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Building Regulation Codes in India

- National Building Code (NBC)
- Energy Conservation Building Code (ECBC)
- Energy Conservation & Sustainable Building Code (ECSBC)

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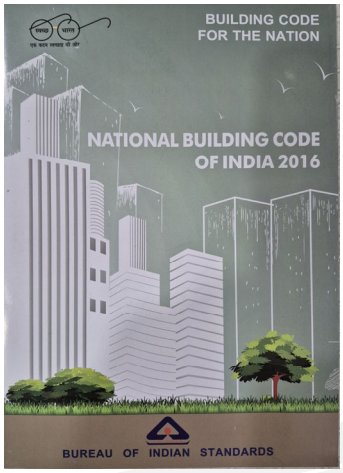
Jurisdictions

National Building Code (NBC)
Bureau of Indian Standards (BIS)
Ministry of Consumer Affairs
Govt. of India

Energy Conservation Building Code (ECBC)
Bureau of Energy Efficiency (BEE)
Ministry of Power
Govt. of India

The National Building Code (NBC)

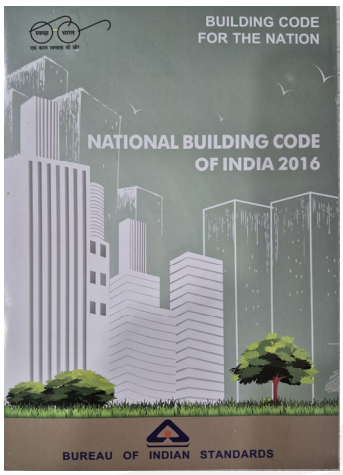
A comprehensive document containing all the information required by the architect, engineer, structural engineer, construction engineer, services engineer and other professionals from the early stages of planning to translating the building on to *terra firma*.



The National Building Code (NBC)

Theme of the code are the four pillars of safety

1. Structural Safety
2. Health Safety
3. Fire Safety
4. Public Safety (safety during construction and during use of building services) and sustainability.



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The National Building Code (NBC) - History

- To optimize the returns on the large public investment in building construction which was necessary for India's development, the Planning Commission appointed an expert committee to study the whole gamut of operations involved in such construction, in 1965.
- The expert committee presented its recommendations in its "Report on Economies in Construction Costs" published in 1968.
- The study led to the conclusion about the necessity of a unified building code at the national level, integrating regulations and byelaws at various levels of government, and reflecting the latest trends in building construction.
- The first version of the NBC was born and published in 1970.
- Vigorous implementation drive launched by the BIS (then ISI) to promote the use of the code.

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The National Building Code (NBC) - Revisions

- NBC 1983
- Two Amendments in 1987
- One Amendment in 1997
- NBC 2005
- Two Amendments in 2015
  1. New chapter on “Approach to Sustainability” and
  2. Modification/Inclusion of certain provisions on “Fire and Life Safety”
- Large scale changes over time viz. high-rise buildings, mixed occupancies, complex nature of building services, innovative construction materials/technologies, preservation of environment etc. led to a comprehensive revision of the NBC
- The result was the NBC 2016, the current version of the code.

NBC 2016

- A comprehensive and voluminous document containing 13 parts (part 0 to 12) and spanning 2210 printed pages.
- HVAC systems are discussed in Part 8 Building Services, Section 3 : Air-conditioning, Heating and Mechanical Ventilation, spanning 86 pages.
- The focus of NBC has traditionally been on safety.
- With the added focus on Sustainability in the 2016 version, fan efficiency provisions were introduced for the first time.
- The efficiency metric used in 2016 is the Fan Efficiency Grade (FEG), developed by AMCA.

NBC 2016 – Fan Efficiency Provisions

Part 8, Section 3, Clause 11.7 – Selection of Fan for Mechanical Ventilation

"The following selection criterion should be used to select fans for various types of mechanical ventilation applications for a new building

a) For axial fans requiring a shaft power of 2.5 kW or more, the fan efficiency grade shall be FEG 60 or more.

(b) For centrifugal fans requiring a shaft power of 2.5 kW or more, the fan efficiency grade shall be FEG 71 or more.

The minimum operating total efficiency of the selected fan at the desired point of operation for a given application shall be within 10 percentage points of its peak total efficiency value."

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Revision of NBC – NBC 2025

A revision of NBC 2016 has been overdue partly as a result of Covid. This exercise is now underway and it is expected that the revised version will be published later this year.

The panel on 'Air-conditioning, Heating and Mechanical Ventilation' has already submitted its draft of the revised section to BIS.

In a major shift in the fan efficiency provisions, it is proposed to replace the FEG criterion in NBC 2016 to the new Fan Energy Index (FEI) metric.

