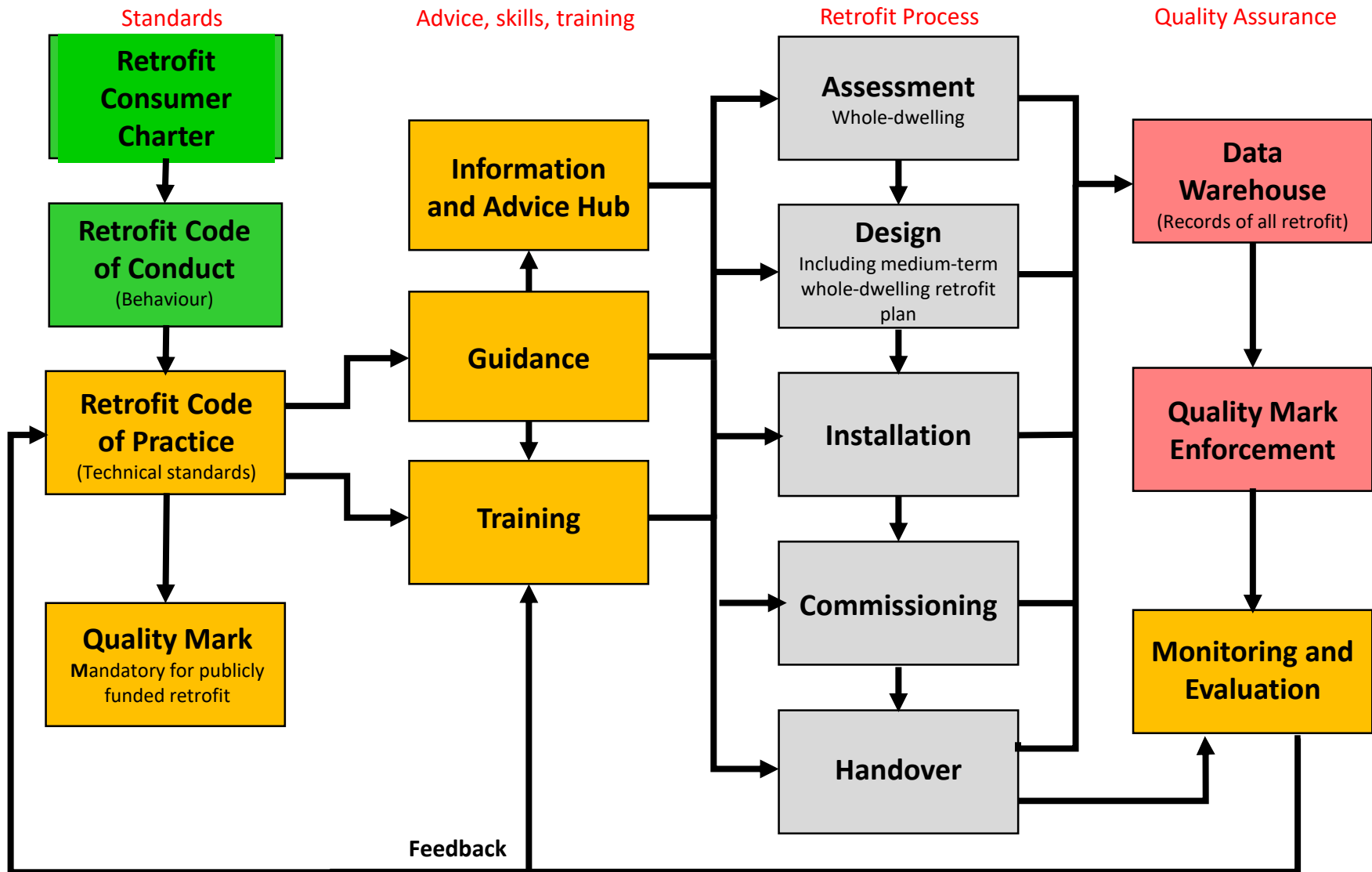

Department for
Communities and
Local Government

December 2016

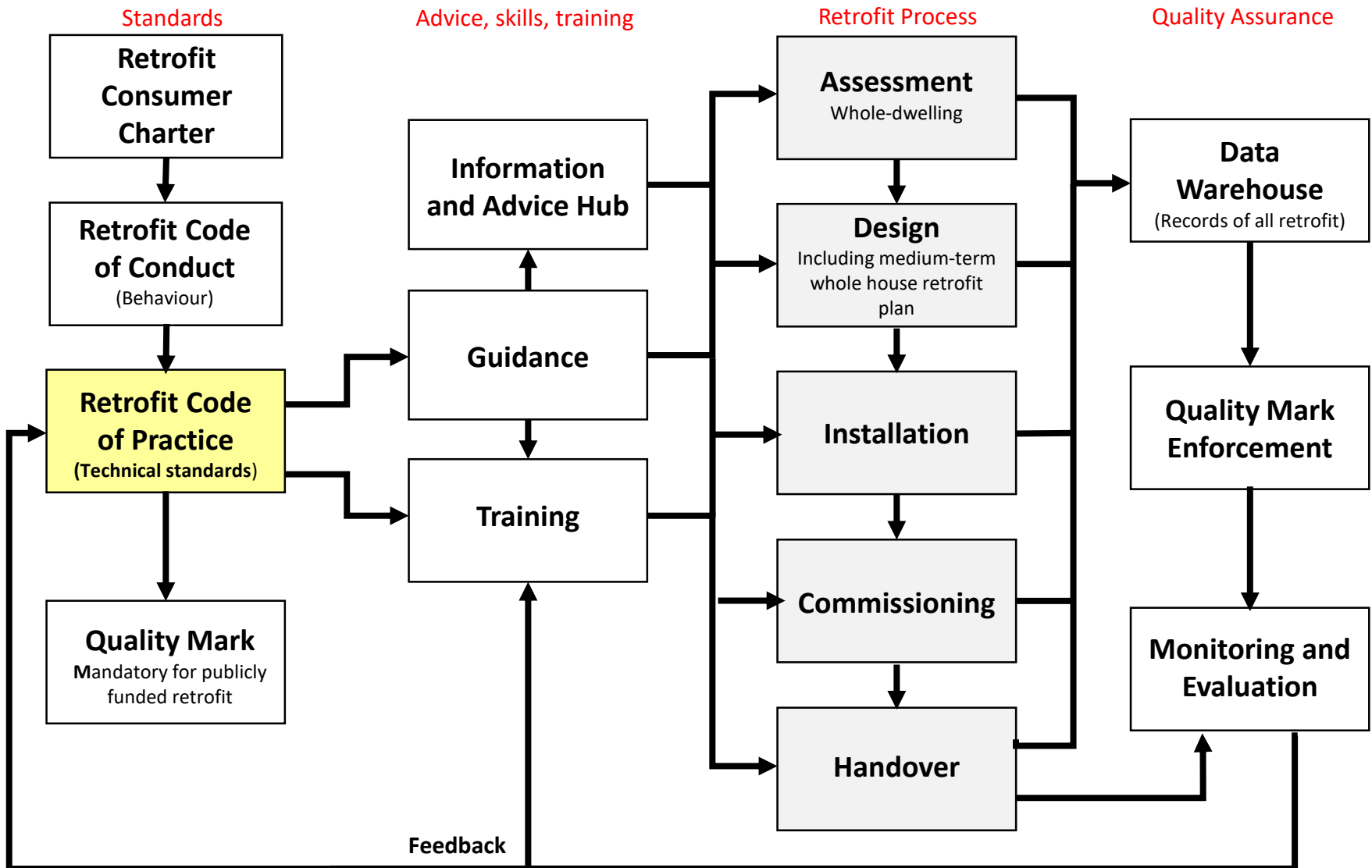
