

## **FLEXIHAUS HOUSE DESIGN FOR DISASTER VICTIM**

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### **ABSTRACT**

Disaster in the hot humid climate region can be catastrophic. The after effect of disaster is not limited to the lost of lives but properties including homes. The condition may be worsen by inadequate and late relief respond. One of the most critical issue in disaster stricken areas are the provision of adequate and suitable transit accommodation. The fastest and suitable system of shelter accommodation available is by using the prefabrication based on local materials. In the current research a system known as 'FLEXIHAUS' which has the advantage of speed and simplicity in construction is the most recent innovation in disaster houses in the hot and humid climate of Malaysia.

### **ABSTRAK**

*Kesan pelbagai bencana alam bukan sahaja melibatkan kehilangan nyawa tetapi harta benda termasuk tempat tinggal. Bantuan yang lambat disalurkan menjadikan keadaan bertambah teruk dan sukar dihadapi oleh mangsa. Salah satu daripada keperluan asas yang sangat penting semasa bencana alam ialah penyediaan tempat tinggal sementara yang segera dan sesuai. Salah satu daripada sistem penyediaan yang cepat ialah menggunakan sistem pasang siap daripada bahan binaan tempatan yang terdapat dalam pasaran sedia ada. Penyelidikan telah menghasilkan satu sistem yang dapat memenuhi keperluan rumah semasa kecemasan melalui inovasi hasil gabungan penggunaan bahan, kaedah, keberkesanan dan kos pembinaan. Sistem cadangan 'FLEXIHAUS' mempunyai keistimewaan yang tersendiri bukan sahaja ia mudah dipasang tetapi ia lebih cepat dan sangat sesuai untuk pelbagai keadaan terutama sekali di dalam iklim seperti di Malaysia.*

## 1. Introduction.

Disaster in the tropical climate of south east Asia can be catastrophic. Located in the center of the most volatile region in the world- realm of fire, the cyclone, eruptions, flood, war and tsunami, Malaysia, though not in the disaster region, but surrounded by the most ferocious potential must be prepared at all times to handle the calamities. Previous experience such as the yearly tropical flood and occasional tsunami has clearly indicated that managing the victim such as providing the suitable shelter for the disaster victim is inadequate. They are extremely temporary with no provision for minimum building services and comfort. Often victims are located within the flimsy hot tent without adequate water and electrical supply. Or take refuge in the nearby schools or community halls. Ironically this has been the yearly event. Effort must be geared to ensure such difficulties must be eradicated or minimized. Current research is inspired and motivated by such hardship to conceptualize a simple, fast, economical and suitable shelter design for the victim in the hot humid climate of Malaysia.

There are many options available, solution from the most utilitarian structure to the most sophisticated high-tech stuff can be considered. But the end user is the local, panic-stricken and helpless unfortunate mass under extreme stress. The key to this is the '*time of construction*' for the longer the delay of providing the shelter the more acute will be the suffering. Hence, not only the system of delivery, the potential of self-help construction, locally known and available material, low technology must be identified.

Temporary shelter during disaster

1. Portable cabin
2. Portable container
3. Lightweight tent.
4. Guest house



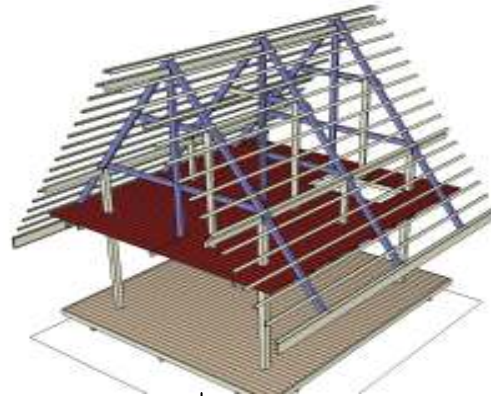
## 2. Concept.

