GRIHA EB

GRIHA FOR EXISTING BUILDINGS

VERSION 1

ABRIDGED MANUAL

TRANSFORMING EXISTING BUILDINGS TO SUSTAINABLE BUILDINGS

A GRIHA Council Publication

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MESSAGE

PRESIDENT GRIHA COUNCIL

India's existing building stock presents a great opportunity to reduce primary energy and water demands. By improving the environmental performance of existing buildings we can take decisive steps towards making our buildings and habitats sustainable. It is important that buildings continuously monitor and improve their performance in order to transition to a resource efficient economy.

In the last few decades, green buildings and retrofit technologies have evolved and matured in India. Taking inputs from technological advancements, the GRIHA Existing Building rating has been prudently designed to stimulate resource efficiency in our built environment. Since its inception, the GRIHA rating has been instrumental in driving India's green building movement. India's "Intended Nationally Determined Contributions" (INDCs) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) highlights GRIHA as the country's own green building rating for combating global warming and climate change and identifies it as a key instrument to facilitate the mitigation of greenhouse gas emissions.

It is our endeavour to facilitate modern, innovative, and green technologies, and the rating for Existing Buildings would help accelerate the greening of the existing stock of buildings in our country. I acknowledge the contribution of the team and industry experts, who provided their valuable insight throughout the development process. I hope that this rating will serve as a valuable learning resource and that building stock owners find it encouraging to adopt the GRIHA rating for their existing buildings.

Ajay Mathur

FOREWORD

CEO GRIHA COUNCIL

To transform the face of habitats towards sustainability, the GRIHA rating system was created integrating both technological and social innovations to infuse resource efficiency in the building industry. So far, the GRIHA variants focused on all segments of new construction with its mission "Inspire, enable and engage with society to achieve sustainable habitats". With buildings consuming about 40% of energy, 25% of water, and 40% of resources, there exists a huge opportunity to identify sustainable solutions to reduce the ever-increasing demand.

With the growing stock of buildings, the potential for enhancing resource efficiency in existing buildings is an opportunity to reduce consumption, optimize operational & maintenance costs, and augment the indoor comforts of the occupants. We, at the GRIHA Council, are pleased to introduce the "GRIHA for Existing Buildings" rating as an integrated tool to evaluate performance and provide solutions for enhanced energy and water efficiencies, increased thermal & visual comfort, and decreased operational & maintenance costs. While focusing on the above, the tool has been developed with the underlying objectives of simplicity of execution, economic viability and alignment with national and sub-national policies. The rating endeavours to cover various categories of buildings across diverse climatic zones of the country.

This abridged version of "GRIHA for Existing Buildings" has been developed through a consultative process across all stakeholders, ranging from facility managers, green building consultants, academia and building practitioners. With the introduction of economically viable advanced technologies and operational practices, the rating would keep evolving over time. This would drive the existing building stock towards attaining higher levels of sustainability with reduced operational costs.

I gratefully acknowledge the support of all those associated with the development of this rating and look forward to their continued guidance for its enhancement.

Sanjay Seth

ACKNOWLEDGEMENTS

The GRIHA Existing Building (EB) abridged version is an outcome of the development team and various experts in the buildings industry. The GRIHA Council would like to express our sincere gratitude to all the experts who spared valuable time and guided us throughout the process.

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The GRIHA EB rating would not have been conceivable without extremely valuable technical guidance of Mr Richie Mittal, Managing Director of Overdrive Engineering Pvt. Ltd, Dr Ishan Purohit, Sr General Manager (Renewables) of Lahmeyer International India Pvt. Ltd, and Mr Jagjit Singh, CEO, M J Engineering Consultants Pvt. Ltd.

We would like to express our gratitude to Dr Ajay Mathur, President, GRIHA Council, for providing his leadership to the GRIHA Council, without which development of this rating would have not been possible.

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ABBREVIATIONS

- AHU : Air Handling Unit
- ASHRAE : American Society of Heating, Refrigerating, and Air-Conditioning Engineers
- BEE : Bureau of Energy Efficiency
- BIS : Bureau of Indian Standards
- BTU : British Thermal Unit
- CFM : Cubic Feet Per Minute
- CFC : Chlorofluorocarbon
- CGWB : Central Ground Water Board
- CPCB : Central Pollution Control Board
- CPWD : Central Public Works Department
- CRRI : Central Road Research Institute
- CTs' : Current Transformer
- DG set : Diesel Generator Set
- EEMs' : Energy Efficiency Measures
- GRIHA : Green Rating for Integrated Habitat Assessment
- HCFC : Hydrochlorofluorocarbon
- HT Panel : High Tension Panel
- HVAC : Heating, Ventilation and Air Conditioning
- IAQ : Indoor Air Quality
- INDCs : Intended Nationally Determined Contributions
- LT Panel : Low Tension Panel
- MNRE : Ministry of New and Renewable Energy
- NAAQS : National Ambient Air Quality Standards
- NABL : National Accreditation Board for Testing and Calibration Laboratories
- NBC : National Building Code
- ODP : Ozone Depleting Material
- PPM : Parts Per Million
- PTs' : Potential Transformer
- RE : Renewable Energy
- REC : Renewable Energy Certificate
- RH : Relative Humidity
- SRI : Solar Reflective Index
- STP : Sewage Treatment Plant
- TERI : The Energy and Resources Institute
- UHIE : Urban Heat Island Effect
- UNFCCC: United Nations Framework Convention on Climate Change
- VRF : Variable Refrigerant Flow
- VOC : Volatile Organic Compound
- WP : Water Performance
- WTP : Water Treatment Plant

INTRODUCTION

India, a leading economy, is the seventh largest country in the world. The construction industry plays an important role in the country's economy, which is reflected in the burgeoning real estate development taking place in India. In the light of growing energy deficit, resource crunch, increasing greenhouse gas emissions, it has become inevitable to shift to a greener construction industry. The GRIHA, Simple Versatile Affordable GRIHA, and GRIHA for large development rating systems have been striving to address these concerns and achieve sustainability since last few years.

Although more than 2/3rd of the building stock in India is yet to be built, the existing buildings are a pool of resource savings ready to be tapped. Solutions must be found for the relatively large quantum of the existing buildings in India, as there is 8700 million kWh and 74 lakh tonnes of CO_2 saving potential locked in them. The running costs also hold a major part of the expenses in the existing buildings, which makes the shift even more lucrative.

Nevertheless, achieving sustainability in a new construction is much easier than an existing building. The existing buildings have more stakeholders than a new construction. Housekeeping and maintenance staff, the occupants and the managers are all part of the building management, with different issues and responsibilities. Thus, simplicity and flexibility must be the underlying theme of any initiative taken towards sustainability.

Keeping this as a benchmark, the GRIHA Council has developed a rating system for existing buildings. GRIHA for Existing Buildings (EB) rating is an integrated tool to assess the performance of existing buildings and provide sustainable solutions whilst augmenting the indoor comfort of the occupants. The rated buildings will enjoy enhanced energy and water performance and increased thermal and visual comfort; ultimately resulting in decreased operational and maintenance costs. Especially the commercial buildings stand to benefit even more with the optimized value of the property cost and increased tenant retention of the rated buildings. GRIHA for Existing Buildings rating is designed with underlining objectives, such as attaining environmental impact reduction, simplicity in execution, alignment with local and national goals, and cost effectiveness. The rating endeavors to provide solutions to various typologies and ages of building catering to the diverse climatic zones of India, and include RWAs & users of habitats in the process. The rating would be assessed on specific sections which are imperative for a holistic improvement in performance of the building.

Efforts are being taken at the global level to move towards efficiency in the existing buildings. The Government of India is carrying out a range of interventions on the "Demand Side Management" of energy specifically. GRIHA, being an indigenous tool highlighted in India's "Intended Nationally Determined Contributions (INDCs): Working Towards Climate Justice" document submitted to the United Nations Framework Convention on Climate Change (UNFCCC), envisions implementation of an integrated process encompassing the regulatory mandates, codes, and standards in India. With the motto, "what gets measured gets managed", GRIHA has been focusing on the new construction since past few years and with the same drive we shall strive to "Inspire, enable and engage with society" and achieve sustainable habitat for all.

RATING PROCESS

1. **Feasibility check** – As a first step, the owner/ maintenance team / project team is responsible for checking the facilities & housekeeping. They are required to check if their project is eligible for a GRIHA for Existing Buildings rating with the help of the online feasibility check calculator available on the GRIHA website. The project must meet the mandatory clauses in order to be eligible for the GRIHA for Existing Buildings rating. Based on the information provided by the project proponent, the calculator gives anticipated level of rating. The rating level achieved in the feasibility check is just an indication, and rating shall be awarded once the project gets registered and submitted documents are evaluated and verified by GRIHA Council.
2. **Registration** – The successful completion of feasibility check enables project proponent to register the project under Existing Building category on the GRIHA Council's website by filing expression of interest (EOI) available on GRIHA website. Once the project is registered, the project proponent shall be provided with username and password for documentation on online panel.
3. **Orientation workshop** – The registration is followed by an orientation workshop conducted by GRIHA Council. The intent of this workshop is to provide detailed information of existing building rating covering all criteria and to address specific queries of project proponent on the certification process.
4. **Submission of documents** – Post the orientation workshop, the project proponent must submit the documents for all criteria on the online panel by using the username and password provided during registration.
5. **Preliminary evaluation** – After online submission of documents, the preliminary evaluation is carried out by a team of professionals and experts from GRIHA Council. The documentation must be complete in all respects for all attempted criteria. Any attempted criteria with incomplete documentation shall not be evaluated. Online calculators provided for specific criteria needs to be filled in and submitted. The GRIHA Council professionals first review compliance of the project with the mandatory criteria and reject the project in the event of non-compliance with such criteria. The GRIHA Council shall than evaluate the optional criteria and estimate the total number of achievable points. A preliminary evaluation report shall be submitted within 20–25[1] working days after document submission.
6. **Due diligence site visit for verification** – A due diligence site visit must be performed by GRIHA Council to verify the submitted documents as compared to the on-site implementation. The due diligence report shall be submit within 7–10 (15 days) working days of the site visit.
7. **Final evaluation** – GRIHA Council evaluates documents submitted in response to preliminary evaluation and due diligence report. On the basis of this evaluation, GRIHA Council shall prepare a final score card within 20–25[2] working days after the project team furnishes requested information sought during preliminary evaluation and due diligence report.

1 Duration of review shall be contingent upon the GRIHA Council capacity.

2 Duration of review shall be contingent upon the GRIHA Council capacity.

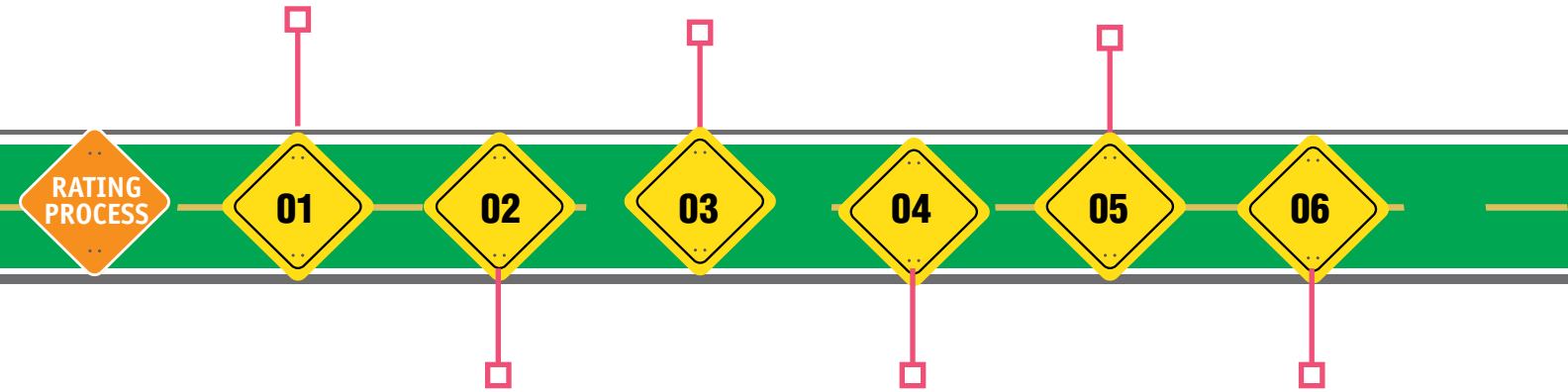
8. **Award of rating** – The final score must be presented to the Advisory Committee comprising eminent personalities and renowned professionals in the field for approval and award of rating. The rating will be valid for a period of five years from the date of award of rating to the project. Note that GRIHA Council reserves the right to undertake a random audit of any criteria for which points have been awarded.

RATING PROCESS

Feasibility Check
Project team conducts a feasibility study to ensure the project is meeting with mandatory requirements with the online calculator available on GRIHA website.

Orientation Workshop
Orientation workshop by GRIHA Officials for handholding the project team through the rating process.

Certification
- **Preliminary evaluation**
- **Due diligence for verification**
- **Final evaluation**



Registration
- **Filing online expression of interest (EOI)**
- **Submission of Registration fee**
- **Username and password for documentation on online panel**

Submission of Documents
Submission of documents by the project team on the online panel.

Award of Rating
Dispatch of certificate and plaque

CRITERIA AND THEIR WEIGHTAGE

GRIHA for Existing Buildings rating is a performance-oriented system where points are earned for meeting the intent (appraisals) of the criteria. Each criterion has a number of points assigned to it.

Compliances, as specified in the relevant criterion, have to be submitted in the prescribed format. While the intent of some of the criteria is self-validating in nature, there are others, such as energy consumption, thermal and visual comfort, noise control, and indoor pollution levels, which need to be validated on-site through performance monitoring. The points related to these criteria (specified under the relevant sections) are awarded after verification through monitoring, validation, and documents/photographs to support the award of point.

GRIHA for Existing Buildings rating system is a 100 point system consisting of 12 criteria categorized under seven sections such as Site Parameters, Maintenance & Housekeeping, Energy, Water, Human Health & Comfort, Social Aspects, and Bonus points. Six of these 12 criteria are mandatory, while the rest are optional. Each criterion, except from the six mandatory criteria, has a number of points assigned to it. It means that a project intending to meet the criterion would qualify for the points.

Different levels of certification (one star to five stars) are awarded based on the number of points earned. The minimum points required for certification is 25.

Threshold	GRIHA for Existing Buildings
25–40	★
41–55	★★
56–70	★★★
71–85	★★★★
86 and above	★★★★★

Eligibility

All operational buildings having a built-up area greater than 2,500 sq. m. are eligible for certification under GRIHA for Existing Buildings rating. The typology of buildings include: offices, retail spaces, institutional buildings, hotels, hospital buildings, healthcare facilities, residences, and multi-family high-rise buildings.

Table 1: Criteria and their weightage

Section	Criterion Name	Intent	Max. Points
Section I. Site Parameters	**Criterion 1** *Accessibility to Basic Services*	Promote walking, cycling, and public transport	2
	Criterion 2 *Microclimatic Impact*	Lower the impact of Urban Heat Island Effect (UHIE), and promote plantation of trees	4
Section II. Maintenance & Housekeeping	**Criterion 3** *Maintenance, Green Procurement and Waste Management*	Ensure good practices for safety, waste management, and green procurement	7
	Criterion 4 *Metering & Monitoring*	Promote reliable metering and monitoring	10
Section III. Energy	**Criterion 5** *Energy Efficiency*	Ensure energy efficiency	20
	Criterion 6 *Renewable Energy Utilization*	Promote use of renewable energy	15
Section IV. Water	**Criterion 7** *Water Footprint*	Implement potential water conservation strategies	15
	Criterion 8 *Reduction in Cumulative Water Performance*	Reduce overall water demand of the habitat	10
Section V. Human Health & Comfort	**Criterion 9** *Achieving Indoor Comfort Requirements*	Ensure that building spaces provide for thermal, visual, and acoustical comfort	8
	Criterion 10 *Maintaining Good IAQ*	Ensure good indoor air quality	4
Section VI. Social Aspects	**Criterion 11** *Universal Accessibility & Environmental Awareness*	Promote accessibility for the persons who are differently-abled & the elderly and to increase environmental awareness amongst the building users & visitors	5
Section VII. Bonus Points	**Criterion 12** *Bonus Points*	Adoption and implementation of innovative strategies in improving the sustainability of the project	4

SITE PARAMETERS

SECTION INTENT

The section primarily deals with two aspects of the site, namely; the accessibility to basic services and lowering the impact of Urban Heat Island Effect (UHIE).

The accessibility to basic services from the project site is one of the key factors that determines the energy consumed by occupants in transportation. This part of the site parameters section aims to reduce the negative environmental impact from automobile use for accessibility to basic services. The second part of this section focusses on enhancing the micro-climate of the project site.

This section contains two criteria as mentioned in Table 2.

Table 2: Site parameters section criteria

Criterion Number	Criterion Name	Maximum Points
Criterion 1	Accessibility to Basic Services	2
Criterion 2	Microclimatic Impact	4

CRITERION 1

ACCESSIBILITY TO BASIC SERVICES

Intent

The intent of this criterion is to reduce use of private vehicles and promote walking, cycling, and use of public transport to fulfill the occupant's basic need.

