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KARNATAKA ENERGY CONSERVATION  
BUILDING CODE (KECBC) 2018



FAQ frequently asked QUESTIONS



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KARNATAKA RENEWABLE ENERGY DEVELOPMENT LTD.

(A GOVERNMENT OF KARNATAKA UNDERTAKING)

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# **PHASE 1**

# **GENERAL FAQs**



## 1. What is KECBC?

The **Energy Conservation Building Code (ECBC)**, was launched by Ministry of Power, Government of India in May 2007, as a first step towards promoting energy efficiency in the building sector. Its main objective is to establish minimum requirements for energy efficient design and construction of buildings. Recognizing the energy and cost savings of efficient buildings and to help address growing energy needs.

In line with the BEE, time to time, the KREDL with the help of ECBC Cell and in consultation with the various stakeholders Karnataka Energy Conservation Building Code has been prepared.

Initially, the Karnataka Energy Conservation Building Code (KECBC-2014) was notified in the State Gazette on 27th November 2014 for efficient use of energy in building sector. It was in effect in the State from the date of notification.

**The updated K ECBC Code 2018 and K ECBC Rules 2018 have been notified in the Karnataka State Gazette on 28th May 2020. The enforcement of the Code and Rules came into effect in the State from the date of the notification i.e., 28th May 2020.**

## 2. Is KECBC applicable to all type of buildings?

The KECBC is applicable to all buildings or building complexes that have a connected load of 100kW or greater, or a contract demand of 120 kVA or greater and used for commercial purposes. It is applicable for both Government and private buildings. The code is not applicable to equipment and portions of building systems that use energy primarily for manufacturing processes.

## 3. In accordance with what section is the KECBC formulated?

In accordance with section 14(p) of the Energy Conservation Act 2001. The purpose of the Energy Conservation Building Code (Code) is to provide minimum requirements for the energy-efficient design and construction of buildings.

This code would become mandatory as and when it is notified by the central or State government in the official Gazette under clause (p) of Section 14 or clause (a) of Section 15 of the Energy Conservation Act 2001 (52 of 2001).



#### **4. In accordance with what section is the KECBC enforced in the State?**

In accordance with section (18) of the Energy Conservation Act 2001, the State Government may issue the directions for the efficient use of energy and its conservation in the State.

The Central Government or the State Government may, in the exercise of its powers and performance of its functions under this Act and for efficient use of energy and its conservation, issue such directions in writing as it deems fit for the purposes of this Act to any person, officer, authority or any designated consumer and such person, officer or authority or any designated consumer shall be bound to comply with such directions.

Under this section, the power to issue the directions includes as follows:

- (a) Regulation of norms for process and energy consumption standards in any industry or building or building complex; or
- (b) Regulation of the energy consumption standards for equipment and appliances.

#### **5. Why is KECBC code important?**

The KECBC compliance for buildings make them more comfortable for its users, lower energy costs and reduce greenhouse gas emissions, thus the effect on environment decreases. It ensures the builders and designers to use the most energy efficient materials and technologies for construction.

#### **6. What are the two sets of incremental requirements in KECBC compliance and what do they indicate?**

The code prescribes the following three levels of energy efficiency:

- (a) Energy Conservation Building Code Compliant Building (ECBC Building) - ECBC Buildings shall demonstrate compliance by adopting the mandatory and prescriptive requirements listed under KECBC Compliant Building requirements in §4 to §7, or by following the provisions of the Whole Building Performance (WBP) Method in §9.
- (b) Energy Conservation Building Code Plus Building (ECBC+ Building) - ECBC+ Buildings shall demonstrate compliance by adopting the mandatory and prescriptive requirements listed under ECBC+ Compliant



Building requirements in §4 to §7, or by following the provisions of the Whole Building Performance (WBP) Method in §9.

- (c) Super Energy Conservation Building Code Building (SuperECBC Building)  
- SuperECBC Buildings shall demonstrate compliance by adopting the mandatory and prescriptive requirements listed under SuperECBC Compliant Building requirements in §4 to §7, or by following the provisions of the Whole Building Performance (WBP) Method in §9.

**7. How can the user reduce the Energy Consumption in their buildings which they make their building KECBC Compliant?**

The KECBC Compliant building will be oriented in such a way to facilitate sufficient daylight and ventilation, thus reducing the dependency on the electrical systems. By use of insulating building materials, the energy consumption by various electrical devices can be reduced even more.

Usage of high performance/ insulated glasses in the fenestrations according to the climatic conditions of the region and location of the fenestrations

**8. What is a mixed-use development building and how do they comply with KECBC?**

**A mixed-use building is when the building has one or more commercial parts to it / when a commercial building also contains residences, only the commercial part needs to comply with KECBC?**

In a mixed-use building, each commercial part of a building must be classified separately, and

- i. If a part of the mixed-use building has different classification and is less than 10% of the total above grade floor area, the mixed-use building shall show compliance based on the building sub-classification having higher percentage of above grade floor area.
- ii. If a part of the mixed-use building has different classification and one or more sub-classification is more than 10% of the total above grade floor area, the compliance requirements for each sub-classification, having area more than 10% of above grade floor area of a mixed-use building shall be determined by the requirements of the respective building.



**9. Can I go with partial compliance?**

There is no partial compliance for ECBC.

**10. Does water conservation come under the scope of KECBC?**

No, KECBC addresses only energy efficiency of buildings. Water and other aspects are generally covered in green building rating systems.

**11. What is a transport building assembly?**

Any building or structure used for the purpose of transportation and transit like airports, railway stations, bus stations, and underground and elevated mass rapid transit system example, underground or elevated railways.

**12. What is an unconditioned building? What are habitable spaces in a building?**

Space in a building or structure intended or used for working, meeting, living, sleeping, eating, or cooking. Bathrooms, water closet compartments, closets, halls, storage or utility space, and similar areas are not considered habitable spaces. Mechanically or naturally ventilated space that is not cooled or heated by mechanical equipment is termed as unconditioned building.

**13. How to calculate annual energy use?**

Annual energy use for the purposes of the WBP method shall be calculated in kilowatt-hours (kWh) of electricity use per year per unit area. Energy sources other than electricity (fuel) that are used in the building shall be converted to kWh of electric energy at the rate of 0.28 kWh per mega-joule.

**14. What factors are to be considered in designing a Building's Envelope? (Envelope)**

- Climate and Microclimate
- Building shape and orientation
- Building envelope component design
- Material specifications



**15. How does the building orientation affect the energy performance of building?**

The orientation of a building affects the energy performance of a building on following two fronts:

- i. Cooling / Heating:** Proper orientation helps keep a building cooler / hotter (as per climatic requirements of the region) with respect to the exterior environment.
- ii. Lighting:** Lighting inside a building during day time can be reduced drastically, if the building orientation facilitates daytime lighting through natural light.

**16. What is cavity wall insulation?**

Cavity wall insulation is used to reduce heat loss through a cavity wall by filling the air space with material that inhibits heat transfer. The air within the cavity (air is the actual insulator), preventing convection, and can substantially reduce space heating costs.

**17. What is insulation and how does it work?**

Most common insulation materials work by slowing conductive heat flow and to a lesser extent convective heat flow. Radiant barriers and reflective insulation systems work by reducing radiant heat gain. To be effective, the reflective surface must face an air space.

**18. Why do we need insulation?**

Insulation will help you keep the desired temperature in your building all year round, protecting it against cold in winter and excess heat in summer. Insulation is also useful to reduce noise pollution. A well-insulated building is very energy efficient.

