

ECO HOUSING ASSESSMENT CRITERIA



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MESSAGE

India has been witnessing a very rapid and country-wide urbanization. It is high time that we recognize this as a positive social force, which needs to be planned and monitored imaginatively. The Jawaharlal Nehru National Urban Renewal Mission is a major initiative by the government to restore, rebuild and renew our cities to make them global gateways. Initiatives like the Eco-housing and water sector energy efficiency are the essential ingredients of such initiatives.

The Eco-Housing program implemented under technical assistance from United States Agency for International Development (USAID) will play a strategic and central role in countering this divide between the need for urbanization and the demand for resources. As such, Eco-housing assumes significance because it effectively addresses issues related to sustainable development and it will help reduce the load on municipal infrastructure including water supply, wastewater treatment, and solid waste management. This program has successfully addressed all measures necessary to scale up and mainstream energy efficient and environment friendly housing. Based on a market development approach the program will encourage entrepreneurship and help create a market for eco-friendly products and services.

The Eco-Housing assessment criteria developed under this program can be adapted to address local environmental concerns and has immense potential for replication in cities across the state. Maharashtra will take a lead in this initiative and provide all the support to urban local bodies to ensure scale up of Eco-Housing activities.

Nanasahab Patil
Principal Secretary, Urban Development Department
Government of Maharashtra



MESSAGE

The United States and India have a long history of fruitful collaboration in the energy and environment sectors. Over the last two decades, USAID has been working closely with Indian public and private sector enterprises and this interaction has resulted in several initiatives leading to efficiency improvement in electricity generation, transmission, distribution, and end-use. Efficiency in the building sector is of special significance to the USAID-GoI program. *'Mainstreaming Eco-housing'* program takes a lead to bring to the forefront the green housing movement in India and support long term sustainability of environment friendly and energy efficient -Housing.

USAID through its 'Global Development Alliance (GDA) forges public-private alliances to mobilizes the ideas, efforts and resources of governments, businesses and civil society to stimulate economic growth, develop businesses and workforces, address environmental issues, and expand access to technology. Eco-housing activity therefore is also a showcase alliance which has helped unite the diverse resources, including technology and intellectual property rights, market creation, best practices, policy influence, in-country networks, and expertise in development programs. Together, the combination of complementary assets has encouraged innovative approaches, more effective problem solving and deeper impact. Importantly, public-private sector conversations almost always lead to a better understanding of the challenge.

This document on 'Eco-housing assessment criteria prepared under USAID technical assistance serves as a **guide** sensitizing readers on the concepts and criteria necessary to adapt and replicate as necessary to the local environment. We are pleased to note that PMC and UDD, GoM will use and disseminate this **document** as a tool to encourage other municipalities in Maharashtra and across the country to promote Eco-housing. USAID wishes all users of this document complete success in their initiatives.

A handwritten signature in blue ink, appearing to read 'Archana'.

Dr Archana Walia
Program Manager

Office of Environment, Energy and Enterprise, USAID



MESSAGE

We are pleased that Pune Municipal Corporation (PMC) is the first urban local body in the country to take up implementation of the Eco-Housing program under technical assistance provided by the United States Agency for International Development (USAID).

In the last year PMC has worked closely with the Eco-Housing implementing agency - the International Institute for Energy Conservation (IIEC), a global not-for profit NGO in developing the Eco-Housing assessment criteria and rating system. The assessment criteria which focus on resource conservation measures like site planning, total water management, energy conservation, eco-friendly and energy efficient building materials, renewable energy and solid waste management will help serve as a benchmark for Eco-Housing projects. With mainstreaming of the Eco-Housing concept in Pune, benefits both to consumers as well as to the Corporation in terms of reduced load on municipal infrastructure will be noteworthy.

Taking the lead to help promote the concept, PMC has set up a dedicated Eco-Housing Cell and is undertaking an Eco-Housing demonstration project. We believe that Eco-Housing is an innovative approach towards conservation that will help free resources for investment in other sectors and facilitate utilization of government funds more efficiently.

A handwritten signature in blue ink, consisting of a stylized name with a long horizontal stroke underneath.

Municipal Commissioner
Pune Municipal Corporation

IIEC



FOREWORD

The premise underlying the Eco-Housing partnership is that large scale adoption of environmentally sustainable construction in the peri-urban fringes of over-populated sprawls in India will have an astounding impact in arresting the adverse environmental impact of staggering commercial growth. As the first step, the criteria presented in this report were developed after engaging various stakeholders in the construction supply chain and provide the initial framework and measures for the assessment of new housing facilities. The engagement of the spectrum of stakeholders, especially the Pune Municipal Corporation, US Agency for International Development, several developers and financial institutions, consumers and non-governmental organizations has enabled the International Institute for Energy Conservation (IIEC) to develop a novel consensus regarding the criteria. It is expected that the framework will be tested in a municipal housing community near Pune, India.

With fundamental changes needed still vis-à-vis land ceiling and rent control, the Eco-Housing assessment criteria should be viewed as an important component in the incremental progress toward sustainable habitat. In fact, the combination of performance criteria and prescriptive requirements should not be seen as normative judgments, but as a methodology designed for decision makers in the peri-urban development community, who want to improve the bottom lines and reduce the environmental externalities.

It is indeed a great pleasure to see the publication of the Eco-Housing criteria... as a living document of important work in progress.

A handwritten signature in black ink, reading "Nitin Pandit". The signature is written in a cursive style with a horizontal line underneath the name.

Dr. Nitin Pandit
President, IIEC

ACKNOWLEDGEMENTS

Eco-housing, a multi-stakeholder partnership spear-headed by United States Agency International Development (USAID/India) under the support from the USAID Global Development Alliance (GDA) secretariat, has benefited from valuable inputs of the individuals and stakeholders associated with the program. The project implementation team led by IIEC acknowledges the support of all our partners.

We thank USAEP/USAID team lead by Ms. Kristen Easter, Mr. Suneel Parasnis, and Ms. Nutan Zarpkar for developing the Eco-housing partnership by mooted this concept in Maharashtra in 2002. Efforts put in by Dr. Archana Walia from USAID to strengthen this partnership leading to the development of Eco-housing mainstreaming program in 2004, along with the funding support are appreciated. Continued support and inputs from the USAID -USAEP team during the implementation are hereby acknowledged. We sincerely thank Mr. Glenn Whaley, Mr. John Smith Sreen, Mr S. Padmanabhan, and Mr. K. Balakrishnan from the Office of Energy, Environment and Enterprise/USAID for their support. The strategic vision provided by IIEC President Dr. Nitin Pandit is also acknowledged by the mainstreaming partners. Funding support from GDA has contributed further in helping achieve USAID's development objective by combining its strengths with the resources and capabilities of the alliance partners.

The team is very grateful to Dr. Nitin Kareer, I.A.S, Commissioner, Pune Municipal Corporation (PMC) for his bold initiative and constant support in implementing this concept for the first time in India. We sincerely appreciate the efforts put in by Mr. Prashant Waghmare, Mr. Dinesh Girolla, and the entire Eco-housing team at PMC.

We wish to thank builders and developers from Pune including Mr. Sanjay Deshpande, Mr. Shashank Paranjape, Mr. Kumar Gera, Mr. Ajay Chordia, Mr. Surendra Shah, and Mr. Bharat Agarwal for their partnership in reviewing the criteria, providing valuable inputs and initiating some of the technical aspects in their ongoing projects.

We would like to thank Mr. Narendra Patel, Mr. Nikesh Shah and Mr. Vinay Parelkar for their active involvement during the review phase. We also appreciate technical contribution made by Ms. Roshni Udyavar, Mr. Milind Kulkarni, Mr. Nitin Deshpande, Ms. Neelam Parelkar, Ms. Shobana Rajappa, and Mr. Duraisamy Rajasekar. Last but most importantly, we are very grateful to Mr. Nanasaheb Patil, I.A.S., Principle Secretary for his inspiring leadership and personal interest resulting in the scale-up of the Eco-housing program across the state.

