SUSTAINABLE HOUSING PROGRAMME

RESEARCH FOR ADVOCACY AND POLICY INTERVENTION

ASSESSING THE APPLICABILITY OF THE ENERGY CONSERVATION BUILDING CODE (ECBC) FOR PUBLIC HOUSING FOR THE POOR

Sustainable Housing Programme intends to explore the possibilities of achieving sustainability in built environment through different interventions on a pilot basis and subsequent scaling of pilots.

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The Energy Conservation Building Code (ECBC) released by the Bureau of Energy Efficiency (BEE), Ministry of Power, and Government of India in 2007 offers a framework to promote energy-efficient technologies and measures in new buildings. The code has recently been updated in February 2018 to include residential use building projects built on a plot area greater than 250 sqm. The code is mainly targeted to multi-storey, multi-family housing projects being constructed in urban areas.

The three major aspects covered by the code are:

- Reducing heat gains and heat loss through the building envelope
- To ensure adequate natural ventilation to improve thermal comfort and reduce energy for space conditioning.
- To ensure adequate day-lighting.

THE KEY OBJECTIVE OF THIS PROJECT

To assess the applicability of the ECBC to public housing complexes (constructed directly by ULBs and development agencies, or through partnersing with developers). MHT also wants to collect scientifically valid data on parameters such as thermal comfort and energy usage in such public housing complexes.

The research aims at assessing the applicability of current Energy conservation building codes (ECBC) in public housing for the poor and suggest alternatives to the extent possible. MHT's Role was to provide CARBSE with the access to public housing societies in Ahmedabad, Gujarat for installation of devices to kick start the research work. MHT has identified 20 households across three different public housing sites in Ahmedabad for monitoring energy usage and its link with built environment.

S1 - Shantadeep Co-operative Housing society, Ambawadi

S2 - Shree Ram Nagar Co-operative Housing society (Himadri Mill), Saraspur

S3 - Gokul Dham Co-operative Housing society, Sabarmati

IMPLEMENTING THE ENERGY CONSERVATION BUILDING CODE

Currently, MHT has been working with AMC (Ahmedabad Municipal Corporation) and prominent affordable housing developers in Ahmedabad, to promote the importance, and the necessity to implement ECBC. The below section emphasizes on the key insights achieved through the collaboration.

MHT has recommended two strategies to address this situation. First, it is fundamental to enhance people's awareness of ECBC and the benefits it provides. This effort also includes gaining stakeholders' support for code adoption, here AMC and the Housing developers.
Stakeholder meeting conducted by MHT with AMC- Housing department and CARBSE. The key agenda for the meetings were to overview the ECBC in India, needed and available resources to support ECBC implementation in the Public Housing Sector in Ahmedabad. The aim is to help AMC to 1) better understand the importance of ECBC wrt to the energy savings of the poor, 2) evaluate buildings and designs if they are ECBC compliance, and 3) use available resources (affordable solutions) to adopt and implement ECBC.

1. Stakeholders meeting by conducted MHT's team with AMC- Housing Department and CARBSE.
2. Presentation by the AMC on "Green affordable building techniques and

Second, the need of addressing the local real estate developers. MHT has organized training sessions and provided informational materials introducing ECBC, documenting energy savings, and affordable solutions to demonstrate the feasibility and benefits of ECBC. Examples are provided by assessing the current public housing projects in Ahmedabad for current ECBC compliance.

RETV ASSESSMENT OF PMAY PROJECTS IN AHMEDABAD A CASE OF ODHAV PPP HOUSING, AHMEDABAD

Odhav PPP Housing in Ahmedabad has been assessed according to the building performance parameters such as building orientation, building materials used, RETV (Residential Envelope Transmittance Value), WFR (Window Floor Ratio), U value (thermal transmittance of roof). Affordable suggestion is provided to make the building blocks ECBC compliant. Suggestions for this project are limited as the construction has already taken place.