**19. How do you insulate a cavity wall?**

The insulation materials are usually either mineral wool or polystyrene beads, but polyurethane foam may sometimes be used instead. To insulate your cavity walls, the installer drills small holes around 22mm in size at intervals of around 1m in the outside wall of your building.



## **20. Do you need insulation in interior walls?**

Walls both exterior and interior -- are the next area to insulate in a building. Rigid boards work best on exterior walls, along with a vapor barrier. Fiberglass batts, foam or cellulose can be used to insulate the interior walls.

## **21. What are the benefits of insulation?**

- It reduces the cost of heating and cooling by over 40%.
- Due to less use of energy to heat or cool it saves non-renewable resources and reduces greenhouse gas emissions.
- In most cases eliminates condensation on walls and ceilings.

## **22. How do you insulate a wall from the inside?**

To insulate solid walls internally, you can fit insulation boards to the walls. This is otherwise known as dry lining. It involves fixing insulation material to the inner side of a solid external wall, and then covering it with plasterboards or cladding.

## **23. What is the ideal way of choosing an external wall composition?**

The ideal way would be to choose a material having good insulation properties or bad conduction properties so as to minimise the heat transfer between the outside and the insides of the building. If required, the wall may be provided with insulation.

## **24. Why is controlling building air leakage important for energy efficiency?**

The exchange of air between the indoor and outdoor environment (infiltration or exfiltration) accounts for between 5 percent (air tight building) and 40 percent (leaky building) of the heating or cooling energy in a building.





## 25. Why is zoning a building important?

A zoning system is designed for the many ways you use your building. Maybe you're caught up in co-worker "thermostat wars." Or perhaps you have unoccupied areas that do not need conditioning. A zoning system allows you to divide your business into separate areas, giving you the comfort and control you've always wanted.

The main benefits of commercial zoning are:

- **Comfort**

Zoning meets the specific temperature and airflow requirements of one area, without affecting other areas.

- **Efficiency**

A properly designed zoning system can save you lakhs of rupees in energy costs each year.

- **Control**

Zoning divides a space into different areas and comfort into different levels, giving you more choices and control than ever before.

- **Quiet Performance**

When integrated with variable speed and/or two-stage HVAC systems, zoning allows your heating and cooling equipment to deliver peak performance and efficiency without continually operating at peak capacity. Lower speeds mean lower sound levels.

## 26. What is U-value?

A U value is a measure of heat loss. It is expressed in  $W/m^2K$ , and shows the amount of heat lost in watts (W) per square meter of material (for example wall, roof, floor etc.) when the temperature (K) outside is at least one degree lower. The lower the U-value, the better the insulation provided by the material.

## 27. What is the main parameter of the building materials/ components that influence the insulation of a building?

U-Value. Lesser the U-value, better it insulates. There are certain figures specified for the U-values of different structural components of a building to become KECBC compliant in the code (Specify the section number here).



**28. What is a double glazed window?**

Double glazed window unit entails two panes of glass with a space/vacuum in between them. In some glazed windows, instead of filling the space with vacuum, nitrogen or argon gas is used. This is simply because, these two gases are denser than air and hence they move transferring heat at a very low rate.

**29. In a double-glazed façade system, what is the maximum air-gap/ cavity that can be and how does it affect the air circulation if it exceeds?**

The maximum air gap/ cavity should be 12mm. if the gap/ cavity exceed this; it results in wind current formation in the gap, resulting in flow of air within the glass, thus making the room grow hotter in hot areas and vice versa.

**30. Which type of a glass is more energy efficiency & why?**

For most energy efficient windows, the whole window U-factor is higher than the Centre-of-glass U-factor. High-performance double-pane windows can have U-factors of 0.30 or lower, while some triple-pane windows can achieve U-factors as low as 0.15.

**31. What are the benefits of double glazed windows?**

Double glazed windows are an ideal energy efficient choice with the added benefit of minimizing noise. The sealed air gap between the two panes acts as an added layer of insulation. This added thermal resistance reduces the amount of heat inside building.

**32. How can you tell the difference between single and double glazing?**

Double glazing has an inner and outer pane of glass separated by a small gap. Single glazing has only one piece of glass. Look at the edge of the window - double glazing has an obvious gap between the two panes most of the time made of an aluminium foil.



**33. What's the difference between double glazing and triple glazing?**

Triple glazing contains three panes of glass within a sealed frame, just as double glazing contains two. Between each pane is a pocket of air or inert gas, such as argon; argon is heavier than air and works as an insulator for both noise and heat.

**34. What is the benefit of triple glazing?**

Some of the top benefits of triple glazing are as follows: Reduces heat loss through the windows improving energy efficiency and helps lower heating bills. Improves security as triple glazing windows are stronger than double glazing.

**35. What is the main difference between double and triple panes?**

It is possible to use the same gas fills in double pane and triple pane windows. The main difference is triple pane fiberglass windows have gas filled into both air spaces between the panes of glass, which greatly increases the energy efficiency of triple pane replacement windows.

**36. What is visible transmittance for windows?**

Visible transmittance is the amount of light in the visible portion of the spectrum that passes through a glazing material. A higher VT means there is more daylight in a space which, if designed properly, can offset electric lighting and its associated cooling loads.

**37. What is Low E glass?**

Low-E, or low-emissivity, glass was created to minimize the amount of infrared and ultraviolet light that comes through your glass, without minimizing the amount of light that enters your home. Low-E glass windows have a microscopically thin coating that is transparent and reflects heat.

**38. Are Low E windows good?**

Hard coat Low-E glass surfaces are considered to be medium grade energy efficient windows and perform much better than plain clear glass.



**39. What is an optimum lux level in an office?**

Earlier it was common with light levels in the range 100 - 300 lux for normal activities. Today the light level is more common in the range 500 - 1000 lux - depending on activity. For precision and detailed works, the light level may even approach 1500 - 2000 lux.

**40. Should I consider porticos, stilt floors and overhangs as thermal zones while simulating?**

No, they are not to be considered as thermal zones in simulation.

**41. If a window or part of my façade glazing is shaded by a tree or a neighbouring structure, should I consider it as shading device?**

Yes, they should be considered as a shading device

**42. How does roof insulation prevent heat loss?**

Insulating materials are bad conductors and so this reduces the heat loss by conduction. The material also prevents air circulating inside the cavity, therefore reducing heat loss by convection. Heat loss through the roof can be reduced by laying loft insulation.

**43. Is it mandatory to put double glazed or triple glazed glass in the building?**

No, it is not mandatory. While complying through the prescriptive path, use of permanent shading devices such as overhangs and fins can help to achieve required SHGC. If you are using whole building performance method then there is no restriction on the SHGC of windows of the proposed building.

**44. What makes the difference in terms of using uPVC frame instead of aluminium or wooden frame?**

Aluminium conducts energy more readily than timber or uPVC and thus, Aluminium products will have a higher U value than timber or uPVC with the same glass. Frame type U-Value (W/m<sup>2</sup>. K) Hardwood window 1.9 Aluminium without thermal break 6.6 Aluminium with thermal break (25 mm Polyamide) 2.2 uPVC frame 1.3.



**45. What's the difference between daylight and sunlight?**

Sunlight is all the electromagnetic radiation given off by the sun, especially that in the visible spectrum that bathes the earth while daylight is the light from the sun, as opposed to that from any other source.

**46. What is the difference between daylight and visible-light? How are UDI and VLT measured?**

Natural sunlight comprises of light rays visible to human eyes, infra-red rays & ultra-violet rays. The three together are known as daylight whereas, the visible part alone is called visible light. The UDI & VLT are measured in terms of Lux levels.

