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Investigations On Coir Fibre Powder for Building Thermal Comfort

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ABSTRACT

This paper presents the study carriedout to analyse the thermal insulation performance of Coir Powder. Coir fibre Powder is renewable thermal insulation material also is available everywhere. Natural insulation material Coconut Coir fibre powder is selected for our study. This study include, the assessing of the thermal performance of Coir powder under field conditions through field measurements with the help of proto type model(experimental set up). Model-B insulated with Coir powder exhibited a lesser heat transfer and archived a better thermal comfort.

Keywords: *Coir fibrePowder, Thermal Insulation, Thermal comfort.*

I. INTRODUCTION

Achieving effective thermal comfort in building at lower costs is a biggest challenge for us. In building to maintain thermal comfort we are consuming more electricity power. Most of the power generation in the world is based on fossil fuel burning and nuclear fuel. It leads to environmental pollution also disposal of nuclear waste also difficult one. In this regard selection of renewable thermal insulation material for building could reduce the fossil fuel burning. The coir fibre has low thermal conductivity properties[1]. Today the existing conventional insulation materials cost is high compare with natural insulation material.

Most of heat transfer to the building is through roof only[2].Compared with roof, the window, door and side walls permits a lesser heat transfer.

II. THERMAL COMFORT IN BUILDING

Thermal comfort in building is depending upon the building material, wind flow, Geographical position, ventilation,etc.There are six primary factors that directly affect thermal comfort that can be grouped in two categories: personal factors - because they are characteristics of the occupants - and environmental factors - which are conditions of the thermal environment. The former are metabolic rate and clothing level, the latter are air temperature, mean radiant temperature, air speed and humidity. Even if all these factors may vary with time, standards usually refer to a steady state to study thermal comfort, just allowing limited temperature variations

III. EXPERIMENTAL DETAILS

Figure 1 show the Experimental models created for this study. Two Experimental models Model-A(without insulation) andModel-B(with insulation) wereconstructed in identical size(0.9mx0.9mx0.75m) and orientation. The coir fibre powder ,fevicol (Poly Vinyl Acetate) and water is mixed in the ratio of 1kg:½ litre :1litre.Then the mixer is formed into 0.005m thickness sheet and laid over the card board of 0.003m thickness. Then the cardboard with insulation sheet(coir fibre powder) is placed below the roof in order to avoid the accumulation of dust over the insulation material.

The gap maintained between the roof and insulation material is 0.25m.The longer axis of the building is lying in east-west direction[3].Experimental model walls constructed with brick, cement, mortar and sand aggregates. Both the model constructed with single brick lining and M20 RCC slab placed as a roof on the experimental setup. Thickness of roof and wall is 0.05m ,0.15 m. A small opening(0.25mx0.15mx0.15m) is made in east wall side to measure indoor temperature. Both the models located in 79.4275 East longitude and 11.2846 north latitude.

Fig1. Experimental setup

IV. FIELD OBSERVATION

Here three thermometers were used simultaneously to measure the ambient temperature and two models temperature.The indoor Temperature of the models is measured at a height of 45cm from the base. Field observation made on May month during noon time.The measurement carried out for a week.

V. RESULTS AND DISCUSSION

Table 1.show the temperature measurement during May month. The temperature data measured from Model-A is showing that it is lesser value than ambient temperature on that consecutive days. Similarly the temperature measured from Model-B is lesser than Model-A temperature.

Table 1. Temperature measurement during May month

Day	Ambient Temperature (°C)	Model-A(without insulation) Temperature (°C)	Model-B(with insulation) Temperature (°C)
May 1	33	32	31
May 2	30	30	29
May 3	32	31	30
May 4	33	32	31
May 5	33	32	32

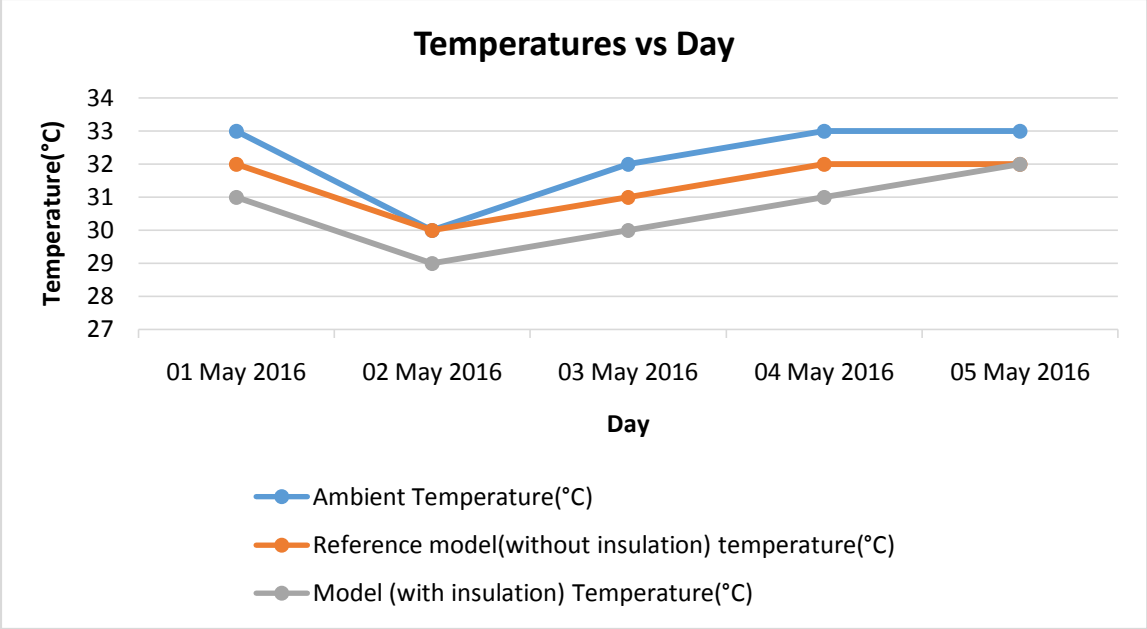

Figure 1 –Graph for Temperatures vs Day

The temperature fluctuation on Graph shown in figure 1 may be due to wind flow variation.

VI. CONCLUSION

This paper concentrates on study of thermal insulation performance of coir fibre. From the experimental result we can conclude that the Model-B(with coir fibre insulation) showing the better thermal insulation performance. In the present experimental work ventilation has not considered. Theventilationeffect and varied air gap between the roof and insulationmay significantly affect the effectiveness of insulation at a specific thickness.

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