Eco-Housing team

ECO-HOUSING ASSESSMENT CRITERIA DEVELOPMENT TEAM

The Eco-Housing Assessment criteria has been developed by the International Institute for Energy Conservation (IIEC), The Energy Resources Institute (TERI) and the Science and Technology Park (STP), University of Pune under the USAID-GDA sponsored eco-housing initiative. The assessment criteria development team include the following:

International Institute for Energy Conservation

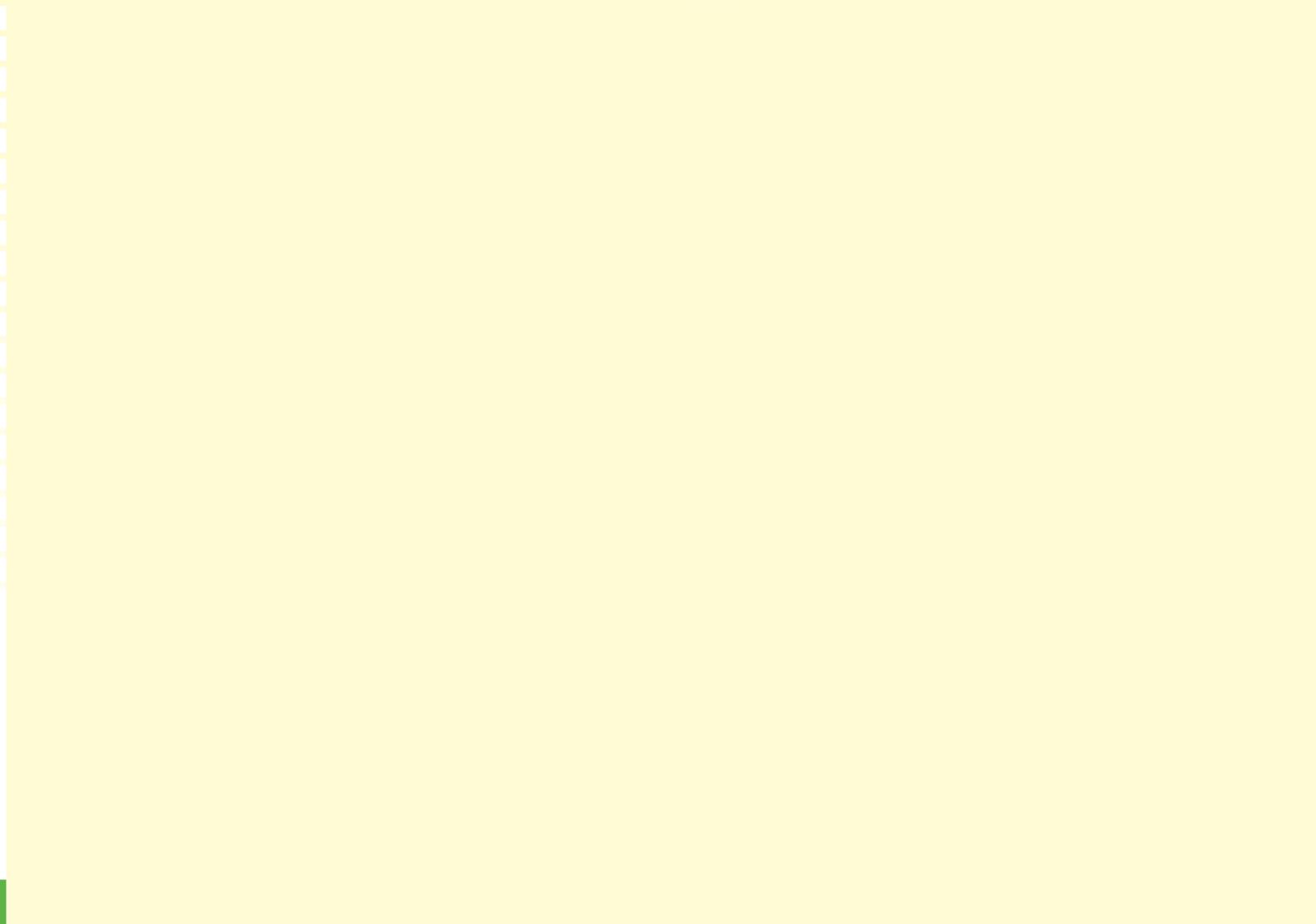
- Mahesh Patankar
- Tanmay Tathagat
- Veena Dharmaraj
- Dolly Jain

The Energy Resources Institute

- Mili Majumdar
- K V Rajeshwari
- Pradeep Kumar

Science and Technology Park,
University of Pune

- Dr Rajendra Jagdale
- Zigisha Mhaskar
- Rajiv Nehru
- Vikram Saraph
- Sonali Bhattacharjee
- Mayura Arya



Corporation (the local urban body), Science and Technology Park (STP), University of Pune; The Energy Resources Institute (TERI); Builders Association of India (BAI), Indian Institute of Architects (IIA), academic institutions, technology providers and leading housing finance institutions. Program interventions include the development of Eco-Housing performance assessment criteria, integration of Eco-Housing policy and fiscal incentives, capacity building and the setting up of a sustainable institutional mechanism to mainstream eco-friendly and energy efficient construction practices.

ECO-HOUSING IMPLEMENTATION STRUCTURE

The institutional mechanism to rate Eco-Housing projects is developed around the Eco-Housing Cell set up by the Pune Municipal Corporation (PMC). Builders applying in for Eco-Housing certification are charged a fee to process their application. To certify a project as 'Eco-Housing' the developer submits his proposal to PMC's Building Proposal Department. Here the building plans are reviewed to see if they meet the existing PMC norms. On

clearance, the proposal goes to the PMC's Eco-Housing Cell, which is the apex body for Eco-Housing certification. The Eco-Housing Cell then forwards the proposal to an independent third party organization registered with the Pune Municipal Corporation to monitor and verify compliance with Eco-Housing criteria. Independent consultants depending on their area of expertise may be engaged to assist in the certification process. Eco-Housing Cell is responsible for developing a customized verification plan.

A temporary Eco-Housing certification is awarded to projects that pass the initial checks. Verification of measures adopted takes place at different stages during construction. After verification, a complete report is submitted to the Eco-Housing Cell based on which PMC gives the final certification.

ECO-HOUSING ASSESSMENT CRITERIA

1. SCOPE

The Eco-Housing Assessment Criteria are applicable to all residential building/building complexes, and single family residences.

2. OVERVIEW

As a part of the program, a set of Eco-Housing assessment criteria have been developed for including a project in its fold. The criteria are based on local environmental issues and have a checklist of measures aimed at architects, builders, financial institutions, and homeowners. Designed to serve as a performance assessment tool, the criteria help quantify the environmental achievement of a building and provide a meaningful differentiation of buildings in the market place.

The Eco-Housing assessment criteria and rating system, developed after studying other national and international green rating systems, is applicable only to residential projects. The voluntary rating system incorporates global best practices to help developers and architects design and evaluate the green quotient of new residential projects. To determine the environmental performance of a building, the Eco-Housing assessment criteria are divided into the following eight broad categories, with each individual category describes a set of measures that need to be fulfilled.

Focus areas	Points
Site Planning	260
Environment Architecture	80
Efficient Building Materials	200
Energy Efficient Lighting	50
Solar Water Heaters	50
Water Conservation	200
Segregation of Waste	80
Other Innovative Technologies	80
Total number of points	1000

All projects > 1 hectare are considered as large projects in the criteria.

- Site Planning
- Environment Architecture
- Energy Efficient Lighting
- Solar Water Heaters
- Efficient Building Materials
- Water Conservation
- Segregation of Waste
- Other Innovative Technologies

Every measure has been assigned points depending on its impact on environment, and its relevance to local conditions. Wherever possible, the objective (intent), submittal requirements, financial implications and the impact of each measure across the value chain, are summarized.

