MALAYSIA IMPROVISED RAPID ALL-WEATHER SHELTER 1 (MIRAS1)

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ABSTRACT: The destruction due to earthquake in certain parts of the world had created problem of shelter to the survivors. Countries likes Iran and Pakistan which are prone to earthquake have severe weather condition. The people need immediate shelter to protect from this weather. Under these circumstances rapid shelter all weather is the best option to help the survivors. This paper presents a model of rapid shelter known as Malaysia Improvised Rapid All-Weather Shelter or MIRAS. It discusses the construction aspect of the model and constructed MIRAS kit that is easily mobile and measurement of simple relationship between outdoor and indoor temperature and relative humidity. The measurements showed indoor environment of the shelter suitable to protect from severe outside weather. The study revealed that the reduction of the high temperature was 8.5% between outdoor and indoor heat.

Keywords: Malaysia improvised rapid all-weather shelter

1. INTRODUCTION

The need for emergency mitigation has been visibly emphasized throughout the world in recent history. Natural disasters, such as earthquakes in regions of Pakistan, Iran and Turkey, or man-made disasters such as ethic conflict in Africa. Primary to the facilitation of these services is the issue of shelter. Shelter can come in many form, be it as the canvas tent carried in battle, the mud hut on open plain, or the wood-framed box with a backyard and a white picket fence.

Earthquake that hit Pakistan on last 2005 produced a great damage and death. The phenomenon makes many residents become homeless. Most of the survivors of 7.8 Richter scale earthquake lives under a canvas or fabrics shelter or else an open air area after the incident. This situation makes them bared due to cold winter and strong wind moreover majority victims lived in mountainous village. A non-government organisation, World Health Organization (WHO) stated the main reason of North Pakistan earthquake survivors' death treated by pneumonia. They were suffering neither insufficient amount of food nor shelter for winter. Other source The Times reported more than 87000 people are death and this number increased during winter. On set of winter below 10 degree Celsius at night, 100 Pakistani's children death at least caused by extreme cold. The available temporary shelters proved that it can't protect them against coldness. Besides, the shelters can't stand longer on load of snow and easily blew away during harsh wind.

One of the best ways to shield against fire, flood and storm may as well be with earth, water, air and fire. Nature does that itself. The equilibrium of the natural elements are the natural balancing acts among these universal element (Cal-Earth Institute, 1992). The strongest structure in nature which work in tune with gravity, friction, minimum exposure and maximum compression are arches, domes and vault forms. And it can be easily learned and utilize the most available material on the earth: (Cal-Earth Institute, 1992).

Based on problem created, researchers recognized that the earthquake survivors need an express shelter that strong to face brutal weather condition. The idea of MIRAS inspired to help the survivors for having a good shelter in addition to give them a comfortable living. It is designed for the earthquake victims who have been turn into homeless and have to fight the chilliness of winter. As an alternative shelter, MIRAS provide as a temporary shelter which practical, made by local materials and effective cost with earthquake resistance. The aim of this project is to create an emergency shelter for the homeless that meets those all requirements. This paper review the model material and construction methodology that carries out the element needed also measurement on model environment.

2. MIRAS

MIRAS is the temporary shelters that could quickly and cheaply be built for immediate distribution to the earthquake victim especially countries likes Pakistan, Iran and Turkey. This type of shelter designed to meets all requirements of not only suitable emergency shelter but that of integration of emergency shelter into longer life structure. MIRAS constructed at the basic guidelines of temporary shelter and established that shelters should be, quick and easy to build by community members, be safe against extreme weather and further earthquakes, be inexpensive, easily transported to remote mountainous village by foot, constructed of locally and culturally familiar materials and methods of construction, and built requiring no special tools or equipment.

The materials used include earth bags, filled with sand or soil on site to construct the walls. These replace brick and stone. Barbed wire is used as a binder instead of cement mortar and gives the structure a monolithic design and contributes to earthquake resistance. The roof is made of only seven sheets of corrugated galvanised iron sheets with internal support due to the barrel vault roof design. This Model is a transitional shelter and can last between one to five years depending on how well owners project the structure by using plastic sheeting or mud render, therefore the cost of the design will go to providing permanent structures.