Maximum Points: 2

1.1 Appraisal

1.1.1 Availability of at least 5 services (from the list given below) within the campus or within 500m walking distance from main entrance of project. **– 1 point**

Services: Grocery store, Pharmacy, Bank/ATM, Park, Restaurant, Community Centre, Gym, Public transit stop / Metro Station.

1.1.2 Collective transport service (as listed below) to nearest public transportation nodes is provided for building occupants. **– 1 point**

- Preferred parking for electric vehicles
- Preferred parking for pooled vehicles
- Bicycle rental/parking
- Shuttle services

1.2 Compliance

1.2.1 Submit a satellite image/context drawing highlighting locations of 5 basic amenities from the main entrance of the project site to comply with Appraisal 1.1.1.

1.2.2 Submit narrative and photographs highlighting total number of preferred parking slots for collective transportation services as mentioned in Appraisal 1.1.2.

CRITERION 2

MICROCLIMATIC IMPACT

Intent

The intent of this criterion is to encourage plantation of trees and implement adequate measures on-site to reduce the impact of urban heat island effect and enhance the micro-climate of the project site.

Maximum Points: 4

2.1 Appraisal

2.1.1 Analyse total number of trees planted on site and demonstrate compliance with GRIHA for Existing Building threshold of 1 tree per 80 m^2 of total site/plot area . Total number of trees on site must meet/exceed the GRIHA for Existing Buildings threshold. **– 2 points**

2.1.2 *To reduce the urban heat island effect*:

- More than 25% of the site surface visible to sky (including building roofs) are either soft paved/covered with high SRI coating (SRI >50)/shaded by trees/shaded by vegetated pergolas/shaded by solar panels or any combination of these strategies. **– 1 point**
- More than 50% of the site surface visible to sky (including building roofs) are either soft paved/covered with high SRI coating (SRI >50)/shaded by trees/shaded by vegetated pergolas/shaded by solar panels or any combination of these strategies. **– 2 points**

Non-Applicability

- If site area (excluding the building footprint)[3] is not available to the project, then 2.1.1 is not applicable
- If the sky is not visible (including building roofs) in the area available for the registered project, then 2.1.2 is non-applicable.

2.2 Compliance

2.2.1 Submit calculations to demonstrate compliance with Appraisal 2.1.1 and 2.1.2.

2.2.2 Submit site plan with area statements highlighting the existing or proposed trees, site surfaces which are soft paved/covered with high SRI coating/shaded by trees/vegetated pergolas/solar panels.

2.2.3 Upload photographs with description of the measures implemented.

[3] The difference between total site area and the building footprint is to be considered here. If this said area is not available to the project, then the Non-Applicability clause shall be applied.

MAINTENANCE & HOUSEKEEPING

SECTION INTENT

In existing buildings, facility management plays a key role in operation and maintenance of all functions in the building. This section rewards building maintenance, operations & housekeeping, the use of sustainable and environment-friendly processes and products, use of low ozone depleting (ODP) materials, and provision of waste management. This section further appraises performance monitoring and validation in facilities/organization's maintenance/ retrofitting and housekeeping manuals.

This section contains two criteria as mentioned in Table 3.

Table 3: Maintenance & housekeeping section criteria

Criterion Number	Criterion Name	Maximum Points
Criterion 3	Maintenance, Green Procurement & Waste Management	7
Criterion 4	Metering & Monitoring	10

CRITERION 3

MAINTENANCE, GREEN PROCUREMENT & WASTE MANAGEMENT

Intent

The intent of this criterion is to ensure that good practices are followed in operation & maintenance of building systems, eco-friendly and biodegradable products are used for housekeeping, energy efficient appliances are used in operations, and solid waste is managed responsibly within the project boundary.

Maximum Points: 7

3.1 Appraisal

Maintenance

3.1.1 Ensure that maintenance and housekeeping protocols are maintained and followed for electrical, HVAC, plumbing systems, and civil repair work. **– Mandatory**

3.1.2 Ensure the following:

- In case of conditioned spaces all HVAC equipment are CFC-free and all insulation used in buildings should be CFC- and HCFC-free OR phase-out plan for HCFC/CFC using equipment. **– Mandatory**
- Firefighting equipment are Halon-free **– Mandatory**

Green Procurement

3.1.3 Maintain and follow a policy of purchasing environment-friendly cleaning and pest control products for housekeeping materials with low ODP in building interiors. **– 1 point**

3.1.4 Maintain and follow a policy of purchasing appliances with at least 3-star BEE rating for all appliances under the scheme of the BEE Star Rating program. **– 1 point**

Waste Management

3.1.5 Provide infrastructure (multicoloured dustbins/ different garbage chutes) to building occupants to ensure segregation of waste at source. **– 1 point**

3.1.6 Provide dedicated, segregated and hygienic storage spaces in the project site to store different wastes before treatment /recycling. **– 1 point**

3.1.7 Provide contractual tie-ups with waste recyclers for safe recycling for recyclable wastes, like metal, paper, plastic, glass, e-waste, etc. **– 1 point**

3.1.8 Implement strategies to treat all organic (kitchen and landscape) waste on-site and to convert it into a resource (manure, biogas, etc.) and reuse. **– 2 points**

Non-applicability: If the total waste generation on site is less than 100 kg/day, then the project is exempt from Appraisal 3.1.8.

3.2 Compliance

Maintenance[4]

3.2.1 Submit proof of provision for a core facility/ service group responsible for the operation and maintenance of the building's systems.

[4] Please refer Appendix I: Maintenance and Housekeeping protocols for detail

This should be supported with the contract (mutually signed between the respective parties) document or supportive documents, verified and signed by the responsible parties).

3.2.2 Maintenance and safety protocols followed by the facility management team should cover the following systems: (if applicable)

- Electrical system: transformer, DG, HT and LT panels, motors.
- HVAC system: AHU, cooling tower, chillers and pumps, VRF, ventilation fans.
- Plumbing systems.
- Renewable energy systems.
- Sewage treatment plant and/or waste treatment plant.
- Storm water drainage and rainwater harvesting systems.
- All energy and water meters installed in the building.
- Fire alarm and / or smoke detectors.

3.2.3 Submit records and schedules of maintenance activity undertaken for all these systems in the last three months.

3.2.4 "Submit specification sheets for: (if applicable)

- HVAC and other cooling equipment in the building that are CFC-free.
- All insulation used in buildings that is CFC- and HCFC-free
- Nameplate data of firefighting systems that is Halon-free.

3.2.5 Submit phase out plan for CFC, HCFC using equipment in the building and firefighting systems using Halon, if such equipment are currently used.

Green Procurement[5]

3.2.6 Submit proof of purchase and inventory of environment-friendly housekeeping and pest control products at least for the past three months.

3.2.7 Submit verified purchasing policy documents/ contracts incorporating provisions of procurement of environment-friendly, low ODP materials and BEE star labelled appliances.[6]

Waste Management

3.2.8 Submit the solid waste management plan for the building, detailing the sizing of segregated waste storage facilities, strategy for primary and secondary collection and storage.

3.2.9 Submit site plan indicating location of various primary (multicoloured dustbins) and secondary storage facilities.

3.2.10 Submit documents highlighting tie-up with recyclers for ensuring safe disposal and recycling of recyclable wastes.

3.2.11 Submit narrative detailing specification, the type and sizing of the on-site waste treatment strategy and highlight method of reuse on site.

[5] Please refer Appendix II: Green Procurement for detail

[6] For details please refer BEE star appliances - https://www.beestarlabel.com/

CRITERION 4

METERING & MONITORING

Intent

The intent of this criterion is to promote reliable metering of energy and water consumption of the building to monitor and analyze the performance of the habitat.

Maximum Points: 10

4.1 Appraisal

4.1.1 Demonstrate compliance with the basic metering requirements as mentioned in Table 4. **– Mandatory**

Table 4: Basic metering requirements

Energy metering requirements	Water metering requirements
Ensure regular monitoring of building's energy consumption by installing digital meters at the following point sources: • Utility grid • On-site renewable energy system • Diesel generators, gas generator sets, etc.	Ensure regular monitoring of building's water consumption by installing digital meters at the following point sources: • Municipal supply • Bore well • Tanker water • STP Inlet and Outlet Additionally, quality of water used for various purposes shall conform to relevant national standards (BIS/CPCB). Water quality should be tested at least quarterly.

4.1.2 Advanced metering requirements[7] as mentioned in Table 5. **– 3 points**

Table 5: Advanced metering requirements

Energy metering requirements	Water metering requirements	Comfort & Air Quality
Sub-meters at the following point sources: **Commercial buildings:** • HVAC plant, AHU, cooling tower and chillers (BTU meters) • Lighting (indoor and outdoor) • Each commercial tenant • Water pumping **Residential buildings**: • Basement parking lighting, community/ recreation centre • Water pumping • Each apartment • Common areas lighting	Sub-meters at the following point sources: • Irrigation • Cooling towers • Fresh water and waste water consumption at each building level • Captured rainwater	Ensure regular monitoring and open display of the following metrics of indoor air: • Air temperature • Relative humidity • CO_2 levels (ppm) Install sensors in basement and/or closed parking areas, and regularly occupied spaces.

[7] In Appraisal 4.1.2; 1 point shall be awarded for showing compliance in each category.

4.1.3 Install one-way communicable[8] smart meters[9] and monitoring system capable of: **– 3 points**

- Tracking consumption of energy/water through a web-hosted portal.
- Hourly data reporting in near-real time.
- Tracking consumption patterns.
- Setting consumption targets and alarms.
- Comparing historical and benchmark data.
- Real-time monitoring with user interface which can operate on mobile devices.

4.1.4 Provide two-way communication for consumers and connect to GRIHA IT platform to allow for communication on the following: **– 4 points**

- Monthly energy consumption and water consumption.
- Average energy and water consumption for display to building occupants to assess building energy and water efficiency.

4.2 Compliance

4.2.1 Submit drawings indicating the location of various meters in the building.

4.2.2 Submit photograph of each meter installed in the building.

4.2.3 Submit technical specification sheets and purchase orders/ actual photograph of the smart metering system installed in the building.

4.2.4 Submit latest water quality testing report of all applicable water sources, conducted by an NABL accredited laboratory or any other government approved laboratory.

[8] Project teams may opt for two-way communicable meters.

[9] Smart meter must have provision for below mentioned parameters –

- All new energy meters installed should be of at least class 1 with Class 1 CTs/PTs, and should have an active RS-485 port, with industry standard Modbus protocol with publicly available register maps.
- All new water/BTU meters should have an RS485/RS232 port with publicly available/industry standard protocol (Modbus, etc.) and register maps.
- All meters/CT should be calibrated by an authorized certified auditor at least 2 years.
- The metering and monitoring hardware and software should support comply with the relevant requirements of IS/ ISO50001, "Energy Management Systems-Requirements with Guidance for Use".

ENERGY

SECTION INTENT

Building efficiency is key to cutting energy consumption. Improving energy performance in existing buildings has been receiving significant attention recently, which entails reducing energy demand for building operations, without affecting the health and comfort of its occupants. This approach requires strategies beyond mere technical advancements. Efficiency measures, such as building retrofitting, represent a vast opportunity to improve energy efficiency. In some ways, they denote a "missed opportunity" for savings – bypassed design and construction decisions that could have led to large reductions in energy use and carbon emissions over the life cycle of the building. The challenge for existing building efficiency is to "unlock" that vast potential and realize the benefits of a built environment that is comfortable, efficient, and cost-effective.

The section rewards the effectiveness of energy efficiency measures and use of renewable energy from a holistic perspective. Auditing and retrofitting are important and the rating processes through these tools encourage the habitat to adopt energy efficiency measures (EEMs).

This section contains two criteria as mentioned in Table 6.

Table 6: Energy section criteria

Criterion Number	Criterion Name	Maximum Points
Criterion 5	Energy Efficiency	20
Criterion 6	Renewable Energy Utilization	15

CRITERION 5

ENERGY EFFICIENCY

Intent

The intent of this criterion is to enable the project to reduce their energy consumption by adoption of energy efficient strategies.

Maximum Points: 20

5.1 Appraisal

5.1.1 Provide building energy consumption information as per compliance 5.2.1. **– Mandatory**

5.1.2 Implementation of operation and maintenance no cost EEMs'[10] **– 5 points**

5.1.3 Demonstrate percentage reduction in energy consumption over the base case as mentioned in Table 7. **– 15 points**

- % Reduction in energy consumption = $\frac{(A-B)}{A} \times 100$

where

- A = Base case energy consumption[11] (kWh/year)
- B = Existing case energy consumption[12] (kWh/year)

Table 7: Percentage reduction in energy consumption

% Reduction in energy consumption residential buildings	% Reduction in energy consumption for non–residential and commercial buildings	Points
3	4	2
6	8	5
9	12	8
12	16	11
15	20	15

Non-Applicability: Projects which have operational[13] data of less than 3 years are required to conduct an energy audit by a BEE certified auditor and submit an energy audit report. In the submitted report, if all the saving opportunities (EEM's) have a payback of more than 5 years, then maximum points shall be awarded in Appraisals 5.1.2 and 5.1.3, provided all EEMs with a payback of less than 5 years are implemented.

5.2 Compliance

5.2.1 Submit following details of building system and energy consumption -

- Energy consumption from all major sources (utility/grid electricity bill, diesel, gas, RE generation, etc., atleast 12 months, whichever is applicable)

[10] No cost EEMs relate to preventive maintenance.

[11] Base case energy consumption is the average consumption of 2 consecutive years immediately before implementation of EEMs.

[12] Existing case energy consumption is the energy consumption of latest 12 month energy consumption data post implementation of EEMs.

[13] Operation of building shall be considered from the occupancy certificate issued.

- Area distribution i.e. defining conditioned and unconditioned area (areas are to be demarcated on building plans)
- Building operation schedule
- Building occupancy (full-time employees, part-time and visitors)
- Inventory of connected load (all system including HVAC, internal lighting, external lighting, pumping load, equipment, and miscellaneous load)
- As built mechanical and electrical floor plans
- In case of conditioned spaces, submit as built single line drawing of low side, high side HVAC system and electrical loads along with set points for all seasons
- As built drawing (all architectural floor plans, elevations, and sections)

5.2.2 Provide detailed narrative of implemented EEMs' within the last 5 years

5.2.3 Provide the base case and existing case energy consumption calculation along with monthly energy bills for both base case and existing case.

CRITERION 6

RENEWABLE ENERGY UTILIZATION

Intent

The intent of this criterion is to promote the use of renewable energy technologies and enable energy generation on site.

Maximum Points: 15

6.1 Appraisal

Project can demonstrate compliance with either of the two alternatives.

6.1.1 Alternative I: On-site/On-site & off-site combination of renewable energy system installation to offset a part of the annual total energy consumption.[14]

Points will be awarded as mentioned in Table 8 :

Table 8: Percentage of on-site/on-site and offsite generation of energy from renewable energy source

Percentage offset for daytime occupied commercial buildings	Percentage offset for residential buildings	Percentage offset for 24 × 7 occupied commercial buildings	Points
2.5% (only On-site)	-	0.5% (only On-site)	Mandatory
5%	5%	1%	3
10%	10%	3%	5
15%	15%	5%	7
20%	20%	7%	10
25%	25%	10%	15

[14] Total energy consumption from all major sources (utility/grid electricity bill, diesel, gas, coal, etc.)

6.1.2 Alternative II: Off-site renewable energy system to offset a part of total energy consumption.

Points will be awarded as mentioned in Table 9:

Table 9: Percentage of off-site generation of energy from renewable energy sources

Percentage offset of energy consumption	Points
10%	Mandatory
20%	3
40%	5
60%	7
80%	10
100%	15

6.2 Compliances

6.2.1 Provide RE system commissioning report along with photographs and generation certificate/ performance guarantee from vendor.

6.2.2 Submit documents to demonstrate off-site generation of energy through renewable energy systems. These may either be Renewable Energy Certificates (RECs) for at least 2 years or a Power Purchase Agreement from the utility for purchase of green power. Kindly note that the address of the site must be mentioned in the agreement (if applicable).

6.2.3 Submit drawings in CAD format demarcating the location of renewable energy system.

6.2.4 Submit calculations / simulations reports for renewable energy system sizing & annual energy generation potential at the proposed location.

WATER EFFICIENCY

SECTION INTENT

In an existing building, water efficiency becomes one of the most critical criteria for assessment. This section rewards reduction in the consumption of potable water supplied by municipal local body through integration of improved technologies and practices. It further focusses on implementation of no/low cost water conservation measures and recycling and reuse of water for overall improvement in the water performance.

When a building's structural retrofitting is considered with respect to water efficiency, integrative options like dual plumbing, low flow fixtures, on-site sewage treatment, rain water harvesting, and so on, are likely to be considered, however, they are cost effective in the long run. Thus, the adopted water conservation measures would be rewarded and its execution would be duly considered under building/project's sustainability.

This section contains two criteria as mentioned in Table 10.

Table 10: Water efficiency section criteria

Criterion Number	Criterion Name	Maximum Points
Criterion 7	Water Footprint	15
Criterion 8	Reduction in Cumulative Water Performance	10

CRITERION 7

WATER FOOTPRINT

Intent

The criterion intent is to estimate water consumption under different applications and to identify potential areas to optimize water consumption in the project boundary.

