

Use of Crop Residue in Solar Insulated Mud House: An Alternative of Burning Crop Residue

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Introduction:

What will you do if you are stationed at 12000ft above sea level in a cold desert like Ladakh where you do not have access to 24x7 power? The usual solution is to burn diesel and kerosene to keep warm or if it's available, burn firewood. This is exactly what people in Ladakh have traditionally done and does the Indian army for scores of its men stationed out there in Ladakh. With the mercury dipping to -20°C or lower during winter nights and about -5°C at night during March & April, it becomes virtually impossible to live without proper heating. Above all, Ladakh is not connected to the national electricity grid. It has a few areas that get power from local hydro plant while de-centralized solar power helps in many other remote areas but is highly inadequate.

Solar passive structures are not new. However, the one we are talking about are movable, prefabricated and can be assembled on the spot and give solution to meet the army's shelter requirements. The cost of heating will be zero. Even if the temperature outside is -20°C , it will be 20°C inside the hut, without any heating. This is going to rid of all the pollution caused by the massive amounts of the army consume to keep the jawan's warm.



India's first solar insulated mud house

Passive Solar Heating or Solar Insulated Mud House

Passive solar design takes advantages of building's location and climate with the use of materials such as soil and local resources that will lead to low or almost nil use of energy for heating all through the day and still provides sufficient natural light.

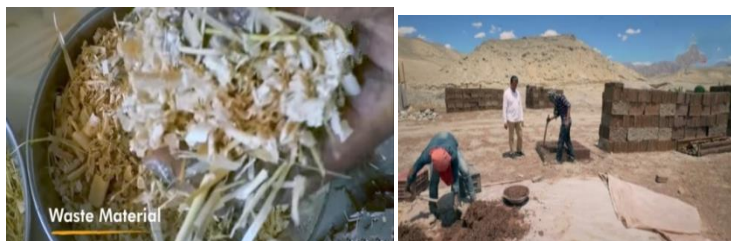
Procurement of Material:

We require clay soil, water, straw fibre and waste fibre. All the material is very economical as it is natural & mostly waste reused. The straw to be used in mud house can be sourced from states like Punjab & Haryana where it would otherwise be burnt & cause pollution. Moreover, the waste fibre can also be obtained from the food processing units & textile industries so as to reduce the amount of waste generated.

Procedure of the making:

Whole procedure is quite simple. First of all clay is mixed with water to form a paste like matter called clay slurry. In this clay slurry we add the straw, fibre & waste fibre's. Then we solidify this mixture in small brick like structures. On a large scale, instead of bricks, large wall can also be formed as per the comfort. The block formed is highly insulating & forms all the walls of our solar insulated mud house. The only fault in this was that the compressive strength was low but very efficient solution was found for that too. The solution is to make the straw clay block with hole. While assembling, we may add either gravel or mixture of cement & gravel to increase its compressive strength. If we use rods we can even replicate this technique in reinforced/multi-storeyed buildings too.





How to Assemble This Mud House?

In a mud house, there are specific functions of the walls & the directioning is quite important. The math is simple, it adds up to massive successful result. The south face of the building needs to be all windows, so that it gets maximum exposure of sunlight from sunrise to sunset in winters. The building's south side has huge thick plastic sheet or highly absorbent fibre glass attached to these windows at an angle. This stops strong chilly winds but allows sunlight & heat in winters. The top of the building has glass openings to keep the inside of the building well illuminated during the day and also trap heat in winters. Essentially, it is the double-layered, south-facing windows (plastic sheet & glass sheet or both). The other sidewalls are made up of thick mud with insulation in between. The insulation is the clay straw block we created earlier. The idea of passive solar design is that it absorbs & traps all the heat directly from sunlight & the architecture lets us store it for long.

The Indian army had invited this initiative to its seminars on warm habitats in cold places like Ladakh. A prototype has been made of a cost- effective solar-heated mud-built house for officers & the army has been testing it. "The Indian Army spends a lot of money & carbon for keeping soldiers warm in a cold place like Ladakh which is one of the sunniest places". We don't really need to drain national treasures to buy Qatar oil & become vulnerable to enemy fire on our supply line. We can be independent in every way by using the energy from sun. Through this youngster would build careers in the mountains & army will get cleaner habitats wit lower costs & carbon footprints. It will be safer too, because many soldiers are burnt in fire accidents because of kerosene.