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"COMPARATIVE ANALYSIS ON DIFFERENT TYPES OF TENT MATERIALS BY USING THERMAL TRANSIENT METHOD"

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ABSTRACT

Tents are used as temporary shelters and may become homes for several years if return to permanent shelter is too late or out of reach of anyone. That's why the comfort of these tents, just like at home, is very important. The main goal of our current work is to reduce the indoor air temperature of the tents using various retroreflective materials. In this study, we performed a computational fluid dynamics analysis of a tent under summer climate conditions, following experimental results by Lili Zhang in 2017, using various retroreflective materials such as polyvinyl chloride, wood fiber, polystyrene, and aerogel. to measure the internal air temperature of the tent. Phenolic mold. For the CFD analysis, set the air free stream temperature to 311 K measured at a constant heat flux of 900 W/m^2. Solar irradiance is used for the roof and a quadratic downwind discretization scheme is used to approximate the momentum and pressure solutions. The results show a minimum temperature change of 4.8°K and 18.74 using the phenolic form of the retroreflective material, a% temperature change compared to other reflective materials.

Keyword: *energy, tents, thermal comfort, flow simulation, retroreflective materials.*

I. INTRODUCTION

1.1 Overview

Tents are one of the most practical shelters for living outdoors. A lightweight safe house can be carried long distances and can be quickly set up and destroyed. Tents come in a variety of sizes and shapes. Many people can engage in a very large scale carnival type. Smaller pop-up tents are usually ready to serve several people, while the more modest ones can only accommodate one person (see camp settings).

Itinerant groups or homeless people who move from one place to another also use tents as mobile homes. These included everything from Assyrian human progress to his 20th-century Bedouins in North Africa and the Middle East.material and nylon are commonly used in current tents. Most often, the entrance folds are sewn. Many covered the floors and mosquito nets on the windows. Poles and ropes assemble and hold the tent. Ropes are usually attached to adjacent metal or wooden posts. Depending on the style of tent, the poles are inside or outside. There is an upward pole inside the umbrella tent. This post concludes with a variety of more limited shafts. The roof of the tent is supported by these.

Almost all advanced tents rely on one of three main blueprints. The letter "A" is shaped like a wedge tent. The lower part of the pyramid tent is wide and the upper channel is tapered. The front of the baking tent is open, there may be creases to close it From these three ideas, several different shapes were born. Among them were outdoor fire tents, wall tents, excavator tents and pioneer tents.Excavator tent is camper number one. Works very well by using a shank or by tying a rope to the top and throwing it over the extension of the tree and keeping it in place after the top is lifted.A wall tent is similar to a wedge tent However, the bottom on both sides is a vertical strut structure. This type of wall allows

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access to extra space for bunks and storage.

1.2 Various Types of Tents Back

In the days when the tent was introduced, it was necessary to place the center pole on the ground, cover it with a breathable texture, and mark all the corners of the texture on the ground for stability. it's over. Different tents are now arriving in different constructions, with highlights customized for specific purposes. This part describes different types of tents.

1) A-Contour/Border Tent

This tent looks like the letters An when assembled and is known for its straight plane. Previously made from materials and wooden or metal poles, Edge tent advanced options are lighter. Unlike other types, it is easy to set up, but it is small and heavy when fully packed. Great for camping setups.

2) Dome tent

The most famous strategic tent is the vault tent.

It is easily recognized because of its plan. There are two poles with broken ends that form two semicircles that roll down into the tent body. This is what makes the tent bow. Vaulted tents come in different sizes, from 2 he can accommodate up to 8 people. The Vault Tent is softer, more roomy, more ventilated and easier to set up than other alternative tents.

3) Pop Up Tent

A tent that can be set up in no time. They are incredibly easy to grow and destroy. They are elastically stacked and spring back to their original shape when removed from the bag. The Spring Up Tent is a hassle-free, low-profile, small tent that's ideal for setting up summer camping. Again, these are not suitable for exorbitant temperatures or areas. Spring-up tents are great for large gatherings, as 1-6 people can work anywhere.

4) Tunnel Tent

The construction tent looks like an arch tent in every way. They have a round, hollow shape and are longer. However, waves in walkthrough tents, especially vaulted tents, flow outside the tent body. Tabs are recessed into the ground that work from attachment points outside the tent body for consistency in the tent Construction tents provide plenty of open space and room for large gatherings, such as families, and can withstand harsh weather if set up properly. Of course, when stuffed they tend to be very heavy, clumsy and unsuitable for continuous footing.A vehicle that sets up camp is a great solution for them.

