



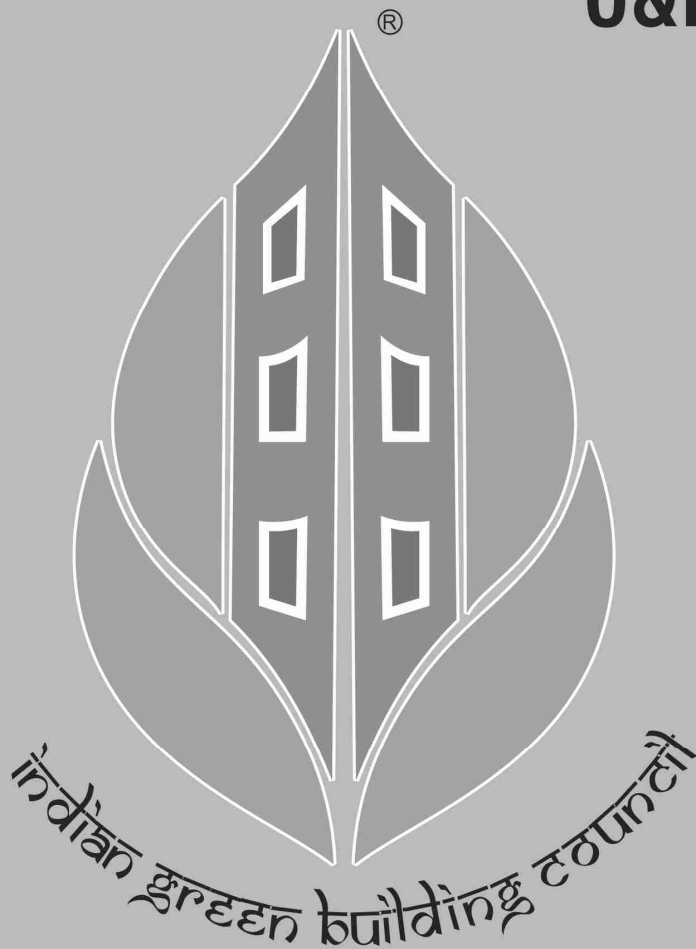
IGBC Green Existing Buildings

Operations & Maintenance

IGBC Green Existing Buildings O&M Rating System

Pilot Version

Abridged Reference Guide
April 2013



www.igbc.in

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Foreword from the Indian Green Building Council (IGBC)

India is witnessing tremendous growth in infrastructure and construction development. The construction industry in India is one of the largest economic activities and is growing rapidly. As the sector is growing rapidly, preserving the environment poses a host of challenges. To enable the construction industry to be environmentally sensitive, CII has established the Indian Green Building Council (IGBC). IGBC is a consensus driven not-for-profit council representing the building industry, consisting of more than 1400 committed members. The council encourages architects, builders, developers and owners to build green to enhance the economic and environmental performance of buildings.

The Green Building Movement in India has been spearheaded by IGBC since 2001, by creating national awareness. The council's activities have enabled a market transformation with regard to green building concepts, materials and technologies.

IGBC continuously works to provide tools that facilitate the adoption of green building practices in India. The development of IGBC Green Existing Buildings O&M Rating System is another important step in this direction.

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I. Introduction

The building footprint in India is growing at a rapid pace and is contributing immensely to the growth of the economy. This augurs well for the country and now there is an imminent need to introduce green building concepts in this sector, which can aid growth in a sustainable manner.

Green practices in the existing buildings can help address national issues like water efficiency, energy efficiency, reduction in fossil fuel use in commuting, handling of waste and conserving natural resources. Most importantly, these concepts can enhance occupant health, happiness and well-being.

Against this background, the Indian Green Building Council (IGBC) has launched 'IGBC Green Existing Building O&M Rating System' to address the National priorities. By applying IGBC Green Existing Building O&M criteria, existing buildings can be sustainable over the life cycle of the building. This rating programme enables the building owner / developer to apply green concepts and criteria, so as to reduce the environmental impacts, which are measurable. The programme covers methodologies to cover diverse climatic zones and changing lifestyles.

IGBC Green Existing Building O&M is the first rating programme developed in India, exclusively for existing building stock. It is based on accepted environmental principles and strikes a balance between known established practices and emerging concepts. The system is designed to be comprehensive in scope, yet simple in operation.

II. Benefits of Green Existing Buildings

Green existing buildings can have tremendous benefits, both tangible and intangible. The most tangible benefits are the reduction in water & energy consumption. The operational savings through energy & water efficiency could range from 15 - 30 %. The consumer waste generated in the building can also be substantially reduced. Intangible benefits of green existing buildings include enhanced air quality, health & higher satisfaction levels of occupants.

III. National Priorities Addressed in the Rating System

The Green Existing Buildings O&M Rating System addresses the most important National priorities which include water conservation, energy efficiency, handling of waste, reduced use of fossil fuels, lesser dependence on usage of virgin materials and health & well-being of occupants.

❖ Water Conservation:

Most of the Asian countries are water stressed and in countries like India, the water table has reduced drastically over the last decade. Green Existing Buildings O&M Rating System encourages use of water in a self-sustainable manner through reducing, recycling and reusing strategies. By adopting this rating programme, green existing buildings can save potable water to an extent of 15 – 30%.

❖ **Handling of Consumer Waste:**

Handling of waste in existing buildings is extremely difficult as most of the waste generated is not segregated at source and has a high probability of going to land-fills. This continues to be a challenge to the municipalities which needs to be addressed. IGBC intends to address this by encouraging green existing buildings to segregate the building waste.

❖ **Energy Efficiency:**

The building sector is a large consumer of electrical energy. Through IGBC Green Existing Building O&M rating system, buildings have scope to reduce energy consumption through energy efficient-lighting, air conditioning systems, motors, pumps etc., The operational energy savings that can be realised by adopting this rating programme can be to the tune of 15 – 30%.

❖ **Reduced Dependency on Virgin Materials:**

The rating system encourages projects to use recycled materials, and discourages the use of virgin wood during renovation, thereby, addressing environmental impacts associated with extraction and processing of virgin materials.

❖ **Health and Well-being of Occupants:**

Health and well-being of occupants is the most important aspect of Green Existing Buildings. IGBC Green Existing Buildings O&M Rating System ensures minimum ventilation aspects, occupant well-being facilities which are critical in a building. The rating system also recognises measures to minimise the indoor air pollutants.

IV. IGBC Green Existing Buildings O&M

IGBC has set up the Green Existing Buildings O&M Committee to focus on Existing Buildings. The committee includes facility managers, corporate, government, builders, developers, architects, consultants, manufacturers and industry representatives. The varied experience and professions of the members brings in a holistic perspective in the process of developing the rating programme.

