UK COLLABORATIVE CENTRE FOR HOUSING EVIDENCE

Kenneth Gibb

Deep Retrofit Case Study: 107 Niddrie Road

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Niddrie Road, Glasgow: Tenement Retrofit Evaluation

Project supported by the Scottish Funding Council

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September 2023

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Background to Retrofit and Evaluation

- GCC PRS strategy and link to tenement retrofit and net zero -70,000 plus pre1919 tenements in Glasgow
- Potential retrofit by Southside HA working with John Gilbert architects and CCG Ltd enhanced by possible Scottish Funding Council Climate Emergency application
- Retrofit evaluation partnership led by CaCHE, Tim Sharpe and the retrofit partners including GCC
- Project began Feb 2020, ultimately completed summer of 2022, the evaluation has continued throughout
- About the site:107 Niddrie Road

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107 NIDDRIE ROAD Glasgow

TENEMENT EnerPHit Passivhaus Retrofit

107 Niddrie Road is a pre-1919 red sandstone tenement in Govanhill in the south side of Glasgow owned by Southside Housing Association. Like most traditional Scottish tenements, it consists of eight flats and a communal close and back court. Each flat includes one bedroom, a living / kitchen, bathroom, hallway and store.

This project will achieve EnerPHit standard (the equivalent of Passivhaus for retrofit) and will have high levels of insulation and airtightness combined with new heating and ventilation systems. These energy efficient measures drastically reduce energy bills for the tenants while providing them with the healthiest possible internal environment.

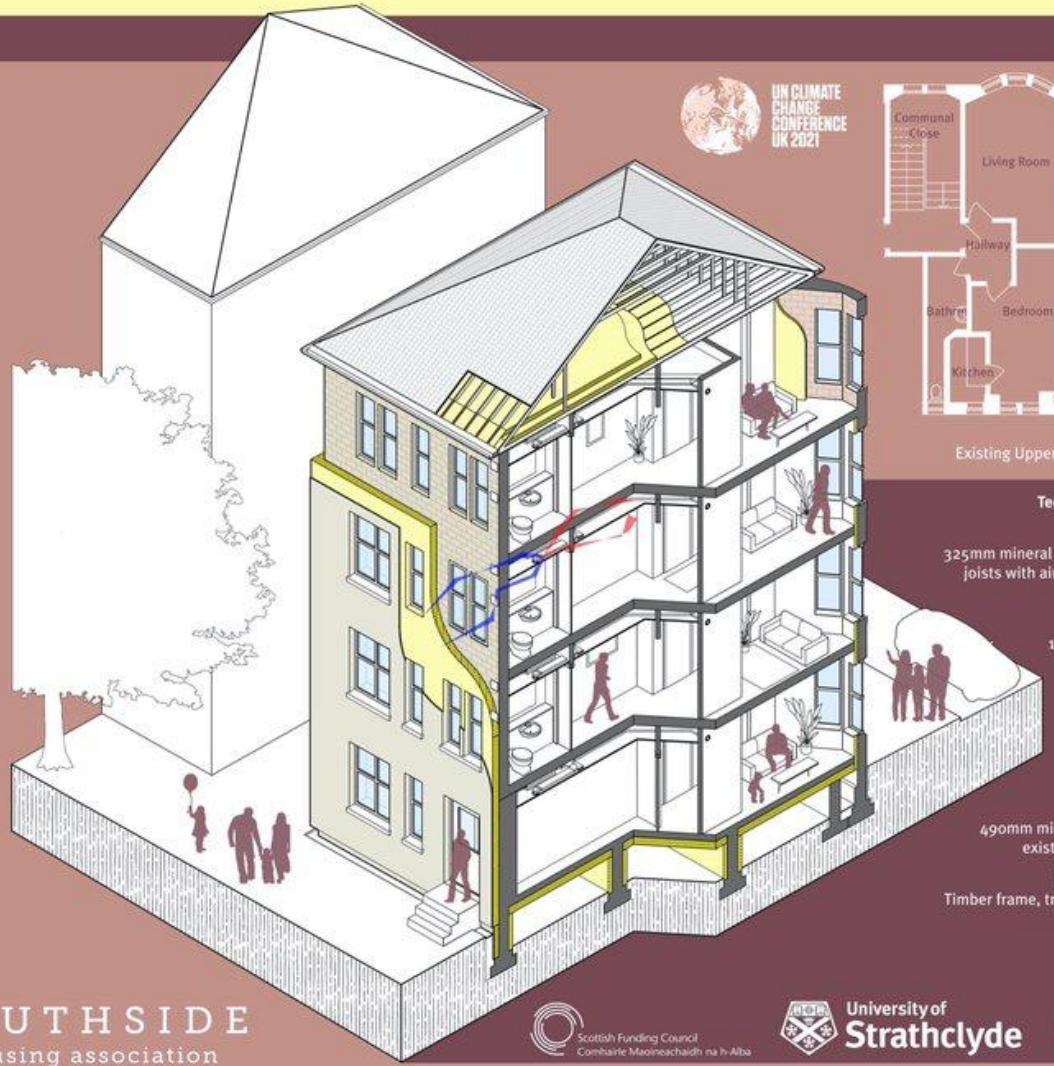
As well as the energy efficient measures, we will be cleaning and repairing the sandstone front elevation, improving the internal layouts and installing new kitchens and bathrooms.

