



PROCEDURE FOR ECBC COMPLIANCE

Uttarakhand Renewable Energy Development Agency (UREDA)

(State Designated Agency of Uttarakhand)

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Introduction

The Energy Conservation Building Code (ECBC) was launched in May 2007 by the Bureau of Energy Efficiency (BEE), Ministry of Power. Its main objective is to establish minimum requirements for energy efficient design and construction of buildings. Recognizing the energy and cost savings of efficient buildings and to help address growing energy needs. On 19th June 2017, Shri Piyush Goyal, Minister of State (IC) for Power, Coal, New and Renewable Energy and Mines launched the Energy Conservation Building Code 2017 (ECBC 2017) prescribes the energy performance standards for new commercial buildings to be constructed across India.

The updated version of ECBC provides current as well as futuristic advancements in building technology to further reduce building energy consumption and promote low-carbon growth. ECBC 2017 sets parameters for builders, designers and architects to integrate renewable energy sources in building design with the inclusion of passive design strategies. The code aims to optimise energy savings with the comfort levels for occupants, and prefers life-cycle cost effectiveness to achieve energy neutrality in commercial buildings

Importance of ECBC:

India's two thirds of the total building stock that will exist in 2030 are yet to be built. New buildings possess a great challenge to meeting its increasing energy demand. ECBC sets minimum energy efficiency levels for commercial buildings, locking in energy savings for years to come, retaining occupant comfort, while combating climate change.

Purpose of ECBC:

The purpose of the Energy Conservation Building Code (Code) is to provide minimum requirements for the energy-efficient design and construction of buildings. The Code provides two additional sets of incremental requirements for buildings to achieve enhanced levels of energy efficiency that go beyond the minimum requirements.

The ECBC was developed as a first step towards promoting energy efficiency in the building sector and addresses the views of the manufacturing, design, and construction communities as an appropriate set of minimum requirements for energy-efficient building design and construction.

ECBC in Uttarakhand

Uttarakhand has amended ECBC code according to the climatic conditions of the state. This code has been amended with detailed study and discussion with Local Architects and Scientists.

Following key parameters has undergone the amendments.

Climatic zones

In ECBC-2007, India is mapped under 5 Nos. of Climatic zones where as Uttarakhand has two climatic zones cold and composite. The plains of the state i.e. Pauri, Tehri, Champawat , Haridwar, Dehradun, U.S. Nagar etc. fall under composite climate while the hills fall under cold climate.

Scope Definition

Looking into the geo-climatic conditions of Uttarakhand, the Code is applicable to buildings or building complexes that have a connected load of 50 kW or greater or a contract demand of 60 kVA or greater or The plot area of the building is more than 500 m² with minimum 500 m² as built-up area (excluding basement) and are intended to be used for commercial purposes.

Buildings intended for private residential purposes only are not covered by the Code.

The scope of the ECBC 2017 covering the main building design components, i.e.

- Building Envelope,
- Comfort systems and Controls,
- Lighting and controls and
- Electrical and Renewable Energy systems.

Saving Potential:

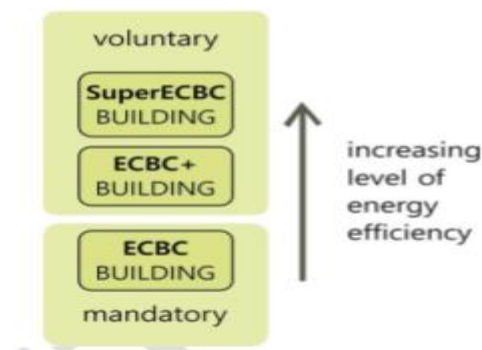
The building sector represents about 33% of electricity consumption in India, with commercial sector and residential sector accounting for 8% and 25% respectively. Estimates based on computer simulation models indicate that ECBC-compliant buildings can use 40% to 60% less energy than conventional buildings. It is estimated that the nationwide mandatory enforcement of the ECBC will yield annual savings of approximately 1.7 billion kWh. The ECBC is expected to overcome market barriers, which otherwise result in underinvestment in building energy efficiency

Potential for reducing energy use with technology and materials thus varies from building type to type. By analysing this potential, ECBC energy efficiency requirements are now sensitive to building typologies and, to the extent possible, only requirements that are feasible have been included.

Energy Efficiency Performance Levels

In addition to Code compliance, ECBC has introduced two voluntary performance thresholds for buildings that choose to go beyond Code and achieve higher energy performance.

The materials and technology to design a high performance building is available in the market today. The first cost might be higher, but the life cycle cost is lower. In the near future, market transformation will make high performance buildings mainstream. This will further help in the smooth transition to the next technical update of the Code with higher stringency levels eventually leading the country towards the net zero energy goal.



