IGBC Green Homes

IGBC Green Homes Rating System

-Abridged Version-

16 July 2008

Confederation of Indian Industry
CII-Sohrabji Godrej Green Business Centre

IGBC Green Homes

REFERENCE GUIDE

Abridged Version 1.0

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- SEW Constructions Ltd, Hyderabad

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- JDS Architects, Bangalore
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- Jones Lang LaSalle Meghraj, Gurgaon
- K Raheja Corp, Mumbai
- Kalpataru Ltd, Mumbai
- Khivraj Tech Park Pvt Ltd, Chennai
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- Total Environment, Bangalore
- TSI Ventures, Bangalore
- U P Twiga Fiberglass Ltd, Hyderabad
- UNUS Architects and Interior Designers, Hyderabad
- USAID, New Delhi
- Vida Calma Homes Private Limited, Goa
- Voltas Limited, Hyderabad
- V Raheja Design Construction, Bangalore

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Foreword from the 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 at an average rate of 9.5% as compared to the global average of 5%. As the sector is growing rapidly, preserving the environment poses a plethora of challenges. To enable the construction industry to be environmentally sensitive, CII Godrej Green Business Centre, has established the Indian Green Building Council (IGBC). The IGBC is a consensus not-for-profit council representing the building industry, consisting of more than 350 committed members. The council encourages 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 the 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.

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

IGBC Membership

The IGBC draws its strength from its members who have been partners in facilitating the Green Building Movement in India. The Local Chapters led by individual champions and committed members have been instrumental in reaching out the vision of the IGBC at the regional levels. The IGBC is today seen as a leader in spearheading the Indian Green Building Movement. The Council is member driven and consensus based.

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I. Introduction

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

Green concepts and techniques in the residential sector can help address National issues like handling of consumer waste, water efficiency, reduction in fossil fuel use in commuting, energy efficiency and conserving natural resources. Most importantly, these concepts can enhance occupant health, happiness and wellbeing.

Against this background, the Indian Green Building Council (IGBC) has launched the 'IGBC Green Homes Rating System' to address the National priorities. By applying IGBC Green Homes criteria, homes which are sustainable over the life cycle of the building can be constructed. This rating programme is a tool which enables the designer 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 Homes is the first rating programme developed in India, exclusively for the residential sector. It is based on accepted energy and 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.

The IGBC set up the IGBC Green Homes Core Committee to develop the rating programme. This committee comprised of key stakeholders including architects, developers, home owners, manufacturers, institutions and industry representatives. The committee, with a diverse background and knowledge has enriched the rating system both in its content and process.

II. Benefits of Green Homes

A Green Home can have tremendous benefits, both tangible and intangible. The immediate and most tangible benefit is in the reduction in water and operating energy costs right from day one, during the entire life cycle of the building. The energy savings could range from 20 – 30 % and water savings is around 30 – 50%. Green Homes Rating tool can also enhance marketability for the project. Intangible benefits of Green Homes include enhanced air quality, excellent day lighting, health & wellbeing of the occupants, safety benefits and conservation of scarce National resources.

III. National Priorities Addressed in the Rating System

The Green Homes Rating System addresses the most important National priorities which include water conservation, handling of consumer wastes, energy conservation, conservation of resources like wood and lesser dependence on usage of virgin materials.

Water Efficiency:

Most of the Asian countries are water stressed and in countries like India the water table has reduced drastically over the last decade. Green Homes encourages use of water in a self sustainable manner through reducing, recycling and reusing strategies. By adopting this rating programme green homes can save potable water to an extent of 30 – 50%.

Handling of Consumer Waste:

Handling of wastes in residential buildings is extremely difficult to handle as most of the waste generated is not segregated at the time of disposal and has a high probability of going to land fills. This would be a challenge to the municipalities which needs to be addressed. The IGBC Green Homes rating programme encourages waste management through segregation, storage and effective disposal.

Energy Efficiency:

The residential sector is a large consumer of electrical energy. IGBC Green Homes can reduce energy consumption through energy efficient lighting, air conditioning systems, motors, pumps etc., The rating system encourages green homes which select and use BEE labeled equipment and appliances. The energy savings that can be realised by adopting this rating programme can be to the tune of 20 – 30%.

Reduced Use of Fossil Fuels:

Fossil fuel is a slowly depleting resource, world over. The use of fossil fuel for transportation has been a major source of pollution. The rating system encourages the use of alternate fuels for transportation and captive power generation.

Reduced Dependency on Virgin Materials:

The rating system encourages projects to use recycled & reused material and discourages the use of virgin wood thereby addressing environmental impacts associated with extraction and processing of virgin materials. Reduced usage of virgin wood is also encouraged.

Health and Well-being of Occupants:

Health and well-being of occupants is the most important aspect of Green Homes. The IGBC Green Homes rating system ensures minimum performance on day lighting and ventilation aspects which are critical in a home. The rating system recognises measures to minimise the indoor air pollutants.

IV. IGBC Green Homes Rating System

The IGBC set up the IGBC Green Homes Core Committee to focus on residential sector. **The committee included architects, realtors, experts on building science and industry representatives.** The varied experience and professions of the committee members brought in a holistic perspective in the process of developing the rating programme.

A. Features of IGBC Green Homes

The IGBC Green Homes Green Building Rating System is a voluntary and consensus based programme. The rating system has been developed based on materials and technologies that are presently available. The objective of IGBC Green Homes is to facilitate the creation of energy efficient, water efficient, healthy, and environmentally friendly residential buildings.

The rating system evaluates certain credit points using a prescriptive approach and other credits on a performance based approach. The rating system is evolved so as to be comprehensive and at the same time is user-friendly. The programme is designed according importance to the National priorities and 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.

B. Scope of IGBC Green Homes

IGBC Green Homes is a measurement system designed for rating new residential buildings which include construction categories such as

- Individual homes
- Gated communities and
- High rise residential apartments.
- Existing residential buildings who retrofit and meet the mandatory requirements and the minimum number of credit points

Various levels of green building certification are awarded based on the total points earned.

C. The Future of IGBC Green Homes

Many new green building materials, equipment and technologies are being introduced in the market. With continuous up-gradation and introduction of new green technologies and products, it is important that the rating programme also keeps pace with current standards and technologies. Therefore, the rating programme will also undergo periodic revisions to incorporate the latest advances and changes. It is important to note that project teams applying for IGBC Green Homes should register their projects with the latest version of the rating system. During the course of implementation, projects have an option to transit to the latest version of the rating system.

The IGBC will highlight new developments on its website on a continuous basis at www.igbc.in

V. IGBC Green Homes Process

The guidelines detailed under each credit enable the design and construction of green homes of all sizes and types. IGBC Green Homes addresses green features under the following categories:

- Site Efficiency
- Water Efficiency
- Energy Efficiency
- Materials and
- Indoor Air Quality
- Innovation

Different levels of green building certification are awarded based on the total credits earned. However every Green Home should meet certain mandatory requirements, which are non-negotiable.

The various levels of rating awarded are:

- ‘Certified’ to recognise Best Practices
- ‘Silver’ to recognise Outstanding Performance
- ‘Gold’ to recognise National Excellence
- ‘Platinum’ to recognise Global leadership

A. When to use IGBC Green Homes

IGBC Green Homes is designed primarily for new residential buildings. However it is also applicable for existing buildings, redesigned in accordance with the IGBC Green Homes criteria.

The project team can evaluate all the possible points to apply under the rating system using the suitable checklist. The project can apply for IGBC Green Homes certification if it can meet all mandatory requirements and achieve the minimum required points.

B. IGBC Green Homes Registration

Project teams interested in the IGBC Green Homes Certification for their project must first register with the IGBC. Projects can be registered on the IGBC website (www.igbc.in) under ‘IGBC Green Homes’. 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 the IGBC and provides access to the required documents, templates, important communications and other necessary information.

Consult the Web site for important details about applying the IGBC Green Homes application as well as the certification review process, schedule and fee.

C. IGBC Green Homes Certification Levels

The rating system caters to both individual homes and multi-dwelling units. By and large, the context for both the types are similar; however the applicability of few of the green homes features may vary for each of these types of dwelling units. Hence the threshold criteria for certification level are different for these types:

Individual Homes

Certification Level	Points
Certified	32 – 39
Silver	40 – 46
Gold	47 – 54
Platinum	55 – 79

Multi-dwelling Units

Certification Level	Points
Certified	30 – 37
Silver	38 – 44
Gold	45 – 52
Platinum	53 – 75

For more information, visit the IGBC Green Homes Web page on www.igbc.in

D. Documentation

Once a project has registered under the IGBC Green Homes Rating System, the project design must ensure that the requirements of the rating system are met. The project team will be expected to provide supporting documents for each stage of submission for all the mandatory requirements and the credits attempted. Supporting documents are those which provide specific proof of meeting the required performance level – such specifications, drawings (in pdf/ jpeg format only), cutsheets, manufacturer's literature, purchase invoices and other documents. These items are described in the Abridged Reference Guide under each credit.

Documentation is submitted in two phases – Design submittals and construction submittals. The design submission involves those credits which can be evaluated at the design stage. The reference guide provides the list of design and construction phase credits. After the Design submission, the review is done by third party assessors and review comments would be provided after 30 working days. The next phase involves submission of clarifications to design queries and construction document submittal. The construction document submission is done at the completion of construction which will comprise of the balance credit submissions and documents showing implementation of design credits. The final review will also take 30 working days, after which the rating is awarded. It is important to note that the credits earned at the design review are only considered as anticipated and are not

awarded until the final construction documents are submitted along with additional documents showing implementation of design features. If there are changes for any design credit anticipated, these changes need to be documented and resubmitted for the construction review phase. It is helpful to designate a team leader who is responsible for managing the compilation of this information by project team.

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

Projects by developers can register for Precertification.

E. Precertification

This is an option provided for projects aspiring to get precertified at the design stage. The documentation submitted for precertification must detail the project design features which will be implemented. The rating awarded under precertification is based on the projects intention to conform to the requirements of the Green Homes Rating system. It is important to note that the Precertification rating awarded need not neccesarily corresponds to the final IGBC Green Homes Rating. The final rating would depend on the implementation of all the design parameters detailed in the Precertification documents.

Precertification gives the owner/developer a unique advantage to market the project to potential buyers.

Those projects which seek precertification need to submit the following documentation:

- For each credit, a narrative on how the project would meet the goal
- Design Calculations, wherever appropriate
- Drawings (in pdf/ jpeg format only) as appropriate
- Filled in templates wherever applicable

IGBC would take 30 working days to review the first set of precertification documents. On receiving the clarifications posed in the first review, IGBC would take another 30 working days to award the precertification.

