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Summary of lean, low carbon structure and house design considerations

14/10/25

Introduction

This summary details the consideration given to design a lean, low carbon structure and house, focusing on minimising material use and carbon emissions throughout the building's lifecycle. The design process has and will prioritise efficiency, sustainability, and adaptability, responding to the constraints of the site, user needs, and future flexibility.

Structural and Material Design

A key consideration in the project can be the reduction of material use through efficient structural design. The building form has been optimised within the parameters of the existing site, orientation, and specific user requirements, with a strong emphasis on avoiding unnecessary material consumption. The structures can be engineered to use only the minimal material required, ensuring all safety standards are met while avoiding over-designing for excessive loads.

Material choices further support the low carbon objective. The specification will prioritise where possible materials with a low embodied energy, such as sustainably sourced timber, options containing high recycled content, and low-carbon cement alternatives. These selections help to minimise the overall environmental impact of the building.

Long-term durability and adaptability will be integrated into the design, ensuring the house can accommodate future changes in usage and occupation. Additionally, the potential for future disassembly has been considered, allowing the building to be deconstructed into high-grade components suitable for reuse or recycling. The overall form factor of the house has been refined within site constraints and user requirements, with the deliberate decision to avoid a basement, thus further reducing material use and embodied carbon.

Energy and Operational Efficiency

Operational and embodied carbon can be minimised through the incorporation of passive design strategies. Where possible, given the fixed orientation of the site, the house can benefit from high insulation values, optimised facades, and natural ventilation. These measures collectively reduce the need for heating, cooling, and artificial lighting.

To further decrease reliance on fossil fuels and lower operational carbon emissions, renewable energy sources such as solar panels will be integrated into the design. The new house will switch from gas-based systems, as used in the existing house, to electrical systems for heating and hot water provision, aligning with the decarbonisation of the supply grid. All building systems, from lighting to HVAC, are designed for maximum efficiency, supported by effective control strategies.

Design Process and Construction

Sustainability can be embedded as a core principle throughout every stage of the design process. Computer simulations can be utilised to test and optimise passive design measures prior to construction, enabling the fine-tuning of building and system performance. In addition, there can be a shift towards industrialised construction methods and platform-based design approaches, which will contribute to significant reductions in waste and further enhance the sustainability credentials of the project.