A. Evolution of the Rating System

IGBC, in its endeavor to extend green building concepts to all building types envisioned a rating programme exclusively for Existing Buildings O&M. The rating system will be subject to review by the committee, every year, to ensure that it is updated and contemporary. The rating system encourages the use of Indian building codes and standards.

B. Features of IGBC Green Existing Buildings O&M

IGBC Green Existing Buildings O&M Rating System is a voluntary and consensus based programme. The rating is focused on sustained performance of buildings with respect to the green features. The overarching objective of this rating system is to facilitate building owners & facility managers in implementation of green strategies, measure their impacts and sustain the performance in the long run.

IGBC Green Existing Buildings O&M Rating System is fundamentally designed to address national priorities of resource conservation while providing quality of life for occupants. The rating programme uses well accepted National standards and wherever local or National standards are not available, appropriate international benchmarks have been considered.

Some of the unique features of IGBC Green Existing Buildings O&M Rating System are as follows:-

- Focus is on implementation and results achieved
- Documentation requirements have been drastically reduced. Instead, it is more of evidence like photos and calculations
- The rating can be applied to both air-conditioned and non-air conditioned buildings
- The rating is designed to suit all building types in all climatic zones. Exclusions are residential and Factory buildings for which IGBC's existing ratings can be applied
- Water being of prime national concern, is given higher weightage
- For energy related aspects, Energy Conservation Building Code (ECBC) or the Energy Performance Index (EPI) as recommended by Bureau of Energy Efficiency (BEE), is the reference standard.
- Buildings are all about people. A separate module called 'health and comfort' is included, to address health and wellbeing of occupants in the buildings.

C. When to use IGBC Green Existing Buildings O&M Rating

- The pilot version of IGBC Existing Buildings O&M rating system is applicable for all types of non-residential buildings including office buildings, IT Parks, BPOs, shopping malls, hotels, hospitals, airports, banks, etc. Building types such as factory and schools will be covered under respective IGBC rating programmes.
- Buildings which are 80% occupied (with respect to the carpet area) and operational for a minimum of 1 year are eligible for certification under IGBC Existing Buildings O&M rating.
- Projects already certified and operational for more than 1 year are also eligible to apply for IGBC Existing Buildings O&M certification
- Campus projects having multiple buildings can be considered as one single project for registration and certification. However each building has to individually conform to the energy, water and fresh air mandatory requirements.

V. IGBC Green Existing Buildings O&M Certification Process

IGBC Green Existing Buildings O&M rating system addresses green features under the following categories:

- Site & Facility Management
- Water Efficiency
- Energy Efficiency
- Health & Comfort
- Innovation

a. IGBC Green Existing Buildings O&M Registration

Project teams interested in IGBC Green Existing Buildings O&M Certification for their project must first register with IGBC. Projects can be registered on IGBC website (www.igbc.in) under ‘IGBC Green Existing Buildings O&M’. The website includes information on registration fee for IGBC member companies as well as non-members. Registration is the initial step which helps establish contact with IGBC and provides access to the required documents, templates, important communications and other necessary information.

IGBC web site will have all important details on IGBC Green Existing Buildings O&M registration & certification - process, schedule and fee.

b. Certification

To achieve the IGBC Green Existing Building O&M certification, the project must satisfy all the mandatory requirements and the minimum number of credit points.

The project team is expected to provide supporting documents at preliminary and final stage of submission for all the mandatory requirements and the credits attempted.

Projects need to submit the following:

- a. A brief stating project type, age of building, different type of spaces, number of floors, area statement, occupancy, building photographs etc.,
- b. Filled-in Master Template (in excel format)
- c. Narratives and supporting documentation such as calculations (in excel sheets), plans, declarations/ contract documents, utility bills, purchase invoices, manufacturer cut-sheets/ letters/ material test reports, etc., for each mandatory requirement/ credit

The necessary details are mentioned in this guide, under each mandatory requirement and credit. Documentation is submitted in two phases – preliminary submittal and final submittal:

- ❖ The preliminary submission involves all mandatory requirements and minimum number of credits. After preliminary submission, review is done by third party assessors and review comments would be provided within 30 days.
- ❖ The next phase involves submission of clarifications to preliminary review queries and final submittal. The final review will also be provided within 30 days, indicating the rating achieved.

It is important to note that the mandatory requirements/ credits earned during the preliminary review are only considered as anticipated. These mandatory requirements/ credits are not awarded until the final documents are submitted. If there are changes in any ‘credit anticipated’ after preliminary review, these changes need to be documented and resubmitted during the final review.

The threshold criteria for certification levels are as under:

Certification Level	Points	Recognition
Certified	50-59	Best Practices
Silver	60-69	Outstanding Performance
Gold	70-79	National Excellence
Platinum	80-100	Global Leadership

IGBC will recognise existing buildings that achieve the rating with a formal letter of certification and a mountable plaque.

c. Validity of IGBC Existing Buildings O&M Certification

- IGBC Existing Buildings O&M rating is valid for a period of 3 years from the date of issue of the certification.
- For recertification, the projects have to show compliance to the latest version of IGBC Existing Buildings O&M rating prevailing at the time of recertification

d. Credit Interpretation Ruling

In some instances, the project team can face certain challenges in applying or interpreting a mandatory requirement or a credit. It can also happen in cases where the project can opt to achieve the same intent through a different compliance path.

In such cases IGBC uses the process of ‘Credit Interpretation Ruling’ (CIR) wherein projects post the issue faced and seek the clarification. Such clarification is provided in the form of ruling which would be in the public domain and are applicable to other projects as well, effective from the date of ruling.

The following are the steps to be followed in seeking a CIR:

- ❖ Refer the abridged reference guide for description of the mandatory requirement / credit intent, compliance options and documentation requirements
- ❖ Review the intent of the mandatory requirement/ credit and evaluate whether the project satisfies the intent.
- ❖ Review the Credit Interpretation web page for previous CIRs on the relevant mandatory requirement or credit. All projects registered under IGBC Green Existing Building will have access to this page.
- ❖ If a similar CIR has not been addressed or does not sufficiently answer the question, submit a credit interpretation request. Only registered projects are eligible to post CIRs. Two CIRs are answered without levying any fee and for any CIR beyond first two CIRs, a fee is levied to cover the professional administrative fee involved.

e. Appeal

In rare cases, mandatory requirements or credits may be denied due to misinterpretation of the intent. On receipt of the final review, if the project team feels that sufficient grounds exist to appeal a credit denied in the final review, the project has an option to appeal to IGBC for reassessment of denied mandatory requirements or credits. The documentation for the mandatory requirements or credits seeking appeal may be resubmitted to IGBC along with necessary fee. IGBC will take 30 days to review such documentation. If an appeal is pursued, please note that a different review team will be assessing the appeal documentation.

f. Fee

Registration, Certification and CIR fee details are available on IGBC website (www.igbc.in).