A certificate and letter are provided to the project on precertification.

VI. Fee

Certification fee details can be found on the IGBC website. The IGBC will acknowledge receipt of your application and proceed with review when all project documentation has been submitted.

VII. Updates and Addenda

This is the first version of the IGBC Green Homes Abridged Reference Guide. As the rating system continues to improve and evolve, updates and addenda to the reference guide will be made available through the website. These additions will be incorporated in the next version of the Rating System.

Checklist for Individual Homes

	Credits	Points
Site Efficiency		
Mandatory Requirement 1	Local Regulations	Required
Mandatory Requirement 2	Soil Erosion	Required
Site Credit 1.0	Basic Amenities	1
Site Credit 2.0	Natural Topography or Landscape	2
Site Credit 3.0	Heat Island Effect on Roof	2
Site Credit 4.0	Parking Facilities	2
Site Credit 5.0	Non Fossil Fuelling Facility for Vehicles	1
Site Credit 6.0	Design for Physically Challenged	1
Site Credit 7.0	**Home User Guide**	**NA**
		9
Water Efficiency		
Mandatory Requirement 1	Rainwater Harvesting, 30%	Required
Mandatory Requirement 2	Water Efficient Fixtures	Required
Water Credit 1.0	Turf Design	2
Water Credit 2.0	Drought Tolerant Species	3
Water Credit 3.0	Management of Irrigation System	2
Water Credit 4.0	Rainwater Harvesting, 50%, 70%, 90%	3
Water Credit 5.0	Grey Water - Treatment	2
Water Credit 6.0	Grey Water - Reuse	3
Water Credit 7.0	Plumbing Systems for Flushing	2
Water Credit 8.0	Water Efficient Fixtures, 10%, 20%	6
		23
Energy Efficiency		
Mandatory Requirement 1	CFC Free Equipment	Required
Energy Credit 1.0	Energy Performance	11
Energy Credit 2.0	Metering	1
Energy Credit 3.0	Refrigerators	1
Energy Credit 4.0	Solar Water Heating Systems	1
Energy Credit 5.0	**Captive power Generation**	**NA**
Energy Credit 6.0	Onsite Renewable Energy	3
Energy Credit 7.1	Lighting - Internal	1
Energy Credit 7.2	Lighting - External	1
Energy Credit 8.0	Energy Saving Measures in other Equipment	1
		20
Materials		
Mandatory Requirement 1	Separation of Wastes	Required
Material Credit 1.0	Waste Reduction during Construction	3
Material Credit 2.0	Solid Waste Management, Post Occupancy	1
Material Credit 3.0	Materials with Recycled Content	2
Material Credit 4.0	Rapidly Renewable Materials	1
Material Credit 5.0	Local Materials	2
Material Credit 6.0	Reuse of Salvaged Materials	2
Material Credit 7.0	Wood Based Building Materials and Furniture	2
		13

Indoor Air Quality		
Mandatory Requirement 1	Tobacco Smoke Control	Required
Mandatory Requirement 2	Day Lighting, 50%	Required
IAQ Credit 1.0	Exhaust Systems	2
IAQ Credit 2.0	Fresh Air Ventilation	1
IAQ Credit 3.0	Low VOC Materials	2
IAQ Credit 4.0	Carpets	1
IAQ Credit 5.0	Building Flush Out	1
IAQ Credit 6.0	Day Lighting, 75%,95%	2
IAQ Credit 7.0	Cross Ventilation	1
		10
Innovation		
INN Credit 1.1	Innovation	1
INN Credit 1.2	Innovation	1
INN Credit 1.3	Innovation	1
INN Credit 2.0	IGBC AP	1
		4
Total Number of Points		79

IGBC Green Homes' Certification Levels for Individual Homes

Rating	Points
Certified	32 – 39
Silver	40 – 46
Gold	47 – 54
Platinum	55 – 79

Checklist for Multi-dwelling units

	Credits	Points
Site Efficiency		
Mandatory Requirement 1	Local Regulations	Required
Mandatory Requirement 2	Soil Erosion	Required
Site Credit 1.0	Basic Amenities	1
Site Credit 2.0	Natural Topography or Landscape	2
Site Credit 3.0	Heat Island Effect on Roof	2
Site Credit 4.0	Parking Facilities	2
Site Credit 5.0	Non Fossil Fueling Facility for Vehicles	1
Site Credit 6.0	Design for Physically Challenged	1
Site Credit 7.0	Home User Guide	1
		10
Water Efficiency		
Mandatory Requirement 1	Rainwater Harvesting, 30%	Required
Mandatory Requirement 2	Water Efficient Fixtures	Required
Water Credit 1.0	Turf Design	2
Water Credit 2.0	Drought Tolerant Species	3
Water Credit 3.0	Management of Irrigation System	2
Water Credit 4.0	Rainwater Harvesting, 50%, 70%, 90%	3
Water Credit 5.0	Grey Water – Treatment	2
Water Credit 6.0	Grey Water – Reuse	3
Water Credit 7.0	Plumbing Systems for Flushing	2
Water Credit 8.0	Water Efficient Fixtures, 10%, 20%	6
		23
Energy Efficiency		
Mandatory Requirement 1	CFC Free Equipment	Required
Energy Credit 1.0	Energy Performance	11
Energy Credit 2.0	Metering	1
Energy Credit 3.0	**Refrigerators**	**NA**
Energy Credit 4.0	Solar Water Heating Systems	1
Energy Credit 5.0	Captive Power Generation	1
Energy Credit 6.0	Onsite Renewable Energy	3
Energy Credit 7.1	**Lighting - Internal**	**NA**
Energy Credit 7.2	Lighting - External	1
Energy Credit 8.0	Energy Saving Measures in other Equipment	1
		19
Materials		
Mandatory Requirement 1	Separation of Wastes	Required
Material Credit 1.0	Waste Reduction during Construction	3
Material Credit 2.0	Solid Waste Management, Post Occupancy	1
Material Credit 3.0	Materials with Recycled Content	2
Material Credit 4.0	**Rapidly Renewable Materials**	**NA**
Material Credit 5.0	Local Materials	2
Material Credit 6.0	**Reuse of Salvaged Materials**	**NA**
Material Credit 7.0	Wood Based Materials and Furniture	2
		10

Indoor Air Quality		
Mandatory Requirement 1	Tobacco Smoke Control	Required
Mandatory Requirement 2	Day Lighting, 50%	Required
IAQ Credit 1.0	Exhaust Systems	2
IAQ Credit 2.0	Fresh Air Ventilation	1
IAQ Credit 3.0	Low VOC Materials	2
IAQ Credit 4.0	**Carpets**	**NA**
IAQ Credit 5.0	Building Flush Out	1
IAQ Credit 6.0	Day Lighting, 75%, 95%	2
IAQ Credit 7.0	Cross Ventilation	1
		9
Innovation		
INN Credit 1.1	Innovation	1
INN Credit 1.2	Innovation	1
INN Credit 1.3	Innovation	1
INN Credit 2.0	IGBC AP	1
		4
Total Number of Points		75

IGBC Green Homes' Certification Levels for Multi-dwelling Units

Rating	Points
Certified	30 – 37
Silver	38 – 44
Gold	45 – 52
Platinum	53 – 75

Site Efficiency

Local Regulations

Construction Submittal

Mandatory Requirement 1

Goal:

To ensure that the building complies with the required statutory regulatory codes.

Compliance options:

The following measures need to be ensured

- Approval of the plan from the competent Government authority
- Fit for occupancy document from the competent Government authority

Documentation Required:

Provide an approved plan or/ and fit for occupancy documents obtained from the competent Government authority.

Please provide photographs/ as built drawings of the completed building.

Approach and Methodologies:

Survey the statutory requirements in the area that the building is constructed. Ensure that these requirements are incorporated at the design stage.

Soil Erosion

Construction Submittal

Mandatory Requirement 2

Goal:

To control soil erosion and thereby reduce negative impacts to the site.

Compliance options:

Adopt all the measures listed below to control erosion:

1. Ensure erosion control measures conform to the best management practices highlighted in the National Building Code of India.
2. Ensure that topsoil is stockpiled for reuse later.
3. Develop appropriate measures to address soil erosion, post occupancy.

Documentation Required:

Provide photographs to show stockpiling of topsoil. Submit a description on the measures implemented/ provide the erosion control plan adopted. Submit a post occupancy erosion control plan.

Approach and Methodologies:

Evolve strategies to stockpile top soil and reuse later for landscaping purpose or stockpiled soil can be donated to other sites for landscaping purpose.

Consider adopting measures such as temporary and permanent seeding, mulching, earth dikes, silt fencing, sediment traps, and sediment basins as appropriate.

Open areas can be landscaped (e.g. grass, trees, shrubs, etc.). Paved areas can be installed with permeable paving. For impermeable surfaces direct all run off towards storm water collection pits.

Basic Amenities

Design Submittal

Site Credit 1.0

Points: 1

Goal:

To enhance the overall quality of life by providing amenities within and closer to the site.

Compliance Options:

Select a site with access to atleast five amenities, within a walking distance of 1 Km (see list in Exhibit A)

AND

In multi-dwelling units, provide seating area & toilets in the common area and totlots within the campus.

Note: This point can be earned only if the amenities are available before or at the time of project completion.

Documentation Required:

Provide an area map (to scale) indicating the path and distances from the proposed building to the household amenities or public transport systems. Provide photographs.

Approach and Methodologies:

Select sites near public transit and/or household services and amenities that are accessible by safe, convenient pedestrian pathways. Only restaurants can be counted twice and all other amenities to be considered only once.

Exhibit A - List of Basic Amenities

- □ Grocery store
- □ Electrician/ plumbing services
- □ School
- □ Dhobi/ Laundry
- □ Bank/ ATM
- □ Crèche
- □ Fire Station
- □ Fitness Center /Gym
- □ Library
- □ Medical clinic/ hospital
- □ Pharmacy
- □ Post Office/ Courier service
- □ Place of Worship
- □ Restaurant
- □ Supermarket
- □ Other neighborhood-serving retail
- □ Electricity/ water utility bills payment counter
- □ Police Station
- □ Playground
- □ Jogging track

Natural Topography or Landscape

Construction Submittal

Site Credit 2.0

Points: 2

Goal:

Minimise disturbances to the building site so as to reduce long-term environmental impacts.

Compliance Options:

Avoid disturbance to site by retaining the natural topography of the site (and/ or) landscape at least 15% of the site area. Points are awarded as follows:

Points for retaining natural topography or landscaping

Percentage of site area with natural topography (and/or) landscaped area	Points
≥ 15%	1
≥ 25%	2

Notes:

Parking areas, walkways etc., are considered as site disturbances.

