



### Light weight ferro-cement elements

In many cities as well as small towns the building plots are small and it is important to have thin walls for two- and three storey buildings. In addition, the construction time should be minimized due to social and financial reasons. Conventional construction can not respond to those demands.

Big industry has developed many different systems to deal with those conditions, but they invariably respond to a complicated technological level and depend on sophisticated equipment and workmanship. They are usually geared to large projects and do not respond to the demands of small constructions.

Very often the plot is already being occupied by a shack or a substandard house and it is important to erect the new building within days and with labor from the same neighborhood, but at an affordable cost.

Thus, several members of EcoSouth have put their minds toward creating an easier and less expensive system. We would like to present to our public a solution developed by CECAT in Cuba and put in practice in Cuba as well as in Nicaragua.

### What is the difference to other systems?

This system is based on vertical elements made of ferrocement and horizontal concrete tie-beams. All elements can be lifted and placed by two people, no mechanical device is needed. Elements are precast in the workshop and transported to site. U-shaped beams form the foundation and are placed on top of concrete blocks that have been poured a few days earlier.

The vertical elements are self-supporting and are placed one next to another and then a H-shaped tie-beam is placed on top of them. All joints are filled in with concrete. The system is highly resistant to earthquakes, according to calculations based on international standards; an earthquake of 6.5 on Richter scale will not do any structural damage to a 3-storey house made with this system. The same is true for wind loads from hurricanes of the maximum known scale.



Placing the walling elements on U-beams

The wall panels are made of high performance micro concrete and have a smooth finish. They are 3 cm thick and every element is "framed" with an 8 cm wide reinforcing girder. A wire mesh is imbedded in the concrete as reinforcement. The tie-beams are reinforced with steel bars.



The technology adapts to local design culture

### The cost advantage

Wherever speed in construction is important this system should be an economical option. The elements can be produced by local workshops of the formal or informal sector and react with flexibility to the customer, thanks to the fact that the technology is easy to master and does not

need expensive investments in tools and machinery. Good moulds and a vibrator represent an investment of approximately 2,000 USD and will allow the production of elements for two to three rooms per week.



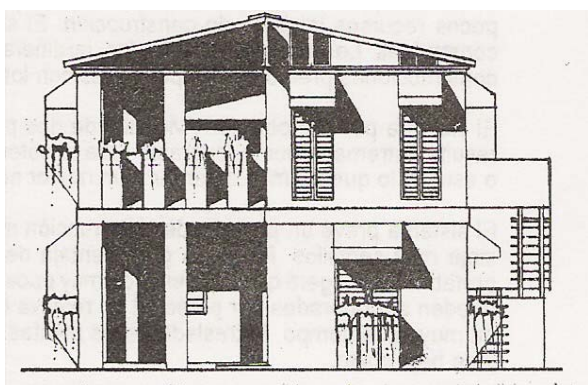
vibrating the panels

### Limits of application

The production process of the beams and panels has to be closely monitored, as errors in concrete mixing or placing of the wire mesh can diminish the product quality. As all elements are calculated to optimize the use of materials, this could represent a danger.

The same is true for the construction process; it is advisable to have a specialist direct the assembly of the building.

Building codes and standards could be a hindrance in many places, and the proper specifications and calculations might be needed to get a construction permit in many places.



Design with fancy walling elements

### Ferro-cement elements produced by SME's ?

This system has been conceived specifically for production in small workshops. Panels are using the micro concrete technology and can be vibrated by different means. The beams are produced in standard sizes, but they can also be made to the exact dimensions of the houses to be built. All elements are manipulated by hand, none of them weighs more than what two people can easily carry.

A workshop can operate in a small area, possibly right inside high density neighborhoods and slum areas, close to the potential market. It does not emit high levels of noise.