### 2.1 Design Concept.

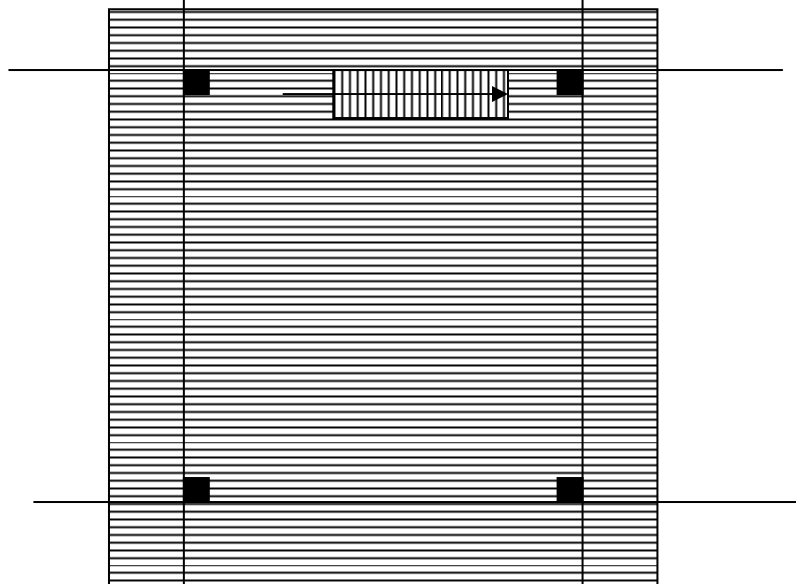
The proposed shelter is based on a simple one spaced core house supported by four main columns covered with high pitched roof with or without attic. The structure is a raised floor with provision for extension and expansion when required. The structure is based on prefabricated system using local timber material with new addition of jointing technique for easy and fast assembly. The house known as “FLEXIHAUS” can be preassembled or in situ construction or self help construction depending on the site potentials.



Basic space for living.



Design concept of FLEXIHAUS



Plan of the core house

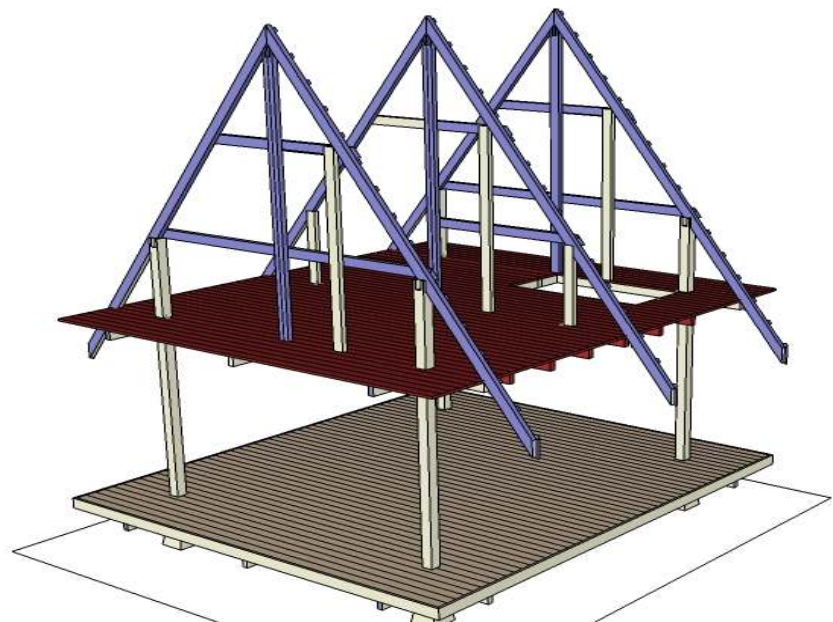
## 2.2 Structural Concept.

The structure consist of two main supporting component separately assemble. Erected on concrete pad footing by precut and predetermine member to secure the two main structure to form the core space of the house. This task will only take a few minute with suitable number of helpers. The task is to prepare a floor component which is install in position ready to support the next task of work for the roof cover. Roof covering material uses lightweight material such as corrugated metal preferred for ease of handling and transport. Wall cladding can be added later at respective time. Bathroom facilities is a ready-made cubical erected on site when the septic position is completed. Electrical and water supply can be connected when the main core house is ready.



The structure of the house is supported on four main columns.