The criteria have also been developed as a web based assessment tool and are available online at www.ecohousingindia.org. The tool provides the user with the flexibility to assess the eco-performance of a project and gauge its rating based on the number of measures being complied with.

3. USING THE ECO-HOUSING ASSESSMENT CRITERIA

The Eco-Housing assessment criteria developed for the city of Pune are still evolving and include both voluntary and mandatory measures. Each measure has been assigned points depending on the environmental impact. Points can be earned by meeting the performance goal of the criteria. While all the 27 mandatory measures have to be complied with, there is a choice as to the implementation of the voluntary measures.

The assessment criteria has a total of 88 measures spread over the 8 focus areas viz: site planning, environment architecture, efficient building materials, water conservation, energy efficient lighting, solar water heating, waste segregation and other innovative eco-friendly technologies. Only

27 of the 88 measures are mandatory. The maximum achievable points are 1000 and the project has to get a minimum of 500 points to qualify for Eco-Housing rating. Each measure has a submittal requirement and the necessary documentation should be enclosed with the Eco-Housing proposal to show compliance with the measures being attempted. The Eco-Housing rating system is based on the number of points earned. The rating achieved depends on the number of voluntary measures incorporated in addition to the mandatory ones.

POINTS ACHEIVED	ECO-HOUSING RATING
500	★
501 - 600	★★
601 - 700	★★★
701 - 800	★★★★
> 800	★★★★★



1. Site Planning

1.1 MANDATORY Do not select public parkland, land within 30m or 100 feet of wetland, forest land/ heritage belt, hills and hill slopes as site for housing as mentioned in Development Plan Rules 5

Submittal Requirement: Site plan showing site and its surrounding areas upto 2 Km radius
 Intent: To protect parkland, forestland/heritage belt from disturbance due to construction; to protect biodiversity

** Refer Appendix 'Biodiversity Conservation for Eco-Housing'*

1.2 Locate eco-housing site so that basic amenities namely i) bank/ATM ii) childcare iii) post office, park iv) library v) convenience grocery are within ½ km of housing 5

Submittal Requirement: Site plan showing site and the facilities within 1/2 Km radius
 Intent: To discourage use of vehicles for common chores

(1 points for each facility being located within ½ km of the site)*

1.3 Locate basic amenities namely i) convenience grocery ii) healthcare facility (with provisions for first aid, doctor with scheduled timing), iii) community hall within site premises 5

Submittal Requirement: Site plan with location of these facilities on site
 Intent: • Convenience

- Ensure emergency healthcare
- Dissuade use of personalised transport

* *Applicable for large sites only (those larger than or equal to 1.0 hectare)*

1.4 MANDATORY

Implement the measures prescribed in the Appendix – Biodiversity Conservation for Eco-housing in Section 3.0 a) Conservation of the existing natural habitat b) Remedial measures to restore and promote the natural biodiversity of the area, especially for sites located in the vicinity of ecologically sensitive areas (as identified in Appendix – Biodiversity Conservation for Eco-housing)

5

Submittal Requirement:

- Inventory report on existing flora & fauna
- Narrative and supporting drawings on measures implemented

Intent:

Biodiversity conservation and preservation

* *Refer Appendix - Biodiversity Conservation for Eco-housing*

1.5

Landscape design should promote and create habitats conducive to native fauna in the form of ‘urban niches’. Refer to Appendix – Native Fauna of Pune- Section 4, for suggested measures.

5

Submittal Requirement:

Landscape drawings showing the measures implemented

Intent:

Biodiversity conservation and preservation

* *Refer Appendix - Native Fauna of Pune*

1.6 MANDATORY

For projects larger than 1.0 hectare, remove topsoil, other than black cotton soil that is not suitable to landscaping, and preserve for reuse on site or send to Pune Municipal Corporation (PMC) designated sites.

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Method to be followed in removing and laying back topsoil:

- Topsoil shall be stripped to a depth of 200 mm from areas proposed to be occupied by buildings, roads, paved areas and external services
- Stockpile topsoil to a height of 400 mm in designated areas and re-apply topsoil to site during plantations
- Separate topsoil from subsoil debris and stones larger than 50 mm diameter
- A pH of 6.0 to 7.5 and organic content of not less than 1.5% by mass be maintained; add lime where pH < 6.0 to adjust to 6.5 or higher up to 7.5. Any soil having soluble salt content > 500 parts/million shall not be used for purpose of landscaping
- Topsoil should be spread uniformly at minimum compacted depth of 50 mm on grade of 1:3 or steeper slopes; minimum depth of 100 mm for shallower slopes or 300 mm for flatter land

Submittal Requirement:

- Site plan (1 no. CAD drawing) along with a narrative to demarcate areas on site from which topsoil has to be gathered
- Designate area where it will be stored
- Indicate areas where it will be reapplied after construction is complete
- Narrative explaining the methods of soil stabilization used; wherever required accompanied by photographs with brief description
- Certificate by the landscape architect on topsoil laying, soil stabilization, adequate primary soil nutrient and pH

Intent:

To preserve and reuse nutrient rich topsoil for landscaping

<p>1.7 MANDATORY</p> <p>Submittal Requirement:</p> <p>Intent:</p>	<p>Prevent soil erosion for large sites during construction by providing sedimentation basin, contour trenching, mulching, as required. Provide plans to show erosion control measures taken.</p> <p>CAD drawing showing site plan details of</p> <ul style="list-style-type: none"> • Existing buildings • Existing slopes • Site drainage pattern • Erosion and sedimentation control measures <p>Prevent soil erosion by proper storm water management</p>	<p>10</p>
<p>1.8</p> <p>Submittal Requirement:</p> <p>Intent:</p>	<p>Preserve existing vegetation on site; preserve land that is rich in bio diversity; mark all existing vegetation in tree survey plan; follow detailed guidelines of tree preservation as per draft National Building Code; Part 10:Landscaping, signs, and outdoor display structures (under revision)</p> <p>1 no. CAD drawing showing proposed landscape plan with identification of trees (different colour coding for trees to be used for protected, preserved, transplanted, removed trees) corresponding to a tabular tree survey (to be included in the drawing)</p> <ul style="list-style-type: none"> • Explain in brief measures adopted for protecting existing landscape (limit to 250 words) • Certificate of landscape architect confirming proper protection and preservation of existing trees during construction process <p>To protect vegetation; carbon sequestration; reduce soil erosion</p>	<p>15</p>

<p>1.9</p> <p>Submittal Requirement:</p> <p>Intent:</p>	<p>Do compensatory depository forestation in ratio of 1:5 within site premises for all mature trees removed</p> <ul style="list-style-type: none"> • Landscape plan, with photographs, clearly highlighting the trees removed (indicating the number of trees), if applicable, with the number of replanted trees in the proportion of 1:5 in the proposed landscape design • List details about species, which existed, and the species that have been replanted on site • To be validated/cross checked during plinth checking and completion checking <p>To compensate for the removed vegetation</p>	<p>10</p>
<p>1.10</p> <p>Submittal Requirement:</p> <p>Intent:</p>	<p>Existing drainage pattern should be surveyed and documented. The proposed drainage pattern of the site should not alter the existing drainage pattern. Necessary approval from PMC to show compliance with master drainage plan shall be obtained</p> <ul style="list-style-type: none"> • Pre-construction site survey plan showing existing drainage patterns, slopes and contours • Site plans for proposed construction to show compliance • A pre-construction survey has to be done and PMC approval on proposed drainage system has to be taken <p>To minimize erosion; design with minimum disruption of site; drainage following existing slopes/contours would minimize addition pumping costs</p>	<p>10</p>
<p>1.11</p>	<p>Measures shall be followed for collecting runoff from construction areas and material storage sites; diverting water flow away from such polluted areas, so that pollutants do not mix with storm water runoff from undisturbed</p>	<p>10</p>

areas. Temporary drainage channels, perimeter dike/swale, etc shall be constructed to carry the pollutant-laden water directly to treatment device or facility/municipal drains. The plan shall indicate how the above is accomplished on site, well in advance of the commencing of the construction activity. Treatment devices include rapid sand filter/slow sand filters

- Submittal Requirement:
- Narratives and drawings showing measures to collect run off from construction areas and material storage sites
 - Diversion channels to ensure that pollutants do not mix with storm water run off from undisturbed areas
 - Treatment devices or connection with municipal drains as applicable
- Intent: To prevent contamination of ground water during construction

1.12

Take adequate measures for spill prevention and control. Spill prevention and control plans shall be made, clearly stating measures to stop the source of the spill, to contain the spill, to dispose the contaminated material and hazardous wastes, and stating designation of personnel trained to prevent and control spills. Hazardous wastes are pesticides, paints, cleaners, and petroleum products. All guidelines as specified in the Appendix on Handling and Disposal of Hazardous Material at Construction Site to be followed as applicable

5

- Submittal Requirement: Provide narrative on handling of hazardous wastes on site; list out hazardous wastes and provide signed letter from responsible person that all measures, as applicable, in the referenced document has been followed.

