



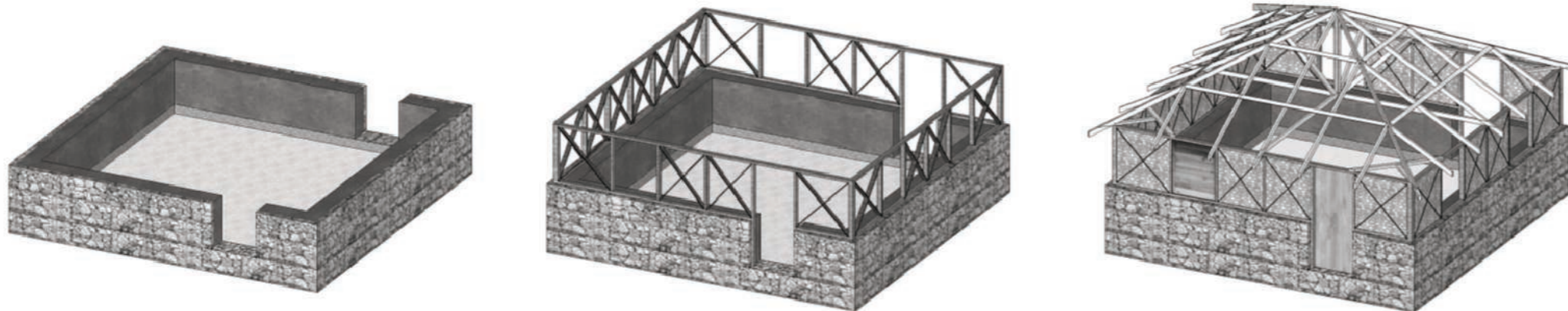
JACMEL
Haïti

Personnel

- Ludovic JONARD, architect
- Aurelio DOUAY, timber expert
- Guy BESACIER, seismic engineer
- Frédéric POTIER, trainer-logistician
- Silvia GALLO, architect
- Anne-Lise LEYMARIE, architect
- Pauline CARRIOT, architect
- Estelle COLLINET, architect



RECONSTRUCTION OF A SUSTAINABLE HABITAT USING CONFINED STONE WALL TECHNOLOGY



Project description

july 2012 - nov 2013

This project constitutes phase 2 of the "A Roof, A Future" programme. On 12th January 2010, an earthquake of magnitude 7 on the Richter scale, struck Haiti causing considerable damage. More than 200,000 people died and a further 1.3 million lost their homes. Several months after the immediate disaster-relief phase, A&D (in a technical role) partnered with Planète Urgence to implement a programme of reconstruction of rural habitats. The local context is integral to our approach to re-development, which utilizes stone gabion wall technology. The project should provide re-housing for 100 families in the Jacmel rural zone, La Montagne. The approach is based on a local farmer organization implemented since 2004 in the area, Opadel.

The goal of 'stone-gabion wall' technology is to significantly reduce sensitivity to climatic risks and to provide a long-term housing solution at good value for money. These self-help housing projects do not claim to strictly comply with international seismic and high pressure regulations. However, they help raise awareness of better building practices for post-disaster reconstruction.

Project roles

- Assistance to project promoters
- Education - construction schools
- Site supervision



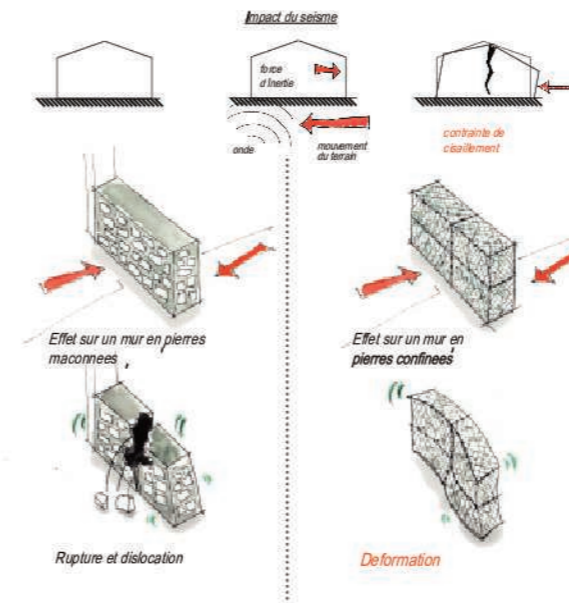
Project partner



Financing



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Seismic principles of gabion stone wall