COMPLIANCE AND APPROACH

While ECBC is adopted as a national Code, the State governments can have some additional or amended requirements. Hence, when using this manual, one should check with the adopting jurisdiction for supplemental information on compliance.

To comply with Code, building needs to meet the following two requirements.

- 1) Comply with the mandatory requirements as per Section 4.2, Section 5.2, Section 6.2 and Section 7.2
- 2) Determine the Energy Performance Index Ratio (EPI ratio) as defined in Section 3.1.2. To comply with the Code, buildings shall have an EPI ratio less than or equal to 1.

Determining the EPI ratio for all buildings is a major update in the Code. The EPI ratio provides a means to quantify energy performance of building. Just being Code compliant does not communicate

how well the building is performing. EPI ratio clearly recognizes buildings going beyond Code compliance. The intent of including the EPI ratio is to encourage project proponents to aim for better energy performance beyond Code compliance.

Energy Performance Index

The Energy Performance Index (EPI) is a benchmark to measure the energy performance of a building. It is the annual energy consumption in kilowatt-hours per square meter of the building. EPI can be determined by:

$$EPI = \frac{\text{annual energy consumption in kWh}}{\text{total built - up area (excluding unconditioned basements)}}$$

Lower EPI denotes a lower energy use and hence a better performance. Buildings should target to achieve as low a EPI as possible. The EPI will have to be defined first before determining the EPI Ratio.

Determining EPI Ratio

The EPI Ratio of a building is the ratio of the EPI of the Proposed Building to the EPI of the Standard Building:

$$EPI\ Ratio = EPI\ of\ Proposed\ Building / EPI\ of\ Standard\ Building$$

Proposed Building is as per the actual design of the building, and complies with all the mandatory requirements of ECBC.

Baseline Building is a standardized building that has the same building floor area, gross wall area and gross roof area as the Proposed Building, complies with the mandatory requirements, and minimally complies with prescriptive requirements of ECBC 2017.

Compliance Requirements

New Building Compliance (Full building Compliance)

The main focus of the ECBC is on new buildings. Every building project is unique and the designer needs to address specific issues of building design and still comply with the Code. Hence the Code offers flexibility by providing multiple compliance approach.

New buildings with completed fit-outs shall comply with either the provisions of Section 4 through Section 7 of this Code or the Whole Building Performance Method.

Additions and Alterations to Existing Buildings

An addition is a new floor, wing or a block that extends or increases the area or height of the existing building. An example of an alteration could be a change in converting an unconditioned space to a conditioned space.

The Code is applicable when the connected load of the addition or the alteration plus the existing building exceeds 50kW or of connected load or 60 kVA of contract demand.

Approved Analytical Tools

Alternate Compliance Approach essentially requires the use of computer simulation tools that help estimate the energy use of a building. Only BEE approved software tools can be used to show compliance.

BEE approved list of software to show compliance

Analysis	Software	
Whole Building Performance Method	AECOSim	
	Design Builder DOE2	
	EnergyPlus	
	eQUEST	
	HAP	
	IDA-ICE	
	IES-VE	
	OpenStudio	
	Simergy	
	Trace700	
	TRNSYS	
	Visual DOE	
	Daylighting	AGI32 (Licaso)
Daysim		
Design Builder		
DIVA		
Groundhog		
IES-VE		
OpenStudio		
Radiance-Rhino-Grasshopper with Daylighting		
Plugins		
Sefaira		
Sensor Placement + Optimization Tool (SPOT)		

Administrative Requirements

Administrative requirements, including but not limited to, permit requirements, enforcement, interpretations, claims of exemption, approved calculation methods, and rights of appeal are specified by the authority having jurisdiction.

In the Uttarakhand Building Bylaws, Uttarakhand Renewable Energy Development Agency (UREDA) is the Nodal Agency for the issuance of a Compliance Certificate on ECBC.

Compliance Documents

Thorough documentation is essential for a smooth approval process. Documentation of compliance can be shown through drawings, technical data, specification, material brochure, calculations, report and any other supporting material.

As per the Code, construction drawings and specifications shall show all pertinent data and features of the building, equipment, and systems in sufficient detail to permit the authority having jurisdiction to verify that the building complies with the requirements of this code.