Landscaped areas over built structures such as roofs, basement etc ***cannot*** *be considered for the purpose of calculation of landscaped area.*

Potted plants will not be considered as landscape.

Documentation Required:

Provide drawings, calculations and photographs showing the site area with natural topography (and/or) landscaped area.

Approach and Methodologies:

Design the building with a minimal footprint (by tightening design needs and stacking floor plans). Consider retaining the natural landscapes in the site, to the extent possible. In sites which have fully grown trees, avoid destruction. Avoid developing paved surfaces on the site, as much as possible.

Heat Island Effect on Roof

Construction Submittal

Site Credit 3.0

Points: 2

Goal:

Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimise impact on microclimate.

Compliance Options:

Use high albedo roofing material or heat resistant paint or china mosaic or white cement tiles or any other highly reflective materials over the roof to cover atleast 50% of the exposed roof area.

OR

Provide vegetation to cover atleast 50% of the exposed roof area.
Points are awarded as below.

Points for Heat Island Effect - Roof

Percentage of roof area with high reflective material/ roof garden	Points
$\geq$ 50%	1
$\geq$ 75%	2

Note: Exposed roof area does not include areas occupied by equipment such as HVAC, solar water heater, photovoltaic etc.,

Documentation Required:

Provide roof drawings highlighting location and the extent of highly reflective roof materials/ green roof provided.

Approach and Methodologies:

Consider installing heat resistant paint and vegetated roofs to reduce the heat island effect. Typical materials with high reflective properties include china mosaic, white cement tiles, paints with high Solar Reflective Index (SRI) values etc.,

Parking Facilities

Design Submittal

Site Credit 4.0

Points: 2

Goal:

To provide adequate parking within the site to minimise disturbance on road.

Compliance Options:

Parking for Building Occupants: (1 point)

Parking capacity to be provided as per the following guidelines (OR) as per local bye laws, whichever is more stringent:

Parking Requirement

No. of bedrooms per dwelling unit	2 wheeler parking (nos)	4 wheeler parking (nos)
1	1	0
2	1	1
3	1	2
4	1	2

Parking for Visitors: (1 point)

Provide parking provisions for visitors as follows:

- For individual homes provide 1 visitor car park
- For residential complexes provide 10% of the total parking capacity as parking for visitors

Documentation Required:

Provide drawings and calculations showing parking provisions.

Approach and Methodologies:

Design the building to ensure adequate parking provisions are made to cater to the occupants as well as the visitors. Parking provisions should take into account two wheelers and four wheelers. While planning parking, consider basement/ stilts parking to reduce the heat island effect. When surface parking is planned, consider permanent cover; however consider design strategies to address heat island effect as a result of such provisions.

Non Fossil Fueling Facility for Vehicles

Design Submittal

Site Credit 5.0

Points: 1

Goal:

To encourage the use of non fossil fuel vehicles to reduce pollution from automobile use.

Compliance Options:

Provide non fossil fueling facility within the site, as follows:

- For individual homes provide atleast one such facility
- For residential complexes provide non fossil fueling facility in a common area, to cover 3% of the total parking capacity. The non fossil fueling facility should cater to both two wheelers and four wheelers.

Documentation Required:

Provide parking plans showing provisions for non fossil fueling facility. Provide calculations demonstrating that these facilities meet the credit criteria.

Approach and Methodologies:

Survey the type of non fossil fueled vehicles already plying on the roads and also survey the kind of vehicles which may come up in the future. Create facilities so as to refuel these kinds of vehicles. Consider having adequate number of refueling facilities based on the refuel time.

While considering such fueling facilities, ensure all safety aspects have been addressed.

Design for Physically Challenged

Design Submittal

Site Credit 6.0

Points: 1

Goal:

To ensure that the building is user-friendly for physically challenged persons.

Compliance Options:

The building design should incorporate the following provisions for physically challenged persons, as applicable:

- Appropriately designed preferred car parking spaces in an area which has easy access to the main entrance or closer to the lift (one parking space for every 100 dwelling units)
- Provision for easy access to the main entrance
- Uniformity in flooring level/ ramps in common areas
- Rest rooms (toilets) in common areas designed for physically challenged persons

Documentation Required:

Provide drawings showing provisions for physically challenged persons. Also submit photographs.

Approach and Methodologies:

Identify all probable facilities required to cater to physically challenged persons. Design the building to ensure that certain basic minimum provisions for handicapped persons are incorporated.

Home User Guide

Design Submittal

Site Credit 7.0

Points: 1

Not applicable for Individual Homes

Goal:

Provide occupants with descriptive guidelines that educate and help them implement green design features within their apartment/ house space.

Compliance Options:

Publish an illustrated document that provides occupants with design, construction and operational information that details the following:

- Description of the sustainable design, construction and operational features incorporated in the Green Home project by builder/ developer.
- Information that enables occupants to design, construct and operate spaces within their control as per Green Home guidelines.

Documentation Required:

Provide a copy of the Home user guide which details occupant design, construction and operational guidelines.

Approach and Methodologies:

Develop a summary of sustainable design features incorporated in the Green Home project. Also include tips and guidelines which can be considered by the occupants in designing the interiors.

Water Efficiency

Rainwater Harvesting, 30%

Construction Submittal

Mandatory Requirement 1

Goal:

To increase the ground water table or to reduce the usage of water through effective and appropriate rainwater management.

Compliance Options:

Provide rainwater harvesting or storage system to capture atleast 30% of the runoff volumes from the roof. Storage system and/ or harvesting structure must be designed to hold 20 mm rainfall.

Runoff coefficients for Typical Surface Types

S.No	Surface Type	Runoff Coefficient
1	Cemented/ tiled Roof	0.95
2	Roof Garden	0.30

Documentation Required:

Provide details on the rainwater harvesting system specifying capacity. Provide details of application of captured rainwater usage with quantity calculations.

Approach and Methodologies:

Survey the water table in the area. Design appropriate harvesting techniques. Capture rainwater from roof top for reuse. This can be designed such that the first shower can be let out since it may carry impurities.

Water Efficient Fixtures

Construction Submittal

Mandatory Requirement 2

Goal:

To minimise indoor water usage by installing efficient water fixtures.

Compliance Options:

Select water fixtures whose flow rates are as indicated in the table below:

Baseline Flow Rates for Water Fixtures in a Typical Household

S.No	Items	Base line	Units
1	Flushing	6/3	LPF
2	Faucets* (taps)	7.6	LPM
3	Showers*	7.6	LPM

** At flowing water pressure of 3 bar*

Note: Flowing water pressure of 3 bar does not mean that the water supply in the building is at 3 bar. The building fixtures can operate at lower pressures but to show compliance under this credit, the flow rates are to be extrapolated at 3 bar.

Documentation Required:

Submit data manual by product manufacturer to confirm that conditions above have been satisfied.

Approach and Methodologies:

While selecting water fixtures, look for the efficiencies. The product catalogue or the brochure may detail the flow rates at various pressures. Fixtures are available with ultra high efficiency which can reduce substantial quantity of water consumption.

Turf Design

Design Submittal

Water Credit 1.0

Points: 2

Goal:

To limit such landscape which consume large quantities of water.

Compliance Options:

Limit the use of turf on the site so as to conserve water. Points are awarded as specified below.

Points for Limited Use of Turf

Turf area as a percentage of total landscaped area	Points
$\leq$ 20%	2
$\leq$ 40%	1

Areas planted with turf should not exceed a slope of 25 percent (i.e., a 4 to 1 slope).

Note: This point is applicable only for those projects which has 15% of the site area landscaped.

Documentation Required:

Provide a landscape plan specifying the species used. Provide photographs.

Approach and Methodologies:

Landscape as much open areas as possible. Select turf, plants, shrubs and trees which consume less water.

Drought Tolerant Species

Design Submittal

Water Credit 2.0

Points: 3

Goal:

Landscape to be designed to ensure minimum consumption of water.

Compliance Options:

Ensure atleast 20% of the landscaped area is planted with drought tolerant species. Points are awarded as specified below.

Points for Reducing Water Consumption through Drought Tolerant Species

Drought tolerant species as a percentage of the total landscaped area	Points
≥ 20%	1
≥ 30%	2
≥ 40%	3

Note: This point is applicable only for those projects which has atleast 15% of the site/ plot area landscaped.
Drought tolerant species are those species that do not require supplemental irrigation. Generally accepted time frame for temporary irrigation is one to two years.

Documentation Required:

Provide a landscape plan indicating the percentage of landscaped area which uses drought tolerant species. Also provide a list of the species used and highlight their drought tolerant nature.

Approach and Methodologies:

Select species that are well-adapted to the site. Select those species which are drought tolerant. Consider xeriscaping as an approach for landscaping.

Management of Irrigation system

Construction Submittal

Water Credit 3.0

Points: 2

Goal:

Reduce the demand for irrigation water through water-efficient management techniques.

Compliance Options: (1 point for any two features)

Provide high efficient irrigation system incorporating atleast two features mentioned below:

- Provide a central shut-off valve
- Provide a sub-meter for the irrigation system
- Provide a moisture sensor controller
- Turf and each type of bedding area (based on watering needs) must be segregated into independent zones
- At least 50% of landscape planting beds must have drip irrigation system to reduce evaporation
- Install time based controller for the valves such that the evaporation loss is minimum and plant health is ensured
- Use pressure regulating devices to maintain optimal pressure and prevent misting
- Any other innovative methods for watering

Documentation Required:

Provide a detailed description of managing the irrigation systems installed. Provide landscape plans with the names of the species. Provide cut sheets and photographs of the systems installed.

Approach and Methodologies:

The irrigation management system must be designed based on the requirements of the landscape plan, and installed as per the design. The designer and the installer must work together and ensure the planned performance of the system.

Rainwater Harvesting, 50%, 70%, 90%

Construction Submittal

Water Credit 4.0

Points: 3

Goal:

To increase the ground water table or to reduce the usage of water through effective and appropriate rainwater management.

Compliance Options:

Provide rainwater harvesting or storage system to capture run-off from roof area to utilize in landscape irrigation or indoor water usage. Storage system and/ or harvesting structure must be designed to hold 20 mm rainfall. Points are awarded as below.

Points for Rainwater Harvesting

Rainwater Harvesting System to capture/ recharge	Points
• 50% runoff from roof area	1
• 70% runoff from roof area	2
• 90% runoff from roof area	3

Note: In areas where recharging the aquifier is not feasible, collection and reuse may be considered.

Documentation Required:

Provide details on the rainwater harvesting system specifying capacity. Provide details of application of captured rainwater usage with quantity calculations.