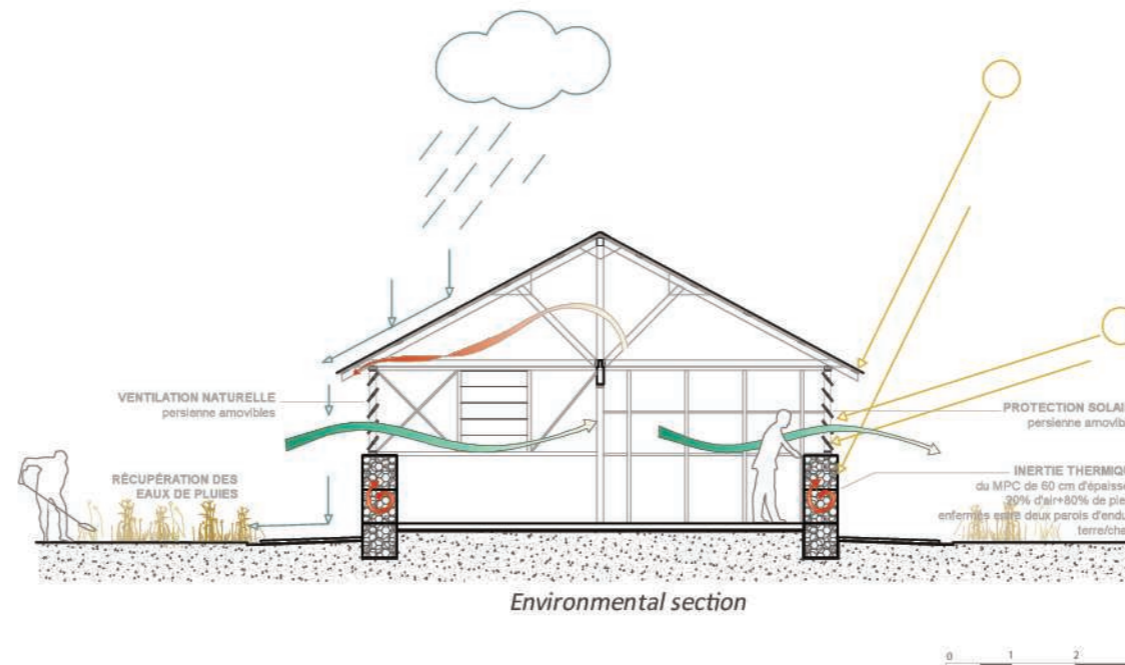
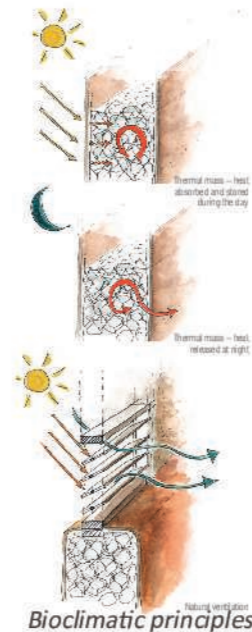
Hasselt Principle 01 - Cooperate for fair and sustainable development initiatives in active collaboration with disadvantaged people or communities. This process shall follow principles of human solidarity, non-discrimination and will be aimed at promoting their self-sufficiency

The project aims to develop a local supply-chain by training craftsmen and teaching them alternative building techniques. The creation of building material workshops and a construction school ensures this training and knowledge transfer. This is the most delicate but also the most crucial aspect of the projects' long-term success.

