Energy Conservation Building Code

Implementation Road Map for Madhya Pradesh

February 2016

Prepared by

Urban Management Consulting Pvt. Ltd.

Technical Support

CEPT UNIVERSITY

An initiative supported by

SHAKTI SUSTAINABLE ENERGY FOUNDATION

Shakti Sustainable Energy Foundation
Shakti Sustainable Energy Foundation works to strengthen the energy security of India by aiding the design and implementation of policies that support energy efficiency and renewable energy.

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UMC works towards professionalizing urban management in India and worldwide by providing technical assistance and support to city governments and facilitates change through peer-to-peer learning processes. It enhances the capacity of city governments by providing expertise and ready access to innovations on good governance implemented in India and abroad. It facilitates city governments to design, implement and evaluate municipal development and management projects. UMC extensively works in the areas of urban water and sanitation, heritage management, urban planning, urban health, municipal finance, urban management, urban transportation and institutional restructuring. More details are available on www.umcasia.org.

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Abbreviations

ABPAS	Automated Building Plan Approval System
BEE	Bureau of Energy Efficiency
CEA	Central Electricity Authority
CPWD	Central Public Works Department
CBRE	Commercial Real Estate Services
DCR	Develomepnt Control Regulations
DISCOM	Distribution Company
ECBC	Energy Conservation Building Code
EC Act	Energy Conservation Act
ECBC AP	ECBC Accredited Professional
EEC	ECBC Expert Committee
EPCO	Environmental Planning and Coordination Organization
EPF	Envelope Performance Factor
EPI	Energy Performance Index
ECO	Energy Conservation and Commercialization
HT	High Tension
HVAC	Heating, Ventilation, and Air Conditioning
IIEC	International Institute for Energy Conservation
KVA	Kilo Volt Ampere
KWh	Kilo Watt Hours
LT	Low Tension
MANIT	Maulana Azad National Institute of Technology
MoP	Ministry of Power
MP	Madhya Pradesh
MPEIAA	Madhya Pradesh state Environment Impact Assessment Authority
MPERC	Madhya Pradesh Electricity Regulatory Commission
MPUVN	Madhya Pradesh Urja Vikas Nigam Ltd.
MoUD	Ministry of Urban Development
NAPCC	National Action Plan on Climate Change
NIGUM	National Institute for Governance and Urban Management
NIT	National Institute of Technology
NOC	No Objection Certificate

PWD	Public Works Department
SADA	Special Area Development Authority
SDA	State Designated Agencies
SOR	Schedule of Rates
SPA	School of Planning, Bhopal
TPA	Third Party Assessment
UD&ED	Urban Development and Environment Department
ULB	Urban Local Body
UMC	Urban Management Consulting Pvt. Ltd.
USAID	United States Agency for International Development
WBP	Whole Building Performance

1. Introduction

The Government of India has been making efforts to work towards the nation's long-term energy security. India, as per Dunn (2014), is the fourth largest energy consumer in the world after China, the United State of America, and Russia. While it is extremely important for India to continue to add new electricity generation capacity to meet the nation's growing energy requirements, it is also very essential to move towards sustainable options that help conserve electricity and reduce demand at the user end. Since buildings account for 33% of the total electricity consumption in India (Central Electricity Authority 2013) and since it is the fastest growing sector, it is critical that policy interventions are put in place to improve energy efficiency in both new constructions as well as in existing buildings.

Overview of growth in the commercial buildings sector in India

According to Census 2011, 37.7% of India's 121crore people live in urban areas. Although it has been observed that the rate of urbanization in the country has been relatively stable over the past two decades, when it comes to a discourse on the energy requirements, it is pertinent to note that the quantum of growth that our urbanization entails is considerable. According to CBRE (2011), the commercial building sector alone, in the top-seven major Indian cities is expanding at approximately 9% per annum, with 5.5million square metres of floor-space being added annually. On a national scale, about a third of the total energy consumed in the country is consumed by buildings and this energy-consumption is growing at the rate of 8% per annum-implying that by the end of this century, the energy demand of the 'building-sector' will have grown over by five times. Giving a sense of the quantum of growth that the building-sector is yet to witness, Satish et al. (2010) suggest that out of the total floor space India requires for the year 2030, only a third exists today.

As income-levels rise, electricity demand shall also rise due to the thermal-comfort aspirations and increase in electricity; and of course also through growth in population, our energy consumption as well as our requirements shall increase many-fold. Given this understanding, what also becomes a matter of significant concern is the shortage of energy supply that Central Electricity Authority (2013) estimates at 8.5% and a peak-demand shortage of 9%. But as Yu et al. (2014) rightly put it, 'growth in building energy use poses a challenge for the Indian government, as well as an opportunity'. Keeping cognizance of this opportunity in context of our energy scenario, it is important that each new building is built with energy efficient systems and materials.

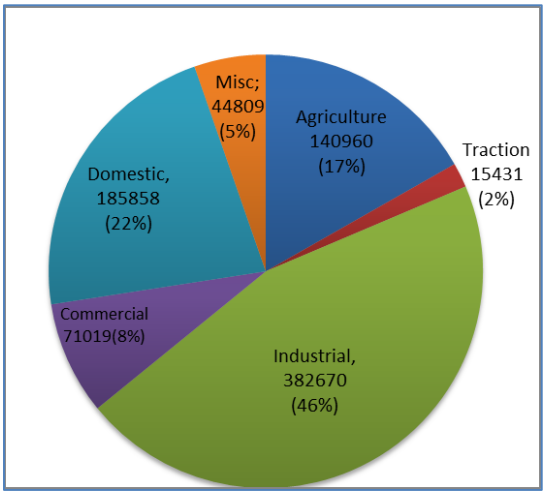

Figure 1: Sector-wise electricity consumption in India

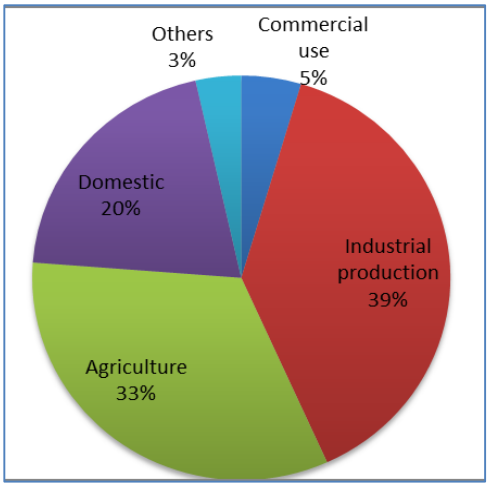

Figure 2: Sector-wise electricity consumption in Madhya Pradesh State

The figure above gives a graphical comparison of the electricity consumption in Madhya Pradesh (right) and in India (left)

Source: CEA,2013 (All India electricity consumption sector-wise at the end of the first year of 12th Plan), Madhya Pradesh Development Report, Planning Commission, 2011

1.1. Energy Conservation Act 2001

The Energy Conservation Act (EC Act), enacted by the Government of India in October, 2001, provides a framework for all initiatives in the realm of energy-conservation in the country. Under this Act, the Government of India established the Bureau of Energy Efficiency (BEE) in March 2002, as a statutory body under the Ministry of Power (MoP), Government of India. The EC Act 2001 ordains BEE to research and develop policies and strategies in the building energy efficiency sector through various regulatory and promotional measures and to implement them as provisions of the Act.

In order to enhance and support assessments of the energy efficiency activities in the commercial buildings, BEE developed a Star Rating Program for office buildings. The EC Act 2001 has empowered the governments at the central as well as at the state level to promote energy conservation in buildings. It also assists in monitoring compliance by putting in place a legal framework to the energy saving targets and energy intensity of the economy.

Under this Act, independent State Designated Agencies (SDAs) were formed to implement and supervise energy efficiency programs in the states. An 'Energy Efficiency Building code' was also created to create a guiding framework for monitoring and implementation of energy-efficiency objectives for the building-sector. The following section presents details of the code.

1.2. Energy Conservation Building Code (ECBC)

The Energy Conservation Building Code (ECBC) was launched by the Ministry of Power, Government of India in May 2007, as the first step towards promoting energy efficiency in the

building sector. The purpose of this Code is to provide minimum requirements for an energy-efficient design and for construction of buildings. It clearly defines buildings that fall under the scope of ECBC-implementation. Buildings that meet the defined criteria, can strive to meet the minimum energy performance according to the code. Given this, it is felt as essential that all new buildings conforming to the criteria be designed and built with energy-efficiency considerations right at the onset. It is expected that the implementation of the code will help reduce the energy demand in commercial buildings significantly.

The state governments may choose to amend and implement the code to suit the local context. Each state has a designated agency for implementation of the code. In case of MP, Madhya Pradesh Urja Vikas Nigam (MPUVN) is the State Designated Agency (SDA)

In this context, it is essential to define the scope of the ECBC proposed for implementation in the state of MP.

1.3. Scope of the Code

New Buildings: ECBC is applicable to all new commercial buildings with a connected load that is in excess of 500kW/ 100kW or that have a contract demand in excess of 600 kVA/110kVA (Bureau of Energy Efficiency 2007).

Existing Buildings: For the existing commercial buildings having an air-conditioned area of 1000 m^2 or more, when the additional as well as the existing building area combined exceeds the 'conditioned floor area threshold' mentioned earlier, the additional conditioned area alone shall comply with ECBC. However, the existing building together with the additional conditioned area can also comply with the ECBC mandates.

Commercial buildings that are eligible for ECBC compliance are**:** Office buildings, Hotels, Hospitals, Educational Institutions and Retail-malls.

Applicable building systems/components:
ECBC specifies provisions for the following building components:

- Building envelopes, except for unconditioned storage spaces or warehouses.
- Mechanical systems and equipment, including heating, ventilating, and air conditioning.
- Service hot water heating.
- Interior and exterior lighting.
- Electrical power and motors.

According to a research conducted by CEPT University and Weidt Group, the return on investment is high when energy conservation measures (ECMs) are implemented for building shell (or envelope). It also makes enforcement easier than an approach that tries to enforce and implement ECBC in its entirety (Energy Code Enforcement for Beginners: A Tiered Approach to Enforcement of Energy Code in India, 2012).

2. Enforcement and Compliance models for ECBC implementation

During the course of studying the existing institutional framework for the purpose of making recommendations for ECBC implementation in MP, ECBC enforcement as well as compliance models that have already been implemented in various states in India were studied and assessed for their applicability in context of MP. They are briefly explained here followed by a brief on the applicability of one of these in context of ECBC for the state.

2.1. ECBC enforcement models

2.1.1. ULB Model

In this model, the responsibility of enforcement of the code and checking of compliance to it falls entirely with the ULB. This model requires a robust building-permission process and additional capacity (in terms of ECBC trained staff) for the ULB. The ULB's responsibility includes site verification of ECBC compliance during the construction phases of the building.

2.1.2. Third Party Assessment Model (TPA)

This enforcement model involves independent Third Party Assessors (TPA) in the compliance check process. Since the procedural responsibility of checking compliance lies with the TPAs, this model minimizes the capacity-building and management burden on the ULBs. Capacity building will be done by the private parties outside the ULB. This model is market-driven, allowing easy scaling-up and scaling-down, based on the demand. Projects or design teams would be free to engage TPAs from any part of the country and the quality and consistency would be easier to maintain. This model would be easy to integrate within the existing building permit process.

2.1.3. ECBC Expert Committee Model (EEC)

In this model, the responsibility of checking compliance and providing guidance will be institutionalized under ECBC Expert Committees. Regional committees at selected urban development authorities (UDA) may be formed across the state. The committees will consist of senior town planners, ECBC-accredited professionals (ECBC AP), and trained ULB officials. The committee may also have 'floating' members (only as observers) from the ULBs. The ECBC AP will have skills or experience, similar to TPA qualifications and will be selected by SDA. No objection certificate (NOC) to be issued by EEC to compliant buildings will be a pre-requisite for document submittal at ULB.

2.1.4. Utility Enforcement Model

In this model, the enforcement responsibility rests with the utility entity. This enforcement model is based on the self-declaration of ECBC compliance of the building by an ECBC AP appointed for the project. The project (read: building application) with assistance of the ECBC AP would submit a self-declaration of ECBC compliance of the building to the ULB during the building permission process along with other drawings as per the building plan permission

requirements. The project team (read: all concerned parties in the building application process, including the ECBC AP) would submit two self-declarations – one at the initiation of design and second after the construction is completed. While applying for the final electricity connection, the utility company would intimate the ECBC technical unit for confirmation. The ECBC technical unit will recommend the DISCOM for providing the final connection.

2.2. Compliance Approaches

The ECBC compliance procedure requires all new buildings to fulfil certain set of mandatory provisions related to energy use in the building. After referring to the ECBC user guide and discussions with experts on ECBC, various methods for ECBC compliance have been charted out.

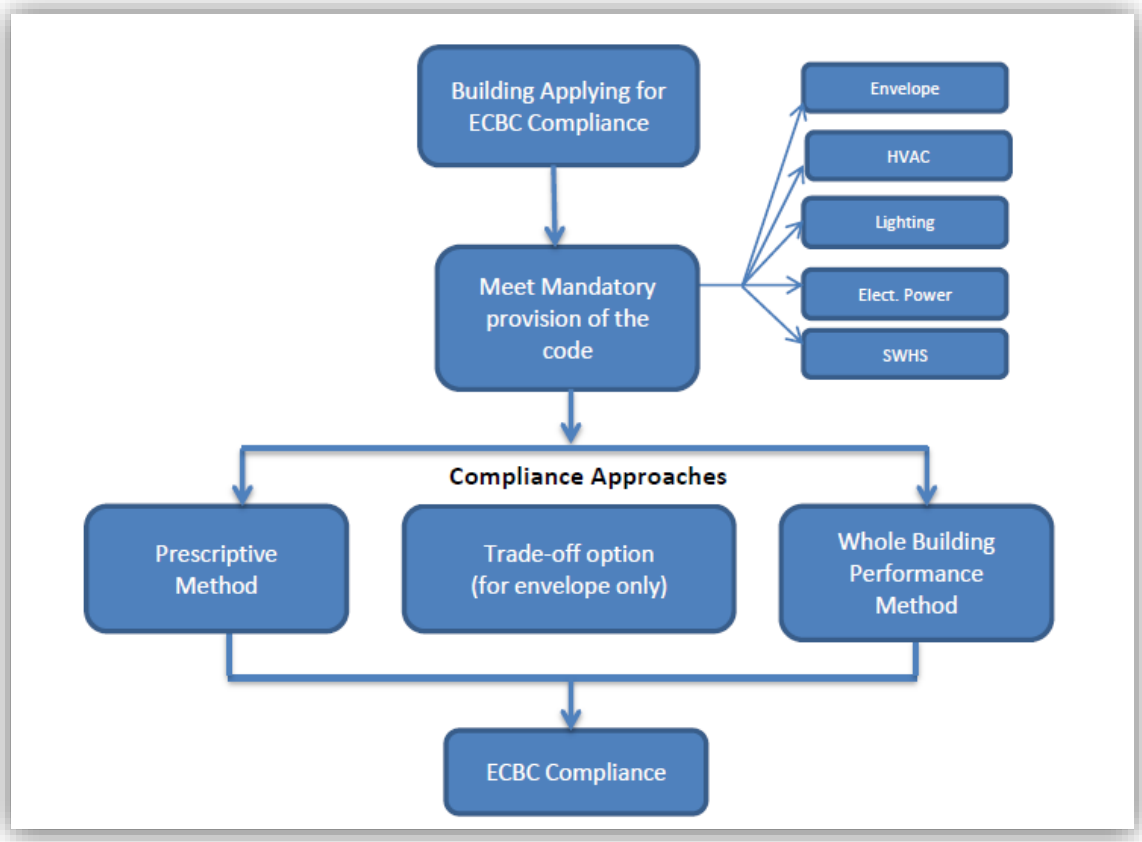

Figure 3: Methods for ECBC code compliance
Source: ECBC User Guide 2007

To maintain a certain level of flexibility in design and construction, the code compliance requirements can be met by the following compliance approaches as suited.

2.2.1. Prescriptive Approach

Prescriptive method specifies prescribed minimum energy efficiency parameters for various components and systems of the proposed buildings. Prescriptive requirements for each building system (building envelope, HVAC systems, service hot water and pumping, lighting systems and electric power) are defined. Compliance with the code can be achieved by meeting the minimum standards mentioned in the code. However, it also allows exceeding these standards that result in higher energy-efficiency. For the building envelope, ECBC allows the Trade-Off option that

allows for a trade-off between the efficiency of one envelope element with another without compromising on the overall efficiency level required by the code.

2.2.2. Building Envelope Trade-off Approach

This is a systems-based approach, where the thermal performance of individual envelope components can be reduced if compensated by higher efficiency in other building components (e.g., using higher wall insulation could allow for a less stringent U-factor requirement for windows, or vice versa). These trade-offs typically occur within major building systems – roofs, walls, fenestration, overhangs etc.

This method offers the building design more flexibility than the prescribed values for individual elements. The trade-offs are permitted only between building envelope components. It is not possible, for instance, to make trade-offs against improvements in lighting or HVAC systems. Thus the trade-off option requires more calculations to be performed by the user than prescriptive path. It is necessary to calculate the surface area of each exterior and semi-exterior surface; all areas must be calculated separately for each orientation.

2.2.3. Whole Building Performance Approach

The Whole Building Performance (WBP) is the alternate approach for the building to complying with the ECBC. This method involves developing a computer based hourly energy simulation model of proposed design and comparing its energy consumption to standard design for compliance with the ECBC. The computer based simulation models the thermal, visual, ventilation and other energy consuming processes taking place within the building to monitor its energy performance. The simulation takes into account building orientation, building materials, building façade, climatic condition, indoor and outdoor environment conditions. Energy consumption in the standard design represents the upper limit of energy use allowed for that particular building under a scenario where all mandatory and prescriptive requirements of the code are adopted. Code compliance will be achieved if the energy use in proposed design is not greater than the energy used in the standard design.

WBP method is more complex than the Prescriptive method, but offers considerable design flexibility. It allows for compliance to be achieved by optimizing energy usage in various building components and systems such as the building envelope, HVAC, lighting and others, in order to find the most efficient solution. WBP method requires an approved computer software program and a simulation expert to model a 'Proposed Design' determine its annual energy use and compare it with the 'Standard Design' of the building by comparing their Energy Performance Index (EPI). It also requires that the simulations be performed using a standard energy modelling protocol prescribed in of ECBC.

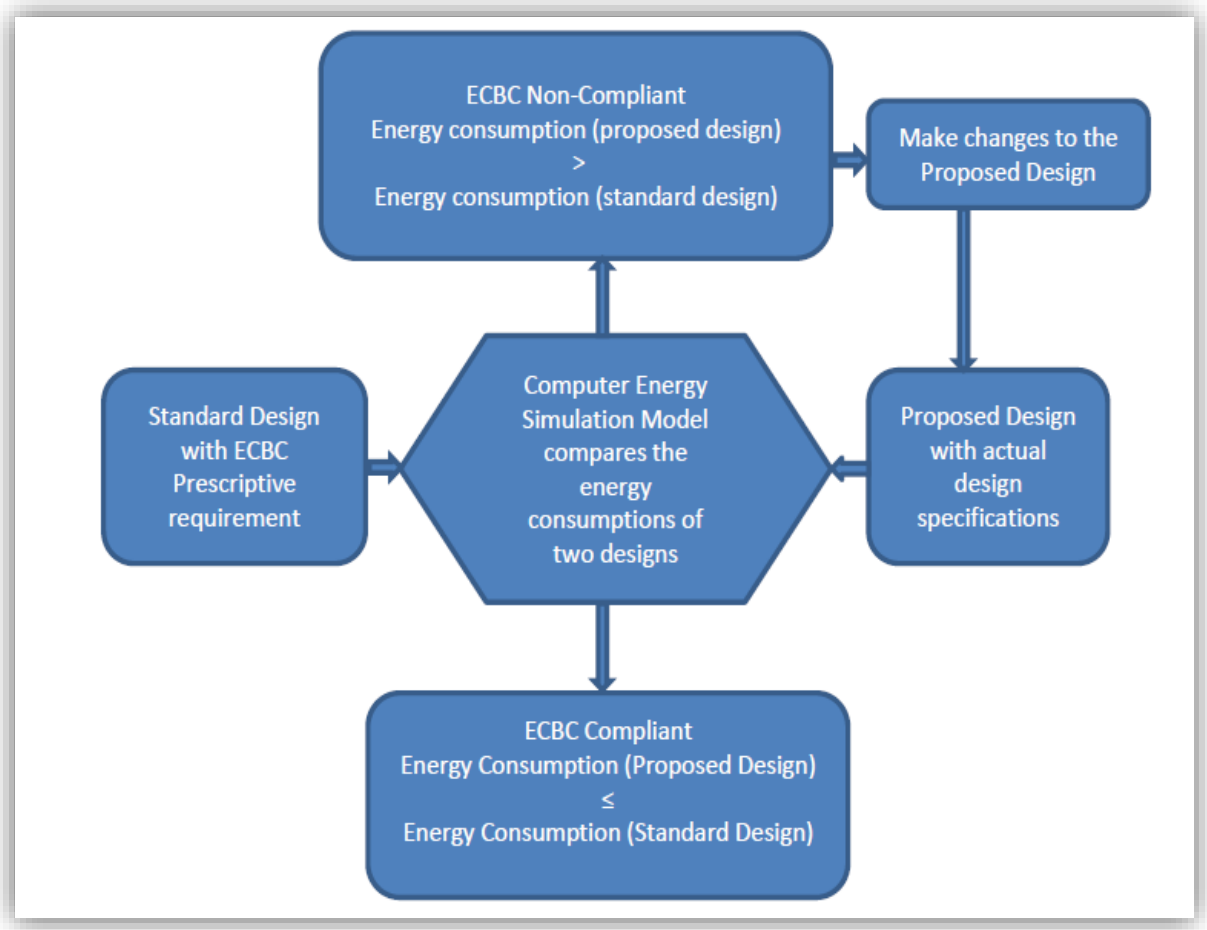

Figure 4: Whole Building Performance Approach
Source: ECBC user guide 2011

Applicability for MP: During consultation, various government officials opined that the building permission process enforcement is weak in the state. Considering very few building permission applications are received by the ULBs, the ULB and TPA models are not suited for MP at present. Other than building permission application, the final electricity connection application could be a final 'check point' to check for ECBC compliance of buildings applying for connections of 100 kW or 110 KVA or higher. Since the final electricity application is submitted to the utility companies, this 'check point' can be enforced through them.

Further, it is recommended that the compliance to the code could be enforced starting with the 'Building envelope' using either Prescriptive or the Trade-off approach. In the consequent phases, in addition, upon review by MPUVN, Building systems and WBP approach could be included and any of the three compliance approaches could be adopted.

3. Current scenario for ECBC in Madhya Pradesh

A detailed assessment of the existing building permission process was undertaken in two of the largest municipal corporations of the state- Indore Municipal Corporation and the Bhopal Municipal Corporation. This was done to understand the current strengths and challenges in the existing building permission process in order to suggest an appropriate and implementable roadmap. This assessment is presented in Annexure 1.

This section presents the mapping of existing institutional framework and stakeholders and their roles and responsibilities and they have been put in context with the implementation of the code. Along with this emerging challenges for ECBC's implementation in the state have also been presented.

3.1. Existing institutional setup in MP

For a clear understanding of the institutional framework within which the proposed ECBC would be embedded UMC listed all relevant government departments in Madhya Pradesh and mapped various state and private stakeholders using the following methodology:

- Research on organizational structure of Government of Madhya Pradesh (GoMP) and departments of new and renewable energy, and its linkages with other state departments such as the Urban Development and Environment Department (UD&ED).
- Discussions with the officials of the BEE, MPUVN, UD&ED and ULBs regarding the enforcement and implementation of ECBC in Madhya Pradesh.
- Key informant interviews with practicing professionals and experts.

