

Conclusions and Recommendations

- From a policy perspective, the requirements of the ECBC need to be incorporated in the model bye-laws of the central government, and in to the local bye-laws by the ULBs. Deconstructing ECBC in to tiers will help the implementation of ECBC at the state and local levels. The Tier 1 requirements can be incorporated in to the local building bye laws more easily for mandatory compliance enforced by the ULBs.
- Within the Tiered Approach to ECBC, the occupancy certificate will be issued by the ULB for compliance with Tier 1 of ECBC. HVAC systems efficiencies can be enforced through an expanded labeling program. Lighting system installations can be checked by independent Third Party Assessors.
- A building owner who successfully implements only Tier 1 in the building will be recognized for completing a set of requirements, as opposed to being penalized for not completing the requirements in the higher tiers. This builds success stories and encourages builders and developers to attempt the higher tiers in subsequent building projects.
- This approach is anticipated to result in higher compliance rates for Tier 1 and result in larger cumulative lifetime energy savings.
- As the market gains momentum in these areas, BEE can focus on updating ECBC to achieve higher levels of energy efficiency in buildings in India.

Acknowledgment

This was carried out by CEPT University, The Weidt Group and was funded by the Shakti Sustainable Energy Foundation (SSEF).

An initiative supported by



For Further Information, contact

Ms. Asha Joshi

Centre for Advanced Research in
Building Science and Energy
CEPT University, K.L.Campus, Navarangpura
Ahmedabad 380 009, INDIA

Phone: +9179 2630 2470 Ext 183

Email: ashajoshi@cept.ac.in

Website: www.cept.ac.in/carbse

Developing A Tiered Approach for ECBC Compliance

Background: The Bureau of Energy Efficiency, India (BEE) developed the Energy Conservation Building Code (ECBC). Through mandatory ECBC compliance, India can achieve estimated annual energy saving of 1.7 billion kWh. The rate of compliance with ECBC is forecasted at 10% until 2013, 35% by 2015 and 65% by 2017.

Project Overview

Shakti Sustainable Energy Foundation funded the Centre for Advanced Research in Building Science and Energy (CARBSE), CEPT University, and The Weidt Group to conduct a study to develop a tiered approach to ECBC compliance. An evaluation of individual ECBC measures for energy savings, incremental cost, and ease of enforcement. The findings were peer reviewed and the measures were then bundled into tiers. Lower tiers include ECBC measures that are easy to market adoption, and are enforceable through the current building permit process. This will help build capacity over time and allow developers to get experience with building energy efficiency, without reducing stringency of the code. This approach can be enforced more effectively given the current construction and real estate practices.

Summary of Research Outcomes to

Proposing a Tiered Approach

A tiered approach for ECBC compliance was proposed. Under this approach, Tier 1 can include those requirements of ECBC that are easy for market adoption, have high return on investment (ROI), and are enforceable through the current building permit process. Tier 2 and Tier 3 can include additional measures that are more difficult to implement or enforce. This shows the market transformation that could be achieved through such a tiered approach.

By keeping Tier 1 easier for market entry, the compliance rates for Tier 1 can be higher, resulting in significant energy savings.

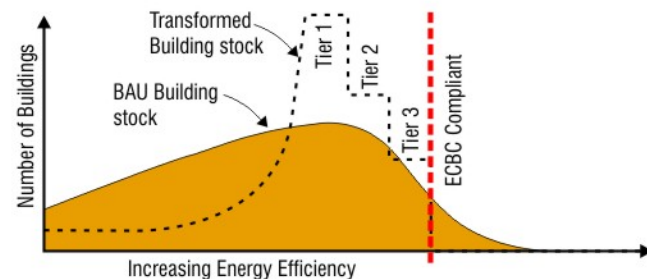


Fig 1: Market transformation that could be achieved through tiered approach towards ECBC compliance

Research work undertaken for proposing a Tiered Approach

In-depth research was conducted to arrive at the tiered approach. The research methodology included the following elements of work:

- 1 Energy Analysis:** Using Energy simulation, the savings potential of 75 individual Energy Conservation Measures (ECM) was evaluated for 90 different cases of notional office buildings differing in floor areas, climatic zones, building operation schedules and building plan proportions.
- 2 Defining a Baseline or Business as Usual (BAU) scenario:** Through ground level research for each climatic zone, a BAU scenario was defined incorporating current practices for building systems, building operation schedules, thermal comfort set-points, schedules for enabling cooling and heating systems, fuel types and electricity rates.
- 3 Cost estimation:** The BAU scenario and the improved efficiency scenario costs were estimated in detail to arrive at the incremental cost for each ECM. The costs included cost of raw material at site, installation cost, taxes and prevailing business practices for profit margins. These incremental costs were then normalized to the floor area.
- 4 Implementability and enforceability:** Implementability of each ECM was evaluated for the current level of expertise in the industry and enforceability of each ECM was evaluated for the local government officials' ability to carry out compliance checks.
- 5 Peer Review:** The evaluation for energy savings, costs, ROI, implementability and enforceability was peer reviewed at a workshop by industry experts.
- 6 Individual ECM Energy Results Summary:** Annual energy consumption of BAU scenarios ranges between 140 and 633 kWh/m² with an average of about 360 kWh/m². As compared to the average annual energy consumption of BAU buildings of about 360 kWh/m², the energy savings for an individual measure was as high as 40%. The incremental construction costs for an individual measures was as high as 5500 Rs/m². ECMs have a wide range of potential energy savings compared to business-as-usual scenarios.

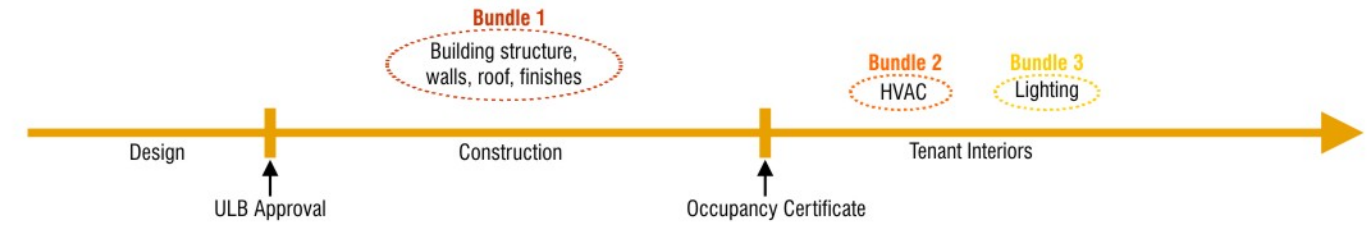


Fig 2: ECBC compliance check process under approach 2

Formulating the Tiers

The Tiers were formulated based on feedback from the peer review and with special attention to issues of implementation as well as enforcement in the building approval process in typical ULBs.

Tier 1 contains ECMs that can be checked when the building shell is completed and ready for approval. Tier 2 contains ECMs that could be implemented by the developer/owner under labeling programs. Tier 3 contains measures that may require an independent third party assessor to do the compliance check, or may require a change in the way ULBs currently provide building completion approvals. With this approach, the compliance check process is aligned with the current building permitting process. This makes enforcement by the ULBs easier than an approach that tries to enforce and implement ECBC in its entirety. The ECMs in Tier 1 add up to over 80% of lifetime energy savings based on Equipment Useful Life (EUL) (see Fig 3).

Lifetime Savings based on Equipment Useful Life (kWh/m²)

Savings for Tiers are incremental

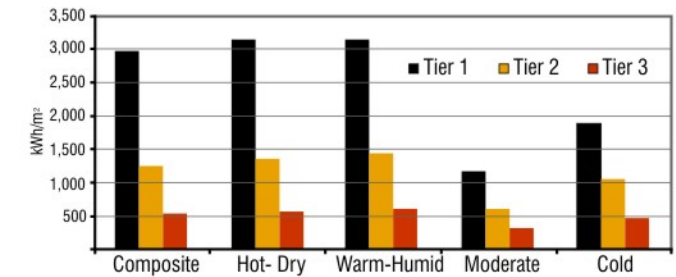


Fig 3: Lifetime energy savings with Approach 2

ECMs under Approach 1



ECMs under Approach 2

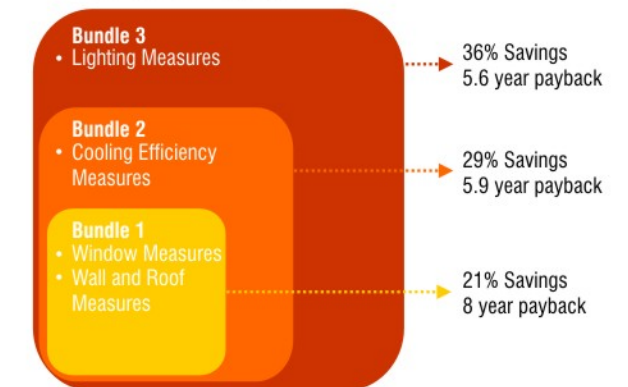


Fig 4: Energy saving measures (ECMs) under tiered approach 1 and approach 2 for ECBC compliance.