Development from a core unit to a full house

### Disaster Mitigation

The system has high potential for fast action after earthquakes, floods, hurricanes or other events where fast construction is needed. If panels are available, a group of very small structures of only one room could be erected within days. The rest of the house could be built later around those core structures. Ferrocement elements could be stored for long times without them deteriorating, and they could be transported to the site while production could be set up near the site of the catastrophe. This could be the start-up of an income generation project.

The **ECOSUR SOUTH** network provides comprehensive know-how transfer including feasibility studies, technical training (production, quality control) and business skills.

**This publication is financed by the European Union and the Werkhof Darmstadt**

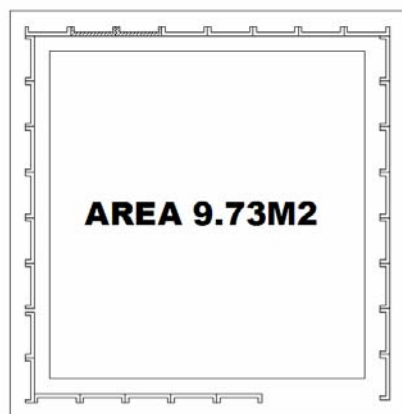
**Switzerland**  
**Grupo Sofonias**  
 Schatzgutstr. 9, 8750 Glarus  
 Tel/Fax ++ 41-55-640 1081  
 sofonias@ecosur.org

**Namibia**  
**Clay House Project**  
 PO Box 1496, Otjiwarongo  
 Tel/Fax ++264 67 304 548  
 chp@africaonline.com.na

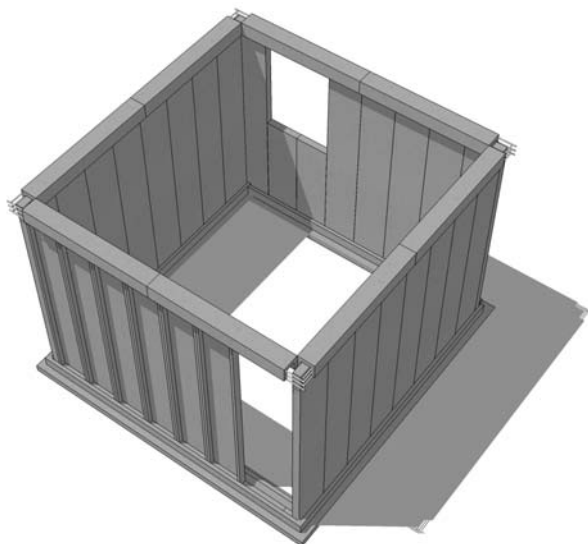
**Nicaragua**  
**Sofonic**  
 PO Box 107 Jinotepe, Carazo  
 Tel/Fax ++ 505-532 0686  
 sofonic@ecosur.org

## MODULO PREFABRICADO DE FERROCEMENTO

---



**PLANTA DE MÓDULO BÁSICO**



**MONTAJE DE MODULO BASICO**

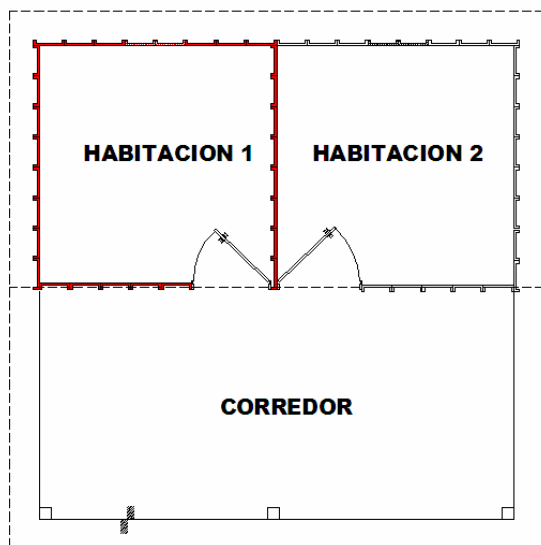
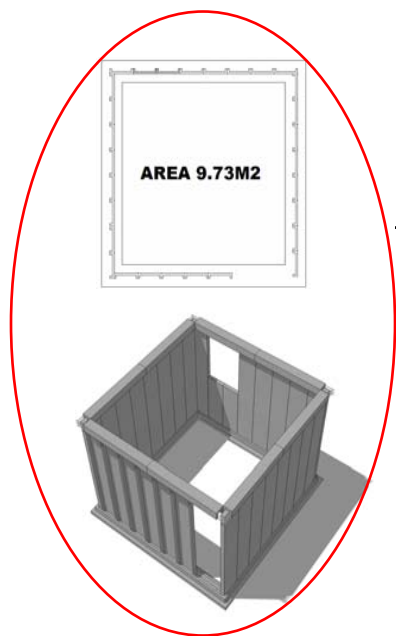