Figure 5: charts out the institutions and their linkages for implementation of ECBC in the state. These institutions are from the central, state and local tiers of our government framework.

At the central level, the BEE is the key organization spearheading the energy conservation initiative in India. Its role has already been elaborated. At the state level, the UD&ED is the umbrella organization under which all urban development issues are managed. The Directorate of Town and Country Planning (DTCP), a department of the UD&ED, as well as all the ULBs in the state fall within its purview. ULBs, on the other hand, are the key institutions involved in the adoption and enforcement of the ECBC code. Amendments and incorporation of ECBC into the local development control regulations (i.e. Madhya Pradesh Nagar Tatha Gram Nivesh Adhiniyam 1973) is essentially the responsibility of DTCP. BEE has nominated MPUVN as the State Designated Agency (SDA) that is responsible for the facilitation and smooth implementation of ECBC in MP.

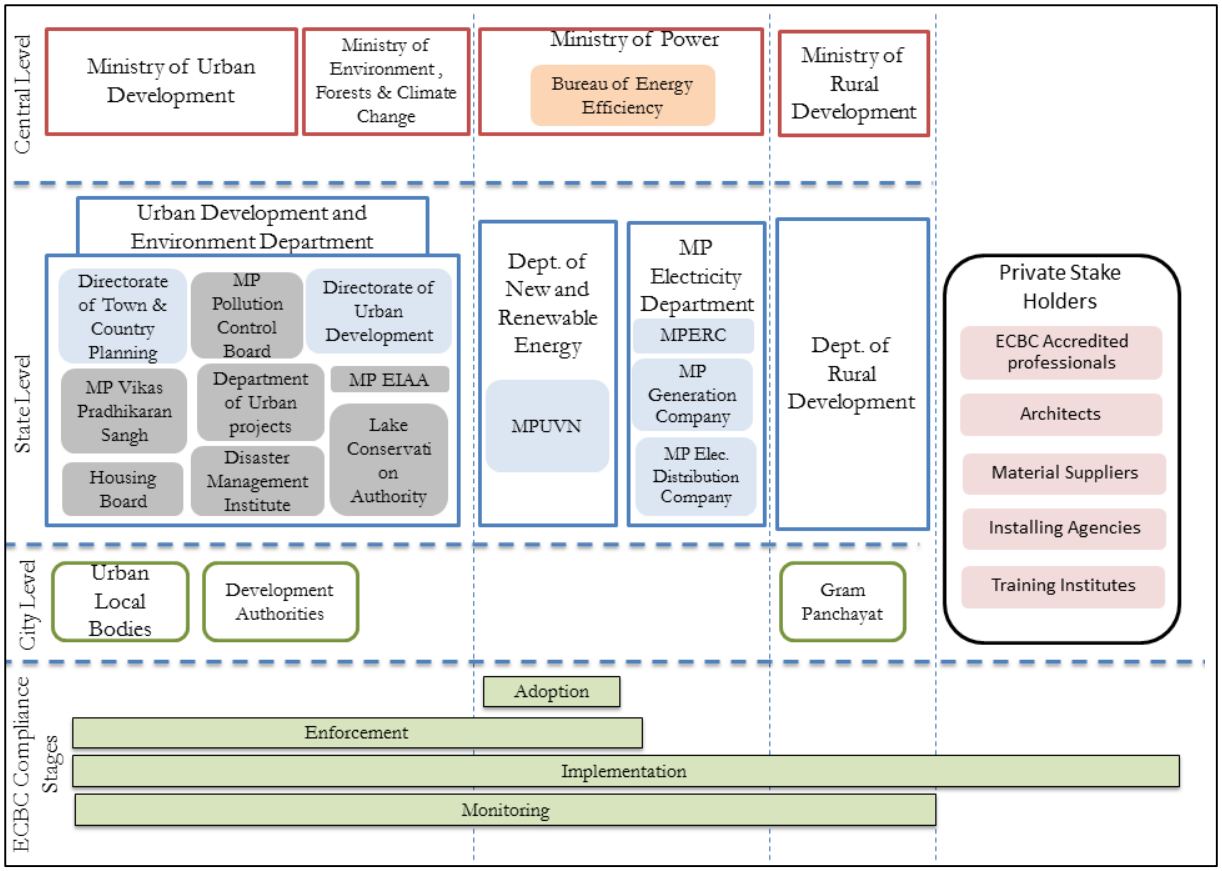

Figure 5: Institutional Mapping

Source: Urban Management Consulting Pvt. Ltd.

The Electricity Department in the state and its sub-units, such as, the Madhya Pradesh Electricity Regulatory Commission (MPERC), and electricity distribution companies (that include the Madhya Pradesh Electricity Transmission Company (MPETC) and its three divisions- Madhya Kshetra Vidyut Vittran Company (Central Electricity Distribution Division), Paschim Kshetra Vidyut Vittran Company (Western Electricity Distribution Division) and Poorva Kshetra Vidyut Vittran Company (Eastern Electricity Distribution Division), could be involved in the monitoring and enforcement of ECBC. MPERC in coordination with MPUVN will be responsible for defining corrective measures and punitive actions, in case of non-compliance to ECBC, if they wish to do so.

At the local level, ULBs in MP are responsible for sanctioning building plan permissions; regulate building use and enforcing development control regulations (DCR). The development authorities and the gram panchayats (rural local bodies) in the state oversee compliance to DCRs in the areas beyond ULB limits. By virtue of this, they too have a role in ensuring the implementation of the code.

Other private stakeholders such as local practicing architects, ECBC accredited professional and universities in the state such as the National Institute of Technology (NIT), Bhopal and Devi Ahilya Vishwa Vidyalaya (DAVV), Indore could be involved in training and capacity building for ECBC implementation in MP.

3.2. Challenges in ECBC implementation in Madhya Pradesh

There are several anticipated challenges for implementation of ECBC in MP. These have been discussed below.

- **Weak enforcement of the building permission process**: Enforcement of the building bye-laws in the state of MP is weak. Despite a defined process for application for building permission, document-verification, site-check and issuing of occupancy certificate, currently it is not followed extensively (see Figure 6). Only buildings taller than 30m undergo scrutiny by the High Rise Committee[1]. The ULBs and gram panchayats that have the authority and responsibility to inspect compliance to building bye-laws, lack the capacity to do so.

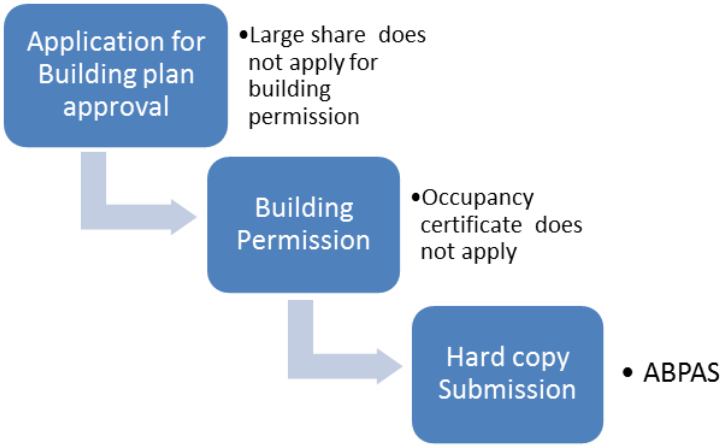

Figure 6: Challenges in building permission process
Source: Urban Management Consulting Pvt. Ltd.

- **Lack of technical-knowledge with implementation-staff**: Most of the ULBs and gram panchayats do not have adequate staff and sound technical knowledge to assess the compliance to the ECBC norms.
- **Poor awareness among citizens and architects/ builders**: Based on the consultations and interaction of UMC's team in MP, the awareness about ECBC is very poor. Overall there is awareness about energy conservation and certifications such as Green Buildings Rating System India (GRIHA) and Leadership in Energy Efficient Design (LEED) by the United States Green Buildings Council (USGBC) but not about ECBC. While GRIHA and LEED are voluntary, ECBC compliance will be mandated by law for eligible buildings. The builders may see ECBC as another compliance procedure to be followed and may perceive it as a burden. The architects too may find it difficult to comply with unless enough training material is provided in the public domain. Public awareness campaigns would play a crucial role in overcoming this challenge.
- **Lack of infrastructure for testing building materials**: Success of the ECBC is also dependent on the performance characteristics of the building materials used. There are limited material testing facilities in MP and India. Without testing labs, building material manufacturers may not be able to test and promote their materials for energy efficient

[1] The building permission guidelines in the state provides for a special 'High Rise Committee' who scrutinizes application for buildings with height of 30metres or more for their compliance with the bye-laws.

buildings. This would leave architects with fewer material options while designing ECBC compliant buildings.

- **Absence of new energy efficient materials in the Schedule of Rates (SOR)**[2]: The current SOR prepared by the state PWD does not have newer energy efficient materials and hence, discourages its use. With the government tenders for buildings based on local SORs, the government buildings maybe left with little options to use energy efficient building material.

[2] Schedule of Rates, aka, SOR, is published by the Public Works Department in every state, as well as by the Central government, publishing standardized rates of cost for different civil-works. They are updated time to time. A state's SOR reflects local rates (costs) of such works.

4. Proposed models for ECBC implementation in MP

The ECBC proposed for MP takes into account two climatic zones applicable to the region: 'hot and dry', and 'composite climate'. Specifications based on these two climatic zones will be applicable to the buildings in MP.

Based on assessments and discussions with stakeholders, this roadmap proposes establishment of ECBC technical unit by the SDA (MPUVN) for ECBC implementation in MP. The Technical unit should be established for enforcement, with compliance to the code recommended to be based on 'Building Envelope' approach in the first phase, and subsequently, include 'Building Systems' in the later phases. Also, it has been recommended that the scope of the code in the state would include all buildings that have a connected load in excess of 100kW or with a contract demand that is in excess of 110kVA. The implementation process for the code can be categorized in four major steps – adoption, enabling environment, enforcement and monitoring and has been discussed below.

4.1. Adoption of ECBC for the state of MP

After deliberations in stakeholder consultations and through interdepartmental meetings, MPUVN suggests that the Department of New and Renewable Energy, GoMP should notify the ECBC in MP under the Energy Conservation Act.

ECBC being primarily a building bye-law should be included in the existing development control regulations (DCR) being followed in Madhya Pradesh through the statutory master plans of the towns and cities. The BEE has prepared guidelines to assist integration of ECBC in the DCR (Model Energy Efficiency Guidelines for Integration into Building Byelaws, 2011). Once the ECBC is notified in the state, Directorate of Town & Country Planning (DT&CP) should incorporate the code into the DCR and local planning authorities should incorporate it in their respective building bye-laws.

Once ECBC is incorporated in the DCRs, UD&ED should then issue a circular to all ULBs and area development authorities and instruct them to include ECBC compliance in their building permission processes. Likewise, the MPERC should issue a circular to all utility companies in MP to check for ECBC compliance certificate prior to providing a new electricity connection to consumers seeking connection above 100 kW or 110 kVA.

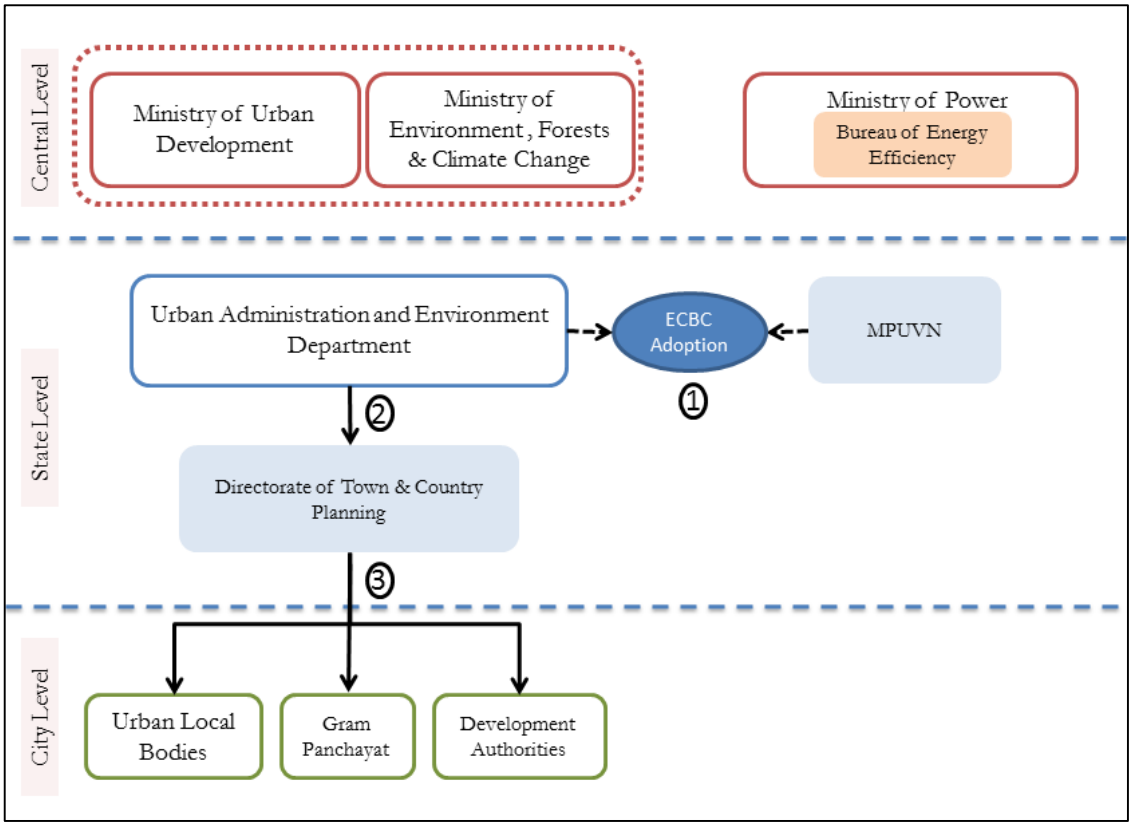

Figure 7: ECBC Notification process

Source: Urban Management Consulting Pvt. Ltd.

4.2. Creating an Enabling Environment for ECBC implementation

According to the proposed implementation model, MPUVN would take the following measures to create an enabling environment for implementation of ECBC in the state:

Training accredited professionals: At the national level, there is a pool of master-trainers to train professionals in ECBC compliance. BEE is preparing training-instructions material at the national level for capacity-building activities. This roadmap recommends MPUVN to accept BEE's and other states' accreditation to be valid in MP. In addition, GoMP should nominate and encourage local institutions such as Environmental Planning and Coordination Organization (EPCO), School of Planning and Architecture (SPA), National Institute of Governance and Urban Management (NIGUM), Maulana Azad National Institute of Technology (MANIT), Bhopal and Devi Ahilya Vishwa Vidyalaya (DAVV), Indore to develop capacity to train professionals and create a resource-pool of ECBC accredited professionals (ECBC AP).

Establishment of an ECBC technical unit: During the first phase of implementation of ECBC in the state, this roadmap recommends MPUVN to establish an ECBC technical unit comprising at least two engineers and two architects who are ECBC accredited. The ECBC technical unit should also have one nodal officer. The role of the nodal officer would be to coordinate and facilitate smooth implementation of the code in the state. The technical unit would have the following key responsibilities:

i. Assist MPUVN to notify the ECBC in MP
ii. Facilitate incorporation of ECBC in the Madhya Pradesh Nagar Tatha Gram Nivesh Adhiniyam, 1973 and subsequently in the statutory master plans of cities in MP
iii. Assist Madhya Pradesh Public Works Department (PWD) to revise the existing schedule of rates to incorporate new energy efficient materials
iv. Assist training institutes in the state to initiate ECBC Accreditation program
v. Help the training institutes in sourcing training material, prepare training calendars and share cases of other states' training institutes
vi. Inspect buildings and issue compliance certificates
vii. Conduct public awareness about ECBC with architects, engineers, project developers and relevant government organizations
viii. Coordinate, on behalf of MPUVN, establishment of material testing laboratories in MP
ix. Provide handholding support to project developers in complying with ECBC
x. Support preparation and implementation demonstration projects in the state
xi. Coordinate with the utility companies to create a database of ECBC compliant buildings which could further be used for creating a baseline

BEE has agreed to fund the ECBC technical unit for the first year and may extend this financial support beyond the first year. Post this, MPUVN should financially support the operation of the technical unit for the entire duration of the first phase of ECBC implementation.

Revision of Schedule of Rates: As discussed earlier, MPUVN (through its ECBC technical unit) should assist MPPWD to revise existing SOR and incorporate new energy efficient materials.

Liaising with other institutional partners: This roadmap suggests that MPUVN should conduct joint annual meetings of all the stakeholders involved in adoption, enabling, enforcement and monitoring of ECBC norms to review the progress and address the inter-departmental coordination challenges encountered during implementation of the code.

4.3. ECBC Enforcement framework

During consultations, various government officials opined that the building permission process enforcement is weak in the state. Considering very few building permission applications are received by the ULBs, the ULB and TPA models are not suited for MP at present. Other than building permission application, the final electricity connection application could be a final 'check point' to check for ECBC compliance of buildings applying for connections of 100 kW or 110 KVA or higher. Since the final electricity application is submitted to the utility companies, this 'check point' can be enforced through them. However, this roadmap recommends that site inspection during construction be done by the proposed ECBC technical unit (created by MPUVN, i.e. the SDA) at the state level. Therefore, this proposed model for enforcement is being termed as the 'SDA Model'. A graphical representation of the proposed enforcement process is given in Figure 8.

This enforcement model is based on the two self-declarations regarding the building's ECBC compliance by an ECBC AP of the builder's project team. The first self-declaration will be submitted to the ULB during the building-permission process (copy of self-declaration is presented in the Annexure 13) along with the regular application permission application. The second self-declaration will be submitted upon completion of construction of the building. The project team should submit a copy of both declarations to MPUVN's ECBC technical unit.

This ECBC technical unit would provide an acknowledgment of receipt of the first self-declaration to the project team. MPUVN suggested that the ECBC technical unit should conduct on-site inspections, either through its own staff or by engaging third-party assessors (TPA) for a sample of at least 25% buildings (i.e. by the rule of thumb, every fourth application), verify its compliance with the ECBC and provide compliance certificate to compliant buildings.

While applying for the final electricity connection, the utility company would demand the compliance certificate mandatorily, based on the directives by the MPERC. During our meeting with MPERC on April 29, 2015, the directive from MPERC would be sufficient for the utility companies to demand the compliance certificate.

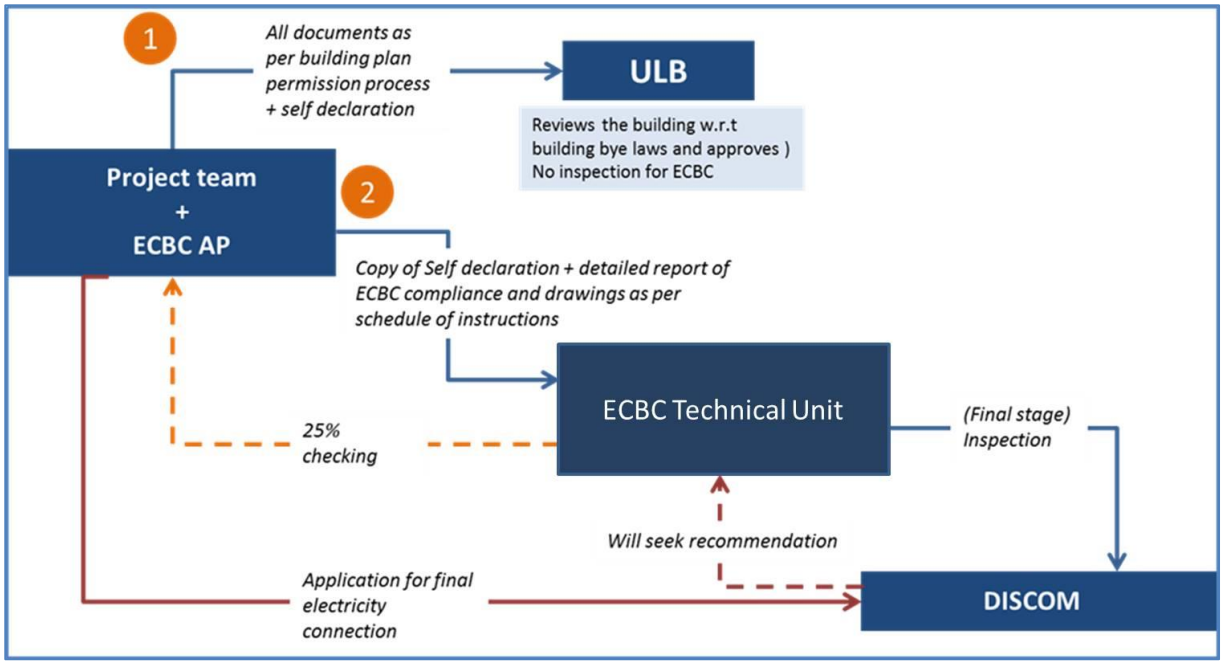

Figure 8: Proposed enforcement model

Source: Urban Management Consulting Pvt. Ltd.

This model can be adopted until the ULBs demonstrate a robust building permission process including issuing of completion certificate. MPUVN may review this enforcement model after a period of 5 years, or as deemed appropriate.

Change of connected load from DISCOM

In the event that an existing building wants to change the connected load of its electricity connection, and the requested change is for a connection higher than 100 kW or 110 KVA, the project team will be required to declare the reason(s) for the change. In case, the reason includes additions to existing buildings (Section 3.1.3 of the ECBC, 2007), the addition alone shall comply with the applicable requirements. In case, the reason includes alteration to existing buildings (Section 3.1.4 of the ECBC, 2007), the altered part of the building shall comply with the provisions in 'Section 3.1.4.1 Building Envelope' of the ECBC, 2007. In both the cases, the project team shall seek a compliance certificate from the ECBC technical unit for the additions/ alterations to the existing building. Based on this compliance certificate, the utility company would change the connection of the building.

4.4. Monitoring of compliance with ECBC

In this phase, the ECBC technical unit monitors the performance of the ECBC compliant buildings through the self-declaration of yearly consumption of electricity along with electricity bills. The ECBC technical unit should use this data to build a baseline for energy consumption by different categories of buildings.

4.5. Compliance check process and documentation

The project team may choose any of the three compliance approaches to design the ECBC compliance of the building. These include Prescriptive Approach, Building Envelope Trade-Off Approach and Whole Building Approach (WBA). While the WBA requires mandatory compliance with all building systems, the other two can be used for building envelope only. The project team will submit forms and reports as specified in annexures. The following diagram explains the compliance path and the forms to be submitted have been listed further in this section.