5) Geodesic Tent

The Geodesic Tent is a more complete representation of the vaulted tent, ready to withstand a wide variety of climates and geographical conditions. There are many waves moving between each other, affecting the consistency of the tent. Geodesic tents have a particular focus on reliability and strength, making them ideal for setting up camp in the wild and in harsh weather conditions.Spacious in the front, it can accommodate up to 4 people. Because it is of better quality, the price is also higher.

6) Lodge Tent

Lodge Tent is perfect if you are looking for an economical tent to set up a family camp. They are made of aluminum struts that combine to form a shack-like housing and are attached with waterproof polyester, nylon, or fabric. Lodge tents provide ample living space and headroom, but are of poor quality and cannot withstand inclement weather.

7) Vehicle Roof Roof Tent

A lodge type tent that can be opened and closed immediately. A car rooftop tent is the most exciting way to set up a camp designed for people who travel by car. A step stool is included to help you get into the tent

Most vehicles have roof poles that can support a tent in camper camps.

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8) Camp Tent / Camp Tent

Actually, the first camp tent was planned as a crisis shelter. They are simply in the plan and give everything that is considered additional certainty from the other world. These tents are ideal for climbers and wild campers who don't want to pack too much and are unwilling to accept environmental or geographic constraints.

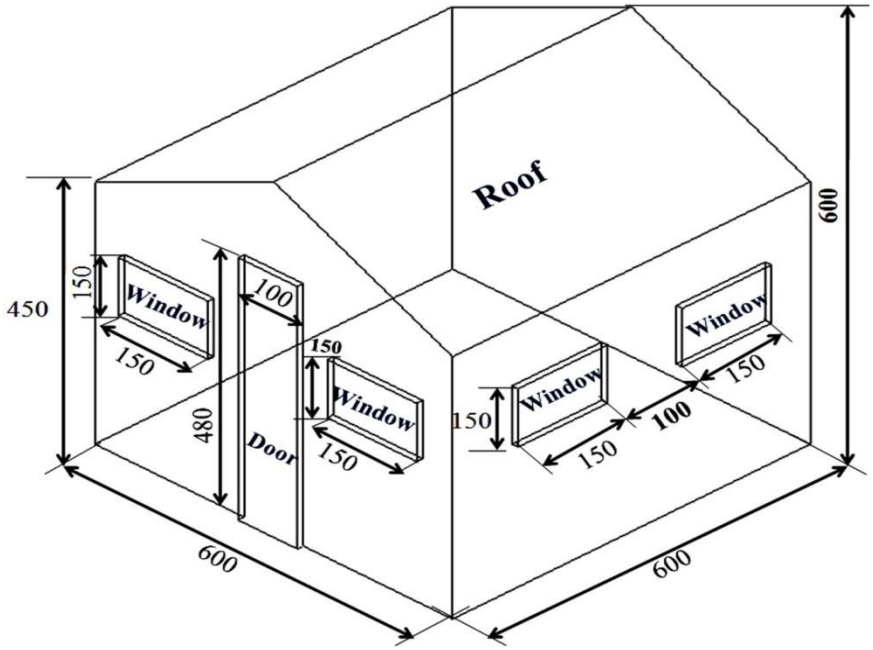

Fig. 1 Tent model structure dimension

II. CAD MODELING

CAD Model: With the assistance of something like the design module of ANSYS workbench, a three-dimensional CAD model of Tent is generated in this project. The measurements of the tent are 600 mm 600 mm 600 mm, with two windows of 150 mm 150mm in the center of the front wall and two windows of 150 mm 150 mm on the side wall-1, with a door of 100 mm 480 mm in the center of front wall and a door of 100 mm 480 mm in the middle of the side wall-1. [2017, Li Li Zhang]. Figure no. 1 depicts a three- dimensional depiction of the tent.