**47. What is a daylight zone?**

Areas within a building that are close enough to a source of daylight that daylight harvesting is possible are considered within a “daylight zone”.

**48. What is useful daylight illuminance?**

Useful daylight illuminance (UDI) is a daylight availability metric that corresponds to the percentage of the occupied time when a target range of illuminance at a point in a space is met by daylight.

**49. What's better lux or lumens?**

One lux equals 1 Lumen/m<sup>2</sup>, in other words – light intensity in a specific area. Lux is used to measure the amount of light output in a given area. We use lux because it is an efficient measurement for determining the brightness of a beam.

**50. How are illuminance levels calculated?**

Square the distance and multiply it by Pi and then by four. This is the area of a surface at the specified distance. Divide the light intensity in lumens by the surface area. The result is the illuminance in foot-candles or lux, depending on whether feet or meters were used.



**51. How many Lumens is a 100 watt incandescent light bulb?**

The present 100-watt incandescent bulb is the equivalent of about 1600 lumens.

**52. How bright is a Foot-candle?**

A lumen is a unit of measurement of light. It measures light much the same way. Remember, a foot-candle is how bright the light is one foot away from the source. A lumen is equal to one foot-candle falling on one square foot of area.

**53. Lighting and controls apply to which parts of the Building?**

- Interior spaces of buildings,
- Exterior building features, including facades, illuminated roofs, architectural features, entrances, exits, loading docks, and illuminated canopies, and,
- Exterior building grounds lighting that is provided through the building's electrical service.

**54. Is it mandatory to install manual override for the lighting sensors?**

Yes, its mandatory, in case of Sensors failure.

**55. Is it mandatory to install LED lights for interiors?**

Depends on the users' perusal. The LED can save upto 50% of the energy. You can install any type of light fixture. If you are following prescriptive path for compliance you need to meet Lighting Power Density ( $W/m^2$ ) requirements based on Building area method or Space by space method. If WBP method is followed, your proposed design annual energy consumption must be lesser than the standard case annual energy consumption

**56. Is it possible to be trade-off Lighting Power allowance amongst different portion of building?**

Trade-offs of interior lighting power allowance among portions of the building for which a different method of calculation has been used are not permitted.



**57. In the calculation of LPD what parameters to be considered if both general building area type and a specific building area type are listed?**

In cases where both a general building area type and a specific building area type are listed, the specific building area type shall apply.

**58. Does user have to take into account emergency lighting load in LPD calculations?**

No, emergency lighting that is automatically off during normal building operation and is powered by battery, generator, or another alternate power source are exempted.

**59. What is meant by the term “Colour of a lamp”, and what is the difference between Watts and Lumens?**

The colour of a lamp characterizes the colour of the light emitted and is given in units of Kelvin. The higher this value is, the cooler the colour tone of the light will be. The lower this value is, the warmer the light will be. Lumen is the unit of luminous flux, typically abbreviated by “lm”. Watt is the unit for the actual electrical power consumption by the bulb.

**60. What is energy efficient lighting system?**

The energy efficiency in the lighting sector gives the required illumination level of the lighting scheme for the application it has been designed for, while consuming the least amount of energy. Simply, energy efficient lighting can save the electricity while maintaining good quality and quantity of the light.

**61. How does the Dimmers works?**

Light dimmers save energy by reducing the flow of electricity to the bulb and allowing lights to operate with lower power outputs. Since lights under less stress shine longer, dimmers are known to extend the life span of your bulbs.



**62. How does lighting control system work?**

Lighting controls are input/output devices and systems. The control system receives information, decides what to do with it, and then adjusts lighting power accordingly. Power travels along the circuit to energize a group of lights.

**63. Can I install a motion sensor to an existing light?**

Yes, they allow you to keep your light fixture and your light bulb while adding in a motion sensor. Hence, a simple effective motion for sensor to your existing outdoor lights can be installed. Many PIR sockets are rated for indoor use only.

**64. Which bulb saves the most electricity?**

Clearly the LED-light. The LED can save upto 50% of the energy, thereby surpassing the energy saver bulb's performance. Replacing all bulbs in your home oftentimes results in a fifty percent reduction of the electrical power consumption.

**65. Are certain bulbs more favourable in different interior spaces than others?**

Different spaces can certainly be equipped with different types of lighting. For example, in rooms in which bulb replacement poses a challenge, LED or energy saver bulbs might be advantageous, as they have a long lifespan. In constant-light-on-situations, the energy saver bulb is best.

**66. Where and why do conventional bulbs have to be disposed off separately?**

Conventional bulbs are completely safe in normal use. When a bulb has reached the end of its service life, it is not recommended to dispose of them in the household waste. Instead it must be brought to a special collection point, since it contains small amounts of Mercury, among other important recyclable constituents.

LED-lights do not contain harmful material, but because of the electrical components involved, they must be disposed of separately as well.





**67. Which type of lighting do you recommend as a replacement for the incandescent bulb?**

Alternatives to the incandescent bulb are LED, Induction and other energy saver light bulbs. The energy saver bulb is available in the standard light bulb sockets E27 (E26) and E14 (E12) as well. The advantage is that up to 50 percent of the energy is saved, since the energy saver bulb is much more efficient than the conventional bulb which uses only five percent of the energy to create light, while the rest just creates heat and heats the environment.

**68. Which type of lighting do you recommend as a replacement for the incandescent bulb?**

Alternatives to the incandescent bulb are LED, Induction and energy saver light bulbs. The energy saver bulb is available in the standard light bulb sockets E27 (E26) and E14 (E12) as well. The advantage is that up to 80 percent of the energy is saved, since the energy saver bulb is much more efficient than the incandescent bulb which uses only five percent of the energy to create light, while the rest just creates heat and heats the environment.

The LED-lamp is also available in bulb form. Similar to the energy saver bulb, it also has a favourable energy balance. A 12-watt LED-lamp can replace a 60-watt incandescent light while maintaining the same luminous power and using a fraction of the energy.

**69. What is LED lighting and why is it superior to other kinds of lighting?**

While incandescent lights operate by burning a fragile filament, an LED is a “light emitting diode” which is illuminated through the movement of electrons. LED lighting uses much less energy than incandescent or fluorescent lighting and lasts significantly longer than these older technologies. You can feel the wasted energy of incandescent light bulbs: excess energy is given off as heat. LED lights convert a significantly higher percentage of electricity into light, saving you money on your utility bill.



**70. What is the maximum voltage drop in a LED?**

The forward voltage of an LED is between 1.8 and 3.3 volts. It varies by the color of the LED. A red LED typically drops around 1.7 to 2.0 volts, but since both voltage drop and light frequency increase with band gap, a blue LED may drop around 3 to 3.3 volts.

**71. What kind of a difference does replace a regular light bulb with an energy-saving bulb really make?**

Replacing one incandescent light bulb with an energy-saving compact fluorescent bulb prevents 500 kg of carbon dioxide from being emitted to the atmosphere from power plants and saves Rs. 5000 in energy costs over the bulb's lifetime.

A simple annual consumption and CO<sub>2</sub> emission calculation is shown below:

Lighting Technology (800 Lumens)	Daily Kwh Consumed (@8hr)	Annual Kwh Consumed (@8hr/day)	Co2 Produced (Coal Based Power Generation)
Incandescent (60 Watts)	0.48	175.2	152.42 Kg
Halogen (42 Watts)	0.34	124.1	107.96 Kg
CFL (14 Watts)	0.11	40.15	34.93 Kg
LED (9 Watts)	0.07	25.55	22.23 Kg

**72. Will the Low voltage LED lamps work with my existing transformer?**

Low Voltage LED lamps are compatible with magnetic transformers used with VAC lighting. If you have an electronic transformer one LED lamp may not work due to its very low power consumption. To work properly most electronic transformers, require a minimum load greater than the 3-watt used by our LED Spot Lights. When connecting a few LED lamps to one transformer the load increases to a point where the use of an electronic transformer is acceptable.