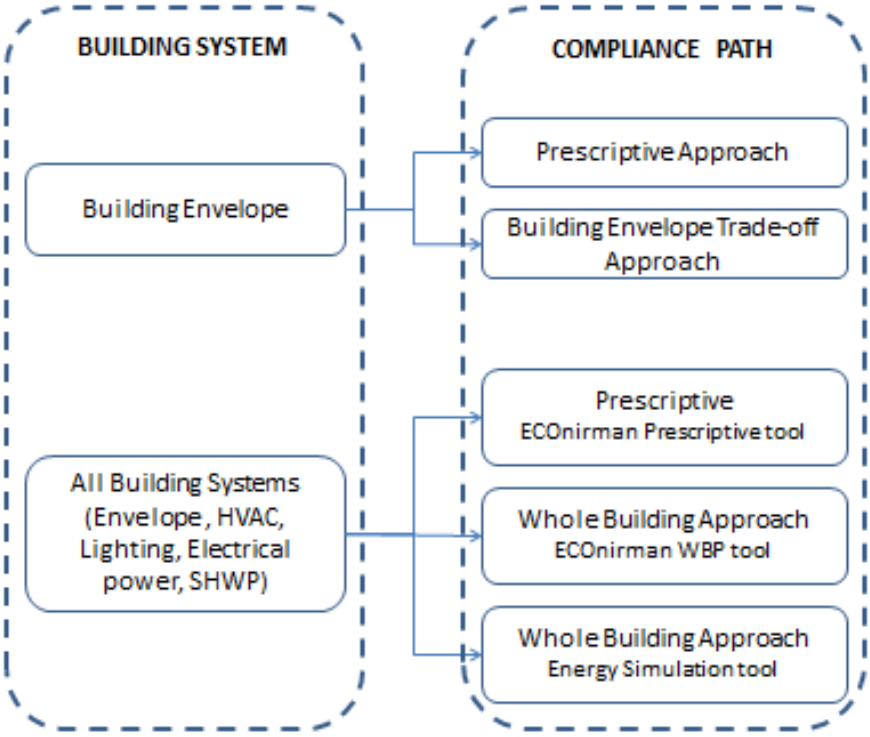

Figure 9: Compliance path
Source: Urban Management Consulting Pvt. Ltd.

For all compliance approaches there are a few common mandatory forms, which have been listed below:

- **Compliance Report Cover**: lists the basic unique Identifiers for the project and the compliance approach adopted.
- **Project Summary report:** this form will list the project details related to the scope of ECBC code compliance and exception for the building.
- **Mandatory requirements:** this form is important as it lists out all the important mandatory requirements of the code related to building.

Depending on the ECBC compliance approach which is opted the following forms will have to be attached with the building plans:

Building Envelope compliance to ECBC using prescriptive method

This is the easiest compliance method where the user has to only refer to ECBC § 4 and fill details in the required forms along with the mandatory forms. Copies of these forms have been attached as annexure (Annexure 5 through Annexure 8) with this document:

- Form 4A: Envelope Assembly details (Wall)
- Form 4B:Envelope Assembly details(Vertical Fenestration)
- Form 4C:Envelope Assembly details(Roof)
- Form 4D:Envelope Assembly details(Skylight)
- Form 5: Envelope Prescriptive requirements
- Affidavit for Compliance Declaration

Building Envelope compliance to ECBC using prescriptive trade-off option
This method allows for more design flexibility in building envelope that the prescriptive approach does not offer. It is more complex than the Prescriptive method as it involves Envelope Performance Factor (EPF) calculation using the equation given in ECBC § 12.1.1. These calculations use the EPF coefficients that vary according to local climate zones, building occupancy and envelope component characteristics and are given in ECBC tables 12.1 through 12.5. For the building envelope to comply with the code, EPF of the proposed design should be less than the standard design, where the standard design complies with the criteria in ECBC § 4.3. One drawback of this method is that these EPF coefficients are still under review and the method has not been validated for compliance of ECBC.

The forms required at the time of submission together with mandatory forms are the same as those mentioned in the prescriptive option before.

All building systems compliance to ECBC using ECOnirman Prescriptive Tool
The USAID ECOnirman prescriptive tool is an online tool which assists the project team to check the compliance of all building systems to ECBC using the prescriptive approach. This tool can be easily accessed and operated as it is an online interface with no advance software or requirement of building science expertise. The tool will analyse the compliance based on the inputs of the user giving details of each building component. The tool gives an output stating if the building and all its components are compliant or not. This result can be printed in the form of a detailed report.

Key features of this tool

- Guides the users in assessing if a building meets the conformance requirements, keeping in view the local applicable climatic zones as specified in the ECBC
- Generates a building's conformance report that compiles the data provided by the user and also indicates if the systems and sub-systems of the building are conforming or not conforming to the code requirements.
- Multiple building projects can be stored under a single user profile
- Data of every project is stored in a central database for future reference, review, edit, and analysis purposes
- All the information is kept secured and confidential
- The tool is available in public domain for easy access to the users

The tool can be accessed at: http://econirmanwbp.eetools.in/

A detailed user manual for this tool can be accessed at:
http://eetools.in/ECOnirman_WBP_UserManual.pdf

Forms that need to be submitted together with the mandatory forms for this method are the same as listed earlier, and additionally, ECOnirman Prescriptive Tool report

All building systems compliance to ECBC using ECOnirman Whole Building Performance Tool

Similar to the ECOnirman Prescriptive tool, the ECOnirman Whole Building Performance tool is an online tool which allows the user to check compliance to ECBC as per the WBP approach. This toll also predicts the buildings annual energy consumption. Since the tool is online, it can be easily accessed by users. The user input interface requires minimum building science and energy simulation expertise.

The tool compares the analysis on the Standard Design with the Proposed Design to compare the Energy Performance Intensity (EPI) from the two simulation results. The final output as a result of the comparison is available in the form of a detailed report.

Key features of this tool are as follows:

- This tool guides users in assessing if a building meets the conformance requirements, keeping in view the local applicable climatic zones as specified in the ECBC
- Generates a building's conformance report that compiles the data provided by the user and also indicates if the systems and sub-systems of the building are conforming or not conforming with the code requirements
- Multiple building projects can be stored under a single user profile
- Stores the information in a central database for future reference, review, edit, and analysis purposes
- Keeps the information secured and confidential
- Is available in public domain for easy access to the users

The tool can be accessed at: http://econirmanwbp.eetools.in/

A detailed User Manual for this tool can be accessed at:
http://eetools.in/ECOnirman_WBP_UserManual.pdf

Along with the mandatory forms the documents that need to be submitted are:

- ECO*nirman* WBP tool report
- Affidavit for Compliance Declaration

All building systems compliance to ECBC using Energy Simulation Tool

This is an alternate method to check compliance of all building systems to ECBC using the Whole Building Performance approach. This is the most complex among all the compliance approaches; hence the user needs to have a thorough knowledge of building sciences as well as building energy simulation. Similar to the ECOnirman WBP tool the Energy simulation tool also compares the performance of the standard design with the proposed design. For the building to comply with the norms of ECBC the energy use of the proposed design should be less than the energy use of the standard building.

For this method of compliance, following forms have to be submitted along with the mandatory forms:

- Energy simulation tool report
- Affidavit for Compliance Declaration

The enforcement of ECBC norms will be applicable in the state only once; MPUVN issues a notification of ECBC adoption and implementation for the state of MP.

5. Phasing of ECBC implementation

To facilitate smooth implementation of ECBC, through consultative process, MPUVN would enforce compliance to ECBC in phases. The details of each phase of implementation as discussed with key stakeholders, including MPUVN, and UD&ED, are as follows:

- **Phase 1:** During the first phase of ECBC implementation, compliance to the code will be enforced only for the building envelope. Compliance to ECBC will be applicable for new commercial buildings under all Special Area Development Authorities (SADA) and 16 municipal corporations of the state - Indore, Bhopal, Jabalpur, Gwalior, Ujjain, Sagar, Dewas, Satna, Ratlam, Burhanpur, Murwara (Katni), Rewa, Khandwa, Singrauli, Chindwara and Morena

- **Phase 2:** In the second phase, ECBC compliance will be applicable to all the building systems of new commercial buildings in the 16 municipal Corporations and all SADAs. ECBC compliance to the building envelope will be made mandatory for commercial buildings in all the urban local bodies of the state in this phase.

- **Phase 3:** The final phase of ECBC implementation will ensure full compliance to ECBC wherein all building systems will have to comply with the norms of ECBC. ECBC compliance will become mandatory throughout the state across all municipal corporations, municipalities, SADAs and well as all gram panchayats.

Under the proposed phasing, the first phase is suggested to be for a period of five years; however, the key-responsibility of reviewing the implementation phases rests with MPUVN as it is a state designated agency in MP.

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Annexures

Annexure 1 Existing Building Permission Process in Madhya Pradesh

The existing building permission processes was mapped through discussions with local practicing architects, building officers and officials from the Urban Development and Environment Department (UDED).The building plan permission process for cities of Indore and Bhopal was mapped which are the largest cities of the state and where most new construction activity is currently happening and is also envisaged in the future.

Building Permission Process in Indore

Indore is the fastest growing commercial capital of Madhya Pradesh. It is a rapidly growing city and an important educational, medical, industrial and trade hub in the state and central India.

The building permission process mapping was conducted based on detailed discussions with Mr. Harbhajan Singh Polley, City Engineer and City Planner, Indore Municipal Corporation (IMC) and Mr. Mahesh Sharma, Building Inspector, IMC.

Indore is one of the first cities in Madhya Pradesh to adopt the online building plan approval process also known as the "Automated Building Plan Approval System" (ABPAS). The process is still in the initial transition phase towards fully automated building plan approval system. The municipal corporation currently follows the online and hard copy submission sequentially.

Discussions with IMC officials and local practicing architects affirmed that while the automated system exists, its implementation is abysmally weak. Not much of the building stock undergoes this formal building permission process. IMC officials stated that even amongst the applications for permissions received, the building inspections are not conducted on all sites due the lack of staff capacity.

As per the Bhumi Vikas Niyam, 2012, buildings taller than 30m are required to seek an additional approval from the high-rise Committee in Indore and undergo an additional scrutiny by the municipal commissioner in Indore.

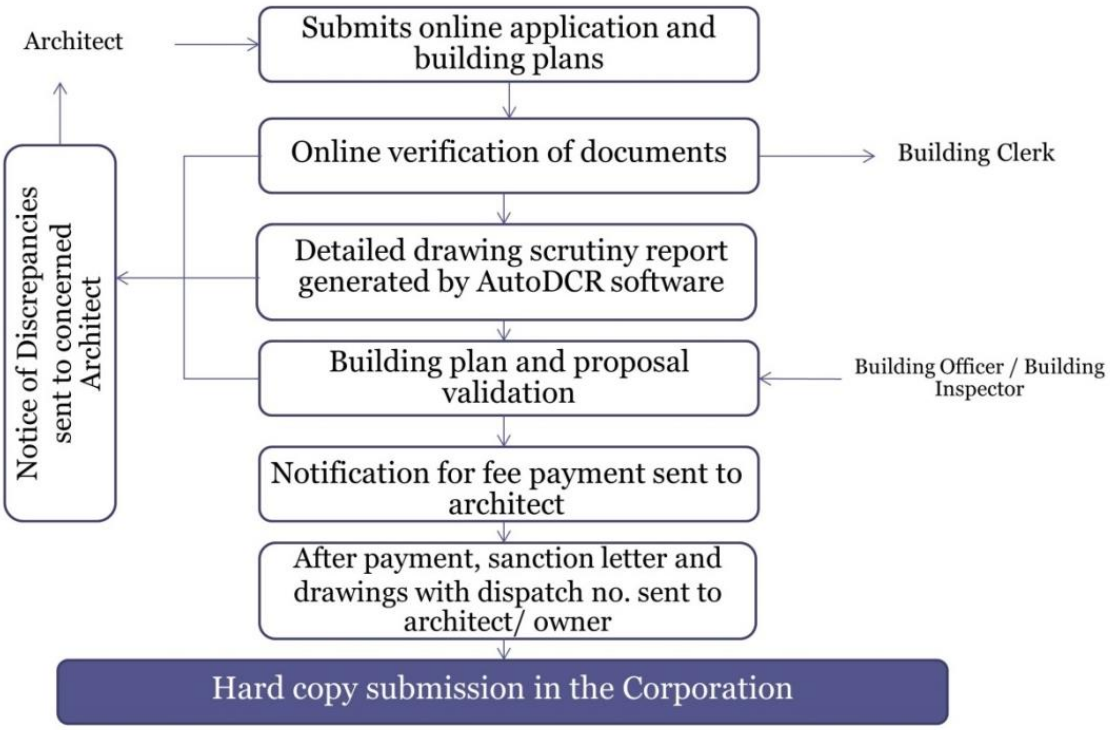


Figure 10: Building permission online process, Indore

The process for automated building plan approval is as follows:

i. A registered architect submits the application form online along with documents such as building plans in required Auto DCR format. The architect also uploads mandatory certificates for verification.
ii. Verification of mandatory documents and applicable certificates is done online. If the application is incomplete, an online notification from the building clerk is sent to the concerned architect.
iii. Once, all required documents are submitted, the plans are scrutinized by the online software for compliance with the
    a. Madhya Pradesh Bhumi Vikas Niyam,2012
    b. Town and Country planning Act 1973 and
    c. Master Plan
iv. If the drawings do not comply, then a mail is sent to the concerned architect informing the discrepancies. If the drawings pass the verification, these are sent for validation to the building officer.
v. The building officer verifies the drawings and notifies the architect in case s/he has any suggestions or opinions for change.
vi. Once the building plan receives validation from the building officer, the architect is notified to make the payment.
vii. On receipt of payment, a sanction letter is dispatched to the architect / owner. The sanction letter allows the owner to initiate construction. The prints of this letter are then to be submitted to the building permission office. Along with this, all documents and building plans are also to be submitted.

After submitting hard copies of all documents, the following process is to be followed:

i. After verifying the required documents, the proposal is forwarded to the assistant engineer.
ii. The assistance engineer conducts a detailed site inspection of the site at plinth level.
iii. A successful plinth level site inspection will earn a plinth level approval certificate.
iv. The next site inspection is to check compliance of various services provided in the building.
v. Successful inspection of compliance of all required services in the building will earn the project the Service Certificate.
vi. Final site inspection is on completion of the building.
vii. Successful site inspection will earn the Building Completion Certificate.

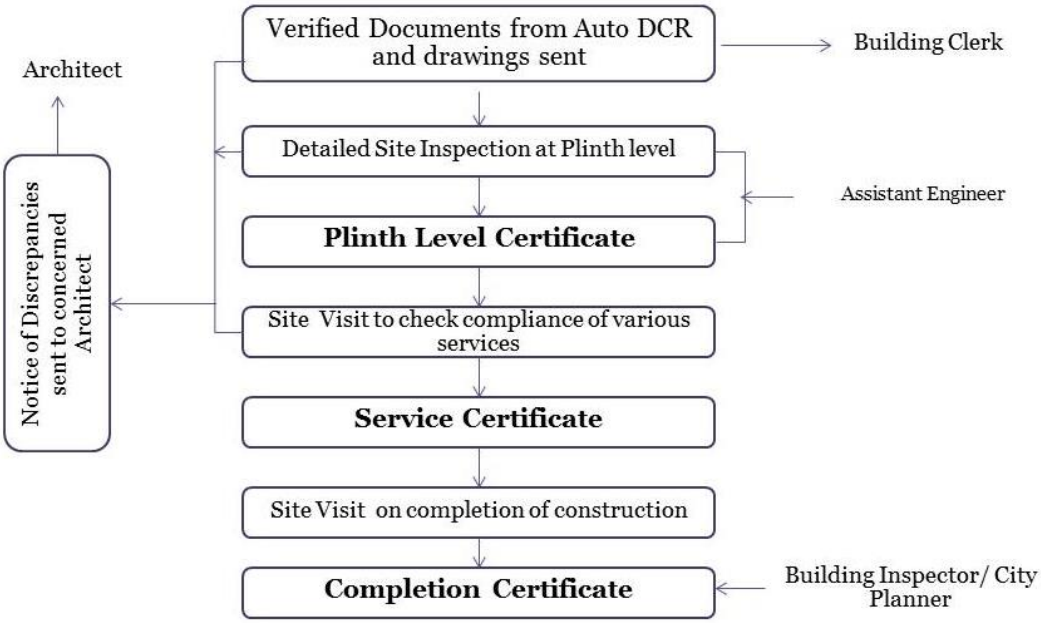


Figure 11: Building permission hard copy submission process, Indore

High-Rise Committee

As per the amendment to the *Bhumi Vikas Niyam*, 1984, Gazette notification dated 28/4/2000, clause 28 A, all buildings taller than 30m must get an additional no objection certificate from the high rise committee (which comprises of the Municipal Commissioner; Divisional Commissioner of UDED and the Jt. Director of Town and Country Planning, Indore Division). This committee meets twice a month. A NOC from the high-rise committee is issued for construction. IMC then grants the final building occupancy certificate on completion of the construction of the building.

Building Permission Process in Bhopal

Bhopal is the capital city of Madhya Pradesh. Today the city has a population over 17 lakh and is the sixteenth largest city in India. It serves as the principal city in the Bhopal district which is more than 80% urbanized. With a number of educational institutes and other large organizations, Bhopal is a major institutional hub in the region.

The building plan permission process for Bhopal was mapped based on discussions with Mr. Akash Parashar, Engineer, Building Permission Office of the Bhopal Municipal Corporation, and multiple consultations with local practicing architects and planners.

Process for building plan approval in Bhopal

The typical process involves the following steps:

1. The registered architect submits the online application form along with the plans in the required Auto DCR format. All other required mandatory documents are uploaded online.
2. The verification of the documents takes place online and in case of any discrepancies, an online notification is sent to the concerned architect.
3. After the plans clear the first verification, the proposal reaches the next stage where the concerned architect is informed about the date and time for the site visit by the Assistant engineer of the Bhopal Municipal Corporation.
4. After the site inspection is conducted, a detailed site inspection report is uploaded online and any suggestions or changes in the plan are notified to the concerned architect.
5. The revised plans are then scrutinized by the Auto DCR software to check compliance with the Bhumi Vikas Niyam 2012, Madhya Pradesh Nagar Tatha Gram Nivesh Adhiniyam, 1973 and the master plan.
6. For buildings which are taller than 30m, the plans undergo another scrutiny by the Municipal Commissioner of the Bhopal Municipal Corporation.
7. After clearing this stage, the plans undergo a final scrutiny by the city planner. On clearing this scrutiny the proposal earns the "Building Permission".
8. As compared to Indore, there are no further site visits conducted by the planning department at the plinth completion or services completion stages.

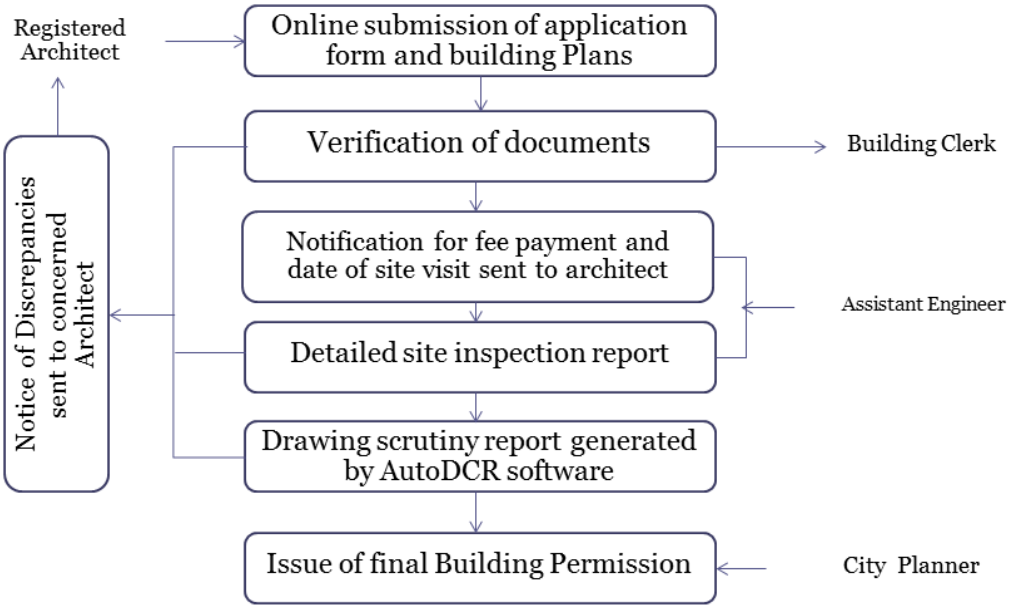


Figure 12: Building permission process, Bhopal

Discussions have revealed that the compliance to the development control regulation (DCR) and the local building bye-laws is very weak. Indore Municipal Corporation conducts site inspection during various stages of construction, as per the Bhumi Vikas Niyam, however in Bhopal, once the building permission is granted there is no site inspection during the construction stage. It is also evident from the discussions that very few buildings apply for building permission. Due to the lack of capacity with the corporations, permissions and compliance certificates are often issued without any site inspection.