Details shall include, but are not limited to:

(a) Building Envelope: opaque construction materials and their thermal properties including thermal conductivity, specific heat, density along with thickness; fenestration U-factors, solar heat gain coefficients (SHGC), visible light transmittance (VLT) and building envelope sealing documentation; overhangs and side fins, building envelope sealing details;

(b) Heating, Ventilation, and Air Conditioning: system and equipment types, sizes, efficiencies, and controls; economizers; variable speed drives; piping insulation; duct sealing, insulation and location; solar water heating system; requirement for balance report;

(c) 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;

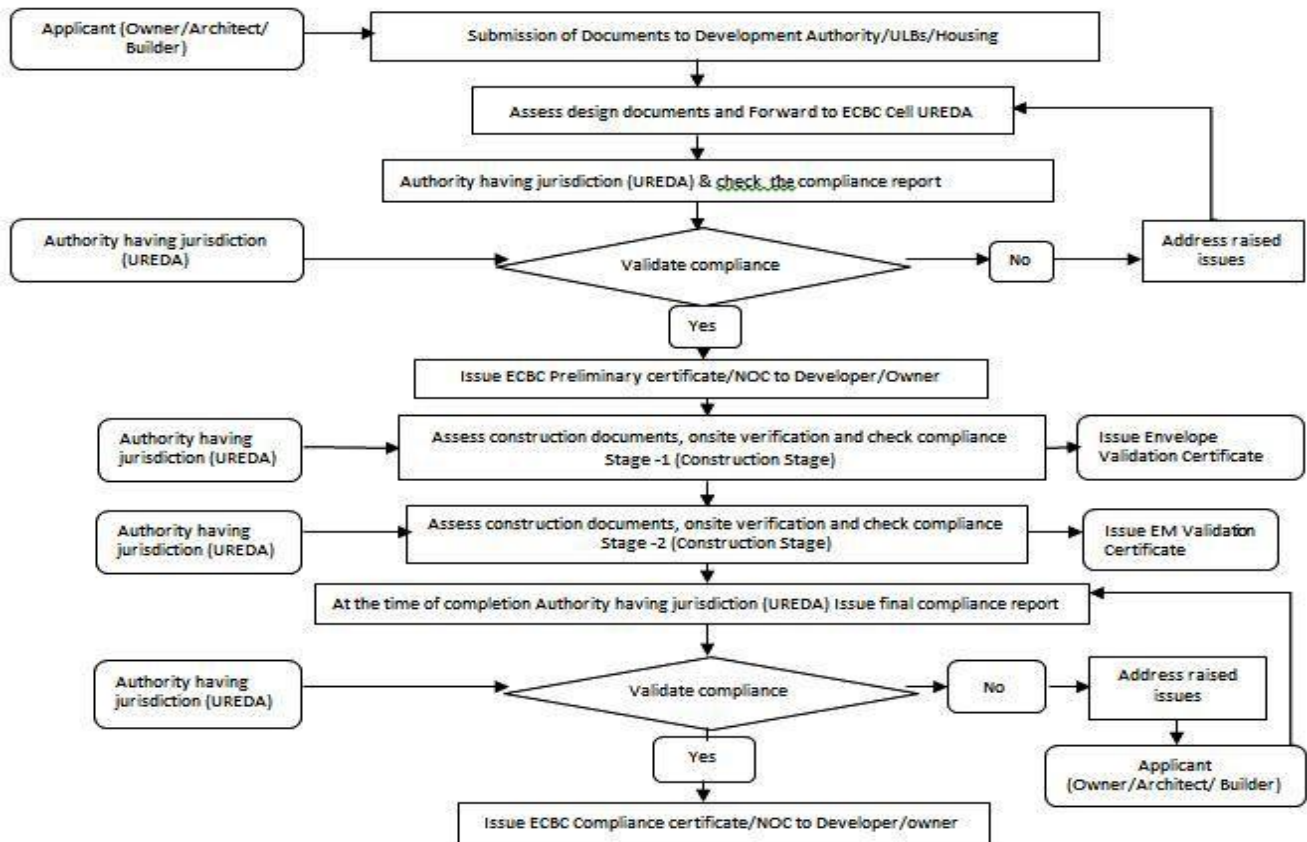
(d) Electrical Power: electric schedule showing transformer losses, motor efficiencies, and power factor correction devices; electric check metering and monitoring system.

(e) Renewable energy systems: system peak generation capacity, technical specifications, solar zone area

Supplemental Information

The authority having jurisdiction may require supplemental information necessary to verify compliance with this code, such as calculations, worksheets, compliance forms, manufacturer’s literature, or other data.

IMPLEMENTATION PROCESS FLOWCHART FOR ECBC



Documents Required for issuance the ECBC NOC:

- ECBC Compliance/Application Form.
- Compliance Report duly signed with Architects and Owner.
- CAD File and Electrical Drawing.
- A fee for preliminary, final evaluation and Site validation (Twice) shall be submitted in the form of NEFT/DD in the favour of DIRECTOR, UREDA payable at Dehradun.