VI. Updates and Addenda

This is the pilot version of IGBC Green Existing Building O&M Abridged Reference Guide. As the rating system continues to improve and evolve, updates, addenda and errata to the abridged reference guide will be made available through IGBC website. These additions will be incorporated in the next version of the rating system.

VII. IGBC Existing Buildings O&M Checklist

		Credit Points
Site & Facility Management (Maximum 18 Points)		
SF Mandatory Requirement 1	Green Policy	Required
SF Mandatory Requirement 2	Waste Collection & Disposal	Required
SF Credit 1	Eco-friendly Commuting Practices: 25%, 50%	4
SF Credit 2	Eco-friendly Landscaping Practices: 50%, 75%	2
SF Credit 3.1	Heat Island Reduction, Non-roof: 50%, 75%	4
SF Credit 3.2	Heat Island Reduction, Roof: 50%, 75%	4
SF Credit 4	Outdoor Light Pollution Reduction	2
SF Credit 5	Building Operations & Maintenance	2
		18
Water Efficiency (Maximum 26 Points)		
WE Mandatory Requirement	Water Efficient Fixtures	Required
WE Credit 1	Water Efficient Fixtures: 20%,30%,40%	6
WE Credit 2	Rain Water Harvesting: 25%, 50%	4
WE Credit 3	Waste Water Treatment, 100%	4
WE Credit 4	Waste Water Reuse, 75%, 100%	4
WE Credit 5	Water Metering	4
WE Credit 6	Turf Area: 50%, 25%	4
		26

Energy Efficiency (Maximum 30 Points)		
EE Mandatory Requirement 1	Eco-friendly Refrigerants & Halons	Required
EE Mandatory Requirement 2	Minimum Energy Performance	Required
EE Credit 1	Improved Energy Performance : 10%, 12.5%, 15%, 17.5%, 20%, 22.5%, 25%	14
EE Credit 2	On site Renewable Energy: 2.5%, 5%, 7.5%	6
EE Credit 3	Off Site Renewable Energy: 25%, 50%, 75%	6
EE Credit 4	Energy Metering	4
		30
Health & Comfort (Maximum 14 Points)		
HC Mandatory Requirement 1	Tobacco Smoke Control	Required
HC Mandatory Requirement 2	Fresh Air Ventilation	Required
HC Credit 1	Carbon dioxide Monitoring & Control	2
HC Credit 2	Isolation of Polluting Equipment & Systems	2
HC Credit 3	Eco-friendly Housekeeping Chemicals	2
HC Credit 4	Thermal Comfort, Indoor Temperature & RH	2
HC Credit 5	Facilities for Differently Abled People	4
HC Credit 6	Occupant Well-being Facilities	2
		14
Innovation Category (Maximum 12 Points)		
INN Credit 1.1 – 1.5	Innovation Credits	10
INN Credit 2	IGBC AP	2
		12
Total		100

Certification Level	Points	Recognition
Certified	50-59	Best Practices
Silver	60-69	Outstanding Performance
Gold	70-79	National Excellence
Platinum	80-100	Global Leadership

Site & Facility Management

SF Mandatory Requirement 1

Green Policy

Intent

To adopt green practices as and when the buildings go for retrofitting and renovation, thereby reducing the environmental impacts.

Compliance Options

To ensure that the building conforms to the requirements of the local bylaws, provide a declaration from the building owner stating that the required clearances from all regulatory bodies are in place.

Have a policy in place which mandates the adoption of atleast 3 of the following eco friendly practices during renovation of the building.

- Building materials including interior materials to have atleast 10% recycled content, by cost
- 50% of the wood materials to have FSC or PEFC or equivalent certification
- 50% of waste generated (by weight or volume) on site do not go to a landfill
- Paints and adhesives to have low VOC
- Workmen involved in the construction to be provided with restrooms and safe drinking water facility.
- All appliances purchased to have BEE 3 star or above rating. This applies to appliances for which the BEE star labeling program is in place.

Note:

Refer Annexure I for VOC limits of materials

Documentation Required

- Declaration from the building owner stating that the required clearances from all regulatory bodies are in place
- Organisational policy signed by the building owner, mandating the use of eco-friendly materials for any future renovation activities
- Projects while applying recertification, have to submit narratives, calculations, photographs, letters, certificates (as applicable), for showing compliance to the above measures
- Strategies to implement the green policy

SF Mandatory Requirement 2

Waste Collection & Disposal

Intent

Segregate building waste at source and facilitate proper disposal for recycling, thereby avoiding such waste being sent to land fills

Compliance Options

- Demonstrate an ongoing solid waste collection and disposal system to include both hazardous & non-hazardous waste.

Hazardous waste includes e-waste, batteries, lamps etc and non-hazardous waste includes paper, plastic, metals, organic waste, etc. The project has to follow the Hazardous Waste management Guidelines as prescribed by Ministry of Environment & Forest (MoEF), Government of India.

- Have provision to segregate atleast food, e-waste, metals, plastic and paper in the central waste collection area

Documentation Required

- List of waste generated, quantities and locations to which they were sent during the preceding 1 year.
- Certificates / letters from manufacturers/ recyclers indicating the type of waste and quantity received
- Photographs of central waste collection area

SF Credit 1

Eco-friendly Commuting Practices : 25%, 50%

Points : 2, 4

Intent

Reduce air pollution and land development impacts from personal automobile use.

Compliance Option

Provide shuttle services to nearest public transportation facility (OR) Provide bus pool / van pool facilities to pick and drop permanent occupants to their residential places.

Points are awarded as below:

Percentage of occupants served with shuttle or bus/ van pool services	Points
25%	2
50%	4

Exemplary Performance

The project is eligible for exemplary performance under Innovation category, if more than 75% of permanent building occupants are provided with vehicle pool facilities / shuttle services

Documentation Required

- Contract for engaging bus/ van pools or shuttle services in place (as applicable)
- Details including number of bus or van pools along with their route and frequency

SF Credit 2

Eco-friendly Landscaping Practices: 50%, 75%

Points : 1, 2

Intent

Adopt eco-friendly landscaping practices to minimise the impact of chemicals on ecology

Compliance Options

Have in place, eco-friendly landscaping practices such as use of organic fertilisers and / or use of locally adaptive plants for a minimum of 50% of the landscape requirements.