Approach and Methodologies:

Survey the water table in the area. Design appropriate harvesting techniques. Capture rainwater from roof top for reuse. This can be designed such that the first shower can be let out since it may carry impurities. In areas where recharging the aquifier is not possible, collection and reuse may be considered.

Grey Water - Treatment

Construction Submittal

Water Credit 5.0

Points: 2

Goal:

Reduce the consumption of water by in situ treatment of grey water generated so as to not pollute the municipal streams.

Compliance Options:

Provide an onsite grey water treatment system to treat atleast 70% of grey water generated in the building, to standards suitable for flushing and landscaping purpose. Points are awarded as specified below.

Points for Grey Water Treatment

Percentage of grey water treated	Points
$\geq$ 70%	1
$\geq$ 90%	2

Notes:

Grey water is neither clean nor heavily soiled waste water that comes from clothes washers, bath tubs, showers, bathroom wash basins, kitchen sinks and dish washers. More specifically it is the untreated waste water which has not come into contact with toilet waste.

Documentation Required:

Provide a detailed description of the onsite grey water treatment system. Provide photographs/ cut sheets from the manufacturers. Provide water balance of the building. Provide details of usage of treated grey water within the building.

Approach and Methodologies:

Calculate the grey water volumes generated in the building. Design appropriately the capacity of the onsite grey water treatment system. While designing the treatment system, ensure that the treated grey water meets the required quality standards based on its purpose of application. Have signages all around the building to caution occupants and housekeeping staff that this water is not potable.

Grey Water – Reuse

Construction Submittal

Water Credit 6.0

Points: 3

Goal:

Reduce demand for fresh water by using treated grey water.

Compliance Options:

Reuse atleast 50% of the grey water generated for landscape or other purposes. Points are awarded as detailed below.

Points for Reuse of Grey Water

Reuse of grey water	Points
Reuse ≥ 50% of grey water generated	1
Reuse ≥ 70% of grey water generated	2
Reuse ≥ 90% of grey water generated	3

AND

The reused treated grey water must conform to the quality standards as highlighted in the table below or local standards whichever is more stringent:

Quality Standards for Treated Grey Water Reused

Parameter	Quality Standards for treated water
BOD 5 days @ 20 deg C	100 mg/l
Suspended solids (SS)	200 mg/l
Oil and grease (After grease trap for canteen/kitchen)	10 mg/l
pH	5.5-9.0

Note: This point can be claimed only if the grey water that is reused is treated in situ.

Documentation Required:

Provide a detailed description on the grey water re-use system. Also provide calculations on quantity and quality of grey water reused. Provide details of applications of grey water reused.

Approach and Methodologies:

Install an adequately sized grey water treatment plant and explore areas within the building where grey water can be reused. In areas where there is human contact ensure that the quality of the treated grey water is fit and safe for reuse. Treated grey water can be typically used for irrigation, flushing and make up water for air-conditioning systems. Ensure periodic testing of the treated water to meet the prescribed quality standards.

Plumbing Systems for flushing

Construction Submittal

Water Credit 7.0

Points: 2

Goal:

To have infrastructure in the building so as to encourage use of treated grey water.

Compliance Options:

Provide separate water plumbing lines for flushing purpose and source 100% of the flushing water requirements from the treated grey water available.

AND

The reused treated grey water must conform to the quality standards as highlighted in the table below or local standards whichever is more stringent:

Quality Standards for Treated Grey Water Reused

Parameter	Quality Standards for treated water
BOD 5 days @ 20 deg C	100 mg/l
Suspended solids (SS)	200 mg/l
Oil and grease (After grease trap for canteen/kitchen)	10 mg/l
pH	5.5-9.0

Note: This point can be claimed only if the grey water that is reused is treated in situ.

Documentation Required:

Submit drawings showing separate plumbing lines for treated grey water. Provide calculations to show the quantity of grey water used for flushing.

Approach and Methodologies:

Evaluate the water consumption in the building and ascertain the quantity of grey water generated. Also evaluate the availability of grey water for flushing purposes and accordingly install the dual plumbing lines. Design the plumbing system accordingly.

Water Efficient Fixtures, 10%, 20%

Construction Submittal

Water Credit 8.0

Points: 6

Goal:

To minimise indoor water usage by installing efficient water fixtures.

Compliance Options:

Select water fixtures for all the three items mentioned below whose flow rates are atleast 10% lower than the given baseline values. Points are awarded as below.

Baseline Flow Rates for Water Fixtures in a Typical Household & Points for Efficient Water Fixtures

S S.No	Items	Base line	Units	Points Awarded	
				Water consumption 10% Lower than base line	Water consumption- 20% lower than base line
1	Flushing	6/3	LPF	1	2
2	Faucets* (taps)	7.6	LPM	1	2
3	Showers*	7.6	LPM	1	2

** At flowing water pressure of 3 bar*

Note: Flowing water pressure of 3 bar does not mean that the water supply in the building is at 3 bar. The building fixtures can operate at lower pressures but to show compliance under this credit, the flow rates are to be extrapolated at 3 bar.

Documentation Required:

Submit data manual by product manufacturer to confirm that conditions above have been satisfied. Provide calculations to show the percentage of water savings.

Approach and Methodologies:

While selecting water fixtures, look for the efficiencies. The product catalogue or the brochure may detail the flow rates at various pressures. Fixtures are available with ultra high efficiency which can reduce substantial quantity of water consumption.

Energy Efficiency

CFC Free Equipment

Design Submittal

Mandatory Requirement 1

Goal:

To avoid the use of such refrigerants and ozone layer depleting gases which will negatively impact the ozone layer.

Compliance Options:

Refrigerants used in Heating, Ventilation & Air-conditioning (HVAC) equipment and unitary air-conditioners installed must be CFC-free.

Documentation Required:

Provide a signed declaration signed by the responsible party declaring that the building HVAC systems do not used CFC based refrigerants.

Approach and Methodologies:

Survey the market for all CFC free HVAC systems. Such systems are also available in smaller capacities. Install HVAC equipment which does not use CFC based refrigerant.

Energy Performance

Design Submittal

Energy Credit 1.0

Points: 11
(2 points Mandatory)

Goal:

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

Compliance Options:

The project can choose any one of the following options:

Option 1 - Prescriptive Approach (1 to 7 points) as detailed in Annexure – II

The prescriptive approach allows the project to comply with all applicable criteria as outlined in Annexure II. This approach does not require energy simulation of the project design and does not allow tradeoffs.

OR

Option 2 – Performance Based Approach (6 to 11 points) as detailed in Annexure – II

The Performance based approach involves a building energy simulation and modeling. Tradeoffs are permissible. This approach allows the project to demonstrate improvements over the baseline criteria.

Documentation Required:

Option 1

Provide the following documents:

- The manufacturer cut sheets indicating 'U' values and SHGC values for glazing.
- Details of roof, roof insulation material, specifying the U value of the overall roof assembly.
- Details of the wall construction, specifying the U value of the wall assembly.

- Manufacturers cut sheets specifying the energy efficiency or performance values of the Air conditioning or Heating units.
- Details of the design lighting power density for exterior and interior spaces.
- Details on all the automatic controls installed. Provide manufacturers cut sheets/ photographs.

Option 2

Provide the following documents:

- The building energy simulation results indicating savings in energy cost in the format prescribed in Annexure IV.
- The manufacturers cut sheets indicating 'U' values and SHGC values of the glazing.
- Details of roof, roof insulation material, specifying the U value of the overall roof assembly.
- Details of the wall construction, specifying the u value of the wall assembly.
- Manufacturers cut sheets specifying the energy efficiency or performance values of the Air conditioning or Heating units.
- Details of the design lighting power density for exterior and interior spaces.

Approach and Methodologies:

Consider a holistic energy efficiency approach to include the building orientation, envelope, systems, lighting and other equipment.

Research on the materials and equipment available in the market and their properties with regard to energy performance. While selecting these material and equipment, consider their associated environmental impacts.

Decision making with respect to selection of materials can be based on a life cycle assesment approach rather than the initial cost.

Determine the applications where automatic controls can help in energy savings. Obtain details of the controls and ensure proper installation.

Annexure - I

Baseline Criteria for Energy Performance of the Building

A. Envelope Measures:

Window Glazing - 'U' Value and SHGC Value

Climate Zone *	U-Value (W/m^2K)	SHGC Value	
		WWR < 20%	WWR 20 - 30%
Composite	3.3	0.38	0.30
Hot and Dry	3.3	0.38	0.30
Warm and Humid	5.0	0.38	0.30
Moderate	6.9	0.50	0.40
Cold	3.3	Not required	Not required

Roof Assembly 'U' Value

Climate Zone*	'U'-Value of the overall assembly (W/m^2K)
Composite	0.50
Hot and Dry	0.50
Warm and Humid	0.50
Moderate	0.50
Cold	0.50

Wall Assembly 'U' Value

Climate Zone*	'U'-Value of the overall assembly (W/m^2K)
Composite	1.1
Hot and Dry	1.1
Warm and Humid	1.25
Moderate	1.25
Cold	0.5

Note: For Climatic Zone of India, please refer Exhibit – B.

B. Air conditioning and Heating Systems/ Equipment

Depending on the climatic zone, heating/ cooling systems should be considered as follows:

Heating and Cooling Requirements for Climatic Zones

Climate Zone*	System
Composite	Cooling & Heating (for places having more than 150 Heating degree days – HDD18)
Hot and Dry	Cooling
Warm and Humid	Cooling
Moderate	Cooling
Cold	Heating

Note: For Climatic Zone of India, please refer Exhibit – B.

- Degree day: The difference in temperature between the outdoor mean temperature over 24 hour period and a given base temperature
- Heating degree day base 18^{o}C, HDD 18: for any one day, when the mean temperature is less than 18^{o}C, there are as many degree-days as degree Centigrade temperature difference between the mean temperature for the day and 18^{o}C. Annual heating degree-days (HDDs) are the sum of the degree-days over the calendar year.

Air Conditioners:

Baseline air-conditioning system to be considered as unitary air conditioners with COP/ EER equivalent to three star rated equipment under BEE labeling programme.

For latest list of Air conditioners rated by BEE please refer the BEE website *http://www.bee-india.nic.in/*

Heat pumps:

For buildings with unitary heat pumps, the minimum efficiency requirements are detailed below.