The fee structure is as follows:

- For building less than or equal to 10000 m² built-up area without basement = Rs. 30,000.00
- For building greater than 10000 m² & less than or equal to 50000 m² built-up area without basement = Rs. 50,000.00
- For building greater than 50000 m² built-up area without basement = Rs. 70,000.00

Form-I

Application Form for seeking building permit in respect of erection/re-erection/making alteration in the Energy Conservation Building Code compliant building:

Uttarakhand Energy Conservation Building Code 2017 – Compliance Form

Project Info	Applicant Name and Address:-		
	Project Site Address:-		
	Contact Number:		Email id :
	Scope of Project Under ECBC: Proposed Connected Load <input type="radio"/> Proposed Contract Demand <input type="radio"/> Proposed Plot Area <input type="radio"/> Proposed Build-Up Area (Excluding Basement) <input type="radio"/>		Connected Load : Contract Demand : Plot Area : Build-Up Area (Excluding Basement):
Project Climate Zone :			

Building Classification	Assembly <input type="radio"/>	Health Care <input type="radio"/>
	Hospitality <input type="radio"/>	Shopping Complex <input type="radio"/>
	Educational <input type="radio"/>	Business <input type="radio"/>

Project Description	<input type="checkbox"/> New Building	<input type="checkbox"/> Addition	<input type="checkbox"/> Alteration	<input type="checkbox"/> Others
	<input type="checkbox"/> Self-occupied	<input type="checkbox"/> Core and Shell	<input type="checkbox"/> Mixed-Use	

Compliance is sought for Energy efficiency level	<input type="radio"/> ECBC Compliant	<input type="radio"/> ECBC+ Compliant*	<input type="radio"/> Super ECBC Compliant**
			EPI Ratio

* 20% more efficient than ECBC Standard Case * *40% more efficient than ECBC Standard Case Note: prescriptive compliance as an alternative to WBP compliance is as per UKECBC.

Method of Compliance	<input type="radio"/> Prescriptive Method	<input type="radio"/> Whole Building Performance Method
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The following information is necessary to check a building permit application-				
Code Section	Component	Information	Comply	
			Yes	No
9.1.2	Compliance	The estimated EPI ratio is equal to or less than 1 & meets all the mandatory conditions(4.2,5.2,6.2,7.2)		
9.1.3	Annual Energy Use	kilowatt-hours (kWh) of electricity use per year per unit area (m2) comply as per the code		

9.1.5	Documentation Requirements	Compliance document submitted to the SDA is complete.		
9.3	Simulation Requirements	The simulation program, at a minimum, used have the ability to model as per specified in the code		
9.4	Compliance Report	The WBP compliance report is submitted as per UKECBC Section 9.0		

The following documents are enclosed in support of the above information-

1. Building floor plans and site plan, elevations, sections, & design basis report
2. Prescriptive / WBP (Whole Building Performance) Compliance Report including-
 - a) Brief description of the project with location, number of stories, space types, conditioned and unconditioned areas, hours of operation.
 - b) List showing compliance with the mandatory requirements of this code.
 - c) **For WPB method:** List of the energy efficiency related building features of the Proposed Design. This list shall also document features different from the Standard Design case.
 - d) **For WPB method:** The input and output report (s) from the simulation program including a breakdown of energy usage by at least the following components: lights, internal equipment loads, service water heating equipment, space heating equipment, space cooling and heat rejection equipment, fans, and other HVAC equipment (such as pumps). The output reports shall also show the number of hours any loads are not met by the HVAC system for both the Proposed Design and Standard Design.
 - e) Compliance forms in Appendix D under Prescriptive Method or Whole Building Performance Method shall be submitted.
3. Fee for preliminary, final evaluation and Site validation (Twice) shall be submitted in the form of NEFT/DD in the favour of DIRECTOR, UREDA payable at Dehradun.

Fee structure is as follows:

 - (i) For building less than or equal to 10000 m² built-up area without basement = Rs. 30,000.00
 - (ii) For building greater than 10000 m² & less than or equal to 50000 m² built-up area without basement = Rs. 50,000.00
 - (iii) For building greater than 50000 m² built-up area without basement = Rs. 70,000.00

Declaration: I hereby declare that the details furnished above are true and correct to the best of my knowledge and belief and I undertake to inform you of any changes therein, immediately. In case any of the above information is found to be false or untrue or misleading or misrepresenting, I am aware that I may be held liable for it.

Signature of Architect

Signature of Owner