Points are awarded as follows:

Percentage of organic fertilisers used and / or use of locally adaptive plants	Points
50%	1
75%	2

This credit is applicable for projects where in the landscape area is greater than or equal to 15% of the overall site area. This can also include roof gardens and vertical landscaping.

Documentation Required

- Total quantity and type of fertilisers used for the last 1 year
- Details & quantity of organic fertilisers used in the last 1 year
- List of native/ adaptive species
- Landscape plan highlighting the area of native/adaptive species

Exemplary Performance

The project is eligible for exemplary performance under Innovation category, if 95% of the fertilisers used in the project are organic in nature.

SF Credit 3.1

Heat Island Reduction, Non-roof: 50%, 75%

Points : 2, 4

Intent

Minimise heat island effect to reduce impact on microclimate.

Compliance Options

For exposed non-roof hardscape areas (such as footpaths, pathways, roads, uncovered surface parking and other hardscape areas) within the project site, have atleast one or combination of the following:

- Shade from the existing tree canopy
- Open grid pavers, including grass pavers
- Shade from solar panels
- Structured surface parking

Points are awarded as below:

Percentage of shaded non- roof hardscape areas	Points
50%	2
75%	4

Exemplary Performance

This credit is eligible for exemplary performance under Innovation category; if more than 95% of exposed non-roof hardscape areas are under tree cover and/ or open grid pavers.

Documentation Required

- Photographs of hardscape areas covered with existing tree canopy/ open grid pavers / structured surface parking / solar panels
- Site plan showing the above features
- Calculations showing the extent of shaded non - roof area

SF Credit 3.2

Heat Island Reduction, Roof: 50%, 75%

Points : 2, 4

Intent

Minimise heat island effect to reduce impact on microclimate.

Compliance Options

For exposed roof areas, have vegetation OR materials with high Solar Reflective Index (SRI) value (such as white/ light coloured tiles or high reflective coatings or other high reflective materials). Reflective materials / surfaces shall have a minimum SRI value of 78.

Points are awarded as below:

Percentage of roof area with high reflective materials	Points
50%	2
75%	4

Notes:

- All roof areas, including podium, covered surface parking and utility blocks, which are exposed to the sky (at and above ground level) can be considered for calculations.
- Exposed roof area need not include equipment platforms, areas with solar photovoltaics, skylights, swimming pool, walkways etc.
- China mosaic tiles are exempted from showing SRI value.

Exemplary Performance

Projects are eligible for exemplary performance under Innovation category, if more than 95% of the exposed roof area is covered with vegetation and / or high SRI materials.

Documentation Required

- Photographs of roof areas covered with vegetated garden or high reflective coating or tiles
- Test certificate of high reflective material indicating its SRI value as per ASTM standards.
- Calculations showing the extent of shaded roof area covered with green roof or high SRI materials.

SF Credit 4

Outdoor Light Pollution Reduction

Points : 2

Intent

Reduce light pollution from exterior and façade lighting to increase night sky access and enhance nocturnal environment.

Compliance Option

No external light should be upward looking.

The lighting power densities should not exceed 80% for exterior areas (Parking, landscape, roads, walkways etc.) and 50% for building facades as indicated in ECBC Section 7.3.5.

Documentation Required

- Photographs of all external light fixture types
- Light Power Densities calculations for exterior areas and building façades
- Site plans showing lighting fixtures

SF Credit 5

Building Operations & Maintenance

Points : 1, 2

Intent

Ensure sustained performance of the building systems, so as to achieve benefits during the lifetime of the building systems & facility

Compliance Options

- ❖ Have in place an operation & maintenance plan for the following, as applicable (1 point):
 - HVAC systems (including chillers, cooling towers etc)
 - Lighting systems
 - Waste water treatment systems
 - Onsite renewable energy systems
 - Rain Water harvesting structures
 - Power back-up systems (Generator sets, gas turbines etc)
 - Elevators and escalators
 - Building management systems
- ❖ Carry-out energy and water audit, once in 3 years and explore opportunities for improvement (1 point)

Documentation Required

- Annual maintenance contract for all building systems and equipment. In case the maintenance is done in-house, submit a narrative on preventive and corrective actions in the preceding 1 year.
- Energy & water audit reports carried out by competent agencies

Water Efficiency

WE Mandatory Requirement

Water Efficient Fixtures

Intent

To enhance water use efficiency and minimise the use of potable water

Compliance Options

Use water efficient plumbing fixtures whose flow rates meet the baseline criteria, individually or in aggregate. The baseline criteria is as under:

Fixture Type	Maximum Flow Rate/ Consumption	Duration	Estimated daily uses per person*
Water Closets	6.0 LPF	1 flush	1 for male; 3 for females
Faucets / taps**	8.0 LPM	0.25 min	4
Urinals	4.0 LPF	1 flush	2 for males

Source: Uniform Plumbing Code- India, 2008

* Estimated daily usage per person for 8 hours of stay.

** Includes faucets / taps used in rest rooms and canteen

Notes:

- Water from sources such as bore wells, natural wells, municipal water systems is considered as potable water
- In case treated waste water/ captured rain water is being reused for flushing, the reused quantity can be subtracted from the annual water use and compared against the baseline annual quantity.

Documentation Required

- Declaration from the facility manager indicating the flow rates and flush rates of all fixture types installed onsite.
- Overall annual water balance chart
- Filled templates showing the calculations

WE Credit 1

Water Efficient Fixtures: 20%, 30%, 40%

Points : 2, 4, 6

Intent

To enhance water use efficiency and minimise the use of potable water

Compliance Options

Use water efficient plumbing fixtures whose flow rates less than the baseline criteria, individually or in aggregate. The baseline criteria is as under:

Fixture Type	Maximum Flow Rate/ Consumption	Duration	Estimated daily uses per person*
Water Closets	6.0 LPF	1 flush	1 for male; 3 for females
Faucets / taps**	8.0 LPM	0.25 min	4
Urinals	4.0 LPF	1 flush	2 for males

Source: Uniform Plumbing Code- India, 2008

* Estimated daily usage per person for 8 hours of stay.

** Includes faucets / taps used in rest rooms and canteen

The points are awarded as below:

Percentage of potable water savings over baseline	Points
20%	2
30%	4
40%	6

Notes:

- Water from sources such as bore wells, natural wells, municipal water systems is considered as potable water
- In case treated waste water/ captured rain water is being reused for flushing, the reused quantity can be subtracted from the annual water use and compared against the baseline annual quantity.