Each Home Counts: **Vision**



Each Home Counts: Progress



Each Home Counts



BSI Retrofit Standards Framework

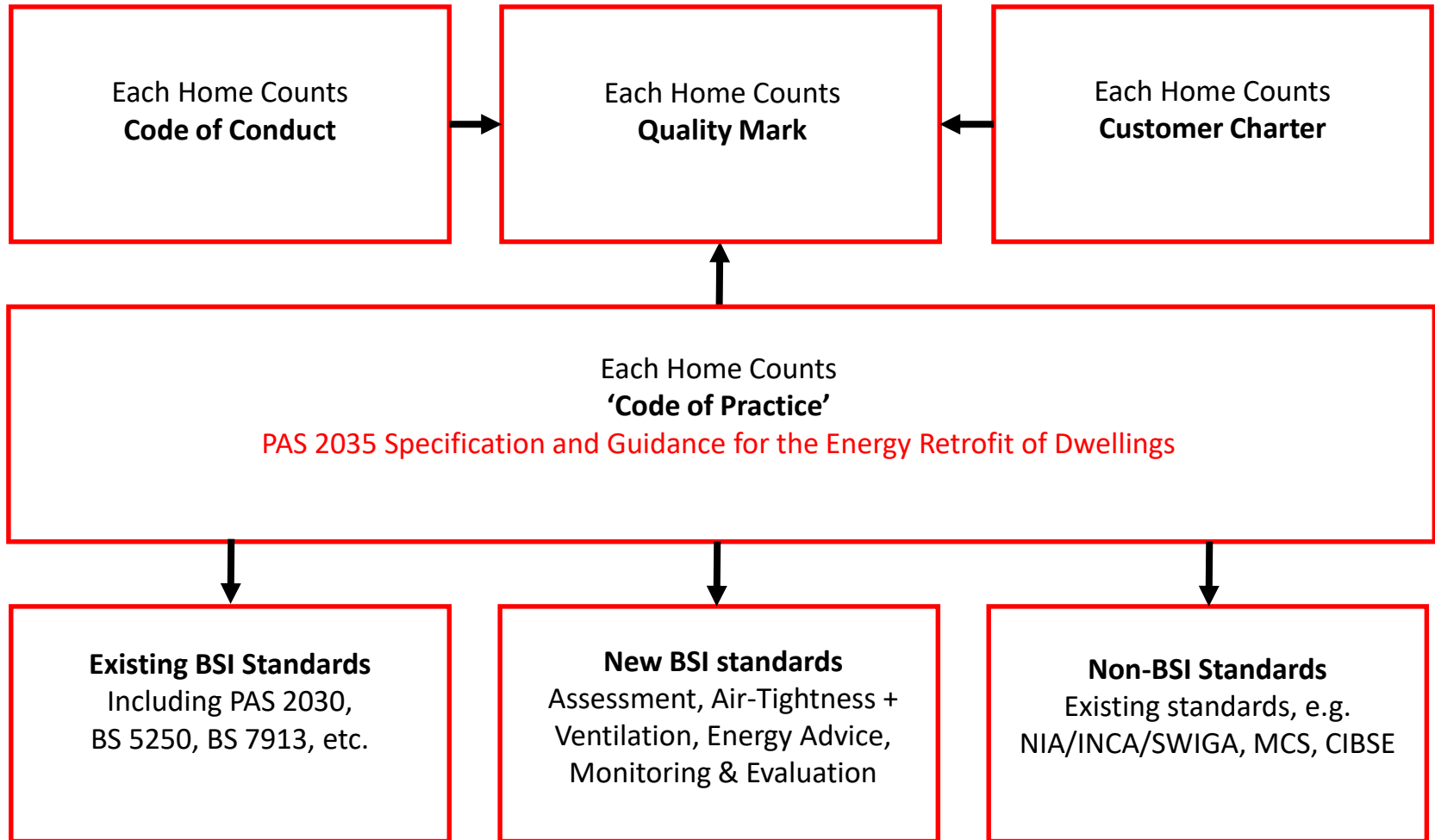
