Energy Conservation Building Code
Regional Experiences – Gujarat, Maharashtra, Madhya Pradesh

2nd Region; Workshop on ECBC Implementation in States
March 16, 2017, Ahmedabad
Energy Conservation Building Code, India

ECBC set minimum energy efficiency standards for design and construction

It encourage energy efficient design or retrofit of buildings

It does not constrain the building function, comfort, health, or the productivity of the occupants

Has appropriate regard for economic considerations
Adoption
– Mandatory requirement is to be adopted at SDA or by the ULB or by an agency such as the state PWD. ECBC compliance is included in building bye-laws.

Implementation
– Architects and engineers design the building to meet ECBC requirements
– Contractors construct and commission the building to meet ECBC Requirements

Enforcement
– The process of checking ECBC requirements in a building
– Happens at design stage to get construction permit, and after construction to get occupancy certificate
Energy Conservation Building Code, India

Code Enforcement Overview

Step 1 must be a compliance check before construction that gives a permit to construct based on drawings and Documentation.

Step 2 must be a compliance check with on-site inspection that ensures that the building as an asset is code compliant.

Step 3 may be an optional ongoing check for compliance based on building Energy Performance Index.
Compliance Approaches

**Mandatory Requirements**

- **ENVELOPE**
- **HVAC**
- **LIGHTING**
- **ELEC. POWER**
- **SHWP**

**Applicable BUILDING SYSTEMS**

**COMPLIANCE APPROACHES**

- Prescriptive
- Trade-off option (for **ENVELOPE** only)
- Whole Building Performance

*Required for ALL Compliance Approaches*
Energy Performance Index of Buildings

Source: TWG-CEPT Study
Savings Summary Of Various Energy Conservation Measures

Source: TWG-CEPT Study
Implementation and Enforcement

Approach 1: Energy Saving

– The most promising measures for each climate zone in terms of annual energy savings are included in the first Bundle.

– Thus, ECMs with high energy savings are in Bundle 1, followed by moderate energy savings in Bundle 2 and those with lower energy savings in Bundle 3.

– This ensures that high energy savings are realized even when the first step- Stepped Bundle 1 is implemented.

Source: TWG-CEPT Study
Approach 1  Hot-Dry and Warm-Humid Climates

Bundle 1

• Cooling Efficiency Measures
• Window Measures

22-25% Savings
7 year payback

Bundle 2

• Wall and Roof Measures

28-29% Savings
6.0 year payback

Bundle 3

• Lighting Measures

35-36% Savings
5.6 year payback

Source: TWG-CEPT Study
Approach 1  Cold, Moderate and Composite Climates

Bundle 1
- Cooling Efficiency Measures
- Window Measures
- Wall and Roof Measures

18-29% Savings
6.5-9.4 year payback

Bundle 2
- NA

NA

Bundle 3
- Lighting Measures

30-36% Savings
5.9-8.0 year payback

Source: TWG-CEPT Study
Construction and Permitting Process

For majority developer projects

Design
- ULB Approval

Construction
- Bundle 1: Building structure, walls, roof, finishes
- Bundle 2: HVAC
- Bundle 3: Lighting

Owners / Tenant / Interiors
- Occupancy Certificate

Source: TWG-CEPT Study
Implementation and Enforcement Approach 2: Ease of implementation

Bundles area arranged with ECBC requirements that align with the current building permitting process

- Bundle 1 contains measures that can be checked when the building shell is completed and ready for approval given the current construction approval process of most ULBs.
- Bundle 2 contains measures that could be implemented by the developer/owner with labeling programs as the mode of enforcement.
- Bundle 3 contains measures that are difficult to enforce with labeling programs or with the current ULB approval process, and may require an independent Third Party Agency.