**73. What is Colour Rendering Index (CRI)?**

The Colour Rendering Index (CRI) is measuring the ability of a light source to simulate the colours of different objects accurately in comparison with the sunlight. Although there are critics of the subjective colour rendering in practice, the CRI is widely used as a measurement of the quality of the light. Higher CRI corresponds to better quality light, on a scale from 0 to 100.

**74. What is the CRI of LED lamp?**

Generally LED lamps score above **Color Rendering Index (CRI)** greater than 70, which is higher than many other light sources. LED Lamps with CRI above 80 are used for visual inspection tasks.

**75. Is Lumen/Watt the only aspect I should consider while choosing an LED lamp?**

No, you should consider also the CRI (quality of light) and your individual visual preferences. Some people like the more yellow Warm (Soft) White light that resembles the light from the incandescent lamp. Others prefer the brighter and more true-colour rendering Cool / Daylight white.

**76. Does the life span of an LED be affected by frequent on/off switching?**

Unlike the fluorescent lamps, lifespan of LED Lamps is NOT influenced by frequent switching.

**77. How do you calculate the power of lighting density?**

To complete the calculation, the total allowed power is first determined by multiplying the total building area by the maximum allowed power density. Next, the total lighting power of all installed fixtures is calculated. Finally, the installed power is compared to the allowed power, and must be less to meet KECBC Code.



**78. How do you calculate LPD?**

Lighting Power Density (LPD) is defined as the installed lighting power, in wattages, in a building space divided by the space area in square meters or square feet (watts/ft<sup>2</sup> or watts/m<sup>2</sup>).

**79. How do you calculate lighting requirements?**

To determine the needed lumens, you will need to multiply your room square footage by your room foot-candle requirement. For example, a 100 square foot living room, which needs 10-20 foot-candles, will need 1,000-2,000 lumens. A 100 square foot dining room, which needs 30-40 foot-candles, will need 3,000-4,000 lumens.

**80. How many lights are needed in a room calculator?**

Will change from space to space: For the average space of 250 square feet, you'll need roughly 5,000 lumens as your primary light source (20 lumens x 250 square feet). In your dining room, you'll want about 30 lumens per square foot on your dining table (to see, not examine, food), so if your table is 6 x 3 feet, that's 540 lumens. According the lumens select your light fixtures.

**81. What is automatic lighting control?**

The automatic control switch is used for automatic lighting control, for example in long hallways and passageways. It is installed in the ceiling and monitors the area beneath it.

**82. How does automatic light sensor work?**

The light sensor is a passive devices that convert this "light energy" whether visible or in the infra-red parts of the spectrum into an electrical signal output. Light sensors are more commonly known as "Photoelectric Devices" or "Photo Sensors" because the convert light energy (photons) into electricity (electrons).



**83. What is a light sensor and how does it work?**

The light sensor is a device which converts light energy of various wavelengths from infrared to UV into the electrical energy (or to an electrical signal). This is the reason that they are named as photoelectric devices. They sense the light during this process so can be called as 'photo sensors'.

**84. What is the meaning visible light?**

Visible light is a form of electromagnetic (EM) radiation, as are radio waves, infrared radiation, ultraviolet radiation, X-rays and microwaves. Generally, visible light is defined as the wavelengths that are visible to most human eyes. This broad range of wavelengths is known as the electromagnetic spectrum.

**85. What is the difference between Lumen & Lux?**

The difference between the unit's lumen and lux is that the lux takes into account the area over which the luminous flux is spread. A flux of 1000 lumens, concentrated into an area of one square meter, lights up that square meter with an illuminance of 1000 lux.

**86. What is the minimum illumination level is required in workplace?**

The minimum illumination required for general lighting in general construction areas, warehouses and workplace hallways and corridors is 5 lm/ft<sup>2</sup>. Physical plants, shops, machining areas, equipment and work rooms is 10 lm/ft<sup>2</sup>, and office areas require at least 30 lm/ft<sup>2</sup> of illumination.

**87. How many lumens are required in an office?**

Office lighting standards state that a normal workstation requires 500 lumens per square meter.

**88. What is the recommended illuminance level for office occupancies?**

Recommended illuminance levels for offices range from 30-60 lm/ft<sup>2</sup>, but the quality of the visual environment can have a substantial impact on the "appropriate" amount of illumination.



**89. How do we meet the minimum criteria for building ventilation requirements?**

All habitable spaces will be ventilated, and the guidelines provided in NBC 2016 (Part 8: Building Services, Section 1: Lighting and natural Ventilation, Subsection 5: Ventilation) will be followed. Three modes of ventilation need to consider. Natural Ventilation, Mechanical Ventilation & Mixed mode ventilation.

**90. Explain the need for natural ventilation. How do we meet the criteria of natural ventilation in a building?**

Natural ventilation caters to the air change requirements based on the occupancy in the zones of a building. Naturally ventilated buildings or spaces in mixed mode ventilated buildings shall comply with guidelines provided by natural ventilation in NBC. Should have minimum 3 star rated equipment catering mixed mode ventilation.

**91. What is variable speed drives?**

Variable speed drives (VSDs), also called adjustable speed drives (ASDs), are devices that can vary the speed of a normally fixed speed motor. In HVAC systems, they are used primarily to control fans in variable air volume systems instead of other devices such as inlet vanes and discharge dampers.

**92. What is a Low energy comfort system?**

Space conditioning or ventilation systems that are less energy intensive than vapor compression-based space condition systems. These primarily employ alternate heat transfer methods or materials (adiabatic cooling, radiation, desiccant, etc.), or renewable sources of energy (solar energy, geo-thermal) so that minimal electrical energy input is required to deliver heating or cooling to spaces.

**93. What is the difference between air and water-cooled chillers?**

An air-cooled chiller has a condenser that is cooled by the environment air. The air-cooled chillers are preferred for small or medium installations



but lately the quality improvement in their structure, allows the usage, in modular type, for large installations also.

The water-cooled chillers have water cooled condenser connected with cooling tower and are usually preferred for medium and large installations where there is sufficiency of water. In addition, they are also preferred in cases that is demanded constant performance of the system, independently of the ambient temperature (industrial air conditioning, air conditioning of digital systems etc.), because the capacity of the water-cooled chillers is not affected by the ambient temperature fluctuations.

**94. Why piping insulation is important?**

The piping insulation is a good insulation, which keeps heat in and out for certain conditions to maintain an ideal/required temperature.

**95. What are the maintenance requirements for solar water heating system?**

Domestic solar water heating system does not need significant maintenance requirements. Occasional leakages in the plumbing could be easily repaired by common plumbers. In case quality of water is hard, scale deposition in the collectors may result over the years. This may require descaling with acids for which it is best to contact the suppliers. Broken glass may also have to be replaced by the suppliers. If outside exposed surfaces are painted, the paint may have to be redone every 2-3 years to prevent corrosion of the surfaces.

**96. What are the operational requirements for solar systems?**

Domestic solar systems do not require any special operational skills. However, if following are observed, the efficiency of the systems will be maintained at a high level: Try to consume most of the heated water at one time - either in the morning or in the evening. Frequent on and off the hot water tap would lead to reduced electricity savings. If an electrical back up is provided in the tank, set the thermostat at the lowest acceptable temperature. In the north Indian climate, hot water may not be used for bathing in summers. If the system is to be put totally out of use, it should be drained of water and the collector should be covered.



