Energy Conservation Building Code

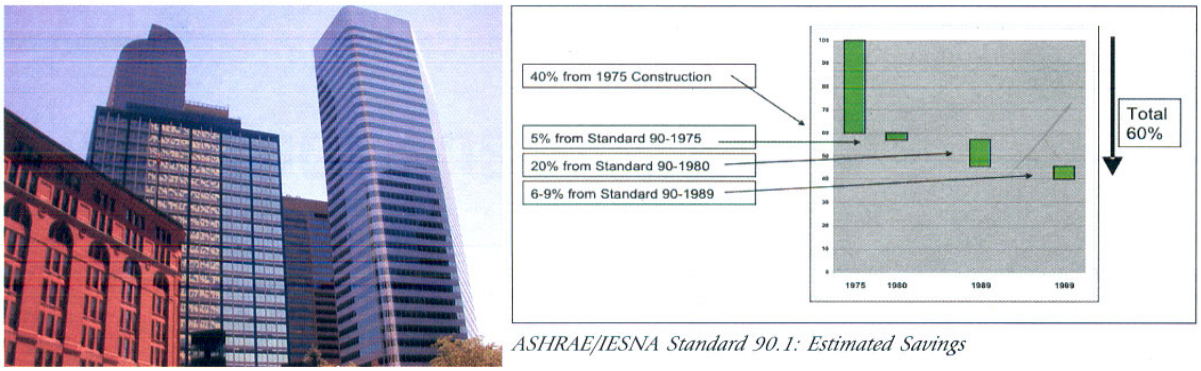
Powering Energy Conservation

Introduction

Building design has not been a subject of study in India for its electrical and thermal performance. Building configuration, its aesthetics, first cost, uniqueness and ultimate salability are some of the factors, which have driven the building design. With the result, the building's operating energy cost has increased tremendously as the energy efficiency factors were either not considered or ignored at the design stage.

Aiming to stop wasteful use of energy and bridge the power demand-supply gap, the Government enacted the Energy Conservation Act and established Bureau of Energy Efficiency under Ministry of Power. One of the important provisions of the EC Act relates to the enforcement of Energy Conservation Building Codes for efficient use of energy and its conservation in the buildings or building complexes.

Energy Conservation Building Code (ECBC) sets the minimum energy performance standards for buildings. ECBC for commercial buildings are widely considered to be cost-effective as government-based regulatory programs that can potentially help to capture substantial energy savings. It is essential that new buildings be designed and built with energy efficiency considerations having been incorporated right from the initial stages. The development of energy conservation buildings codes is necessary for this purpose. The intention of the ECBC is to benchmark energy consumption levels in large commercial buildings and introduce a level of awareness for energy conservation.



ASHRAE/IESNA Standard 90.1: Estimated Savings

Energy conservation building codes have had a long and proven history of improving energy performance of buildings and yielding significant savings. ECBC has been used as one of the most effective tools for reducing energy use in buildings. The ASHRAE standard in the US, for example, has resulted in aver 60% reduction in energy use in typical buildings (as per figure).

In developing countries, estimates of potential energy savings for first-generation building energy coded have typically ranged from 20% to 35%, and these savings can be significant since commercial buildings can often account for 25% - 33% of the country's electricity use.

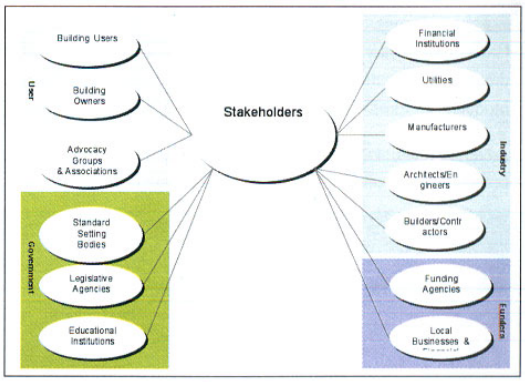
Energy Conservation Building Code-Provisions in the EC Act 2001

As defined in the EC Act, "energy conservation building codes" means the norms and standards of energy consumption expressed in terms of per square metre of the area where the energy is used and includes the location of the building.

The EC Act empowers the Central Government under section 14 (p) to prescribe the Energy Conservation Building Code. Bureau of Energy Efficiency (BEE) has the responsibility under section 13 (d) to take suitable steps to prescribe guidelines for ECBC.

The EC Act mandates the ECBC for buildings with a connected load of 500 kW or contract demand of 600 kVA and above and are intended to be used for the commercial purposes and are constructed after the rules relating to ECBC have been notified by the States Governments under section 15 (a).

