Thermal Comfort
Performance based Design
Standard for Affordable
Housing in India

First Expert Group Consultation
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The Team

Building Policies, Building Performance Analysis, Sustainable Design Practices, Training

Research and Development in Building Policies, Development of Technical Standards

Affordable Housing Design and Policy, Research in Traditional Building Techniques

Total Housing Inc.

Affordable Housing Policies & Strategy Formulation, Micro Finance, Urban Renewal
Context and background

Outlines the guiding principles and conceptual approach towards standard development.
Context

India is rapidly urbanizing.
- Urban population will nearly double by 2051 to 880 Million

So is the demand for affordable housing.
- Nearly 90% of affordable housing demand is unmet.

Inadequate housing increases vulnerability to climate change
- About a quarter of India’s urban population—live in informal settlements, vulnerable to climate risks

Affordable, low-carbon, climate-resilient housing is critical to improving quality of life and supporting economic development in cities around the world.

Source:
1. Affordable And Quality Housing Is Still A Dream For Many In India
2. Resilient and affordable housing for all: Lessons on house building from Kochi and Trivandrum, India, Coalition for Urban Transitions
Program Overview

1. **Thermal Comfort Performance based Design Standard**
   - Develop Design Standard for Affordable Housing based on Thermal Comfort Performance
   - Facilitate Design Standard in bye-laws of 6 ULBs across India

2. **Design Guidelines for Thermally Comfortable Homes**
   - Develop Design Guidelines for 5 Climatic Zones in India
   - Develop Training Modules for Dissemination

3. **Thermal Comfort Action Plan**
   - Design Financial Incentive Schemes
Workshop Objective

Review and feedback on:

1. Approach for Development of Design Standard for Thermally Comfortable Affordable Housing

2. Affordable Housing Characteristics
   - Affordable Housing Typologies
   - Affordable Housing Material Characteristics

3. Thermal Comfort Standards and Indices
Thermal Comfort Action Plan 2050 & Development of Thermal Comfort Based Standard cum Guidelines for Affordable Housing

Thermal Comfort Scope

Determinants of Thermal Comfort

- Clothing insulation
- Metabolic rate
- Human comfort

Determinants of Building Design

- Humidity
- Air temperature
- Mean radiant temperature
- Air speed
- Wall
- Window
- Interior lighting
- Roof
- Daylight
- NV
- Night ventilation
- Wall
- Window
- Roof
- Interior lighting
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APPROACH & METHODOLOGY FOR STANDARD DEVELOPMENT
Development Approach

Outlines the guiding principles and conceptual approach towards standard development.
Guiding principles for developing standard

1) Target **enhancing thermal comfort by 50 %** (over existing performance)

2) Employ **passive design** strategies to enhance comfort (i.e. without mechanical conditioning systems)

3) Through standard promote use of,
   - **local building materials** (also low in embodied energy),
   - **low or ‘No’ cost strategies** to enhance comfort, and,
   - **expeditious construction techniques/technologies**
Approach to standard development

1. Establish COMFORT POTENTIAL

2. Establish MINIMUM PERFORMANCE through Passive Means

3. Establish ENHANCED PERFORMANCE by Low energy or added cost technologies

Image Credit: Andrew Marsh
Development Methodology

Outline key steps/tasks in developing standard.
Thermal Comfort Action Plan 2050 & Development of Thermal Comfort Based Standard cum Guidelines for Affordable Housing
A| Research

1. Review policies to outline affordable housing typologies and their attributes (area, family characteristics, etc.)
2. Conduct market analysis through data in public domain (journals, industry & technical reports, project information – pvt. & govt., case studies) to outline:
   1. typical building characteristics,
   2. range of attributes
   3. exemplary building practices
3. Review technical documents (codes, standards, peer reviewed journals, technical reports, etc.) to outline suitable:
   1. adaptive comfort models
   2. thermal comfort indices & metrics
   3. energy modeling best practices
B| Simulation Studies

1. Weather analysis to
   1. realize comfort potential for climate zone
   2. outline natural ventilation and window operation potential

2. Parametric studies to identify
   1. Sensitivity and Correlation of building parameters to comfort performance

3. Establish minimum and enhanced performance characteristics
C| Code Development

1. Translate performance characteristics to Design features
2. Frame prescriptive Requirements
3. Devise compliance paths and adapt requirements for Mandatory/Prescriptive/Enhanced Performance
4. Compile Design Standard
Expected Outcomes

A Standard based on Adaptive Comfort Models

A Standard focused on Envelope Measures & Passive Design

A Standard that establishes Minimum & Enhanced Performance Criteria
Ease of Compliance – key to uptake & adoption

**Easy to Interpret**
Outline Min. performance criteria
Layout standard by Sections
Examples of calculations

**Easy to Comply with**
Form based Prescriptive approach
Alternative paths to document beyond code performance

**Prescriptive approach**
Easy to adopt and document.

**Performance approach**
Equation or simulation based compliance for flexibility in design & to promote beyond code performance

**Performance bundles approach**
Pre-defined design bundles to reduce burden of compliance on end user

**Easy to Verify**
Checklist based compliance.
Thank You!