2.1 Specification of Miras

The floor area of MIRAS was 90 square feet (9'x 10') with end or side wall height of three and the half inches and seven and the half inches in front meanwhile back wall five inches height as shown in Figure 1. The number of sandbag or earthbag needed in this project was about 400 bags. Two strands of four point barbed wire are laid in between every row of bags which required six number of the barbed wire half roll. Wood door size (3' x 7') needed and seven sheet of corrugated galvanised iron dimension of (12' x 3'). The wood lintel size (12" x 1") provided and nine numbers of bettens (2"x2") used to support the roofing.

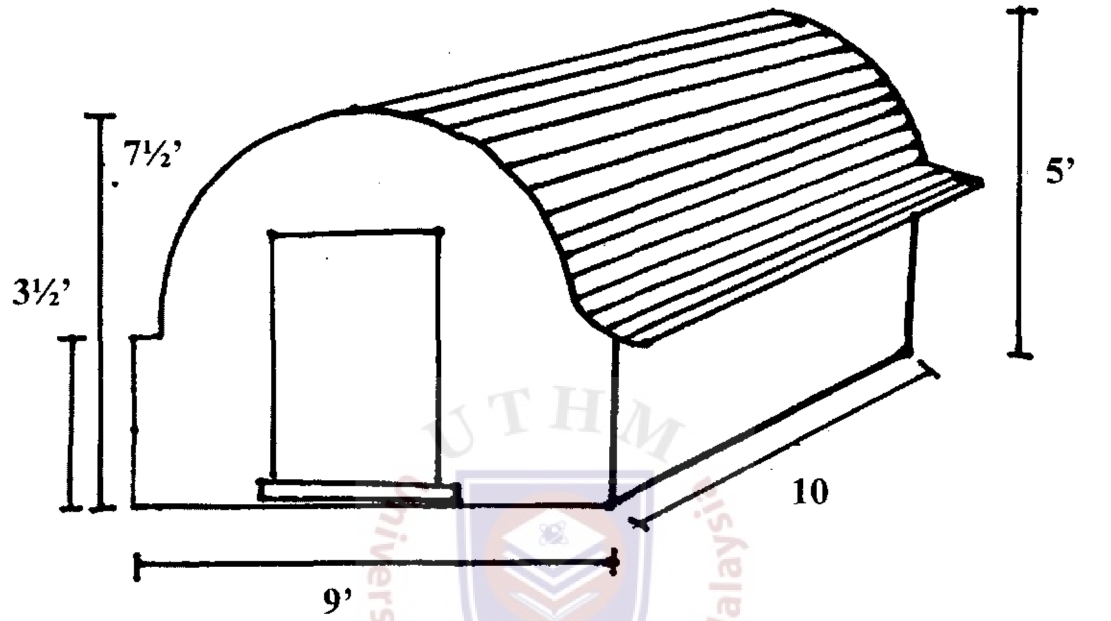


Figure 1: MIRAS Dimension

2.2 Construction Process.

The construction of MIRAS will took about one to three days depend on the weather condition, resource management and the number of member involved in the construction. The cost estimate in this model was about RM 1,500 per unit and it will be cheaper if utilizations of the environment material. Figure 2 shown the three dimensions (3D) of MIRAS.

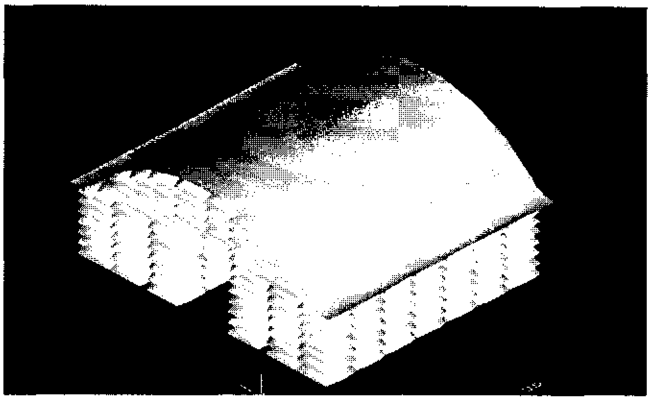


Figure 2: The 3D of MIRAS.