Documentation Required

- Declaration from the facility manager indicating the flow rates and flush rates of all fixture types installed onsite.
- Overall annual water balance chart
- Filled templates and calculations

Exemplary Performance

The project is eligible for exemplary performance under Innovation category, if the project achieves 50% potable water savings over baseline.

WE Credit 2

Rain Water Harvesting: 25%, 50%

Points : 2, 4

Intent

Recharge the local aquifer or capture rain water to reduce potable water consumption.

Compliance Options

Have rainwater harvesting systems in place, to capture atleast 25% of run-off volumes from roof and non- roof areas. The harvesting system have to cater atleast 1 day of normal rainfall* occurred in the last 5 years.

Points are awarded as below:

Percentage of Rainwater harvested onsite from roof & non - roof areas	Points
25%	2
50%	4

In areas where the Central/ State Ground Water Board does not recommend artificial rain water recharge (or) if the groundwater table is less than 4 m, the projects can show nominal compliance by collection & reuse and points are awarded as below:

Rainwater Harvesting System to Capture	Points
10% from roof & non-roof areas	2
20% from roof & non-roof areas	4

Notes:

- For rainfall information, refer Indian Metrological Department data at <http://www.imd.gov.in>
- *To arrive at the normal rainfall, divide peak month rainfall occurred in each year (in last 5 years) by number of rainy days in the respective month, and take the average of the five values obtained. Abnormal rainy days like flash floods can be excluded from calculations.

Run-off coefficients for typical surface types are listed below:

S. No	Surface Type	Runoff Coefficient
1	Cemented/ Tiled Roof	0.95
2	Roof Garden (<100 mm thickness)	0.95
3	Roof Garden (100-200 mm thickness)	0.3
4	Roof Garden (201-500 mm thickness)	0.2
5	Roof Garden (>500 mm thickness)	0.1
6	Turf, Flat (0-1% slope)	0.25
7	Turf, Hilly (1-3% slope)	0.35
8	Turf, steep (3-10% slope)	0.4
9	Turf, Steep (>10% slope)	0.45
10	Vegetation, Flat (0-1% slope)	0.1
11	Vegetation, Average (1-3% slope)	0.2
12	Vegetation, Hilly (1-3% slope)	0.25
13	Vegetation, Steep (>10% slope)	0.3
14	Concrete Pavement	0.95
15	Gravel Pavement	0.75
16	Open Grid Concrete Pavement	0.75
17	Open Grid Grass Pavement	0.5

Documentation Required

- Details of rain water harvesting structures including the number and their harvesting volumes
- Filled templates showing the rain water harvesting calculations
- Photographs of rain water harvesting systems
- Site Plan showing the location of rain water harvesting systems

Exemplary Performance

The project is eligible for exemplary performance under Innovation category, if the project harvests atleast 75% of rain water run off from roof and non-roof areas.

WE Credit 3

Waste Water Treatment: 100%

Points : 4

Intent

Treat waste water generated on site so as to make it available for reuse or safe disposal and hence avoid polluting the receiving streams

Compliance Options

Have on-site treatment systems to treat 100% of waste water generated in the building / campus, to the quality standards suitable for reuse as prescribed by Central (or) State Pollution Control Board (CPCB), as applicable.

Documentation Required

- Details of quantity of waste water generated and treated in the last 1 year
- Test reports indicating water quality standards of influent and effluent from waste water treatment plant
- Quality requirements of treated waste water from the Central or State Pollution Control Board.
- Photographs of waste water treatment plant

WE Credit 4

Waste Water Reuse, 75%, 100%

Points : 2, 4

Intent

Use treated waste water thereby reducing dependence on potable water.

Compliance Options

Demonstrate that the treated waste water from waste water treatment plant is being reused for irrigation/ cooling water make-up/ flushing water requirements. Points are awarded as under:

Percentage of Treated Water Reused	Points
75%	2
100%	4

Notes:

- *Water from sources such as bore wells, natural wells, municipal water systems is considered as potable water*
- *Treated waste water from other sites/ local authorities through piped connections can also be considered to show compliance.*

Documentation Required

- Details of quantity of potable water requirement and percentage of waste water reused for each application in the last 1 year
- Test reports indicating water quality standards of influent and effluent from waste water treatment plant
- Photographs & schematic of dual plumbing lines installed

WE Credit 5

Water Metering

Points : 4

Intent

Ensure continuous monitoring of water consumption, both on supply and demand side, to identify improvement opportunities in potable water efficiency.

Compliance Options

Demonstrate water monitoring for the following, as applicable:

- Water consumption through bore well
- Municipal water supply
- Water consumption of each tenant in multi-tenant spaces (as applicable)
- Water purchased from external sources like tankers
- Water consumption/ supply for flushing
- Water consumption/ supply for irrigation requirements
- Any other major consumers of water consumption

Documentation Required

- Water balance schematic for the entire facility
- Photographs of water meters
- Log sheets if water is purchased from external sources.

WE Credit 6

Turf Area: 50%, 25%

Points : 2, 4

Intent

Minimise the extent of turf areas in landscaping to reduce potable water consumption.

Compliance Options

Have limited turf onsite. The points are awarded as below*:

Turf Area as a Percentage of Total Landscaped Area	Points
50%	2
25%	4

**This credit is applicable for projects where in the landscape area is greater than or equal to 15% of the overall site area.*

Notes:

- *Landscape here refers to soft landscaping which includes only vegetation.*
- *Landscape areas over built structures such as basements, podium, roofs, etc., can be considered for calculations.*
- *Potted plants cannot be considered under landscaping.*

Documentation Required

- Photographs of landscape area
- Calculations showing the extent of turf area in landscape
- Site plan showing turf area

Exemplary Performance

The project is eligible for exemplary performance under Innovation category, if no turf is used in the landscape.

Energy Efficiency

EE Mandatory Requirement 1

Eco-friendly Refrigerants & Halons

Intent

To encourage the use of eco-friendly refrigerants and halons in the facility, thereby minimising leakage in the atmosphere and the resultant impact on the ozone layer

Compliance Options

Demonstrate that Heating, Ventilation & Air-conditioning (HVAC) equipment and Unitary Air-Conditioners installed in the project are CFC-free.

Also, the fire suppression systems used in the project should be free from halons or other ozone depleting substances.

In case the project is still using HVAC systems with CFC, submit a phase out plan & replace the refrigerant which is free from CFC within the next 3 years. Also, submit a phase out plan for fire suppression systems to ensure that the equipment will be free from halons or other ozone depleting substances within the next 3 years.