Components are  
Prefabricated assemble  
on site



### Assembling of the experimental model house



Preparing the site



Erecting the main structure



Completing the roof structure



Preparing the roof covering material



Jointing system

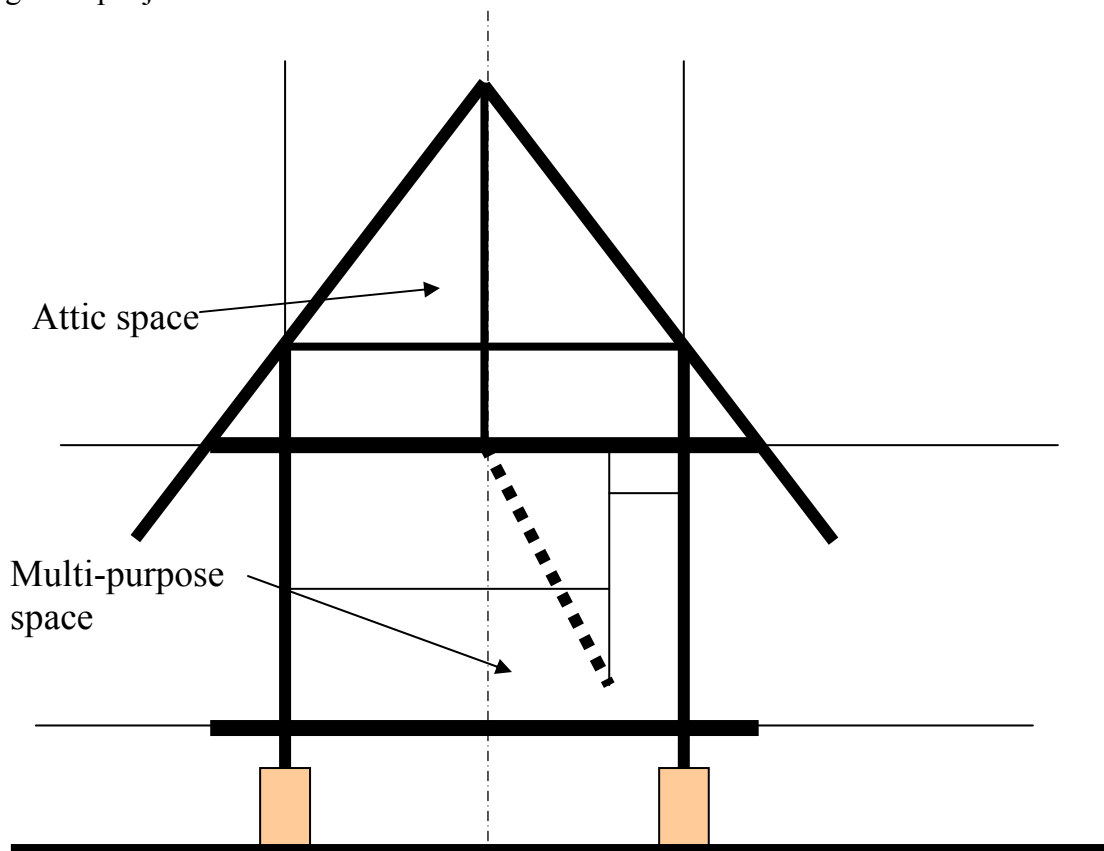


Partially completed house.

Stages of construction of the prototype model of the **FLEXHAUS** system on display at The School of Housing Building and Planning. USM, Penang, Malaysia

### 3. Structural System.

Since the house is intended to cater for future expansion, the core house is design to accept additional load from the new structure. A special joint is design at specific location to allow for easy connection and assembly. In most emergency condition accommodation spaces are essential, the core house must be able to be expanded by setting a simple joint on the main structure.