Minimum efficiency requirements for Packaged Terminal Heat Pumps (PTHP)

Equipment Type	Size Category (Input)	Minimum Efficiency COP	Test Procedure
PTHP (Heating Mode)	All capacities	2.5	ARI 310/380

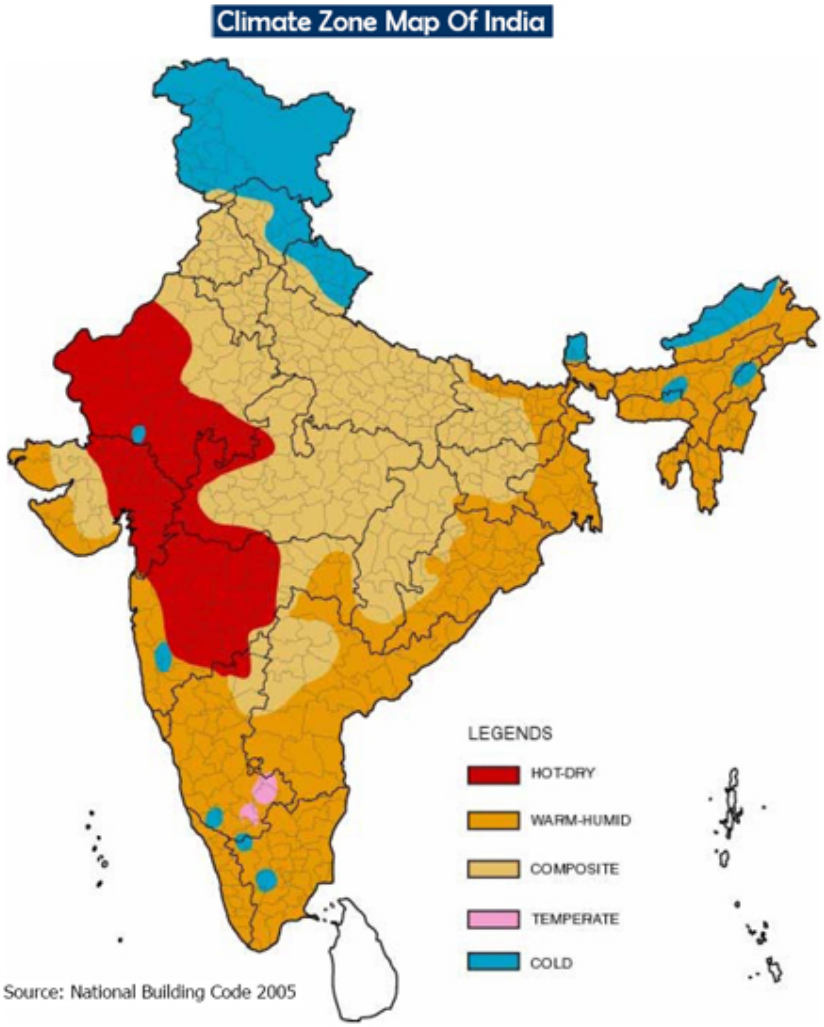
C. Lighting Power Density

The Lighting power density (LPD) in the interior spaces should be less than 5.445 W/sq.m (0.5 W/sq.ft) and for common areas, the LPD should be less than 3.26W/sq.m (0.3 W/sq.ft.) This LPD includes the power consumption of the complete fixtures which include lamps and ballasts.

Multi-dwelling Units

In dwellings where interior spaces are not in control of the developer, the LPD in the common areas should be addressed and for interior LPD the 'Home User Guide' must incorporate guidelines on maximum allowable LPD in the interior spaces.

Exhibit B – Climatic Zone of India



Annexure – II

Procedure for achieving points under the credit 'Energy Performance'

Option 1 – Prescriptive Approach (1 to 7 points)

A. Envelope Measures: (1 to 3 points)

The project must ensure that the envelope measures meet the baseline criteria as outlined in Annexure I. Points are awarded as follows.

- **Window Glazing 'U' Value and SHGC Value (1 point)**
- **Overall Roof Assembly 'U' Value (1 point)**
- **Wall Assembly 'U' Value (1 point)**

B. Air conditioning and Heating systems/ equipment (2 points)

- **Air Conditioning System**
    - Unitary air conditioners must meet the baseline criteria (Annexure I)
    - Centralised Air conditioning chiller should meet the criteria as per the following table:

Minimum Efficiency Requirements

Equipment Type	Size Category	Minimum Efficiency [a]	Test Procedures
Air Cooled, with Condenser, Electrically Operated	All Capacities	2.80 COP 3.05 IPLV	ARI 550/590
Air Cooled, without Condenser, Electrically Operated	All Capacities	3.10 COP 3.45 IPLV	
Water Cooled, Electrically Operated	All Capacities	4.45 COP 5.20 IPLV	ARI 550/590

Air-Cooled Absorption Single Effect	All Capacities	0.60 COP	ARI 560
Water-Cooled Absorption Single Effect	All Capacities	0.70 COP	
Absorption Double Effect, Indirect-Fired	All Capacities	1.00 COP 1.05 IPLV	
Absorption Double Effect, Direct-Fired	All Capacities	1.00 COP 1.00 IPLV	

- **Heating Systems**

    - Unitary heat pumps must meet the baseline criteria (Annexure I)
    - Non electricity based heating system should have a minimum thermal efficiency of 70%

C. Lighting Power Density (1 point)

The Lighting power density in the interior and exterior spaces should meet the baseline values as detailed in Annexure I.

D. Automatic Controls (1 point)

Install automatic controls to address the following:

Individual homes - (1 point for any 3 features from list below)

- Automatic shades and blinds
- Timer based controls for all lawn sprinklers
- Movement sensors for lighting control to cover the following areas: toilets, study, staircases, stair cabins, corridors, garage, balconies, wash and storage areas
- Dimmer controls/ daylight cut off sensors for internal and external lighting as appropriate.
- Sleep mode control for air conditioners in bedrooms

Multi-dwelling units - (1 point for 2 features)

- Timer based controls for all lawn sprinklers
- Movement sensors for lighting control to cover the common areas (which includes staircases, corridors, lifts, club house, gym etc.,)
- Dimmer controls/ daylight cut off sensors for external lighting as appropriate

Option 2 – Performance Based Approach (6 to 11 points)

The project must perform a building energy simulation model taking into consideration the building envelope, lighting, HVAC and other systems. The base case criteria for the computer simulation will be the values as detailed in Annexure I.

The following comfort conditions should be considered for energy simulation:

Indoor temperature set point for simulation should be between 24 and 28^0 C all through the year. Comfort conditions to be considered both for summer and winter.

Points are awarded based on percentage savings as detailed below:

Points for Energy Performance (Option 2)

Percentage Energy Cost Savings	Points
Equivalent to base case	6
4 % above base case	7
8 % above base case	8
12 % above base case	9
16 % above base case	10
20 % above base case	11

The protocol for energy simulation is detailed in Annexure III.

Annexure III

Protocol for Building Energy Simulation

Performance Based Approach

This method can be adopted for buildings which implement energy efficiency measures beyond those specified in the baseline parameters outlined in Annexure I.

Simulation general requirements:

- Performance Evaluation.

  The proposed building performance and baseline building performance shall be evaluated using the same:

  (a) Simulation program
  (b) Weather data and
  (c) Energy rates

- Simulation Program.

  The simulation program shall be a computer-based program for the analysis of energy consumption in buildings (a program such as, but not limited to, DOE-2, E-10, BLAST, or Energy Plus). The simulation program shall include calculation methodologies for the building components being modeled. For components which cannot be modeled by the simulation programme, the project may submit calculations for the performance of such components.

  The simulation program shall, at a minimum, have the ability to explicitly model all of the following:

  - 8,760 hours per year;
  - Hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat set points, and HVAC system operation, defined separately for each day of the week and holidays;
  - Thermal mass effects;

- Two or more thermal zones;
- Part-load performance curves for mechanical equipment;
- Capacity and efficiency correction curves for mechanical heating and cooling equipment;

- The simulation program shall perform the simulation using hourly values of climate data, such as temperature and humidity from representative climate data, for the site in which the proposed design is to be located. For cities or urban regions with several climate data entries, and for locations where weather data are not available, the designer shall select available weather data that best represent the climate at the construction site.

- For projects which use on-site renewable energy sources or site-recovered energy, the energy from such sources can be subtracted from the total energy of the proposed case.

- The equipment capacities for the baseline building design shall be oversized by 15% for cooling and 25% for heating as compared to the system sizing done by the simulation programme.

- Unmet load hours for each of the zones in the proposed design or baseline building designs shall not exceed 300 hours (of the 8,760 hours simulated). The unmet hours in the proposed case shall not exceed the unmet hours in the base case by more than 50 hours.

- If unmet load hours for the proposed design or baseline building design exceed 300, simulated capacities shall be increased incrementally, and the building with unmet loads resimulated until unmet load hours are reduced to 300 or less.

Calculation of the Proposed and Baseline Building Performance

Building energy modeling requirements for proposed and baseline building:

The baseline model shall be identical to the proposed model except as specifically detailed in the table below.

	Case	Proposed building	Baseline building
1.	Design model	a) The simulation model of the proposed design shall be consistent with the actual design and should include envelope measures and all systems b) All end use energy consumers in the building and associated with the building must be modeled.	a) The baseline model should have the same conditioned area and same number of floors as the proposed building. b) All end use energy consumers in and associated with the building in the base case should be the same as the proposed case.
2.	Schedules	The schedules shall be typical of the proposed building as determined by the designer.	Same as proposed design
3.	Building envelope	All components of the building envelope in the proposed design shall be modeled as shown on architectural drawings or as installed for existing building envelopes. a) Orientation: As per design b) Opaque assemblies such as roof and walls shall be modeled with the same heat capacity and U-value as per proposed design. c) Fenestration: as per design Manually operated fenestration shading devices	The standard design shall have identical conditioned, unconditioned floor area and identical exterior dimensions and orientations as proposed design, unless otherwise mentioned. a) Orientation: The baseline energy performance shall be the average of the performance with original orientation and after rotating the entire building 90, 180, 270 degrees. The building shall be modeled so that it does not shade itself. b) Opaque assemblies such as roof and walls shall be modeled with the same heat capacity as the proposed design but the U-values as per Annexure I. c) Fenestration: Fenestration areas shall be equal to that in the proposed design or 30% of gross

		such as blinds or shades shall not be modeled. Permanent shading devices such as fins, overhangs, and light shelves shall be modeled. d) For exterior roofs the reflectance and emittance of the roof surface shall be modeled as 0.45 if the actual value is more than 0.7 for reflectance and 0.75 for emittance.	wall area above grade, whichever is smaller, and shall be distributed uniformly in horizontal bands across the four orientations. • No shading projections are to be modeled; fenestration shall be assumed to be flush with the exterior wall or roof. • Manually operated fenestration shading devices such as blinds or shades shall not be modeled. • Fenestration U-factor and SHGC shall be as per Annexure I. d) Roof albedo: all roof surfaces shall be modeled with a reflectivity of 0.30.
4.	Lighting	Lighting power in the proposed design shall be as per the actual design. In addition the following Energy conservation measures (ECM) can be factored, if considered in design. a) Occupancy/Motion sensors with daylight cut-off sensors used in the common areas (like staircases, common corridors, parking areas) in the proposed case, should not be modeled can be giving a direct saving of 15% over the lighting power of those fixtures connected to such sensors.	Lighting power in the standard design shall be determined using the Baseline values as detailed in Annexure I.