Investment in the project by the beneficiary families is fundamental. Each family must collect 35-38m³ of stones that can be placed in the woven metal cages, which form the bedrock of the house. Construction of the walls (with no foundations) is very easy and requires 1 mason, 1 skilled worker and 3 beneficiaries. This technology is reproducible due to the simplicity of construction. It can therefore be appropriated by unskilled workers (self-help builders). The beneficiaries' financial contribution also guarantees their 'ownership' of the project. Due to their involvement from the start of construction, they know how to maintain the building into the future.

Sustainable and bioclimatic construction

The finished, stone-gabion walls provide the house with a good thermal performance. The 50cm deep walls comprise stones and voids with no other special apparatus. The stones and earth/lime finish provide good thermal mass and the air trapped in the voids improves the envelope's thermal resistance. Natural ventilation is provided through shutter openings and ventilation grilles with detachable wooden doors.

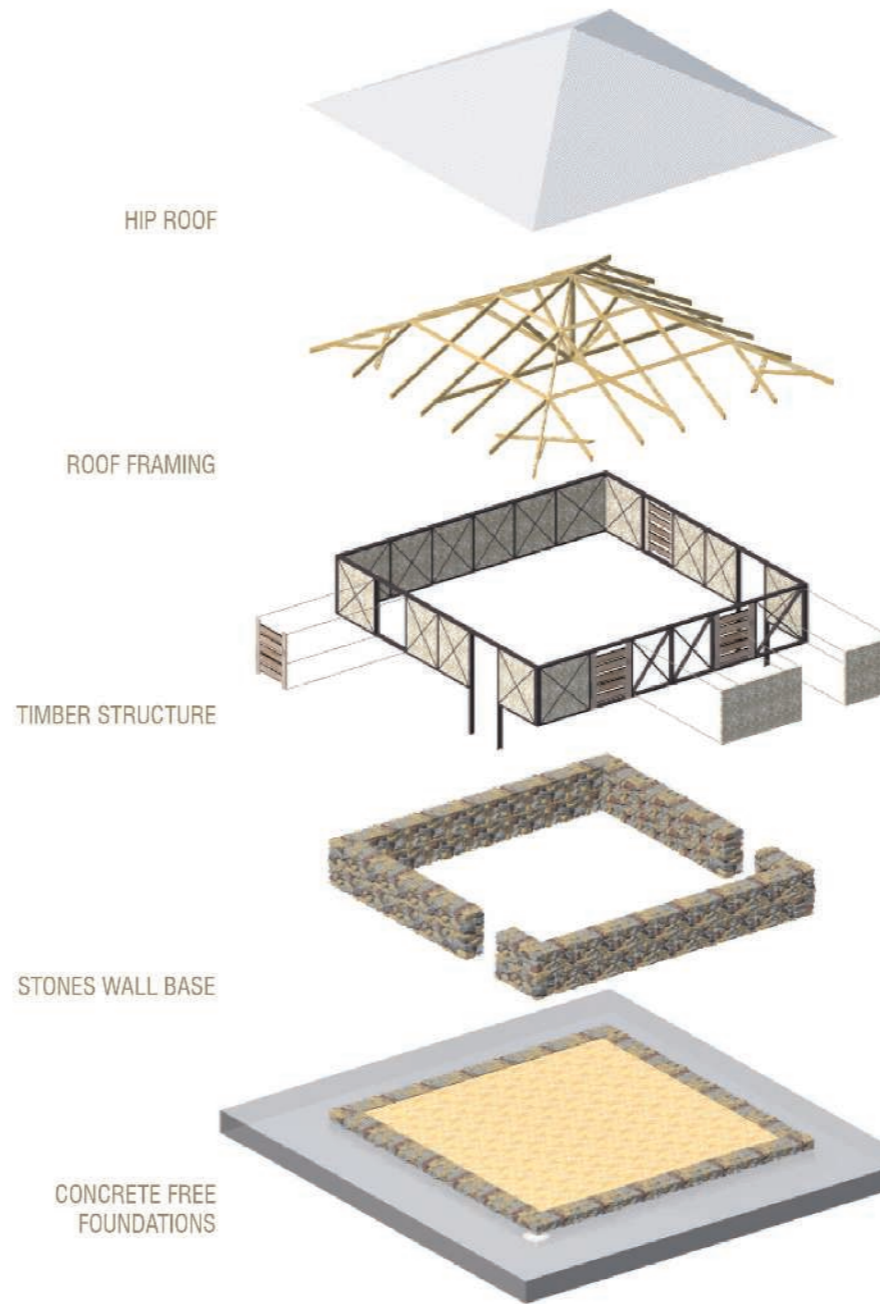


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A quick and safe construction

- Construction of the walls (with no foundations) is very easy and requires 1 mason, 1 skilled worker and 3 beneficiaries. The site is dry, no masonry is required. The structural walls are comprised of cages filled with stones collected locally.