Alternatively, if the hot water requirement remains in summers also, though at a reduced level, cover the collector partially.

**97. What are other efficient comfort systems or technology which can be utilised for comfort systems?**

Alternative HVAC systems have been described in detail in section 5.5 which in general could be replacement to refrigerant based cooling system. Evaporative cooling, desiccant cooling system, solar air conditioning, tri-generation, radiant cooling system, ground source heat pump & adiabatic cooling system are some of the approved list comfort system. For updated list of low energy comfort systems please visit ([www.beeindia.gov.in](http://www.beeindia.gov.in)).

**98. What is the benefit of installing occupant-controlled thermostat? (HVAC Controls)**

Occupant Controlled Smart Thermostats maximizes energy savings by monitoring and controlling energy use more effectively. The occupant can override demand response programs at any time.

**99. What does the TR (Tonnage Refrigeration) of an air-conditioning equipment mean?**

A ton of refrigeration (TR), also called a refrigeration ton (RT), is a unit of power used to describe the heat-extraction capacity of refrigeration and air conditioning equipment. A refrigeration ton is approximately equivalent to 12,000 BTU/h or 3.5 kW.

**100. Does a heat pump or a chiller unit placed in the basement (below grade) floor need ventilation?**

Yes, it does, and the air required for ventilation is provided through air handling units (AHUs).

**101. What does all those air conditioner and heat pump ratings mean?**

SEER (Seasonal Energy Efficiency Ratio) is a system for rating the efficiency of cooling equipment. The higher the SEER rating, the less your unit will cost to operate.





HSPF (Heating Seasonal Performance Factor) is a measurement similar to SEER, but it measures the efficiency of the heating portion of a heat pump.

Energy Efficiency Ratio (EER): This measures the cooling output of a unit divided by its total energy consumption, measured during continuous operation at a given operating condition (95 degrees or full load).

Integrated Energy Efficiency Ratio (IEER): This measure expresses cooling part-load EER efficiency for commercial unitary air conditioning and heat pump equipment on the basis of weighted operation at various load capacities.

**102. Why are compressor units of a unitary and split air-conditioning systems placed outdoors?**

They are placed outdoors so that the heat dissipated by them is lost to the environment and does not get back into the room again, or else it will increase the load on the AC too much

**103. What is the difference between VRF and VRV systems?**

VRV is Variable Refrigerant Volume and VRF is Variable Refrigerant Flow. They are essentially the same, but the term VRV is copyrighted by Daikin. For example, a system by Daikin may be called a VRV, but a similar system made by some other company is a VRF.

**104. Whether 5 star rated fans are providing air quantity similar to ordinary fans without star rating?**

Yes, 5 star rated fans will provide same quantity of air and its life is also similar to ordinary fans without star rating, available these days. Star rating is provided by Bureau of Energy Efficiency based on the electricity consumption of the fan. 5 star rating fans will consume least electricity. Normally these days 5 star rated fans are of 50 watt while ordinary fans of 80 watts.



**105. Why Should KECBC recommend to Buy Energy Star Rated Products/appliances though it is costly?**

All the products have two price tags: 1. The purchase price and 2. The operating cost. Star rated products might be costlier initially but operation cost will be low. Star rated products are energy efficient thus consume less energy in comparison to non-rated products. For many appliances even we replace normal product by 5 star rated energy efficient one the payback period is only one to two years, for example 5 star rated fans.. Continuously rising cost of energy and effect of energy on global warming have made us think to give preference to energy efficient appliances. Thus purchase of star rated products/appliances is beneficial.

**106. What is the percentage of usage of air-cooled chiller in a building?**

The application of air-cooled chiller is allowed in all buildings with cooling load less than 530 kW. For buildings with cooling load equal to or greater than 530 kW, the number capacity of air-cooled chiller shall be restricted to 33% of the total installed chilled water capacity unless the authority having jurisdiction mandates the application of air cooled chillers.

**107. What are low energy comfort systems?**

Desert Coolers, Fans, Exhausts may be called low energy comfort systems

**108. Is there a minimum requirement for Renewable Energy Generation to account for the total energy consumed in a building?**

A dedicated REGZ equivalent to at least 25 % of roof area or area required for generation of energy equivalent to 1% of total peak demand or connected load of the building, whichever is less, shall be provided in all buildings.

**109. I am ventilating the building mechanically. But during peak operation there is lack of freshness in the occupied zones. What is the cause and how do we rectify it?**

There is no requisite amount of fresh air being supplied for the zone. Buildings that are ventilated using a mechanical ventilation system or spaces in mixed mode ventilated buildings that are ventilated with



mechanical system, either completely or in conjunction with natural ventilation system shall have mechanical system that provide outdoor air change per person as per the latest national building code.

**110. If the power factor at the point of connection is less than 0.97, what should I do?**

You can use APFC panels (Automatic Power Factor Control Panels) for maintaining the required power factor.

**For KECBC compliance it is recommended to have minimum PF (Power Factor) of 0.97 for achieving KECBC compliance.**

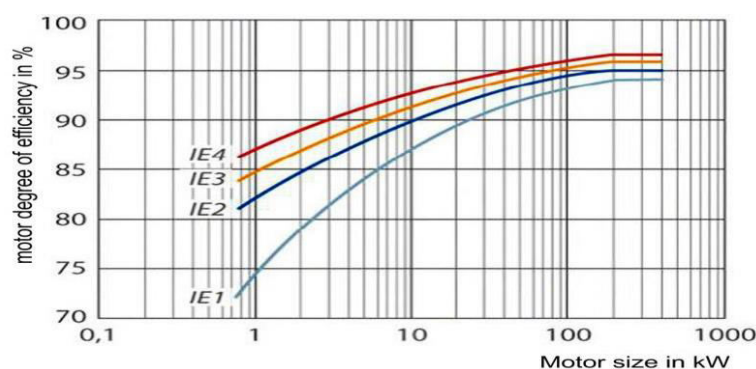
**111. What is power factor and how lower power factor effects power consumption?**

The power factor is the ratio of the real power that is used to do work and the apparent power that is supplied to the circuit.

Lower power factor means higher KVA for same KW. At unity power factor, both are same. So lower power factor means more current, and more losses in transmission and distribution lines. This also means increased drop in voltage along the lines, leading to lower voltages at receiving end.

**112. For compliance to the code what is the minimum requirement for energy efficient motors?**

For base compliance requirement IE2 (high efficiency) motors need to be used which will fulfil minimum energy efficient requirement. For voluntary saving schemes like ECBC+ and super ECBC IE3 (premium efficiency) and IE4 (super premium efficiency) classes need to be considered. An illustration is provided below showing efficiency differences.





### **113. What are No-Load losses in Transformer?**

No-load losses are caused by the magnetizing current needed to energize the core of the transformer, and do not vary according to the loading on the transformer. They are constant

Occur 24 hours a day, 365 days a year, regardless of the load, hence the term no-load losses.

### **114. What Are Load Losses in Transformer?**

Load losses vary according to the loading on the transformer. They include heat losses and eddy currents in the primary and secondary conductors of the transformer.

Heat losses, or  $I^2R$  losses, in the winding materials contribute the largest part of the load losses. They are created by resistance of the conductor to the flow of current or electrons. The electron motion causes the conductor molecules to move and produce friction and heat.