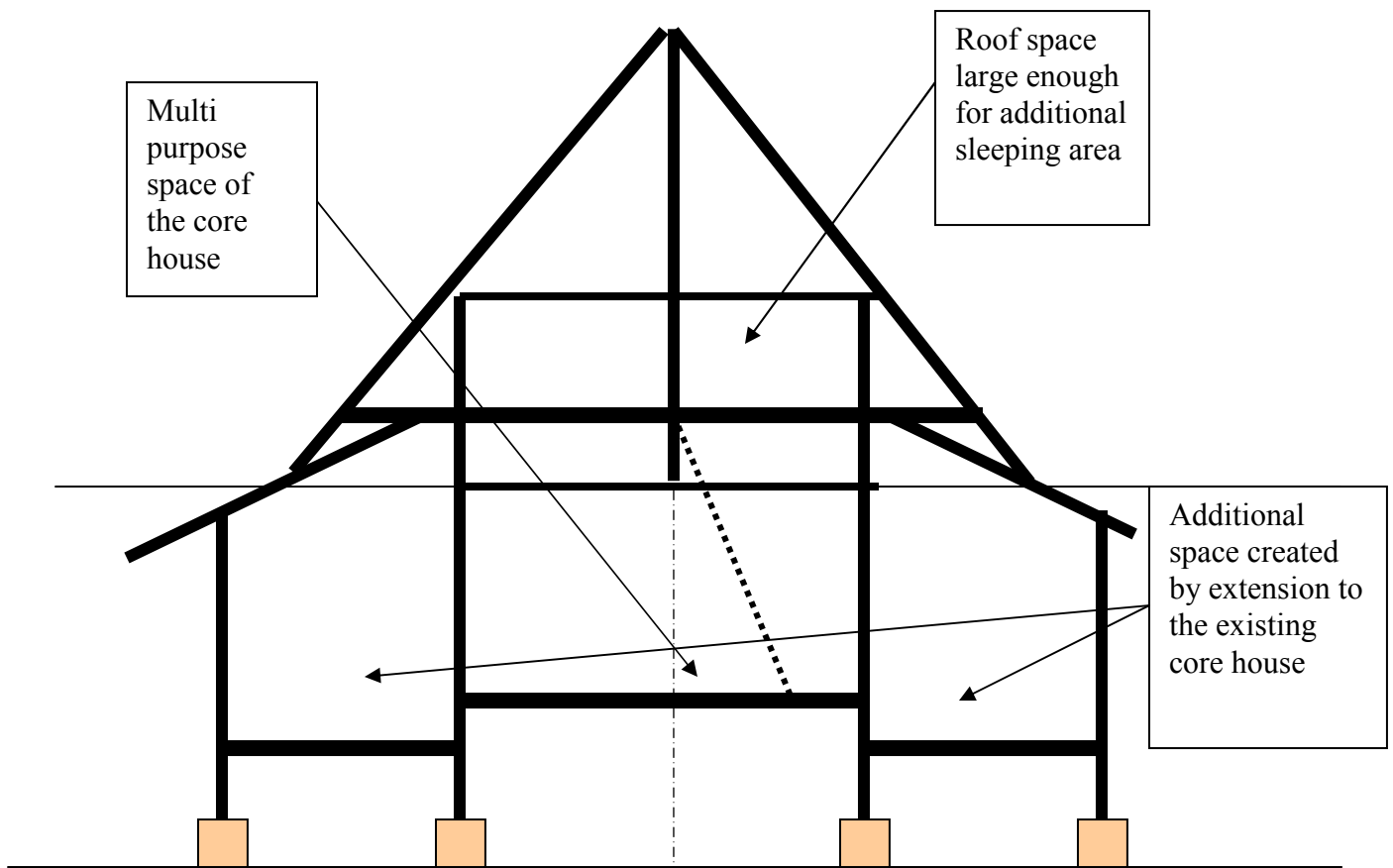


**Section of the core house**

Roof structure under construction

Jointing system using bolt and nut.





Section of core spaces and the possible expansion

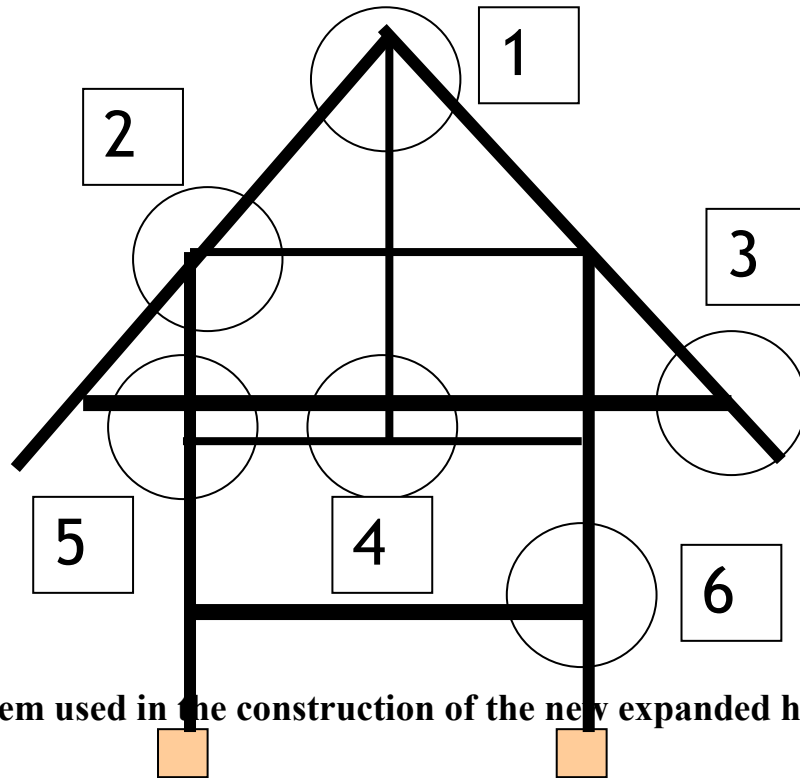


Erecting the first panel of superstructure.