### **GENERALIDADES:**

- DIMENSIÓN DE PANELES:  
2.50M X 0.40M.
- NÚMERO DE PANELES  
PARA UN MÓDULO: 29.
- ALTURA DE PANELES  
PARA VENTANAS: 1.25M.



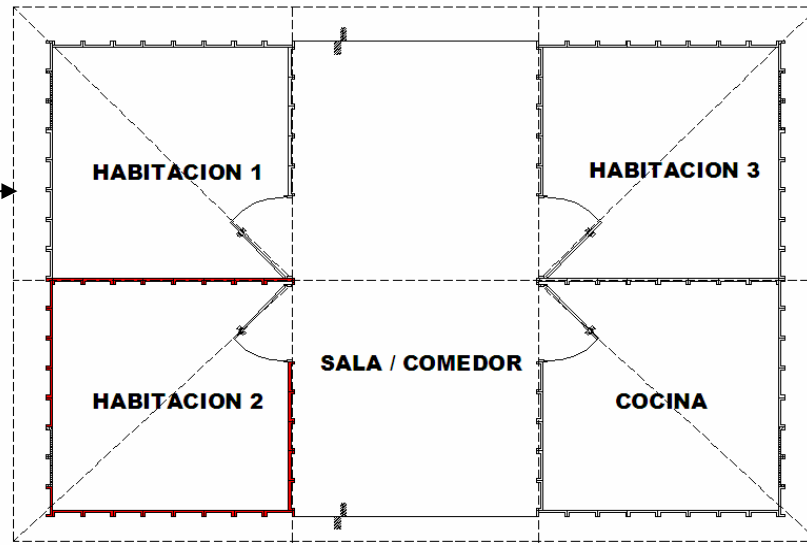
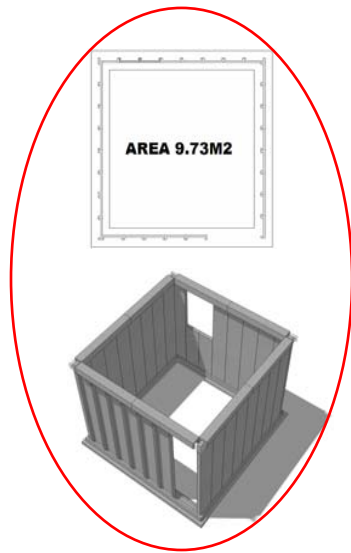
# POSIBILIDAD DE AMPLIACION 1