Documentation Required

- Documentation to show the type of refrigerant used in the HVAC systems.
- Documentation to show the type of gases used in the fire suppression systems.
- Phase out plan of CFC and halons from existing HVAC & fire fighting systems

EE Mandatory Requirement 2

Minimum Energy Performance

Intent

Enhance energy efficiency of the building to reduce environmental impacts from excessive energy use

Compliance Options

1) EPI Method

Demonstrate that the annual energy consumption in the building is within the EPI (Energy Performance Index) limits as mentioned in the table below:

- **Day Time Office Buildings ***

Climatic Zone	EPI range for buildings having more than 50% occupied area as air conditioned (kWh/m2/year)	EPI range for buildings having less than 50% of occupied area as air conditioned (kWh/m2/year)
Composite	190-165	80-70
Warm & Humid	200-175	85-75
Hot & Dry; Temperate	180-155	75-65

Source: BEE

* EPI values are applicable only for day use office buildings which operate for 260 to 300 days in a year. For office buildings which operate in multiple shifts, the projects can show compliance by simulation approach

- **Shopping Malls**

Climatic Zone	EPI range (kWh/m2/year)
Composite	350-300
Warm & Humid	450-400
Hot & Dry	300-250
Temperate	275-250

Source: BEE

- BPOs

Climatic Zone	EPI range (kWh/m ² /year)
Composite	450-400
Warm & Humid	460-410
Hot & Dry	315-265
Temperate	400-350

Source: BEE

2) Energy Simulation Method

For buildings located in cold climatic zone, other building types such as 24-hour office buildings, IT Parks, hotels, hospitals, airports, banks etc., and any other building types not mentioned above, follow ECBC (Revised Version may, 2008) whole building simulation approach. The actual annual energy consumption of the building should not exceed the base case energy consumption computed as per ECBC. Simulation is to be carried out for achieving comfort temperatures of 26 ± 2 deg C.

Note:

Building types where baseline EPI have been shown can also opt for the Simulation method

Documentation Required

- Electricity consumption details including utility power, captive generation and renewable energy of preceding 1 year
- EPI calculations
- Energy simulation report showing the annual energy consumption as per ECBC requirements vis-à-vis actual energy consumption.

EE Credit 1

Improved Energy Performance: 10%, 12.5%, 15%, 17.5%, 20%, 22.5%, 25%

Maximum points: 14

Intent

Enhance energy efficiency of the building to reduce environmental impacts from excessive energy use

Compliance Options

Demonstrate that the annual energy consumption of energy systems in the building achieves the EPI limits as mentioned in the table below:

1) EPI Method

- **Day Time Office Buildings ***

Climatic Zone	EPI range for buildings having more than 50% of occupied area as air-conditioned (kWh/m²/year)	EPI range for buildings having less than 50% of occupied area as air conditioned (kWh/m²/year)	No. of Points
Composite	165-153	70-66	2
	152-141	65-61	4
	140-128	60-56	6
	127-115	55-51	8
	115-103	50-46	10
	102-91	45-41	12
	Below 90	Below 40	14
Warm & Humid	175-163	75-71	2
	162-151	70-66	4
	150-138	65-61	6
	137-126	60-56	8
	125-113	55-51	10
	112-101	50-46	12
	Below 100	Below 45	14

Climatic Zone	EPI range for buildings having more than 50% of occupied area as air-conditioned (kWh/m2/year)	EPI range for buildings having less than 50% of occupied area as air conditioned (kWh/m2/year)	No. of Points
Hot & Dry/ Temperate	155-143	65-61	2
	142-131	60-56	4
	130-118	55-51	6
	117-106	50-46	8
	105-93	45-41	10
	92-81	40-36	12
	Below 80	Below 35	14

Source: BEE

* EPI values are applicable only for day use office buildings which operate for 260 to 300 days in a year. For office buildings which operate in two shifts, the projects can show compliance by simulation approach

- **Shopping Malls**

Climatic Zone	EPI range (kWh/m2/year)	No. of points
Composite	300-276	2
	275-251	4
	250-226	6
	225-201	8
	200-176	10
	175-151	12
	Below 150	14
Warm & Humid	400-376	2
	375-351	4
	350-326	6
	325-301	8
	300-276	10
	275-251	12
	Below 250	14

Climatic Zone	EPI range (kWh/m²/year)	No of points
Hot & Dry	250-226	2
	225-201	4
	200-176	6
	175-151	8
	150-126	10
	125-101	12
	Below 100	14
Temperate	250-238	2
	237-226	4
	225-213	6
	212-201	8
	200-188	10
	187-176	12
	Below 175	14

Source: BEE

- **BPOs**

Climatic Zone	EPI range (kWh/m²/year)	No of points
Composite	400-376	2
	375-351	4
	350-326	6
	325-301	8
	300-276	10
	275-251	12
	Below 250	14
Warm & Humid	410-386	2
	385-361	4
	360-336	6
	335-311	8
	310-286	10
	285-261	12
	Below 260	14

Climatic Zone	EPI range (kWh/m²/year)	No of points
Hot & Dry	265-241	2
	240-216	4
	215-191	6
	190-166	8
	165-141	10
	140-116	12
	Below 115	14
Temperate	350-326	2
	325-301	4
	300-276	6
	275-251	8
	250-226	10
	225-201	12
	Below 200	14

Source: BEE

2) Energy Simulation Method

For buildings located in cold climatic zone, other building types such as 24-hour office buildings, IT Parks, hotels, hospitals, airports, banks etc., and any other building types not mentioned above, follow ECBC (Revised Version may, 2008) whole building simulation approach. The actual annual energy consumption of the building should better the base case energy consumption computed as per ECBC. Simulation is to be carried out for achieving comfort temperatures of 26 ± 2 deg C.

Note:

Building types where baseline EPI have been shown can also opt for the Simulation method

Points are awarded as below:

Percentage energy savings over ECBC	No. of points
10%	2
12.5%	4
15%	6
17.5%	8
20%	10
22.5%	12
25%	14

Exemplary Performance

This credit is eligible for exemplary performance under Innovation category if the percentage of actual energy savings over ECBC baseline is more than 27.5%.

Documentation Required

- Electricity consumption details including utility power, captive generation and renewable energy of preceding 1 year
- EPI calculations
- Energy simulation report showing the annual energy consumption as per ECBC requirements vis-à-vis actual energy consumption.