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NBC 2025 – Proposed Fan Efficiency Provisions

"The following selection criterion shall be used to select fan for various type of mechanical ventilation applications for a new building:

1. *For axial fan requiring a shaft power of 2.0 kW or more, its Fan Energy Index shall be 1.00 or more.*
2. *For centrifugal fan and mixed flow fan requiring a shaft power of 2.0 kW or more, its Fan Energy Index (FEI) shall be 1.10 or more.*
3. *The above prescribed minimum FEI values shall be applicable for all the duty points the fan is selected to operate at."*

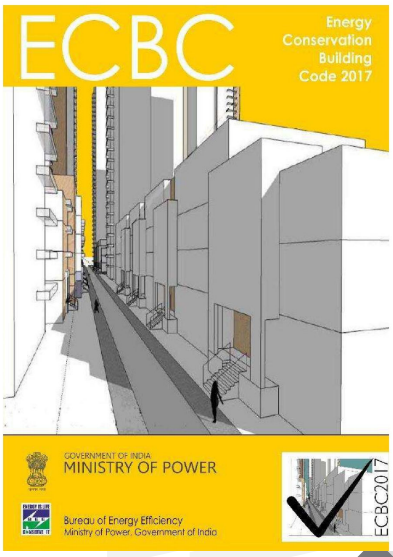
NBC 2025 – Proposed Fan Efficiency Provisions

For Fans used in Air Handling Units, the fan efficiency is prescribed in terms of a minimum fan efficiency of 65% with an IE3 motor or as per the provision of ECBC, whichever is more stringent.

It is further specified that for all fans used in AHUs having shaft power 2.5 kw or higher shall meet or exceed the FEI requirements of > 1.10.

Energy Conservation Building Code (ECBC)

- Introduced in 2007 under the Energy Conservation Act 2001 of Indian Parliament.
- Sets minimum energy performance standards for design & construction of large commercial buildings.
- Encourages energy efficiency without compromising building function, comfort, health or productivity of occupants.
- Bureau of Energy Efficiency (BEE) under the Ministry of Power is mandated to implement the ECBC.



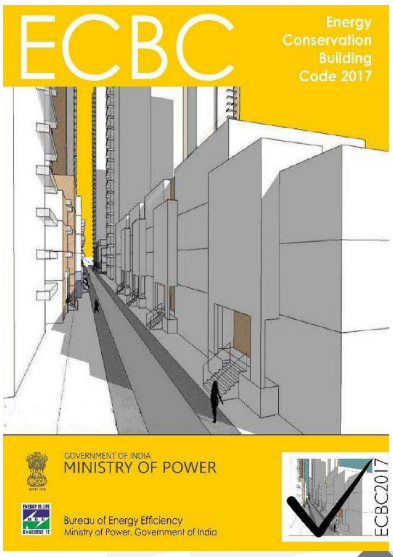
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ECBC 2017

ECBC 2007 was revised in 2017 as ECBC 2017 to

- Reflect advancements in building energy efficient technologies and materials
- Building management practices
- Streamline compliance processes
- Lower the threshold for applicability of ECBC



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ECBC 2017

- Commercial buildings with connected load of 100kW or more or contract demand of 120kVA or more
- Types of commercial buildings – Hospitality, Health Care, Assembly, Business, Educational, Shopping Complex, Mixed Use
- Provisions of the code apply to – Building Envelope, Mechanical Systems and Equipment including HVAC, Interior and Exterior Lighting, Electric Power and Motors and Renewable Energy Systems
- Three levels of energy efficiency rating
  - ECBC (meets minimum mandatory requirements)
  - ECBC+ (meets enhanced efficiency requirements)
  - Super ECBC (meets further enhanced efficiency requirements)

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ECBC 2017
Fan Efficiency Provisions

- Fan and motor minimum efficiency provisions are specified in the prescriptive requirements for supply, exhaust or return fans in AHUs with motor power exceeding 0.37kW
- Exceptions – Fans in un-ducted AC units, Fans with HEPA filters in Health Care Buildings and Inbuilt fans in energy recovery systems to pre-condition the outdoor air.
- ECBC Building – Fan efficiency 60% and IE2 motor
- ECBC+ Building – Fan efficiency 65% and IE3 motor
- Super ECBC Building – Fan efficiency 70% and IE4 motor

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ECSBC 2024

In recognition of the rising concerns about sustainability in the last decade and country's net zero goals, a pressing need was felt to incorporate elements of sustainability in the ECBC.

This was achieved by the publication of the "Energy Conservation and Sustainable Building Code 2024" with active support from ISHRAE.