Annexure 2 Form 1: Compliance Report Cover

Energy Conservation Building Code (ECBC)

Form 1: Compliance Report Cover

Date :

SECTION 1: General		
1.1	Building name	As mentioned on the drawings submitted for approval
1.2	Sub plot no.	As mentioned on the drawings submitted for approval
1.3	Final plot no.	As mentioned on the drawings submitted for approval
1.4	TP scheme no.	As mentioned on the drawings submitted for approval
1.5	Taluka	As mentioned on the drawings submitted for approval
1.6	District	As mentioned on the drawings submitted for approval
1.7	Climate Zone	
1.8	Latitude/Longitude	

SECTION 2: Compliance Approach Adopted		
Tick the ECBC compliance approach adopted for this project		
2.1	Building Envelope - Prescriptive Approach	☐
2.2	Building Envelope - Prescriptive Trade-off Approach	
2.3	All Building Systems - Prescriptive Tool Method	
2.4	All Building Systems - Whole Building Performance Tool Method	
2.5	All Building Systems - Energy Simulation Tool Method	

Annexure 3 Form 2: Project Summary

Energy Conservation Building Code (ECBC)

Form 2: Summary Report

Date:

SECTION 1: General			
1.1	Building name	***As mentioned on the drawings submitted for approval***	
1.2	Sub plot no.	***As mentioned on the drawings submitted for approval***	
1.3	Final plot no.	***As mentioned on the drawings submitted for approval***	
1.4	TP scheme no.	***As mentioned on the drawings submitted for approval***	
1.5	Taluka	***As mentioned on the drawings submitted for approval***	
1.6	District	***As mentioned on the drawings submitted for approval***	
1.7	Climate Zone		
1.8	Latitude/Longitude		
SECTION 2: Project Details			
2.1	Building Type*(e.g. Hotel, office,)*		
2.2	Building Us e *(24 hours | 8 hours)*		
2.3	*Fill either of the two fields*	Connected Load (kW)	
		Contract Demand (kVA)	
2.4	Project Type (*New building | Additions to existing building | Alterations to existing building*)		
2.5	Built-up Area (m2)		
2.6	Conditioned Area (m2)		
SECTION 3: Envelope Exceptions *(Fill this section only if your answer to 2.4 is 'Alterations to existing buildings')*			
3.1	Does the energy us age of the building increase due to:		
	(a) Replacement of glass in an existing s as h and frame (provided the U-factor and SHGC of the replacement glazing are equal to or lower than the existing glazing)?	**YES | NO**	
	(b) Modifications to roof/ceiling, wall, or floor cavities (which are insulated to full depth with insulation)?	**YES | NO**	
	(c) Modifications to walls and floors without cavities (where no new cavities are created)?	**YES | NO**	
	(d) Any other alterations?	**YES | NO**	

Annexure 4 Form 3: Mandatory Requirements

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
Envelope - Prescriptive Forms Method

FORM 3: Envelope Mandatory Requirements

DATE:

SECTION 1: Mandatory Requirements						
Questions					**Compliance Status**	
SECTION 1.1: Fenestration						
U-factor	i	Is the U-factor for overall fenestration (including the sash and frame) determined as per ECBC using one of the two (a, b) options below? Tick the option used.			YES | NO | NA	Explanation for NA
		a	ECBC § 4.2.1.1			
			If you have ticked (a), tick one of the two boxes below:			
			Attachments	U-factor test report by an accredited independent laboratory is attached		
				Cut sheet provided by the maufacturer is attached		
		b	Default values from ECBC Appendix C for unrated products			
	ii	Is the U-factor for sloped glazing and skylights determined at a slope of 20 degrees above the horizontal?			YES | NO | NA	Explanation for NA
SHGC	**iii**	Is the SHGC for overall fenestration (including the sash and frame) determined as per ECBC using one of the four (a, b, c, d) options below? Tick the option used.			YES | NO | NA	Explanation for NA
		a	ECBC § 4.2.1.2			
			If you have ticked (a), tick one of the two boxes below:			
			Attachments	SHGC test report by an accredited independent laboratory is attached		
				Cut sheet provided by the maufacturer is attached		
		b	ECBC § 4.2.1.2 (a)			
		c	ECBC § 4.2.1.2 (b)			
		d	Default values from ECBC Appendix C for unrated products			
Air Leakage	iv	Is Air Leakage for glazed swinging entrance doors and revolving doors less than 5.0 l/sm^2?			YES | NO | NA	Explanation for NA
	v	Is Air Leakage for fenestration and doors, other than glazed swinging entrance doors and revolving doors, less than 2.0 l/sm^2?			YES | NO | NA	Explanation for NA
SECTION 1.2: Opaque Construction						
	i	Are U-factors determined as per ECBC using one of the two (a, b) options below? Tick the option used.			YES/NO/NA	Explanation for NA
		a	Default tables in ECBC Appendix C § 11			
		b	Data or procedure contained in the ASHRAE Fundamentals, 2005			
SECTION 1.3: Building Envelope Sealing						
	i	Are the following areas of the enclosed building envelope sealed, caulked, gasketed, or weather-stripped to minimize air leakage?				
		a	Joints around fenestration and door frames		YES | NO | NA	Explanation for NA
		b	Opening between walls and foundations and between walls and roof and wall panels		YES | NO | NA	Explanation for NA
		c	Openings at penetrations of utility services through roofs, walls and floors		YES | NO | NA	Explanation for NA
		d	Site-built fenestration and doors		YES | NO | NA	Explanation for NA
		e	Building assemblies used as ducts or plenums		YES | NO | NA	Explanation for NA
		f	All other openings in the building envelope		YES | NO | NA	Explanation for NA

Annexure 5 Form 4A: Envelope Assembly Details (Wall)

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
Envelope - Prescriptive Forms Method

FORM 4A: Envelope - Wall Assembly

DATE:

Specify the layers in the roof assembly in the form below from outside to inside.	*Insert a schematic drawing of the wall assembly in the box below. Indicate the material name and thickness for each layer.*

Type 1

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

1.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	
1.2	R-value of Insulation Alone *($m^2 \cdot K/W$)*	
1.3	Wall area *(m^2)*	

Type 2

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

2.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	
2.2	R-value of Insulation Alone *($m^2 \cdot K/W$)*	
2.3	Wall area *(m^2)*	

Type 3

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

3.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	
3.2	R-value of Insulation Alone *($m^2 \cdot K/W$)*	
3.3	Wall area *(m^2)*	

Type 4

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

4.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	
4.2	R-value of Insulation Alone *($m^2 \cdot K/W$)*	
4.3	Wall area *(m^2)*	

5	**TOTAL Wall Area** *(m^2)*	

Annexure 6 Form 4B: Envelope Assembly Details (Vertical Fenestration)

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
Envelope Assembly Details

FORM 4B: Envelope - Vertical Fenestration Assembly

DATE:

Specify the layers in the roof assembly in the form below from outside to inside.	*Insert a schematic drawing of the fenestration assembly in the box below. Indicate the material name and thickness for each layer.*

Type 1

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

1.1	U-factor *($W/m^2 \cdot K$)*	
1.2	SHGC	
1.3	VLT	
1.4	Frame material	
1.5	Fenestration area *(m^2)*	

Type 2

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

2.1	U-factor *($W/m^2 \cdot K$)*	
2.2	SHGC	
2.3	VLT	
2.4	Frame material	
2.5	Fenestration area *(m^2)*	

Type 3

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

3.1	U-factor *($W/m^2 \cdot K$)*	
3.2	SHGC	
3.3	VLT	
3.4	Frame material	
3.5	Fenestration area *(m^2)*	

Type 4

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

4.1	U-factor *($W/m^2 \cdot K$)*	
4.2	SHGC	
4.3	VLT	
4.4	Frame material	
4.5	Fenestration area *(m^2)*	

5	**TOTAL Fenestration Area** *(m^2)*	

Annexure 7 Form 4C: Envelope Assembly Details (Roof)

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
Envelope Assembly Details

FORM 4C: Envelope - Roof Assembly

DATE:

Specify the layers in the roof assembly in the form below from outside to inside.	*Insert a schematic drawing of the roof assembly in the box below. Indicate the material name and thickness for each layer.*

Type 1

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

1.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	
1.2	R-value of Insulation Alone *($m^2 \cdot K/W$)*	
1.3	Roof area *(m^2)*	

Type 2

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

2.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	
2.2	R-value of Insulation Alone *($m^2 \cdot K/W$)*	
2.3	Roof area *(m^2)*	

Type 3

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

3.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	
3.2	R-value of Insulation Alone *($m^2 \cdot K/W$)*	
3.3	Roof area *(m^2)*	

4	**TOTAL Roof Area** *(m^2)*	

Annexure 8 Form 4D: Envelope Assembly Details (Skylight)

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
Envelope Assembly Details

FORM 4D: Envelope - Skylight Assembly

DATE:

Specify the layers in the roof assembly in the form below from outside to inside.	*Insert a schematic drawing of the skylight assembly in the box below. Indicate the material name and thickness for each layer.*

Type 1

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

1.1	U-factor *($W/m^2 \cdot K$)*	
1.2	SHGC	
1.3	Frame material	
1.4	Skylight area *(m^2)*	

Type 2

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

2.1	U-factor *($W/m^2 \cdot K$)*	
2.2	SHGC	
2.3	Frame material	
2.4	Skylight area *(m^2)*	

Type 3

OUTSIDE	Material	Thickness *(m)*
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
INSIDE		
TOTAL thickness		

3.1	U-factor *($W/m^2 \cdot K$)*	
3.2	SHGC	
3.3	Frame material	
3.4	Skylight area *(m^2)*	

4	**TOTAL Skylight Area** *(m^2)*	

Annexure 9 Form 5: Envelope Prescriptive Requirements

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
Envelope - Prescriptive Forms Method

FORM 5: Envelope Prescriptive Requirements

DATE:

SECTION 1: Walls

S. No.	Component	Description *(Specify the layers in the wall assembly from outside to inside. Use FORM 3A to attach schematic wall cross-section drawing/s and details)*	*Fill only one of these columns*					
			1.1	U-factor of Overall Assembly ($W/m^2 \cdot K$)	1.2	R-value of Insulation Alone ($m^2 \cdot K/W$)	1.3	Area (m^2)
1	Type 1							
2	Type 2							
3	Type 3							
4	Type 4							

Check FORM 3A

SECTION 2: Vertical Fenestration

S. No.	Component	Description *(Specify the glazing and air layers with thickness and frame. Use FORM 3B to attach schematic vertical fenestration cross-section drawing/s and details)*	2.1	U-factor ($W/m^2 \cdot K$)	2.2	SHGC	2.3	VLT	2.4	Area (m^2)
1	Type 1									
2	Type 2									
3	Type 3									
4	Type 4									

2.4	(EA) Effective aperture:	
2.5	(WWR) Window-to-wall ratio for the entire building:	

Check FORM 3B

SECTION 3: Roofs

S. No.	Component	Description *(Specify the layers in the roof assembly from outside to inside. Use FORM 3C to attach schematic roof cross-section drawing/s and details)*	*Fill only one of these columns*													
			3.1	U-factor of Overall Assembly ($W/m^2 \cdot K$)	3.2	R-value of Insulation Alone ($m^2 \cdot K/W$)	3.3	Cool Roof Application	3.4	Roof slope (degrees)	3.5	Solar reflectance	3.6	Emittance	3.7	Area (m^2)
1	Type 1							YES | NO								
2	Type 2							YES | NO								
3	Type 3							YES | NO								

Check FORM 3C

SECTION 4: Skylights

S. No.	Component	Description *(Specify the glazing and air layers with thickness and frame. Use FORM 3D to attach schematic skylight cross-section drawing/s and details)*	4.1	Has curb?	4.2	U-factor ($W/m^2 \cdot K$)	4.3	SHGC	4.4	Area (m^2)
1	Type 1			YES | NO						
2	Type 2			YES | NO						
3	Type 3			YES | NO						

4.4	(SRR) Skylight roof ratio for the entire building:	

Check FORM 3D

Annexure 10 Form 6: Envelope Trade-off Method requirements

ENERGY CONSERVATION
BUILDING CODE (ECBC)

Compliance Report
Envelope - Trade-off Method

FORM 6: Envelope Trade-off Method

DATE:

SECTION 1: Walls													
Category	**Sub-Category**	**Type** *(Curtain | Mass |*	1.1	**U-factor** *(W/m² ·K)*			1.2	**Area** *(m²)*			1.3	**EPF**		
			a	**Standard**	**b**	**Proposed**	a	**Standard**	**b**	**Proposed**	a	**Standard**	**b**	**Proposed**
Walls	Type 1													
	Type 2													
	Type 3													
	Type 4													
	Total													

SECTION 2: Vertical Fenestration																		
Category	**Sub-Category**	**Orientation** *(N | S | E | W)*	2.1	**U-factor** *(W/m² ·K)*			2.2	**SHGC**			2.3	**Area** *(m²)*			2.4	**EPF**		
			a	**Standard**	b	**Proposed**	a	**Standard**	b	**Proposed**	a	**Standard**	**b**	**Proposed**	a	**Standard**	b	**Proposed**
Vertical Fenestration	Type 1																	
	Type 2																	
	Type 3																	
	Type 4																	
	Total																	

SECTION 3: Roofs														
Category	**Sub-Category**		3.1	**U-factor** *(W/m² ·K)*			3.2	**Area** *(m²)*			3.3	**EPF**		
			a	**Standard**	**b**	**Proposed**	a	**Standard**	**b**	**Proposed**	a	**Standard**	**b**	**Proposed**
Roofs	Type 1													
	Type 2													
	Type 3													
	Total													

SECTION 4: Skylights																		
Category	**Sub-Category**		4.1	**U-factor** *(W/m² ·K)*			4.2	**SHGC**			4.3	**Area** *(m²)*			4.4	**EPF**		
			a	**Standard**	**b**	**Proposed**	a	**Standard**	**b**	**Proposed**	a	**Standard**	**b**	**Proposed**	a	**Standard**	b	**Proposed**
Skylight	Type 1																	
	Type 2																	
	Type 3																	
	Total																	

SUMMARY																			
	5.1	Wall			5.2	Vertical Fenestration			5.3	Roof			5.4	Skylight			**5.5**	**EPF Total**	
EPF	a	Standard	b	Proposed	a	Standard	b	Proposed	a	Standard	b	Proposed	a	Standard	b	Proposed	**a**	**Standard**	**b**	**Proposed**

Annexure 11 ECOnirman Prescriptive Tool Report Sample

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - Prescriptive Tool Method

1.0 PROJECT SUMMARY

DATE:

General		
Building ID *(auto-generated)*		
Building Name		
Location		
State/Union Territory		
City		
Climate Zone		
Latitude/Longitude		
Project Details		
Building Type		
Building Use		
Connected Load | Contract Demand		
Project Type		Alterations to Existing Building
Built-up Area		1.23456E+12
Conditioned Area		
Conformance checked for		Envelope and/or HVAC and/or SHWP and/or Lighting and/or Electrical Power
Envelope Exceptions		
Does the energy usage of the building increase due to:		
	(a) Replacement of glass in an existing sash and frame (provided the U-factor and SHGC of the replacement glazing are equal to or lower than the existing glazing)?	NO
	As per ECBC 2007, this alteration is not required to conform with the provisions of the Code. However, the requirements for your state may vary.	
	(b) Modifications to roof/ceiling, wall, or floor cavities (which are insulated to full depth with	NO
	As per ECBC 2007, this alteration is not required to conform with the provisions of the Code. However, the requirements for your state may vary.	
	(c) Modifications to walls and floors without cavities (where no new cavities are created)?	NO
	As per ECBC 2007, this alteration is not required to conform with the provisions of the Code. However, the requirements for your state may vary.	
	(d) Any other alterations?	NO
	As per ECBC 2007, this alteration is not required to conform with the provisions of the Code. However, the requirements for your state may vary.	

Lighting Exceptions		
	Do the alterations replace less than 50% of the luminaires in a given space without increasing the connected lighting load?	YES
	As per ECBC 2007, these alterations are not required to conform with the provisions of the Code. However, the requirements for your state may vary.	

Site Details	
Description	
Address	
City	
Pincode	

Approval Details	
Approving Authority	
Approval Number	
Approval Date	

Contact Details	
Owner	
Name	
Organization	
City	
State	
Pincode	
Phone	
Email	
Architect	
Name	
Organization	
City	
State	
Pincode	
Phone	
Email	

Building Conformance Summary	
System	***Conformance Status***
Envelope	**Conforming / Non-Conforming**
HVAC	**Conforming / Non-Conforming**
SHWP	**Conforming / Non-Conforming / NA**
Lighting	**Conforming / Non-Conforming / NA**
Electrical Power	**Conforming / Non-Conforming / NA**

Building Conformance as per the ECBC	**CONFORMING / NON-COMFORMING**

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - Prescriptive Tool Method

2.0 ENVELOPE SUMMARY

DATE:

General	
Building Name	
Location	
State/Union Territory	
City	
Climate Zone	
Latitude/Longitude	
Project Details	
Building Type	
Building Use	
Connected Load | Contract Demand	
Project Type	Alterations to Existing Building
Built-up Area	1.23456E+12
Conditioned Area	
Conformance checked for	Envelope and/or HVAC and/or SHWP and/or Lighting and/or Electrical Power

% Vertical Fenestration Area (WWR) Calculation	Total Vertical Fenestration Area	*divided by*	Gross Exterior Wall Area	*times 100 equals*	% Vertical Fenestration Area (WWR)
Note: % Vertical Fenestration Area (WWR) cannot exceed 60% for Prescriptive Conformance		/		**x 100 =**	
% Skylight Area (SRR) Calculation	Total Skylight Area	*divided by*	Gross Roof Area	*times 100 equals*	% Skylight Area (SRR)
Note: % Skylight Area (SRR) cannot exceed 5% for Prescriptive Conformance		/		**x 100 =**	

Envelope Conformance Summary			
Envelope Component	***No. of Conforming***	***No. of Non-conforming***	***Conformance Status***
Walls	*Number of Walls*	*Number of Walls*	**Conforming / Non-Conforming**
Roofs	*Number of Roofs*	*Number of Roofs*	**Conforming / Non-Conforming**
Vertical Fenestration	*Number of Vertical Fenestration*	*Number of Vertical Fenestration*	**Conforming / Non-Conforming**
Skylights	*Number of Skylights*	*Number of Skylights*	**Conforming / Non-Conforming /NA**

Envelope Conformance as per the ECBC	**CONFORMING / NON-COMFORMING - Using Building Envelope Trade-off Option**

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - Prescriptive Tool Method

2.1 ENVELOPE CHECKLIST

DATE:

General	
Building ID	
Building Name	
Location	
State/Union Territory	
City	
Climate Zone	
Latitude/Longitude	
Project Details	
Building Type	
Building Use	
Connected Load | Contract Demand	
Project Type	Alterations to Existing Building
Built-up Area	1.23456E+12
Conditioned Area	
Conformance checked for	Envelope and/or HVAC and/or SHWP and/or Lighting and/or Electrical Power

Mandatory Requirements				
Questions			**Conformance Status**	
Fenestration				
U-factor	1	Is the U-factor for overall fenestration (including the sash and frame) determined in accordance with ISO- 15099, as specified in Appendix C §11 of ECBC, by an accredited independent laboratory, and labeled and certified by the manufacturer or other responsible party?	**Conforming / Non-Conforming / NA**	Description for NA
	2	Is the U-factor for sloped glazing and skylights determined at a slope of 20 degrees above the horizontal?	**Conforming / Non-Conforming / NA**	Description for NA
	3	Is the default table in Appendix C §11 used for determining the fenestration properties of unrated products?	**Conforming / Non-Conforming / NA**	Description for NA
SHGC	4	Is the SHGC determined for the overall fenestration product (including the sash and frame) in accordance with ISO-15099, as specified in Appendix C §11, by an accredited independent laboratory, and labeled and certified by the manufacturer or other responsible party?	**Conforming / Non-Conforming / NA**	Description for NA
Air Leakage	5	Is Air Leakage for glazed swinging entrance doors and revolving doors less than 5.0 l/sm^2?	**Conforming / Non-Conforming / NA**	Description for NA
	6	Is Air Leakage for fenestration and doors, other than glazed swinging entrance doors and revolving doors, less than 2.0 l/sm^2?	**Conforming / Non-Conforming / NA**	Description for NA
Opaque Construction				
	7	Are U-factors determined from the default tables in Appendix C §11 or from data or procedure contained in the ASHRAE Fundamentals, 2005?	**Conforming / Non-Conforming / NA**	Description for NA
Building Envelope Sealing				
	8	Are the following areas of the enclosed building envelope sealed, caulked, gasketed, or weather-stripped to minimize air leakage?	**Conforming / Non-Conforming / NA**	Description for NA
		(a) Joints around fenestration and door frames		
		(b) Opening between walls and foundations and between walls and roof and wall panels		
		(c) Openings at penetrations of utility services through roofs, walls and floors		
		(d) Site-built fenestration and doors		
		(e) Building assemblies used as ducts or plenums		
		(f) All other openings in the building envelope		

Prescriptive Requirements							
Roofs							
S. No.	Component	Description	Area (m^2)	U-factor of Overall Assembly ($W/m^2 \cdot K$)	R-value of Insulation Alone ($m^2 \cdot K/W$)	Cool Roof Application	Conformance Status
1	Roof 1					YES | NO	**Conforming / Non-Conforming**
2	Roof 2					YES | NO	**Conforming / Non-Conforming**
3	Roof 3					YES | NO	**Conforming / Non-Conforming**

Walls						
S. No.	Component	Description	Area (m^2)	U-factor of Overall Assembly ($W/m^2 \cdot K$)	R-value of Insulation Alone ($m^2 \cdot K/W$)	Conformance Status
1	Wall 1					**Conforming / Non-Conforming**
2	Wall 2					**Conforming / Non-Conforming**
3	Wall 3					**Conforming / Non-Conforming**

Vertical Fenestration								
S. No.	Component	Description	Area (m^2)	U-factor ($W/m^2 \cdot K$)	SHGC	VLT	Interior Light Shelf or Shading Device	Conformance Status
1	Vertical Fenestration Element 1						Interior Light Shelf and/or Overhang and/or Vertical Fins	Conforming / Non-Conforming | Exemption | Conforming (as Exception)
2	Vertical Fenestration Element 2						Interior Light Shelf and/or Overhang and/or Vertical Fins	Conforming / Non-Conforming | Exemption | Conforming (as Exception)
3	Vertical Fenestration Element 3						Interior Light Shelf and/or Overhang and/or Vertical Fins	Conforming / Non-Conforming | Exemption | Conforming (as Exception)

Skylights						
S. No.	Component	Description	Area (m^2)	U-factor ($W/m^2 \cdot K$)	SHGC	Conformance Status
1	Skylight 1					**Conforming / Non-Conforming**
2	Skylight 2					**Conforming / Non-Conforming**
3	Skylight 3					**Conforming / Non-Conforming**

Building Envelope Trade-off Option Calculation						
		EPF_{Roof}	EPF_{Wall}	EPF_{Fenest}	EPF_{Total}	Conformance Status
Standard Design						**Conforming / Non-Conforming**
Proposed Building						

Envelope Conformance as per the ECBC	**CONFORMING / NON-COMFORMING - Using Building Envelope Trade-off Option**

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - Prescriptive Tool Method

3.0 HVAC CHECKLIST

Date of creation:	
General	
Building ID	
Building Name	
Location	
State/Union Territory	
City	
Climate Zone	
Latitude/Longitude	
Project Details	
Building Type	
Building Use	
Connected Load | Contract Demand	
Project Type	Alterations to Existing Building
Built-up Area	1.23456E+12
Conditioned Area	
Conformance checked for	Envelope and/or HVAC and/or SHWP and/or Lighting and/or Electrical Power

Mandatory Requirements				
Questions			**Conformance Status**	
Natural Ventilation				
	1	Does the natural ventilation comply with the design guidelines provided for natural ventilation in the National Building Code of India Part 8 Section 1, 5.4.3 and 5.7.1?	**Conforming / Non-Conforming / NA**	Description for NA
Minimum Equipment Efficiencies				
Cooling Equipment	**2**	Does the chiller efficiency comply with the efficiency requirements of ECBC 2007 or ASHRAE 90.1 2004 as applicable?	**Conforming / Non-Conforming / NA**	Description for NA
	3	Does the condenser efficiency comply with the efficiency requirements of ECBC 2007 or ASHRAE 90.1 2004 as applicable?	**Conforming / Non-Conforming / NA**	Description for NA
	4	Do the Unitary Air Conditioner (IS 1391, part 1), Split Air Conditioner (IS 1391, part 2), Packaged Air Conditioner (IS 8148) meet the applicable IS standards?	**Conforming / Non-Conforming / NA**	Description for NA
Heating Equipment	**5**	Does the heating equipment efficiency comply with the efficiency requirements of ECBC 2007 or ASHRAE 90.1 2004 as applicable?	**Conforming / Non-Conforming / NA**	Description for NA
Controls				
Time Clock Control	**6**	Can the timeclock controlling the mechanical cooling and heating system have the ability to start and stop under different schedules for three different day-types per week?	**Conforming / Non-Conforming / NA**	Description for NA
	7	Is the timeclock controlling the mechanical cooling and heating system capable of retaining programming and time setting during loss of power for a period of at least 10 hours?	**Conforming / Non-Conforming / NA**	Description for NA
	8	Does the timeclock controlling the mechanical cooling and heating system include an accessible manual override that allows temporary operation of the system for upto 2 hours?	**Conforming / Non-Conforming / NA**	Description for NA

Temperature Control		Are all heating and cooling equipment temperature controlled?	Conforming / Non-Conforming / NA	Description for NA
	9	Where a unit provides both heating and cooling, Are the controls capable of providing a temperature dead band of 3degC (5degF) within which the supply of heating and cooling energy to the zone is shut off or reduced to minimum?		
	10	Where separate heating and cooling serve the same temperature zone, are the thermostats interlocked to prevent simultaneous heating and cooling?		
Condenser Control	11	Do the cooling towers and closed circuit fluid coolers have either a two speed motors, pony motors or variable speed drives controlling the fan	Conforming / Non-Conforming / NA	Description for NA
Piping & Ductwork				
Piping	12	Does the piping for heating systems with a design operating temperature of 60degC or greater have atleast R- 0.70 (R-4) insulation?	Conforming / Non-Conforming / NA	Description for NA
	13	Does the piping for heating systems with a design operating temperature of less than 60degC but greater than 40degC have atleast R- 0.35 (R-2) insulation?		
	14	Does the piping for cooling systems with a design operating temperature less than 15degC have atleast R-0.35 (R-2) insulation?		
	15	Does the piping for regerigerant suction piping on split systems have atleast R-0.35 (R-2) insulation?		
	16	Is the insulation exposed to weather protected by aluminium sheet metal, painted canvas, or plastic cover?		
	17	If the piping system incorporates cellular foam insulation, is that protected as stated above or painted with water retardant paint?		
Ductwork	18	Is the ductwork insulated as per ECBC 2007 Table 5.2	Conforming / Non-Conforming / NA	Description for NA
System Balancing				
General	19	Do the construction documents include HVAC systems that have been balanced in accordance to generally accepted engineering standards?	Conforming / Non-Conforming / NA	Description for NA
	20	Has a written balance report been provided to the owner or the designated representative of the building owner for HVAC systems serving zones with a total conditioned area exceeding 500sqmt (5000 sqft)		
Air Systems Balancing	21	Have the air systems been balanced to minimize throttling losses?	Conforming / Non-Conforming / NA	Description for NA
	22	Have the fan speed been adjusted for fans with a fan system power greater than 0.75kW?		
Hydronic Systems Balancing	23	Have the hydronic systems been proportionately balanced to minimize throttling losses?	Conforming / Non-Conforming / NA	Description for NA
	24	Has the pump impeller been trimmed or pump speed adjusted to meet design flow conditions?		