Objectives

- 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

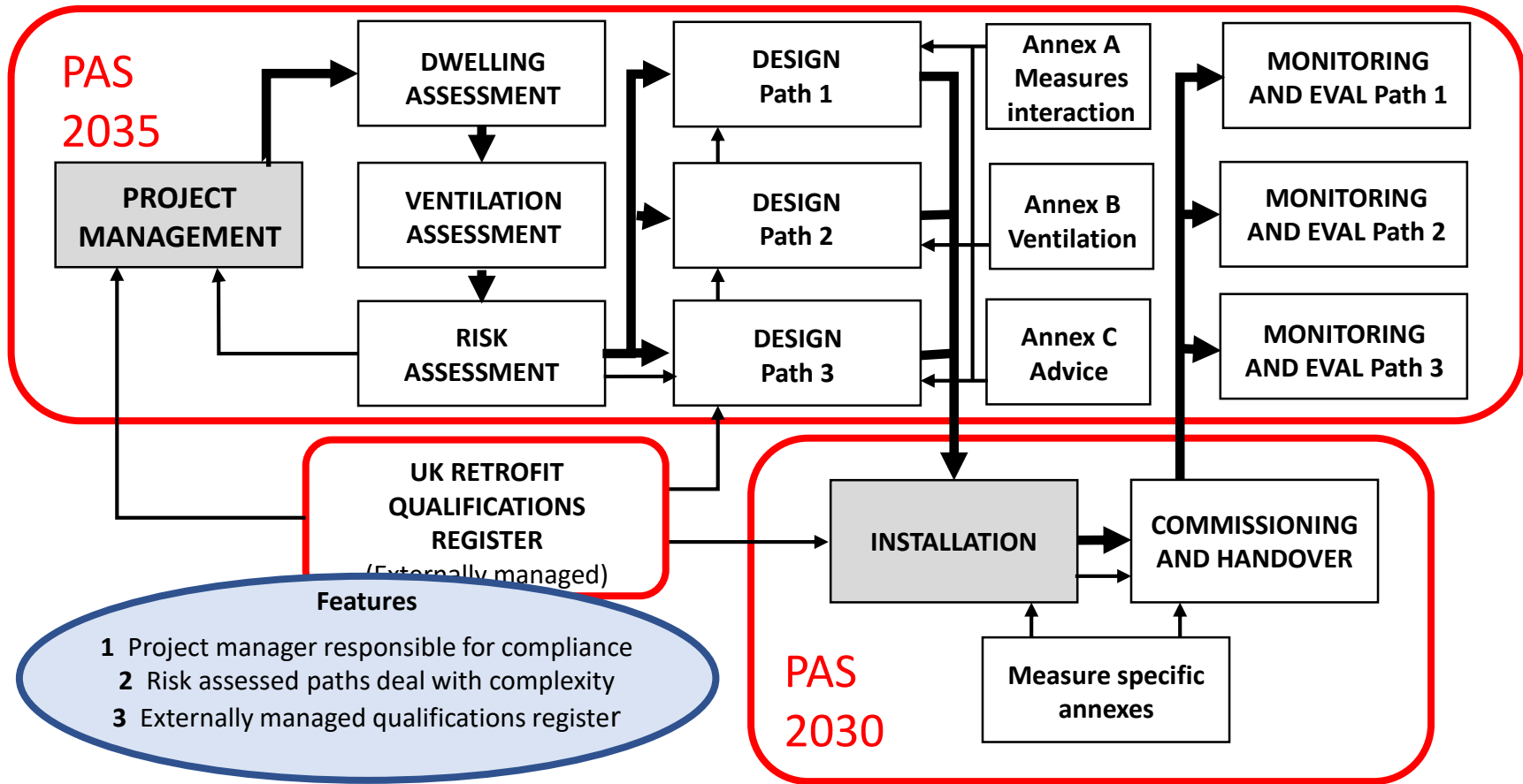
Principles

- Focus on materials, workmanship and processes
- Make retrofit standards accessible (online portal)
- Combine technical standards with guidance