'Fabric First Approach'
We have to improve the building fabric in order to minimise the heating demand and we have done this by ensuring the whole envelope is wrapped in high levels of insulation, minimising thermal bridging and ensuring there is a continuous airtightness line. The insulation and airtightness lines are continous at all key junctions (eg. at eaves level, windows, doors etc.) General building improvements have also been carried out.

Heating and Domestic Hot Water
The lower four flats will be heated by individual air source heat pumps (ASHP) which take heat from the external air and uses it to provide hot water for new radiators and domestic hot water. The four upper flats will be heated by new efficient combi condensing gas boilers which provide hot water for new radiators and domestic hot water.

Mechanical Ventilation Heat Recovery
All eight flats will have their own mechanical ventilation heat recovery unit (MVHR) installed above the ceiling in the bathrooms. These will extract moist / stale air from kitchens and bathrooms while bringing in fresh air from the outside. The heat exchanger transfers the heat from the stale air to the fresh to minimise heat loss which reduces the heating demand.

Wastewater Heat Recovery
The upper six flats will have wastewater heat recovery units installed to the bath / shower so heat can be recirculated back into the hot water system which reduces the heating demand.



UN CLIMATE CHANGE CONFERENCE UK 2021

Existing Upper Plan

Proposed Upper Plan

Technical Data - insulation and airtightness

Ground Floor 0.11 W/m²K
325mm mineral wool insulation fixed between and below joists with airtightness membrane above and breather membrane below

External Walls (front) 0.38 W/m²K
120mm wood fibre internal wall insulation with two layers of natural lime parge

External Walls (rear) 0.18 W/m²K
200mm mineral wool external wall insulation with silicone render and a layer of natural lime parge internally as the airtightness layer

Loft Insulation 0.07 W/m²K
490mm mineral wool packed between and on top of existing timber joists and breather membrane

High Performance Windows 0.89 W/m²K
Timber frame, triple glazed Passivhaus certified windows from Green Building Store

CCG

John Gilbert ARCHITECTS

SOUTHSIDE housing association

Scottish Funding Council
Comhairle Maoineachaidh na h-Alba

University of Strathclyde

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Glasgow CITY COUNCIL

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Decision making lessons

- Covid and working practice for the evaluation
- Decision to pursue ‘fabric first’ EnerPHit (passivhaus for existing buildings)
- Delays with funding and how that shapes what is done e.g. air source heat pumps
- Uncertainty over planning permission: external wall insulation, ASHP, no PV panels
- Airtight insulation, joists and protecting internal air quality through use of materials
- Mechanical Ventilation and Waste water heat recovery
- Engagement with residents
- Control over the building (an empty block)
- Managing airtightness testing