AREA 38.87 M2  
PROPUESTA AMPLIACION 1



# POSIBILIDAD DE AMPLIACION 2

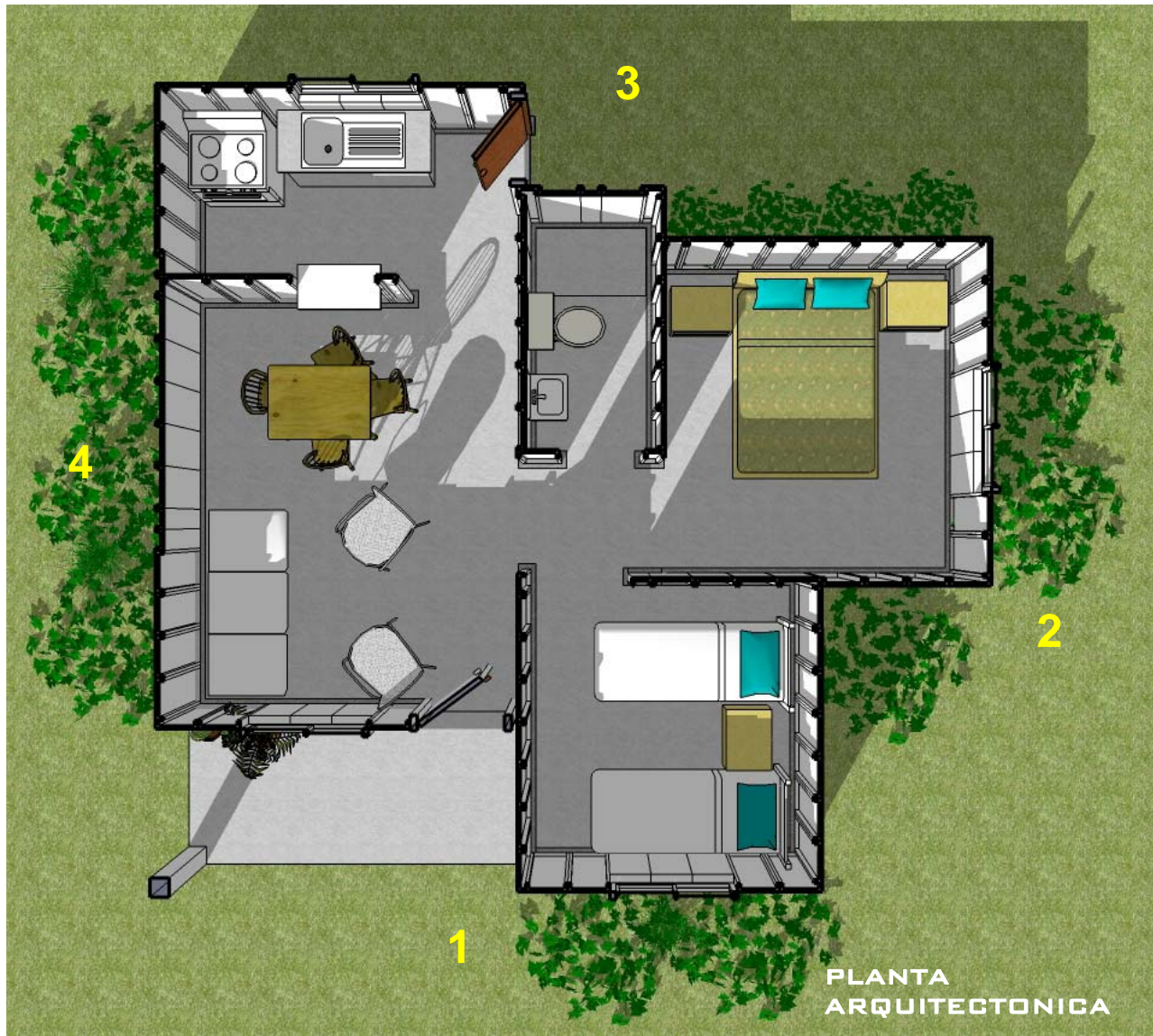


PROPUESTA AMPLIACION 2





# VIVIENDA DE FERROCEMENTO



## GENERALIDADES

### Ambientes:

Sala/Comedor

Cocina

2 Dormitorios

Servicio Sanitario

### Área útil:

46.4m<sup>2</sup>

### Total de Paneles:

106

# SofoNic

asesoría en desarrollo integral

# VIVIENDA DE FERROCEMENTO



1

ELEVACION ARQUITECTONICA



3

ELEVACION ARQUITECTONICA



2

ELEVACION ARQUITECTONICA



4

ELEVACION ARQUITECTONICA

**SofoNic**

asesoría en desarrollo integral