

Development of insulator curtains for the restriction of extreme cold and fog

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Abstract: Extreme cold weather in winter days and winter nights is very serious problem for those homes and buildings in which outside walls becomes too much cold due to the conduction of coldness and cold breeze. In foreign countries trend of construction of green buildings is very common but when we are talking about the developing countries like Nepal, Bhutan, India and Sri-Lanka homes and buildings are being constructed according to affordability. So, it's a problem of many traditional and common houses. It becomes very difficult to live/ survive in such weather conditions where the room temperature becomes less than 18 °C in days and less than 10 °C in winter nights. The solution for such type of serious problem exists in the invention of such composite insulator materials for making curtains/ curtain pads and window insulator covers to avoid the entry of cold breeze and fog in our homes which will add comfort in living during these days.

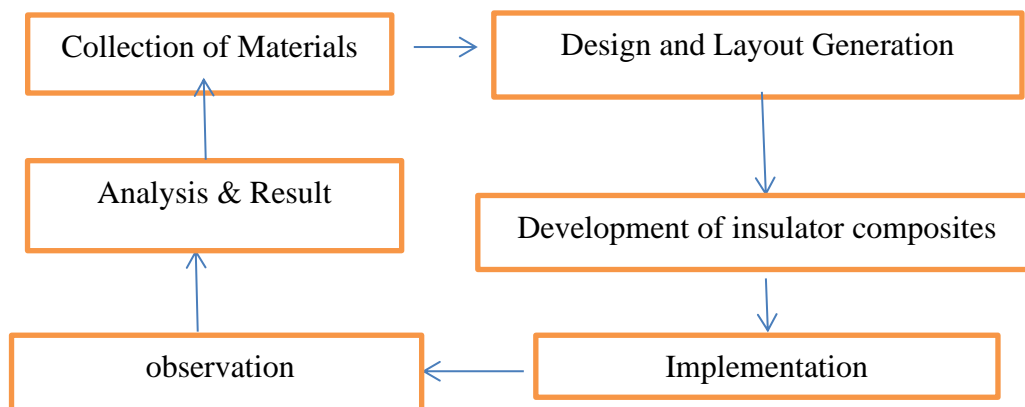
Keywords: Layering effect, vertical band effect, window covers, cold wave, insulation.

1. INTRODUCTION:-

The problem of extreme cold is not the present time problem instead it's an issue of thousands of years back in the past everywhere. sometimes extreme cold breeze flows in some states or specific geographic area along with appearance of too much fog and mist in the morning time such type of climatic conditions adversely affect the human health, Aquatic life, wild life etc. When we are talking about its adverse effect on the human health then we can say that by the cooling of body parts leads to frostnip, frostbite (freezing injuries), immersion foot and hypothermia (non-freezing injuries). Among non-freezing injuries hypothermia is most serious one. The arrival of cold wave in the Madhya Pradesh and some other states which results into drop of 4-5 °C in various districts like Bhopal, Ujjain, Indore, Seoni, Chhatarpur, Sagar, Datia and Gwalior (weather report obtained from India Meteorological Department's Bhopal office.) in the last month of December 2021. Due to Cold wave the normal room temperature decreases very rapidly and it was reported 4°C in Datia and Gwalior. The problem of extreme cold originates from arrival of cold breeze from north east of our country which is also called as cold wave.

In order to prevent from the adverse effect of extreme cold we can use and install some insulator curtain pads and window insulation covers on our windows and ventilation. Jute, cotton and wool are very good insulators of heat among organic category whereas polystyrene foam, polystyrene and Khaadi cloths are having very good thermal insulation properties as a man made products.

2. EXPERIMENTAL METHODS OR METHODOLOGY



Methodology of my research work is a systematic step by step process which includes many important steps. These steps are as follows:-

Collection of Materials-Insulator materials used: Insulator material used are padded cotton or clean used cotton pads, used woollens,Khaadi cloth or used Khaadi bed sheet, used packaging cartoon, polystyrene boards as rigid expanded boards, Polystyrene Foam sheets, Jute fibers,used egg trays. Other materials:-Epoxy foam adhesive, cello tape, Thread and needle, Polystyrene board pins. Equipments:- Infra red Thermometer with Laser sensor, Room temperature thermometer.