### **115. What are the losses in a transformer?**

Transformer losses are produced by the electrical current flowing in the coils and the magnetic field alternating in the core. The losses associated with the coils are called the load losses, while the losses produced in the core are called no-load losses.

### **116. Is loss monitoring mandatory for the transformers?**

Yes, it is mandatory for all transformers above 500kVA. It is mandatory, and the transformers should be equipped with current transformers (CTs) and Potential Transformers (PTs) additional to requirements to monitor and study periodic losses.



# **PHASE 2**

# **Technical FAQs on**

# **ECBC**



### **1. What is Total System Efficiency methods indicate?**

For projects using central chilled water plants, the Total System Efficiency approach may be used to comply with the Prescriptive Method of §5. This approach may be used in place of the prescriptive criteria of chillers (§5.3.1 and §5.3.6), chilled water pumps (§5.3.2), condenser water pumps (§5.3.2), and cooling tower fan (§5.3.3). Per this approach, a building complies if the Total System Efficiency thresholds are met as per Table 5-23 Maximum System Efficiency Threshold for ECBC, ECBC+, and SuperECBC Buildings.

### **2. What is Lower Energy Comfort system?**

Low Energy Comfort Systems (§5.3.13) is a simplified approach that provides projects using Low Energy Comfort Systems an opportunity to achieve improved compliance levels of ECBC+ and SuperECBC. This approach is applicable to Prescriptive Method of Section §5. In addition to compliance with the applicable prescriptive requirements (§5.3), the projects must meet the sum of cooling and heating requirement using approved list of low energy systems as per requirements in §5.3.13.

### **3. If there are additions or alterations to the existing buildings (Retrofits and Refurbishments), how should they comply to the code?**

Compliance may be demonstrated in either of the following ways:

- The addition shall comply with the applicable requirements, or
- The addition, together with the entire existing building, shall comply with the requirements of this Code that shall apply to the entire building, as if it were a new building.
- Exceptions are when space conditioning is provided by existing systems and equipment, the existing systems and equipment need not comply with this code. However, any new equipment installed must comply with specific requirements applicable to that equipment.



#### **4. Who is the Authority having Jurisdiction and what is their role?**

Construction drawings and specifications shall show all pertinent data and features of the building, equipment, and systems in sufficient detail to permit the Authority Having Jurisdiction (AHJ) to verify that the building complies with the requirements of this code. The AHJ varies from State to State, it is usually the ULB (municipality department) / Public Works Department (PWD) / Urban Development Department (UDD).

#### **5. What are the codes, policies and programs that take precedence over KECBC?**

- Any policy notified as taking precedence over this Code, or any other rules on safety, security, health, or environment by Central, State, or Local Government.
- Bureau of Energy Efficiency's Standards and Labelling for appliances and Star Rating Program for buildings provided both or either are more stringent than the requirements of this Code.

#### **6. What is the difference between a standard building and a proposed building?**

- Proposed Building is consistent with the actual design of the building and complies with all the mandatory requirements of KECBC.
- Standard Building is a standardized building that has the same building floor area, gross wall area and gross roof area as the Proposed Building, complies with the mandatory requirements and minimally complies with prescriptive requirements of for KECBC Buildings.

#### **7. What is EPI of a Building?**

The EPI of a building stands for Energy Performance Index and is given as:

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



## 8. What is EPI ratio?

The EPI ratio is the ratio of the EPI of the proposed building to the EPI of the standard building

$$EPI \text{ Ratio} = \frac{EPI \text{ of Proposed building}}{EPI \text{ of Standard building}}$$

## 9. What are the different building classifications under KECBC?

<b>HOSPITALITY</b>	<b>ASSEMBLY</b>	<b>HEALTHCARE</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> NO STAR HOTEL	<input type="checkbox"/> THEATRE	<input type="checkbox"/> HOSPITAL
<input type="checkbox"/> STAR HOTEL	<input type="checkbox"/> TRANSPORT SERVICE FACILITIES	<input type="checkbox"/> OUT PATIENT HEALTHCARE
<input type="checkbox"/> RESORT	<input type="checkbox"/> MULTIPLEX	
<b>BUSINESS</b>	<b>EDUCATION</b>	<b>SHOPPING FACILITY</b>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> SMALL OFFICES (<10,000 m <sup>2</sup> )	<input type="checkbox"/> SCHOOLS	<input type="checkbox"/> SHOPPING MALLS
<input type="checkbox"/> MEDIUM OFFICES (10,000-30,000 m <sup>2</sup> )	<input type="checkbox"/> COLLEGES	<input type="checkbox"/> STAND-ALONE RETAILS
<input type="checkbox"/> LARGE OFFICE (>30,000 m <sup>2</sup> )	<input type="checkbox"/> UNIVERSITIES	<input type="checkbox"/> OPEN GALLERY MALLS
	<input type="checkbox"/> TRAINING INSTITUTIONS	<input type="checkbox"/> SUPER MARKETS

## 10. How to identify if building is ECBC, ECBC+ and Super ECBC compliance?

For buildings to qualify as ECBC+ and Super ECBC Buildings, the WBP Method shall be followed for the Standard Design as detailed above. The Proposed Design for ECBC+ and Super ECBC Buildings shall meet the mandatory provisions in the Section of §4, §5, §6, and §7.

The EPI Ratio for ECBC+ and Super ECBC Buildings shall be equal to or less than the EPI Ratios listed under the applicable climate zone in Table 9-5.





**11. What are the mandatory code requirements?**

Irrespective of whether one opts for Whole Building Performance (WBP) method or Prescriptive method, the code compliance requires the building to fulfil a set of mandatory provisions. The mandatory requirements are described in KECBC under sections §4.2, §5.2, §6.2, and §7.2. of the KECBC code.

**12. What EPI ratio should a building have in order to be KECBC compliant?**

A building should have an EPI ratio of less than or equal to, but not exceeding 1 to be an KECBC compliant building

**13. What is a cumulative design EPI?**

Energy performance index for a building having two or more different functional uses and calculated based on the area weighted average (AWA) method.

**14. Which building or building systems are exempted from the KECBC code?**

The provisions of this code do not apply to:

- Buildings that do not use either electricity or fossil fuels.
- Equipment and portions of building systems that use energy primarily for manufacturing process.
- Multi-family buildings of three or fewer stories above grade and single-family buildings.

**15. What are the various compliance approaches to KECBC?**

Buildings that fall within the scope of the Code, shall comply with the Code by meeting all the mandatory requirements and any of the compliance paths mentioned below:

- Prescriptive Method
- Building Envelope Trade-off Method
- Whole Building Performance (WBP) Method



**16. Is it necessary to show KECBC compliance through simulation software?**

A building following the whole building performance approach shall show compliance through a whole building energy simulation software that has been approved by BEE.

**17. What are the administrative requirements for KECBC compliance?**

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

**18. What are the various documents required to show KECBC compliance?**

Construction drawings and specifications shall show all pertinent data and features of the building, equipment, and systems in sufficient detail to permit the authority having jurisdiction to verify that the building complies with the requirements of this code. The information submitted shall include, at a minimum, the following (Refer the section 9.1.5)

**19. Is there any supplemental information to be provided?**

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

**20. What software is available for WBP simulations? Are there any open-source or freely available?**

There are many software/tools available such as eQUEST, OpenStudio, DesignBuilder, IES-VE, Simergy, EnergyPlus etc. eQUEST and EnergyPlus are free tools.

**21. Where can user find weather data for my city for energy simulation?**

The Indian Society of Heating, Refrigerating and Air Conditioning Engineers (ISHRAE) provide weather data for Indian locations for



simulations. Weather files can be downloaded from EnergyPlus website for Indian cities given on the link below.