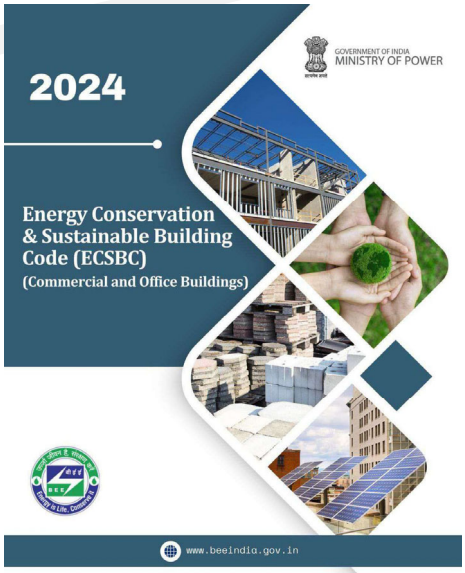
ECSBC 2024 incorporates provisions of sustainable development e.g. sustainable sites and planning, sustainable materials, waste management, water management, renewable energy, control strategies with IoT and raising the threshold on energy efficiency.

Three levels of ECSBC Building Rating – ECSBC, ECSBC+, Super ECSBC

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ECSBC 2024



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ECSBC 2024

More Stringent Fan Efficiency Provisions

Fan and motor minimum efficiency provisions for supply, exhaust or return fans in AHUs with motor power exceeding 0.37kW (*exception – Fans in un-ducted AC units where fan efficiency has already been taken into account to calculate the total efficiency of the comfort system*).

- ECSBC Building – Fan efficiency 65% and IE3 motor
- ECSBC+ Building – Fan efficiency 70% and IE4 motor
- Super ECSBC Building – Fan efficiency 75% and IE4 motor

For all Centrifugal and Axial Flow fans used in comfort systems that require shaft power of 2.0 kW or higher, the Fan Energy Index (FEI) shall be for

i. Centrifugal Fans ≥ 1.10
ii. Axial Flow Fans ≥ 1.00

ECSBC 2024 & NBC 2025

A note of Caution

ECSBC 2024

The final print version is still not out. As on 20 March 2025, the code is with the printer awaiting printing. Whatever has been discussed here is expected to be included in the final printed version, but will be confirmed only after the print version is available.

NBC 2025

The revised code is in the process of drafting and yet to be finalized. Whatever has been discussed here is what has been proposed by the drafting panel. The code draft has yet to go through a public review process before finalization and some provisions may change.

NBC & ECBC
Implementation

NBC – Primary Focus is Safety

Is a code written by the Bureau of Indian Standards (BIS) and is not mandatory by itself across the country. Instead, it serves as a model code that individual states, UTs and city planners can choose to adopt, modify or refer to in their local building regulations. Many states have fully aligned with the NBC, while others have only partially adopted it or have their own codes.

For fire safety, the NBC provisions are increasingly being made mandatory, in the absence of local regulations.

NBC is also indirectly enforced e.g. buildings falling under the jurisdictions of RERA – Real Estate (Regulation and Development) Act 2016 – are required to comply with NBC.

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NBC & ECBC
Implementation

ECBC – Primary Focus is on Energy Conservation

- Is a code written by the Bureau of Energy Efficiency (BEE) and the responsibility to adopt and enforce lies with the states and the UTs.
- States can amend the code to suit local or regional conditions and notify their own versions of ECBC.
- Some states offer financial incentives or fast track approvals for ECBC compliant buildings
- Several states including Delhi, Maharashtra, Karnataka and Telangana have made ECBC compliance mandatory.
- ECBC is also indirectly enforced e.g. buildings falling under the provisions of Environment Impact Assessment (EIA), are required to comply with ECBC.

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AMCA's Role and Support

AMCA has actively supported the work of revision of ECBC (ECSBC 2024) and drafting of the upcoming NBC 2025, over the last couple of years, on matters related to fan efficiency with particular reference to FEI. This has been made possible through the following two mediums:

1. AMCA's India Representative – Manoj Khati
2. AMCA Asia Region Advocacy Work Group (India)

- Asia AMCA
- Systemair
- Airflow
- Blowtech
- Flaktwood
- Greenheck
- Kruger

Fan Energy Index (FEI)

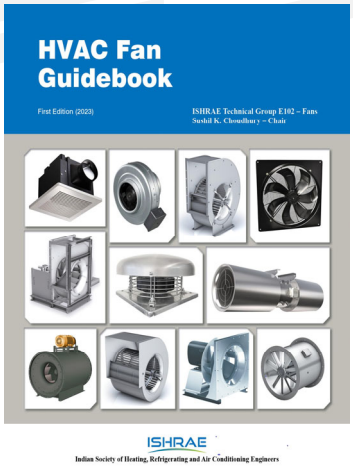
The Fan Energy Index (FEI) relates the electric input power to the fan motor (or to the motor drive) with the aerodynamic power imparted to the air by the fan. Thus, it is a measure of the overall efficiency of the fan system – a *wire to air* metric.