Maximum Points: 15

7.1 Appraisal

7.1.1 Detailed water audit report clearly demonstrating the water supply and usage study, process and system audit, and discharge analysis. **– Mandatory**

7.1.2 Reduction in building water consumption by 30% below the base case through water efficient fixtures. Refer Tables 20, & 21 and Appendix 3 for flow values of water fixtures to create base case.[15] **– 3 points**

Methodology for calculating water consumption and water use reduction is as follows:

Water consumption (lpd) = N×FR×U

where,

- N = Total occupants
- FR = Flow rate of each type of fixtures
- U = Number of uses of each type of fixtures fixed

$$\text{Water use reduction (\%)} = \frac{(A-B)}{A} \times 100$$

where,

- A = Annual building water consumption through water fixture- Base case (liters/year)
- B = Annual building water consumption through water fixture- Existing case (liters/year)

Non-applicability

All faucets, which are installed in spaces with water head heights less than 5 meter or 17 feet, in gravity fed systems, are exempt from calculations in the appraisal 7.1.2.

Reducing landscape water demand

7.1.3 Minimizing lawn area and restricting it to 25% of the total landscaped area.[16] **– 2 points**

7.1.4 Use of water-efficient irrigation systems to reduce the water requirement by at least 50% from the GRIHA base case.[17] **– 2 points**

Methodology for calculating landscape water requirement and reduction is as follows:

Landscape water requirement (lpd)=

$$\frac{\text{(Plant factor} \times \text{Evapotranspiration rate (mpd)} \times \text{Canopy area (sq.m))}}{\text{Irrigation system efficiency}} \times 1000$$

where,

- Plant factor refers to water requirement of the plants.

[15] Base case is applicable for those buildings, in which already water efficient fixtures/fittings have been installed. For buildings with conventional fixtures, base case would be the actual flow rate monitored on site.

[16] Base case would be 100% lawn area, whereas design case would be as done on site.

[17] Further in base case, the irrigation of the landscape area would be considered to be done manually and hence the efficiency would be 45%.

- Evapotranspiration rate refers to the amount of water required by the plant for healthy growth and determines the rate at which the plant loses water through evaporation.
- Canopy area refers to the area covered by shrubs, grass covers, and trees in the plan view.
- Irrigation system efficiency refers to the ability of an irrigation system to deliver water to plants without any water loss.

Landscape water use reduction (%) =

$$\frac{(A-B)}{A} \times 100$$

where,

A = Annual landscape water demand of base case

B = Annual landscape water demand of existing case

7.1.5 Provision of on-site sewage water treatment system:

- 100 % of grey[18] water treatment on site **– 2 points**
- Treatment of sewage[19] water (grey water and black[20] water combined) to meet 100% of non-potable water requirement **– 4 points**

Non-applicability: If the total waste water generated on site is less than 10 kLD, then the project is exempt from appraisal 7.1.5.

7.1.6 Provision of rainwater harvesting system:

- Only roof rainwater harvesting **– 2 points**
- 100% of catchment area **– 4 points**

7.2 Compliance

7.2.1 Submit detailed water balance of the project boundary clearly demonstrating water footprint[21] in the project boundary.

7.2.2 Submit narrative demonstrating adoption of water-saving measures

7.2.3 Submit landscape layout showing plantation of native species (list of plantation) and calculation demonstrating restricted lawn area.

7.2.4 Submit calculation sheet demonstrating required percentage savings through water-efficient fixtures.

7.2.5 Provide purchase orders of water fixtures / fittings.

7.2.6 Manufactures cut-sheet, purchase order reflecting full quantities of the irrigation system installed on site, on-site data monitoring (for old systems) through videos and photographs to indicate the efficiency of the system and date stamped photographs.

7.2.7 Submit as built drawing of building layout/floors layout showing location of water fixtures/fittings.

7.2.8 Submit document showing inventory of water fixtures/fitting (make, model no, flow rates, etc.) along with photographs.

7.2.9 Submit design basis report, technical specification sheet, and layout of sewage treatment plant and rainwater harvesting systems along with photographs.

7.2.10 Layout and sectional details of the filtration system of the rain water recharge pits, along with the date stamped photographs.

[18] Grey Water - Water that has already been used for bathing, washing, laundry, dishwashing etc. but does not contain excreta.

[19] Sewage water - liquid waste and wastewater generated and carried in sewers.

[20] Black Water - Combined domestic effluent including liquid and solid human body waste and the water discharged from the toilet usage.

[21] Please refer Appendix III: Water Efficiency for details.

CRITERION 8

REDUCTION IN CUMULATIVE WATER PERFORMANCE

Intent

The criterion intent is to promote water reuse and recycling to meet non-portable water use requirement and to reduce overall water demand from the local municipal supply/ground water.

Maximum Points: 10

8.1 Appraisal

8.1.1 Cumulative water performance (WP) reduces to 20% of total water use. **– 2 points**

8.1.2 Cumulative WP reduces to 30% of total water use. **– 3 points**

8.1.3 Cumulative WP reduces to 50% of total water use. **– 6 points**

8.1.4 Cumulative WP reduces to 70% of total water use. **– 10 points**

Cumulative water performance

$$\frac{\text{Annual water demand of the municipal or ground water}}{\text{Annual water demand of the project}} \times 100$$

where,

Annual fresh water demand (liters/year)= (Annual water demand of the project) – (Annual water recycled & reused)

Annual water demand liters/year of the project includes the water requirement of the following:

- Planned and floating population,
- Landscape, and
- Services like HVAC, fire-fighting, and so on.

8.2 Compliance

8.2.1 Calculation demonstrating percentage reduction in cumulative WP.

HUMAN HEALTH & COMFORT

SECTION INTENT

This section focusses on improving human health & comfort in terms of thermal, visual, and acoustic comfort of the building occupants. Good indoor air quality (IAQ) and quantity is an additional consideration which is evaluated with respect to established indicators.

This section contains two criteria, as mentioned in Table 11.

Table 11: Human health and comfort section criteria

Criterion Number	Criterion Name	Maximum Points
Criterion 9	Achieving Indoor Comfort Requirements (thermal, visual, and acoustic)	8
Criterion 10	Maintaining Good IAQ	4

CRITERION 9

ACHIEVING INDOOR COMFORT REQUIREMENTS (THERMAL, VISUAL, AND ACOUSTIC)

Intent

The intent of this criterion is to ensure that interior spaces of the building meet thermal, visual, and acoustical comfort as compared to benchmark for building occupants.

Maximum Points: 8

9.1 Appraisal

9.1.1 Demonstrate that project can achieve thermal comfort requirements of NBC 2005 or ASHRAE 55 or requirement of Indian Adaptive Comfort Model.[22] **– 2 points**

9.1.2 Demonstrate following –

Artificial lighting Lux level to fall within limits (lower and higher range limits), space/task specific lighting levels as per NBC 2005.

- 2 points

Daylight Factor (DF) of at least 25% of all living area should meet the adequate levels as prescribed in SP 41. **– 2 points**

9.1.3 The indoor noise levels should be within the acceptable limits as specified in NBC 2005 and key noise source on site (such as, diesel genset, chiller plant, etc.) should have sufficient acoustic insulation as per NBC 2005 norms. **– 2 points**

9.2 Compliance

9.2.1 To comply with Appraisal 9.1.1, submit the following details:

- The hourly temperature and relative humidity profile of the building areas for at least one day. Readings should be taken for at least 80% of all representative spaces of the building.
- Space-wise temperature and RH schedule to be maintained for all seasons (summer, winter, and monsoon).

9.2.2 To comply with Appraisal 9.1.2, submit the following details:

- Submit the Lux reading taken at working plane level for all regularly occupied spaces.[23]
- Submit the daylight simulation reports demonstrating that at least 25% of all living areas should meet the adequate levels of daylight factors as prescribed in SP 41.

9.2.3 To comply with Appraisal 9.1.3, submit the following details:

- A third-party noise audit report on the measured average indoor noise level at

[22] Please refer Appendix IV: Indian Adaptive Comfort Model Source: CEPT University for details

[23] Artificial light does not include decorative lights

[24] Please refer Appendix V: Human Health and Comfort Survey Form

regularly occupied locations inside the building.

- A narrative listing all the measures adopted to meet indoor noise levels of NBC 2005 and to limit noise from noise-generating sources mentioned.

9.2.4 Conduct an occupant comfort survey within three months prior to submission of documents. The occupant comfort survey report[24] must demonstrate that 80% of the building occupants are satisfied with thermal, visual, and indoor noise levels.

CRITERION 10

MAINTAINING GOOD IAQ

Intent

The objective of this criterion is to ensure good indoor air quality and quantity (IAQ) for all occupants inside the building.

Maximum Points: 4

10.1 Appraisal

10.1.1 Smoking must be banned/ prohibited within the building premises. In case smoking is allowed, the air from the smoking area must be isolated to prevent recirculation of tobacco smoke-containing air to non-smoking areas. **– Mandatory**

10.1.2 Meet the minimum requirements of -

- CPCB National Ambient Air Quality Standard (NAAQS) for quality of fresh air.[25] **– 2 points**
- ASHRAE Standard 62.1–2010, Ventilation for Acceptable Indoor Air Quality or a NBC-2005 for quantity of fresh air. **– 2 points**

Non-applicability: Appraisal 10.1.2 is not applicable for non-AC spaces / residential spaces with operable windows.

10.2 Compliances

10.2.1 Submit the no-smoking policy along with the photographs of no-smoking signage along with penalty clauses, if applicable.

10.2.2 Company policy for ban/prohibition on smoking within the building premise, if applicable, with the supporting documents verified and signed by facility manager/ building owner.

10.2.3 The building floor plan or interior layout signed by facility manager/owner, demonstrating the internal planning for smoke control by demarcating a designated smoking zone on the building premises separated from non-smoking areas by full height impermeable internal partitions.

10.2.4 For a conditioned space, clearly demonstrate with the help of as built ducting drawing that

- Designated smoking area is independent of the non-smoking areas in the building.
- Smoking zone air is exhausted directly to the outdoor such that there is no recirculation of the tobacco smoke air to non-smoking spaces of the building. Smoking spaces are operated on separate ventilation systems, with higher ventilation rate than the non-smoking area and is designed for 60 cfm per person.
- Smoking spaces must operate at negative pressure in comparison to surrounding non-smoking spaces.

10.2.5 Submit the test report highlighting fresh air quality from a NABL-accredited laboratory.

10.2.6 Submit documentation detailing the specifications of the filtration system in case of air conditioned space.

10.2.7 Submit as built drawings of HVAC floor plans.

[25] The clause shall cover treatment of outdoor air for PM 10, PM 2.5 and CO_2.

10.2.8 Submit space by space calculation for all regular occupied spaces highlighting provision of sufficient fresh air in the HVAC system design, as per the ASHRAE 62.1 or NBC 2005 norms.

10.2.9 Submit the occupant comfort survey report[26] conducted within three months prior to submission to demonstrate that 80% of the building occupants are satisfied with the IAQ.

[26] Please refer Appendix V: Human Health And Comfort Survey form.

SOCIAL ASPECTS

SECTION INTENT

This section focusses on promoting barrier-free accessibility for elderly and differently-abled persons. This section further focusses on increasing environmental awareness among the users and visitors of the building.
This section comprises one criterion, as mentioned in Table 12.

Table 12: Social aspects section criterion

Criterion Number	Criterion Name	Maximum Points
Criterion 11	Universal Accessibility & Environmental Awareness	5

CRITERION 11

UNIVERSAL ACCESSIBILITY & ENVIRONMENTAL AWARENESS

Intent

The intent of this criterion is to make the project accessible for persons who are elderly and differently-abled and to increase environmental awareness amongst the building users and visitors.

Maximum Points: 5

11.1 Appraisal

Universal Accessibility

11.1.1 Provide facilities as per Harmonised Guidelines[27] and space standards for barrier-free built environment for the differently-abled person and elderly people for following minimum requirement in residential and public buildings. **– 2 points**

- Provision of ramp at the entrance.
- Parking (preferred parking near entrance, parking specifications for persons with special needs to be addressed).
- Toilet for persons with special needs.

Environmental awareness

11.1.2 Adopt any three measures from the list below to increase environmental awareness among users and visitors: **– 3 points**

- Innovative display on 'Environmental concerns and possible solutions at individual level' in common area/lobby or any other relevant location where the footfall would be maximum.
- Local outreach through posters, brochures, newspapers, and social media.
- Short tours may be organized within the facility to highlight the green initiatives taken by the project proponent. This may also be supplemented with a small video presentation focussing on sustainable measures taken in the building design to save energy and water.
- Awareness programmes for occupants/ and O & M staff.
- Adopt innovative strategies such as labelling the lines highlighting the water source. For example, this water line uses rainwater harvested from the roof.
- A label for native species or aromatic herbs, which would raise awareness towards low maintenance and low water-consuming native species as compared to high maintenance exotic species.

11.2 Compliance

11.2.1 Provide narrative and supporting photographs for demonstrating adherence to Harmonised Guidelines.

11.2.2 Submit a narrative along with photographs to highlight the implemented measures for increasing environmental awareness among building occupants and visitors.

[27] Please refer 'Harmonised Guidelines and Space Standards for Barrier-Free Built Environment for persons with Disability and Elderly Persons.

BONUS POINTS

SECTION INTENT

The section intent is to reward additional measures adopted by the project that have not been covered in the previous section but can significantly improve the sustainability quotient of the project.

This section contains one criterion, as mentioned in Table 13.

Table 13: Bonus points section criteria

Criterion Number	Criterion Name	Maximum Points
Criterion 12	Bonus Points	4

CRITERION 12

BONUS POINTS

Intent

The intent of this criterion is to promote adoption and implementation of innovative strategies in improving sustainability of the project.

Maximum Points: 4

12.1 Appraisal

12.1.1 The project can adopt a maximum of two strategies. Each strategy carries 2 points.
– **4 Points**

Examples of strategies project can choose to demonstrate the compliance are

- Net zero water discharge
- Net positive energy/net zero energy—generation of energy from renewable energy sources on-site
- Previously GRIHA certified project
- Urban farming
- Any other strategy that is not covered in the previous section but can significantly improve the sustainability of the project.

12.2 Compliance

12.2.1 Submit supporting documents for each bonus strategy highlighting measurable impact along with supporting photographs.

APPENDIX 1

MAINTENANCE AND HOUSEKEEPING PROTOCOLS

1. Checklist of maintenance protocols

Table 14: Maintenance protocol checklist

Sl. No.	Type of system	Check	Remarks
1.	**Electrical system**		
a)	Transformers		
b)	Diesel generator sets		
c)	HT, LT panels		
d)	Motors		
2.	**Mechanical system**		
a)	AHU		
b)	Cooling tower		
c)	Chillers		
d)	Pumps		
e)	VRF		
f)	Ventilation fans		
g)	Ducting		
3.	**Plumbing system**		
a)	Piping		
b)	Fixtures and fittings		
c)	Fire safety pumps		
d)	Sprinklers		
4.	**Metering and sensors**		
a)	Energy meters		
b)	Water meters		
c)	Air quality meters		
5.	**Renewable energy systems**		
a)	Solar PV		
b)	Solar thermal		
c)	Wind turbines		

d)	Bio-gasifiers		
e)	Any other as per MNRE guidelines		
6.	**Sewage treatment plant**		
7.	**Waste treatment plant**		
8.	**Storm water drainage system**		
9.	**Rainwater harvesting system**		

2. Maintenance manuals followed by the facility management staff should at least contain the following:

- Provision for inspection and regular maintenance as per respective systems' schedules
- Corrective measures to be implemented according to the periodic inspection report
- Records tracking the periodic inspection and maintenance
- Provision for training core facility/service group

3. Checklist of green housekeeping products

Table 15: Checklist for green housekeeping products

Sl. No.	Type of Product	Check	Remarks
1.	Low-VOC interior paints		
2.	Low-VOC adhesives		
3.	Low-VOC sealants		

3.1 Limits for low-VOC content in interior paints

Table 16: Allowable limit for VOC content in interior paints

Paint applications	VOC limits (grams of VOC per litre)	
Interior coatings	Flat	<50
	Non-flat	<150
Exterior coatings	Flat	<200
	Non-flat	<100
Anti-corrosive	Gross/semi-gloss/flat	<250

3.2 Limits for low-VOC content in adhesives in interior applications

Table 17: Allowable limit for VOC content in adhesives

Architectural adhesive application	VOC content limit (grams of VOC / litre)
Wood flooring	100
Industrial / rubber flooring	60
Ceramic tile	65
Structural glazing	100
Multi–purpose construction	70
Sub- floor	50
Wall boards/panel	50
PVC welding	285
Adhesive primer for plastic	250
Structural wood member	140
Sub-specific use metal to metal	30
Wood	30
Fiber glass	80
Plastic foam/porous materials (except wood)	50

3.3 Limits for low-VOC content in interior sealants

Table 18: Allowable limit for VOC content in sealant

Sealant Application	VOC content limit (grams of VOC / litre)
Architectural/roadways	250
Single–ply roof material installation/repair	450
Other	420
Sealant primer application architectural non-porous	250
Sealant primer applications architectural porous	775
Other sealant primer applications architectural	750

APPENDIX 2

GREEN PROCUREMENT

1. The BEE Star Rating programme for appliances covers the following:

Mandatory scheme

- Frost-free refrigerators
- Direct cool refrigerators
- Tubular Fluorescent lights
- Room air conditioners
- Distribution transformers
- Electric geysers
- Colour televisions

Voluntary scheme

- Induction motors
- Agricultural pumpsets
- Ceiling fans
- Domestic LPG stoves
- Washing machines
- Computers (Notebook/Laptops)
- Lighting ballasts
- Office equipment (Printers, Copiers, Scanners, MFDs)
- Diesel engine-driven moonset pumps for agricultural purposes
- Solid state inverters
- Diesel generators
- Variable capacity ACs
- LED lamps

2. Low environmental impact materials in building interiors should include low-VOC sealants, adhesives, and paints. Materials used in the building interiors (as listed below) should have a low environmental impact. Additionally, materials used in building interiors shall have a low environmental impact:

- False ceilings
- Internal partitions
- Panelling
- Built-in furniture
- Flooring
- Internal door and window panels and frames

When existing interior materials fall in the above mentioned categories requiring a replacement, they should be replaced with low-environmental impact materials. The following materials will be accepted as low-environmental impact:

- Stones from the same state as the project or a neighbouring state
- Composite wood-based products
- FSC Chain of Custody certified products
- Manufactured products with at least 5% recycled content
- Products with EPD (cradle to gate) analysed and published as per ISO 21930
- Products with water footprint (cradle to gate) analysed and published as per ISO 14046.