[https://energyplus.net/weather-region/asia\\_wmo\\_region\\_2/IND%20%20](https://energyplus.net/weather-region/asia_wmo_region_2/IND%20%20)

**22. What type of file format is required to upload climate data in simulation program?**

To choose the location option in simulation program and upload the climate data of location, EPW and bin file format is required to upload climate data.

**23. What are the types of check list required for KECBC compliance report?**

- Envelope Checklist
- Comfort Systems and Controls Checklist
- Lighting and Controls Checklist
- Electrical and Renewable Energy Systems Checklist

The appendix D contains the compliance forms to fill up and the filled forms should be submitted to the authority having jurisdiction.

**24. What are the types of schedules required in building simulation program?**

- Occupancy schedule
- Lighting schedule
- Equipment schedule
- Elevator schedule
- External lighting schedule
- HVAC fan schedule
- Cooling schedule
- Heating schedule
- HVAC schedule

**25. What are all the modelling requirement for calculating proposed and standard design?**

- Design Model



- Space Use Classification
- Schedules
- Building Envelope
- Lighting
- HVAC Thermal Zones

**26. What parameters are to be considered in choosing a window glazing?**

- a. U-value
- b. Solar Heat Gain Coefficient (SHGC) and
- c. Visual Light Transmittance (VLT).

**27. What is U-Factor and SHGC?**

- a. U-factor is interchangeable terms referring to a measure of the heat gain or loss through glass due to the difference between indoor and outdoor air temperatures.
- b. Solar heat gain coefficient (SHGC) is the fraction of solar radiation admitted through a window, door, or skylight - transmitted directly and/or absorbed, and subsequently released as heat inside a home.

**28. What is a good U factor for a window?**

Lower is better with U-factor-the opposite of R-value, when higher is better. The low end of that range is only achievable with higher-quality triple-glazed windows--windows with three layers of glass.

**29. How do you calculate the U value of a window?**

$$\text{Heat loss} = U \times A \times dT$$

where U = U-value (W/m<sup>2</sup>K) Thermal transmittance

A = Area of surface (m<sup>2</sup>)

dT = Temperature difference inside to outside (K)

Units of heat loss = Watts.

**30. Is acoustic insulation coming in KECBC compliance? If yes, can you suggest some materials for thermal and acoustic insulation in common?**



No, acoustic insulation does not come under KECBC compliance.

**31. What is Solar Reflectance index?**

The Solar Reflectance Index (SRI) is a measure of the solar reflectance and emissivity of materials that can be used as an indicator of how hot they are likely to become when solar radiation is incident on their surface. The lower the SRI, the hotter a material is likely to become in the sunshine.

**32. What is Building Envelope Trade-Off method and can one trade-off amongst Envelope, Lighting and Comfort systems?**

The building trade-off method allows flexibility in use to the owner/constructor by allowing to provide a better than required building component in one part, to compensate for another not that good component in other, as long as the EPI of the building does not change. For instance, a better than required roof can compensate for a wall which is not of that standard, given the EPI remains constant.

No, one cannot trade-off between different systems. Trade-off is allowed only in building envelope.

**33. What are areas in a building where the air-leaks can probably occur?**

The possible areas for air leaks are:

- Joints around fenestration, skylights, and door frames
- Openings between walls and foundations, and between walls and roof, and wall panels
- Openings at penetrations of utility services through roofs, walls, and floors
- Site-built fenestration and doors
- Building assemblies used as ducts or plenums

**34. What measures are to be taken in installing a green/ vegetated roofing system?**



- For qualifying as a cool roof, roofs with slopes less than  $20^\circ$  shall have an initial solar reflectance of no less than 0.60 and an initial emittance no less than 0.90. Solar reflectance shall be determined in accordance with ASTM E903-96 and emittance shall be determined in accordance with ASTM E408-71 (RA 1996).
- For qualifying as a vegetated roof, roof areas shall be covered by living vegetation

**35. Which form of insulation is most effective?**

Aero gel is more expensive, but definitely the best type of insulation. Fiberglass is cheap, but requires careful handling. Mineral wool is effective, but not fire resistant. Cellulose is fire resistant, eco-friendly, and effective, but hard to apply.

**36. What is the best insulation for roofs?**

Batts or blanket insulation are the best choice for ceiling insulation if you have a flat ceiling and pitched metal or tile roof. The ranges of batts and blankets that may be suitable for ceiling insulation include; polyester, natural wool, glass wool and rock wool.

**37. What type of insulation should I use?**

Insulation with a higher R-value will perform better than insulation with a lower rating. The most common insulation materials are fiberglass, cellulose and foam. Insulation types include loose fill, batts, rolls, foam board, spray board and vapor barriers.

**38. What are the advantages and constrains of living green facades?**

- Advantages: good aesthetics, cooler insides
- Constrains: may cause seepage

**39. What is Skylight roof ratio (SRR)? How to measure it?**

It is defined as the ratio of the total skylight area of the roof, measured to the outside of the frame, to the gross exterior roof area and should not be greater than 5%. It is measured by dividing the area of skylights



(inclusive of frames) to the net area of the roof, i.e. roof area after removing skylight area.

**40. What are the disadvantages of double glazing with cavity?**

- The cavity/ gap is to be strictly maintained or may cause conduction instead of insulation
- Does not reduce SHGC by much

**41. Where can I find construction material properties?**

The user can find construction material properties from suppliers and test certificates. If they are not available with manufacture/ vendor/supplier you can refer appendix of the KECBC for default values.

**42. Do I need to put roof insulation over deck or under deck?**

You can put either over deck or under deck. For prescriptive path roof U-value needs to be met. In the hot climates, it is preferable to put insulation over deck as stopping heat at source is more effective.

**43. Can I install glass with higher SHGC, if windows are shaded with trees?**

No, you cannot take benefit of shading by trees. Permanent shading devices such as overhangs and fins can be considered. Automated moveable shading system can also be installed.

**44. Can I take benefit of manual shading controlling WBP method?**

No, you can take benefit only if it is automatic shading if implemented in the project.

**45. What are the strategies which I can use to comply with cool roof criteria of KECBC?**

The materials with initial solar reflectance of not less than 0.7 and initial emittance not less than 0.75 such as broken China Mosaic, Heat Reflective paint/tile, etc. can be used.

**46. What is average “daylight” factor?**



A daylight factor is how the level of light inside a building compares to the level of light outside a building.

**47. How is daylight measured?**

Illuminance is the measure of the amount of light received on the surface. Luminance is the measure of the amount of light reflected or emitted from a surface. It is typically expressed in  $\text{cd}/\text{m}^2$ .

**48. What is daylight autonomy?**

Daylight Autonomy (DA) was the first of a string of annual daylight metrics, now commonly referred to as “dynamic daylight metrics”. It is represented as a percentage of annual daytime hours that a given point in a space is above a specified illumination level.

**49. How to calculate daylight in a room?**

$$DF = (E_i / E_o) \times 100\%$$

where,  $E_i$  = illuminance due to daylight at a point on the indoors working plane,

$E_o$  = simultaneous outdoor illuminance on a horizontal plane from an unobstructed hemisphere of overcast sky.

To calculate  $E_i$ , requires knowing the amount of outside light received inside of a building.

**50. Is it mandatory to use daylighting in my building in order to show KECBC compliance?**

Above grade floor areas shall meet or exceed the Useful Daylight Illuminance (UDI) area requirements listed in Table 4-1 for 90% of the potential day lit time in a year. Mixed-use buildings shall show compliance as per the criteria prescribed.

