

THE INFORMAL HOUSING THERMAL COMFORT PROJECT

HOUSING & LAND RIGHTS NETWORK (HLRN)



&

FAIRCONDITIONING TRUST

*f*AIR CONDITIONING

DRAFT REPORT

August 2026

Table of Contents

1. Project Brief	3
2. Passive Cooling Solutions Brief	3
a. MLP Wrapped Wood Wool Panels	3
b. MLP Wrapped Biomass Panels	4
c. MLP Coated Vertical Cane Blinds	4
3. Description of the Project Activities	5
a. Participatory Design Workshop	5
b. Structural Audit	5
c. Solution Installation	6
d. Thermal Comfort Monitoring Training	8

1. Project Brief

With support from the Wipro Foundation, HLRN piloted the upgradation of two shelters for homeless persons in Delhi, operated by the Delhi Urban Shelter Improvement Board (DUSIB), Government of Delhi, with the aim of developing practical and scalable models to respond to extreme heat. These include passive cooling measures such as internal insulation, external heat barriers, and reflective treatments, alongside improvements in ventilation, access to cold drinking water, and designated cooling and rest areas, among others. This also builds on HLRN's ongoing work to foreground access to adequate housing options for homeless persons, recognizing that strengthening shelter conditions and access to basic services is a key component of climate-responsive urban action.

In this context, HLRN collaborated with Fairconditioning Foundation as a technical expert to implement passive cooling solutions in two porta cabin homeless shelters in Delhi. Fairconditioning Foundation provided technical and implementation support for the design, installation, monitoring, and assessment of agreed passive cooling interventions.

2. Passive Cooling Solutions Brief

a. MLP Wrapped Wood Wool Panels

This is an under the roof static solution which works on the principle of insulation. Wood wool panels consist of wooden shreds mixed with concrete to form a panel like structure. Multi Layered Plastic (MLP) sheets, which are made of MLP waste, act as a low-emissivity surface. A single layer consisting of 3 MLP sheets joined together, is wrapped around the wood wool panels such that the shiny surface is facing out. This enhances the effectiveness of the solution further.

The solution is installed through a metal framework structure. This is made using L-angles welded together to form a grid-like structure.



Fig 1: MLP Wrapped Wood Wool Panels

b. MLP Wrapped Biomass Panels

This is another under the roof static solution which works on the principle of insulation. Biomass panels consist of waste biomass, processed, compressed and dried to form a panel like structure. Multi Layered Plastic (MLP) sheets, which are made of MLP waste, act as a low-emissivity surface. A single layer consisting of 3 MLP sheets joined together, is wrapped around the wood wool panels such that the shiny surface is facing out. This enhances the effectiveness of the solution further.

The solution is installed through a metal framework structure. This is made using L-angles welded together to form a grid-like structure.



Fig 2: MLP Wrapped Biomass Panels

c. MLP Coated Vertical Cane Blinds

Vertical cane blind is like a manual curtain mechanism where the MLP sheet can be folded and unfolded as required. The solution works on the principle of Radiant Barrier + Night Sky Radiation. It works as a Radiant Barrier during the day and facilitates Night Sky Radiation at night. This is a dynamic solution as it allows for open and close movement during different times of the day. The solution needs to be closed during the day (covering the wall) and open during the evening/night (post 5-6 PM).

Vertical blinds are made up of bamboo cane strips joined together to form a curtain like structure. A rope is then attached to this curtain to operate it. Multi Layered Plastic (MLP) sheets, which are made of MLP waste, act as a low-emissivity surface. A single layer consisting of 3 MLP sheets joined together, is attached to the curtain such that the MLP is between the curtain and the wall with the shiny surface facing towards the wall. The curtain is then attached to the outside wall with the help of hooks and fasteners.



Fig 3: MLP Coated Vertical Cane Blinds

3. Description of the Project Activities

a. Participatory Design Workshop

Small-scale working models of the selected solutions were presented to the community as prompts in the Participatory Design Workshops. We invited them to observe, touch, and imagine the solution and also shared basic information about the solutions. The invitation to the community was to share their insights and feedback and contribute to co-creating the roofing solutions. The participants participated enthusiastically. The intention of the workshop was to facilitate a process of working 'with' the community. We conducted 2 Participatory Design Workshops, one for each shelter. Input and feedback from the residents was analysed and integrated to co-create and contextualise the designs.



Fig 4: Participatory Design Workshop

b. Structural Audit

The Structural Audits were conducted for both the structures to measure structural details of the shelters. This included measuring roof and wall areas, structure heights, building materials, defects in the structure, space availability around the structure etc. Community members also provided insights on the age of the structures, structural issues, water availability, structure maintenance etc.



Fig 5: Structural Audit

c. Solution Installation

First the Wood Wool Panel installation was carried out in the Raja Garden shelter followed by the Biomass Panel installation in the Britannia Chowk shelter. The Vertical Cane Blinds were installed in both the shelters. The fabrication and installation method remained the same for both the shelters.

The MLP sheets were made by the women from Women's Heat Action Cooperative (WEHAC) in Chennai and were then transported to Delhi.



Fig 6: MLP Sheets Fabrication by WEHAC Women in Chennai

The Wood Wool Panels were procured from Delhi. The women from the Raja Garden shelter wrapped the MLP sheets on the panels.



Fig 7: MLP Sheets Wrapping by the Women from the Shelter

The fabricator was then brought on board. The supporting L-angles were first painted by the fabricator and then welded by keeping them parallel to the roof of the shelter, to make the grid like structure. The panels were then placed inside the slots provided by L-angles in the grid.



Fig 8: Panels Installation

Once the panel installation was over, the MLP sheets were attached to the Vertical Cane Blinds. The blinds were then installed on the outer walls by fixing hooks.



Fig 9: Vertical Cane Blinds Installation

d. Thermal Comfort Monitoring Training

Since the effectiveness of the installed solutions rely on reducing the temperature of surfaces (walls, roofs), it is important to measure the roof and wall surface temperatures apart from the sensor readings. The inside surface temperatures are measured with the help of a temperature gun every hour starting from 10 AM in the morning till 7 PM in the evening. The corresponding outside temperature is also measured with the help of a sling psychrometer. To facilitate this measurement, a thermal comfort monitoring training was provided to the field team who will be doing the testing for a continuous period of at least 5 days during peak summer time to assess the effectiveness of the solution.



Fig 10: Thermal Comfort Monitoring Training