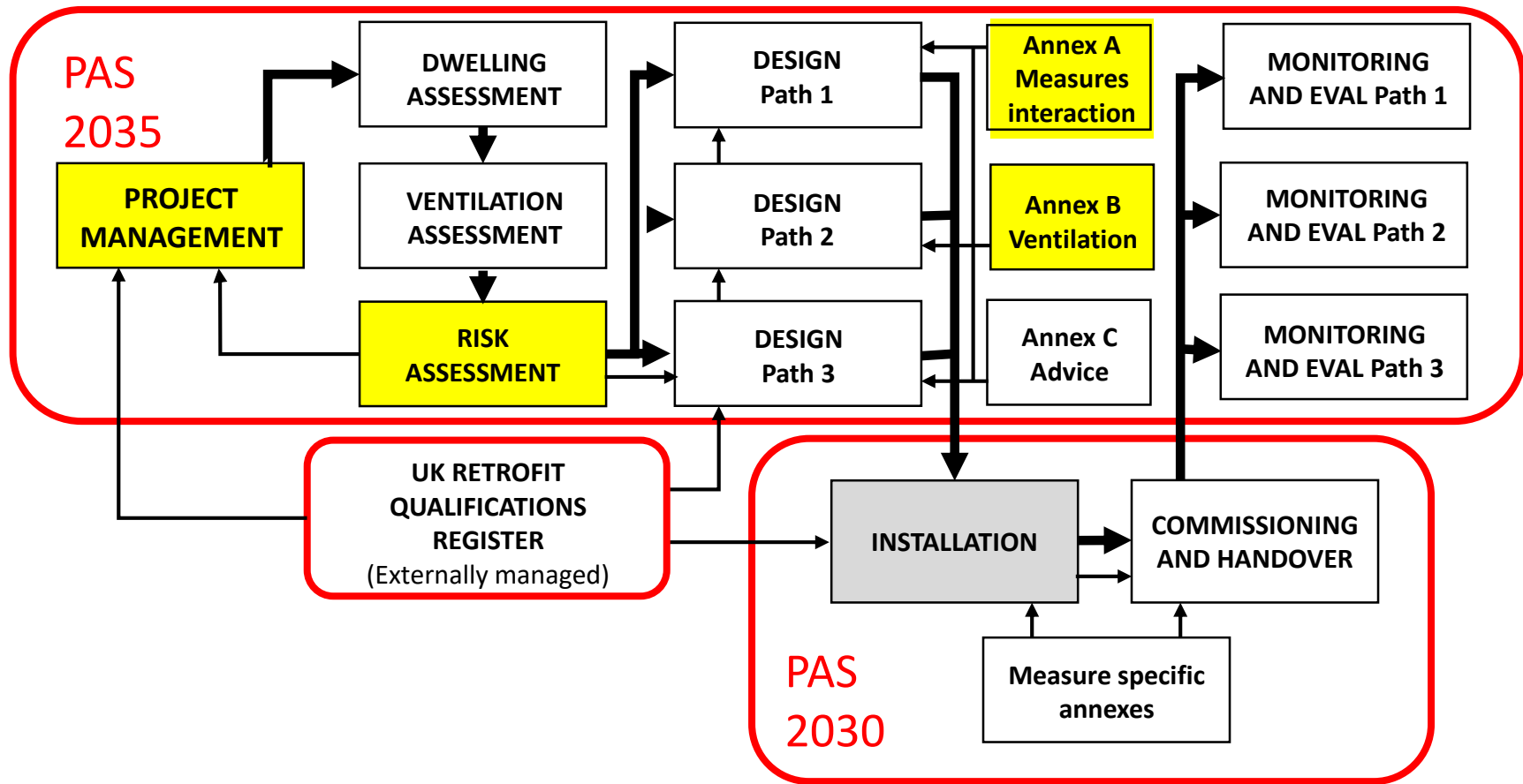
The BSI Retrofit Standards Framework



Proposed structure (PAS 2035 Draft 2)