Condensers				
Condenser Location	**25**	Have the condensers been located in a manner so that the heat sink is free of interference from heat discharge by devices located in adjoining spaces and also does not interfere with such other systems installed nearby	**Conforming / Non-Conforming / NA**	Description for NA
Treated water for Condensers	**26**	Does the centralized cooling water system use soft water for the condenser and chilled water system	**Conforming / Non-Conforming / NA**	Description for NA

Prescriptive Requirements				
Economizer				
	27	Does each cooling system having a fan with an air or water economizer meet the requirements as prescribed by ECBC 2007 or ASHRAE 90.1. 2004 6.5.1 as applicable?	**Conforming / Non-Conforming / NA**	Description for NA
Simultaneous Heating and Cooling Limitation				
	28	Does the mechanical system meet the requirements of simulatenous heating and cooling as prescribed by ASHRAE 90.1. 2004 6.5.2 as applicable?	**Conforming / Non-Conforming / NA**	Description for NA
Air System Design & Control				
	29	Does the HVAC system with a total fan system power exceeding 5 hp meet the provisions of air system design and control as prescribed by ASHRAE 90.1. 2004 6.5.3 ?	**Conforming / Non-Conforming / NA**	Description for NA
Hydronic System Design & Control				
	30	Does the HVAC system having a total pump system power exceeding 10 hp meet the requirements of ECBC 2007 or ASHRAE 90.1.2004 6.5.4	**Conforming / Non-Conforming / NA**	Description for NA
Heat Rejection Equipment				
	31	Do the heat rejection equipment used in the cooling systems meet the requirements of ECBC 2007 or ASHRAE 90.1 2004 6.5.5?	**Conforming / Non-Conforming / NA**	Description for NA
Energy Recovery				
	32	Does the energy recovery installed in the HVAC system meet the requirements of ECBC 2007 or ASHRAE 90.1.2004 6.5.6?	**Conforming / Non-Conforming / NA**	Description for NA
Exhaust Hoods				
	33	Do the exhaust or fume hoods installed meet the requirements of ECBC 2007 or ASHRAE 90.1.2004 6.5.7?	**Conforming / Non-Conforming / NA**	Description for NA
Radiant Heating Systems				
		Do the radiant systems installed meet the requirements of ECBC 2007 or ASHRAE 90.1. 2004 6.5.8?	**Conforming / Non-Conforming / NA**	Description for NA

Temperature Control		Are all heating and cooling equipment temperature controlled?	Conforming / Non-Conforming / NA	Description for NA
	9	Where a unit provides both heating and cooling, Are the controls capable of providing a temperature dead band of 3degC (5degF) within which the supply of heating and cooling energy to the zone is shut off or reduced to minimum?		
	10	Where separate heating and cooling serve the same temperature zone, are the thermostats interlocked to prevent simultaneous heating and cooling?		
Condenser Control	11	Do the cooling towers and closed circuit fluid coolers have either a two speed motors, pony motors or variable speed drives controlling the fan	Conforming / Non-Conforming / NA	Description for NA
Piping & Ductwork				
Piping	12	Does the piping for heating systems with a design operating temperature of 60degC or greater have atleast R- 0.70 (R-4) insulation?	Conforming / Non-Conforming / NA	Description for NA
	13	Does the piping for heating systems with a design operating temperature of less than 60degC but greater than 40degC have atleast R- 0.35 (R-2) insulation?		
	14	Does the piping for cooling systems with a design operating temperature less than 15degC have atleast R-0.35 (R-2) insulation?		
	15	Does the piping for regerigerant suction piping on split systems have atleast R-0.35 (R-2) insulation?		
	16	Is the insulation exposed to weather protected by aluminium sheet metal, painted canvas, or plastic cover?		
	17	If the piping system incorporates cellular foam insulation, is that protected as stated above or painted with water retardant paint?		
Ductwork	18	Is the ductwork insulated as per ECBC 2007 Table 5.2	Conforming / Non-Conforming / NA	Description for NA
System Balancing				
General	19	Do the construction documents include HVAC systems that have been balanced in accordance to generally accepted engineering standards?	Conforming / Non-Conforming / NA	Description for NA
	20	Has a written balance report been provided to the owner or the designated representative of the building owner for HVAC systems serving zones with a total conditioned area exceeding 500sqmt (5000 sqft)		
Air Systems Balancing	21	Have the air systems been balanced to minimize throttling losses?	Conforming / Non-Conforming / NA	Description for NA
	22	Have the fan speed been adjusted for fans with a fan system power greater than 0.75kW?		
Hydronic Systems Balancing	23	Have the hydronic systems been proportionately balanced to minimize throttling losses?	Conforming / Non-Conforming / NA	Description for NA
	24	Has the pump impeller been trimmed or pump speed adjusted to meet design flow conditions?		

Condensers				
Condenser Location	**25**	Have the condensers been located in a manner so that the heat sink is free of interference from heat discharge by devices located in adjoining spaces and also does not interfere with such other systems installed nearby	**Conforming / Non-Conforming / NA**	Description for NA
Treated water for Condensers	**26**	Does the centralized cooling water system use soft water for the condenser and chilled water system	**Conforming / Non-Conforming / NA**	Description for NA

Prescriptive Requirements				
Economizer				
	27	Does each cooling system having a fan with an air or water economizer meet the requirements as prescribed by ECBC 2007 or ASHRAE 90.1. 2004 6.5.1 as applicable?	**Conforming / Non-Conforming / NA**	Description for NA
Simultaneous Heating and Cooling Limitation				
	28	Does the mechanical system meet the requirements of simulatenous heating and cooling as prescribed by ASHRAE 90.1. 2004 6.5.2 as applicable?	**Conforming / Non-Conforming / NA**	Description for NA
Air System Design & Control				
	29	Does the HVAC system with a total fan system power exceeding 5 hp meet the provisions of air system design and control as prescribed by ASHRAE 90.1. 2004 6.5.3 ?	**Conforming / Non-Conforming / NA**	Description for NA
Hydronic System Design & Control				
	30	Does the HVAC system having a total pump system power exceeding 10 hp meet the requirements of ECBC 2007 or ASHRAE 90.1.2004 6.5.4	**Conforming / Non-Conforming / NA**	Description for NA
Heat Rejection Equipment				
	31	Do the heat rejection equipment used in the cooling systems meet the requirements of ECBC 2007 or ASHRAE 90.1 2004 6.5.5?	**Conforming / Non-Conforming / NA**	Description for NA
Energy Recovery				
	32	Does the energy recovery installed in the HVAC system meet the requirements of ECBC 2007 or ASHRAE 90.1.2004 6.5.6?	**Conforming / Non-Conforming / NA**	Description for NA
Exhaust Hoods				
	33	Do the exhaust or fume hoods installed meet the requirements of ECBC 2007 or ASHRAE 90.1.2004 6.5.7?	**Conforming / Non-Conforming / NA**	Description for NA
Radiant Heating Systems				
		Do the radiant systems installed meet the requirements of ECBC 2007 or ASHRAE 90.1. 2004 6.5.8?	**Conforming / Non-Conforming / NA**	Description for NA

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - Prescriptive Tool Method

4.0 SHWP SUMMARY

DATE:

General	
Building ID	
Building Name	
Location	
State/Union Territory	
City	
Climate Zone	
Latitude/Longitude	
Project Details	
Building Type	
Building Use	
Connected Load | Contract Demand	
Project Type	Alterations to Existing Building
Built-up Area	1.23456E+12
Conditioned Area	
Conformance checked for	Envelope and/or HVAC and/or SHWP and/or Lighting and/or Electrical Power

SHWP Conformance Summary	
SHWP Component	***Conformance Status***
Solar Water Heating	**Conforming / Non-Conforming / NA**
Equipment Efficiency	**Conforming / Non-Conforming / NA**
Supplementary Water Heating	**Conforming / Non-Conforming / NA**
Piping Insulation	**Conforming / Non-Conforming / NA**
Heat Traps	**Conforming / Non-Conforming / NA**
Swimming Pools	**Conforming / Non-Conforming / NA**
Compliance Documentation	**Conforming / Non-Conforming / NA**

SHWP Conformance as per the ECBC	**CONFORMING / NON-COMFORMING / NA**

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - Prescriptive Tool Method

4.1 SHWP CHECKLIST

DATE:

General	
Building ID	
Building Name	
Location	
State/Union Territory	
City	
Climate Zone	
Latitude/Longitude	
Project Details	
Building Type	
Building Use	
Connected Load | Contract Demand	
Project Type	Alterations to Existing Building
Built-up Area	1.23456E+12
Conditioned Area	
Conformance checked for	Envelope and/or HVAC and/or SHWP and/or Lighting and/or Electrical Power

Mandatory Requirements				
Questions			**Conformance Status**	
Solar Water Heating				
	1	Is the building a hotel or a hospital with a centralized water heating system?	**Conforming / Non-Conforming**	
	2	Specify the design heating capacity of the centralized water heating system		kL/day
	3	Does the heating system have a heat recovery system that provides water heating?	**Conforming / Non-Conforming**	
	4	What is the water heating capacity of the heat recovery system?		kL/day
		As the water heating capacity of the heat recovery system is at least one-fifth of the design heating capacity of the centralized water heating system, this building is exempt from the mandatory requirement for Solar Water Heating.		
	5	Does the building have a solar water heating system?	**Conforming / Non-Conforming**	
	6	What is the water heating capacity of the solar water heating system?		kL/day

Equipment Efficiency				
Solar Water Heater	7	Does the Solar Water Heater meet the performance/minimum efficiency level mentioned in IS 13129 (Part 1 & 2)?	**Conforming / Non-Conforming**	
Gas Instantaneous Water Heater	8	Does the Gas Instantaneous Water Heater meet the performance/minimum efficiency level mentioned in IS 15558 with above 80% thermal efficiency?	**Conforming / Non-Conforming**	
Electric Water Heater	9	Does the Electric Water Heater meet the performance/minimum efficiency level mentioned in IS 2082?	**Conforming / Non-Conforming**	
Supplementary Water Heating System				
	10	Is the supplementary heating system designed to maximize the energy efficiency of the system?	**Conforming / Non-Conforming /NA**	Description for NA
	11	Does the supplementary heating system incorporate the design features listed below in cascade?	**Conforming / Non-Conforming /NA**	Description for NA
		(a) Incorporate maximum heat recovery from hot discharge system like condensers of air conditioning units		
		(b) Use gas fired heaters wherever gas is available		
		(c) Use electric heater as last resort		
Piping Insulation				
	12	What is the operating temperature of the water?	≥ 60°C | 40.1-59.9°C	
	13	What is the R-value of piping insulation used in heating system?		$m^2 \cdot °C/W$
	14	Does the insulation for the entire hot water system, including the storage tanks and pipelines, conform to the relevant IS standards on materials and applications?	**Conforming / Non-Conforming /NA**	Description for NA
Heat Traps				
	15	Have heat traps been provided on both inlet and out piping, as close as practical to the storage tanks, for vertical pipe risers serving storage water heaters?	**Conforming / Non-Conforming /NA**	Description for NA
	16	Have heat traps been provided on both inlet and out piping, as close as practical to the storage tanks not having integral heat traps and serving non-recirculating system?	**Conforming / Non-Conforming /NA**	Description for NA
Swimming Pools				
	17	Does the building have heated swimming pool(s)?	**Conforming / Non-Conforming**	
	18	Does the pool(s) derive over 60% of its energy from site-recovered energy or solar energy source?	**Conforming / Non-Conforming**	
		As the pool(s) derives over 60% of its energy from site-recovered energy or solar energy source, this building is exempt from the mandatory requirements for swimming pool(s).		
	19	Is a vapor retardant pool cover provided on or at the water surface?	**Conforming / Non-Conforming**	
	20	What is the water temperature of the heated pool(s)?	≤ 32°C | > 32°C	
	21	What is the R-value of the pool cover?		$m^2 \cdot °C/W$
Compliance Documentation				
	22	Does the application for approval furnish detailed calculations showing the design to ensure at least 20% of the heating requirement is met from solar heat/heat recovery?	**Conforming / Non-Conforming /NA**	Description for NA
	23	Does the application for approval furnish detailed calculations showing the design to ensure not more than 80% of the heating requirement is met from electrical heating?	**Conforming / Non-Conforming /NA**	Description for NA
	24	Does the application for approval furnish detailed calculations showing the design to ensure not more than 20% of the heating requirement is met from electrical heating wherever gas is available?	**Conforming / Non-Conforming /NA**	Description for NA

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - Prescriptive Tool Method

5.0 LIGHTING SUMMARY

DATE:

General	
Building ID	
Building Name	
Location	
State/Union Territory	
City	
Climate Zone	
Latitude/Longitude	
Project Details	
Building Type	
Building Use	
Connected Load | Contract Demand	
Project Type	Alterations to Existing Building
Built-up Area	1.23456E+12
Conditioned Area	
Conformance checked for	Envelope and/or HVAC and/or SHWP and/or Lighting and/or

Interior Lighting Power Allowance Method	Building Area Method

Maximum Interior Lighting Power Allowance						
S. No.	Zone Name	Building Area Type | Space Function Type	Allowed Interior Lighting Power Density (W/m^2)	Lighted Floor Area (m2)	Interior Lighting Power Allowance (W)	Installed Interior Lighting Power (W)
			Total			

Maximum Exterior Lighting Power Allowance					
S. No.	Zone Name	Type	Allowed Exterior Lighting Power Limits (W/m^2)/ (W/lin m)	Exterior Lighting Power Allowance (W)	Installed Exterior Lighting Power (W)
			Total		

Lighting Conformance Summary	
Mandatory Requirements	***Conformance Status***
Lighting Control	**Conforming / Non-Conforming / NA**
Exit Signs	**Conforming / Non-Conforming / NA**
Exterior Building Grounds Lighting	**Conforming / Non-Conforming / NA**
Prescriptive Requirements	***Conformance Status***
Interior Lighting Power	**Conforming / Non-Conforming / NA**
Exterior Lighting Power	**Conforming / Non-Conforming / NA**

Lighting Conformance as per the ECBC	**CONFORMING / NON-COMFORMING / NA**

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - Prescriptive Tool Method

5.1 LIGHTING CHECKLIST

DATE:	
General	
Building ID	
Building Name	
Location	
State/Union Territory	
City	
Climate Zone	
Latitude/Longitude	
Project Details	
Building Type	
Building Use	
Connected Load | Contract Demand	
Project Type	Alterations to Existing Building
Built-up Area	1.23456E+12
Conditioned Area	
Conformance checked for	Envelope and/or HVAC and/or SHWP and/or Lighting and/or Electrical Power
Interior Lighting Power Allowance Method	Building Area Method

Mandatory Requirements				
Questions			**Conformance Status**	
Lighting Control				
Automatic Lighting Shutoff	1	For a building that is not a 24-hour use building, are interior lighting systems equipped with an automatic control device for buildings larger than 500m^2?	YES | NO | NA	Description for NA
	2	For a building that is not a 24-hour use building, are all office areas less than 30 m2 and enclosed by walls or ceiling-height partitions, all meeting and conference rooms, all school classrooms, and all storage spaces, equipped with occupancy sensors?	YES | NO | NA	Description for NA
	3	For all spaces other than office areas less than 30 m^2 and enclosed by walls or ceiling-height partitions, meeting and conference rooms, school classrooms, and storage spaces, in a building that is not a 24-hour use building, does the automatic control device function on either of the following bases?	YES | NO | NA	Description for NA
		(a) scheduled for specified programmed times, wherein an independent program schedule is provided for areas up to 2500m^2, and for a single floor		
		(b) with occupancy sensors that turn the lighting off within 30 minutes of an occupant leaving the space, wherein the light fixtures controlled by occupancy sensors have a wall-mounted, manual switch capable of turning off lights when the space is occupied		
Space Control	4	Is each space enclosed by ceiling-height partitions provided with at least one control device to independently control the general lighting within the space?	YES | NO | NA	Description for NA
	5	Is each control device activated either manually by an occupant or automatically by sensing an occupant?	YES | NO | NA	Description for NA
	6	Does each control device control a maximum of 250 m2 for a space less than or equal to 1000 m2 and a maximum of 1000 m2 for a space greater than 1000 m2?	YES | NO | NA	Description for NA
	7	Is each control device capable of overriding the automatic lighting shutoff control for no more than 2 hours?	YES | NO | NA	Description for NA
	8	Is each control device readily accessible and located so the occupant can see the control, unless it is installed remotely for reasons of safety or security?	YES | NO | NA	Description for NA
	9	Does each control device installed remotely for reasons of safety or security, have a pilot light indicator as a part of it or next to it and clearly labelled to identify the controlled lighting?	YES | NO | NA	Description for NA

Control in day lighted areas	10	For daylighted areas greater than 25 m2, are the luminaires equipped with either a manual or an automatic control device?	YES | NO | NA	Description for NA
	11	For daylighted areas greater than 25 m2, is the manual or automatic control device capable of reducing the light output of the luminaires in the daylighted areas by at least 50%?	YES | NO | NA	Description for NA
	12	For daylighted areas greater than 25 m2, does the manual or automatic control control only the luminaires located entirely within the daylighted area?	YES | NO | NA	Description for NA
Exterior Lighting control	13	Does the exterior space have two or more independently operating lighting systems controlled to prevent simultaneous user operations?	YES | NO | NA	Description for NA
	14	When two or more independently operating lighting systems are not controlled to prevent simultaneous user operations in an exterior space, is the lighting controlled by a photo sensor or an astronomical time switch that is capable of automatically turning off when daylight is available or the lighting is not required?	YES | NO | NA	Description for NA
Additional control	15	Is a separate control device provided for display or accent lighting in area greater than 300 m2?	YES | NO | NA	Description for NA
	16	Is a separate control device provided for case lighting in area greater than 300 m2 for cases used for display purposes?	YES | NO | NA	Description for NA
	17	Is a master control device provided for hotel and motel guest rooms and guest suites at the main room entry to control all permanently installed luminaires and switched receptacles?	YES | NO | NA	Description for NA
	18	Does supplemental task lighting (including permanently installed under shelf or under cabinet lighting) have a control device integral to the luminaires or is it controlled by a wall-mounted control device provided the control device is readily accessible and located so the occupant can see it?	YES | NO | NA	Description for NA
	19	Is a separate control device provided for lighting for non-visual applications (plant growth and food-warming)?	YES | NO | NA	Description for NA
	20	Is a separate control device, accessible only to authorized personnel, provided for lighting equipment that is for sale or for demonstrations in lighting education?	YES | NO | NA	Description for NA
Exit Signs				
	21	Do all internally illuminated exit signs have wattage of 5 W per face or less?	YES | NO | NA	Description for NA
Exterior Building Grounds Lighting				
	22	Are the exterior building grounds luminaires operating at greater than 100W controlled by a motion sensor or work as emergency lighting that is automatically turned off during normal building operation and is powered by battery, generator, or other alternate power source?	YES | NO | NA	Description for NA
	23	Do the exterior building grounds luminaires operating at greater than 100W contain lamps having a minimum efficacy of 60 lm/W in case they are not controlled by a motion sensor or do not work as emergency lighting that is automatically turned off during normal building operation, powered by battery, generator, or other alternate power source?	YES | NO | NA	Description for NA

Prescriptive Requirements						
Interior Lighting						
Interior Lighting Zones						
S. No.	Zone Name	Building Area Type | Space Function Type	Allowed Interior Lighting Power Density (W/m^2)	Lighted Floor Area (m2)	Interior Lighting Power Allowance (W)	Installed Interior Lighting Power (W)
1	Zone 1					
1	Zone 2					
1	Zone 3					
1	Zone 4					
			Total			

Luminaires						
Zone Name	Luminaire ID	Description	Lamp type	Luminaire Wattage	Number of luminaires	
Zone 1						

Zone 2						

Zone 3						

Zone 4						

Exemptions and Exceptions
Exemtpion 1 (Display/accent lighting in galleries/museums/monuments)
Exemtpion 2 (Lighting in dwelling Units)

Exterior Lighting					
Exterior Lighting Applications					
S. No.	Zone Name	Type	Allowed Exterior Lighting Power Limits (W/m^2)/ (W/lin m)	Exterior Lighting Power	Installed Exterior Lighting
1	Zone 1				
1	Zone 2				
1	Zone 3				
1	Zone 4				
			Total		

Luminaires						
Zone Name	Luminaire ID	Description	Lamp type	Luminaire Wattage	Number of luminaires	
Zone 1						

Zone 2						

Zone 3						

Zone 4						

Exemptions and Exceptions
Exemtpion 1 (Transportation marker, signal and directional lighting)
Exemtpion 2 (Emergency lighting powered by battery/generator/alternate power source and automatically turned off during normal operation)

Lighting Conformance Summary	
Mandatory Requirements	***Conformance Status***
Lighting Control	**Conforming / Non-Conforming / NA**
Exit Signs	**Conforming / Non-Conforming / NA**
Exterior Building Grounds Lighting	**Conforming / Non-Conforming / NA**
Prescriptive Requirements	***Conformance Status***
Interior Lighting Power	**Conforming / Non-Conforming / NA**
Exterior Lighting Power	**Conforming / Non-Conforming / NA**

Lighting Conformance as per the ECBC	**CONFORMING / NON-COMFORMING / NA**

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - Prescriptive Tool Method

6.0 ELECTRICAL POWER SUMMARY

DATE:	
General	
Building ID	
Building Name	
Location	
State/Union Territory	
City	
Climate Zone	
Latitude/Longitude	
Project Details	
Building Type	
Building Use	
Connected Load | Contract Demand	
Project Type	Alterations to Existing Building
Built-up Area	1.23456E+12
Conditioned Area	
Conformance checked for	Envelope and/or HVAC and/or SHWP and/or Lighting and/or Electrical Power

Electrical Power Conformance Summary	
Electrical Power Component	***Conformance Status***
Transformers	**Conforming / Non-Conforming / NA**
Energy Efficient Motors	**Conforming / Non-Conforming / NA**
Power Factor Correction	**Conforming / Non-Conforming / NA**
Check Metering & Monitoring	**Conforming / Non-Conforming / NA**
Power Distribution Systems	**Conforming / Non-Conforming / NA**

Electrical Power Conformance as per the ECBC	**CONFORMING / NON-COMFORMING / NA**

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - Prescriptive Tool Method

6.1 ELECTRICAL POWER CHECKLIST

DATE:	
General	
Building ID	
Building Name	
Location	
State/Union Territory	
City	
Climate Zone	
Latitude/Longitude	
Project Details	
Building Type	
Building Use	
Connected Load/Contract Demand	
Project Type	Alterations to Existing Building
Built-up Area	1.23456E+12
Conditioned Area	
Conformance checked for	Envelope and/or HVAC and/or SHWP and/or Lighting and/or Electrical Power