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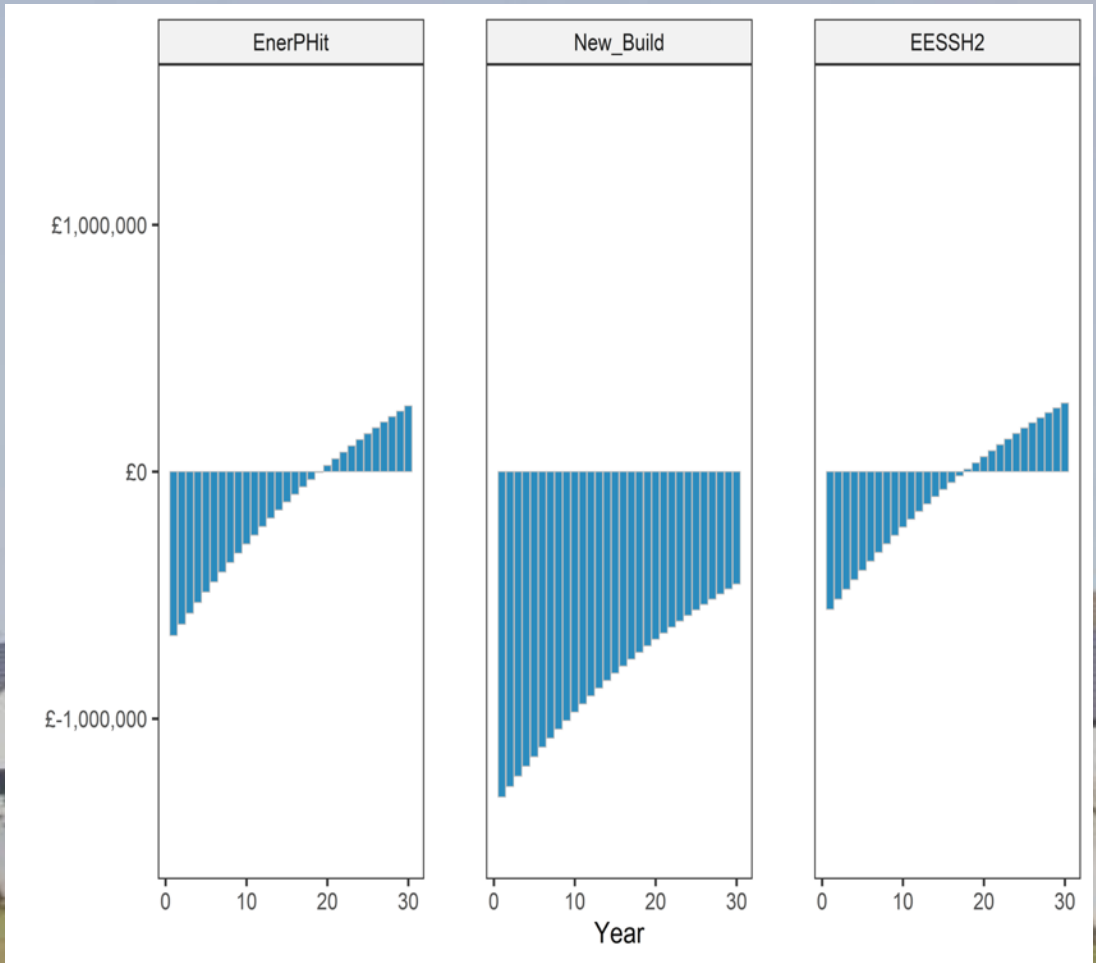
Cost Benefit Analysis