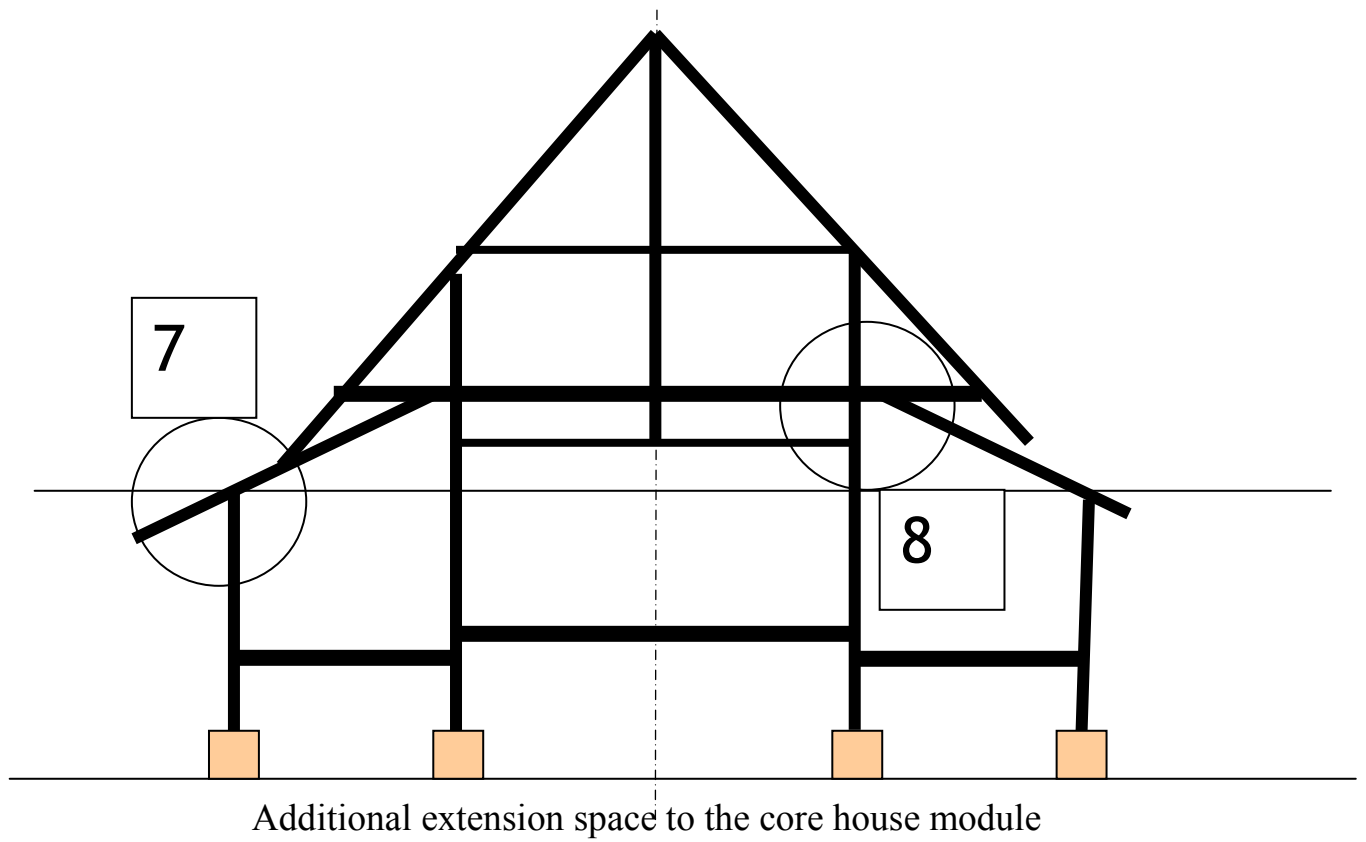


Complete module of the house

**Joining system used in the construction of the core house**



**Joining system used in the construction of the new expanded house**



**Detail construction of the jointing system of the FLEXIHOUSE module.**

Details 1:



Details 2:



Details 3:



Details 4:



Details 5:



Details 6:



Details 7:



Details 8:



Other details of the main structure

#### **4. Prototype Construction.**

Prototype construction is an important element and was used to study the construction system in relation to assembly time on site, problem related to prefabricated component. Preparation time during assembly time for main structural component will take half a day while to erect the structural core house will require half a day. The core house can be erected on one day. Roof construction require another day and wall component can be completed in one day. To complete the basic house require only five days.

#### **5. Prospect**

FLEXIHAUS house design system is a lightweight, fast and economical suitable for simple accommodation such as wakaf, bus stand, core house, store house and even for permanent house such as chalet and private holiday retreat house. It is a prefabricated component, easy to assemble and reduced construction time.

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