Training Program on Innovative Construction Technologies & Thermal Comfort in Affordable Housing

RESILIENT, AFFORDABLE AND COMFORTABLE HOUSING THROUGH NATIONAL ACTION

RACHNA for Practitioners on 20th & 21st April 2022

Venue: Amaltas Hall, India Habitat Centre, New Delhi

Thermal Comfort Training Modules in Affordable Housing

'RACHNA for practitioners' training program will deliver in-depth knowledge on thermal comfort, its nuances, and its relationship with building physics. Moreover, it will discuss design strategies, construction techniques, policy documents, building codes, international practices, and other aspects relevant to thermal comfort in affordable housing through a suite of case studies. Additionally, it will familiarize participants with the evaluation process of thermal comfort, the statistics and indicators involved as well as affordable cooling technologies and their applicability in various climates.

Session plan is as follows:

Day 1- April 20th, 2022 (Wednesday)		
10h00 – 10h10	**Welcome address by GIZ**	**Mr. Markus Wypior, Dy. Cluster Co-ordinator, GIZ**
10h10 – 10h20	**Introduction to Rachna Training Programme**	**Prof. Rajan Rawal Senior Advisor, CARBSE, CEPT University**
10h20 – 10h30	**Special address by BMTPC**	**Dr. Shailesh Kumar Agrawal, Executive Director, BMTPC**
10h30 – 10h45	**Keynote address by MoHUA**	**Shri. Kuldip Narayan Joint Secretary andMission Director (HFA), MoHUA**
10h45 – 10h50	**Vote of thanks**	**Mr. S Vikash Ranjan, Project Head, IGEN-CSB, GIZ**
10h50 – 11h00	**Tea Break**	

11h00 – 11h45	**Session 2 (Technical): Importance of Thermal Comfort** *This session will establish the importance of thermal comfort. It will provide an insight into the connections between comfort, physiology, health, and productivity. It will very briefly expose the readers to the connection between buildings and comfort. It will provide overarching guidance about the ways and means to achieve comfort in buildings. With the help of examples, the section on the factors affecting thermal comfort will help the reader understand the factors affecting thermal comfort. The chapter will end with establishing a relation between comfort and associated energy consumption through cooling needs.*	**Prof. Rajan Rawal**
11h45 – 12h00	**Questions and Answers**	
12h00 – 12h15	**Health Break**	
12h15 – 13h15	**Session 3 (Technical): Building Physics and its relationship with Thermal comfort** *This session will deal with building envelop, its heat transfer mechanism and its effect on the thermal comfort. Each heat transfer mode will be discussed in detail with its associated building elements. The chapter also will discuss climate context in detail and the impact of building elements on the comfort. The chapter will also provide selected case studies that demonstrates the correlation between envelop thermal performance, HVAC energy consumption and thermal comfort.*	**Dr Yash Shukla**
13h15 – 13h30	**Questions and Answers**	
13h30 – 14h15	**Lunch Break**	
14h15 – 15h00	**Session 4 (Technical): Fundamentals of Thermal Comfort** *This session will provide an insight into the connections between comfort and human behavior, physiology, and psychology in detail. The session will further provide advanced understanding about local discomfort, thermal asymmetry. It will discuss various theories of thermal comfort, thermal comfort induced behavior and emerging trends in thermo-physiology. It will provide overarching guidance about the ways and means to measure thermal comfort among occupants along with explanation of the metrics involved.*	**Prof. Rajan Rawal**
15h00 – 15h15	**Questions and Answers**	

