History of British homes a story of resilience

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- NHBC Foundation
- Homes through the decades – historical perspective
- A broad view of resilience
- Back to the future – twice
- Resilient homes – some observations

NHBC Foundation

- Set up in 2006
- To provide research, guidance and good practice for the house-building industry
- Re-investing NHBC surplus for benefit of homeowners & the industry
- £620k funding for this year
- Some projects specifically to support small firms
- Our work feeds into government policy and debate

Homes through the decades

Mid 1800s-1918 *Victorian/Edwardian*

1919-1939 *Between the wars*

1945-1959 *Post war recovery*

1960-1979 *Towers in the sky*

1980-1999 *Technology and society*

2000-present *Embracing sustainability*

The future *Meeting tomorrow's needs*

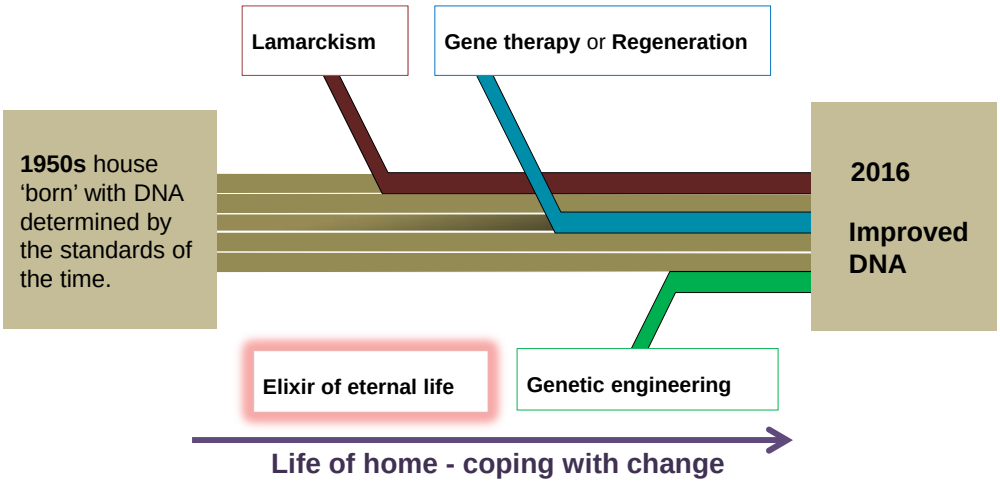
History of British housing
many pockets of resilience

c1900

c1930

c1950

Why housing can be resilient



What do we want homes to be resilient to?

Climate change – greater risk of flood, higher temperatures, storms

Lifestyle change – changing pattern of use, different requirements, working from home

Demographic change – changes in household size, age profile. Providing suitable homes for the future

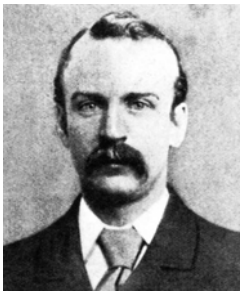
Built-in obsolescence/underperformance/misuse – problematic operation, maintenance or repair, risk to health

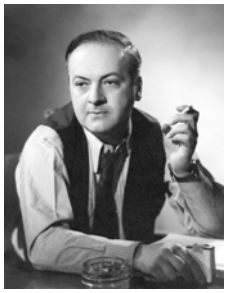
Negative psychological/social change – poor design for community cohesion, risk of social problems/limited life chances

Policy/regulatory change (with unintended consequences)

National/international change – recession, austerity, shortages, energy costs/energy security, Brexit

Resilience of homes (in the round)…
has always been a priority





Understanding and delivering the broader aspects of resilience has been the domain of reformers and many professionals

Back to the future 1

Air quality in homes - Mid 1800s

Edwin Chadwick

Links poor living conditions with poor health

Henry Roberts

Designs new Model homes for working families

Miasma

The story continues – 150 years later….

- Homes were draughty
- Major source of heat loss
- 'Build tight ventilate right'
- Building Regs 2006: $10m^3/hr/m^2$
- Building Regs 2010: $6m^3/hr/m^2$

Airtightness requirement driven by low carbon agenda/policy and Approved Document L1A

Indoor air quality

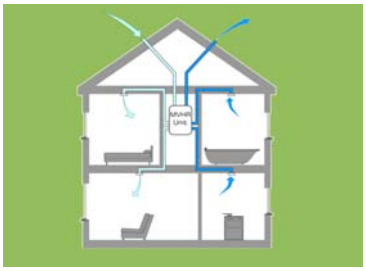
Appropriate IAQ is the absence of air contaminants and pollution, such as:

