RISE | Retrofit information, support & expertise

System Built Housing: Pre-cast concrete

Quick Guide

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Contents

Summary

This quick guide has been prepared to inform people on the nuance around system built: Pre-cast concrete housing. The document will offer an introduction into this housing type, before highlighting why these buildings are considered differently when being retrofitted. It ends with a discussion about some of the retrofit measures that are commonly installed in these properties.

This is an introduction to this subject. Those wishing to explore this topic further should refer to the relevant material available on the RISE website. Furthermore, readers that would like this document in a more accessible format should contact rise@turntown.co.uk.

An introduction to system built – pre-cast concrete

To understand system-built housing, it's helpful to go back to the 1920s. Before the First World War, buildings typically had solid walls made of substrate materials like brick or stone, held together with mortar. These buildings would get wet and then dry out, and their 'draftiness' helped keep open fires going and allowed the walls to dry out—a system that worked well for the time.

Post-war, there was a significant skills shortage due to the loss of life during the war. This, coupled with an urgent need to build homes quickly, led to the development of system-built housing-homes that were designed to be constructed quickly with less reliance on skilled labour.

The method of construction is the significant difference between these and traditional buildings. System-built homes used pre-cast parts like pillars and panels, assembled like Lego or Meccano. Standardised pieces were used to speed up the building process, with concrete cast around rods and metalwork.

Example of pre-cast concrete buildings

The umbrella category of Precast Reinforced Concrete (PRC) covers a wide range of building designs.

Airey houses, designed by Sir Edwin Airey, feature a frame of precast concrete columns reinforced with tubing recycled from military trucks. The external envelope consists of shiplap-style concrete panels.

Figure 1: An example of a Reema house. Source: Non Standard House Construction

Reema houses may incorporate some cast in-situ elements, blending precast and cast-in-place concrete techniques.

Duo Slab is known for its dual-density construction and is used in ventilated cladding systems and sealed systems like curtain walling. It was also produced by the same builder who went on to make the more commonly known Airey type.

Cornish units are distinctive for their Mansard roof and are often found as three-storey flats, with the top floor within the timber Mansard roof, built using precast reinforced concrete elements.

Orlit houses are constructed with a precast concrete frame and externally clad with reinforced concrete hollow blocks, though they were prone to structural weaknesses due to degrading high alumina cement joints.

Unity houses are built using precast concrete components reinforced with steel.

Whilst these are some of the more common examples of PRC designs, this is by no means an exhaustive list.

Why these buildings are considered differently when being retrofitted

Energy Performance Certificates (EPCs) on system-built properties can be misleading due to favourable assumptions made by the Reduced Data Standard Assessment Procedure (RdSAP). These properties are anecdotally known to be cold. Previous examples of this have shown that the actual EPC rating can be much lower than the RdSAP suggests, leading to challenged applications. To truly

understand the insulation levels of these buildings, a scientific survey may prove to be beneficial, providing actual u-values for building components measured on site.

System-built properties can also be seen as less favourable by mortgage companies, as some designs were marked as defective in the 1980s. Unlike standard cavity wall properties, system-built homes are more likely to experience concrete failure at a structural level. Warning signs of issues with these buildings might not be spotted by most people, as they are less well known and understood. Often, the only way to understand them is through investigation by experts in the building type.

The structural condition of system-built properties is often poor, making them expensive to retrofit. For example, remediation works may be required before measures like external wall insulation (EWI) can be applied.

What sort of retrofit measures work well

A fabric-first approach is optimal for retrofit installation in system-built properties, as it prioritises the improvement of the building's fabric to enhance performance and energy efficiency. However, this approach may need to be bespoke for different houses depending on the properties condition. Typical measures employed in the retrofit of PRC homes might include:

- **External Wall Insulation (EWI) and window upgrades:** Both external wall and window improvements are common and effective measures to improve the thermal efficiency of system-built pre-cast concrete properties. As these properties are often characterised by a lack of or very narrow cavities, they often have low U-values, meaning they lose heat quickly. EWI also has multifaceted benefits, as it can add to the structural integrity of a building while improving its thermal properties.

- **Underfloor and loft insulation:** Underfloor and loft insulation are both viable options in pre-cast concrete homes to enhance thermal performance. However, the usual challenges around underfloor insulation being disruptive or technically challenging remain. These types of insulation may be more suitable for more recently built pre-cast concrete properties, particularly those without chimneys. Homes without chimneys tend to have better airtightness, making insulation upgrades more effective and beneficial.

- **Heat pumps:** Once housing is insulated, heat pumps are increasingly being installed as an efficient heating solution. This often is a simple process with cast in-situ housing, as they are generally quite spacious, allowing for easy installation of the external heat pump unit and the internal cylinder.

Further resources

For those interested in expanding their knowledge on system build cast in-situ housing beyond this quick guide, here are a couple valuable sources to consider:

- The **Non Standard House Construction (NSH)** offers extensive information on non-standard house construction.
- Another excellent resource is the BRE Group, which provides comprehensive coverage on various topics related to cast in-situ buildings through their extensive publications, including the **Non Traditional Houses Publication**. This requires purchase.