Source: TWG-CEPT Study
Approach 2 Hot-Dry and Warm-Humid Climates

Bundle 1
- Window Measures
- Wall and Roof Measures

Bundle 2
- Cooling Efficiency Measures

Bundle 3
- Lighting Measures

Savings and Payback:
- Bundle 1: 21% Savings, 8 year payback
- Bundle 2: 29% Savings, 5.9 year payback
- Bundle 3: 36% Savings, 5.6 year payback

Source: TWG-CEPT Study
Approach 2 Cold, Composite and Moderate Climate

Bundle 1
- Window Measures
- Wall and Roof Measures

Bundle 2
- Cooling Efficiency Measures

Bundle 3
- Lighting Measures

30-36% Savings
5.9-8.0 year payback

20-29% Savings
6.7-9.4 year payback

13-22% Savings
10-15 year payback

Source: TWG-CEPT Study
Approach 2

- **Bundle 1**
  - Window Measures
  - Wall and Roof Measures

- **Bundle 2**
  - Cooling Efficiency Measures

- **Bundle 3**
  - Lighting Measures

  - Third Party Assessor Verification
  - Appliance Labeling Program
  - ULB Approval

Source: TWG-CEPT Study
Enforcement Models

- Urban Local Body (ULB) Model
- Third Party Assessment (TPA) Model
- ECBC Expert Committee (EEC) model
Energy Conservation Building Code, India

ULB Building Permit Flowchart

Ahmedabad

- Drawings in prescribed format
  - Signed by Lic. Architect, Engineer & Clerk of Works

- Documents
  - Ownership + Affidavits + Undertakings (i.e. Construction Safety, Child Labour, Aviation rules, Preservation of Tree / Water well etc)

- Scrutiny officer – Checks Drawings and documents
  - Junior level officer and senior level officer
  - Sometimes they visit the site before construction

- Assistant Town Planners Approval
  - Based on Scrutiny officer’s recommendation

- ULB Zone level Inward officer receives
  - OR
  - Online submittal of drawings and documents

- Zone level office drawing department – verification about site conditions

- ULB Assistant Commissioner
  - For Final Approval and signature

- Municipal Commissioner Final Approval
Increasingly popular mode of code enforcement.
• Allows easier scale up and scale down of capacity to handle growth
• Once instituted, it can include Rating Authorities

Challenges
– Requires a certification and qualification for TPAs

• Examples of Success
– Adopted in China with good success, 80% compliance reported.
– In response to issues about municipal-led regulatory enforcement, governments in Canada have used TPAs.
– Over 90% of the US State of Pennsylvania's 2,562 municipalities have enforced the code locally, using employees or via Certified TPAs.
– Rating systems with TPAs used in Australia (NABERS), USA (HERS)
ECBC: Implementation Challenges and Approach

- **Urban Local Bodies to enforce**
  - Scope up to building construction
  - No control over operation of building
  - Limited Capacity

- **Tiered approach of implementation**
  - ULB focused –
    - Construction permit
    - Occupancy permit
  - State Designated Agency
    - Third party assessment
    - Utility managed assessment process

Energy Saved by Each Measure of Building
Challenge: Estimation of energy savings at city level

- How much energy can be saved
  - Envelop and/or building systems
  - At city or At State level

- Should code be expanded to/for
  - Smaller commercial buildings
  - Large residential buildings

- Prioritise enforcement

- Readiness and benefits to industry
  - Manufacturing
  - Service Industry

Prediction of future energy scenario
Extending work to potential retrofits and Emissions

- 1 KWh/m²-year efficiency in the total existing floor space at Ahmedabad can result in City level cost savings: INR 79.8 crores
  - Avoided CO₂ emission and avoided installed capacity
  - **Triple bottom line Energy, Environment, Equity**
THANK YOU

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Backup Slide
Third Party Assessors (TPA)

Local Government:
- ULB

Central Government:
- MoUDc

State Government:
- GEDA

Projects
- Consultation
- Recommendation letter
- Verification

Utilities
- Construction and Occupancy permit
- Increased tariff

Special Purpose Vehicle (BEE/EESL/NPC)
- Accreditation
- QA Report

ECBC AP
- TPA (ECBC AP+)
- QA bodies (TPA+)

SERCs

Coordination of tariff for non-compliance
Payment of fees
Penalty
List of violations
List of violations
Documentation

Tariff notification
Annual audit
Registration
Empanelment