		b) Using timer/ daylight based controls for the external lighting systems (areas like façade lighting, landscape lighting, and street lighting) will have a direct saving of 15% on the lighting power of those fixtures connected to such controls.	
5.	Heating and Cooling systems	a) Where a cooling and heating system has been designed, the model shall be consistent with design documents. b) Where no heating or cooling system is proposed, the systems shall be the same as the baseline. At a minimum the bedrooms and living rooms shall be assumed as conditioned.	a) The Cooling system for the base case is to be modeled considering the system defined in Annexure I. If the building requires heating (as defined in the table 'Heating and Cooling Requirements for Climatic Zones' of Annexure I) the heating system would be heat pump with efficiencies as per the baseline criteria – Annexure I.
6.	Service hot water	a) The system shall be as per the design. b) Where no service hot water system exists or it is specified, no service hot water heating shall be modeled.	Base case system should be an electrical heating system.
9.	Miscellaneous load	Plug loads and process loads shall be modeled as designed. All end-use load components shall be modeled such as exhaust fans, parking garage ventilation fans, exterior building lighting, swimming pool heaters and pumps, elevators and escalators, refrigeration equipment, and cooking equipment.	Plug loads and process loads shall be modeled the same as the proposed design.

Annexure IV

Performance Based Approach – Energy Cost savings

	Proposed building				Baseline Building	
End Use	Energy Type	Energy (10^6 kCal)	Peak (10^6 kCal)	Energy (10^6 kCal)	Peak (10^6 kCal)	Energy (%)
Interior Lighting	Electricity					
Exterior Lighting	Electricity					
Space Heating	Natural Gas					
Space Cooling	Electricity					
Fans - Interior	Electricity					
Plug loads & other miscellaneous loads	Electricity					
Service Water Heating	Electricity					
Plug loads	Electricity					
Total Building Consumption						

	Proposed building		Base Building		% Improvement	
Type	Energy Use (10^6 kCal)	Energy Cost (Rs/yr)	Energy Use (10^6 KCal)	Energy Cost (Rs/yr)	Energy %	Cost %
Nonrenewable (Regulated & Unregulated)						
Electricity						
Natural Gas						
Steam or Hot Water						
Chilled Water						
Other						
Total Nonrenewable (Regulated & Unregulated)						

ENERGY EFFICIENCY

	Proposed building		Base Building		% Improvement	
Renewable energy & savings through exceptional calculations	Energy Use (10^6 kCal)	Energy Cost (Rs/yr)	Energy Use (10^6 kCal)	Energy Cost (Rs/yr)	Energy %	Cost %
Site generated renewable energy						
Exceptional Calculations Savings						
Total excluding renewable energy & including exceptional calculations						

Note: The tables detailed in Annexure IV are not exhaustive and only indicate the format for energy savings of the energy simulation results.

Metering

Design Submittal

Energy Credit 2.0

Points: 1

Goal:

To encourage continuous monitoring and enhance the performance of the residential dwelling unit(s).

Compliance Options:

Provide meters for any four of the following:

- Meter for total energy consumption of the building
- Energy meter for internal lights
- Energy meter for external lights
- Meter for municipal water pumping
- Meter for grey water pumping
- Meter for landscaping requirements
- Meter for chilled water consumption for individual units

Documentation Required:

Describe the metering equipment installed. Provide cut sheets for the meters installed.

Approach and Methodologies:

Identify all the major energy and water consuming equipment and install systems to monitor their consumptions. Develop and implement a measurement and verification mechanism to compare predicted savings to actual energy performance.

Refrigerators

Construction Submittal

Energy Credit 3.0

Points: 1

Not applicable for multi-dwelling units

Goal:

To encourage the use of energy efficient appliances to reduce energy consumption in the proposed building.

Compliance Options:

All Direct Cool and Frost Free Refrigerators installed must be rated atleast three stars under BEE labeling or equivalent.

List of Refrigerators rated by BEE can be referred from the BEE website *http://www.bee-india.nic.in/*

Documentation Required:

Provide manufacturers brochures of the refrigerators used. Provide photographs.

Approach and Methodologies:

Conduct a market survey before selecting appliances. Consider the energy efficiency of these appliances. Consider BEE rated appliances.

Solar Water Heating Systems

Construction Submittal

Energy Credit 4.0

Points: 1

Goal:

To encourage use of solar energy for water heating applications in the building.

Compliance Options:

Provide solar water heating system to satisfy hot water for domestic needs. The capacity for the system should be designed as follows:

Capacity for Solar Water Heater

Number of Bedrooms	Capacity in litres per day
Upto 3	100
> 3	200

Documentation Required:

Submit installation design for solar hot water system. Provide manufacturers cut sheets and purchase invoice.

Approach and Methodologies:

Calculate hot water requirement for the building. The design should consider the availability of space to install the solar heating panels.

Captive Power Generation

Construction Submittal

Energy Credit 5.0

Points: 1

Not applicable for Individual Homes

Goal:

To reduce dependence on fossil fuels for insitu power generation.

Compliance Options:

Provide Generator sets to meet atleast 10% of the total connected load (excluding air-conditioning load) which meets the following criteria, as applicable:

- Use bio fuels or non edible oils or any other non-fossil based fuel for captive power generation.
- Use Diesel Generator sets which is Central Pollution Control Board (CPCB) certified for emissions and noise compliance.

Documentation Required:

Submit details on the alternative fuel used for captive power generation or provide details on the noise and emission levels of the diesel generator sets along with the CPCB certification.

Approach and Methodologies:

Survey the market for available captive power generators which operate on bio fuels or non edible oils and diesel generator sets which are CPCB certified for emissions and noise. Also consider availability of fuel on a sustained basis and the economic viability.

Onsite Renewable Energy

Design Submittal

Energy Credit 6.0

Points: 3

Goal:

Promote self sufficiency in energy through renewable technologies for onsite power generation and use within the building.

Compliance Options:

Install renewable energy systems for atleast 2.5% of annual consumption of the building. Points are awarded as below.

Points for Renewable Energy Power

Percentage of connected load	Points
$\geq$ 2.5 %	1
$\geq$ 5.0 %	2
$\geq$ 7.5 %	3

Documentation required:

Submit installation design for renewable energy source. Submit cut sheets from manufacturers and provide purchase invoice.

Approach and Methodologies:

Take into consideration the renewable energy feasibility while determining the power requirement from the local utility. The following are the sources of renewable energy that can be considered under this credit: Solar energy, Wind energy, Biomass, Bio gas etc.,

Lighting – Internal

Design Submittal

Energy Credit 7.1

Points: 1

Not applicable for multi-dwelling units

Goal:

To encourage use of energy efficient lighting systems to reduce energy consumption within the home.

Compliance Options:

Install energy efficient internal lighting fixtures which are atleast three star rated under BEE labeling programme or fixtures which are more efficient.

Points are awarded as follows:

Points for Energy Efficient Internal Lighting

Lighting Provision	Points
90% of all internal lighting load to be installed with fixtures that are BEE 3 star rated or more efficient	1

The list of BEE labeled light fittings can be referred from the BEE website *http://www.bee-india.nic.in/*.

Documentation Required:

Provide specifications and drawings of the internal light fixtures used and provide copies of purchase orders/ receipts for lighting in all rooms. When calculating the percentage of energy efficient light fittings the following rooms can be considered: living rooms, dining rooms, kitchens, bedrooms, hallways, study rooms, bathrooms and utility rooms.

Approach and Methodologies:

Survey available energy efficient lighting fixtures in the market. Also consider the life of the lamps and evaluate the economic viability.

Lighting – External

Design Submittal

Energy Credit 7.2

Points: 1

Goal:

To encourage the use of energy efficient outdoor lighting fixtures, thereby reducing overall energy consumption.

Compliance Options:

Provide all external space lighting by energy efficient lighting fixtures.

Points are awarded as follows:

Points for Energy Efficient External Lighting

Lighting Provision	Points
90% of all external lighting load to be installed with fixtures that are BEE 3 star rated or more efficient	1

Documentation Required:

Provide specifications and drawings of the external light fixtures used or provide copies of purchase orders/ receipts for lighting in all external spaces. Provide details of daylight cut off sensors or timers.

Approach and Methodologies:

Survey available energy efficient lighting fixtures in the market. Also consider the life of the lamps and evaluate the economic viability.
Following are some of the energy efficient light fittings: efficient tubular fluorescent light fittings, T5 lamps, Compact fluorescent light fittings, Light emitting diodes etc.,

Energy Saving Measures in Other Equipment *Construction Submittal*

Energy Credit 8.0 Points: 1

Goal:

To conserve energy in the use of other equipment.

Compliance Options:

Provide any three of the following measures:

- Level controllers in overhead water tanks
- Energy efficient lifts with group control
- Minimum 60% efficiency in water pumps
- Minimum 75% efficiency in motors

Documentation Required:

Provide details of the energy saving measures provided which include manufacturers cut sheets, drawings etc., as applicable.

Approach and Methodologies:

Determine the applications where energy saving measures can be adopted. Obtain details of the equipment required, identify the vendors and install energy saving measures.

Materials

Separation of wastes

Design Submittal

Mandatory requirement 1

Goal:

To facilitate segregation of waste at source so as to prevent such waste being sent to landfills.

Compliance Options:

- Provide separate bins at individual house level to collect organic waste, plastics and paper.

AND

- In multi dwelling units, in addition to the above, also provide a common facility to collect waste which should cover atleast three of the following:
  - ❖ Organic waste
  - ❖ Paper & Cardboard
  - ❖ Plastics
  - ❖ Metals (tins and cans)
  - ❖ 'e' waste and
  - ❖ Batteries

Documentation Required:

Submit detailed drawings of the bins and their location within the building.

Approach and Methodologies:

Allocate suitable site for sorting out dry and wet wastes. Examine the scope for recycling items of waste collected from building debris and residential wastes. Locate local dealers of waste material such as glass, plastic, paper, newspaper, cardboard, organic wastes and 'e' wastes & batteries. Educate residents about recycling methods.

Waste Reduction during Construction

Construction Submittal

Material Credit 1.0

Points: 3

Goal:

Minimise construction waste being sent to landfills.