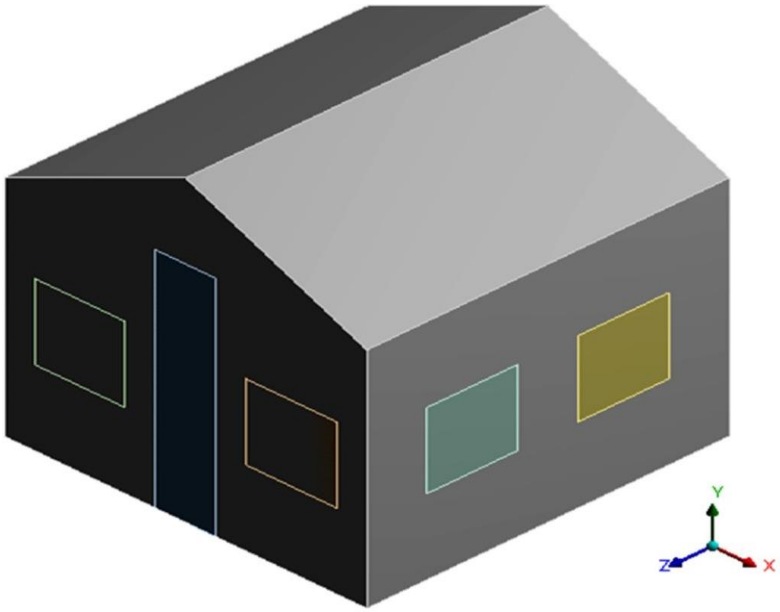

Fig. 2 CAD Geometry of Tent

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Thermal Diffusivity

The material absorbs to transmit temperature energy in comparison to its capacity to storeexcess heat is measured by heat capacity.

$$Thermal\ Diffusivity\ (mm^2/sec) = \frac{Thermal\ Cokdutivity}{Deksity \times Specific\ Heat\ Capacity}$$

Table 2 Material Properties

Material Properties	PVC	Wood-fiber	Polystrene	Aerogel	Phenolic-Form
Density [Kg/m^3]	1380	645	960-1050	3	35-200
Thermal Conductivity [w/m-k]	0.19	0.038-0.042	0.033	0.03-0.04	0.018-0.023
Specific Heat [KJ/Kg-k]	0.9	2.3	1.3	1.9-2.3	1.05

III. RESULT AND DISCUSSION

According to an experimental outcomes of Lili Zhang 2017, simulation software analysis has been performed for a tent under springtime climatic conditions to start reducing of inside atmospheric temperature of both the tent using distinct vintage components such as polycarbonate, timber, polystrene, nanocomposite, and polyphenol form to start reducing an inside temperature of both the tent. For the CFD study, the flow velocity ambient air is set at 311K, with a heat transfer of 900 w/m^2 solar irradiation on the roof, as well as a higher order advection finite difference technique is employed to approximation the velocity and pressuressolutions. Calculated results from simulation software study are covered in this section in the design of different contours, charts, and table.

Computational Fluid dynamics analysis of Tent for polyvinyl chloride as a retro-reflective material

The highest air temperature on the inside of the tent is 324 degrees Kelvin, and the minimum ambient temperature is 311.1 degrees Kelvin, according to the results of a computer simulation simulation of a tent using plastic products as an antique materials.

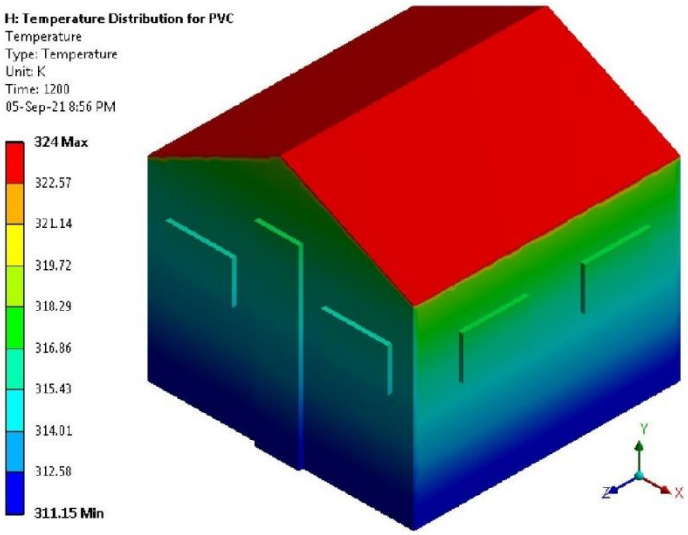

Fig.3 Computational Fluid dynamics analysis of Tent

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Fig.3 With varied color contour, depict the dispersion of ambient temperature on the insideof the tent. The temperatures of the inner air of the tent is 12.8 °K greater than the temp of theoutside air. Fig.4 shows the overall result of a computer simulation analysis of a tent employing PVC as a nostalgia materials for discharge coefficient, with a maximal air speed of 1.82 m/secat wing mirrors.