Intent: To stop spillage of hazardous material on site

** Refer Appendix on 'Handling and Disposal of Hazardous Material at Construction Site'.*

1.13

For large sites plan an aggregate utility corridor for utility systems namely sewage, power, water, telecommunication and storm water near other corridor areas maintain minimum distance between corridors as per local code/norm to ensure safety, prevent interference and prevent contamination)

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Submittal Requirement: Drawings with cut sections showing adoption of aggregate utility corridor
Intent: To facilitate easy maintenance and minimize site disruption

1.14

Site should be properly planned to mitigate the ‘heat island effect’ (thermal gradient difference between developed and undeveloped areas) by the following:

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- Provide shade on at least 40% of non-roof impervious surfaces on the site, including parking lots, walkways, plazas etc
- Place a minimum of 50% of parking space underground or plan covered parking with a reflective roof (net impervious area of less than 50%) for a minimum of 50% of the parking area
- Use light coloured (Solar Reflectance index >0.5) for pavements, walkways etc
- Exception: Mandatory side space as per fire regulation and PMC byelaws shall be exempt for the calculation of impervious areas

Submittal Requirement:

- Site drawings showing paved/unpaved areas parking lots with specifications for surface properties
- Show shading plans proposed for paved surfaces
- If trees are proposed to shade the hard paved surfaces, provide details of proposed trees to demonstrate that 100% shading shall be obtained by 5 years

	of establishment of proposed trees	
Intent:	To reduce micro climate temperature rise	
1.15	Restrict net surface run-off of site to 0.6	10
Submittal Requirement:	<p>Run off calculations in specified format (given below)</p> <p>Calculations for restricting the run-off coefficient (C) on site</p> <p>- Gross site area: A sqm, Ground coverage: p%</p> <p>Built-up area on site (A_b): $p / 100 \times A$ (sq m)</p> <p>Open area on site (A_0): $(A - A_b)$ (sqm)</p> <p>Open Area on site planned for perviousness (Ap): $A_1 \times A_{1p} + A_2 \times A_{2p} + \dots$</p> <p>Where A_1, A_2 – Area of various surfaces such as pavements/roads/vegetation etc planned for different run-off coefficients c_1, c_2 etc.</p> <p>Average Run-off coefficient = Ap/A_0</p>	
Intent:	To facilitate ground water recharge and restrict run off	
1.16	Use renewable energy based (solar PV, biomass, wind, fuel cells) lighting system for 50-100% external lighting (wattage) requirement in kW on site namely walkways, driveways, and landscaped areas.	20 (if 50%) 40 (if 100%)
Submittal Requirement:	<ul style="list-style-type: none"> • Demarcate renewable energy based lighting systems for outdoor lighting in outdoor lighting layout and give details of the same • Provide product cut sheets and total numbers planned • Demonstrate compliance with above clause to seek partial or full points 	
Intent:	To promote use of clean/green sources of energy	

1.17 MANDATORY Design street lighting as per IS: 1944 (Parts I & II) - 1970 “Code of practice for lighting of public thoroughfares” of BIS (Bureau of Indian Standards). Applicable for large sites requiring street lighting 10

Submittal Requirement: Signed template from concerned person that this clause has been complied with.

1.18 MANDATORY Use fluorescent/compact fluorescent lamps operating on low loss ballast for general lighting of brightly lit outdoor spaces and common/circulation areas namely passage, staircase, lifts, corridors, lobbies, common areas. Minimum average luminaire efficacy to be 65lm/W 10

Submittal Requirement:

- Luminous efficacy of each type of lamps used in outdoor lighting.
Luminous efficacy (lm/W) = $\frac{\{\text{Lamp lumen output (lm)}\}}{\{\text{Lamp wattage (W)+ballast power loss (W)}\}}$. Format given in Table on page 29
- Outdoor lighting layout with manufacturers’ details of lamps, ballasts, luminaires and automatic controls
- Wiring diagram and placement of automatic switch(s) for outdoor lighting.

Intent: To reduce energy usage for common area lighting

1.19 MANDATORY The average luminaire efficacy for external lights (all lights outside building premises used for parking, pathways, landscaping) not less than 40 luminaire lumens/ circuit watt. Use HID (high-intensity discharge) lamps for outdoor lighting such as high-pressure sodium lamps, SON etc Circuit efficacy of 80lm/W to be used. 10

Submittal Requirement:

- Luminous efficacy of each type of lamps used in outdoor lighting
- Luminous efficacy (lm/W) = $\frac{\{\text{Lamp lumen output (lm)}\}}{\{\text{Lamp wattage (W)+ballast power loss (W)}\}}$. Format given in Table on page 29

		<ul style="list-style-type: none"> • Outdoor lighting layout with manufacturers' details of lamps, ballasts, luminaires and automatic controls • Test certificate from manufacturer citing batch number 	
		Intent: To reduce energy usage for site lighting	
1.20		Apply control devices, as appropriate, timers or photocells to turn lights on and off for a minimum 50% of installed lighting fixtures; Provide alternate circuits for groups of adjacent lamps; provide control points for easy accessibility	15 (for 50% lights on auto-controls); 30 (for 100% lights on auto-controls)
		Submittal Requirement: Wiring diagram and placement of automatic switch(s) for outdoor lighting.	
		Intent: To minimize wastage of lighting during un needed hours	
1.21	MANDATORY	Design exterior lighting such that any luminaire within distance of 2.5 times its mounting height from property boundary shall have shielding such that no light from luminaire crosses property boundary. Exterior lighting to be designed such that all exterior luminaires with more than 1000 initial lamp lumens are shielded and all luminaires with more than 3500 initial lamp lumens meet Full Cut off IESNA classification.	10
		Submittal Requirement: Product cut sheets with cut off specifications as per IESNA.	
		Intent: To prevent light pollution of night sky and light trespass into adjacent property	

1.22	Provide fixed/pre-wired luminaries to have its sockets that will only accept CFLs. Use lamps with an efficacy greater than 40lm/W. This limit is expressed in 'initial' lamp lumen per circuit watt and includes associated power loss from the control gear.	10
Submittal Requirement:	Luminaire details showing usage of ballasted luminaires	
Intent:	To prevent later retrofit with GLS lamps	
1.23	All electrical systems to meet minimum efficiency criteria as specified by Draft Energy Conservation Building Code 2005 (motors, transformers)	10
Submittal Requirement:	Certificate from relevant personnel showing compliance with energy conservation building code of the Bureau of Energy Efficiency (Govt. of India)	
Intent:	Energy efficiency	
	<i>* Draft code is ready</i>	
1.24	Provide electrical charging point for charging of electric vehicles	5
Submittal Requirement:	Details of electric charging points	
SUB-TOTAL		260

LUMINAIRE	LAMPS			BALLAST		LUMINAIRE	LUMINOUS EFFICACY	
Description TBC-22 or equivalent reputed make	Type CFL	Lumen output 600	Wattage 10	Type Electronic	Power loss(W) 2	(Lamp+Bal last) 12	Achieved 50	Minimum recommended 50



2. Environmental Architecture

2.1

Set up an integrated design team with following members: architect, structural, electrical, mechanical, plumbing/water/waste, landscape architect, and energy/environmental consultant.