APPENDIX 3

WATER EFFICIENCY

Water Audit Sample Format

Please tick (√) the correct answers and provide description/attach extra sheet where required.

Table 19: Water audit sample format

Water System			
A	**Water Supply**		
1	Source of water	:	☐ Municipal ☐ Ground water ☐ Any other
	Please specify, in case of any other source of water	:	
	Average daily water requirement (kl/d)	:	
2	Whether water balance diagram (WBD) is available	:	☐ Yes ☐ No
	if yes, then provide copy of the WBD	:	
3	Whether water bills (for last 1 year) are available	:	☐ Yes ☐ No
	if yes, then provide copy of the water bills	:	
4	Whether on-site water treatment plant is provided	:	☐ Yes ☐ No
	If yes, then provide the following details:	:	
	• Capacity	:	
	• Copy of water quality analysis report (if available)	:	
5	Whether water meters are installed	:	☐ Yes ☐ No
	If yes, then provide following details:	:	
	• Nos.	:	
	• Layout showing location of all water meters and sub meters	:	
6	Whether water efficient/low flow faucets and fixtures are installed:	:	☐ Yes ☐ No

	If yes, then provide the following details:	:	Nos.	Make	Flow Rate
	Shower	:			
	Faucets/Water taps (with/without aerators arrangement)	:			
	Urinals (waterless/sensor-based)	:			
	Water closets (single flush/dual flush)	:			
	Other	:			
7	Whether plumbing layout/drawing is available	:	☐ Yes ☐ No		
	If yes, then provide copy of plumbing layout	:			
B	**Sewerage system**				
1	Method of disposal of wastewater	:	☐ Into municipal drain ☐ On-site treatment		
	In case of on-site treatment provide the following details:	:			
	• Capacity of sewage treatment plant	:			
	• Technology	:			
	• Operating hours of the plant	:			
	• Copy of quality check report (if available)	:			
2	Water reuse application (if any)	:	☐ For flushing ☐ For landscaping ☐ For chillers ☐ Any other		
	Quantum of treated water used for different application (in litres)	:			
C	**Rainwater harvesting (RWH)**				
1	Method of RWH	:	☐ Storage ☐ Recharge		
	In case of storage provide the following details:	:			
	• For which application, stored water is used	:			
	• Size of storage tank	:			
	• Number of storage tanks	:			
	In case of recharge provide following:	:			
	• Number of recharge structures	:			
	• Size of recharge structures	:			
	• Is de-silting chamber provided prior to recharge structure	:	☐ Yes ☐ No		
	• If yes, then provide size details of de-silting chamber	:			
2	Is RWH system drawing available	:	☐ Yes ☐ No		
	If yes, then provide copy of RWH system drawing	:			

2. Water fixture flow values for base case

Table 20: For residential buildings

Fixture / Fitting	Flow rate
Water closets (solids)	9 lpm
Kitchen faucets	10 lpm
Water closets (liquid) (female)	9 lpm
Conventional urinals (male)	4 lpm
Showers	10 lpm
Lavatory faucets	10 lpm

Table 21: For commercial buildings

Fixture / Fitting	Flow rate
Water closets (solids)	9 lpm
Kitchen faucets	10 lpm
Conventional urinals (female)	4 lpm
Conventional urinals (male)	4 lpm
Showers	10 lpm
Lavatory faucets	10 lpm

APPENDIX 4

INDIAN ADAPTIVE COMFORT MODEL SOURCE: CEPT UNIVERSITY

1. Design of Indoor Conditions as per Adaptive Thermal Comfort Model:

Standard based on an adaptive thermal comfort model can play a major role in reducing energy use whilst maintaining the comfort, productivity, and well-being of occupants. This approach recognizes that people's thermal comfort needs depend on their past and present context and that these needs vary with the outdoor environmental conditions of their location. People living year-round in air-conditioned spaces are likely to develop high expectations for homogeneity and cool temperatures, and may become quite critical if thermal conditions deviate from the centre of the comfort zone they have come to expect. In contrast, people who live or work in naturally ventilated buildings, where they are able to control their immediate interior spaces, get accustomed to variable indoor thermal conditions that reflect local patterns of daily and seasonal climate changes. Their thermal perceptions, preferences as well as tolerances are likely to extend over a wider range of temperatures. It allows buildings to operate within broader temperature bands. The specification of a broader comfort band suited to the Indian context has the potential to reduce the use of energy-intensive space cooling for Indian buildings.

This theory deals with adaptive thermal comfort model which differentiate the thermal response of occupants in air conditioned and naturally ventilated buildings. It is imperative to specify indoor comfort conditions separately depending upon operation of the building— air conditioned buildings as well as naturally ventilated buildings.

Operative temperature is more suitable index to measure thermal comfort in the building having low indoor air velocities, since the index also accounts for impact of building surface temperatures (radiant temperatures) on human comfort. Indoor operative temperature, for sedentary activities, can be approximated as an arithmetic mean of indoor air and radiant temperatures. For operating air conditioning system based on operative temperature, the prevalent conditions along with the historical outdoor trend can be used to derive suitable operative temperature limits. Statistically analysed typical climatic conditions of various Indian locations are in the public domain.

In case of buildings having higher indoor air velocity (more than 0.5 m/s), an effective temperature-based approach is recommended since in addition to all factors considered in operative temperature, it also takes into account heat dissipation from human body through convective heat transfer. High air velocity can give opportunity of keeping higher air temperature without compromising thermal comfort. However, it is also suggested to keep under consideration noise and other effects of high indoor air velocity. For reference comfort conditions range was derived as per adaptive model for Indian cities. These are indicative simplified values using weather files. More accurate design conditions can be derived using the equations discussed ahead.

a) For naturally ventilated (NV) buildings

The following equation should be used for design and operation of naturally ventilated (NV) buildings. It indicates that occupants in NV buildings thermally adapt to the outdoor temperature of their location. It is based on the 30-day outdoor running mean.[28]

Equation:

Indoor Operative Temp. (˚C) = 0.54 * outdoor temp. + 12.83

Where indoor operative temperature (˚C) is neutral temperature and outdoor temperature is the 30-day outdoor running mean air temperature (˚C)

The 90 per cent acceptability range for the India-specific adaptive models for naturally ventilated buildings is ±2.38˚C.

b) For mixed-mode (MM) buildings

Mixed-mode buildings, where HVAC is operated only during extreme outdoor conditions, are becoming prevalent in India. The occupants in mixed-mode buildings are more adaptive when compared to those in AC buildings and somewhat less adaptive compared to occupants in NV buildings.

Equation:

Indoor Operative Temp. (˚C) = 0.28 * outdoor temp. + 17.87

Where indoor operative temperature (˚C) is neutral temperature and outdoor temperature is the 30-day outdoor running mean air temperature (˚C)

The 90 per cent acceptability range for the India-specific adaptive models for mixed-mode buildings is ±3.46˚C.

c) For air conditioned (AC) buildings[29]

Studies show that static Predictive Mean Vote (PMV) model over-predicts the sensation on the warmer side of the 7-point sensation scale in AC buildings. One of the two methods should be adopted while determining indoor conditions of fully air-conditioned buildings. This is based on air temperature or based on Standard Effective Temperature (SET) which includes effect of body surface area, RH Air Velocity (Va) Air Temperature (Ta), Radiant Temperature (Tr), Outdoor Temperature (Tout), Clothing Insulation (Clo), and activity rate (MET).

- Air temperature-based approach:

Equation:

Indoor Operative Temperature (˚C): = 0.078 * outdoor temp. + 23.25

Where indoor operative temperature (˚C) is neutral temperature and outdoor temperature is the 30-day outdoor running mean air temperature (˚C)

The 90 per cent acceptability range for the adaptive models for conditioned buildings is ±1.5˚C.

- Standard effective temperature-based approach:

Equation:

Indoor Operative Temperature (˚C): = 0.014 * outdoor temp. + 24.53

Where indoor operative temperature (˚C) is neutral temperature and outdoor temperature is the 30-day outdoor running mean air temperature (˚C)

The 90% acceptability range for the adaptive models for conditioned buildings is ±1.0˚C.

Above equations are not applicable for outdoor running mean temperatures below 15(˚C)

NV = Naturally ventilated buildings

MM = Mixed-mode buildings

AC. air tem = Air temperature-based approach

AC. std. eftv = Standard effective temperature-based approach

28 NOTE: To calculate the 30-day outdoor running mean air temperature for a given day 'n', the first step is to identify the maximum and minimum temperature of 30 days preceding 'n', that is day 'n-1' (the day before the current day) to day 'n-30'. The daily mean temperature for these 30 days is calculated. The daily mean is the arithmetical mean of the daily maximum and minimum temperature. 30-day outdoor running mean air temperature is the arithmetical mean of the daily mean temperatures of the last 30 days

29 Analysis of AC buildings done by MNIT, Jaipur

Table 22: Indian adaptive comfort temperature range for different cities of India

	City	Ahmedabad				Amritsar			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	26.3	27.1	26.4	25.8	22.4	25.1	25.8	25.7
	Min. Temp in °C	21.5	20.2	23.4	23.8	17.6	18.1	22.8	23.7
February	Max. Temp in °C	26.5	27.2	26.4	25.8	22.5	25.1	25.8	25.7
	Min. Temp in °C	21.7	20.2	23.4	23.8	17.8	18.1	22.8	23.7
March	Max. Temp in °C	28.6	28.3	26.7	25.9	24.5	26.2	26.1	25.8
	Min. Temp in °C	23.8	21.3	23.7	23.9	19.8	19.2	23.1	23.8
April	Max. Temp in °C	31.3	29.7	27.1	25.9	27.6	27.8	26.5	25.9
	Min. Temp in °C	26.5	22.7	24.1	23.9	22.9	20.9	23.5	23.9
May	Max. Temp in °C	33.2	30.7	27.4	26	30.3	29.2	26.9	25.9
	Min. Temp in °C	28.5	23.8	24.4	24	25.6	22.3	23.9	23.9
June	Max. Temp in °C	33.7	30.9	27.4	26	31.9	30	27.2	26
	Min. Temp in °C	28.9	24	24.4	24	27.2	23.1	24.2	24
July	Max. Temp in °C	32.1	30.1	27.2	26	32	30.1	27.2	26
	Min. Temp in °C	27.4	23.2	24.2	24	27.3	23.1	24.2	24
August	Max. Temp in °C	30.7	29.4	27	25.9	31.4	29.7	27.1	26
	Min. Temp in °C	25.9	22.4	24	23.9	26.7	22.8	24.1	24
September	Max. Temp in °C	30.8	29.4	27	25.9	30.9	29.4	27	25.9
	Min. Temp in °C	26	22.5	24	23.9	26.1	22.5	24	23.9
October	Max. Temp in °C	31.4	29.7	27.1	26	29.4	28.7	26.8	25.9
	Min. Temp in °C	26.7	22.8	24.1	24	24.6	21.8	23.8	23.9
November	Max. Temp in °C	30.1	29.1	26.9	25.9	26.7	27.3	26.4	25.8
	Min. Temp in °C	25.4	22.2	23.9	23.9	21.9	20.4	23.4	23.8
December	Max. Temp in °C	28.1	28	26.6	25.9	24	25.9	26	25.8
	Min. Temp in °C	23.4	21.1	23.6	23.9	19.2	18.9	23	23.8

	City	Aurangabad				Akola			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	26.2	27	26.3	25.8	26.9	27.4	26.4	25.8
	Min. Temp in °C	21.4	20.1	23.3	23.8	22.1	20.4	23.4	23.8
February	Max. Temp in °C	26.9	27.4	26.4	25.8	28	28	26.6	25.9
	Min. Temp in °C	22.2	20.1	23.4	23.8	23.3	20.4	23.6	23.9
March	Max. Temp in °C	28.9	28.4	26.7	25.9	29.7	28.8	26.8	25.9
	Min. Temp in °C	24.1	21.5	23.7	23.9	24.9	21.9	23.8	23.9
April	Max. Temp in °C	31.2	29.6	27.1	25.9	31.9	30	27.2	26
	Min. Temp in °C	26.4	22.7	24.1	23.9	27.2	23.1	24.2	24
May	Max. Temp in °C	32.4	30.2	27.2	26	33.7	30.9	27.4	26
	Min. Temp in °C	27.6	23.3	24.2	24	28.9	24	24.4	24
June	Max. Temp in °C	31.7	29.9	27.1	26	32.8	30.5	27.3	26
	Min. Temp in °C	27	23	24.1	24	28.1	23.5	24.3	24
July	Max. Temp in °C	30	29	26.9	25.9	30.9	29.4	27	25.9
	Min. Temp in °C	25.2	22.1	23.9	23.9	26.1	22.5	24	23.9
August	Max. Temp in °C	28.9	28.4	26.7	25.9	29.6	28.8	26.8	25.9
	Min. Temp in °C	24.1	21.5	23.7	23.9	24.9	21.9	23.8	23.9
September	Max. Temp in °C	29	28.5	26.7	25.9	30.2	29.1	26.9	25.9
	Min. Temp in °C	24.2	21.6	23.7	23.9	25.5	22.2	23.9	23.9
October	Max. Temp in °C	29.2	28.6	26.8	25.9	30.2	29.1	26.9	25.9
	Min. Temp in °C	24.4	21.7	23.8	23.9	25.5	22.2	23.9	23.9
November	Max. Temp in °C	28.1	28	26.6	25.9	28.8	28.4	26.7	25.9
	Min. Temp in °C	23.4	21.1	23.6	23.9	24	21.5	23.7	23.9
December	Max. Temp in °C	26.6	27.3	26.4	25.8	27.4	27.6	26.5	25.8
	Min. Temp in °C	21.9	20.3	23.4	23.8	22.6	20.7	23.5	23.8

	City	Allahabad				Belgaum			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	23.9	25.8	26	25.8	26.9	27.4	26.4	25.8
	Min. Temp in °C	19.1	18.9	23	23.8	22.1	20.5	23.4	23.8
February	Max. Temp in °C	24.9	26.3	26.1	25.8	27.4	27.7	26.5	25.8
	Min. Temp in °C	20.1	18.9	23.1	23.8	22.7	20.5	23.5	23.8
March	Max. Temp in °C	27.9	27.9	26.6	25.9	29	28.5	26.7	25.9
	Min. Temp in °C	23.2	21	23.6	23.9	24.2	21.6	23.7	23.9
April	Max. Temp in °C	31.2	29.6	27.1	25.9	30.3	29.1	26.9	25.9
	Min. Temp in °C	26.5	22.7	24.1	23.9	25.5	22.2	23.9	23.9
May	Max. Temp in °C	33.2	30.7	27.4	26	30.3	29.1	26.9	25.9
	Min. Temp in °C	28.5	23.8	24.4	24	25.5	22.2	23.9	23.9
June	Max. Temp in °C	33.7	30.9	27.4	26	29.3	28.6	26.8	25.9
	Min. Temp in °C	28.9	24	24.4	24	24.5	21.7	23.8	23.9
July	Max. Temp in °C	32.4	30.2	27.2	26	28.1	28	26.6	25.9
	Min. Temp in °C	27.6	23.3	24.2	24	23.4	21.1	23.6	23.9
August	Max. Temp in °C	31.4	29.7	27.1	26	27.6	27.8	26.5	25.9
	Min. Temp in °C	26.7	22.8	24.1	24	22.8	20.8	23.5	23.9
September	Max. Temp in °C	31.2	29.6	27.1	25.9	28.1	28	26.6	25.9
	Min. Temp in °C	26.4	22.7	24.1	23.9	23.3	21.1	23.6	23.9
October	Max. Temp in °C	30.6	29.3	27	25.9	28.4	28.2	26.7	25.9
	Min. Temp in °C	25.9	22.4	24	23.9	23.6	21.2	23.7	23.9
November	Max. Temp in °C	28.7	28.3	26.7	25.9	28	28	26.6	25.9
	Min. Temp in °C	23.9	21.4	23.7	23.9	23.2	21	23.6	23.9
December	Max. Temp in °C	25.6	26.7	26.3	25.8	27.4	27.6	26.5	25.8
	Min. Temp in °C	20.9	19.8	23.3	23.8	22.6	20.7	23.5	23.8