EE Credit 2

On site Renewable Energy: 2.5%, 5%, 7.5%

Points : 2, 4, 6

Intent

Encourage the use of on-site renewable technologies to minimise the environmental impacts of generating energy through fossil fuels

Compliance Options

Demonstrate renewable energy generation for atleast 2.5% of total annual energy consumption of the building. Points are awarded as below:

Renewable energy as a percentage of total energy consumption	Points
2.5%	2
5%	4
7.5%	6

Note:

Solar hot water systems cannot be considered as power generation source and cannot be subtracted from the total energy consumed.

Exemplary Performance

This credit is eligible for exemplary performance under Innovation category if more than 10% of total annual energy consumption is met through renewable energy consumption.

Documentation Required

- Documents indicating renewable energy generated through onsite renewable energy systems and the total annual energy consumption of the building
- Photographs of renewable energy systems installed
- In case the renewable energy systems are recently installed, design data can be submitted along with purchase invoices.

EE Credit 3

Off Site Renewable Energy: 25%, 50%, 75%

Points : 2, 4, 6

Intent

Encourage the use of off-site renewable technologies to minimise the environmental impacts from generating energy through fossil fuels

Compliance Option

Demonstrate that the project has invested in off-site green power and wheeling the energy to the building. Have in place a contract with the supplier/ developer for a minimum of 2 years.

Alternatively, buy RECs (Renewable Energy Certificates) equivalent to atleast 25% of the energy consumption of the facility, in the last one year. Type of renewable energy source has to be inline with the definition as recommended by MNRE, Government of India and respective State Regulatory Commissions. Points are awarded as below:

Percentage of annual energy consumption	Points
25%	2
50%	4
75%	6

Exemplary Performance

This credit is eligible for exemplary performance under Innovation category if 95% of total annual energy consumption is met through offsite green power.

Documentation Required

- Copy of Power Purchase Agreement (PPA) or contract indicating the wheeling of Green power
- Green power purchased and annual energy consumption of the facility in the last one year. The energy consumption values have to be expressed in kWh.

EE Credit 4

Energy Metering

Points : 4

Intent

Encourage continuous monitoring to identify improvement opportunities in energy performance of building

Compliance Option

Demonstrate that the facility has energy metering and monitoring for the following applications:

- Central HVAC systems (Main Chiller)
- Interior lighting consumption
- Renewable energy generation
- Power Backup systems (Generators sets, gas turbines etc)

Exemplary Performance

This credit is not eligible for exemplary performance under Innovation criteria.

Documentation Required

- Energy consumption data in the preceding 1 year, for each of the major consumers/ equipment
- Photographs of metering equipment
- Electrical schematic drawings highlighting the location of meters

Health & Comfort

HC Mandatory Requirement 1

Tobacco Smoke Control

Intent

Minimise exposure of non-smokers to the adverse health impacts arising due to passive smoking in the building

Compliance Options

Demonstrate that smoking is prohibited in the building and is in accordance with the Government of India regulations.

In case the project has assigned outdoor smoking areas, locate such areas at a minimum of 7.6 meters from all outdoor air intakes (entrance doors, window openings etc.)

Alternately, compliance can be shown through designated smoking rooms which capture and remove tobacco smoke from the building. At a minimum, the smoking room must be directly exhausted to the outdoors, away from air intakes and building entry paths, with no recirculation of tobacco smoke-containing air to nonsmoking areas and enclosed with impermeable deck-to-deck partitions.

The smoking room must be operated at a negative pressure, compared with the surrounding spaces, of at least an average of 5 Pascals (Pa) (0.5 mm of water gauge) and a minimum of 1 Pa (0.025 mm of water gauge) when the doors to the smoking rooms are closed.

Documentation Required

- Copy of HR policy indicating that smoking is prohibited in the facility.
- Photographs of signages displayed at various locations in the facility to educate occupants and visitors
- Photographs of the designated smoking spaces (if applicable)

HC Mandatory Requirement 2

Fresh Air Ventilation

Intent

Provide adequate outdoor air ventilation so as to avoid pollutants affecting indoor air quality

Compliance Options

For Air Conditioned spaces

Demonstrate that the fresh air ventilation in all regularly occupied areas meet the minimum ventilation rates as prescribed in Annexure II. Also provide test results of the system in operation.

For Naturally Ventilated Spaces

Demonstrate that the ratio of openable area to the carpet area is atleast 4% in each regularly occupied zone.

Note:

Regularly occupied areas are those where people sit or stand as they work, irrespective of the number of days occupied in a year.

Documentation Required

- For each regularly occupied air conditioned space, provide calculations of outdoor air intake to show compliance with the reference standard.
- Test reports of the fresh air ventilation systems in operation
- For each regularly occupied naturally ventilated space, provide calculations of openable area with respect to carpet area.

HC Credit 1

Carbon dioxide Monitoring & Control

Points : 2

Intent

Continuously monitor and control carbon dioxide level in the building to provide occupant comfort and well being

Compliance Options

For Air Conditioned Spaces

Demonstrate that the project has installed CO₂ sensors and a control system to maintain a differential CO₂ level of 530 ppm in all regularly occupied areas.

For densely occupied areas, have in place CO₂ sensors at the breathing zone levels with monitoring systems.

For Naturally Ventilated Spaces

For each regularly occupied area in the project, demonstrate that the ratio of openable area to the carpet area is atleast 6%.

Note:

Densely occupied space is any space with a occupant density of 25 people or more per 1,000 sq ft.

Documentation Required

For Air conditioned spaces:

- Schematic of CO₂ control system and details of set point
- Photographs of CO₂ sensors

Non-air conditioned spaces:

- For each regularly occupied naturally ventilated space, provide calculations of openable area with respect to carpet area.

HC Credit 2

Isolation of Polluting Equipment & Systems

Points : 2

Intent

To minimise the exposure of building occupants and maintenance team to hazardous indoor pollutants which adversely affect indoor air quality and occupant health

Compliance Option

For areas such as janitor rooms, housekeeping areas and printer rooms, demonstrate that the project has isolated these areas with regularly occupied areas by providing partitions.

Each of these spaces have to be provided with exhaust systems. The exhaust rate should be atleast 0.5 cfm per sq.ft.

Documentation Required

- Details of exhaust systems provided
- Photographs of janitor rooms, housekeeping areas and printer rooms showing their isolation from regularly occupied areas

HC Credit 3

Eco-friendly Housekeeping Chemicals

Points : 2

Intent

To encourage the use of eco-friendly housekeeping chemicals so as to reduce adverse health impacts for building occupants

Compliance Options

Demonstrate that project is using housekeeping chemicals that meet green seal standard (GS-37) or other Indian/European equivalent standards, for all building applications.