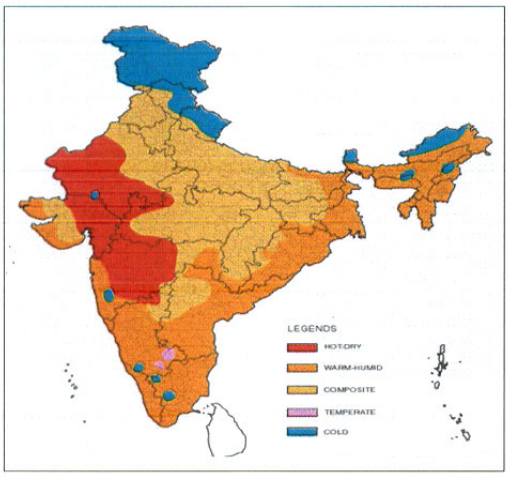
The ECBC will also be applicable to additions, alterations and modifications to existing buildings. Applicability to existing buildings is subject to several riders and exclusions, which are set out in the ECBC.



ECBC Development

The process adopted for developing the Energy Conservation Building Code is by facilitating participation of all stakeholders in the process, including architects, engineers, and other design professionals. Concerned government agencies, building product manufacturers, developers, and non-governmental organizations are also involved in the process.

BEE constituted a Committee of Experts (COE) and stakeholders that piloted such extensive consultation spread over 3 years. Participation of these groups ensured that the requirements are appropriate for local design conditions and construction practices.



Broad Stakeholder Participation

The ECBC has been developed to cater to 5 different climatic zones in the country, as is the case with the national building code. These climatic regions are composite, hot and dry, warm and humid, moderate and cold.

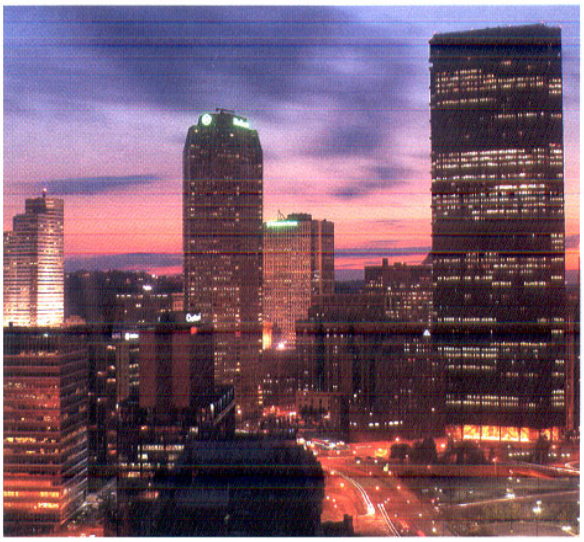
Due care has been taken to ensure that the codes regulating energy use in buildings are simple and easy to use. The code document will only specify performance requirement in an easy-to-use format.

Features of ECBC

The ECBC will set minimum energy efficiency standards for design and construction of a nonresidential building. Energy performance standards for the following building systems are included in the ECBC

- Building Envelope.
- Lighting.
- Heating Ventilation and Air Conditioning.
- Service Water Heating.
- Electric Power and Distribution.

However, the broad requirements of the Code with respect to the building envelope are the same for new buildings as well as for extensions and modifications.



ECBC provisions will enhance comfort and occupant productivity. ECBC encourage energy efficient design or retrofit of commercial buildings so that they are designed in a manner that reduces the use of energy without affecting the building function, the comfort, health, or the productivity of the occupants and with appropriate regard for economic considerations. These codes eliminate building design practices that lead to unnecessarily high building energy use and associated costs. Energy cost savings resulting from energy code compliance directly benefit building owners and occupants over the life cycle of the building.

All over the world, ECBCs have a proven track record of significantly reducing energy use in buildings in a highly cost effective way. The ECBC benefit both individual building owners and the people and government at large. Benefit to property owners include reduced energy costs and improved comfort (both thermal and visual). The benefits to society include the following:

- Reduced capital investments in energy supply infrastructure.
- Reduced environmental impacts.
- Improved electricity reliability.
- More efficient use of resource (It is cheaper to save energy than it is to build new power plants).

ECBC

- ECBC covers energy usage per unit of floor space and other high energy consuming equipments like HVAC, lighting.
- ECBC details the parameters of various building material to be used to achieve overall performance of building envelope so as to minimize heat gain and thus the cooling cost.
- ECBC specifies use of energy efficient glass combinations to maximize daylight and minimize cooling loads.

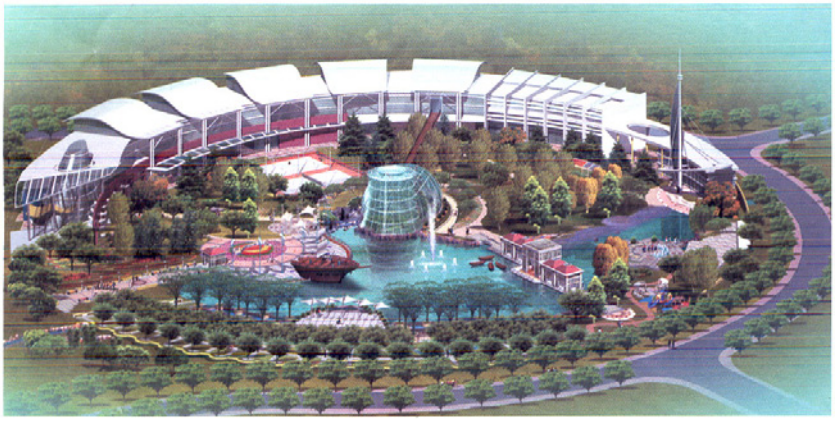
It is estimated that buildings that are ECBC complaint have a potential of savings to the tune of about 30%-35%.