The construction process of Malaysian Improvised Rapid All Weather Shelter,

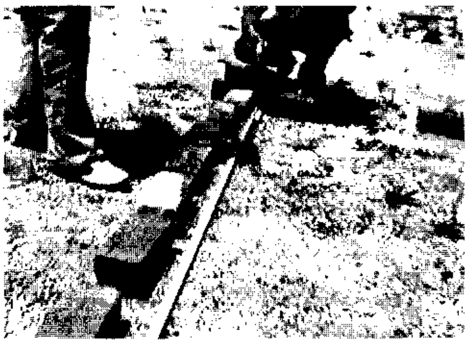
1. First of all spread the crusher run on the top of the base and than establish a baseline from which the whole MIRAS can be set out. The position of this line must be clearly marked on-site so that it can be re-established at any time. For on-site measuring a steel tape and typical builder square should be provided.

2. Next step filled the sandbag with the sand and tied it up. After that laid the sandbags like the sculpted masonry appearance (brick bonding).

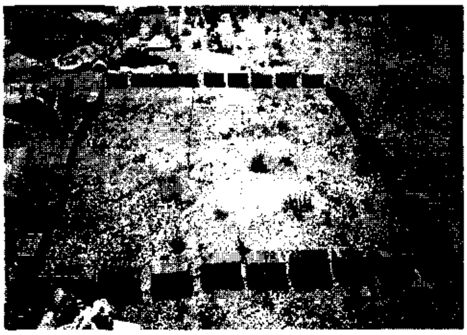
3. Strand of four point barbed wire are laid in between every row of bags. The barbed wire acts as the hook and mortar provide tensile strength inhibits the walls from being pulled apart.

4 Step two and three gives the structure its monolithic strength and adds to earthquake resistance.

5. Corrugated galvernised Iron (zink) used as the roofing for the MIRAS and supported by the bettens. It will provide a covering that will exclude the rain.



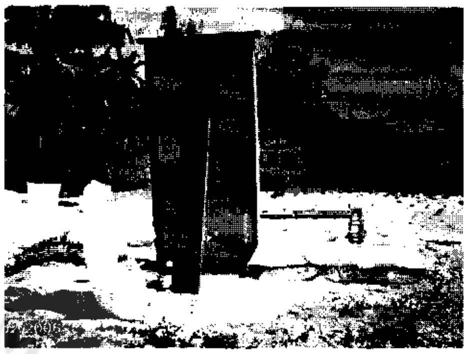
1) Setting up the angle of MIRAS



2) Use brick as the foundation baseline

3) Sand use to fill in the sandbag

4) Tied the end of sandbag



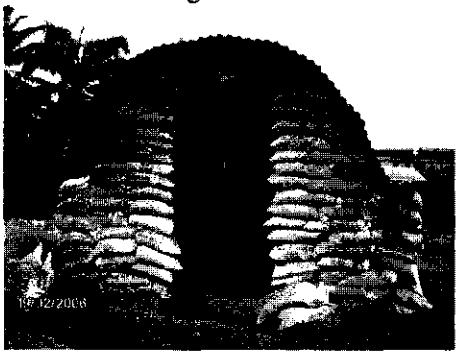
5) Lay the sandbag around the brick

6) Setting up the door with supporter.

7) Attach the continuous barbed wire

8) Arrange the sandbag close to the door frame

9) Place the wood lintel on the top of the door 10) Laid the sandbags like the brick bonding.



11) Place the bettens on the top of sand bags. 12) Place the zink on the top of bettens

13) Construction complete

Figure 2: The Construction Process of Malaysian Improvised Rapid All Weather Shelter.

3.0 IMPACT OF OUTDOOR TEMPERATURE.

MIRAS is designed to withstand severe weather condition. The weather variants know to have impact of the MIRAS are extreme temperature, heavy rainfall or snows, earthquake, fire and winds. This study will only manage to focus on the simple relation between outside temperature and inside temperature. Table 1 shows the temperature data of indoor and outdoor MIRAS that has been collected during the days and three of its situations, namely, during early morning, evening and night. The data observed for three days.