- The cages are fabricated from a woven mesh of galvanised steel. These are cut, folded and assembled as elements to form the containment for the walls.
- The cages are filled in bulk, by hand to a height of 1.2m. The individual elements of the stone-gabion walls are linked together. The timber framing that sits above is inserted into these elements.
- The hurricane-resistant timber framing is bonded into the stone-gabion walls, forming a seismic-resistant assembly. The roof is of corrugated iron. The walls are finished with earth and lime.



6-
 1- Prefabrication Workspace
 2- Concrete free foundation filling
 3- Stones wall base filling
 4- Timber structures filling
 5- Mud plaster
 6- Axonometric of the house

Hasselt Principle 05 - Facilitate the use of appropriate technologies, materials and labour adequate to local values, to the cultural specificity and responsive to the natural environment

The most interesting aspect of this technology is the use of stones collected on site, thus benefitting from local materials and limiting the need for imported materials (and their associated transport costs and environmental impact). The site is dry and masonry is not required. Consequently, cement and its associated problems are avoided. Internal and external walls are plastered with mud and the final design respects local typology.

The system is hurricane and seismic-resistant, with a lightweight timber frame fixed above the seismic-resistant stone-gabion walls. This braced frame uses local construction techniques. The lightweight roof comprised of 4 panels is bonded to the walls, forming a seismic-resistant assembly.

