

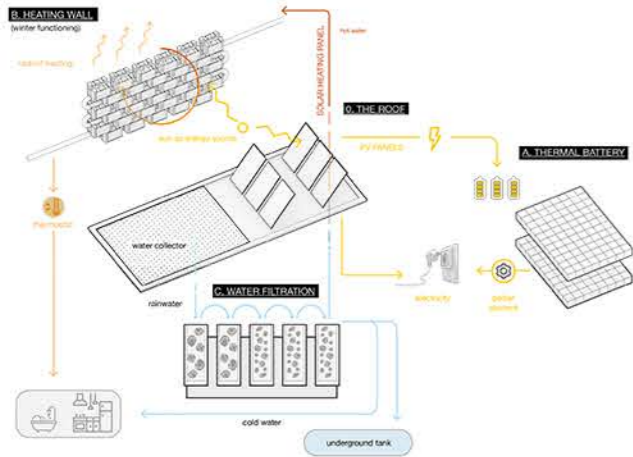
Slag-Crete

Context for designing: The Steel Slag House

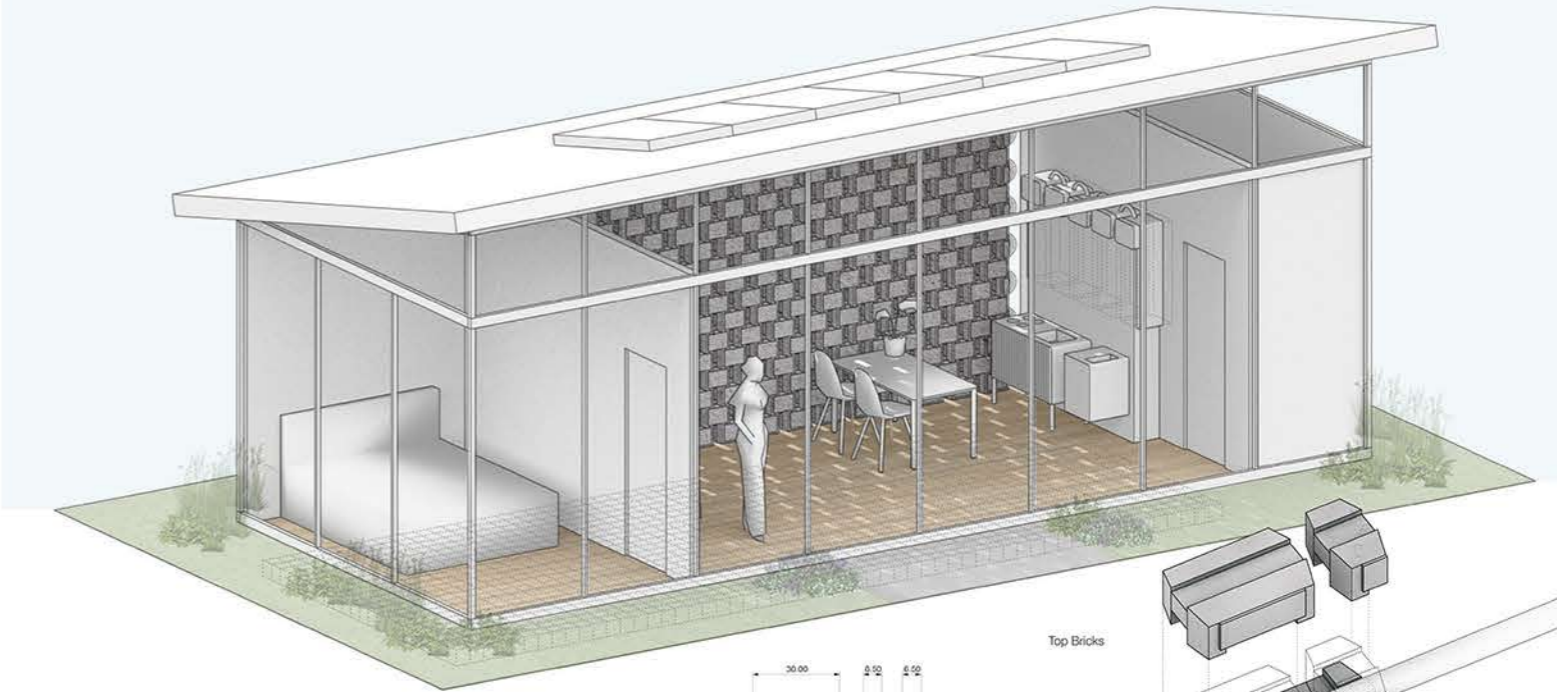
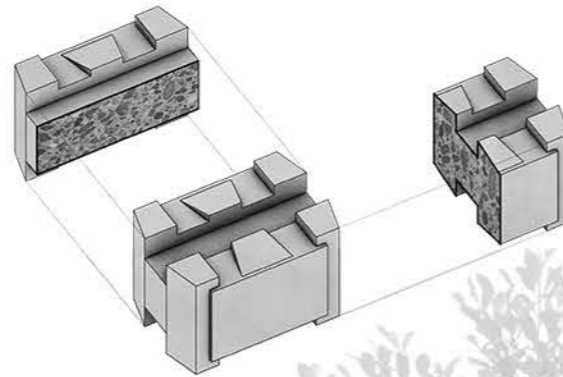
The "Steel Slag House" is a concept for a prototype home that highlights the various properties and resulting opportunities the material can provide for the functional needs of a small scale, off-grid, 2-person dwelling. Due to the nature of the chemical properties of steel slag, it is vulnerable to water and prone to expansion and cracking.