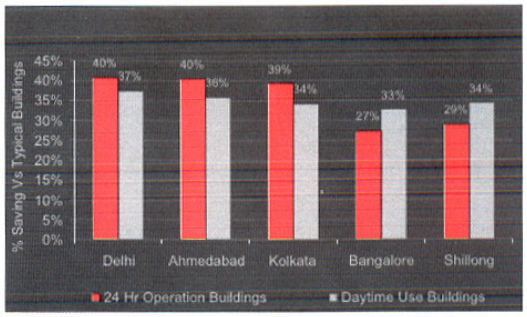
ECBC – Major Elements of the Building Plan

The ECBC seeks to specify performance requirement. However, it expects the building plans to include all pertinent data and features of the building, equipment, and systems in sufficient detail of the following:

- **Building Envelope:** insulation materials, fenestration, solar heat gain coefficients (SHGC), visible light transmittance, and air leakage; overhangs and side fins, building envelope sealing details.
- **Heating, Ventilation, and Air Conditioning:** system and equipment types, sizes, efficiencies, and controls; economizers; variable speed drives; piping insulation; duct sealing, insulation and location.
- **Service Hot Water and Pumping:** solar water heating system.

- **Lighting:** lighting schedule showing type, number, and wattage of lamps and ballasts; automatic lighting shutoff, occupancy sensors, and other lighting controls; lamp efficacy for exterior lamps.
- **Electrical Power:** electric schedule showing transformer losses, motor efficiencies, and power factor correction devices; electric check metering and monitoring systems.





Projected building level savings for different climates and building types due to ECBC
Source: ECBC Impact Analysis done by IIEC for BEE/USAID under the ECO Project)

ECBC – Benefits

In India, estimates suggest that about 20 to 25% of the total energy demand is due to manufacturing materials required in the construction sector, while another 15% goes into the running needs of the building.

The proposed Energy Conservation Building Code sets a minimum efficiency standard for commercial buildings in all climate zones in the country. The estimated reduction in energy use for new buildings range between 25% to 40% depending on climate, building type, and hours of operation.

ECBC benefits both the individual building owners and the society. Benefits to property owners include reduced energy costs and improved comfort (both thermal and visual).

The benefits to society include reduced capital investments in energy supply infrastructure, reduced environmental impacts, improved electricity reliability, and more efficient use of resources.

The proposed Energy Conservation Building Code sets a minimum efficiency standard for commercial buildings in all climate zones in the country. The estimated reduction in energy use for new buildings range between 25% to 40%.

The average energy use for typical commercial building is 200 kWh/sq metre/year. Mandatory enforcement of ECBC can reduce the energy use by 30-40% to 120-160 kWh/sq metre/year. In 2004-05, residential construction accounted for 19.25 million sq metres and commercial construction 21.50 million sq metres. For 2005-06, a 10% increase from previous year is expected.

Mandatory enforcement of ECBC is expected to yield annual saving of 1.7 billion units in the first year of its implementation itself based on current data.

Table: National energy savings technical potential for commercial construction

Year	Commercial Construction (sq metres)	Current Energy Use (kWh/Year)	Reduced Energy Use (kWh/Year)	Technical Potential for Annual savings (kWh)
2004-2005	21,500,000	4,300,000,000	2,795,000,000	1,505,000,000
2005-2006	23,650,000	4,730,000,000	3,074,500,000	1,655,500,000

ECBC Implementation – All India Level

The ECBC has been prepared to ensure that:

- The compliance processes are as simple, clear, and easy to use as possible.
- The proven techniques/ best practices globally are adopted appropriately to suit India's conditions and objectives.
- The compliance path is such that it incentives all major stakeholders.

The Government will take necessary measures to ensure proper dissemination of information about ECBC compliance procedures while making it consumer friendly. It also commits to identify appropriate methods of encouraging compliance, including monetary awards, publicity awards, building energy labels, and technical assistance.

Road Map to make ECBC Mandatory

Given the fact that the capacity in the country required to effectively implement this code is inadequate, the implementation of the codes will be on voluntary basis initially. Incentives to promote its use in the voluntary phase will be provided alongwith promoting the industry for insulators, windows, etc. Only when there is sufficient availability of both technical expertise and complaint material, will the codes be made mandatory. The Government will launch an effective awareness campaign to promote ECBC all over the country.

Conclusion

ECBC are delivering significant and lasting energy savings in new construction. ECBC are rightly considered as a pillar to any government energy efficiency and climate change policy. ECBC benefits both the individual building owners and the society. Benefits to property owners include reduced energy costs, improved comfort, reduced capital investments in energy supply infrastructure, improved electricity reliability and efficient use of resources.

Reference Book:

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