Design:-In my Research work ,i have developed two insulator composites.(i)Insulator Curtains or Cold Insulator curtain Pads (CICP) (ii)Window Insulation Covers (WIC's).

Development of composite insulator- I developed my models by the use of layering method and vertical bands of hard board as in case of insulator curtain.

Layering effect: If we make an Insulator composite to resist cold by different layers of different insulator materials then we observed that the inner most layer of insulation material has the lowest thermal conduction capacity..

Band effect of hard insulator material: - In the development of cold Insulator curtain pads (CICP) I have added vertical bands made of hard board or used packaging cartoon in order to break the continuity of incident cold air on the composite surface. These bands play a role of coldness barrier in the spreading of cool air.

Implementation part:- Implementation of these models have been done by the installation and fixing of such models into our home windows.

- 1) insulator curtain :- by cloth picker
- 2) Window insulator cover:- by tie up with ropes to grills of the windows.

Observation & Analysis:--After the successful installation of these insulator composite models in the windows I have taken readings of temperature outside and inside the rooms of house after an equal interval of 3 days for one month.

3.RESULTS AND DISCUSSION

As the insulator composites are made according to layering effect of insulation materials and vertical band effect of hard insulation material hence both are very effect in prevention of falling of temperature during extreme cold days and foggy days..



a) Image-a showing curtain insulator and image b showing window insulator cover.

Used blanket piece 2mm
Wool 2mm
Bands of hard board 3 mm thickness
Wool 2mm
Khaadi 1mm

USED EGG TRAYS Layer-1 thickness 1.5 inch
Polystyrene board Layer 2 thickness 1.5 cms
Polystyrene foam Layer3 thickness 1 cm
Polystyrene board Layer 4 thickness 1.5 cm
Jute and lamination Layer 5 thickness 1.5 inch

Table-1 (a) showing layers in curtain insulator & (b) showing window cover.

Date of recording	Temperature outside home	Temperature of room
22/12/2021	11.0 °C	15.2°C
25/12 /2021	10.5 °C	15.0 °C
28/12/2021	12.0 °C	17.2 °C
31/12/2021	11.5°C	16.2 °C
03/01/2022	13.0 °C	17.5 °C
06/01/2022	13.8 °C	17.8 °C
09/01/2022	12.3 °C	16.5 °C
15/01/2022	12.7 °C	17.1 °C
18/01/2022	12.9 °C	17.5°C
21/01/2022	11.9 °C	16.5 °C

Table 2 showing performance of curtain insulator(CICP),x axis-dates, y axis –temperature values

For taking readings I have used IR thermometer compatible with laser sensor to take the temperature readings of outside the window and inside the window (room).

Analysis:- Insulator curtains or cold insulator curtain pads obstructs the cold efficiently by its layering effect of adjacent insulator materials and Vertical band effect of hard board bands which helps in discontinuity of flow of air uniformly on the surface of composite.This composite if we apply on all the windows and ventilation of room then it prevents the room temperature from fall down and approximately it maintains temperature higher than outside 3-4 °C.

Date of recording	Temperature outside home	Temperature of room
28 /12/2021	12.6 °C	16.2°C
30/12 /2021	11.8 °C	15.6 °C
02/01/2022	12.5 °C	16.1 °C
05/01/2022	13.1°C	16.4 °C
08/01/2022	12.1 °C	16.5 °C
11/01/2022	13.2 °C	15.8 °C
14//01/2022	12.5 °C	17..5 °C
17/01/2022	12.7 °C	18.1 °C
20/01/2022	12.1 °C	17.5°C

Table 3 showing maintenance of room temperature in °C by window insulator covers.

Data Analysis:- Window insulator covers obstructs the cold efficiently by its layering effect of adjacent insulator materials and Air insulation effect of hard board based used egg trays which helps in filling of air uniformly in its exposed surface on outside the room.This composite if we apply on all the windows and ventilation of room in winter season then it prevents the room temperature from its falling and approximately it maintains temperature higher than outside in the range of 3.3 to 5.4 °C..

CONCLUSION

Insulator composite designing is vast field of development of thermal composite insulator materials and models in the field of green chemistry and Energy savings of buildings. In the result part I found that the energy saving efficiency or temperature maintenance capacity of window insulator covers is better than insulator curtains. As windows covers maintains temperature higher than outside upto higher limit of 5.4 °C.

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