	City	Bengaluru				Bhopal			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	26.8	27.3	26.4	25.8	25.1	26.5	26.2	25.8
	Min. Temp in °C	22.1	20.4	23.4	23.8	20.4	19.5	23.2	23.8
February	Max. Temp in °C	27.8	27.8	26.6	25.9	25.6	26.7	26.3	25.8
	Min. Temp in °C	23	20.4	23.6	23.9	20.9	19.5	23.3	23.8
March	Max. Temp in °C	29	28.5	26.7	25.9	28.3	28.1	26.6	25.9
	Min. Temp in °C	24.3	21.6	23.7	23.9	23.5	21.2	23.6	23.9
April	Max. Temp in °C	30.2	29.1	26.9	25.9	30.6	29.3	27	25.9
	Min. Temp in °C	25.5	22.2	23.9	23.9	25.8	22.4	24	23.9
May	Max. Temp in °C	30.2	29.1	26.9	25.9	32.6	30.3	27.3	26
	Min. Temp in °C	25.5	22.2	23.9	23.9	27.8	23.4	24.3	24
June	Max. Temp in °C	29.4	28.7	26.8	25.9	33.2	30.7	27.3	26
	Min. Temp in °C	24.6	21.8	23.8	23.9	28.4	23.7	24.3	24
July	Max. Temp in °C	28.5	28.2	26.7	25.9	31	29.5	27	25.9
	Min. Temp in °C	23.7	21.3	23.7	23.9	26.2	22.6	24	23.9
August	Max. Temp in °C	28.1	28	26.6	25.9	29.8	28.9	26.9	25.9
	Min. Temp in °C	23.4	21.1	23.6	23.9	25	22	23.9	23.9
September	Max. Temp in °C	28.2	28.1	26.6	25.9	29.5	28.7	26.8	25.9
	Min. Temp in °C	23.4	21.1	23.6	23.9	24.7	21.8	23.8	23.9
October	Max. Temp in °C	28.1	28	26.6	25.9	29.2	28.6	26.8	25.9
	Min. Temp in °C	23.3	21.1	23.6	23.9	24.4	21.6	23.8	23.9
November	Max. Temp in °C	27.7	27.8	26.5	25.9	27.8	27.9	26.6	25.9
	Min. Temp in °C	22.9	20.9	23.5	23.9	23.1	21	23.6	23.9
December	Max. Temp in °C	26.8	27.4	26.4	25.8	26.2	27	26.3	25.8
	Min. Temp in °C	22.1	20.4	23.4	23.8	21.5	20.1	23.3	23.8

	City	Bhubaneswar				Bhuj			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	27.1	27.5	26.5	25.8	25.9	26.9	26.3	25.8
	Min. Temp in °C	22.3	20.6	23.5	23.8	21.2	20	23.3	23.8
February	Max. Temp in °C	28.6	28.2	26.7	25.9	26.3	27.1	26.4	25.8
	Min. Temp in °C	23.8	20.6	23.7	23.9	21.5	20	23.4	23.8
March	Max. Temp in °C	30.3	29.2	26.9	25.9	28.5	28.2	26.7	25.9
	Min. Temp in °C	25.6	22.2	23.9	23.9	23.7	21.3	23.7	23.9
April	Max. Temp in °C	31.6	29.8	27.1	26	30.9	29.5	27	25.9
	Min. Temp in °C	26.8	22.9	24.1	24	26.1	22.5	24	23.9
May	Max. Temp in °C	31.9	30	27.2	26	32.5	30.3	27.2	26
	Min. Temp in °C	27.1	23.1	24.2	24	27.7	23.4	24.2	24
June	Max. Temp in °C	32.6	30.3	27.3	26	32.5	30.3	27.2	26
	Min. Temp in °C	27.8	23.4	24.3	24	27.8	23.4	24.2	24
July	Max. Temp in °C	31.4	29.7	27.1	25.9	32.1	30.1	27.2	26
	Min. Temp in °C	26.6	22.8	24.1	23.9	27.3	23.2	24.2	24
August	Max. Temp in °C	30.6	29.3	27	25.9	31.3	29.6	27.1	25.9
	Min. Temp in °C	25.9	22.4	24	23.9	26.5	22.7	24.1	23.9
September	Max. Temp in °C	30.6	29.3	27	25.9	31	29.5	27	25.9
	Min. Temp in °C	25.8	22.4	24	23.9	26.2	22.6	24	23.9
October	Max. Temp in °C	30.2	29.1	26.9	25.9	31.7	29.9	27.1	26
	Min. Temp in °C	25.4	22.2	23.9	23.9	26.9	23	24.1	24
November	Max. Temp in °C	28.9	28.4	26.7	25.9	30.3	29.1	26.9	25.9
	Min. Temp in °C	24.1	21.5	23.7	23.9	25.5	22.2	23.9	23.9
December	Max. Temp in °C	27.4	27.6	26.5	25.8	27.6	27.7	26.5	25.9
	Min. Temp in °C	22.6	20.7	23.5	23.8	22.8	20.8	23.5	23.9

	City	Barmer				Bhagalpur			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	25	26.4	26.2	25.8	25.5	26.7	26.2	25.8
	Min. Temp in °C	20.3	19.5	23.2	23.8	20.7	19.7	23.2	23.8
February	Max. Temp in °C	25.3	26.6	26.2	25.8	26.1	27	26.3	25.8
	Min. Temp in °C	20.5	19.5	23.2	23.8	21.3	19.7	23.3	23.8
March	Max. Temp in °C	27.9	27.9	26.6	25.9	28.3	28.1	26.6	25.9
	Min. Temp in °C	23.1	21	23.6	23.9	23.5	21.2	23.6	23.9
April	Max. Temp in °C	30.9	29.5	27	25.9	30.7	29.3	27	25.9
	Min. Temp in °C	26.1	22.5	24	23.9	25.9	22.4	24	23.9
May	Max. Temp in °C	33.1	30.6	27.3	26	31.6	29.8	27.1	26
	Min. Temp in °C	28.4	23.7	24.3	24	26.8	22.9	24.1	24
June	Max. Temp in °C	34	31.1	27.5	26	31.9	30	27.2	26
	Min. Temp in °C	29.3	24.2	24.5	24	27.2	23.1	24.2	24
July	Max. Temp in °C	32.9	30.5	27.3	26	31.5	29.8	27.1	26
	Min. Temp in °C	28.2	23.6	24.3	24	26.7	22.8	24.1	24
August	Max. Temp in °C	31.8	29.9	27.1	26	31.5	29.8	27.1	26
	Min. Temp in °C	27	23	24.1	24	26.7	22.9	24.1	24
September	Max. Temp in °C	31.5	29.8	27.1	26	31.4	29.7	27.1	26
	Min. Temp in °C	26.7	22.9	24.1	24	26.7	22.8	24.1	24
October	Max. Temp in °C	31.7	29.9	27.1	26	31	29.5	27	25.9
	Min. Temp in °C	26.9	23	24.1	24	26.3	22.6	24	23.9
November	Max. Temp in °C	29.6	28.8	26.8	25.9	29.5	28.7	26.8	25.9
	Min. Temp in °C	24.8	21.9	23.8	23.9	24.7	21.8	23.8	23.9
December	Max. Temp in °C	26.8	27.3	26.4	25.8	27.2	27.5	26.5	25.8
	Min. Temp in °C	22	20.4	23.4	23.8	22.4	20.6	23.5	23.8

	City	Bikaner				Chennai			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in ^{0}C	22.7	25.2	25.8	25.7	28.8	28.4	26.7	25.9
	Min. Temp in ^{0}C	17.9	18.3	22.8	23.7	24	21.4	23.7	23.9
February	Max. Temp in ^{0}C	23.9	25.8	26	25.8	29.4	28.7	26.8	25.9
	Min. Temp in ^{0}C	19.1	18.3	23	23.8	24.7	21.4	23.8	23.9
March	Max. Temp in ^{0}C	26.7	27.3	26.4	25.8	30.3	29.2	26.9	25.9
	Min. Temp in ^{0}C	22	20.4	23.4	23.8	25.6	22.2	23.9	23.9
April	Max. Temp in ^{0}C	30.3	29.1	26.9	25.9	31.4	29.7	27.1	25.9
	Min. Temp in ^{0}C	25.5	22.2	23.9	23.9	26.6	22.8	24.1	23.9
May	Max. Temp in ^{0}C	32.6	30.4	27.3	26	32.6	30.3	27.3	26
	Min. Temp in ^{0}C	27.8	23.4	24.3	24	27.8	23.4	24.3	24
June	Max. Temp in ^{0}C	34	31.1	27.5	26	32.9	30.5	27.3	26
	Min. Temp in ^{0}C	29.2	24.2	24.5	24	28.1	23.6	24.3	24
July	Max. Temp in ^{0}C	33.4	30.8	27.4	26	31.9	30	27.2	26
	Min. Temp in ^{0}C	28.7	23.9	24.4	24	27.1	23.1	24.2	24
August	Max. Temp in ^{0}C	32.6	30.3	27.3	26	31.5	29.8	27.1	26
	Min. Temp in ^{0}C	27.8	23.4	24.3	24	26.7	22.8	24.1	24
September	Max. Temp in ^{0}C	32.4	30.2	27.2	26	31.3	29.7	27.1	25.9
	Min. Temp in ^{0}C	27.6	23.3	24.2	24	26.5	22.7	24.1	23.9
October	Max. Temp in ^{0}C	31.1	29.6	27	25.9	30.8	29.4	27	25.9
	Min. Temp in ^{0}C	26.3	22.6	24	23.9	26	22.5	24	23.9
November	Max. Temp in ^{0}C	28.4	28.2	26.7	25.9	30	29	26.9	25.9
	Min. Temp in ^{0}C	23.7	21.3	23.7	23.9	25.3	22.1	23.9	23.9
December	Max. Temp in ^{0}C	25	26.4	26.2	25.8	29.2	28.6	26.8	25.9
	Min. Temp in ^{0}C	20.3	19.5	23.2	23.8	24.5	21.7	23.8	23.9

	City	Chitradurga				Dehradun			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	27.7	27.8	26.5	25.9	22.61	25.17	25.82	25.72
	Min. Temp in °C	22.9	20.9	23.5	23.9	17.85	18.25	22.82	23.72
February	Max. Temp in °C	28.6	28.3	26.7	25.9	22.95	25.34	25.87	25.73
	Min. Temp in °C	23.8	20.9	23.7	23.9	18.19	18.25	22.87	23.73
March	Max. Temp in °C	29.8	28.9	26.9	25.9	24.77	26.29	26.13	25.78
	Min. Temp in °C	25	22	23.9	23.9	20.01	19.37	23.13	23.78
April	Max. Temp in °C	30.9	29.5	27	25.9	27.42	27.66	26.51	25.85
	Min. Temp in °C	26.1	22.5	24	23.9	22.66	20.74	23.51	23.85
May	Max. Temp in °C	30.9	29.5	27	25.9	29.66	28.82	26.84	25.9
	Min. Temp in °C	26.1	22.5	24	23.9	24.9	21.9	23.84	23.9
June	Max. Temp in °C	29.7	28.8	26.8	25.9	30.66	29.34	26.98	25.93
	Min. Temp in °C	24.9	21.9	23.8	23.9	25.9	22.42	23.98	23.93
July	Max. Temp in °C	28.6	28.3	26.7	25.9	30.14	29.07	26.91	25.92
	Min. Temp in °C	23.9	21.4	23.7	23.9	25.38	22.15	23.91	23.92
August	Max. Temp in °C	28.2	28.1	26.6	25.9	29.66	28.82	26.84	25.9
	Min. Temp in °C	23.5	21.2	23.6	23.9	24.9	21.9	23.84	23.9
September	Max. Temp in °C	28.4	28.2	26.7	25.9	29.34	28.66	26.79	25.9
	Min. Temp in °C	23.7	21.3	23.7	23.9	24.58	21.74	23.79	23.9
October	Max. Temp in °C	28.5	28.2	26.7	25.9	28.21	28.07	26.63	25.87
	Min. Temp in °C	23.7	21.3	23.7	23.9	23.45	21.15	23.63	23.87
November	Max. Temp in °C	28.1	28	26.6	25.9	26.04	26.94	26.31	25.81
	Min. Temp in °C	23.3	21.1	23.6	23.9	21.28	20.02	23.31	23.81
December	Max. Temp in °C	27.5	27.7	26.5	25.8	24.09	25.93	26.03	25.76
	Min. Temp in °C	22.8	20.8	23.5	23.8	19.33	19.01	23.03	23.76

	City	Dibrugarh				Gorakhpur			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	23.47	25.61	25.94	25.74	23.6	25.68	25.96	25.75
	Min. Temp in °C	18.71	18.69	22.94	23.74	18.84	18.76	22.96	23.75
February	Max. Temp in °C	23.88	25.82	26	25.75	24.55	26.17	26.1	25.77
	Min. Temp in °C	19.12	18.69	23	23.75	19.79	18.76	23.1	23.77
March	Max. Temp in °C	25.37	26.6	26.22	25.79	27.49	27.7	26.52	25.85
	Min. Temp in °C	20.61	19.68	23.22	23.79	22.73	20.78	23.52	23.85
April	Max. Temp in °C	26.91	27.4	26.44	25.83	30.27	29.14	26.93	25.92
	Min. Temp in °C	22.15	20.48	23.44	23.83	25.51	22.22	23.93	23.92
May	Max. Temp in °C	28.28	28.11	26.64	25.87	31.83	29.95	27.15	25.96
	Min. Temp in °C	23.52	21.19	23.64	23.87	27.07	23.03	24.15	23.96
June	Max. Temp in °C	29.64	28.81	26.83	25.9	32.11	30.09	27.19	25.97
	Min. Temp in °C	24.88	21.89	23.83	23.9	27.35	23.17	24.19	23.97
July	Max. Temp in °C	29.93	28.96	26.88	25.91	31.43	29.74	27.09	25.95
	Min. Temp in °C	25.17	22.04	23.88	23.91	26.67	22.82	24.09	23.95
August	Max. Temp in °C	30.06	29.03	26.9	25.92	31.34	29.69	27.08	25.95
	Min. Temp in °C	25.3	22.11	23.9	23.92	26.58	22.77	24.08	23.95
September	Max. Temp in °C	29.95	28.97	26.88	25.91	30.89	29.46	27.01	25.94
	Min. Temp in °C	25.19	22.05	23.88	23.91	26.13	22.54	24.01	23.94
October	Max. Temp in °C	28.94	28.45	26.73	25.89	30.12	29.06	26.9	25.92
	Min. Temp in °C	24.18	21.53	23.73	23.89	25.36	22.14	23.9	23.92
November	Max. Temp in °C	27.19	27.54	26.48	25.84	28.46	28.2	26.66	25.87
	Min. Temp in °C	22.43	20.62	23.48	23.84	23.7	21.28	23.66	23.87
December	Max. Temp in °C	24.92	26.36	26.15	25.78	26.14	27	26.33	25.81
	Min. Temp in °C	20.16	19.44	23.15	23.78	21.38	20.08	23.33	23.81

	City	Guwahati				Gwalior			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	24.62	26.21	26.11	25.77	23.1	25.42	25.89	25.73
	Min. Temp in °C	19.86	19.29	23.11	23.77	18.34	18.5	22.89	23.73
February	Max. Temp in °C	25.03	26.42	26.17	25.78	24.46	26.13	26.09	25.77
	Min. Temp in °C	20.27	19.29	23.17	23.78	19.7	18.5	23.09	23.77
March	Max. Temp in °C	26.34	27.1	26.36	25.82	26.85	27.36	26.43	25.83
	Min. Temp in °C	21.58	20.18	23.36	23.82	22.09	20.44	23.43	23.83
April	Max. Temp in °C	28.14	28.03	26.62	25.87	29.84	28.92	26.86	25.91
	Min. Temp in °C	23.38	21.11	23.62	23.87	25.08	22	23.86	23.91
May	Max. Temp in °C	29.47	28.73	26.81	25.9	32.53	30.31	27.25	25.98
	Min. Temp in °C	24.71	21.81	23.81	23.9	27.77	23.39	24.25	23.98
June	Max. Temp in °C	30.38	29.2	26.94	25.92	34.03	31.09	27.47	26.02
	Min. Temp in °C	25.62	22.28	23.94	23.92	29.27	24.17	24.47	24.02
July	Max. Temp in °C	30.36	29.18	26.94	25.92	32.51	30.3	27.25	25.98
	Min. Temp in °C	25.6	22.26	23.94	23.92	27.75	23.38	24.25	23.98
August	Max. Temp in °C	30.59	29.31	26.97	25.93	31.38	29.71	27.09	25.95
	Min. Temp in °C	25.83	22.39	23.97	23.93	26.62	22.79	24.09	23.95
September	Max. Temp in °C	30.47	29.24	26.95	25.93	31.46	29.75	27.1	25.95
	Min. Temp in °C	25.71	22.32	23.95	23.93	26.7	22.83	24.1	23.95
October	Max. Temp in °C	29.64	28.81	26.83	25.9	29.96	28.98	26.88	25.91
	Min. Temp in °C	24.88	21.89	23.83	23.9	25.2	22.06	23.88	23.91
November	Max. Temp in °C	28.17	28.05	26.62	25.87	27.64	27.77	26.55	25.85
	Min. Temp in °C	23.41	21.13	23.62	23.87	22.88	20.85	23.55	23.85
December	Max. Temp in °C	26.14	27	26.33	25.81	24.61	26.21	26.11	25.77
	Min. Temp in °C	21.38	20.08	23.33	23.81	19.85	19.29	23.11	23.77