Key Figures

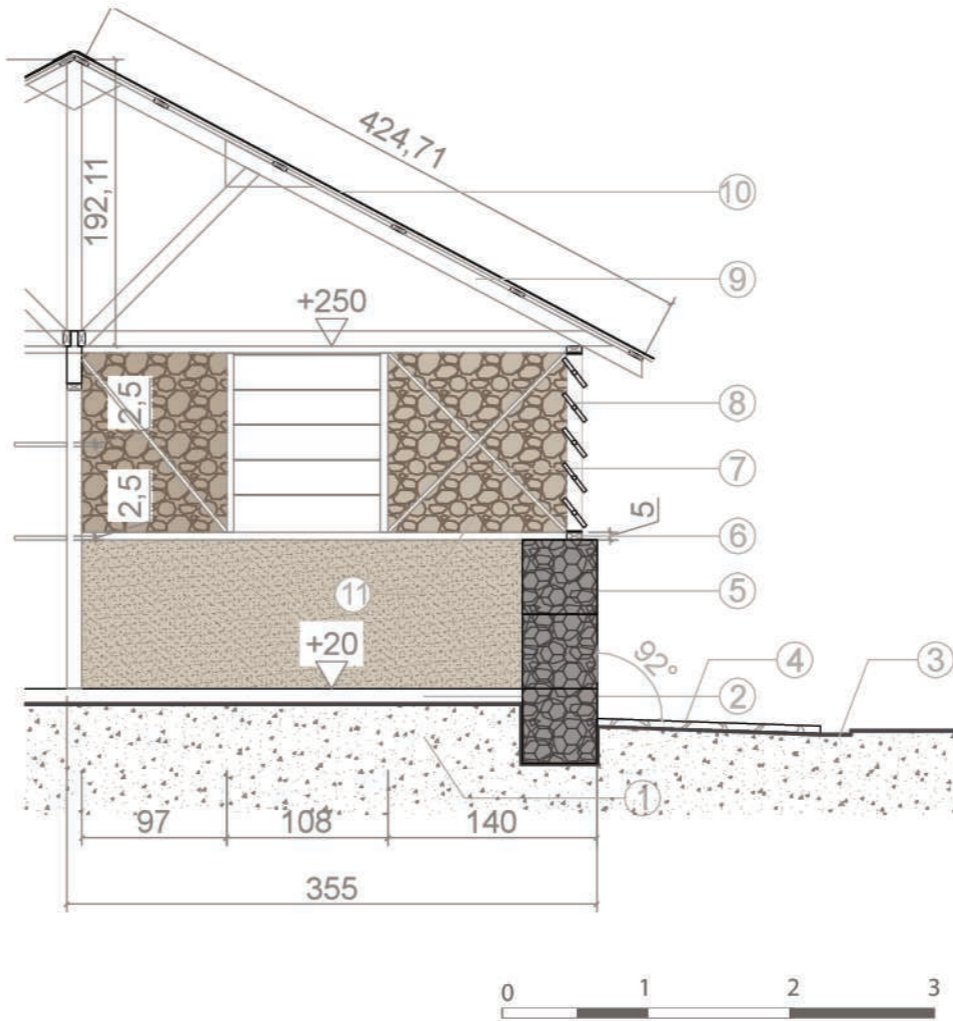
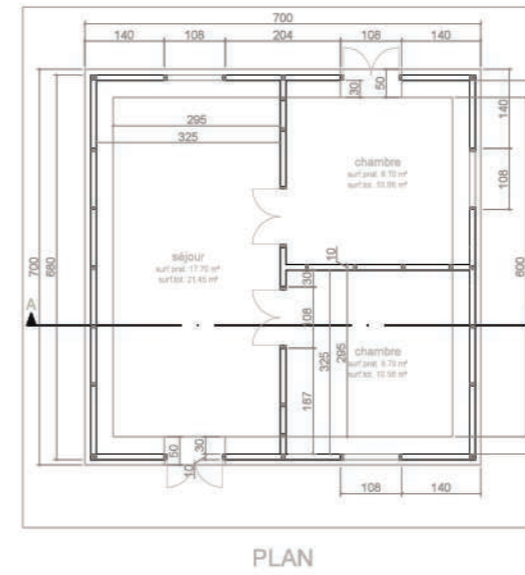
- 35 m³** of stone per house
- 55** new **35m²** houses
- 60** qualified workers
- 4 km** of galvanized wire per house
- 85€/m²** cost de la construction

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Effective Architectural Design

A&D developed the model of a 4 to 5 person family house. The compact, rectangular plan facilitates arrangement of the stone-gabion cages and timber bracing structure, on which the anti-seismic roof sits. This assembly guarantees the stability of the structure in extreme weather.



Hasselt Principle 09 - Endorse the integration of post-emergency relief interventions into long-term sustainable development strategies

The project offers a global approach to reconstruction through provision of appropriate and accessible technology - which can be taken on by local entrepreneurs and craftsmen - and a new resource center for habitats and sustainable, bioclimatic construction.

The initiative also includes prototype control buildings, construction 'schools', a workshop to produce building materials and two community hurricane refuges. Together with educating locals in self-help construction, this gives a new impetus to rural areas.

The 35m² house - combining wood and stone-gabion wall technology and utilizing self-help construction - costs approximately €3000 (supply and installation). Compared with 18m² T-Shelters or standard construction costs in Haiti of €300/m², which means this is an excellent low-cost model for durable and comfortable housing. Combined with a simple architectural form, the stone-gabion wall technology is efficient to implement and reduces production times.

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