Table 1.0: Heat exchanges

Situations	**Morning**			**Evening**			**Night**		
Location/Day	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Inside MIRAS (°C)	28.7	29.4	27.7	33.6	31.6	31.4	30.2	27.6	29.1
Outside MIRAS (°C)	27.1	28.3	27.4	34.2	34.0	37.3	29.5	26.2	28.7
Average Temperature Inside MIRAS (°C)	28.6			32.2			29.0		
Average Temperature Outside MIRAS (°C)	27.6			35.2			28.2		

As anticipated, three (3) situations were examined according to standard time to differentiate the heat exposed to MIRAS. The situations are:

1 = during morning (8.00am)
2 = during evening (2.00pm)
3 = during night (9.00pm)

3.1 Temperature Analysis

Figure 3 shows that went the high temperature of 35.2°C for outdoor the reduction of 32.2°C for indoor temperature. Meanwhile the different heat at the morning and night time was not much. The percentage of reduction at the high time was 8.5%. From the comparison, it shows that MIRAS could reduce heat during high temperature situation and increase the temperature during morning and night. The implication of this findings is that MIRAS can help occupants stabilize the temperature of their body by maintaining the ratio of temperature level and make life comfortable in MIRAS.

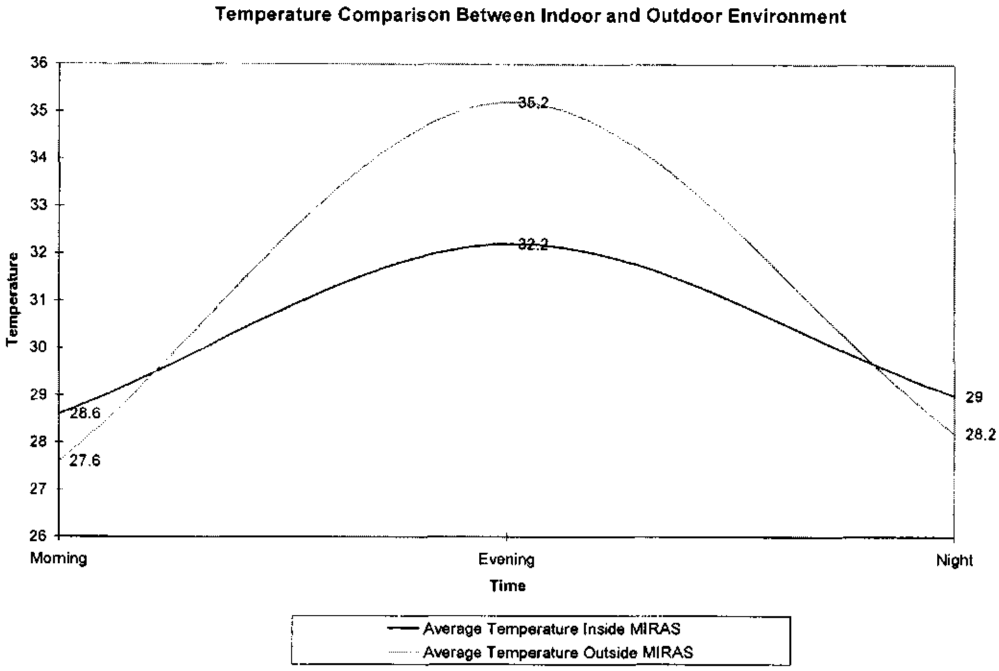


Figure 3: Temperature Comparison Between Indoor and Outdoor of MIRAS.

3.2 Relative Humidity

Table 2 shows the relative humidity exchanges during the days examined and three of its situations, namely, during early morning, evening and night. The transparent parts of the facade were specified with two environments which are inside MIRAS and outside MIRAS.

Table 2.0: Relative Humidity Exchanges

Situations	**Morning**			**Evening**			**Night**		
Location/Day	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Inside MIRAS (%RH)	95.1	95.1	96	68.9	94.8	95.5	89.6	87.8	95.4
Outside Relative Humidity MIRAS (%RH)	98.9	96.6	98.1	62.6	86.5	86.8	90.4	88.3	96.3
Average Relative Humidity MIRAS (%RH)	95.4			86.4			90.9		
Average Relative Humidity Outside MIRAS (%RH)	97.9			78.6			91.7		

As anticipated, three (3) situations were examined according to standard time to differentiate the relative humidity effected to MIRAS. The situations are:

1 = during morning (8.00am)
2 = during evening (2.00pm)
3 = during night (9.00pm)

3.3 Humidity Analysis

Figure 4 represent the different between relatives humidity for indoor and outdoor water vapour content. The result indicates that when the outdoor relative humidity 78.6% the indoor relative humidity increasing to 86.4% during the evening time it mean the percentage of different value of HR was 10%. The optimum relative humidity range for the well being of the home and for the health of the occupants is between 30% to 50% RH. There for this model was suitable for living.