	City	Hisar				Hyderabad			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	23.19	25.47	25.9	25.74	27.18	27.54	26.48	25.84
	Min. Temp in °C	18.43	18.55	22.9	23.74	22.42	20.62	23.48	23.84
February	Max. Temp in °C	23.9	25.84	26.01	25.76	28.32	28.13	26.64	25.87
	Min. Temp in °C	19.14	18.55	23.01	23.76	23.56	20.62	23.64	23.87
March	Max. Temp in °C	26.64	27.26	26.4	25.83	29.84	28.92	26.86	25.91
	Min. Temp in °C	21.88	20.34	23.4	23.83	25.08	22	23.86	23.91
April	Max. Temp in °C	29.88	28.94	26.87	25.91	31.57	29.81	27.11	25.95
	Min. Temp in °C	25.12	22.02	23.87	23.91	26.81	22.89	24.11	23.95
May	Max. Temp in °C	32.78	30.44	27.29	25.99	32.15	30.11	27.2	25.97
	Min. Temp in °C	28.02	23.52	24.29	23.99	27.39	23.19	24.2	23.97
June	Max. Temp in °C	33.87	31	27.44	26.01	31.83	29.95	27.15	25.96
	Min. Temp in °C	29.11	24.08	24.44	24.01	27.07	23.03	24.15	23.96
July	Max. Temp in °C	33.73	30.93	27.42	26.01	30.5	29.26	26.96	25.93
	Min. Temp in °C	28.97	24.01	24.42	24.01	25.74	22.34	23.96	23.93
August	Max. Temp in °C	32.48	30.29	27.24	25.98	29.42	28.7	26.8	25.9
	Min. Temp in °C	27.72	23.37	24.24	23.98	24.66	21.78	23.8	23.9
September	Max. Temp in °C	31.74	29.9	27.14	25.96	29.52	28.75	26.82	25.9
	Min. Temp in °C	26.98	22.98	24.14	23.96	24.76	21.83	23.82	23.9
October	Max. Temp in °C	30.72	29.37	26.99	25.93	29.15	28.56	26.76	25.89
	Min. Temp in °C	25.96	22.45	23.99	23.93	24.39	21.64	23.76	23.89
November	Max. Temp in °C	28.42	28.18	26.66	25.87	28.51	28.23	26.67	25.87
	Min. Temp in °C	23.66	21.26	23.66	23.87	23.75	21.31	23.67	23.87
December	Max. Temp in °C	25.58	26.71	26.25	25.8	27.47	27.69	26.52	25.85
	Min. Temp in °C	20.82	19.79	23.25	23.8	22.71	20.77	23.52	23.85

	City	Imphal				Indore			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	22.23	24.97	25.76	25.71	25.05	26.43	26.17	25.78
	Min. Temp in °C	17.47	18.05	22.76	23.71	20.29	19.51	23.17	23.78
February	Max. Temp in °C	22.65	25.19	25.83	25.72	25.83	26.84	26.28	25.81
	Min. Temp in °C	17.89	18.05	22.83	23.72	21.07	19.51	23.28	23.81
March	Max. Temp in °C	24.28	26.03	26.06	25.77	27.67	27.79	26.55	25.85
	Min. Temp in °C	19.52	19.11	23.06	23.77	22.91	20.87	23.55	23.85
April	Max. Temp in °C	25.96	26.9	26.3	25.81	30.23	29.12	26.92	25.92
	Min. Temp in °C	21.2	19.98	23.3	23.81	25.47	22.2	23.92	23.92
May	Max. Temp in °C	27.32	27.61	26.5	25.84	32.06	30.07	27.18	25.97
	Min. Temp in °C	22.56	20.69	23.5	23.84	27.3	23.15	24.18	23.97
June	Max. Temp in °C	28.45	28.19	26.66	25.87	31.86	29.96	27.15	25.96
	Min. Temp in °C	23.69	21.27	23.66	23.87	27.1	23.04	24.15	23.96
July	Max. Temp in °C	28.76	28.36	26.71	25.88	30.27	29.14	26.93	25.92
	Min. Temp in °C	24	21.44	23.71	23.88	25.51	22.22	23.93	23.92
August	Max. Temp in °C	28.99	28.47	26.74	25.89	29.11	28.54	26.76	25.89
	Min. Temp in °C	24.23	21.55	23.74	23.89	24.35	21.62	23.76	23.89
September	Max. Temp in °C	28.78	28.37	26.71	25.88	28.87	28.41	26.72	25.88
	Min. Temp in °C	24.02	21.45	23.71	23.88	24.11	21.49	23.72	23.88
October	Max. Temp in °C	27.92	27.92	26.59	25.86	29.06	28.51	26.75	25.89
	Min. Temp in °C	23.16	21	23.59	23.86	24.3	21.59	23.75	23.89
November	Max. Temp in °C	25.94	26.89	26.3	25.81	27.76	27.84	26.56	25.86
	Min. Temp in °C	21.18	19.97	23.3	23.81	23	20.92	23.56	23.86
December	Max. Temp in °C	23.47	25.61	25.94	25.74	26.05	26.95	26.32	25.81
	Min. Temp in °C	18.71	18.69	22.94	23.74	21.29	20.03	23.32	23.81

	City	Jaipur				Jaisalmer			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	24.13	25.95	26.04	25.76	24.9	26.36	26.15	25.78
	Min. Temp in °C	19.37	19.03	23.04	23.76	20.14	19.44	23.15	23.78
February	Max. Temp in °C	24.58	26.19	26.1	25.77	25.31	26.57	26.21	25.79
	Min. Temp in °C	19.82	19.03	23.1	23.77	20.55	19.44	23.21	23.79
March	Max. Temp in °C	27.09	27.49	26.47	25.84	28	27.96	26.6	25.86
	Min. Temp in °C	22.33	20.57	23.47	23.84	23.24	21.04	23.6	23.86
April	Max. Temp in °C	29.96	28.98	26.88	25.91	31.11	29.58	27.05	25.94
	Min. Temp in °C	25.2	22.06	23.88	23.91	26.35	22.66	24.05	23.94
May	Max. Temp in °C	32.5	30.29	27.25	25.98	33.18	30.65	27.35	26
	Min. Temp in °C	27.74	23.37	24.25	23.98	28.42	23.73	24.35	24
June	Max. Temp in °C	33.78	30.96	27.43	26.01	33.89	31.01	27.45	26.01
	Min. Temp in °C	29.02	24.04	24.43	24.01	29.13	24.09	24.45	24.01
July	Max. Temp in °C	32.41	30.25	27.23	25.98	33.17	30.64	27.34	26
	Min. Temp in °C	27.65	23.33	24.23	23.98	28.41	23.72	24.34	24
August	Max. Temp in °C	30.71	29.37	26.99	25.93	32.43	30.26	27.24	25.98
	Min. Temp in °C	25.95	22.45	23.99	23.93	27.67	23.34	24.24	23.98
September	Max. Temp in °C	30.69	29.36	26.99	25.93	32.29	30.18	27.22	25.97
	Min. Temp in °C	25.93	22.44	23.99	23.93	27.53	23.26	24.22	23.97
October	Max. Temp in °C	30.71	29.37	26.99	25.93	32.16	30.12	27.2	25.97
	Min. Temp in °C	25.95	22.45	23.99	23.93	27.4	23.2	24.2	23.97
November	Max. Temp in °C	28.63	28.29	26.69	25.88	29.96	28.98	26.88	25.91
	Min. Temp in °C	23.87	21.37	23.69	23.88	25.2	22.06	23.88	23.91
December	Max. Temp in °C	25.99	26.92	26.31	25.81	26.89	27.39	26.44	25.83
	Min. Temp in °C	21.23	20	23.31	23.81	22.13	20.47	23.44	23.83

	City	Jodhpur				Jabalpur			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in	25.44	26.64	26.23	25.8	24.43	26.11	26.08	25.77
	Min. Temp in °C	20.68	19.72	23.23	23.8	19.67	19.19	23.08	23.77
February	Max. Temp in °C	25.63	26.73	26.26	25.8	25.54	26.69	26.24	25.8
	Min. Temp in °C	20.87	19.72	23.26	23.8	20.78	19.19	23.24	23.8
March	Max. Temp in °C	28.47	28.2	26.66	25.87	27.55	27.73	26.53	25.85
	Min. Temp in °C	23.71	21.28	23.66	23.87	22.79	20.81	23.53	23.85
April	Max. Temp in °C	31.72	29.89	27.13	25.96	30.12	29.06	26.9	25.92
	Min. Temp in °C	26.96	22.97	24.13	23.96	25.36	22.14	23.9	23.92
May	Max. Temp in °C	33.49	30.81	27.39	26	31.9	29.98	27.16	25.96
	Min. Temp in °C	28.73	23.89	24.39	24	27.14	23.06	24.16	23.96
June	Max. Temp in °C	33.99	31.07	27.46	26.02	32.46	30.27	27.24	25.98
	Min. Temp in °C	29.23	24.15	24.46	24.02	27.7	23.35	24.24	23.98
July	Max. Temp in °C	33.06	30.59	27.33	25.99	30.84	29.43	27.01	25.94
	Min. Temp in °C	28.3	23.67	24.33	23.99	26.08	22.51	24.01	23.94
August	Max. Temp in °C	31.6	29.83	27.12	25.95	29.66	28.82	26.84	25.9
	Min. Temp in °C	26.84	22.91	24.12	23.95	24.9	21.9	23.84	23.9
September	Max. Temp in °C	31.58	29.82	27.11	25.95	29.82	28.9	26.86	25.91
	Min. Temp in °C	26.82	22.9	24.11	23.95	25.06	21.98	23.86	23.91
October	Max. Temp in °C	31.85	29.96	27.15	25.96	29.41	28.7	26.8	25.9
	Min. Temp in °C	27.09	23.04	24.15	23.96	24.65	21.78	23.8	23.9
November	Max. Temp in °C	29.58	28.78	26.83	25.9	27.69	27.8	26.55	25.85
	Min. Temp in °C	24.82	21.86	23.83	23.9	22.93	20.88	23.55	23.85
December	Max. Temp in °C	27.03	27.46	26.46	25.84	25.31	26.57	26.21	25.79
	Min. Temp in °C	22.27	20.54	23.46	23.84	20.55	19.65	23.21	23.79

	City	Jagdalpur				Jamnagar			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	25.78	26.81	26.28	25.8	25.5	26.67	26.24	25.8
	Min. Temp in °C	21.02	19.89	23.28	23.8	20.74	19.75	23.24	23.8
February	Max. Temp in °C	26.6	27.24	26.4	25.83	25.83	26.84	26.28	25.81
	Min. Temp in °C	21.84	19.89	23.4	23.83	21.07	19.75	23.28	23.81
March	Max. Temp in °C	28.04	27.98	26.6	25.86	27.33	27.62	26.5	25.84
	Min. Temp in °C	23.28	21.06	23.6	23.86	22.57	20.7	23.5	23.84
April	Max. Temp in °C	30.06	29.03	26.89	25.91	29.33	28.65	26.79	25.9
	Min. Temp in °C	25.3	22.11	23.89	23.91	24.57	21.73	23.79	23.9
May	Max. Temp in °C	31.23	29.63	27.06	25.95	30.82	29.42	27	25.93
	Min. Temp in °C	26.47	22.71	24.06	23.95	26.06	22.5	24	23.93
June	Max. Temp in °C	30.52	29.27	26.96	25.93	31.59	29.83	27.12	25.95
	Min. Temp in °C	25.76	22.35	23.96	23.93	26.83	22.91	24.12	23.95
July	Max. Temp in °C	29.3	28.63	26.78	25.9	31.25	29.65	27.07	25.95
	Min. Temp in °C	24.54	21.71	23.78	23.9	26.49	22.73	24.07	23.95
August	Max. Temp in °C	28.71	28.33	26.7	25.88	30.33	29.17	26.93	25.92
	Min. Temp in °C	23.95	21.41	23.7	23.88	25.57	22.25	23.93	23.92
September	Max. Temp in °C	28.91	28.43	26.73	25.89	30	29	26.89	25.91
	Min. Temp in °C	24.15	21.51	23.73	23.89	25.24	22.08	23.89	23.91
October	Max. Temp in °C	28.82	28.39	26.72	25.88	30.23	29.12	26.92	25.92
	Min. Temp in °C	24.06	21.47	23.72	23.88	25.47	22.2	23.92	23.92
November	Max. Temp in °C	27.54	27.72	26.53	25.85	29.04	28.5	26.75	25.89
	Min. Temp in °C	22.78	20.8	23.53	23.85	24.28	21.58	23.75	23.89
December	Max. Temp in °C	26.17	27.01	26.33	25.81	27.08	27.49	26.47	25.84
	Min. Temp in °C	21.41	20.09	23.33	23.81	22.32	20.57	23.47	23.84

	City	Jorhat				Kolkata			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	23.84	25.81	26	25.75	25.87	26.86	26.29	25.81
	Min. Temp in °C	19.08	18.89	23	23.75	21.11	19.94	23.29	23.81
February	Max. Temp in °C	24.3	26.04	26.06	25.77	26.5	27.18	26.38	25.82
	Min. Temp in °C	19.54	18.89	23.06	23.77	21.74	19.94	23.38	23.82
March	Max. Temp in °C	25.86	26.85	26.29	25.81	28.93	28.45	26.73	25.89
	Min. Temp in °C	21.1	19.93	23.29	23.81	24.17	21.53	23.73	23.89
April	Max. Temp in °C	27.29	27.59	26.5	25.84	31.2	29.62	27.06	25.94
	Min. Temp in °C	22.53	20.67	23.5	23.84	26.44	22.7	24.06	23.94
May	Max. Temp in °C	28.53	28.24	26.67	25.88	31.6	29.83	27.12	25.96
	Min. Temp in °C	23.77	21.32	23.67	23.88	26.84	22.91	24.12	23.96
June	Max. Temp in °C	29.93	28.96	26.88	25.91	31.75	29.9	27.14	25.96
	Min. Temp in °C	25.17	22.04	23.88	23.91	26.99	22.98	24.14	23.96
July	Max. Temp in °C	30.42	29.22	26.95	25.92	31.18	29.61	27.06	25.94
	Min. Temp in °C	25.66	22.3	23.95	23.92	26.42	22.69	24.06	23.94
August	Max. Temp in °C	30.72	29.37	26.99	25.93	31.15	29.6	27.05	25.94
	Min. Temp in °C	25.96	22.45	23.99	23.93	26.39	22.68	24.05	23.94
September	Max. Temp in °C	30.54	29.28	26.96	25.93	31.07	29.56	27.04	25.94
	Min. Temp in °C	25.78	22.36	23.96	23.93	26.31	22.64	24.04	23.94
October	Max. Temp in °C	29.64	28.81	26.83	25.9	30.54	29.28	26.96	25.93
	Min. Temp in °C	24.88	21.89	23.83	23.9	25.78	22.36	23.96	23.93
November	Max. Temp in °C	27.81	27.86	26.57	25.86	29.26	28.62	26.78	25.89
	Min. Temp in °C	23.05	20.94	23.57	23.86	24.5	21.7	23.78	23.89
December	Max. Temp in °C	25.21	26.52	26.2	25.79	27.23	27.56	26.49	25.84
	Min. Temp in °C	20.45	19.6	23.2	23.79	22.47	20.64	23.49	23.84

	City	Kurnool				Kota			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	28.35	28.15	26.65	25.87	24.76	26.28	26.13	25.78
	Min. Temp in °C	23.59	21.23	23.65	23.87	20	19.36	23.13	23.78
February	Max. Temp in °C	29.39	28.68	26.8	25.9	24.88	26.35	26.15	25.78
	Min. Temp in °C	24.63	21.23	23.8	23.9	20.12	19.36	23.15	23.78
March	Max. Temp in °C	30.91	29.47	27.02	25.94	27.4	27.65	26.51	25.85
	Min. Temp in °C	26.15	22.55	24.02	23.94	22.64	20.73	23.51	23.85
April	Max. Temp in °C	32.86	30.48	27.3	25.99	30.91	29.47	27.02	25.94
	Min. Temp in °C	28.1	23.56	24.3	23.99	26.15	22.55	24.02	23.94
May	Max. Temp in °C	33.8	30.97	27.44	26.01	33.75	30.94	27.43	26.01
	Min. Temp in °C	29.04	24.05	24.44	24.01	28.99	24.02	24.43	24.01
June	Max. Temp in °C	33.11	30.61	27.34	25.99	34.43	31.29	27.53	26.03
	Min. Temp in °C	28.35	23.69	24.34	23.99	29.67	24.37	24.53	24.03
July	Max. Temp in °C	31.52	29.79	27.11	25.95	32.25	30.16	27.21	25.97
	Min. Temp in °C	26.76	22.87	24.11	23.95	27.49	23.24	24.21	23.97
August	Max. Temp in °C	30.59	29.3	26.97	25.93	30.73	29.38	26.99	25.93
	Min. Temp in °C	25.83	22.38	23.97	23.93	25.97	22.46	23.99	23.93
September	Max. Temp in °C	30.25	29.13	26.92	25.92	30.6	29.31	26.97	25.93
	Min. Temp in °C	25.49	22.21	23.92	23.92	25.84	22.39	23.97	23.93
October	Max. Temp in °C	30.22	29.11	26.92	25.92	30.59	29.31	26.97	25.93
	Min. Temp in °C	25.46	22.19	23.92	23.92	25.83	22.39	23.97	23.93
November	Max. Temp in °C	29.51	28.75	26.82	25.9	28.63	28.29	26.69	25.88
	Min. Temp in °C	24.75	21.83	23.82	23.9	23.87	21.37	23.69	23.88
December	Max. Temp in °C	28.39	28.16	26.65	25.87	26.18	27.02	26.33	25.81
	Min. Temp in °C	23.63	21.24	23.65	23.87	21.42	20.1	23.33	23.81