- Well known high-cost project though the truth is a little different (but it is still very expensive)
- We wanted to do a full cost benefit analysis NPV over 30 years
- Green Book mainstream conventional analysis
- Assessing the projects against two counterfactuals: demolish and rebuild; EESHH2 style retrofit
- Use government estimates of carbon costs and undertake extensive sensitivity analysis
- Retrofit almost always superior to demolish and build
- Not clear between EnerPHit and EESHH2 but both strongly positive and only EnerPHit gets close to net zero

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Post Occupancy work

- Resident views matter and are part of the evaluation
- So good we did it twice both as part of the technical performance but also as dwelling and neighbourhood study – both are longitudinal and on-going
- Thermal comfort and radical reductions to fuel bills – also newly refurbished flats
- Some challenges – ASHPs, using the technology, co-operation – lessons to learn
- Sense of growing satisfaction over time
- Important to locate resident lived experience in the place they are living

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Summarising Lessons from Niddrie Road 1

- **Energy & carbon benefits**
  - low carbon emissions
  - fuel poverty/energy bills
  - future proofing energy security
  - performance gap closed
  - tenant engagement
  - waste water heat recovery
  - use of heat pumps

Summarising Lessons from Niddrie Road 2

Health & wellbeing benefits

- thermal comfort
- controlled humidity
- no mould or condensation
- reduced toxicity

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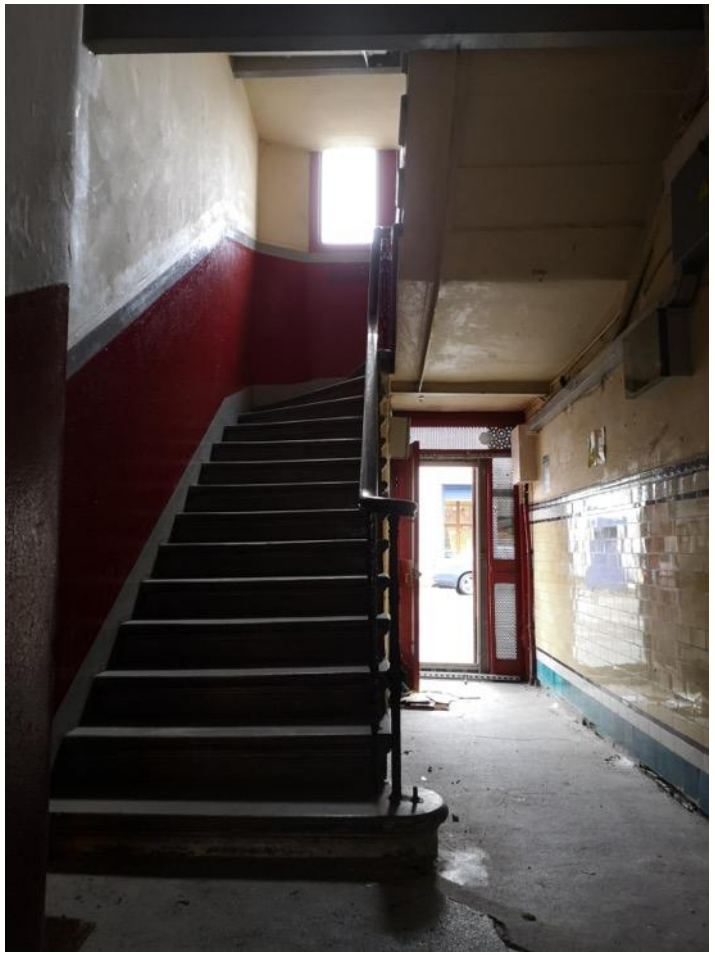
Summarising Lessons from Niddrie Road 3



- **Resource & other benefits:**
  - renovation saves embodied energy
  - safeguard heritage
  - build quality
  - moisture-safe joist removal
  - climate change adaptation
  - improve internal layout
  - future-proofing legal requirements