- Combustion products
- Ozone
- Allergens including mould spores
- Chemicals and particles from building products and furnishings
- Cleaning products
- Tobacco smoke, cooking, hobbies, and pets
- Radon

Strong links with:

- ***Allergic and asthma symptoms***
- ***Lung cancer***
- ***Lung disease***
- ***Airborne respiratory infections***
- ***Cardiovascular disease***
- ***'Sick building syndrome'***

Emergence of MVHR
(mechanical ventilation with heat recovery)



A whole-house mechanical ventilation system

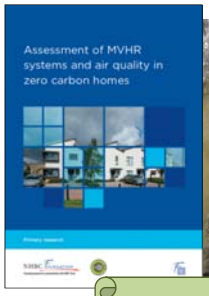
A design option adopted to reduce the energy demand of a home

Only works well if the home is very airtight

Built-in obsolescence/underperformance/misuse – problematic operation maintenance or repair risk to health

Policy/regulatory change (with unintended consequences)

Embedding resilience: reducing risk – MVHR

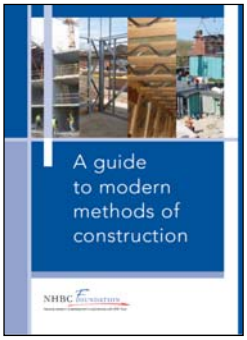


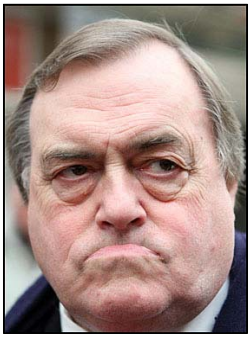
MVHR increasingly adopted → MVHR evaluated in research → New NHBC standards generated

Back to the future 2

Non-conventional construction

Fast forward 50 years - MMC debate





MMC today: a spectrum

Volumetric

Pod

Panelised

Sub-assemblies

MMC sub-assemblies

67%
have used

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MMC today – embedding resilience/verifying performance. NHBC model

Establish critical functions

- Structure
- Fire
- Weatherproofing
- Durability
- Thermal
- Acoustic
- Services

Determine performance

- Test evidence. Compliance with Standards

Apply to the building

- Making sure that systems/ components are tuned to meet specific local conditions

Resilient homes: some observations

a) Energy efficiency – annual energy spend

Victorian
With some modern day improvements

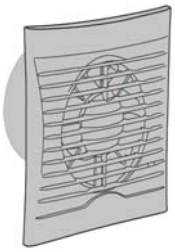
New build
Built to 2013 Building Regulations

Energy efficiency - design

Rectangular detached
Form Factor 2.5

L-shaped detached
Form Factor 2.7

Energy efficiency - use



Ventilation

1 Natural

2 Mechanic

3 Mechanic
with h

9 systems/ technologies that users may not fully understand or be able to use effectively

Heat pumps

6 Air source

7 Ground source

Solar ene

4 Solar PV

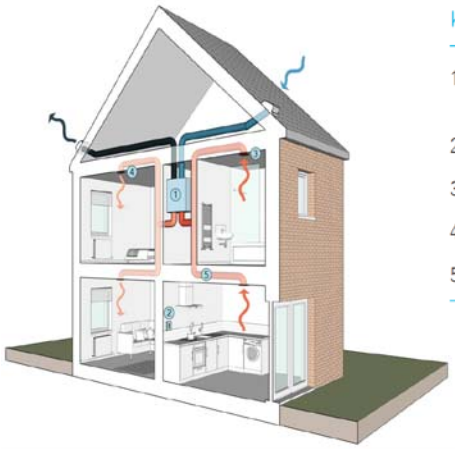
5 Solar thermal

Heating controls

8 Single zone

9 Multiple zone

Energy efficiency - use



Key

1 Central fan unit with heat exchanger

2 Boost switch

3 Extract grille

4 Supply grille

5 Ducting

b) Resilience of fabric – exteriors

c) Resilient to overheating

d) Resilient to changing needs of occupants

Smart/connected home

- Emerging smarter features, for example:
  - Low occupancy setback
  - Proactive transport applications
  - Occupant-sensing security
  - Advanced telecare
  - Low voltage DC circuits

Connectivity: future-proofing new homes

In order of priority:

1. Make sure router can be located centrally within the home
2. Provide one single extra data cable to allow future expansion of the network
3. Provide wired connection to main TV
4. Provide further wired connections to principal rooms

Projects referred to

NHBC FOUNDATION

Housing research & guidance

NHBCFoundation.org