	City	Lucknow				Mumbai			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	23.71	25.74	25.98	25.75	28.82	28.39	26.72	25.88
	Min. Temp in °C	18.95	18.82	22.98	23.75	24.06	21.47	23.72	23.88
February	Max. Temp in °C	24.61	26.2	26.11	25.77	28.89	28.42	26.73	25.88
	Min. Temp in °C	19.85	18.82	23.11	23.77	24.13	21.47	23.73	23.88
March	Max. Temp in °C	27.18	27.54	26.48	25.84	29.28	28.62	26.78	25.89
	Min. Temp in °C	22.42	20.62	23.48	23.84	24.52	21.7	23.78	23.89
April	Max. Temp in °C	30.33	29.17	26.93	25.92	30.14	29.07	26.91	25.92
	Min. Temp in °C	25.57	22.25	23.93	23.92	25.38	22.15	23.91	23.92
May	Max. Temp in °C	32.48	30.28	27.24	25.98	31.15	29.6	27.05	25.94
	Min. Temp in °C	27.72	23.36	24.24	23.98	26.39	22.68	24.05	23.94
June	Max. Temp in °C	33.06	30.59	27.33	25.99	31.3	29.67	27.07	25.95
	Min. Temp in °C	28.3	23.67	24.33	23.99	26.54	22.75	24.07	23.95
July	Max. Temp in °C	32.12	30.1	27.19	25.97	30.68	29.35	26.98	25.93
	Min. Temp in °C	27.36	23.18	24.19	23.97	25.92	22.43	23.98	23.93
August	Max. Temp in °C	31.17	29.61	27.06	25.94	30.23	29.12	26.92	25.92
	Min. Temp in °C	26.41	22.69	24.06	23.94	25.47	22.2	23.92	23.92
September	Max. Temp in °C	30.72	29.37	26.99	25.93	30.23	29.12	26.92	25.92
	Min. Temp in °C	25.96	22.45	23.99	23.93	25.47	22.2	23.92	23.92
October	Max. Temp in °C	29.71	28.85	26.84	25.91	30.4	29.21	26.94	25.92
	Min. Temp in °C	24.95	21.93	23.84	23.91	25.64	22.29	23.94	23.92
November	Max. Temp in °C	27.8	27.86	26.57	25.86	30.22	29.11	26.92	25.92
	Min. Temp in °C	23.04	20.94	23.57	23.86	25.46	22.19	23.92	23.92
December	Max. Temp in °C	25.45	26.64	26.23	25.8	29.28	28.63	26.78	25.89
	Min. Temp in °C	20.69	19.72	23.23	23.8	24.52	21.71	23.78	23.89

	City	Mangalore				Nagpur			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	29.72	28.86	26.85	25.91	26.52	27.2	26.38	25.82
	Min. Temp in °C	24.96	21.94	23.85	23.91	21.76	20.28	23.38	23.82
February	Max. Temp in °C	29.8	28.89	26.86	25.91	27.48	27.69	26.52	25.85
	Min. Temp in °C	25.04	21.94	23.86	23.91	22.72	20.28	23.52	23.85
March	Max. Temp in °C	30.32	29.16	26.93	25.92	28.8	28.38	26.71	25.88
	Min. Temp in °C	25.56	22.24	23.93	23.92	24.04	21.46	23.71	23.88
April	Max. Temp in °C	30.81	29.42	27	25.93	30.99	29.51	27.03	25.94
	Min. Temp in °C	26.05	22.5	24	23.93	26.23	22.59	24.03	23.94
May	Max. Temp in °C	31.07	29.55	27.04	25.94	33.34	30.73	27.37	26
	Min. Temp in °C	26.31	22.63	24.04	23.94	28.58	23.81	24.37	24
June	Max. Temp in °C	30.25	29.13	26.92	25.92	33.67	30.9	27.42	26.01
	Min. Temp in °C	25.49	22.21	23.92	23.92	28.91	23.98	24.42	24.01
July	Max. Temp in °C	29.17	28.57	26.77	25.89	31.34	29.69	27.08	25.95
	Min. Temp in °C	24.41	21.65	23.77	23.89	26.58	22.77	24.08	23.95
August	Max. Temp in °C	28.94	28.45	26.73	25.89	29.83	28.91	26.86	25.91
	Min. Temp in °C	24.18	21.53	23.73	23.89	25.07	21.99	23.86	23.91
September	Max. Temp in °C	29.28	28.62	26.78	25.89	29.91	28.95	26.87	25.91
	Min. Temp in °C	24.52	21.7	23.78	23.89	25.15	22.03	23.87	23.91
October	Max. Temp in °C	29.64	28.81	26.83	25.9	29.94	28.97	26.88	25.91
	Min. Temp in °C	24.88	21.89	23.83	23.9	25.18	22.05	23.88	23.91
November	Max. Temp in °C	29.96	28.98	26.88	25.91	28.44	28.19	26.66	25.87
	Min. Temp in °C	25.2	22.06	23.88	23.91	23.68	21.27	23.66	23.87
December	Max. Temp in °C	29.91	28.95	26.87	25.91	26.79	27.33	26.42	25.83
	Min. Temp in °C	25.15	22.03	23.87	23.91	22.03	20.41	23.42	23.83

	City	Nellore				New Delhi			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	28.67	28.311	26.695	25.879	22.7	25.22	25.83	25.72
	Min. Temp in °C	23.91	21.391	23.695	23.879	17.94	18.3	22.83	23.72
February	Max. Temp in °C	29.43	28.701	26.803	25.899	23.61	25.69	25.96	25.75
	Min. Temp in °C	24.67	21.391	23.803	23.899	18.85	18.3	22.96	23.75
March	Max. Temp in °C	30.57	29.296	26.969	25.928	26.08	26.97	26.32	25.81
	Min. Temp in °C	25.81	22.376	23.969	23.928	21.32	20.05	23.32	23.81
April	Max. Temp in °C	32	30.033	27.175	25.965	29.66	28.82	26.84	25.9
	Min. Temp in °C	27.24	23.113	24.175	23.965	24.9	21.9	23.84	23.9
May	Max. Temp in °C	33.25	30.685	27.356	25.998	32.49	30.29	27.25	25.98
	Min. Temp in °C	28.49	23.765	24.356	23.998	27.73	23.37	24.25	23.98
June	Max. Temp in °C	33.15	30.632	27.341	25.995	32.98	30.54	27.32	25.99
	Min. Temp in °C	28.39	23.712	24.341	23.995	28.22	23.62	24.32	23.99
July	Max. Temp in °C	32.31	30.194	27.219	25.973	32.19	30.14	27.2	25.97
	Min. Temp in °C	27.55	23.274	24.219	23.973	27.43	23.22	24.2	23.97
August	Max. Temp in °C	31.67	29.863	27.127	25.957	31.69	29.87	27.13	25.96
	Min. Temp in °C	26.91	22.943	24.127	23.957	26.93	22.95	24.13	23.96
September	Max. Temp in °C	31.5	29.775	27.103	25.952	31.42	29.74	27.09	25.95
	Min. Temp in °C	26.74	22.855	24.103	23.952	26.66	22.82	24.09	23.95
October	Max. Temp in °C	30.97	29.504	27.027	25.939	30.49	29.25	26.96	25.93
	Min. Temp in °C	26.21	22.584	24.027	23.939	25.73	22.33	23.96	23.93
November	Max. Temp in °C	29.9	28.948	26.872	25.911	28.08	28	26.61	25.86
	Min. Temp in °C	25.14	22.028	23.872	23.911	23.32	21.08	23.61	23.86
December	Max. Temp in °C	29.04	28.5	26.747	25.888	24.9	26.35	26.15	25.78
	Min. Temp in °C	24.28	21.58	23.747	23.888	20.14	19.43	23.15	23.78

	City	Panjim				Patna			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	29.57	28.78	26.82	25.9	24.19	25.99	26.05	25.76
	Min. Temp in °C	24.81	21.86	23.82	23.9	19.43	19.07	23.05	23.76
February	Max. Temp in °C	29.7	28.84	26.84	25.91	24.72	26.26	26.12	25.78
	Min. Temp in °C	24.94	21.86	23.84	23.91	19.96	19.07	23.12	23.78
March	Max. Temp in °C	29.89	28.94	26.87	25.91	27.13	27.51	26.47	25.84
	Min. Temp in °C	25.13	22.02	23.87	23.91	22.37	20.59	23.47	23.84
April	Max. Temp in °C	30.73	29.38	26.99	25.93	29.99	28.99	26.88	25.91
	Min. Temp in °C	25.97	22.46	23.99	23.93	25.23	22.07	23.88	23.91
May	Max. Temp in °C	31.27	29.66	27.07	25.95	31.44	29.74	27.09	25.95
	Min. Temp in °C	26.51	22.74	24.07	23.95	26.68	22.82	24.09	23.95
June	Max. Temp in °C	30.55	29.28	26.97	25.93	32.24	30.16	27.21	25.97
	Min. Temp in °C	25.79	22.36	23.97	23.93	27.48	23.24	24.21	23.97
July	Max. Temp in °C	29.77	28.88	26.85	25.91	31.44	29.74	27.09	25.95
	Min. Temp in °C	25.01	21.96	23.85	23.91	26.68	22.82	24.09	23.95
August	Max. Temp in °C	29.47	28.73	26.81	25.9	30.82	29.43	27.01	25.93
	Min. Temp in °C	24.71	21.81	23.81	23.9	26.06	22.51	24.01	23.93
September	Max. Temp in °C	29.79	28.89	26.86	25.91	30.9	29.47	27.02	25.94
	Min. Temp in °C	25.03	21.97	23.86	23.91	26.14	22.55	24.02	23.94
October	Max. Temp in °C	30.13	29.07	26.91	25.92	29.89	28.94	26.87	25.91
	Min. Temp in °C	25.37	22.15	23.91	23.92	25.13	22.02	23.87	23.91
November	Max. Temp in °C	30.48	29.25	26.95	25.93	27.99	27.96	26.6	25.86
	Min. Temp in °C	25.72	22.33	23.95	23.93	23.23	21.04	23.6	23.86
December	Max. Temp in °C	30.03	29.01	26.89	25.91	25.69	26.76	26.26	25.8
	Min. Temp in °C	25.27	22.09	23.89	23.91	20.93	19.84	23.26	23.8

	City	Pune				Rajkot			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	25.91	26.88	26.3	25.81	26.91	27.4	26.44	25.83
	Min. Temp in °C	21.15	19.96	23.3	23.81	22.15	20.48	23.44	23.83
February	Max. Temp in °C	26.44	27.15	26.37	25.82	27.66	27.78	26.55	25.85
	Min. Temp in °C	21.68	19.96	23.37	23.82	22.9	20.48	23.55	23.85
March	Max. Temp in °C	28.03	27.98	26.6	25.86	29.39	28.68	26.8	25.9
	Min. Temp in °C	23.27	21.06	23.6	23.86	24.63	21.76	23.8	23.9
April	Max. Temp in °C	29.78	28.89	26.85	25.91	31.41	29.73	27.09	25.95
	Min. Temp in °C	25.02	21.97	23.85	23.91	26.65	22.81	24.09	23.95
May	Max. Temp in °C	30.73	29.38	26.99	25.93	32.78	30.44	27.29	25.99
	Min. Temp in °C	25.97	22.46	23.99	23.93	28.02	23.52	24.29	23.99
June	Max. Temp in °C	30.29	29.15	26.93	25.92	33.05	30.58	27.33	25.99
	Min. Temp in °C	25.53	22.23	23.93	23.92	28.29	23.66	24.33	23.99
July	Max. Temp in °C	28.93	28.45	26.73	25.89	31.78	29.92	27.14	25.96
	Min. Temp in °C	24.17	21.53	23.73	23.89	27.02	23	24.14	23.96
August	Max. Temp in °C	28.28	28.11	26.64	25.87	30.63	29.33	26.98	25.93
	Min. Temp in °C	23.52	21.19	23.64	23.87	25.87	22.41	23.98	23.93
September	Max. Temp in °C	28.23	28.08	26.63	25.87	30.52	29.27	26.96	25.93
	Min. Temp in °C	23.47	21.16	23.63	23.87	25.76	22.35	23.96	23.93
October	Max. Temp in °C	28.75	28.35	26.71	25.88	31.16	29.6	27.05	25.94
	Min. Temp in °C	23.99	21.43	23.71	23.88	26.4	22.68	24.05	23.94
November	Max. Temp in °C	27.84	27.88	26.57	25.86	30.59	29.3	26.97	25.93
	Min. Temp in °C	23.08	20.96	23.57	23.86	25.83	22.38	23.97	23.93
December	Max. Temp in °C	26.44	27.15	26.37	25.82	28.65	28.3	26.69	25.88
	Min. Temp in °C	21.68	20.23	23.37	23.82	23.89	21.38	23.69	23.88

	City	Ratnagiri				Raipur			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	29.02	28.49	26.74	25.89	25.9	26.87	26.29	25.81
	Min. Temp in °C	24.26	21.57	23.74	23.89	21.14	19.95	23.29	23.81
February	Max. Temp in °C	28.8	28.37	26.71	25.88	26.99	27.44	26.45	25.84
	Min. Temp in °C	24.04	21.57	23.71	23.88	22.23	19.95	23.45	23.84
March	Max. Temp in °C	29.14	28.55	26.76	25.89	29.15	28.56	26.76	25.89
	Min. Temp in °C	24.38	21.63	23.76	23.89	24.39	21.64	23.76	23.89
April	Max. Temp in °C	29.97	28.98	26.88	25.91	31.47	29.76	27.1	25.95
	Min. Temp in °C	25.21	22.06	23.88	23.91	26.71	22.84	24.1	23.95
May	Max. Temp in °C	30.7	29.36	26.99	25.93	33.12	30.62	27.34	25.99
	Min. Temp in °C	25.94	22.44	23.99	23.93	28.36	23.7	24.34	23.99
June	Max. Temp in °C	30.52	29.27	26.96	25.93	32.87	30.49	27.3	25.99
	Min. Temp in °C	25.76	22.35	23.96	23.93	28.11	23.57	24.3	23.99
July	Max. Temp in °C	29.93	28.96	26.88	25.91	30.55	29.28	26.97	25.93
	Min. Temp in °C	25.17	22.04	23.88	23.91	25.79	22.36	23.97	23.93
August	Max. Temp in °C	29.44	28.71	26.81	25.9	29.95	28.97	26.88	25.91
	Min. Temp in °C	24.68	21.79	23.81	23.9	25.19	22.05	23.88	23.91
September	Max. Temp in °C	29.48	28.73	26.81	25.9	30.03	29.01	26.89	25.91
	Min. Temp in °C	24.72	21.81	23.81	23.9	25.27	22.09	23.89	23.91
October	Max. Temp in °C	29.86	28.93	26.87	25.91	29.85	28.92	26.86	25.91
	Min. Temp in °C	25.1	22.01	23.87	23.91	25.09	22	23.86	23.91
November	Max. Temp in °C	30.25	29.13	26.92	25.92	28.38	28.16	26.65	25.87
	Min. Temp in °C	25.49	22.21	23.92	23.92	23.62	21.24	23.65	23.87
December	Max. Temp in °C	29.63	28.81	26.83	25.9	26.84	27.36	26.43	25.83
	Min. Temp in °C	24.87	21.89	23.83	23.9	22.08	20.44	23.43	23.83