Mandatory Requirements				
Questions			**Conformance Status**	
Transformers				
Maximum Allowable Power Transformer Losses	1	What is the transformer type?	Dry Type | Oil Filled	
	2	What is the rating of the transformer?		kVA
	3	What is the class of the transformer?	Upto 11 kV | Upto 22kV | 33 kV	
	4	Transformer losses at 50% loading (total loss value):		kW
	5	Transformer losses at 100% loading (total loss value):		kW
Measurement and Reporting of Transformer Losses	6	Is each transformer selected to minimize the total of its initial cost in addition to the present value of the cost of its total lost energy while serving its estimated loads during its respective life span?	**Conforming / Non-Conforming /NA**	Description for NA
	7	Is the measurement of losses carried out using calibrated digital meters of class 0.5 or better accuracy and certified by the manufacturer?	**Conforming / Non-Conforming /NA**	Description for NA
	8	Are all transformers of capacity of 500 kVA and above equipped with additional metering class CTs (current transformers) and PTs (potential transformers) additional to requirements of utilities for periodic loss monitoring?	**Conforming / Non-Conforming /NA**	Description for NA
Energy Efficient Motors				
	9	Do you have permanently wired polyphase motors?	**Conforming / Non-Conforming**	
	10	Number of permanently wired polyphase motors:		

Permanently Wired Polyphase Motors							
S.No.	**Motor ID/Name (for example, CHWP-1)**	**Rated Output (kW)**	**Annual Operating Hours**	**Efficiency Class**	**Number of Poles**	**Nominal Full Load Motor Efficiency**	**Comments**
				Improved efficiency - eff 2 | High efficiency - eff 1	2 | 4 | 6 | 8		**As per ECBC 2007, since the rated output of this permanently wired polyphase motor is less than 0.375 kW, this motor is exempt from the mandatory requirements for Electrical Power."**
	11	Above motor(s) horsepower ratings do not exceed 20% of the calculated maximum load being served	**Conforming / Non-Conforming /NA**	Description for NA			
	12	Do the above motor(s) nameplates list the nominal full load motor efficiency and full load power factor?	**Conforming / Non-Conforming /NA**	Description for NA			
	13	For above motor(s), are proper rewinding practices for rewound motors being followed or damaged motors being replaced with new efficient motors?	**Conforming / Non-Conforming /NA**	Description for NA			
	14	For above motor(s), are certificates indicating motor efficiency being obtained and kept on record?	**Conforming / Non-Conforming /NA**	Description for NA			
	15	For above motor(s), are appropriate measures being taken to preserve the core characteristics of the motor while rewinding?	**Conforming / Non-Conforming /NA**	Description for NA			
	16	For above motor(s), are records indicating a new efficiency test after rewinding being maintained?	**Conforming / Non-Conforming /NA**	Description for NA			
Power Factor							
	17	What is the amperage of the electricity supply?	≤ 100 A | > 100 A				
	18	What is the power factor for 3 phases?	< 0.95 lag | ≥ 0.95 lag ≤ 1.0				
Check-Metering and Monitoring							
	19	What is the contract demand of electricity services?	≤ 65 kVA | > 65 ≤ 1000 kVA | > 1000 kVA				
	20	Does the service have permanently installed electrical metering to record energy (kWh)?	**Conforming / Non-Conforming /NA**	Description for NA			
	21	Does the service have permanently installed electrical metering to record demand (kW), energy (kWh) and total power factor (kVARh)?	**Conforming / Non-Conforming /NA**	Description for NA			
	22	Does the service have permanently installed electrical metering to record demand (kW), energy (kWh), total power factor (kVARh), current (in phase and the neutral), voltage (between phases and between each phase and neutral) and total harmonic distortion (THD) as a percentage of total current?	**Conforming / Non-Conforming /NA**	Description for NA			
Power Distribution System							
	23	What is the total annual power usage?		kWh			
	24	What are the annual distribution losses?		kWh			
	25	Is a record of design calculation for the losses maintained?	**Conforming / Non-Conforming /NA**	Description for NA			

Annexure 12 ECOnirman WBP Tool Report Sample

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - WBP Tool Method

1.0 Building Summary

Project Information			
Project ID		Date:	
Project Name			
Project Address			
Organization Name			
Building			
Building Type			
Building Occupancy			
Total Conditioned Area (m²)			
Total Unconditioned Area (m²)			
Total Interior Floor Area (m²)			
Number of Floors			
Floor to Floor Height (m)			
Location			
State/UT			
City			
General			
Climate Zone			
Weather File			
Simulation Program			

Building Conformance Summary		
Proposed Design Electricity Use per year	**Standard Design Electricity Use per**	**Percent Savings: Electricity Use per year**
Proposed Design EPI (kWh/m^2/year)	**Standard Design EPI** (kWh/m^2/year)	**Percent Savings: EPI**
10.3.2(e) of ECBC Satisfied (Y/N)?		
Mandatory Requirements Met (Y/N)?		

Building Conformance as per the ECBC	**CONFORMING**

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - WBP Tool Method

2.0 Advisory Messages

	Proposed Design	Standard Design (no rotation)	Difference
Number of hours any zone outside of throttling range			
Number of hours any plant load not satisfied			
Number of warnings			
Number of errors			

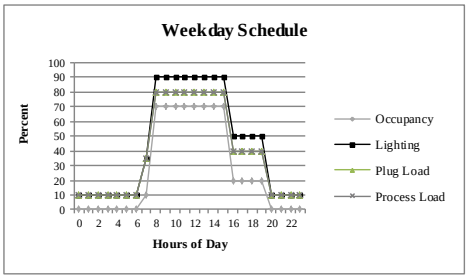
ENERGY CONSERVATION BUILDING CODE (ECBC)

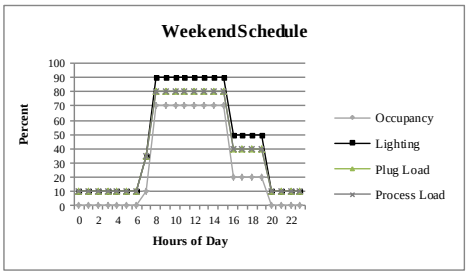
Compliance Report
All Systems - WBP Tool Method

3.0 Electrical Systems & Process Loads - Design Inputs

Building Use (Space Type)		
Lighting		
Lighting Power Density (W/m²)		
Lighting Controls		
Occupancy Sensor Control		
Daylighting Control		
Loads		
Plug Loads (W/m²)		
Process Loads (W/m²)		
Sensible heat load to space (%)		
Latent heat load to space (%)		
Process Load Source		
Thermal Comfort		
People		
	Max Density (m²/person)	
	Sensible Heat Gain (W/person)	
	Latent Heat Gain (W/person)	
Exhaust Fan Settings		
	Include Exhaust Fan?	
	Flow Rate (l/s/m²)	
Is Space Conditioned?		
Thermostat Settings		
	Occupied Heating (°C)	
	Occupied Cooling (°C)	
	Unoccupied Heating (°C)	
	Unoccupied Cooling (°C)	
Humidity Control		
	Maximum (%)	
	Minimum (%)	
Ventilation Requirements		
	People Requirement (l/s/person)	
	Addl Space Vent. Requirement (l/s/m²)	
	Minimum Air Changes - Unoccupied (/hr)	
	Minimum Air Changes - Occupied (/hr)	

Conditioned Area (m²)		
Unconditioned Area (m²)		
Total Area (m²)		
Allocated %		
Zoning	Floor Affinity	
	N Perimeter (m)	
	E Perimeter (m)	
	S Perimeter (m)	
	W Perimeter (m)	
	Total Perimeter (m)	





ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - WBP Tool Method

4.0 Building Envelope - Design Inputs

Windows and Walls	N	E	S	W
Wall Construction				
Window Construction				
Window-to-Wall Ratio				
Vertical Shading				
Horizontal Shading				

Roofs and Skylights	
Roof Construction	
Skylight-to-Roof Ratio	
Roof Reflectivity	

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - WBP Tool Method

5.1 HVAC - Proposed Design Details

Air System Inputs	
System Name	
Volume Control	
Air Flow Sizing	
Max Supply Air Flow (l/s)	
Cooling Coil	
Source	
Condenser Type	
Efficiency (COP)	
Heating Coil	
Source	
Capacity Sizing	
Capacity	
Efficiency (COP)	
Supply Fan	
Location	
Static Pressure (Pa)	
Return Fan	
Static Pressure (Pa)	
Outside Air Control	
Economizing	
Exhaust Air Heat Recovery	
Type	
Terminal Units	
Includes Reheat Coil?	
Source	

Cooling System Inputs	
System name	
Supply Water Temperature (°C)	
Return Water Temperature (°C)	
Cooling Tower	
Fan Control	
Waterside Economizer?	
Primary Pump	
Head Pressure (Pa)	
Flow Control	
Secondary Pump	
Head Pressure (Pa)	
Flow Control	
Condenser Pump	
Head Pressure (Pa)	
Flow Control	
Chillers	
Number of Chillers	
Chiller	
Cooling Type	
Compressor type	
Sizing	
Chiller Efficiency (COP)	
Chiller Capacity (kW)	

5.2 HVAC Assignment

Building Use (Space Type)	Area (m²)	System
Open Office		
Enclosed Office		
Circulation		
Mechanical Electrical Room		
Storage		
Medium Conference Room		
Data Center		
Lobby		
Restrooms		
Large Conference Room		

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - WBP Tool Method

6.0 Mandatory Requirements

Mandatory Requirements				YES	NO	N/A
Envelope						
	Fenestration					
		U-Factor				
		1	Is the U-factor for overall fenestration (including the sash and frame) determined in accordance with ISO-15099, as specified in Appendix C §11, by an accredited independent laboratory, and labeled and certified by the manufacturer or other responsible party?			
		2	Is the U-factor for sloped glazing and skylights determined at a slope of 20 degrees above the horizontal?			
		3	Is the default table in Appendix C §11 used for determining the fenestration properties of unrated products?			
		SHGC				
		4	Is the SHGC determined for the overall fenestration product (including the sash and frame) in accordance with ISO-15099, as specified in Appendix C §11, by an accredited independent laboratory, and labeled and certified by the manufacturer or other responsible party?			
		Air Leakage				
		5	Is Air Leakage for glazed swinging entrance doors and revolving doors less than 5.0 l/sm^2?			
		6	Is Air Leakage for fenestration and doors, other than glazed swinging entrance doors and revolving doors, less than 2.0 l/sm^2?			
	Opaque Construction					
		7	Are U-factors determined from the default tables in Appendix C §11 or from data or procedure contained in the ASHRAE Fundamentals, 2005?			
	Building Envelope Sealing					
		8	Are the following areas of the enclosed building envelope sealed, caulked, gasketed, or weather-stripped to minimize air leakage?			
			Joints around fenestration and door frames			
		9	Opening between walls and foundations and between walls and roof and wall panels			
		10	Openings at penetrations of utility services through roofs, walls and floors			
		11	Site-built fenestration and doors			
		12	Building assemblies used as ducts or plenums			
		13	All other openings in the building envelope			
HVAC						
	Natural Ventilation					
		14	Does the natural ventilation comply with the design guidelines provided for natural ventilation in the National Building Code of India 2005 Part 8 Section 1, 5.4.3 and 5.7.1?			
	Minimum Equipment Efficiencies					
		15	Does the cooling equipment meet or exceed the minimum efficiency requirements as per ECBC Table 5.1?			
		16	Does the heating and cooling equipment not listed in ECBC Table 5.1 comply with ASHRAE 90.1 2004 §6.4.1?			
		17	Do the Unitary air conditioners meet the performance level mentioned in IS 1391 (Part 1)?			
		18	Do the Split air conditioners meet the performance level mentioned in IS 1391 (Part 2)?			
		19	Do the Packaged air conditioners meet the performance level mentioned in IS 8148?			
		20	Do the Boilers meet the performance level mentioned in IS 13980 (with above 75% thermal efficiency)?			
	Controls					
		21	Is all heating and cooling equipment temperature controlled?			
		22	For units providing both heating and cooling, does the temperature control provide a temperature dead band of 3°C (5°F), within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum?			
		23	For different units providing separate heating and cooling to serve the same temperature zone, are the thermostats interlocked to prevent simultaneous heating and cooling?			
		24	Do all cooling towers and closed circuit fluid coolers have either two speed motors, pony motors or variable speed drives controlling the fans?			
		25	Are cooling systems of capacity more than or equal to 28 kW (8 tons), and/or heating systems of capacity more than or equal to 7 kW (2 tons), controlled by a timeclock that has the capabilities listed below?			
			# Can start and stop the system under different schedules for three different day-types per week			
		26	# Can retain programming and time setting for at least 10 hours during loss of power			
		27	# Can be manually overridden, using an accessible device, to allow temporary operation of the system for up to 2 hours			
	Piping and Ductwork					
		28	For heating systems with piping that has design operating temperature of 60°C (140°F), or greater, is the R-value of insulation greater than or equal to 0.7 m^2·°C/W?			
		29	For heating systems with piping that has design operating temperature of < 60°C (140°F) but > 40°C (104°F), is the R-value of insulation greater than or equal to 0.35 m^2·°C/W?			
		30	Is the R-value of insulation for refrigerant suction piping on spilt systems greater than or equal to 0.35 m^2·°C/W?			
		31	Is the insulation exposed to weather protected by aluminum sheet metal, painted canvas, or plastic cover?			
		32	Is cellular foam insulation protected by aluminum sheet metal, painted canvas, or plastic cover, or painted with water retardant paint?			
		33	Does the ductwork insulation follow ECBC Table 5.2?			

	System Balancing					
		General				
			34	Are all HVAC systems balanced in accordance with generally accepted engineering standards?		
			35	For HVAC systems serving zones with a total conditioned area exceeding 500 m^2, is a written balance report provided to the owner or the designated representative of the building owner, as required by the construction documents?		
		Air system balancing				
			36	Are the air systems balanced to minimize throttling losses as a priority?		
			37	Is the fan speed adjusted to meet design flow conditions for fans with fan system power greater than 0.75 kW (1 hp)?		
		Hydronic system balancing				
			38	Are the hydronic systems balanced to minimize throttling losses as a priority?		
			39	For pump motors of power exceeding 7.5 kW (10 hp), is the pump impeller trimmed or pump speed adjusted to meet design flow conditions?		
			40	For horsepower draw exceeding 5% of the nameplate rating, or 2.2 kW (3 hp), (whichever is greater), is the pump impeller trimmed to meet design flow conditions?		
	Condensers					
			41	Are condensers located to prevent interference in heat sink from heat discharge by devices located in adjoining space and to prevent interference with such other systems installed nearby?		
			42	For all high-rise buildings using centralized cooling water system, does the condenser and chilled water system use soft water?		
Service Hot Water and Pumping						
	Solar Water Heating					
			43	Does the centralized system for hotels and hospitals use either heat recovery or solar water heating for at least 1/5 of the design capacity?		
	Equipment Efficiency					
			44	Does the solar water heater meet the performance/minimum efficiency level mentioned in IS 13129 (Part 1 & 2)?		
			45	Does the gas instantaneous water heater meet the performance/minimum efficiency level mentioned in IS 15558 with above 80% thermal efficiency?		
			46	Does the electric water heater meet the performance/minimum efficiency level mentioned in IS 2082?		
	Supplementary Water Heating System					
			47	Is the supplementary heating system designed to maximize the energy efficiency of the system?		
			48	Does the supplementary heating system incorporate the design features listed below in cascade?		
				# incorporate maximum heat recovery from hot discharge system like condensers of air conditioning units		
			49	# use gas fired heaters wherever gas is available		
			50	# use electric heater as a last resort		
	Piping Insulation					
			51	Does the piping insulation comply with ECBC §5.2.4.1?		
			52	Does the insulation for the entire hot water system, including the storage tanks and pipelines, conform to the relevant IS standards on materials and applications?		
	Heat Traps					
			53	Have heat traps been provided on both inlet and out piping, as close as practical to the storage tanks, for vertical pipe risers serving storage water heaters?		
			54	Have heat traps been provided on both inlet and out piping, as close as practical to the storage tanks not having integral heat traps and serving non-recirculating system?		
	Swimming Pools					
			55	Do the pools derive over 60% of their energy from site-recovered energy or solar energy source?		
			56	Are all heated pools that do not derive over 60% of their energy from site-recovered energy or solar energy source, provided with a vapor retardant pool cover on or at the water surface?		
			57	Are all pools that do not derive over 60% of their energy from site-recovered energy or solar energy source, and are heated to more than 32°C (90°F), provided with a pool cover insulation of R-value greater than or equal to 2.1 $m^2 \cdot °C/W$?		
	Compliance Documentation					
			58	Does the application for approval furnish detailed calculations showing the design to ensure at least 20% of the heating requirement is met from solar heat/heat recovery?		
			59	Does the application for approval furnish detailed calculations showing the design to ensure not more than 80% of the heating requirement is met from electrical heating?		
			60	Does the application for approval furnish detailed calculations showing the design to ensure not more than 20% of the heating requirement is met from electrical heating wherever gas is available?		
Lighting						
	Lighting control					
		Automatic Lighting Shutoff				
			61	For a building that is not a 24-hour use building, are interior lighting systems equipped with an automatic control device for buildings larger than 500 m^2?		
			62	For a building that is not a 24-hour use building, are all office areas less than 30 m^2 and enclosed by walls or ceiling-height partitions, all meeting and conference rooms, all school classrooms, and all storage spaces, equipped with occupancy sensors?		
			63	[Lighting][Lighting control][Automatic Lighting Shutoff] For all spaces other than office areas less than 30 m^2 and enclosed by walls or ceiling-height partitions, meeting and conference rooms, school classrooms, and storage spaces, in a building that is not a 24-hour use building, does the automatic control device function on either of the following bases?		
				# scheduled for specified programmed times, wherein an independent program schedule is provided for areas up to 2500 m^2, and for a single floor		
			64	# with occupancy sensors that turn the lighting off within 30 minutes of an occupant leaving the space, wherein the light fixtures controlled by occupancy sensors have a wall-mounted, manual switch capable of turning off lights when the space is occupied		
		Space Control				
			65	Is each space enclosed by ceiling-height partitions provided with at least one control device to independently control the general lighting within the space?		
			66	Is each control device activated either manually by an occupant or automatically by sensing an occupant?		
			67	Does each control device control a maximum of 250 m^2 for a space less than or equal to 1000 m2 and a maximum of 1000 m2 for a space greater than 1000 m^2?		
			68	Is each control device capable of overriding the automatic lighting shutoff control for no more than 2 hours?		

		69	Is each control device readily accessible and located so the occupant can see the control, unless it is installed remotely for reasons of safety or security?			
		70	Does each control device installed remotely for reasons of safety or security, have a pilot light indicator as a part of it or next to it and clearly labelled to identify the controlled lighting?			
		Control in day lighted areas				
		71	For daylighted areas greater than 25 m^2, are the luminaires equipped with either a manual or an automatic control device?			
		72	For daylighted areas greater than 25 m^2, is the manual or automatic control device capable of reducing the light output of the luminaires in the daylighted areas by at least 50%?			
		73	For daylighted areas greater than 25 m^2, does the manual or automatic control control only the luminaires located entirely within the daylighted area?			
		Exterior Lighting control				
		74	Does the exterior space have two or more independently operating lighting systems controlled to prevent simultaneous user operations?			
		75	When two or more independently operating lighting systems are not controlled to prevent simultaneous user operations in an exterior space, is the lighting controlled by a photo sensor or an astronomical time switch that is capable of automatically turning off when daylight is available or the lighting is not required?			
		Additional control				
		76	Is a separate control device provided for display or accent lighting in area greater than 300 m^2?			
		77	Is a separate control device provided for case lighting in area greater than 300 m^2 for cases used for display purposes?			
		78	Is a master control device provided for hotel and motel guest rooms and guest suites at the main room entry to control all permanently installed luminaires and switched receptacles?			
		79	Does supplemental task lighting (including permanently installed under shelf or under cabinet lighting) have a control device integral to the luminaires or is it controlled by a wall-mounted control device provided the control device is readily accessible and located so the occupant can see it?			
		80	Is a separate control device provided for lighting for non-visual applications (plant growth and food-warming)?			
		81	Is a separate control device, accessible only to authorized personnel, provided for lighting equipment that is for sale or for demonstrations in lighting education?			
	Exit Signs					
		82	Do all internally illuminated exit signs have wattage of 5 W per face or less?			
	Exterior Building Grounds Lighting					
		83	Are the exterior building grounds luminaires operating at greater than 100 W controlled by a motion sensor or work as emergency lighting that is automatically turned off during normal building operation and is powered by battery, generator, or other alternate power source?			
		84	Do the exterior building grounds luminaires operating at greater than 100 W contain lamps having a minimum efficacy of 60 lm/W in case they are not controlled by a motion sensor or do not work as emergency lighting that is automatically turned off during normal building operation, powered by battery, generator, or other alternate power source?			
Electrical Power						
	Transformers					
		85	Do all power transformers satisfy the minimum acceptable efficiency at 50% and full load rating as per ECBC Tables 8.1 and 8.2, in terms of their rating and design?			
		86	Is each transformer selected to minimize the total of its initial cost in addition to the present value of the cost of its total lost energy while serving its estimated loads during its respective life span?			
		87	Is the measurement of losses carried out using calibrated digital meters of class 0.5 or better accuracy and certified by the manufacturer?			
		88	Are all transformers of capacity of 500 kVA and above equipped with additional metering class CTs (current transformers) and PTs (potential transformers) additional to requirements of utilities for periodic loss monitoring?			
	Energy Efficient Motors					
		89	Do all permanently wired polyphase motors of 0.375 kW or more, serving the building and expected to operate more than 1500 hours per year, have a minimum acceptable nominal full load motor efficiency not less than as listed in IS 12615 for energy efficient motors?			
		90	Do all permanently wired polyphase motors of 50 kW or more, serving the building and expected to operated more than 500 hours per year, have a minimum acceptable nominal full load motor efficiency not less than as listed in IS 12615 for energy efficient motors?			
		91	For motors of horsepower differing from those listed in the table in IS 12615, is the efficiency greater than that of the next listed kW motor?			
		92	Are the motor horsepower ratings less than or equal to 20% of the calculated maximum load being served?			
		93	Do the motor nameplates list the nominal full load motor efficiency and full load power factor?			
		94	Are proper rewinding practices for rewound motors being followed or damaged motors being replaced with new efficient motors?			
		95	Are certificates indicating motor efficiency being obtained and kept on record?			
		96	Are appropriate measures being taken to preserve the core characteristics of the motor while rewinding?			
		97	Are records indicating a new efficiency test after rewinding being maintained?			
	Power Factor Correction					
		98	Is the power factor for all electricity supplies exceeding 100 A, 3 phases, being maintained between 0.95 lag and 1at the point of connection?			
	Check-metering and Monitoring					
		99	For services exceeding 1000 kVA, does the installed electrical metering record Demand (kVA), Energy (kWh), and Total power factor?			
		100	For services exceeding 1000 kVA, does the installed electrical metering display current (in each phase and the neutral), voltage (between phases and between each phase and neutral), and total harmonic distortion as a percentage of total current?			
		101	For services not exceeding 1000 kVA but over 65 kVA, does the installed electrical metering record demand (kVA), energy (kWh), and total power factor?			
		102	For services not exceeding 65 kVA, does the installed electrical metering record Energy (kWh)?			
	Power Distribution Systems					
		Power Distribution System Losses				
		103	Is the power cabling sized to maintain the distribution losses not to exceed 1% of the total power usage?			
		104	Is a record of design calculation for the losses maintained?			