Compliance Options:

Waste Reduction (Max. 3 Points)

Avoid atleast 50% of the waste generated during construction being sent to landfills and incinerators. Calculate percentage using either weight or volume. Points are awarded as below.

Points for Waste Diversion

Percentage of Waste Diverted	Points
$\geq$ 50%	1
$\geq$ 70 %	2
$\geq$ 90%	3

Documentation Required:

Submit records tabulating the total waste material generated and the quantities which were diverted from landfills.

Approach and Methodologies:

Collect all construction debris generated on site. Segregate these waste based on their utility. Examine means of sending such waste to manufacturing units which use them as raw materials. Typical construction debris in residential projects could be broken bricks, steel bars, broken tiles, glass, wood waste, paint cans, cement bags, packing materials etc.,

Solid Waste Management, Post Occupancy

Construction Submittal

Material Credit 2.0

Points: 1

Goal:

To ensure effective solid waste management in the building, post occupancy.

Compliance Options:

Install onsite solid waste treatment technology for treating all organic wastes. The output from such systems like manure, power, etc., should be reused insitu.

Documentation Required:

Submit design details of the waste treatment system installed. Submit cut sheets from manufacturers and provide purchase invoice. Also provide photographs.

Approach and Methodologies:

Calculate the quantum of organic waste generated in the building. Design the waste treatment plant with suitable capacity to efficiently manage the wastes and recover resources. **Typical technologies recognised are digesters, gasifiers, vermicomposting etc.,**

Materials with Recycled Content

Construction Submittal

Material Credit 3.0

Points: 2

Goal:

To encourage the use of products which contain recycled materials to reduce environmental impacts associated with the use of virgin materials.

Compliance Options:

Use materials with recycled content such that the total recycled content constitutes atleast 5% of the total cost of the materials used in the project. Points are awarded as below.

Points for Recycled Content

Percentage of Recycled content	Points
≥ 5%	1
≥ 10 %	2

Notes:

- *Material Cost = Total Cost – (Labour Cost + Installation Cost)*
- *If Labour and installation cost is not known the default material cost can be considered as 60% of the total cost of the component*
- *Cost of equipment, systems, lighting fixtures, appliances, movable furniture need not be considered in the total material cost*

Documentation Required:

Provide details on all materials used in the project with the material cost. Specify recycled content in the materials used. Submit letters from manufacturers specifying the recycled content.

Approach and Methodologies:

Survey the materials with recycled content and locate such local suppliers. Some of the materials with recycled content are Fly ash blocks, Tiles, Steel, Glass, Cement, False Ceiling, Aluminium and Composite Wood.

Rapidly Renewable Materials

Construction Submittal

Material Credit 4.0

Points: 1

Not applicable for multi-dwelling units

Goal:

Maximise the use of materials which are rapidly renewable.

Compliance Options:

Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) to an extent of 2% of the cost of the building materials.

Documentation Required:

Provide details on the use of rapidly renewable materials in the building. Provide a calculation on the area of such materials used. Also provide the percentage of carpet area that rapidly renewable materials constitute.

Approach and Methodologies:

Survey the applications of rapidly renewable materials in the building design. Consider materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheat board, strawboard and cork. During construction, ensure that the specified rapidly renewable materials are installed.

Local Materials

Construction Submittal

Material Credit 5.0

Points: 2

Goal:

Encourage the use of building materials available locally thereby minimising the associated environmental impacts.

Compliance Options:

Ensure atleast 50% of the total building materials by cost used in the building should have been manufactured within a radius of 500 Km. Points are awarded as follows:

Points for Local Materials

Percentage of local materials	Points
≥ 50 %	1
≥ 75%	2

Documentation Required:

Provide calculations demonstrating that the project uses the required percentage of local materials in terms of cost. Provide letters from the manufacturers/ vendors indicating the distance from the place of manufacture to the project site.

Approach and Methodologies:

Set a project goal for utilization of locally sourced materials from identified suppliers. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed.

Reuse of Salvaged Materials

Construction Submittal

Material Credit 6.0

Points: 2

Not applicable for multi-dwelling units

Goal:

Encourage the use of salvaged building materials and products to reduce the demand for virgin materials thereby minimizing the impacts associated with extraction and processing of virgin materials.

Compliance Options:

Ensure atleast 5% of the total building materials by cost used in the building is salvaged, refurbished and reused. Points are awarded as follows:

Points for Reuse of Salvaged Materials

Percentage of Materials Salvaged	Points
$\geq$ 5 %	1
$\geq$ 10%	2

Documentation Required:

Provide calculations demonstrating that the project uses the required percentage of salvaged materials in terms of cost. Provide sources of such salvaged material.

Approach and Methodologies:

Identify opportunities to incorporate salvaged materials into building design and research potential material suppliers. Consider salvaged materials such as flooring, paneling, doors, frames, furniture, brick etc.,

Wood Based Building Materials and Furniture *Construction Submittal*

Material Credit 7.1 Points: 2

Goal:

To minimise the usage of virgin wood thereby encouraging responsible forest management.

Compliance Options:

Ensure atleast 50% (by cost) of all new wood used in the building will be FSC (Forest Stewardship Council) certified or the local Forest Department certified wood. Points are awarded as below.

Points for Use of FSC/ Forest Department certified wood

Percentage of FSC/ Forest Dept certified wood	Points
$\geq$ 50 %	1
$\geq$ 75%	2

Documentation Required:

Provide details showing the total cost of wood based products procured for the building. Provide details on the FSC/ Forest Department certified wood used. Also show the percentage calculations of the certified wood used to the total cost of new wood used for doors, windows, furniture etc.,

Approach and Methodologies:

Ascertain wood based applications in the home. Substitute the use of virgin wood with FSC or Forest Department Certified wood.

Indoor Air Quality

Tobacco Smoke Control

Design Submittal

Mandatory Requirement 1

Goal:

Minimise exposure of non smokers to the adverse health impacts arising due to passive smoking, post occupancy.

Compliance Options:

Smoking should be prohibited in the common areas of the building.

AND

Locate specifically assigned outdoor smoking areas at a minimum of 7.6 meters (25 feet) from entrance doors, window openings and outdoor air intakes.

Note: In dwelling unit(s) where 7.6 meters (*25 feet) clearance from possible areas of smoke ingress is not possible, assigning outdoor smoking areas will not meet the requirement.*

Documentation Required:

Provide details on how the building complies with the requirement. Also provide details on how this would be implemented and identify the agency responsible to ensure compliance.

Approach and Methodologies:

Prohibit smoking in common areas like corridors, lobby, lifts etc., Design the building to eliminate or minimise tobacco smoke pollution amongst the dwelling units. Occupant guidelines can specify that smokers should ensure that tobacco smoke does not enter common areas or other dwelling units. Smoking should be encouraged only in the outdoor designated smoking areas. Signages can be placed at several places in the building campus to educate occupants and visitors.

Day Lighting, 50%

Design Submittal

Mandatory Requirement 2

Goal:

To ensure connectivity between the interior and the exterior environment, by providing good day lighting.

Compliance Options:

Achieve a minimum average daylight factor of 2% for 50% of the total floor area of all regularly occupied spaces which include kitchens, living rooms, bed rooms, dining rooms and study rooms.

Average Daylight factor can be calculated using the formula given below:

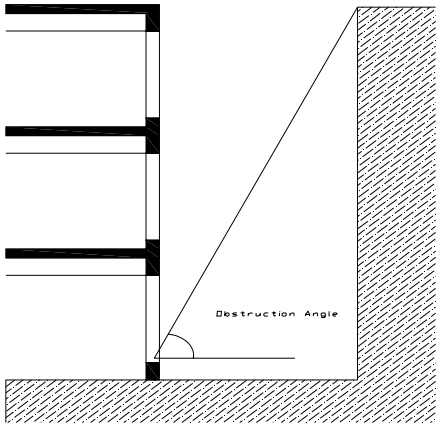
$$\text{Daylight Factor} = \frac{\text{Window Area* [SF]}}{\text{Floor Area [SF]}} \times \text{Window Geometry} \times \frac{\text{Actual Visible transmittance}}{\text{Minimum Visible transmittance}} \times \text{Height Factor}$$

Exceptional calculation for compliance:

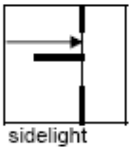
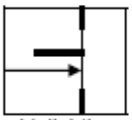
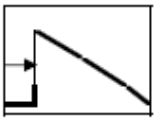
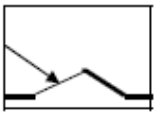
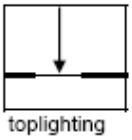
The required daylight factor can also be shown using daylight simulation tools.

Notes:

- *Window openings which are less than 0.76 meters (2.5 feet) above the floor are not considered for daylighting calculations*
- *Window openings where the angle of obstruction of objects obscuring the sky dome is greater than 70 deg. from the horizontal shall not be considered for daylight calculations*



Daylight Design Criteria

Window Type	Geometry Factor	Minimum Tvis	Height Factor
 sidelight daylighting glazing	0.1	0.7	1.4
 sidelighting vertical monitor	0.1	0.4	0.8
 toplighting vertical monitor	0.2	0.4	1
 toplighting sawtooth monitor	0.33	0.4	1
 toplighting horizontal skylights	0.5	0.4	1

Source: LEED India for New Construction

Notes:

- *Sidelight daylight glazing is selected for window openings which are 2.1 meters (7 feet) above the floor*
- *Sidelighting vertical monitor is selected for window openings which are 0.76 to 2.1 meters (2.5 feet to 7feet) above the floor*

Documentation Required:

Provide calculation of daylight for each occupied area like living rooms, bed rooms, dinning areas, study areas, kitchens etc., Sum up all areas which achieve 2% or higher day light factor. This aggregate area as a percentage of the total livable area should be more than 50%. Areas exempted are bathrooms, storage space, corridors etc.,

Approach and Methodologies:

Ensure that daylighting is considered at the design by appropriate orientation. The orientation of the building can be such that maximum daylighting to all the spaces is achieved for most part of the day.

Exhaust Systems

Design Submittal

IAQ Credit 1.0

Points: 2

Goal:

To ensure that kitchens and bathrooms are better ventilated to improve indoor environment.

Compliance Options:

Design exhaust systems in bathrooms and kitchen as per the requirements highlighted in the table below:

Minimum Intermittent Exhaust Flow Requirements

Location	Minimum Airflow		Minimum Airflow
Kitchen	For < 9.3 sq.m (100sq.ft) floor area	100 cfm	For > 9.3 sq.m (100sq.ft) proportionally increase air flow
Bathroom	For < 4.64 sq.m (50sq.ft) floor area	50 cfm	For > 4.64 sq.m (50sq.ft) proportionally increase air flow

Notes:

1. *For kitchens, kitchen range vent hoods which meet the above air flows are also acceptable*
2. *Ensure exhaust systems remove polluted indoor air to the outdoors (i.e. exhaust outlets into common areas are not allowed)*

Documentation Required:

Provide the description and specifications of the exhaust system design.