10

Submittal Requirement: Name and profile of consultants on the project team
Intent: To ensure integrated design approach

2.2 MANDATORY

Adopt climate responsive design practices to achieve thermal comfort criteria as specified in National Building Code Part 8, section 1 lighting and ventilation; subsection 5.2.3.1 (under revision). Strategies may include (but not limited to) the following:

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- Orient buildings to face north-south, longer face to be N-S
- Provide buffer spaces (staircases, lifts, store, toilets, double wall w/o opening) on at least 50% of west wall
- Window shading to be determined through solar path analysis to provide 100% shading between 10 a.m.-3 a.m. in months April-September, (adequate rain protection to be taken) for at least 50% of windows on south, east and west facades
- To ensure complete solar access on south façade, the distance between buildings facing south to be equal to height of building on southern side
- Position windows of living area within 0–30deg of prevalent wind direction,

	<p>prevalent wind direction to be determined through appropriate wind rose diagram.</p> <ul style="list-style-type: none"> - Total area of openings (inlet and outlet) should be a minimum of 30% of floor area. - Provide a gap between horizontal louver and wall. Take rain protection. - Provide verandas/balconies (any projection extending from building that is accessible and is minimum 1.2 m wide), which are open on three sides. - Plant hedges at a distance of 2 m from building on the leeward side. <p>Submittal Requirement: Narrative (maximum 500 words with supporting drawings and sketches) should include climate responsive strategies for 1) natural ventilation 2) daylighting 3) solar control to ensure maximum thermal and visual comfort</p> <p>Intent: To enable energy efficiency, thermal and visual comfort</p>	
<p>2.3</p> <p>Submittal Requirement:</p> <p>Intent:</p> <p><i>* Applicable only if space under the roof is a regularly occupied space</i></p>	<p>Roof should be protected against excessive heat gain by: appropriate insulation to give U-value as specified by Draft Energy Conservation Building Code 2005. Alternately provide roof garden for 100% of exposed roof area or provide 100% shading for 100% of exposed roof area</p> <p>Bill of quantities with roof specifications</p> <p>To prevent roof heat gain</p>	<p>10</p>
<p>2.4</p>	<p>Design for following daylight factors:</p> <ul style="list-style-type: none"> - Kitchen: 2.5 - Living room: 0.625 - Study room: 1.9 	<p>10</p>

<p>Submittal Requirement:</p> <p>Intent:</p>	<p>-Circulation: 0.313</p> <p>- 1 Daylight Factor = 80 lux</p> <p>- Demonstrate compliance by using an appropriate simulation tool</p> <ul style="list-style-type: none"> • Daylight based design • Simulated daylight levels under overcast sky conditions for a typical summer day <p>Adequate daylight</p>	
<p>2.5</p> <p>Submittal Requirement:</p> <p>Intent:</p>	<p>Use of computer simulation tools for climate responsive design to demonstrate compliance with National Building Code as specified above, for 90% of occupied hours; This would include air flow, temperature and humidity profiles.</p> <ul style="list-style-type: none"> • Use of dynamic simulation engine and hourly weather data of Pune to predict temperature • Humidity and airflow pattern inside typical representative spaces • Output for typical summer, monsoon days to show compliance <p>To ensure thermal comfort in regularly occupied spaces</p>	<p>25</p>
<p>SUB-TOTAL</p>		<p>80</p>



3. Energy Efficient Lighting

3.1

Submittal Requirement:

Lighting power density to be restricted to 7.5 W/sq. m

- Calculation (using building area method to show compliance) electrical drawings; bill of quantities; provision in tender
 - Building area method of calculating interior lighting power allowance
- Use the following steps to determine the interior lighting power allowance by the building area method:
- a. Determine the gross lighted floor area (square feet) of the building area type.
 - b. Multiply the gross lighted floor areas of the building area type(s) times the lighting power density (7.5 W/sq.m).
 - c. The interior lighting power allowance for the building is the sum of the lighting power allowances of all building area types.

Intent:

To ensure efficiency in lighting (indoor)

15

3.2

Submittal Requirement:

Lamp efficacy and ballast loss (CFL: 50lm/W; Fluorescent (TL) 80lm/W; ballast loss for CFL 3W; Fluorescent (TL) 4.5W)

- Certificate from builder that the lighting fixtures and fittings are being provided by builders
- Listing of fixtures, lamp types and ballast type using table on pg 29

Intent:

To ensure energy efficiency in installed lighting

** Applicable only if builder is providing lighting fixtures and fittings, lamps and ballasts in 100% of flats*

15

3.3	MANDATORY	Demonstrate efficient use of luminaries, lamps and ballasts in sample building	5
Submittal Requirement:		Identification of the sample flat for demonstration; detailed lighting plan and show compliance with established interior lighting power density	
Intent:		To ensure efficiency in lighting (indoor)	
3.4		Pre-wired CFL fixtures could be provided in all dwellings, @1 fixture per room.	15
Submittal Requirement:		Fixture details and certificate from builder/developer that the criteria has been complied with	
Intent:		To ensure that CFL is not replaced by GLS lamp in future	
Sub-total			50



4. Solar Water Heaters

4.1	<p>Provide solar water heating in all roof / parapet (south facing), minimum provision of capacity to supply hot water adequate for a family size of 4 members, per household (for all households)</p>	30
<p>Submittal Requirement:</p>	<ul style="list-style-type: none"> • Installation plan for solar water heating system • Sizing calculation for a typical household • System specifications and purchase proofs 	
Intent:	To reduce conventional energy demand for water heating	
4.2	<p>Provide solar water heater with non electric booster</p>	10
Submittal Requirement:	System specification and certificate from manufacturer to show compliance	
Intent:	To prevent use of conventional electric energy for back up heating	
4.3	<p>Provide plumbing for solar hot water to houses.</p>	10
Submittal Requirement:	Plumbing drawings to show compliance	
Intent:	To make provision for future integration of solar water heating system	
Sub-total		50



5. Efficient Building Materials

5.1 MANDATORY

Base materials for R.C.C. and steel systems

Mandatory use of 25% pozzolana material Blended Portland Cement (BPC)¹

Submittal Requirement:

Bill of quantities showing quantity (by weight) of cement required and inventory/ purchase schedule showing quantity (by weight) of pozzolana material procured. Quantities must be converted into volumetric equivalents for evaluation.

Intent:

To reuse/ recycle waste products and prevent landfills.

Notes

1. Pozzolana Material content (Flyash/ Slag/ Calcined Clay) attained through use of Blended Portland Cement (BPC) as per IS1489 (flyash and calcined clay based) and IS455 (slag based) and/ or direct addition of pozzolana material (flyash as per IS3812)

* Refer Appendix – Eco-friendly Building Materials, Chapter 3-Section 3.1.1 and Chapter 6-Section 6.1.1(a)

5

5.2

Base Materials for R.C.C. and Steel Systems

a. Use the following materials for structural systems. Increase of pozzolana material¹ content in BPC to 30-50% by direct addition of raw pozzolana material

b. Use Sand & aggregate from pulverized debris and /or sintered flyash for concrete and mortar²

25 - 49%

50 - 74%

17

5

2

3

	75% and above	4
	c. Use Recycled steel forms and bars for reinforcement ³ upto 75% >75%	6 8
Submittal Requirement:	<ul style="list-style-type: none"> • Same as 5.1 • Bill of quantities showing volume of aggregate and sand required and inventory/ purchase schedule showing volume of alternative procured. • Bill of quantities showing quantity (by weight) of steel required (structural and reinforcement) and inventory/ purchase schedule showing quantity (by weight) of recycled steel procured. The manufacturer shall certify the steel as recycled. 	
Intent:	To reuse /recycle waste products and prevent landfills.	
Notes:	<ol style="list-style-type: none"> 1. Pozzolana material blended cement¹ (Flyash/ Slag/ Calcined Clay) attained through use of Blended Portland Cement (BPC) as per IS1489 (flyash and calcined clay based) and IS455 (slag based) and/ or direct addition of pozzolana material (flyash as per IS3812) 2. Equivalent to coarse and fine aggregates from natural sources as per IS3833. 3. Steel reinforcement bars as per IS432, 1785, 1786 and high tensile structural steel as per IS961 	
	<i>Refer to Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.1 - 1,2,3,4; Chapter 6, Section 6.1.1(a) (b) (c)</i>	

5.3

Alternative structural system

Design and construct the structural system using following alternative technologies:

25

a. Ferro cement and/ or Precast components¹ for columns, beams, slabs, staircases, lofts, balconies, roofs etc.