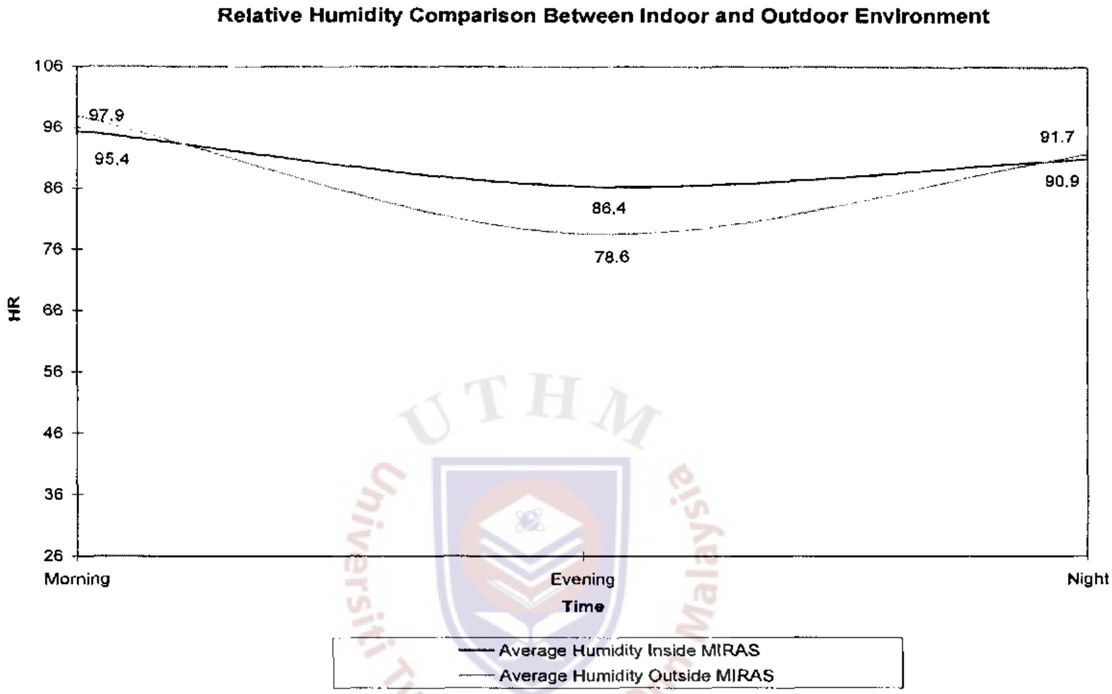


Figure 3: Relative Humidity Comparison Indoor and Outdoor of MIRAS.

4.0 MIRAS BOX.

This study has planning to construct the MIRAS box so that it will mobile for the emergency shelter relief (see figure-5).The size of the box was (3' x 7' x 1') and the body of the box was made from the ½" plywood, further more it has a roller at the bottom of it. Both side of the MIRAS box has a holder. All the material needed to construct the model were place into the kit such as sandbags, door, lintel, battens, barbed wire and corrugated galvernised Iron (CGI).

Figure 5: MIRAS box.

5.0 CONCLUSION.

This study revealed that the reduction of the high temperature was 8.5 % from 35.2°C to 32.2°C. It prove that MIRAS can help occupant stabilize the extreme temperature and safe for living. The research has established that the MIRAS quick and easy to build, safe against extreme weather, and the mobile MIRAS Box will help for immediate distribution. There for the MIRAS meet all the requirement of suitable emergency shelter. Further more this study should extend to look into the impact of the heavy rainfall or snows, earthquake resistances, fire, winds and reduce the size of MIRAS Box.

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