Approach and Methodologies:

Exhaust from bathrooms and kitchens are very vital in preserving the indoor air quality within homes. It is not just adequate to install exhaust fans, but sizing these systems to purge out sufficient quantities of indoor air will determine the performance and thereby the indoor air environment.

Fresh Air Ventilation

Design Submittal

IAQ Credit 2.0

Points: 1

Goal:

To avoid indoor pollutants affecting indoor air quality by providing adequate outdoor air ventilation.

Compliance Options:

For Air Conditioned Spaces:

Design a ventilation system for air conditioned spaces, to meet a requirement of 6 cfm per person for each air conditioned space.

Non-Air conditioned Spaces:

All naturally ventilated regularly occupied spaces shall be within 4.5 meters (15 feet) of operable windows or doors and the openable area (window area) must be atleast 15% of the carpet area. For kitchens and bathrooms provide openable area (window area) which is equal to or more than 10% of the carpet area.

Documentation Required:

Provide details on the building ventilation design giving specific information on fresh air intake volumes for air conditioned spaces. Provide drawings and calculations showing that the openable area requirement for non air conditioned spaces is met.

Approach and Methodologies:

Study the possible methods of taking in fresh air into the air conditioned spaces. Also take into consideration the quality of the fresh air itself and appropriately consider treatment methods. Taking in fresh air may result in higher energy consumption; however suitable pre-cooling technologies of fresh air can be envisaged during design.

Having adequate window openings will help in bringing in fresh air into the building, thereby ensuring good air quality. The approach would be to have large openings on atleast two different directions so as to allow cross-ventilation.

Low VOC Materials

Construction Submittal

IAQ Credit 3.0

Points: 2

Goal:

To encourage the use of materials with low emissions so as to reduce adverse health impacts for building occupants.

Compliance Options:

Use paints with low or no VOC content to an extent of 100% of interior wall surface area. (1 point)

AND

For other VOC emitting materials used within the interiors ensure that the VOC content does not exceed the limits as specified in the table below. (1 point)

VOC Limits for Materials

Type of material	VOC Limit
Paints:	
Non flat paints	150 g/L
Flat (Mat) paints	50 g/L
Anti corrosive/ anti rust paints	250 g/L
Adhesives:	
Wood flooring Adhesive	30 g/L
Tile adhesives	100 g/L
Indoor carpet adhesives	350 g/L
Varnish	65 g/L
Wood	50 g/L

Documentation Required:

Provide letter from the manufacturer/ manufacturer brochures indicating the VOC limit of the paints used OR Provide purchase invoices and provide supporting photographs of paint containers specifying VOC content.

Approach and Methodologies:

Develop a project outline specification and include low or no VOC materials as a criterion for interior material selection. List down all possible interior materials which can have high VOC content. Research and specify no or low VOC materials based on durability, performance and environmental characteristics

Carpets

Construction Submittal

IAQ Credit 4.0

Points: 1

Not applicable for multi-dwelling units

Goal:

To encourage the use of carpets with low emissions so as to reduce adverse health impacts for building occupants.

Compliance Options:

Use CRI certified carpets for 5% of the carpet area.

OR

Use carpets made of naturally available materials like coir, wool etc., for 5% of the carpet area.

Documentation Required:

Provide CRI certificate or provide photographs of carpets used in the building. State the materials used and its environmental features

Approach and Methodologies:

Prepare a list of all carpet requirements in the building and also conduct a market survey of the materials available and their eco friendly features. In many places, carpets are made of naturally available materials which do not require any adhesives while installing.

Building Flush Out

Design Submittal

IAQ Credit 5.0

Points: 1

Goal:

To avoid occupant's exposure to indoor airborne contaminants before occupying the premises.

Compliance Options:

Before the building is occupied and after paints, adhesives and sealants have been used, a building flush out needs to be carried out for ten days by keeping all windows open.

OR

If the building prefers to carry out the flush out using forced ventilation systems, the flush out can be carried out for five days.

Documentation Required:

Provide a narrative describing the flush out procedure followed.

Approach and Methodologies:

Flush out needs to be carried out just before the occupancy. Once the home is ready including the interiors, flushing will be effective in driving away the pollutants in the building materials.

Day Lighting, 75%, 95%

Design Submittal

IAQ Credit 6.0

Points: 2

Goal:

To ensure connectivity between the interior and the exterior environment, by providing good day lighting.

Compliance Options:

Achieve a minimum average daylight factor of 2% for atleast 75% of the total floor area of all regularly occupied spaces which include kitchens, living rooms, bed rooms, dining rooms and study rooms.

Points for Day Light for Living Spaces

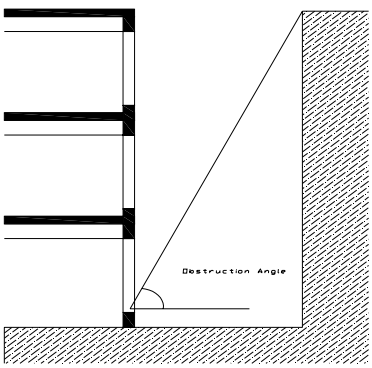
Percentage of Lighting	Points
$\geq$ 75%	1
$\geq$ 95%	2

Average Daylight factor can be calculated using the formula given below:

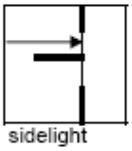
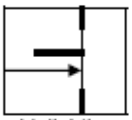
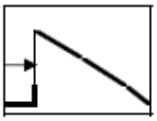
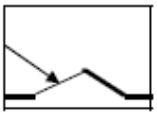
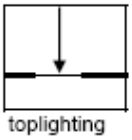
$$\text{Daylight Factor} = \frac{\text{Window Area [SF]}}{\text{Floor Area [SF]}} \times \text{Window Geometry} \times \frac{\text{Actual Visible transmittance}}{\text{Minimum Visible transmittance}} \times \text{Height Factor}$$

Notes:

- *Window openings which are less than 0.76 meters (2.5 feet) above the floor are not considered for daylighting calculations*
- *Window openings where the angle of obstruction of objects obscuring the sky dome is greater than 70 deg. from the horizontal shall not be considered for daylight calculations*



Daylight Design Criteria

Window Type	Geometry Factor	Minimum Tvis	Height Factor
 sidelight daylighting glazing	0.1	0.7	1.4
 sidelighting vertical monitor	0.1	0.4	0.8
 toplighting vertical monitor	0.2	0.4	1
 toplighting sawtooth monitor	0.33	0.4	1
 toplighting horizontal skylights	0.5	0.4	1

Source: LEED India for New Construction

Notes:

- *Sidelight daylight glazing is selected for window openings which are 2.1 meters (7 feet) above the floor*
- *Sidelighting vertical monitor is selected for window openings which are 0.76 to 2.1 meters (2.5 feet to 7feet) above the floor*

Documentation Required:

Provide calculation of daylight for each occupied area like living rooms, bed rooms, dinning areas, study areas, kitchens etc., Sum up all areas which achieve 2% or higher day light factor. This aggregate area as a percentage of the total livable area should be more than 75%. Areas exempted are bathrooms, storage space, corridors etc.,

Approach and Methodologies:

Ensure that daylighting is considered at the design by appropriate orientation. The orientation of the building can be such that maximum daylighting to all the spaces is achieved for most part of the day.

Cross Ventilation *Design Submittal*

IAQ Credit 7.0 Points: 1

Goal:

To encourage home design which have adequate cross ventilation thereby providing a healthy environment.

Compliance Options:

Design the building to ensure that distance between each dwelling unit meets the following criteria:

- A minimum of 3 meters (10 feet) wall to wall distance between two dwelling units
- A minimum of 2.4 meters (8 feet) corridor width separating dwelling units

Documentation Required:

Provide floor plans showing distance between dwelling units and common corridor width.

Approach and Methodologies:

Adequate spaces between dwelling units is important to ensure cross ventilation. Many a time this aspect is neglected which can lead to poor indoor environment both in terms of indoor air and the day lighting aspect. Narrow corridors can impact the indoor environment as well.

Innovation

Innovation

Design/ Construction Submittal

INN Credit 1

Points: 3

Goal:

To provide design teams and projects the opportunity to be awarded points for exceptional performance above requirements set by the IGBC Green Homes Rating System and/or innovative performance in Green Building categories not specifically addressed by the IGBC Green Homes Rating System.

Compliance Options:

Some of the points that can be earned under this credit are as follows

Credit 1.1: Innovation

Identify the intent of the proposed innovation credit, the proposed requirement for compliance, and the proposed documentation to demonstrate compliance, and the design approach used to meet the required elements.

Credit 1.2: Innovation

Same as credit 1.1

Credit 1.3: Innovation

Same as credit 1.1

Documentation Required:

Provide photographs/ drawings/ manufacturers cut sheets whichever is applicable

Approach and Methodologies:

The following can be considered for credit points under innovation:

- Exemplary performance under any of the credits.
- Strategies or measures not covered by IGBC Green Homes such as
  - Adoption of passive architecture techniques
  - Green education etc

IGBC Accredited Professional

Design Submittal

INN Credit 2

Points: 1

Goal:

To support and encourage the involvement of an IGBC AP in the green home building project.

Compliance Options:

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

Note: The project team can apply for an additional innovation till the IGBC Accredited Professional Exam is launched.

Documentation Required:

Submit the IGBC AP certificate.

Approach and Methodologies:

Educate the project team members about Green Home design & construction and application of the IGBC Green Homes Rating System at the design stage of the project.

Abbreviations

ARI

Air-conditioning and Refrigeration Institute

ASHRAE

The American Society of Heating, Refrigerating and Air-conditioning Engineers

BEE

Bureau of Energy Efficiency

CFM

Cubic Feet per Minute

COP

Coefficient of Performance

CRI

Carpet and Rug Institute

ECBC

Energy Conservation Building Code

EER

Energy Efficiency Ratio

FSC

Forest Stewardship Council

HDD

Heating Degree Days

HVAC

Heating Ventilation and Air-conditioning

IPLV

Integrated Part Load Value

LPD

Lighting Power Density

LPF

Liters per Flush

LPM

Liters per Minute

NA

Not Applicable

NBC

National Building Code

PTHP

Packaged Terminal Heat Pumps

SHGC

Solar Heat Gain Coefficient

SRI

Solar Reflective Index

VOC

Volatile Organic Compound

Confederation of Indian Industry
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