Documentation Required

- List of all building applications where housekeeping chemicals are used
- Purchase invoices of eco-friendly housekeeping chemicals procured in the past 1 year
- Materials Safety Data Sheet (MSDS)/ Product datasheets for all housekeeping chemicals.

HC Credit 4

Thermal Comfort, Indoor Temperature & RH

Points : 2

Intent

To provide comfortable thermal indoor environment, to promote productivity and well-being of occupants

Compliance Option

Demonstrate that the building was maintained at the requisite temperature and relative humidity conditions, for 90% of the time. The comfort condition to be maintained is 26 ± 2 degree C and RH in the range of 30 to 70 %

Also conduct a survey once in 6 months and show that 80% of the building occupants are satisfied with the temperatures maintained.

Documentation Required

- Indoor temperature and RH readings during summer, monsoon and winter
- Occupant thermal comfort survey report for the preceding one year

HC Credit 5

Facilities for Differently Abled People`

Points : 4

Intent

Ensure that the building is user-friendly for differently abled people.

Compliance Options

Demonstrate that the facility has the following provisions for differently abled people*

- Non-slippery ramps for easy access to the main entrance of the building. Such ramps should have with hand rails on atleast one side
- Uniformity in floor level for hindrance-free movement in common areas such as wash rooms, canteen and common assembly area
- Preferred car park space(s) having an easy access to the main entrance or closer to the lift lobby
- Braille and audio assistance in lifts for visually impaired people
- Rest rooms (toilets) for differently abled people

** All the above criteria are as per NBC 2005*

Documentation Required

- Photographs showing the provisions for differently abled people in the facility
- Site plan showing facilities for differently abled people

HC Credit 6

Occupant Well-being Facilities

Points : 2

Intent

To provide facilities so as to enhance physical, emotional & spiritual wellbeing of building occupants.

Compliance Options

Demonstrate that the project has at least 2 occupant well-being facilities (such as gymnasium, aerobics, yoga, meditation or any indoor / outdoor games) to cater to at least 10% of building occupants, through the day.

Documentation required

- Calculations to demonstrate that the facilities provided can cater at least 10% of the building occupants
- Photographs of facilities provided

Innovation Category

Innovation Credits

INN Credit 1.1 – 1.5

Maximum points: 10

Intent

To encourage innovation in performance of existing buildings so as to reduce environmental impacts

Compliance Options (2 points for each credit)

Implement measures that are not addressed in the rating system but can significantly reduce environmental impacts.

Perform beyond threshold limits specified in credit categories of rating system

Documentation Required

For each innovation credit, submit the following:

- Intent
- Strategies adopted
- Measurable impacts
- How these measures can be sustained in future

IGBC AP

INN Credit 2

Points : 2

Intent

To involve green building accredited professionals in the project so as to facilitate design & implementation of environment friendly measures

Compliance Options

Atleast one principal participant of the project team shall be an IGBC AP.

Documentation Required

Submit the IGBC AP certificate of atleast one of principal participants in the project

Annexures

VOC limits of materials

Type of Material	VOC Limit (g/L less water)
Paints	
Non- Flat (Glossy) paint	150
Flat (Mat) paint	50
Anti- corrosive/ anti-rust paints	250
Varnish	350
Adhesives	
Glazing adhesives	100
Tiles adhesives	65
Wood adhesive	30
Wood flooring adhesive	100

Minimum Ventilation Rates in Various Functional Zones*

Occupancy Category	People Outdoor Air Rate	Area Outdoor Air Rate
	Cfm/person	Cfm/ sq.ft
Correctional Facilities		
Dayroom, Guard station	5	0.06
Booking/ waiting	7.5	0.06
Education Facilities		
Daycare (through age 4), daycare sickroom, Art Classroom, science laboratories, college laboratories, wood, metal shop	10	0.18
Classrooms (ages 5-8), (age 9+), computer lab, media centre	10	0.12
Lecture Room/ hall (fixed seating)	7.5	0.06
Music/ theater/ dance,	10	0.06
Multi use assembly	7.5	0.06
Food & Beverages Services		
Restaurant dining rooms/ cafeteria/ fast food dining/ Bars/ Cocktail Lounges	7.5	0.18
General		
Break Rooms, Coffee stations, conference/ meeting	5	0.06
Corridors	-	0.06
Storage Rooms	-	0.12
Hotels, Motels, Resorts, Dormitories		
Bedroom/ living room, barracks sleeping areas	5	0.06
laundry rooms	5	0.12
Lobbies/ prefunction	7.5	0.06
Multipurpose assembly	5	0.06

Occupancy Category	People Outdoor Air Rate	Area Outdoor Air Rate
	Cfm/person	Cfm/ sq.ft
Office Building		
Office Spaces, Reception Areas, Telephone, data entry, Main entry Lobbies	5	0.06
Electrical Equipment rooms	-	0.06
Elevator machine rooms	-	0.12
Pharmacy (prep area)	5	0.18
Photo Studios	5	0.12
Shipping/ receiving	-	0.12
Telephone closets	-	0.00
Transportation waiting	7.5	0.06
Warehouses	-	0.06
Public Assembly Spaces		
Auditorium seating area, Place of religious worship, Courtrooms, Legislative Chambers, Lobbies	5	0.06
Libraries	5	0.12
Museums (children's)	7.5	0.06
Museum/ galleries	7.5	0.06
Retail		
Sales	7.5	0.12
Mall common Areas	7.5	0.06
Barber Shop	7.5	0.06
Beauty & nail salons	20	0.12
Pet Shops (animal areas)	7.5	0.18
Super Market, Coin operated Laundries	7.5	0.06

Occupancy Category	People Outdoor Air Rate	Area Outdoor Air Rate
	Cfm/person	Cfm/ sq.ft
Sports & Entertainment		
Sports arena (Play Area), Gym, stadium (play area)	-	0.30
Spectator area	7.5	0.06
Swimming (pool & deck)	-	0.48
Disco/dance floor/ health club/ aerobics room/ weight rooms	20	0.06
Bowling alley (seating)	10	0.12
Gambling casinos/ game arcades	7.5	0.18
Stages, studios	10	0.06

* *Total outdoor air flow in functional zone =*

$$\left\{ \begin{array}{l} \text{Outdoor air flow rate required per} \\ \text{person as per the above table} \\ \times \\ \text{Zone population} \end{array} \right\} + \left\{ \begin{array}{l} \text{Outdoor air flow rate required per unit} \\ \text{area as per the above table} \\ \times \\ \text{Net occupiable zone area} \end{array} \right\}$$