Proposed structure (PAS 2035 Draft 2)



PAS 2035 Risk Assessment

- Carried out by Retrofit Project Manager
 - After whole-dwelling and ventilation assessments
- Risk assessed as Low | Medium | High
 - Depending on five criteria
- Assessed risk determines Path through the PAS
 - Path 1: Low risk = PAS 2030 requirements
 - Path 2: Medium risk = more onerous requirements
 - Path 3: High Risk = much more onerous requirements
- Retrofit Project Manager
 - Path 1: qualified construction project manager
 - Paths 2 and 3: qualified Retrofit Coordinator

PAS 2035 Risk Assessment Criteria

Average number of measures per dwelling



Criterion 1: Number of improvement measures per dwelling

Average number of measures per dwelling	Risk grade	Assessed grade
1	LOW	
2-4	MEDIUM	
5 or more	HIGH	

Inherent technical risk of highest risk measure



Criterion 2: Measures proposed

Inherent technical risk of highest-risk measure*	Risk Grade	Assessed grade
0	LOW	
1	LOW	
2	MEDIUM	
3	HIGH	

Highest risk combination of measures



Criterion 3: Combination of measures

Highest-risk combination of measures*	Risk Grade	Assessed grade
GREEN	LOW	
ORANGE	MEDIUM	
YELLOW	MEDIUM	

Age of oldest building



Criterion 4: Age of buildings

Age band of oldest building	Risk Grade	Assessed grade
pre 1919	HIGH	
1919-1939	MEDIUM	
1946-1959	LOW	
1960-1976	MEDIUM	
post 1976	LOW	

Construction and built form of buildings



Criterion 5: Construction

Construction and built form of buildings	Risk Grade	Assessed grade
Traditional (heritage pre-1919)	HIGH	
System-built (high-rise > 18m)	HIGH	
System built (medium-rise 1960-1976)	MEDIUM	
Traditional (low-rise post 1918)	LOW	

Aggregation

Highest assessed grade	PAS 2035 Path	Assessed Path
LOW	1	
MEDIUM	2	
HIGH	3	

PAS 2035 Ventilation

‘No insulation without ventilation!’

Assessment

- Existing ventilation is inadequate if
 - Evidence of condensation or mould
 - No working ventilation system present
 - IEV or PSV present but incomplete (including air inlets)
 - Good IEV or PSV but intended/potential $Q_{50} < 5 \text{ m}^3/\text{m}^2\text{h}$

Upgrade

- If existing ventilation is inadequate then
 - If intended $Q_{50} > 5 \text{ m}^3/\text{m}^2\text{h}$ then install IEV or PSV
 - If intended $Q_{50} < 5 \text{ m}^3/\text{m}^2\text{h}$ then install MEV or MVHR
 - System capacity must be based on full occupancy

PAS 2035 Summary

- Risk assessment
 - After whole-dwelling and ventilation assessments
 - Determines the Path (1-3) through the PAS
- Retrofit Designer and Retrofit Project Manager
 - Qualification depends on project risk assessment
 - High risk projects must have Retrofit Coordinator
- Measures Interaction Matrix
 - Used in risk assessment (inherent and combined risks)
 - Identifies where retrofit design must consider interfaces
- Ventilation
 - Assessment of existing
 - Upgrade to IEV or PSV if inadequate and intended $Q_{50} > 5$
 - Upgrade to MEV or MVHR if intended $Q_{50} < 5$

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