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
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7.0 Energy Type Summary

Energy Type	Utility Rate Description	Units of Energy	Conversion to Electricity
Electricity		kWh	
Natural Gas		therms	

ENERGY CONSERVATION BUILDING CODE (ECBC)

Compliance Report
All Systems - WBP Tool Method

8.1 Standard Design - End Use Summary

End Use	Energy Type	0° rotation		90° rotation		180° rotation		270° rotation		Average	
		Energy Use (kWh)	Peak Demand (kW)	Energy Use (kWh)	Peak Demand (kW)	Energy Use (kWh)	Peak Demand (kW)	Energy Use (kWh)	Peak Demand (kW)	Energy Use (kWh)	Peak Demand (kW)
InteriorLighting											
InteriorEquipment											
Heating											
Cooling											
HeatRejection											
Pumps											
Fans											
Totals											

ENERGY CONSERVATION BUILDING CODE (ECBC)

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8.2 Performance Rating Table

End Use	Energy Type	Proposed Design		Standard Design (Average)		Energy Percent Savings
		Energy Use (kWh)	Peak Demand (kW)	Energy Use (kWh)	Peak Demand (kW)	
InteriorLighting						
InteriorEquipment						
Heating						
Cooling						
HeatRejection						
Pumps						
Fans						
Totals						

8.3 Energy Consumption

Energy Type	Energy Use (kWh)		
	Proposed Design	Standard Design	Percentage Improvement
Electricity			
Totals			

Annexure 13 Self-Declaration for Energy Conservation Building Code (ECBC) compliance

Energy Conservation Building Code (ECBC) Compliance Declaration

(To be executed on a non-judicial stamp paper of Rs. 100/-)

To whomsoever it may concern

Owner's Name:
Address:
Details about the land on which development is proposed:
T.P.S. No._____ F.P. No.____ S.P. No._____ Tenement No. _____
Name of Village/Gamtal _____ Rev. Sur. No. / Block No./ City Sur. No. _____

I / We hereby solemnly affirm and declare as under:

1. That the proposed building on the aforesaid plot of land falls under the scope of Energy Conservation Building Code
2. That I/ We have proposed to develop and construct building on the aforesaid plot of land as per the provisions of Energy Conservation Building Code. The design and construction work shall be done by me/us through my/our labour contractor to be appointed in due course under my/ our personal responsibilities and in technical supervision of certified/recognized consultants/ professionals according to the aforesaid provisions.
3. That I/We have submitted the relevant documents and drawings plans for compliance check.
4. I, _____ as an Architect/ Engineer, bearing License No. _____ accept the responsibilities as an Architect/ Engineer for the above proposed development and perform my duties as per DCR. I shall be responsible for compliance with Energy Conservation Building Code and checking the executed work at site as per the Energy Conservation Measures included in DCR.

The above stated are true and correct to the best of our knowledge and belief.

Affirm at _____ (*place*) on _____ day of _____ 20__.

Organizer/ Builder/ Owner/ Developer	**Architect/Engineer**
Signature	Signature
Name	Name
Address	Address

DECLARATION OF SELF CERTIFICATION TO BE FILED AFTER THE COMPLETION OF CONSTRUCTION

(To be executed on a non-judicial stamp paper of Rs. 100/-)

To whomsoever it may concern

Owner's Name:
Address:
Details about the land on which development is proposed:
T.P.S. No.____ F.P. No.___ S.P. No._____ Tenement No. ____
Name of Village/Gamtal _____ Rev. Sur. No. / Block No./ City Sur. No. ____

I / We hereby solemnly affirm and declare as under:

1. That I/ We have developed and constructed the building on the aforesaid plot of land as per the provisions of Energy Conservation Building Code.
2. I, _____ as an Architect/ Engineer, bearing License No. _____ accept the responsibilities as an Architect/ Engineer for the above development and perform my duties as per DCR. I shall be responsible for compliance with Energy Conservation Building Code and checking the executed work at site as per the Energy Conservation Measures included in DCR.

The above stated are true and correct to the best of our knowledge and belief.

Affirm at _____ (*place*) on _____ day of _____ 20__.

Organizer/ Builder/ Owner/ Developer	**Architect/Engineer**
Signature	Signature
Name	Name
Address	Address

Annexure 14 Checklist for Envelope Compliance using Prescriptive Forms

S. No.	Form no.	Section details	Field name	Check procedure	Status
1	1	1.1	Building name	Check if this is as mentioned in the drawings submitted fo approval	√
2	1	1.2	Sub plot no.	Check if this is as mentioned in the drawings submitted fo approval	√
3	1	1.3	Final plot no.	Check if this is as mentioned in the drawings submitted fo approval	√
4	1	1.4	TP scheme no.	Check if this is as mentioned in the drawings submitted fo approval	√
5	1	1.5	Taluka	Check if this is as mentioned in the drawings submitted fo approval	√
6	1	1.6	District	Check if this is as mentioned in the drawings submitted fo approval	√
7	1	2.1	Compliance Method	Check if one of the methods (a/b/c/d/e/f) has been selected.	√
8	1	2.1.a		If option 'a' is selected, check if Form 2, 3, Forms 4A-4B, Form 5 and Affidavit for compliance declaration is attached.	√
9	1	2.1.b		If option 'b' is selected, check if Form 2, 3, Forms 4A-4B, Form 6 and Affidavit for compliance declaration is attached.	√
10	1	2.1.c		If option 'c' is selected, check if Form 2, 3, Forms 4A-4B, Form 7 and Affidavit for compliance declaration is attached.	√
11	1	2.1.d		If option 'd' is selected, check if Form 2, 3, Forms 4A-4B, ECO*nirman* Prescriptive Tool Report and Affidavit for compliance declaration is attached.	√
12	1	2.1.e		If option 'e' is selected, check if Form 2, 3, ECOnirman WBP Tool Report and Affidavit for compliance declaration is attached.	√
13	1	2.1.f		If option 'e' is selected, check if Form 2, 3, Energy Simulation Tool Report and Affidavit for compliance declaration is attached.	√
14	2	2.2	Building Use	Use this to determine the U-factor/R-value requirements for opaque walls and roofs as per ECBC § 4.3.1 (Table 4.1) and § 4.3.2 (Table 4.2)	√
15	2	2.3	Connected Load / Contract Demand	If Connected Load ≤ 100 kW OR Contract Demand is ≤ 120 kVA, the project does not fall under the scope of ECBC as per ECBC § 2	√
16	2	2.4	Project Type	Use this to determine compliance requirements as per ECBC § 3.1.2, 3.1.3 and 3.1.4. If the answer to this section is 'Alterations to existing buildings', check SECTION 3	√
17	2	3.1 (a, b, c, d)	Envelope Exceptions	If answers are YES, the alterations are not required to conform with the provisions of the Code as per ECBC § 3.1.4	√
18	3	1.1.i	Fenestration U-factor	As per ECBC §4.2.1.1, if the answer is YES, check 1.1.i.a/b. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
19	3	1.1.i.a		If this option has been selected check for attachments as per ECBC §4.2.1.1	√
20	3	1.1.i.b		Check if this option has been selected, as per ECBC § 4.2.1.1	√
21	3	1.1.ii		As per ECBC § 4.2.1.1, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
22	3	1.1.iii	SHGC	As per ECBC § 4.2.1.2, if the answer is YES, check 1.1.iii.a/b/c/d. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
23	3	1.1.iii.a		If this option has been selected check for attachments as per ECBC § 4.2.1.2	√
24	3	1.1.iii.b		Check if this option has been selected as per ECBC § 4.2.1.2	√
25	3	1.1.iii.c		Check if this option has been selected as per ECBC § 4.2.1.2	√
26	3	1.1.iii.d		Check if this option has been selected as per ECBC § 4.2.1.2	√
27	3	1.1.iv	Air Leakage	As per ECBC §4.2.1.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
28	3	1.1.v		As per ECBC §4.2.1.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
29	3	1.2.i	Opaque construction	As per ECBC § 4.2.2, if the answer is YES, check 1.2.i.a/b. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
30	3	1.1.i.a		Check if this option has been selected, as per ECBC § 4.2.2	√
31	3	1.1.i.b		Check if this option has been selected, as per ECBC § 4.2.2	√

32	3	1.3.i (a, b, c, d, e, f)		Building Envelope Sealing	As per ECBC § 4.2.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
33	4A	1.1	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in Form 5, section 1.1 for Wall type 1	√
34	4A	1.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in Form 5, section 1.2 for Wall type 1	√
35	4A	1.3		Wall area *(m^2)*	Check if this is same as in Form 5, section 1.3 for Wall type 1	√
36	4A	21	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in Form 5, section 1.1 for Wall type 2	√
37	4A	2.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in Form 5, section 1.2 for Wall type 2	√
38	4A	2.3		Wall area *(m^2)*	Check if this is same as in Form 5, section 1.3 for Wall type 2	√
39	4A	31	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in Form 5, section 1.1 for Wall type 3	√
40	4A	3.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in Form 5, section 1.2 for Wall type 3	√
41	4A	3.3		Wall area *(m^2)*	Check if this is same as in Form 5, section 1.3 for Wall type 3	√
42	4A	4.1	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in Form 5, section 1.1 for Wall type 4	√
43	4A	4.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in Form 5, section 1.2 for Wall type 4	√
44	4A	4.3		Wall area *(m^2)*	Check if this is same as in Form 5, section 1.3 for Wall type 4	√
45	4A	5		TOTAL Wall Area *(m^2)*	Check if this is equal to the sum of values in 1.3, 2.3, 3.3 and 4.3 in form 4A	√
46	4B	1.1		U-factor *(W/m^2·K)*	Check if this is same as in Form 5, section 2.1 for Vertical Fenestration type 1	√
47	4B	1.2		SHGC	Check if this is same as in Form 5, section 2.2 for Vertical Fenestration type 1	√
48	4B	1.3		VLT	Check if this is same as in Form 5, section 2.3 for Vertical Fenestration type 1	√
49	4B	1.5		Fenestration area *(m^2)*	Check if this is same as in Form 5, section 2.4 for Vertical Fenestration type 1	√
50	4B	2.1		U-factor *(W/m^2·K)*	Check if this is same as in Form 5, section 2.1 for Vertical Fenestration type 2	√
51	4B	2.2		SHGC	Check if this is same as in Form 5, section 2.2 for Vertical Fenestration type 2	√
52	4B	2.3		VLT	Check if this is same as in Form 5, section 2.3 for Vertical Fenestration type 2	√
53	4B	2.5		Fenestration area *(m^2)*	Check if this is same as in Form 5, section 2.4 for Vertical Fenestration type 2	√
54	4B	3.1		U-factor *(W/m^2·K)*	Check if this is same as in Form 5, section 2.1 for Vertical Fenestration type 3	√
55	4B	3.2		SHGC	Check if this is same as in Form 5, section 2.2 for Vertical Fenestration type 3	√
56	4B	3.3		VLT	Check if this is same as in Form 5, section 2.3 for Vertical Fenestration type 3	√
57	4B	3.5		Fenestration area *(m^2)*	Check if this is same as in Form 5, section 2.4 for Vertical Fenestration type 3	√
58	4B	4.1		U-factor *(W/m^2·K)*	Check if this is same as in Form 5, section 2.1 for Vertical Fenestration type 4	√
59	4B	4.2		SHGC	Check if this is same as in Form 5, section 2.2 for Vertical Fenestration type 4	√
60	4B	4.3		VLT	Check if this is same as in Form 5, section 2.3 for Vertical Fenestration type 4	√
61	4B	4.5		Fenestration area *(m^2)*	Check if this is same as in Form 5, section 2.4 for Vertical Fenestration type 4	√
62	4B	5		TOTAL Fenestration Area *(m^2)*	Check if this is equal to the sum of values in 1.5, 2.5, 3.5 and 4.5 in form 4B	√
63	4C	1.1	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in Form 5, section 3.1 for Roof type 1	√
64	4C	1.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in Form 5, section 3.2 for Roof type 1	√
65	4C	1.3		Roof area *(m^2)*	Check if this is same as in Form 5, section 3.7 for Roof type 1	√
66	4C	21	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in Form 5, section 3.1 for Roof type 2	√
67	4C	2.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in Form 5, section 3.2 for Roof type 2	√
68	4C	2.3		Roof area *(m^2)*	Check if this is same as in Form 5, section 3.7 for Roof type 2	√

69	4C	31	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in Form 5, section 3.1 for Roof type 3	√
70	4C	3.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in Form 5, section 3.2 for Roof type 3	√
71	4C	3.3		Roof area *(m^2)*	Check if this is same as in Form 5, section 3.7 for Roof type 3	√
72	4C	4		TOTAL Roof Area *(m^2)*	Check if this is equal to the sum of values in 1.3, 2.3 and 3.3 in form 4C	√
73	4D	1.1		U-factor *(W/m^2·K)*	Check if this is same as in Form 5, section 4.2 for Skylight type 1	√
74	4D	1.2		SHGC	Check if this is same as in Form 5, section 4.3 for Skylight type 1	√
75	4D	1.4		Skylight area *(m^2)*	Check if this is same as in Form 5, section 4.4 for Skylight type 1	√
76	4D	2.1		U-factor *(W/m^2·K)*	Check if this is same as in Form 5, section 4.2 for Skylight type 2	√
77	4D	2.2		SHGC	Check if this is same as in Form 5, section 4.3 for Skylight type 2	√
78	4D	2.4		Skylight area *(m^2)*	Check if this is same as in Form 5, section 4.4 for Skylight type 2	√
79	4D	3.1		U-factor *(W/m^2·K)*	Check if this is same as in Form 5, section 4.2 for Skylight type 3	√
80	4D	3.2		SHGC	Check if this is same as in Form 5, section 4.3 for Skylight type 3	√
81	4D	3.4		Skylight area *(m^2)*	Check if this is same as in Form 5, section 4.4 for Skylight type 3	√
82	4D	4		TOTAL Skylight Area *(m^2)*	Check if this is equal to the sum of values in 1.4, 2.4 and 3.4 in form 4D	√
83	5	1.1		U-factor of Overall Assembly (W/m^2·K)	As per ECBC § 4.3.2, if the value is ≤ 0.44, the section complies with ECBC. If it is > 0.44, the section does not comply with ECBC.	√
84	5	1.2		R-value of Insulation Alone (m^2·K/W)	As per ECBC § 4.3.2, if the value is ≥ 2.1, the section complies with ECBC. If it is < 2.1, the section does not comply with ECBC.	√
85	5	2.1		U-factor *(W/m^2·K)*	As per ECBC § 4.3.3, if the value is ≤ 3.3, the section complies with ECBC. If it is > 3.3, the section does not comply with ECBC.	√
86	5	2.5		WWR	As per ECBC § 4.3.3, if this is > 60%, Vertical Fenestration does not comply with ECBC. Use WWR to determine compliance for SHGC (section 2.2) as per ECBC § 4.3.3 (Table 4.3), and for VLT (section 2.3) as per ECBC § 4.3.3.1 (Table 4.5).	√
87	5	2.2		SHGC	As per ECBC § 4.3.3, if this is ≤ 0.25 for WWR ≤ 40% OR ≤ 0.20 for 40% < WWR ≤ 60%, the section complies with ECBC.	√
88	5	2.4		Effective Aperture	As per ECBC § 4.3.3.1, if this is ≤ 0.1, this section does not need to comply with ECBC. If this is > 0.1, check section 2.3.	√
89	5	2.3		VLT	As per ECBC § 4.3.3.1, if EA > 0.1, and based on WWR, this needs to be ≥ values in ECBC §4.3.3.1 (Table 4.5).	√
90	5	3.1		U-factor of Overall Assembly *(W/m^2·K)*	As per ECBC § 4.3.1, if the value is ≤ 0.261 (for 24 hour building) AND if the value is ≤ 0.409 (for daytime use building), the section complies with ECBC.	√
91	5	3.2		R-value of Insulation Alone *(m^2·K/W)*	As per ECBC § 4.3.1, if the value is ≥ 3.5 (for 24 hour building) AND if the value is ≥ 2.1 (for daytime use building), the section complies with ECBC.	√
92	5	3.3		Cool Roof application	As per ECBC § 4.3.1.1, if YES, check sections 3.4, 3.5 and 3.6. If NO, move to section 4.	√
93	5	3.4		Roof slope	As per ECBC § 4.3.1.1, if the value is < 20 degrees, check section 3.5 and 3.6. If the value is ≥ 20 degrees, this section does not need to comply with ECBC.	√
94	5	3.5		Solar reflectance	As per ECBC § 4.3.1.1, if the value is ≥ 0.7, the section complies with ECBC.	√
95	5	3.6		Emittance	As per ECBC § 4.3.1.1, if the value is ≥ 0.75, the section complies with ECBC.	√
96	5	4.1		Curb	Use this to determine compliance for U-factor as per ECBC § 4.3.4 (Table 4.6).	√
97	5	4.2		U-factor *(W/m^2·K)*	As per ECBC § 4.3.4 (Table 4.6), if the value is ≤ 11.24 (with curb) AND if the value is ≤ 7.71 (without curb), the section complies with ECBC.	√
98	5	4.4		SRR	As per ECBC § 4.3.4, if this is > 5%, Skylight does not comply with ECBC. Use SRR to determine compliance for SHGC (section 4.3) as per ECBC § 4.3.4 (Table 4.6).	√
99	5	4.3		SHGC	As per ECBC § 4.3.4, if this is ≤ 0.4 for SRR ≤ 2% OR ≤ 0.25 for 2% < SRR ≤ 5%, the section complies with ECBC.	√
100					Check if the Affidavit for Energy Conservation Building Code (ECBC) compliance Declaration has been submitted	√

Annexure 15 Checklist for Envelope Compliance using Trade-off Option

S. No.	Form no.	Section details	Field name	Check procedure	Checked
1	1	1.1	Building name	Check if this is as mentioned in the drawings submitted fo approval	√
2	1	1.2	Sub plot no.	Check if this is as mentioned in the drawings submitted fo approval	√
3	1	1.3	Final plot no.	Check if this is as mentioned in the drawings submitted fo approval	√
4	1	1.4	TP scheme no.	Check if this is as mentioned in the drawings submitted fo approval	√
5	1	1.5	Taluka	Check if this is as mentioned in the drawings submitted fo approval	√
6	1	1.6	District	Check if this is as mentioned in the drawings submitted fo approval	√
7	1	2.1	Compliance Method	Check if one of the methods (a/b/c/d/e/f) has been selected.	√
8	1	2.1.a		If option 'a' is selected, check if Form 2, 3, Forms 4A-4B, Form 5 and Affidavit for compliance declaration is attached.	√
9	1	2.1.b		If option 'b' is selected, check if Form 2, 3, Forms 4A-4B, Form 6 and Affidavit for compliance declaration is attached.	√
10	1	2.1.c		If option 'c' is selected, check if Form 2, 3, Forms 4A-4B, Form 7 and Affidavit for compliance declaration is attached.	√
11	1	2.1.d		If option 'd' is selected, check if Form 2, 3, Forms 4A-4B, ECO*nirman* Prescriptive Tool Report and Affidavit for compliance declaration is attached.	√
12	1	2.1.e		If option 'e' is selected, check if Form 2, 3, ECOnirman WBP Tool Report and Affidavit for compliance declaration is attached.	√
13	1	2.1.f		If option 'e' is selected, check if Form 2, 3, Energy Simulation Tool Report and Affidavit for compliance declaration is attached.	√
14	2	2.2	Building Use	Use this to determine the U-factor/R-value requirements for opaque walls and roofs as per ECBC § 4.3.1 (Table 4.1) and § 4.3.2 (Table 4.2)	√
15	2	2.3	Connected Load / Contract Demand	If Connected Load ≤ 100 kW OR Contract Demand is ≤ 120 kVA, the project does not fall under the scope of ECBC as per ECBC § 2	√
16	2	2.4	Project Type	Use this to determine compliance requirements as per ECBC § 3.1.2, 3.1.3 and 3.1.4. If the answer to this section is 'Alterations to existing buildings', check SECTION 3	√
17	2	3.1 (a, b, c, d)	Envelope Exceptions	If answers are YES, the alterations are not required to conform with the provisions of the Code as per ECBC § 3.1.4	√
18	3	1.1.i	Fenestration U-factor	As per ECBC §4.2.1.1, if the answer is YES, check 1.1.i.a/b. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
19	3	1.1.i.a		If this option has been selected check for attachments as per ECBC §4.2.1.1	√
20	3	1.1.i.b		Check if this option has been selected, as per ECBC § 4.2.1.1	√
21	3	1.1.ii		As per ECBC § 4.2.1.1, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
22	3	1.1.iii	SHGC	As per ECBC § 4.2.1.2, if the answer is YES, check 1.1.iii.a/b/c/d. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
23	3	1.1.iii.a		If this option has been selected check for attachments as per ECBC § 4.2.1.2	√
24	3	1.1.iii.b		Check if this option has been selected as per ECBC § 4.2.1.2	√
25	3	1.1.iii.c		Check if this option has been selected as per ECBC § 4.2.1.2	√
26	3	1.1.iii.d		Check if this option has been selected as per ECBC § 4.2.1.2	√
27	3	1.1.iv	Air Leakage	As per ECBC §4.2.1.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
28	3	1.1.v		As per ECBC §4.2.1.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
29	3	1.2.i	Opaque construction	As per ECBC § 4.2.2, if the answer is YES, check 1.2.i.a/b. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
30	3	1.1.i.a		Check if this option has been selected, as per ECBC § 4.2.2	√
31	3	1.1.i.b		Check if this option has been selected, as per ECBC § 4.2.2	√

32	3	1.3.i (a, b, c, d, e, f)	Building Envelope Sealing	As per ECBC § 4.2.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
33	4A	1.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 1.1.b for Wall type 1	√
34	4A	1.3	Wall area *(m^2)*	Check if this is same as in Form 6, section 1.2.b for Wall type 1	√
35	4A	2.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 1.1.b for Wall type 2	√
36	4A	2.3	Wall area *(m^2)*	Check if this is same as in Form 6, section 1.2.b for Wall type 2	√
37	4A	3.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 1.1.b for Wall type 3	√
38	4A	3.3	Wall area *(m^2)*	Check if this is same as in Form 6, section 1.2.b for Wall type 3	√
39	4A	4.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 1.1.b for Wall type 4	√
40	4A	4.3	Wall area *(m^2)*	Check if this is same as in Form 6, section 1.2.b for Wall type 4	√
41	4A	5	TOTAL Wall Area *(m^2)*	Check if this is equal to the sum of values in 1.3, 2.3, 3.3 and 4.3 in form 4A	√
42	4B	1.1	U-factor *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 2.1.b for Vertical Fenestration type 1	√
43	4B	1.2	SHGC	Check if this is same as in Form 6, section 2.2.b for Vertical Fenestration type 1	√
44	4B	1.5	Fenestration area *(m^2)*	Check if this is same as in Form 5, section 2.3.b for Vertical Fenestration type 1	√
45	4B	2.1	U-factor *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 2.1.b for Vertical Fenestration type 2	√
46	4B	2.2	SHGC	Check if this is same as in Form 6, section 2.2.b for Vertical Fenestration type 2	√
47	4B	2.5	Fenestration area *(m^2)*	Check if this is same as in Form 5, section 2.3.b for Vertical Fenestration type 2	√
48	4B	3.1	U-factor *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 2.1.b for Vertical Fenestration type 3	√
49	4B	3.2	SHGC	Check if this is same as in Form 6, section 2.2.b for Vertical Fenestration type 3	√
50	4B	3.5	Fenestration area *(m^2)*	Check if this is same as in Form 5, section 2.3.b for Vertical Fenestration type 3	√
51	4B	4.1	U-factor *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 2.1.b for Vertical Fenestration type 4	√
52	4B	4.2	SHGC	Check if this is same as in Form 6, section 2.2.b for Vertical Fenestration type 4	√
53	4B	4.5	Fenestration area *(m^2)*	Check if this is same as in Form 5, section 2.3.b for Vertical Fenestration type 4	√
54	4B	5	TOTAL Fenestration Area *(m^2)*	Check if this is equal to the sum of values in 1.5, 2.5, 3.5 and 4.5 in form 4B	√
55	4C	1.1	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 3.1.b for Roof type 1	√
56	4C	1.3	Roof area *(m^2)*	Check if this is same as in Form 6, section 3.2.b for Roof type 1	√
57	4C	21	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 3.1.b for Roof type 2	√
58	4C	2.3	Roof area *(m^2)*	Check if this is same as in Form 6, section 3.2.b for Roof type 2	√
59	4C	31	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 3.1.b for Roof type 3	√
60	4C	3.3	Roof area *(m^2)*	Check if this is same as in Form 6, section 3.2.b for Roof type 3	√
61	4C	4	TOTAL Roof Area *(m^2)*	Check if this is equal to the sum of values in 1.3, 2.3 and 3.3 in form 4C	√
62	4D	1.1	U-factor *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 4.1.b for Skylight type 1	√
63	4D	1.2	SHGC	Check if this is same as in Form 6, section 4.2.b for Skylight type 1	√
64	4D	1.4	Skylight area *(m^2)*	Check if this is same as in Form 5, section 4.3.b for Skylight type 1	√
65	4D	2.1	U-factor *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 4.1.b for Skylight type 2	√
66	4D	2.2	SHGC	Check if this is same as in Form 6, section 4.2.b for Skylight type 2	√
67	4D	2.4	Skylight area *(m^2)*	Check if this is same as in Form 5, section 4.3.b for Skylight type 2	√
68	4D	3.1	U-factor *($W/m^2 \cdot K$)*	Check if this is same as in Form 6, section 4.1.b for Skylight type 3	√