Therefore the concrete products using steel slag were designed to remain on the interior within the curtain wall envelope. The diagram below showcases an overview of all the systems involved across the three products designed. The products include (A) an underfloor thermal battery, (B) a radiant heating wall, and (C) a water filtration system.

Product performance: The Steel Slag House systems' diagram



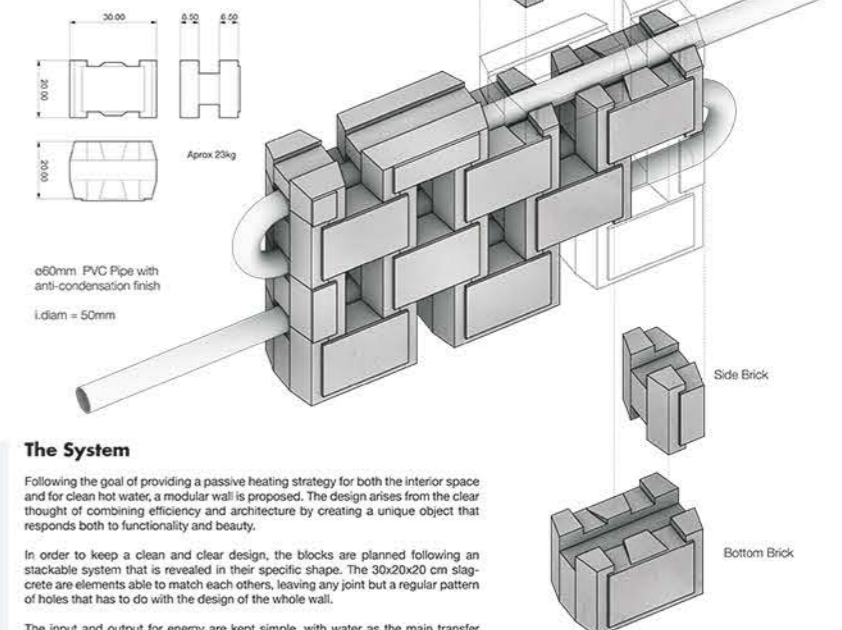
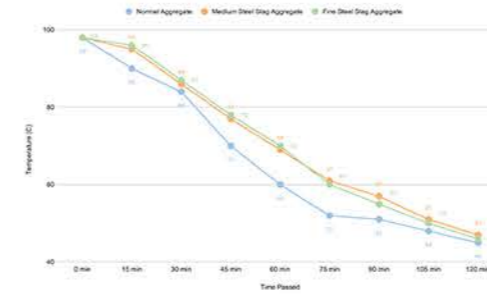
The proposed design: Slag-Crete (30x20x20cm)



Why Slag-Crete?

Steel slag is a by-product from the manufacturing of steel that is in great abundance. This steel slag block finds an alternate use for the material that will divert waste and encourage a sustainable future. A heat capacity test was completed with concrete blocks containing steel slag aggregate vs normal aggregate.