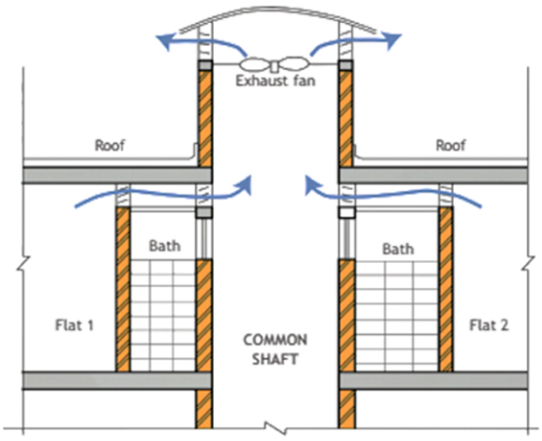
RETV COMPARISON OF TWO HOUSING BLOCKS OF THE SAME PROJECT

No.		Block A+B	Block N_O_C1_D1	Suggestions to make it ECBC-R compliant (RETV=15)
1	Number of units	78	112	-
2	Carpet Area (m^2)	35	35	-
3	Total floor area (m^2)	2410.2	3920	-
4	Orientation	North (337.6°–22.5°)	North (337.6°–22.5°)	It is a favourable orientation.
5	Outer layer	Cement plaster, Density-1762 kg/m3	Cement plaster, Density-1762 kg/m3	Since, outer layer of the walls receive maximum radiation, EPS insulation can be added from the outside.
6	Layer 2	Aerated autoclaved concrete (AAC) block, Density-642 kg/m3	Fly ash brick, Density-1650 kg/m3	AAC blocks are better at providing reduced thermal conduction from walls than typical fly-ash bricks.
7	Inner layer	Gypsum plaster, Density-1120 kg/m3	Cement plaster, Density-1762 kg/m3	-
8	WFR (Ideal for hot & dry climate~10%)	9%	6%	An assisted ventilation design solution is using the existing service shafts for fan on top of the shaft, which will create negative pressure in the shaft (with / without ambient wind) improving air-change through the flats. Providing partially glazed windows, side fins and necessary overhang helps in reducing heat gains from windows.
9	Roof U value (Ideal~1.2 W/sqmK)	0.99	2.68	To significantly bring down the U value of the roof, high SRI paint should be applied on the roof surface.
10	RETV (Ideal~15 W/m2)	13.57	18.11	-
11	**ECBC-R compliance (~15 W/m2)**	**Compliant**	**Non-Compliant**	

For Blocks N_O_C1_D1_If EPS insulation is added, RETV can be brought down to 10.8391 W/m^2 from 18.11 W/m^2. Though construction details and other factors may contribute to make this value variable. Ideal RETV=~15 W/m^2.

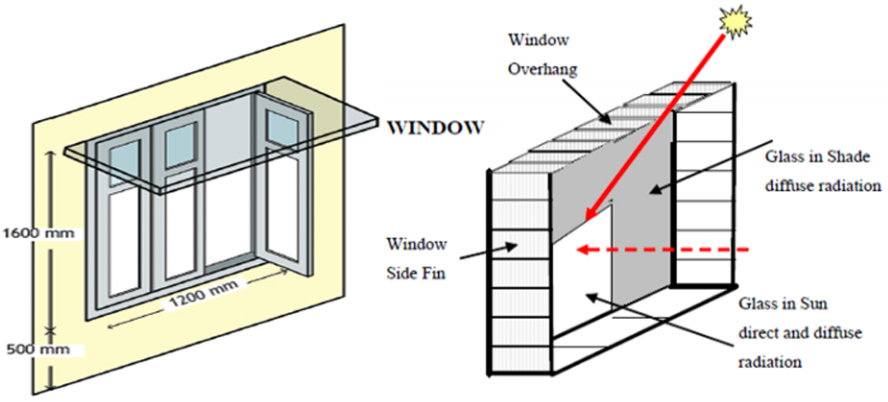
SUGGESTIONS TO MAKE IT ECBC-R COMPLIANT TO THE REAL ESTATE DEVELOPERS AND HOUSING DEPARTMENT, AMC

Since, outer layer of the walls receive maximum radiation, EPS insulation can be added from the outside.



An assisted ventilation design solution is possible using the existing service shafts for fan on top of the shaft, which will create negative pressure in the shaft (with / without ambient wind) improving air-change through the flats.

To significantly bring down the U value of the roof, high SRI paint should be applied on the roof surface.



While maintaining 10% WFR (window to floor area ratio), providing partially glazed windows, side fins and necessary overhang helps in reducing heat gains from windows.

Developers have adapted affordable solutions such as solar reflective white paint and mosaic flooring on the terrace and building material suggestions such as usage of AAC Blocks for walling, extended shading over the windows and partially glazed windows.

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