15h15 – 16h00	**Session 5 (Technical): Affordable Housing Passive Design Strategies** *This session will start with the introduction of passive design and its importance. It will provide a quick overview of various strategies before detailing out few strategies that are important to be incorporated in affordable housing. The session will provide insights into the site level design decisions as well as building-level design decisions. It will further provide a comparative understanding of appropriate orientation, use of building mass to reduce radiative heat gains in warm climates, it will guide fenestration design, location, and shading design appropriate for affordable housing. The use of appropriate ventilation for comfort and well-being also will be covered in this session. The session will also provide selected case studies that have adopted best practice approaches at the site and at the building level to implement passive design strategies.*	**Prof. Rajan Rawal**
16h00 – 16h15	**Questions and Answers**	
16h15 – 16h30	**Health Break**	
16h30 – 17h15	**Session 6 (Technical): Building Materials and Methods of Construction for Affordable Housing** *This session will start with the overview of affordable walling, roofing and fenestration materials and technologies. It will further detail the appropriateness of materials and methods of the construction for housing and its applicability in various housing typologies. The chapter further enhances the understanding of the reader to adopt materials and methods according to the climate context. The focus would also be given to alternative construction technologies, low embodied carbon materials, availability of material locally and economics of it. The chapter will also provide selected case studies that have adopted best practice approaches at the building level with construction technologies and materials.*	**Dr Yash Shukla**
17h15 – 17h25	**Questions and Answers**	
17h25 – 17h30	**Session 7: Day 1 Concluding Remarks**	**Anmol Mathur**

Day 2- April 21, 2022 (Thursday)		
10h00 – 10h15	**Session 8: Day 1 Recap**	**Anmol Mathur**
10h15 – 11h15	**Session 9 (Technical): Building Codes, Affordable Housing and Thermal Comfort** *This session will provide an understanding of the provision of various thermal comfort-related clauses in the National Building Code, Eco Niwas Samhita, various guidelines provided by the government. It also will provide insights into the implementation of policy. The reader will be able to comprehend the process of implementing the code at the local level. It will discuss the programming of code implementation, the economics of it as well as the benefits of the codes. Further, this section will outline the codes implemented internationally through the voluntary market-based systems, government byelaw, provisions in ISO, and ASHRAE standards.*	**Prof. Rajan Rawal**
11h15 – 11h30	**Questions and Answers**	
11h30 – 11h45	**Health Break**	
11h45 – 12h15	**Session 10 (Technical): Application of Thermal Comfort in Affordable Housing- A Suite of Case Studies** *This session will bring salient features of the projects that have demonstrated approaches to achieve thermal comfort in affordable housing. This session will include the projects that were conceived using integrated design practices. The case studies in this session will highlight more than one aspect of the project that meets the objective of affordability and comfort. The on-site performance of the housing also will be included to help the participants understand the methods of field performances.*	**Prof. Rajan Rawal**
12h15 – 13h15	**Session 10A (Technical): Overview of Innovative construction technologies implemented in Light House Projects (LHPs)** *This session will highlight the following innovative technologies being implemented in six LHPs:* 1. *Chennai: Industrialized '3-S' Prefab Technology* 2. *Rajkot: Tunnel Formwork* 3. *Lucknow: Stay-in-Place Formwork System* 4. *Indore: Prefabricated Sandwich Panel System* 5. *Ranchi: Precast Concrete Construction – 3D Volumetric* 6. *Agartala: Light Gauge Steel Structural System & Pre-engineered Steel Structural System*	**Dr. Shailesh Kumar Agrawal, Executive Director, BMTPC**

13h15 – 14h15	**Lunch Break**	
14h15 – 15h00	**Session 11 (Technical): Thermal Comfort Study Methods** *This session will outline the field-based methods, theory-based method and laboratory-based methods adopted in the past and in the contemporary world to understand the thermal comfort. It will demonstrate the applicability of various methods. The session also will introduce some handheld tools and research protocols that can help derive thermal comfort studies. The session further will help to develop an understanding of the analytical approach for data collection and data analysis using appropriate methods of statistics.*	**Prof. Rajan Rawal**
15h00 – 15h15	**Questions and Answers**	
15h15 – 16h15	**Session 12 (Technical): Low Energy Cooling Technologies and Comfort** *This session will familiarize the participants with low energy cooling systems and technologies in gaining comfort. It will provide climate specific guidance as well as insights into their benefits and challenges. The participants will be able to comprehend the design and operation aspects of the low energy cooling system that can work in sync with building envelop. The session also will discuss spatial configuration of the building envelop to accommodate some of the low energy cooling systems.*	**Prof. Rajan Rawal**
16h15 – 16h30	**Questions and Answers**	
16h30 – 17h15	**Session 13: Discussions on quiz-questionnaires and feedback from participants**	**Prof. Rajan Rawal**
17h15 – 17h30	**Session 14: Concluding Remarks**	**Anmol Mathur**