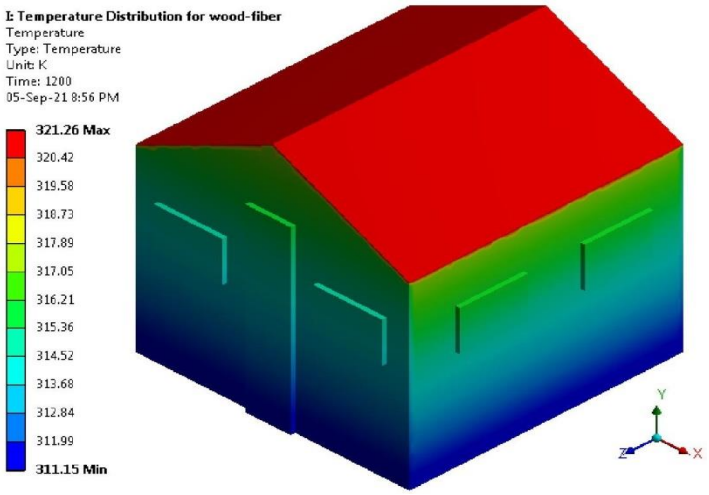

Fig.4 Tent for polyvinyl chloride as a retro-reflective material

Computational Fluid dynamics analysis of Tent for Aerogel as a retro-reflective material

The highest air temperature outside the tent is 317.26 degrees Kelvin, while the lowest ambienttemperature inside the tent is 311.15 degrees Kelvin, according to the results of a computer simulation simulation employing Aerogel as a vintage materials. With varied color contours, depict the dispersion of ambient temperature on the inside of the tent. The temperatures of the inner air of the tent is 6.11 °K higher than the temp of the outside air.

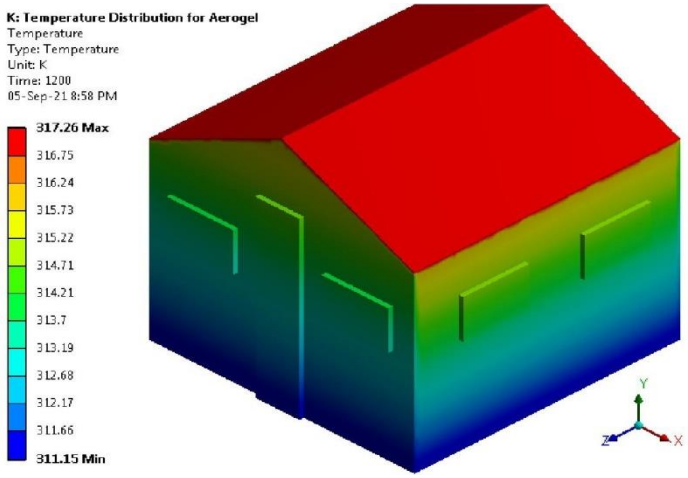

Fig.5 Tent for Aerogel as a retro-reflective material

Computational Fluid dynamics analysis of Tent for Phenolic-Form as a retro-reflective material

The highest ambient temperature from the inside of the tent is 315.9 degrees Kelvin, as well as the maximum ambient temperature is 311.1 degrees Kelvin, according to a computer simulation simulation of the tent employing Polyphenol as a nostalgia materials. Fig.6 With varied color contours, depict the dispersion of air temperature within the tent. The temperatures inside of the tent is 4.8 degrees Celsius greater than the temperatures outside.

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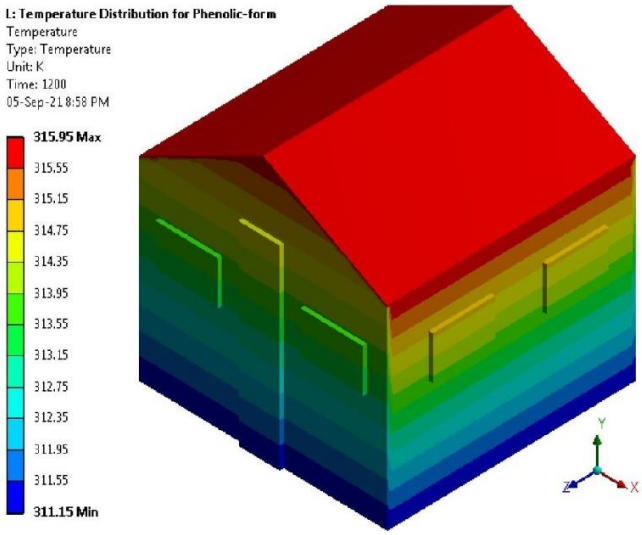

Fig.6 Tent for Phenolic-Form as a retro-reflective material.

IV. CONCLUSION

In this review, certain classical components (polyvinyl chloride, wood fiber, polystyrene, airgel, and phenolic structures) were used to reduce the internal temperature of the tent. In light of Lili Zhang's 2017 research findings, tent reproduction planning evaluations were conducted in the natural environment in July and August, and the accompanying claims were incorporated into the final statement:Findings show that using ancient materials for polyphenols yields a negligible temperature change of 4.8°K and a heat drop of 18.74% compared to polycarbonate.

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