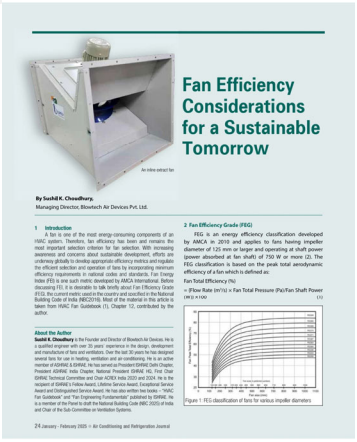
FEI is defined as an index (ratio) that compares the overall energy performance of the selected fan with that of a reference fan. The reference fan is a conceptual fan capable of producing the required airflow and fan pressure at a specified shaft power using a V-belt drive and a 4-pole, IE3 classification motor. The reference fan does not include speed control.

FEI of a selected fan at a desired duty point is defined as :

FEI = (Reference Fan Electrical Input Power)/(Actual Fan Electrical Input Power)

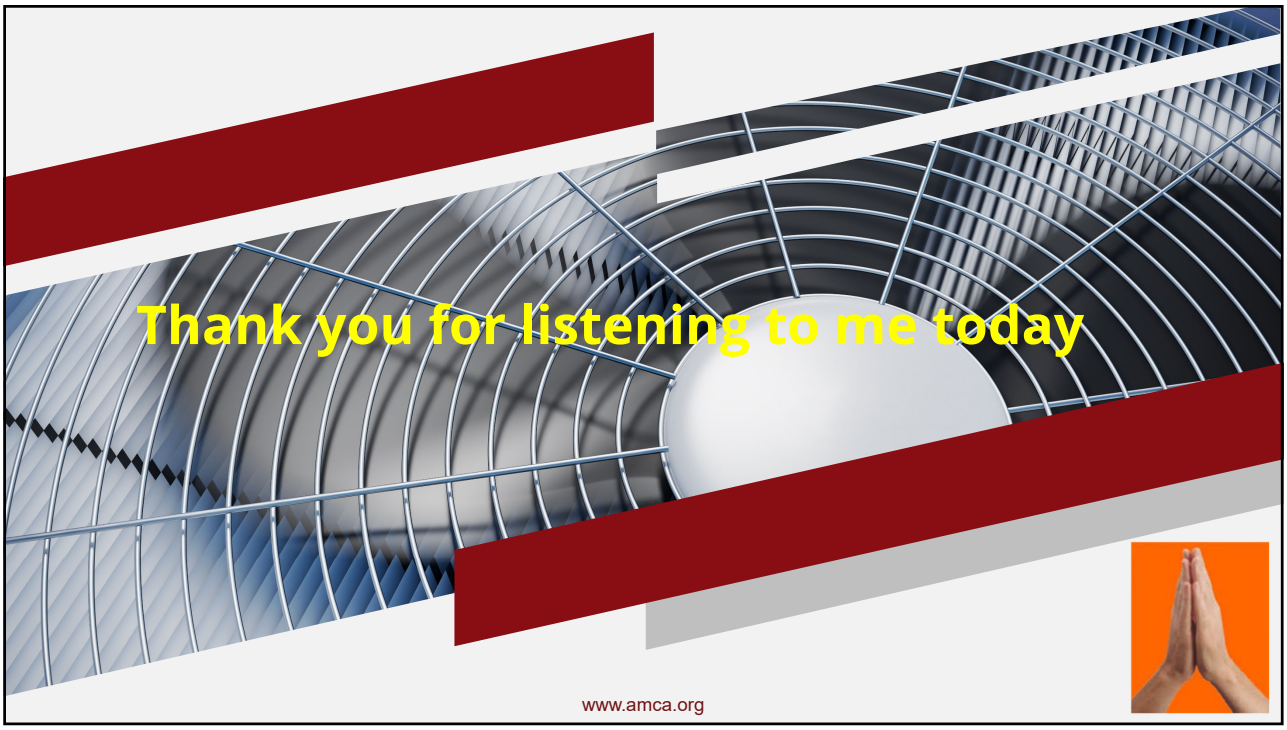
FEI Advocacy





ISHRAE Education Committee Workshops
Work is underway to develop a half day workshop on HVAC Fans, based on the HVAC Fan Guidebook, to be conducted at the national level, by trained professionals across the country.
FEI is one of the topics of the workshop.

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