	City	Ramagundam				Ranchi			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	27.35	27.63	26.5	25.84	24.06	25.92	26.03	25.76
	Min. Temp in °C	22.59	20.71	23.5	23.84	19.3	19	23.03	23.76
February	Max. Temp in °C	28.48	28.21	26.67	25.87	24.64	26.22	26.11	25.77
	Min. Temp in °C	23.72	20.71	23.67	23.87	19.88	19	23.11	23.77
March	Max. Temp in °C	30.01	29	26.89	25.91	26.87	27.38	26.43	25.83
	Min. Temp in °C	25.25	22.08	23.89	23.91	22.11	20.46	23.43	23.83
April	Max. Temp in °C	32.04	30.06	27.18	25.97	29.52	28.75	26.82	25.9
	Min. Temp in °C	27.28	23.14	24.18	23.97	24.76	21.83	23.82	23.9
May	Max. Temp in °C	33.61	30.87	27.41	26.01	30.94	29.49	27.02	25.94
	Min. Temp in °C	28.85	23.95	24.41	24.01	26.18	22.57	24.02	23.94
June	Max. Temp in °C	33.25	30.68	27.36	26	31.18	29.61	27.06	25.94
	Min. Temp in °C	28.49	23.76	24.36	24	26.42	22.69	24.06	23.94
July	Max. Temp in °C	31.15	29.59	27.05	25.94	29.97	28.98	26.88	25.91
	Min. Temp in °C	26.39	22.67	24.05	23.94	25.21	22.06	23.88	23.91
August	Max. Temp in °C	30.3	29.15	26.93	25.92	29.07	28.52	26.75	25.89
	Min. Temp in °C	25.54	22.23	23.93	23.92	24.31	21.6	23.75	23.89
September	Max. Temp in °C	30.55	29.28	26.97	25.93	28.95	28.46	26.74	25.89
	Min. Temp in °C	25.79	22.36	23.97	23.93	24.19	21.54	23.74	23.89
October	Max. Temp in °C	30.36	29.19	26.94	25.92	28.42	28.18	26.66	25.87
	Min. Temp in °C	25.6	22.27	23.94	23.92	23.66	21.26	23.66	23.87
November	Max. Temp in °C	28.99	28.47	26.74	25.89	26.93	27.41	26.44	25.83
	Min. Temp in °C	24.23	21.55	23.74	23.89	22.17	20.49	23.44	23.83
December	Max. Temp in °C	27.5	27.7	26.52	25.85	25.22	26.52	26.2	25.79
	Min. Temp in °C	22.74	20.78	23.52	23.85	20.46	19.6	23.2	23.79

	City	Raxaul				Solapur			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	23.66	25.71	25.97	25.75	28.37	28.15	26.65	25.87
	Min. Temp in °C	18.9	18.79	22.97	23.75	23.61	21.23	23.65	23.87
February	Max. Temp in °C	23.8	25.78	25.99	25.75	29.16	28.56	26.76	25.89
	Min. Temp in °C	19.04	18.79	22.99	23.75	24.4	21.23	23.76	23.89
March	Max. Temp in °C	25.39	26.61	26.22	25.79	30.92	29.47	27.02	25.94
	Min. Temp in °C	20.63	19.69	23.22	23.79	26.16	22.55	24.02	23.94
April	Max. Temp in °C	27.96	27.94	26.59	25.86	32.37	30.23	27.23	25.97
	Min. Temp in °C	23.2	21.02	23.59	23.86	27.61	23.31	24.23	23.97
May	Max. Temp in °C	30.26	29.13	26.92	25.92	32.85	30.48	27.3	25.99
	Min. Temp in °C	25.5	22.21	23.92	23.92	28.09	23.56	24.3	23.99
June	Max. Temp in °C	31.09	29.56	27.04	25.94	32.15	30.12	27.2	25.97
	Min. Temp in °C	26.33	22.64	24.04	23.94	27.39	23.2	24.2	23.97
July	Max. Temp in °C	31.01	29.52	27.03	25.94	30.75	29.39	26.99	25.93
	Min. Temp in °C	26.25	22.6	24.03	23.94	25.99	22.47	23.99	23.93
August	Max. Temp in °C	30.88	29.45	27.01	25.94	29.74	28.86	26.85	25.91
	Min. Temp in °C	26.12	22.53	24.01	23.94	24.98	21.94	23.85	23.91
Septem-ber	Max. Temp in °C	30.56	29.29	26.97	25.93	29.94	28.97	26.88	25.91
	Min. Temp in °C	25.8	22.37	23.97	23.93	25.18	22.05	23.88	23.91
October	Max. Temp in °C	29.64	28.81	26.83	25.9	29.86	28.93	26.87	25.91
	Min. Temp in °C	24.88	21.89	23.83	23.9	25.1	22.01	23.87	23.91
November	Max. Temp in °C	27.73	27.82	26.56	25.85	29.53	28.76	26.82	25.9
	Min. Temp in °C	22.97	20.9	23.56	23.85	24.77	21.84	23.82	23.9
December	Max. Temp in °C	25.47	26.65	26.23	25.8	28.91	28.44	26.73	25.89
	Min. Temp in °C	20.71	19.73	23.23	23.8	24.15	21.52	23.73	23.89

	City	Saharanpur				Shilong			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	21.69	24.69	25.69	25.7	19.16	23.38	25.32	25.63
	Min. Temp in °C	16.93	17.77	22.69	23.7	14.4	16.46	22.32	23.63
February	Max. Temp in °C	22.46	25.09	25.8	25.72	19.37	23.49	25.35	25.64
	Min. Temp in °C	17.7	17.77	22.8	23.72	14.61	16.46	22.35	23.64
March	Max. Temp in °C	24.41	26.1	26.08	25.77	20.66	24.16	25.54	25.67
	Min. Temp in °C	19.65	19.18	23.08	23.77	15.9	17.24	22.54	23.67
April	Max. Temp in °C	27.21	27.55	26.48	25.84	22.62	25.17	25.82	25.72
	Min. Temp in °C	22.45	20.63	23.48	23.84	17.86	18.25	22.82	23.72
May	Max. Temp in °C	29.2	28.58	26.77	25.89	24.16	25.97	26.04	25.76
	Min. Temp in °C	24.44	21.66	23.77	23.89	19.4	19.05	23.04	23.76
June	Max. Temp in °C	30.32	29.16	26.93	25.92	25.09	26.45	26.18	25.79
	Min. Temp in °C	25.56	22.24	23.93	23.92	20.33	19.53	23.18	23.79
July	Max. Temp in °C	31.18	29.61	27.06	25.94	25.47	26.65	26.23	25.8
	Min. Temp in °C	26.42	22.69	24.06	23.94	20.71	19.73	23.23	23.8
August	Max. Temp in °C	30.88	29.45	27.01	25.94	25.61	26.72	26.25	25.8
	Min. Temp in °C	26.12	22.53	24.01	23.94	20.85	19.8	23.25	23.8
September	Max. Temp in °C	30.18	29.09	26.91	25.92	25.32	26.57	26.21	25.79
	Min. Temp in °C	25.42	22.17	23.91	23.92	20.56	19.65	23.21	23.79
October	Max. Temp in °C	28.32	28.13	26.64	25.87	24.27	26.03	26.06	25.76
	Min. Temp in °C	23.56	21.21	23.64	23.87	19.51	19.11	23.06	23.76
November	Max. Temp in °C	25.59	26.71	26.25	25.8	22.23	24.97	25.76	25.71
	Min. Temp in °C	20.83	19.79	23.25	23.8	17.47	18.05	22.76	23.71
December	Max. Temp in °C	23.1	25.42	25.89	25.73	20.21	23.92	25.47	25.66
	Min. Temp in °C	18.34	18.5	22.89	23.73	15.45	17	22.47	23.66

	City	Surat				Thiruvananthapuram			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	27.43	27.67	26.51	25.85	29.97	28.98	26.88	25.91
	Min. Temp in °C	22.67	20.75	23.51	23.85	25.21	22.06	23.88	23.91
February	Max. Temp in °C	28.13	28.03	26.62	25.86	30	29	26.89	25.91
	Min. Temp in °C	23.37	20.75	23.62	23.86	25.24	22.06	23.89	23.91
March	Max. Temp in °C	29.15	28.56	26.76	25.89	30.45	29.23	26.95	25.93
	Min. Temp in °C	24.39	21.64	23.76	23.89	25.69	22.31	23.95	23.93
April	Max. Temp in °C	30.86	29.44	27.01	25.94	30.91	29.47	27.02	25.94
	Min. Temp in °C	26.1	22.52	24.01	23.94	26.15	22.55	24.02	23.94
May	Max. Temp in °C	31.91	29.99	27.16	25.96	30.8	29.41	27	25.93
	Min. Temp in °C	27.15	23.07	24.16	23.96	26.04	22.49	24	23.93
June	Max. Temp in °C	31.89	29.98	27.16	25.96	30.33	29.17	26.93	25.92
	Min. Temp in °C	27.13	23.06	24.16	23.96	25.57	22.25	23.93	23.92
July	Max. Temp in °C	31.04	29.54	27.04	25.94	29.77	28.88	26.85	25.91
	Min. Temp in °C	26.28	22.62	24.04	23.94	25.01	21.96	23.85	23.91
August	Max. Temp in °C	30.34	29.18	26.94	25.92	29.63	28.81	26.83	25.9
	Min. Temp in °C	25.58	22.26	23.94	23.92	24.87	21.89	23.83	23.9
September	Max. Temp in °C	30.36	29.19	26.94	25.92	29.8	28.9	26.86	25.91
	Min. Temp in °C	25.6	22.27	23.94	23.92	25.04	21.98	23.86	23.91
October	Max. Temp in °C	30.78	29.4	27	25.93	29.89	28.94	26.87	25.91
	Min. Temp in °C	26.02	22.48	24	23.93	25.13	22.02	23.87	23.91
November	Max. Temp in °C	30.18	29.09	26.91	25.92	29.73	28.86	26.85	25.91
	Min. Temp in °C	25.42	22.17	23.91	23.92	24.97	21.94	23.85	23.91
December	Max. Temp in °C	28.46	28.2	26.66	25.87	29.93	28.96	26.88	25.91
	Min. Temp in °C	23.7	21.28	23.66	23.87	25.17	22.04	23.88	23.91

	City	Tiruchchirapalli				Tezpur			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	29	28.48	26.74	25.89	24.59	26.19	26.11	25.77
	Min. Temp in °C	24.24	21.56	23.74	23.89	19.83	19.27	23.11	23.77
February	Max. Temp in °C	29.62	28.8	26.83	25.9	25.09	26.45	26.18	25.79
	Min. Temp in °C	24.86	21.56	23.83	23.9	20.33	19.27	23.18	23.79
March	Max. Temp in °C	30.87	29.45	27.01	25.94	26.64	27.26	26.4	25.83
	Min. Temp in °C	26.11	22.53	24.01	23.94	21.88	20.34	23.4	23.83
April	Max. Temp in °C	32.24	30.16	27.21	25.97	28	27.96	26.6	25.86
	Min. Temp in °C	27.48	23.24	24.21	23.97	23.24	21.04	23.6	23.86
May	Max. Temp in °C	32.44	30.26	27.24	25.98	28.74	28.35	26.7	25.88
	Min. Temp in °C	27.68	23.34	24.24	23.98	23.98	21.43	23.7	23.88
June	Max. Temp in °C	32.1	30.09	27.19	25.97	30.14	29.07	26.91	25.92
	Min. Temp in °C	27.34	23.17	24.19	23.97	25.38	22.15	23.91	23.92
July	Max. Temp in °C	32.1	30.09	27.19	25.97	30.48	29.25	26.96	25.93
	Min. Temp in °C	27.34	23.17	24.19	23.97	25.72	22.33	23.96	23.93
August	Max. Temp in °C	32.13	30.11	27.19	25.97	30.54	29.28	26.96	25.93
	Min. Temp in °C	27.37	23.19	24.19	23.97	25.78	22.36	23.96	23.93
September	Max. Temp in °C	31.77	29.92	27.14	25.96	30.29	29.15	26.93	25.92
	Min. Temp in °C	27.01	23	24.14	23.96	25.53	22.23	23.93	23.92
October	Max. Temp in °C	30.92	29.48	27.02	25.94	29.43	28.7	26.8	25.9
	Min. Temp in °C	26.16	22.56	24.02	23.94	24.67	21.78	23.8	23.9
November	Max. Temp in °C	30.15	29.07	26.91	25.92	27.9	27.91	26.58	25.86
	Min. Temp in °C	25.39	22.15	23.91	23.92	23.14	20.99	23.58	23.86
December	Max. Temp in °C	29.47	28.72	26.81	25.9	25.87	26.86	26.29	25.81
	Min. Temp in °C	24.71	21.8	23.81	23.9	21.11	19.94	23.29	23.81

	City	Varanasi				Veraval			
Months	**90% acceptability range**	**NV**	**MM**	**AC air temp**	**AC std eftv**	**NV**	**MM**	**AC air temp**	**AC std eftv**
January	Max. Temp in °C	23.67	25.71	25.97	25.75	27.86	27.89	26.58	25.86
	Min. Temp in °C	18.91	18.79	22.97	23.75	23.1	20.97	23.58	23.86
February	Max. Temp in °C	24.65	26.22	26.11	25.77	28.01	27.97	26.6	25.86
	Min. Temp in °C	19.89	18.79	23.11	23.77	23.25	20.97	23.6	23.86
March	Max. Temp in °C	28.09	28.01	26.61	25.86	28.57	28.26	26.68	25.88
	Min. Temp in °C	23.33	21.09	23.61	23.86	23.81	21.34	23.68	23.88
April	Max. Temp in °C	30.74	29.38	26.99	25.93	29.98	28.99	26.88	25.91
	Min. Temp in °C	25.98	22.46	23.99	23.93	25.22	22.07	23.88	23.91
May	Max. Temp in °C	32.26	30.17	27.21	25.97	30.74	29.38	26.99	25.93
	Min. Temp in °C	27.5	23.25	24.21	23.97	25.98	22.46	23.99	23.93
June	Max. Temp in °C	32.64	30.37	27.27	25.98	31.37	29.71	27.08	25.95
	Min. Temp in °C	27.88	23.45	24.27	23.98	26.61	22.79	24.08	23.95
July	Max. Temp in °C	31.82	29.94	27.15	25.96	31.14	29.59	27.05	25.94
	Min. Temp in °C	27.06	23.02	24.15	23.96	26.38	22.67	24.05	23.94
August	Max. Temp in °C	31.12	29.58	27.05	25.94	30.48	29.25	26.96	25.93
	Min. Temp in °C	26.36	22.66	24.05	23.94	25.72	22.33	23.96	23.93
September	Max. Temp in °C	31.14	29.59	27.05	25.94	30.43	29.22	26.95	25.92
	Min. Temp in °C	26.38	22.67	24.05	23.94	25.67	22.3	23.95	23.92
October	Max. Temp in °C	30.18	29.09	26.91	25.92	30.82	29.43	27.01	25.93
	Min. Temp in °C	25.42	22.17	23.91	23.92	26.06	22.51	24.01	23.93
November	Max. Temp in °C	28.39	28.16	26.65	25.87	30.53	29.28	26.96	25.93
	Min. Temp in °C	23.63	21.24	23.65	23.87	25.77	22.36	23.96	23.93
December	Max. Temp in °C	26.08	26.97	26.32	25.81	29.06	28.51	26.75	25.89
	Min. Temp in °C	21.32	20.05	23.32	23.81	24.3	21.59	23.75	23.89

APPENDIX 5

COMFORT SURVEY FORM

This survey is aimed at assessing the thermal, visual, and acoustic comfort levels of occupants in the building. Additionally, areas of improvement in the building systems can be identified through the survey. This is an attempt to make improvements in the systems, thereby enhancing the comfort of the occupants, providing a better working environment, and increasing productivity.

- What is the name of your building?

.....

- How many years have you been working/residing in this building?

☐ Less than 1 year ☐ 1–3 years
☐ 3–5 years ☐ More than 5 years

- On which floor is your seating area located (if applicable) ?

.....

- In which orientation is your seating located (if applicable) ?

☐ North ☐ South
☐ East ☐ West

- What does your seating face?

☐ Directly faces the window
☐ Side facing towards window
☐ Towards other people
☐ Towards the wall

- Which of the following can you manually control in your workspace (check all that apply)?

☐ Window blinds or shades
☐ Operable window
☐ Room air conditioning unit
☐ Portable fan
☐ Ceiling fan
☐ Adjustable air vent in wall or ceiling
☐ Adjustable floor air vents (diffuser)
☐ Door to interior space
☐ Door to exterior space
☐ None of the above
☐ Others

- How satisfied are you with the temperature in your workspace? Rate it on scale of 1 to 5, where 1 is equivalent to "Very Dissatisfied" and 5 is equivalent to "Very Satisfied".

☐1 ☐2 ☐3 ☐4 ☐5

- Which of the following controls do you have in your workspace (check all that apply)?

☐ Light switch
☐ Light dimmer
☐ Window blinds or shades Desk (task) light
☐ None of the above
☐ Others

- How satisfied are you with the lighting (visual comfort, e.g., glare, reflections, contrast)? Rate it on scale of 1 to 5, where 1 is equivalent to "Very Dissatisfied" and 5 is equivalent to "Very Satisfied".

☐1 ☐2 ☐3 ☐4 ☐5

- How satisfied are you with the noise level in your workspace? Rate it on scale of 1 to 5, where 1 is equivalent to "Very Dissatisfied" and 5 is equivalent to "Very Satisfied".
  ☐1 ☐2 ☐3 ☐4 ☐5
- How would you rate the indoor air quality of this building?
  ☐ Good ☐ Average ☐Poor
- If average or poor then does the problem occur more frequently during specific seasons of the year?
  ☐ Yes ☐No ☐Don't Know ☐Not Applicable
- If "Yes", then, rate each season from 1 to 4, where 1 signifies Worst Case and 4 signifies Best Case, where in Best case means no or little problem with the indoor air quality during that particular season.

  ☐Winter Season: January–February

  ☐ Pre-Monsoon Season (summer): March–May

  ☐Southwest Monsoon Season: June–September

  ☐Post-Monsoon Season: October–December
- If "Yes", then, when is the indoor air quality at its worst?
  ☐ Morning ☐Afternoon ☐All day ☐Not applicable

A GRIHA Council - TERI initiative

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