69	4D	3.2	SHGC	Check if this is same as in Form 6, section 4.2.b for Skylight type 3	√
70	4D	3.4	Skylight area *(m^2)*	Check if this is same as in Form 5, section 4.3.b for Skylight type 3	√
71	4D	4	TOTAL Skylight Area *(m^2)*	Check if this is equal to the sum of values in 1.4, 2.4 and 3.4 in form 4D	√
72	6	1.1.a	U-factor *($W/m^2 \cdot K$)* Standard Design	As per ECBC § 4.3.2, the value should be ≤ 0.44 for all Wall types in this form	√
73	6	1.2.a	Area *(m^2)* Standard Design	Check if this is same as the value in section 1.2.b of this form for all Wall types in this form	√
74	6	2.1.a	U-factor *($W/m^2 \cdot K$)* Standard Design	As per ECBC § 4.3.3, the value should be ≤ 3.3 for all Vertical fenestration types in this form	√
75	6	2.2.a	SHGC Standard Design	As per ECBC § 4.3.3, the value should be ≤ 0.25 for WWR ≤ 40% OR ≤ 0.20 for 40% < WWR ≤ 60% for all Vertical fenestration types in this form	√
76	6	2.3.a	Area *(m^2)* Standard Design	Check if this is same as the value in section 2.3.b of this form Vertical fenestration types in this form	√
77	6	3.1.a	U-factor *($W/m^2 \cdot K$)* Standard Design	As per ECBC § 4.3.2, the value should be ≤ 0.261 (for 24 hour building) AND ≤ 0.409 (for daytime use building) for all Roof types in this form	√
78	6	3.2.a	Area *(m^2)* Standard Design	Check if this is same as the value in section 1.2.b of this form for all roof types	√
79	6	4.1.a	U-factor *($W/m^2 \cdot K$)* Standard Design	As per ECBC § 4.3.3, the value should be ≤ 11.24 (with curb) AND is ≤ 7.71 (without curb) for all Skylight types in this form	√
80	6	4.2.a	SHGC Standard Design	As per ECBC § 4.3.3, the value should be ≤ 0.4 for SRR ≤ 2% OR ≤ 0.25 for 2% < SRR ≤ 5% for all Skylight types in this form	√
81	6	4.3.a	Area *(m^2)* Standard Design	Check if this is same as the value in section 4.3.b of this form for all Skylight types in this form	√
82	6	5.5.a	EPF_{Total} Standard Design	This value should be less than the value in section 5.5.b for compliance	√
83				Check if the Affidavit for Energy Conservation Building Code (ECBC) compliance Declaration has been submitted	√

Annexure 16 Checklist for All Systems Compliance using ECOnirman Prescriptive Tool Option

S. No.	Form no.	Section details	Field name	Check procedure	Status
1	1	1.1	Building name	Check if this is as mentioned in the drawings submitted fo approval	√
2	1	1.2	Sub plot no.	Check if this is as mentioned in the drawings submitted fo approval	√
3	1	1.3	Final plot no.	Check if this is as mentioned in the drawings submitted fo approval	√
4	1	1.4	TP scheme no.	Check if this is as mentioned in the drawings submitted fo approval	√
5	1	1.5	Taluka	Check if this is as mentioned in the drawings submitted fo approval	√
6	1	1.6	District	Check if this is as mentioned in the drawings submitted fo approval	√
7	1	2.1	Compliance Method	Check if one of the methods (a/b/c/d/e/f) has been selected.	√
8	1	2.1.a		If option 'a' is selected, check if Form 2, 3, Forms 4A-4B, Form 5 and Affidavit for compliance declaration is attached.	√
9	1	2.1.b		If option 'b' is selected, check if Form 2, 3, Forms 4A-4B, Form 6 and Affidavit for compliance declaration is attached.	√
10	1	2.1.c		If option 'c' is selected, check if Form 2, 3, Forms 4A-4B, Form 7 and Affidavit for compliance declaration is attached.	√
11	1	2.1.d		If option 'd' is selected, check if Form 2, 3, Forms 4A-4B, ECO*nirman* Prescriptive Tool Report and Affidavit for compliance declaration is attached.	√
12	1	2.1.e		If option 'e' is selected, check if Form 2, 3, ECOnirman WBP Tool Report and Affidavit for compliance declaration is attached.	√
13	1	2.1.f		If option 'e' is selected, check if Form 2, 3, Energy Simulation Tool Report and Affidavit for compliance declaration is attached.	√
14	2	2.2	Building Use	Use this to determine the U-factor/R-value requirements for opaque walls and roofs as per ECBC § 4.3.1 (Table 4.1) and § 4.3.2 (Table 4.2)	√
15	2	2.3	Connected Load / Contract Demand	If Connected Load ≤ 100 kW OR Contract Demand is ≤ 120 kVA, the project does not fall under the scope of ECBC as per ECBC § 2	√
16	2	2.4	Project Type	Use this to determine compliance requirements as per ECBC § 3.1.2, 3.1.3 and 3.1.4. If the answer to this section is 'Alterations to existing buildings', check SECTION 3	√
17	2	3.1 (a, b, c, d)	Envelope Exceptions	If answers are YES, the alterations are not required to conform with the provisions of the Code as per ECBC § 3.1.4	√
18	3	1.1.i	Fenestration U-factor	As per ECBC §4.2.1.1, if the answer is YES, check 1.1.i.a/b. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
19	3	1.1.i.a		If this option has been selected check for attachments as per ECBC §4.2.1.1	√
20	3	1.1.i.b		Check if this option has been selected, as per ECBC § 4.2.1.1	√
21	3	1.1.ii		As per ECBC § 4.2.1.1, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
22	3	1.1.iii	SHGC	As per ECBC § 4.2.1.2, if the answer is YES, check 1.1.iii.a/b/c/d. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
23	3	1.1.iii.a		If this option has been selected check for attachments as per ECBC § 4.2.1.2	√
24	3	1.1.iii.b		Check if this option has been selected as per ECBC § 4.2.1.2	√
25	3	1.1.iii.c		Check if this option has been selected as per ECBC § 4.2.1.2	√
26	3	1.1.iii.d		Check if this option has been selected as per ECBC § 4.2.1.2	√
27	3	1.1.iv	Air Leakage	As per ECBC §4.2.1.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
28	3	1.1.v		As per ECBC §4.2.1.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
29	3	1.2.i	Opaque construction	As per ECBC § 4.2.2, if the answer is YES, check 1.2.i.a/b. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
30	3	1.1.i.a		Check if this option has been selected, as per ECBC § 4.2.2	√
31	3	1.1.i.b		Check if this option has been selected, as per ECBC § 4.2.2	√

32	3	1.3.i (a, b, c, d, e, f)		Building Envelope Sealing	As per ECBC § 4.2.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
33	4A	1.1	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
34	4A	1.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
35	4A	1.3		Wall area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
36	4A	21	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
37	4A	2.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
38	4A	2.3		Wall area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
39	4A	31	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
40	4A	3.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
41	4A	3.3		Wall area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
42	4A	4.1	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
43	4A	4.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
44	4A	4.3		Wall area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Wall type	√
45	4A	5		TOTAL Wall Area *(m^2)*	Check if this is equal to the sum of values in 1.3, 2.3, 3.3 and 4.3 in form 4A	√
46	4B	1.1		U-factor *(W/m^2·K)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
47	4B	1.2		SHGC	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
48	4B	1.3		VLT	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
49	4B	1.5		Fenestration area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
50	4B	2.1		U-factor *(W/m^2·K)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
51	4B	2.2		SHGC	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
52	4B	2.3		VLT	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
53	4B	2.5		Fenestration area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
54	4B	3.1		U-factor *(W/m^2·K)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
55	4B	3.2		SHGC	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
56	4B	3.3		VLT	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
57	4B	3.5		Fenestration area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
58	4B	4.1		U-factor *(W/m^2·K)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
59	4B	4.2		SHGC	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
60	4B	4.3		VLT	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
61	4B	4.5		Fenestration area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Vertical fenestration type	√
62	4B	5		TOTAL Fenestration Area *(m^2)*	Check if this is equal to the sum of values in 1.5, 2.5, 3.5 and 4.5 in form 4B	√
63	4C	1.1	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
64	4C	1.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
65	4C	1.3		Roof area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
66	4C	21	Check either of these fields	U-factor of Overall Assembly *(W/m^2·K)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
67	4C	2.2		R-value of Insulation Alone *(m^2·K/W)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√

68	4C	2.3	Roof area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
69	4C	31 Check either of these fields	U-factor of Overall Assembly *($W/m^2 \cdot K$)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
70	4C	3.2	R-value of Insulation Alone *($m^2 \cdot K/W$)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
71	4C	3.3	Roof area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
72	4C	4	TOTAL Roof Area *(m^2)*	Check if this is equal to the sum of values in 1.3, 2.3 and 3.3 in form 4C	√
73	4D	1.1	U-factor *($W/m^2 \cdot K$)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Skylight type	√
74	4D	1.2	SHGC	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
75	4D	1.4	Skylight area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
76	4D	2.1	U-factor *($W/m^2 \cdot K$)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Skylight type	√
77	4D	2.2	SHGC	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
78	4D	2.4	Skylight area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
79	4D	3.1	U-factor *($W/m^2 \cdot K$)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Skylight type	√
80	4D	3.2	SHGC	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
81	4D	3.4	Skylight area *(m^2)*	Check if this is same as in section 2.1 Envelope Checklist of the Tool Report for the corresponding Roof type	√
82	4D	4	TOTAL Skylight Area *(m^2)*	Check if this is equal to the sum of values in 1.4, 2.4 and 3.4 in form 4D	√
83				Check if the ECO*nirman* Prescriptive Tool Report has been submitted	√
84	Tool Report	1.0 Building Level Summary	Envelope Conformance Status	If the status is 'Conforming', Envelope is ECBC Compliant, otherwise it is non-compliant	√
85			HVAC Conformance Status	If the status is 'Conforming', HVAC is ECBC Compliant, otherwise it is non-compliant	√
86			SHWP Conformance Status	If the status is 'Conforming' OR 'NA', SHWP is ECBC Compliant, otherwise it is non-compliant	√
87			Lighting Conformance Status	If the status is 'Conforming' OR 'NA', Lighting is ECBC Compliant, otherwise it is non-compliant	√
88			Electrical Power Conformance Status	If the status is 'Conforming' OR 'NA', Electrical Power is ECBC Compliant, otherwise it is non-compliant	√
89			Building Conformance Status	If the status is 'Conforming' OR 'NA', the entire Building is ECBC Compliant, otherwise it is non-compliant	√
90				Check if the Affidavit for Energy Conservation Building Code (ECBC) compliance Declaration has been submitted	√

Annexure 17 Checklist for All Systems Compliance using ECOnirman WBP Tool Option

S. No.	Form no.	Section details	Field name	Check procedure	Status
1	1	1.1	Building name	Check if this is as mentioned in the drawings submitted fo approval	√
2	1	1.2	Sub plot no.	Check if this is as mentioned in the drawings submitted fo approval	√
3	1	1.3	Final plot no.	Check if this is as mentioned in the drawings submitted fo approval	√
4	1	1.4	TP scheme no.	Check if this is as mentioned in the drawings submitted fo approval	√
5	1	1.5	Taluka	Check if this is as mentioned in the drawings submitted fo approval	√
6	1	1.6	District	Check if this is as mentioned in the drawings submitted fo approval	√
7	1	2.1	Compliance Method	Check if one of the methods (a/b/c/d/e/f) has been selected.	√
8	1	2.1.a		If option 'a' is selected, check if Form 2, 3, Forms 4A-4B, Form 5 and Affidavit for compliance declaration is attached.	√
9	1	2.1.b		If option 'b' is selected, check if Form 2, 3, Forms 4A-4B, Form 6 and Affidavit for compliance declaration is attached.	√
10	1	2.1.c		If option 'c' is selected, check if Form 2, 3, Forms 4A-4B, Form 7 and Affidavit for compliance declaration is attached.	√
11	1	2.1.d		If option 'd' is selected, check if Form 2, 3, Forms 4A-4B, ECO*nirman* Prescriptive Tool Report and Affidavit for compliance declaration is attached.	√
12	1	2.1.e		If option 'e' is selected, check if Form 2, 3, ECOnirman WBP Tool Report and Affidavit for compliance declaration is attached.	√
13	1	2.1.f		If option 'e' is selected, check if Form 2, 3, Energy Simulation Tool Report and Affidavit for compliance declaration is attached.	√
14	2	2.2	Building Use	Use this to determine the U-factor/R-value requirements for opaque walls and roofs as per ECBC § 4.3.1 (Table 4.1) and § 4.3.2 (Table 4.2)	√
15	2	2.3	Connected Load / Contract Demand	If Connected Load ≤ 100 kW OR Contract Demand is ≤ 120 kVA, the project does not fall under the scope of ECBC as per ECBC § 2	√
16	2	2.4	Project Type	Use this to determine compliance requirements as per ECBC § 3.1.2, 3.1.3 and 3.1.4. If the answer to this section is 'Alterations to existing buildings', check SECTION 3	√
17	2	3.1 (a, b, c, d)	Envelope Exceptions	If answers are YES, the alterations are not required to conform with the provisions of the Code as per ECBC § 3.1.4	√
18	3	1.1.i	Fenestration U-factor	As per ECBC §4.2.1.1, if the answer is YES, check 1.1.i.a/b. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
19	3	1.1.i.a		If this option has been selected check for attachments as per ECBC §4.2.1.1	√
20	3	1.1.i.b		Check if this option has been selected, as per ECBC § 4.2.1.1	√
21	3	1.1.ii		As per ECBC § 4.2.1.1, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
22	3	1.1.iii	SHGC	As per ECBC § 4.2.1.2, if the answer is YES, check 1.1.iii.a/b/c/d. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
23	3	1.1.iii.a		If this option has been selected check for attachments as per ECBC § 4.2.1.2	√
24	3	1.1.iii.b		Check if this option has been selected as per ECBC § 4.2.1.2	√
25	3	1.1.iii.c		Check if this option has been selected as per ECBC § 4.2.1.2	√
26	3	1.1.iii.d		Check if this option has been selected as per ECBC § 4.2.1.2	√
27	3	1.1.iv	Air Leakage	As per ECBC §4.2.1.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
28	3	1.1.v		As per ECBC §4.2.1.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
29	3	1.2.i	Opaque construction	As per ECBC § 4.2.2, if the answer is YES, check 1.2.i.a/b. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
30	3	1.1.i.a		Check if this option has been selected, as per ECBC § 4.2.2	√
31	3	1.1.i.b		Check if this option has been selected, as per ECBC § 4.2.2	√
32	3	1.3.i (a, b, c, d, e, f)	Building Envelope Sealing	As per ECBC § 4.2.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
33				Check if the ECO*nirman* WPB Tool Report has been submitted	√
34	Tool Report	1.0 Building Summary	Building Conformance Status	If the status is 'Conforming', the Building is ECBC Compliant, otherwise it is non-compliant	√
35				Check if the Affidavit for Energy Conservation Building Code (ECBC) compliance Declaration has been submitted	√

Annexure 18 Checklist for All Systems Compliance using Energy Simulation Tool Option

S. No.	Form no.	Section details	Field name	Check procedure	Status
1	1	1.1	Building name	Check if this is as mentioned in the drawings submitted fo approval	√
2	1	1.2	Sub plot no.	Check if this is as mentioned in the drawings submitted fo approval	√
3	1	1.3	Final plot no.	Check if this is as mentioned in the drawings submitted fo approval	√
4	1	1.4	TP scheme no.	Check if this is as mentioned in the drawings submitted fo approval	√
5	1	1.5	Taluka	Check if this is as mentioned in the drawings submitted fo approval	√
6	1	1.6	District	Check if this is as mentioned in the drawings submitted fo approval	√
7	1	2.1	Compliance Method	Check if one of the methods (a/b/c/d/e/f) has been selected.	√
8	1	2.1.a		If option 'a' is selected, check if Form 2, 3, Forms 4A-4B, Form 5 and Affidavit for compliance declaration is attached.	√
9	1	2.1.b		If option 'b' is selected, check if Form 2, 3, Forms 4A-4B, Form 6 and Affidavit for compliance declaration is attached.	√
10	1	2.1.c		If option 'c' is selected, check if Form 2, 3, Forms 4A-4B, Form 7 and Affidavit for compliance declaration is attached.	√
11	1	2.1.d		If option 'd' is selected, check if Form 2, 3, Forms 4A-4B, ECO*nirman* Prescriptive Tool Report and Affidavit for compliance declaration is attached.	√
12	1	2.1.e		If option 'e' is selected, check if Form 2, 3, ECOnirman WBP Tool Report and Affidavit for compliance declaration is attached.	√
13	1	2.1.f		If option 'e' is selected, check if Form 2, 3, Energy Simulation Tool Report and Affidavit for compliance declaration is attached.	√
14	2	2.2	Building Use	Use this to determine the U-factor/R-value requirements for opaque walls and roofs as per ECBC § 4.3.1 (Table 4.1) and § 4.3.2 (Table 4.2)	√
15	2	2.3	Connected Load / Contract Demand	If Connected Load ≤ 100 kW OR Contract Demand is ≤ 120 kVA, the project does not fall under the scope of ECBC as per ECBC § 2	√
16	2	2.4	Project Type	Use this to determine compliance requirements as per ECBC § 3.1.2, 3.1.3 and 3.1.4. If the answer to this section is 'Alterations to existing buildings', check SECTION 3	√
17	2	3.1 (a, b, c, d)	Envelope Exceptions	If answers are YES, the alterations are not required to conform with the provisions of the Code as per ECBC § 3.1.4	√
18	3	1.1.i	Fenestration U-factor	As per ECBC §4.2.1.1, if the answer is YES, check 1.1.i.a/b. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
19	3	1.1.i.a		If this option has been selected check for attachments as per ECBC §4.2.1.1	√
20	3	1.1.i.b		Check if this option has been selected, as per ECBC § 4.2.1.1	√
21	3	1.1.ii		As per ECBC § 4.2.1.1, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
22	3	1.1.iii	SHGC	As per ECBC § 4.2.1.2, if the answer is YES, check 1.1.iii.a/b/c/d. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
23	3	1.1.iii.a		If this option has been selected check for attachments as per ECBC § 4.2.1.2	√
24	3	1.1.iii.b		Check if this option has been selected as per ECBC § 4.2.1.2	√
25	3	1.1.iii.c		Check if this option has been selected as per ECBC § 4.2.1.2	√
26	3	1.1.iii.d		Check if this option has been selected as per ECBC § 4.2.1.2	√
27	3	1.1.iv	Air Leakage	As per ECBC §4.2.1.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
28	3	1.1.v		As per ECBC §4.2.1.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
29	3	1.2.i	Opaque construction	As per ECBC § 4.2.2, if the answer is YES, check 1.2.i.a/b. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
30	3	1.1.i.a		Check if this option has been selected, as per ECBC § 4.2.2	√
31	3	1.1.i.b		Check if this option has been selected, as per ECBC § 4.2.2	√

32	3	1.3.i (a, b, c, d, e, f)	Building Envelope Sealing	As per ECBC § 4.2.3, if the answer is YES, the section complies with ECBC. If the answer is NO, the section does not comply with ECBC. If the answer is NA, check the explanation for NA.	√
33				Check if the Energy Simulation Tool Report has been submitted	√
34				Check if the simulation program is a computer-based program for the analysis of energy consumption in buildings and be approved by the authority having jurisdiction	√
35	Tool Report			If the estimated annual energy use of the proposed design is less than the standard design, the Building is complies with ECBC	√
36	Tool Report			Check if the Report has a list of the energy-related building features in the proposed design that is different from the standard design	√
37	Tool Report			Check if the report has a detailed list of simulation inputs	√
38	Tool Report			Check if the report has output 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).	√
39	Tool Report			Check if the report has output showing the amount of time any loads are not met by the HVAC system for both the proposed design and standard design.	√
40	Tool Report			Check if the report has an explanation of any error messages noted in the simulation program output.	√
41	Tool Report			Check if the proposed design and standard design have been modelled using the following: a) Same simulation program, b) Same weather data, and c) Same building operation assumptions (thermostat setpoints, schedules, internal gains, occupant loads, etc.).	√
42	Tool Report			Check if the simulation model for calculating the proposed design and the standard design have been developed in accordance with the requirements in Table 10.1.	√
43	Tool Report			Check if the HVAC system type and related performance parameters for the standard design have been determined from ECBC Table 10.1 and the rules given in ECBC § 10.3.2	√
44				Check if the Affidavit for Energy Conservation Building Code (ECBC) compliance Declaration has been submitted	√

Annexure 19 List of stakeholders consulted during the preparation of ECBC Implementation Roadmap for MP

Specific personnel/officials from each of these stakeholders were met for discussions over the preparation of a roadmap for ECBC implementation in the state:

- Bhopal Municipal Corporation (BMC), Bhopal
- Bureau of Energy Efficiency (BEE), New Delhi
- CEPT University, Ahmedabad
- D.B. Mall, Bhopal
- D. Vyas and Associates, Bhopal
- Department of Town and Country Planning (DTCP), MP, Bhopal
- Environmental Planning and Coordination Organization (EPCO), Bhopal
- Indore Municipal Corporation (IMC), Indore
- Indian Institute of Architects (IIA), Indore
- Madhya Pradesh Urja Vikas Nigam Ltd. (MPUVN), Bhopal
- Madhya Pradesh Madhya Kshetra Vidyut Vittran Company Ltd. (MPMKVVC), Bhopal
- Madhya Pradesh Electricity Regulatory Commission (MPERC), Bhopal
- National Institute of Governance and Urban Management (NIGUM), Bhopal
- Petroleum Conservation Research Association (PCRA), Bhopal
- School of Energy and Environmental Studies, Devi Ahilya Vishwa Vidyalaya (DAVV), Indore
- Urban Development and Environment Department (UD&ED), Bhopal