25-49%

5

50-74%

10

75 and above

15

b. Ready Mix Concrete

50-74%

4

75 and above

6

c. Use Resinous curing agents

25-49%

2

50% and above

4

Submittal Requirement:

a. Ferro cement/ precast components need to be measured based on square feet for comparison with the conventional methods. E.g. if ferro cement is used to replace a conventional pitched roof, then the total area of roof under consideration must be calculated along with the total area of roof executed by using ferro cement technology. These two areas shall be compared. Calculations for precast elements shall be done similarly. For clarifications, diagrammatic representation to be submitted

b. Bill of quantities showing total concrete requirement (by volume) and inventory/ purchase schedule showing amount of concrete (by volume) procured as a ready mix

c. Calculation showing the total surface area of building components that

Submittal Requirement: Calculations showing total volume of masonry and total volume of alternative masonry units shall be provided. Inventory/purchase schedule must show the procurement of alternative units amounting to the volume calculated.

Intent: To prevent topsoil denudation as a result of manufacture of clay bricks

Notes: Artificial lightweight aggregates for concrete masonry blocks as per IS9142

Refer Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.2; Chapter 6, Section 6.2(a)

5.5 MANDATORY

Mortar

Mandatory use of 25% pozzolana material Blended Portland Cement¹

3

Submittal Requirement: Same as 5.1

Intent: To reuse /recycle waste products and prevent landfills.

Notes: Pozzolana material content (Flyash / Slag / Calcined Clay) attained through use of Blended Portland Cement (BPC) as per IS1489 (flyash and calcined clay based) and IS455 (slag based) and / or direct addition of pozzolana material (flyash as per IS3812, Slag as per IS3812 and Calcined Clay as per IS12089)

Refer Appendix - Eco-friendly Building Materials, Chapter 6, Section 6.3.1(a)

5.6

Mortar

- a. Sand from pulverized debris and/ or sintered flyash¹
 - 25- 49% 2
 - 50 – 74% 3
 - 75% and above 4
- b. Increase of Pozzolana Material¹ content in BPC to 30-50% by direct addition of raw Pozzolana Material 3

Submittal Requirement: a) Same as 5.2 b

b) Same as 5.1
 Intent: To reuse waste material and prevent dredging of water bodies for sand.
 Notes: 1. Quality equivalent to natural sand/ crushed stone sand as per IS2116
Refer Appendix - Eco-friendly Building Materials, Chapter 3, Section 3.1, 1,2,3; Chapter 6, Section 6.1.1(a) (b)

5.7

Plastering

13

Use any of the following alternative plasters

a. Calcium Silicate Plaster

25 - 49%

2

50% and above

3

b. Cement Plaster ¹(sand for plaster as per IS1542)

25 - 49%

1

50% and above

2

c. Fiber reinforced Clay Plaster/ Phosphogypsum Plaster/ Non-erodable Mud Plaster

25 - 49%

2

50% and above

4

d. Use Resinous curing agent instead of water

25 - 49%

2

50% and above

4

Submittal Requirement: Bill of quantities showing total area for plastering and curing and inventory/ purchase schedule indicating total area of alternative procured. Calculations must show total area of plastering done using the alternative. For clarifications, diagrammatic representation to be provided

Intent: To reuse /recycle waste products and prevent landfills

1. In case of cement plaster; cement used must be a blended portland cement type or ordinary portland cement blended with raw pozzolana material.
This criteria is mandatory.

Refer Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.3; Chapter 6, Section 6.1.3(c) and 6.1.4

5.8

Roofing and ceiling

7

Use the following eco-friendly materials for roofing

a. Fibre Reinforced Polymer (FRP) instead of PVC, Foam PVC, Poly Carbonates, Acrylics etc.

25- 49%

1

50% and above

2

b. Micro Concrete Roofing Tiles/ Bamboo Matt Corrugated Roofing Sheets

50 – 74%

3

75% and above

5

Submittal Requirement: Bill of quantities showing total area of roofing required and the total area of roofing executed using the alternative material/ technique. Material procurement must be supported through inventory/ purchase schedules. For clarifications, diagrammatic representation are to be provided.

Intent: To use energy efficient building material and material from renewable sources
Refer Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.4; Chapter 6, Section 6.5(a)(b)

5.9

Flooring, paving and road work

15

a. Fly ash/ industrial waste/ pulverized debris blocks in BPC and/or lime-pozzolana concrete paving blocks (as per IS10359) to be used for all outdoor paving (as per IS7245)

50-75%

2

>75%

4

b. Bedding sand for pavement and outdoor hard surfaces has to be from pulverized debris

50-75%

2

>75%

4

c. Terrazzo floor for terraces and semi covered areas (IS2114)

50-75%

2

>75%

4

d. Use Ceramic tiles (non-vitrified)(IS13712)/ Mosaic Tiles/ Terrazzo Flooring (IS2114)/ Cement Tiles¹ (IS1237, 3801)/ Phospho-Gypsum Tiles (IS12679)/ Bamboo Board Flooring, individually or in combination for interior spaces.

50-75%

2

> 75%

3

Submittal Requirement: Bill of quantities showing total area of flooring/ paving/ bedding required and the total area of flooring/ paving executed using the alternative material/ technique. Material procurement must be supported through inventory/ purchase schedules. For clarifications, diagrammatic representation to be provided

Intent: To reuse /recycle waste products as building material and to use energy efficient building materials.

Notes In case of cement tiles; cement used must be a blended portland cement type or ordinary portland cement blended with raw pozzolana material. This criteria is mandatory.

Refer Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.5; Chapter 6, Section 6.6

5.10

Windows, Doors and openings

8

a. Ferro cement and Precast R.C.C. lintel (IS9893), chajja and jalis instead of RCC

50-75%

4

>75

6

b. Masonry bond combinations for jali work (achievable in rat trap bond)

50-75%

1

>75%

2

Submittal Requirement: Different sizes of lintels, chajjas and jalis have to be quantified differently for ease of comparison. Calculations must show how many pieces of each size needed and how many pieces executed using the alternative. Since these values would not be found in the bill of quantities, a separate quantity schedule must be made and a supporting inventory / purchase schedule shall be provided.

Intent: To use lesser quantities of material and to reduce site wastages, thus reducing the amount of resource extraction.

Refer Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.1.6; Chapter 6, Section 6.1.3(a) and 6.1.7(b)

5.11

Timber and Aluminum/ Steel frames to be replaced by:

10

a. Ferrocement and Precast R.C.C. frames (as per IS6523)/ frameless doors (IS15345) and/or Bamboo Reinforced Concrete Frames¹

50-75%

4

>75%

6

b. Hollow recycled steel channels (IS1038,7452) and recycled Aluminium Channels (IS1948) and Components

25-75%

2

>75%

4

Submittal Requirement: A door and window schedule must be provided clearly indicating number of pieces required for each door/ window size and the numbers procured using the alternative. Procurement of these frames shall be supported by inventory/ purchase schedule

Intent: To use lesser quantities of material, to reduce site wastages and to recycle waste products and prevent landfills.