The blocks were heated to 100C and then the temperature was measured every 15 minutes over 2 hours. It was found that the steel slag block performed better and retained the heat for a longer period than its counterpart. This is due to the high density of steel slag.



The System

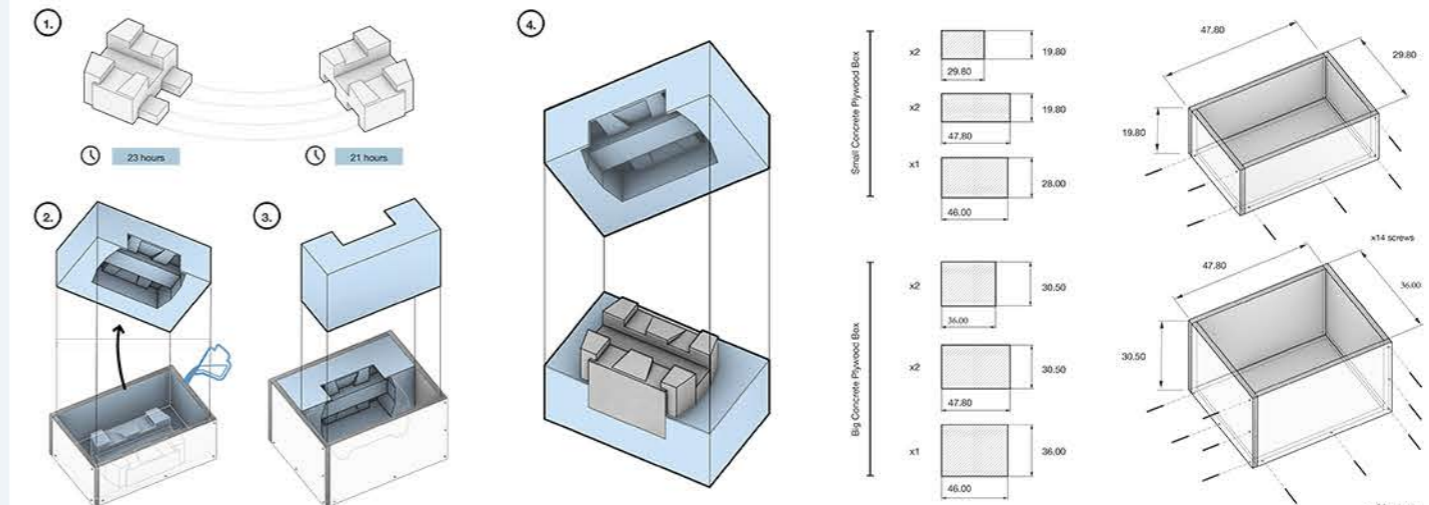
Following the goal of providing a passive heating strategy for both the interior space and for clean hot water, a modular wall is proposed. The design arises from the clear thought of combining efficiency and architecture by creating a unique object that responds both to functionality and beauty.

In order to keep a clean and clear design, the blocks are planned following an stackable system that is revealed in their specific shape. The 30x20x20 cm slag-crete are elements able to match each others, leaving any joint but a regular pattern of holes that has to do with the design of the whole wall.

The input and output for energy are kept simple, with water as the main transfer medium (air plays a minor role outside the pipe). This liquid will run inside the pipes, through a 60mm diameter continuous section.

The simplicity of the system and its modularity allows easy assembly and disassembly, as well as personalization, giving users the chance of modifying the dimensions.

The manufacturing



1. Due to its complex geometry, it is decided that half of the brick will be 3D printed from a digital model, and what is more, it will be printed in two separate parts. These two will fit because one of them has a protruding part, and another one has a void.
2. The 3D model is introduced in the smaller plywood box, that will be used to make the negative mould by pouring liquid silicone. It is important that the protruding face of the half brick stays in touch with the side of the box.
3. After creating two identical silicon moulds using the already mentioned technique, both of them are introduced in the bigger plywood box (it will act as a retainer). The hole in both silicon moulds will eventually become the hole for pouring the concrete.
4. Once the concrete sits down, it is possible to unscrew the plywood container. The protruding face of the block is designed as the trace of the pouring process, and it is sensitive to be polished, giving the chance of creating patterns in the future wall.