**51. How do I show KECBC compliance in Daylighting?**

Compliance shall be demonstrated either through daylighting simulation method or the manual method.





**52. Can I use any software available in the market for daylight simulation?**

Only BEE approved software shall be used to demonstrate compliance through the daylighting simulation method.

**53. Are there any defined lux levels to be adopted for daylighting?**

Buildings shall achieve illuminance level between 100 lux and 2,000 lux for the minimum percentage of floor area prescribed, for at least 90% of the potential daylight time.

**54. What are the methods to calculate the daylighting area in a room/enclosure?**

The daylight may be calculated manually by lux meters or with the help of daylight simulation software.

**55. What percent of floor area should be the window area if natural light through windows is used for illumination of the workplace?**

According to this requirement, openings for natural light may range from 10%–100% of the floor area.

**56. What are the exceptions for Demand Control Ventilation?**

The section 5.2.1.3 of KECBC refers to exceptions:

- Classrooms in Schools, call centers category under Business.
- Spaces that have processes or operations that generate dust, fumes, mists, vapors, or gases and are provided with exhaust ventilation, such as indoor operation of internal combustion engines or areas designated for unvented food service preparation, or beauty salons.
- Systems with exhaust air energy recovering system.

**57. What is sealing of building envelope?**



Sealing works on the same principle, reducing air infiltration through the walls, ceilings, and floors to save energy and stay comfortable.

**58. If the building is naturally ventilated, does it still need to follow the K-ECBC?**

Yes, naturally ventilated buildings are also covered in K-ECBC if they meet the requirement under section 2.

**59. What are the exceptions to lighting and controls of KECBC 2018?**

Emergency or security lighting that is automatically off during normal building operations.

**60. Is it Mandatory to provide Additional controls?**

Additional controls are mandatory to control lighting which is independent of general lighting. Please refer section 6.2.1.6 of KECBC 2018.

**61. What lighting equipment's should have exempted from Interior Lighting Power allowance?**

Please refer section 6.3.1 exception to 6.3 of KECBC 2018

**62. What are the types of method to identify lighting power density for KECBC building?**

Building area method

Space area method

**63. Where is the need for demand control ventilation?**

Mechanical ventilation systems, if they provide outdoor air greater than 1500 litres per second to a space greater than 50m<sup>2</sup> with occupant density exceeding 40 people per 100m<sup>2</sup>. This is incorporated in systems like 1. Air side economizer 2. Automatic Outdoor air damper. Details are available in the section 5.2.1.3



**64. For space conditioning equipment's what does the code mandate?**

Chillers used for larger application should comply minimum energy efficiency requirement of ANSI/ AHRI 550/590 conditions. For VRF/VRV systems, ANSI/AHRI standard 1230 should be met. Minimum efficiency requirements under BEE standards and labelling program shall take precedence over minimum requirements presented.

**65. Can a building be exempted from Economizer compliance for ECBC, ECBC+ and Super ECBC?**

Yes, refer section 5.3.5.1 of K-ECBC:

- Projects in warm-humid climate zones.
- Projects with only daytime occupancy in the hot-dry.
- Individual cooling or heating fan systems less than 3,200 liters per second.

**66. How individual space conditioning equipment's are selected?**

Unitary, Split & Packaged Air-Conditioners shall meet or exceed efficiency requirement as provided in section 5.2.2.2 of the code. Based on the cooling capacity (kW<sub>r</sub>) it is categorised and for load below 10.5 kW<sub>r</sub> air cooled system, minimum 3 star rated system should be used.

**67. In voluntary savings schemes what are the recommendations in comfort systems?**

Detailed explanation Section 5.2.4

**68. I have variable refrigerant flow system with EER & IEER value as given by manufacturer as 3.32 & 4.38 respectively. Will this be suitable for my building usage application?**

It is advised to refer the code section 5.2.2.3, where based on the size (kW<sub>r</sub>) of the system it is categorised, and minimum requirement is defined. For the described values it can be noted from table that for VRF air conditioners <40 kW<sub>r</sub>.



**69. Is the usage of controls mandatory for code compliance?**

Yes. It is listed and described in section 5.2.3. Time clock control, Temperature control, Occupancy Control, Fan Controls & damper controls have been described in the code.

**70. What is the mandatory regulation on voltage drop?**

Voltage drop for feeders shall not exceed 2% at design load. Voltage drop for branch circuit shall not exceed 3% at design load.

**71. What are the systems which are not required to have a time clock?**

The section 5.2.3.1 of KECBC refers to exceptions:

- Cooling systems less than 17.5 kW<sub>r</sub>.
- Heating systems less than 5.0 kW<sub>r</sub>.
- Unitary systems of all capacities.

**72. What are the components to be insulated? What is the minimum insulation requirement?**

Service hot water pipes, pipes for heating & space conditioning also ducts servicing the purpose of space conditioning should be insulated to prevent heat loss due to convection and radiation. Insulation exposed to weather shall be protected by aluminium sheet metal, painted canvas or plastic cover. Section 5.2.6.1 describes in detail about the insulation requirement for pipe, duct and plenums.

**73. What are the minimum criteria for service hot water heating?**

To comply with the code hotels and hospitals (which in general require regular hot water supply) which are present in warm and humid climate zone shall have solar water heating equipment installed to provide 1. at least 20% of the total hot water design capacity for floor area of the building less than 20,000 m<sup>2</sup> 2. At least 40% of the total hot water design capacity for floor area of the building greater than 20,000 m<sup>2</sup>.



- 74. Is it sufficient to install chiller of less efficiency than what is prescribed by K-ECBC if my proposed building energy consumption is less than standard case and I am pursuing the WBP method for compliance?**

No, any chiller that will be installed in the building must meet minimum efficiency requirements as prescribed. For minimum chiller efficiencies, please refer Table 5.1, 5.2, 5.3 of K-ECBC.

- 75. In-case if the resetting chiller water temperature affects the equipment performance or leads to malfunctioning of the equipment, what should be done?**

In the above case the system is exempted from chiller water temperature reset. Refer section 5.3.8.3 of K-ECBC.

- 76. Does the installed chiller have to meet the minimum energy efficiency requirements under the KECBC, even if the proposed building energy consumption is less than standard case and the building uses the WBP method for compliance?**

Yes, any chiller installed in the building must meet minimum efficiency requirements, irrespective of compliance methods or consumption. For minimum chiller efficiencies, please refer to Table 5-1 of KECBC

- 77. Hospitality building also presents its guests swimming pool services. Pools are provided with heater facility. To comply with KECBC what is the minimum criteria?**

To comply with the code the hospitality building should be constructed with parameters specified in mandatory sections of the code. In case of swimming pools with heater facility, vapour retardant pool cover should be provided. For pools heated to more than 32°C pool cover should have minimum insulation value of R-4.1.



**78. I have used equipment of different rating and required capacity. I there any alternate way to achieve compliance for comfort system and controls exclusively?**

For centralised chilled water plant side system in all building type, compliance can be shown based on the energy consumed for unit cooling load (kW<sub>r</sub>). Section 5.4 in the code describes in details and a table is provided for system efficiency requirement.

**79. Is it essential to install solar water heater system to meet hot water requirement of buildings?**

As per KECBC, commercial establishments such as hotels, hospitals, guest houses with a centralized system shall have either solar water heating or waste heat recovery system up-to the criteria given in the above section.

**80. What are the systems exempted from using Solar Water Heater?**

The section 5.2.7.1 of KECBC refers to exceptions: Systems that use heat recovery to provide the hot water capacity required as per the building type and size.