Notes In case of ferrocement, precast cement concrete and cement plaster, reinforcement steel used must be recycled steel and cement used must be a blended portland cement type or ordinary portland cement blended with raw pozzolana material. These criteria are mandatory. The material requirements for ferrocement and precast cement concrete usage shall be evaluated under criteria no.5.1 and 5.2

Refer Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.1-6; Chapter 6, Section 6.1.3(a) and 6.1.7, 2(a)(b)

5.12 MANDATORY

Timber if used for Shutter and Panels must be renewable timber from plantations with species having not more than 10 year cycle or timber from a government certified forest/ plantation or timber from salvaged wood

3

Submittal Requirement: Bill of quantities showing volume of timber required and inventory/ purchase schedule indicating the volume of timber procured in compliance with the recommendation

Intent: To protect rainforest from excessive logging.

Refer Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.6 - 31; Chapter 6, Section - 6.1.7, 3(a)

5.13

Shutters and Panels – instead of timber, plywood, glass, aluminum use the following alternatives

17

a. Use of MDF Board (IS12406)

25-50%

1

>50%

2

b. Use any of the following individually or in combination - Red Mud based composite door shutters, Laminated Hollow Composite Shutters, Fibre Reinforced Polymer Board, Coir Composite Board (Medium Density IS 15491), Bamboo Mat Board (IS 13958), Bamboo mat Veneer Composite (IS 14588), Bagasse Board, Finger Jointed Plantation Board, Recycled Laminated Tube Board and Aluminium Foil+Paper+Plastic Composite Board

50-75%

9

>75%

12

c. Use PVC/ FRP Doors (IS14856)/ poly carbonate and/or recycled aluminum components in wet areas.

50-75%

2

	>75%	3
Submittal Requirement:	Bill of quantities showing area of doors/ shutters required and the area actually made using the substitute board/ ply/ composite recommended. Inventory/ purchase schedule must be provided to support the procurement of such substitute	
Intent:	To protect rainforest from excessive logging, and to reuse waste as building products.	
<i>Refer Appendix – Eco-friendly Building Materials Chapter 3, Section 3.6; Chapter 6, Section 6.1.7, 4(c)</i>		
5.14	Electrical	10
	a. Use unplasticised PVC or HDPE products instead of aluminum, brass, PVC, G.I., S.S. >75%	5
	b. Where applicable use products with recycled aluminum and brass components >75%	5
Submittal Requirement:	Electrical components bill of quantities listing products under different heads and specifying the quantity of material in compliance with the recommendation. This shall be supported by the inventory/ purchase schedule. Manufacturers specifications shall be provided to support the usage	
Intent:	To use energy efficient products and products having higher recycling properties (unplasticised PVC). To use recycled products of non-biodegradable components.	
<i>Refer Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.7; Chapter 6, Section 6.1.8</i>		

5.15 MANDATORY

Water supply, sanitary and plumbing system

Use R.C.C., unplasticised PVC (IS15328), G.I., C.I. pipes instead of lead, A.C. pipes.100%

Submittal Requirement: Bill of quantities showing total requirement (length) and the total amount (lengths) of each alternative procured. Supporting inventory/ purchase schedule must be provided

Intent: To prevent lead and asbestos contamination of water.

Refer Appendix – Eco-friendly Building Materials, Chapter 6, Section 6.1.9, 1(a)

5

5.16

Water supply, sanitary and plumbing system

a. Where applicable use products with recycled aluminum and brass components for fittings, fixtures and accessories

50-75%

>75%

b. Use Polymer Plastic (Random) (ISO EN 15874) hot/ cold water system instead of G.I.

50-75%

>75%

c. Manholes and covers - use precast cement concrete and high strength unplasticised PVC instead of C.I. (as per IS12592)

50-75%

>75%

Submittal Requirement: a.Bill of quantities listing products under different heads and specifying the quantity of material in compliance with the recommendation. This shall be supported by the inventory/ purchase schedule. Manufacturers specifications

9

1

2

2

3

3

4

shall be provided to support the usage

b. Bill of quantities showing total requirement (length) and the total amount (lengths) of alternative procured. Supporting inventory/purchase schedule must be provided.

c. Schedule of manholes/ chambers and covers specifying different sizes and number of pieces for each size must be provided along with the number of pieces procured in compliance with the recommendation. Supporting inventory/ purchase schedule must be provided

Intent: To use energy efficient products and products having higher recycling properties (unplasticised PVC). To use recycled products of non-biodegradable components.

Refer Appendix – Eco-friendly Building Materials, Chapter 6, Section 6.1.9, 2 (b) & (c)

5.17 MANDATORY

Wood Work

6

a. Timber used must be renewable timber from plantations with species having not more than 10 year cycle or timber from a government certified forest/ plantation or timber from salvaged wood. 4

b. If Plywood is used, it should be phenol bonded and not urea bonded. 2

Submittal Requirement: a. Same as 5.12

b. Bill of quantities showing total amount of plywood required and inventory/ purchase schedule indicating procurement of plywood manufactured in compliance with the recommendation. Certification from the manufacturer stating non-use of urea-based binder must be provided

Intent: To protect rainforest from excessive logging, and use chemical with low VOC emissions.

Refer Appendix – Eco-friendly Building Materials, Chapter 6, Section 6.1.7, 3 (a) and 6.1.10, 1 (b)

5.18

Wood work – instead of plywood and natural timber use the following alternatives

14

a. Use of MDF Board (IS12406)

25- 50%

1

>50%

2

b. Use any of the following individually or in combination - Bamboo Ply/ Mat Board (IS 13958), Fibre Reinforced Polymer Board, Bagasse Board, Coir Composite Board (Medium Density IS 15491), Bamboo mat Veneer Composite (IS 14588), Finger Jointed Plantation Timber Board, Recycled Laminated Tube Board and Aluminium-Foil+Paper+Plastic Composite Board

50-75%

6

>75%

8

c. Use of Mica Laminates and Veneer on composite boards instead of natural timber.

50-75%

3

>75%

4

Submittal Requirement: Bill of quantities showing area of woodwork that can be done using substitute boards/ ply/ laminates and the area actually executed using the substitute board recommended. Inventory/ purchase schedule must be provided to support the procurement of such substitute

Intent: To use renewable resources and wood substitutes made from waste products and to prevent excessive logging of natural timber.

Refer Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.6; Chapter 6, Section 6.1.10, 2(a)(b)&(c)

5.19 MANDATORY	<p>Water proofing chemicals, additives, sealants and adhesives</p> <p>Use of water based chemicals instead of solvent based for 100% of use</p>	3 3
<p>Submittal Requirement:</p>	<p>Bill of quantities indicating total amount (by weight and/ or volume) of waterproofing, chemicals, adhesives, sealants, grout etc. required and the amount (by weight and/ or volume) of each product procured. Supporting manufacturers certification indicating compliance of material with the recommendation must be provided</p>	
<p>Intent:</p> <p><i>Refer Appendix – Eco-friendly Building Materials, Chapter 6, Section 6.1.11, 1(a)</i></p>	<p>To use chemical with low VOC emissions.</p>	
5.20	<p>Water proofing chemicals, additives, sealants and adhesives</p> <p>Use Epoxy resins instead of tar felt/pitch</p> <p>50-75%</p> <p>>75%</p>	
<p>Submittal Requirement:</p>	<p>Schedule indicating total area of work and the area executed in compliance with the recommendation. For clarifications, diagrammatic representation might be asked for</p>	
<p>Intent:</p> <p><i>Refer Appendix – Eco-friendly Building Materials, Chapter 6, Section 6.1.11, 2(a)</i></p>	<p>To use efficient building materials.</p>	
5.21	<p>Painting, polishing, priming and similar surface finishing</p> <p>a. Use of Cement Paint (IS5410)/ Epoxy Resin Paint for external surfaces</p> <p>50-75%</p> <p>>75%</p> <p>b. Use of Water based paints, enamels, primers and polishes.</p>	8 3 4

	50-75%	3
	>75%	4
Submittal Requirement:	Schedule indicating total area of work and the area executed in compliance with the recommendation. For clarifications, diagrammatic representation might be asked for	
Intent:	To use efficient building materials and chemical with low VOC emissions	
	<i>Refer Appendix – Eco-friendly Building Materials, Chapter 3, Section 3.9; Chapter 6, Section 6.1.12</i>	
Sub-total		200

COMMON NOTES ON SUBMITTAL REQUIREMENTS

1. In case of procurement of recycled materials/ products, “Recycled Product” certification from the manufacturer must be provided with material specification sheet.
2. Manufacturer’s specifications must be provided where asked for highlighting the criteria considered in the recommendation. For example: specifications for water based paints must indicate they are water based.
3. All measurements documented for evaluation shall comply with the units specified in the verification sheet. Calculations and conversions must be clearly documented.
4. Area diagrams to support calculations must be provided where asked for.
5. The bill of quantities shall be a single document. Materials and quantities must be listed in the order similar to the recommendation listing. All supporting document must also be attached in the same order for the ease of reference for the assessor.



6. Water Conservation

<p>6.1</p> <p>Submittal Requirement:</p> <p>Intent:</p>	<p>Maintain uniform pressure restricted to 25-30 m/head by use of separate distribution downtakes for each set of floors and use of orifice flanges or pressure reducing valves</p> <ul style="list-style-type: none"> • Provide drawings indicating the separate downtakes, cut sheets of the flanges and valves • Purchase proof and bill of quantities <p>Reduce water consumption</p>	<p>5</p>
<p>6.2</p> <p>Submittal Requirement:</p> <p>Intent:</p>	<p>All faucets and fixtures should be low flow to maintain flow rates not exceeding 8 lpm</p> <ul style="list-style-type: none"> • Provide cut sheets of the fixtures indicating the flow rates at design pressure of 80 psi • Purchase proof • Bill of quantities from the plumbing tender indicating the number and flow rates of various fixtures <p>Minimise water use</p>	<p>10</p>

6.3	MANDATORY	All WC to be used with dual flush system with a flow rate of 3 l and 6 l per flush	15
Submittal Requirement:		<ul style="list-style-type: none"> • Provide cut sheets of the flush system indicating the flow rates • Purchase proof • Bill of quantities from the plumbing tender document indicating the number of fixtures and the flow rates 	
Intent:		Reduce water consumption	
6.4	MANDATORY	Install water meters at every downtake lines	5
Submittal Requirement:		Provide the specifications of the meters and the no. of meters installed along with the drawings indicating the location of the meter in each downtake line	
Intent:		Monitoring of water use and preventing losses	
6.5		Water meters installed for every household (Exempted from 6.4) a) With electronic control	5
Submittal Requirement:		Provide the specifications of the meters and the no. of meters installed	
Intent:		Monitoring of water use and preventing losses	
6.6		Restrict areas covered by lawn and exotic or ornamental plants which require more water and high maintenance to 25% of total vegetated area	5
Submittal Requirement:		<ul style="list-style-type: none"> • Provide landscape plan showing the type of species and the areas of plantations of each category of vegetations • Cutsheets of irrigation equipment for the plantations showing the technical specifications, flow rate and dimensions 	

Intent: Reduce water consumption for gardening
 Refer Appendix List of Native Plant Species for Landscaping

6.7	MANDATORY	Plant native/indigenous species with low water requirement so as to form at least 50% of the vegetated area	5
Submittal Requirement:		<ul style="list-style-type: none"> • Provide landscape plan showing the type of species and the areas covered by each of them • Cutsheets of irrigation equipment with the technical specifications 	
Intent:		Efficient water use for gardening	
Refer Appendix List of Native Plant Species for Landscaping			

6.8	MANDATORY	On site recycled water to be used to water lawns, fountains and other water bodies	10
Submittal Requirement:		Provide narrative indicating the quantity and quality of the recycled water used for gardening and for other water bodies	
Intent:		Efficient water use for gardening	
Refer Appendix for water quality standards for various applications as per IS codes			

6.9		Use sprinklers to water lawns and drip irrigation for trees	5
Submittal Requirement:		Specification sheets of the irrigation equipments indicating the flow rates	
Intent:		Reduce water consumption for outdoor use	

6.10 MANDATORY

Harvest, store/recharge and make provisions for utilization of 100% rainwater from roof as well as site runoff of 60%. Refer to criteria on site imperviousness

15

- Submittal Requirement:
- Calculations demonstrating the total quantity of rainwater collected from site and roof based on areas and regional rainfall data
 - Plan indicating the capacity and location of storage and recharge facilities, drainage channels and water bodies where rainwater is directed

Intent: Preserve the available water resource. Utilise the available resource effectively and minimise load on sewage treatment plant

** As storing and groundwater recharging is site specific, the criteria includes those initiatives taken for harvesting the rainwater from the site and directing through various means into suitable aquifers in surrounding areas*

6.11

Reuse collected rain water for gardening, washings and other building applications and recharge excess rainwater into ground to maintain utilisation efficiency of:

10

- 1) 50%
- 2) 100%

- Submittal Requirement:
- Water budget calculations showing the reuse of water for each applications
 - Calculations demonstrating the total quantity of rainwater recharged

Intent: Replenish the declining ground water level and meeting the increased demand and reduce the burden on municipal source

** Utilization efficiency indicates the percentage of water reused out of total quantity of water harvested for any site.*

<p>6.12 MANDATORY</p> <p>Submittal Requirement: Test report of water samples from various sources for different applications</p> <p>Intent: Provide the occupants with desired water quality</p> <p><i>Refer Appendix Indian standards for drinking water (IS 10500-1991)</i></p>	<p>Provide treatment facilities for supplied drinking water if the quality is not meeting IS standards</p>	<p>5</p>
<p>6.13</p> <p>Submittal Requirement: Provide plumbing drawings indicating separation of grey water and black water lines</p> <p>Intent: To improve environmental conditions and meet the growing demand for water</p>	<p>Use dual plumbing lines for separation of total volume of grey water and black water</p>	<p>20</p>
<p>6.14 MANDATORY</p> <p>Submittal Requirement: Details of treatment plant indicating the capacity, components of system, treatment efficiency and projected quality of treated water</p> <p>Intent: To improve environmental conditions</p> <p><i>Refer Appendix Eco-Friendly & non-energy intensive technologies</i></p>	<p>Install a treatment system based on non energy intensive and eco friendly technology for treatment of total volume of grey water</p>	<p>20</p>
<p>6.15</p> <p>Submittal Requirement: Details of treatment plant indicating the capacity, components of system, treatment efficiency, quality of water</p> <p>Intent: To improve environmental conditions</p> <p><i>Refer Appendix Eco-Friendly & non-energy intensive technologies</i></p>	<p>Install an eco-friendly treatment system for combined stream of grey water and black water</p>	<p>35</p>

6.16	Install a separate plumbing line for use of treated water for flushing	15
Submittal Requirement:	Plumbing drawings and calculations demonstrating reuse of treated water	
Intent:	Meet the increased demand of water and efficient use of available water resources	
6.17	Reuse the treated water for various building applications and gardening depending on the treatment level and meeting of prescribed standards	5
Submittal Requirement:	Calculations demonstrating reuse	
Intent:	Meet the increased demand of water and efficient use of available water resources	
6.18	Minimise water use during construction minimizing water use during curing; admixtures during concreting, use of premixed concrete/recycled water	
Submittal Requirement:	Narrative describing the measures taken for minimizing water use during constructions	
Intent:	To reduce the potable water demand.	
Sub-total		200



7. Solid Waste Management

<p>7.1 MANDATORY</p> <p>Submittal Requirement: Plan showing the capacity and location of bins</p> <p>Intent: To efficiently manage the wastes and recover resources</p> <p><i>Refer Appendix M&W Management and Handling Rules of MoEF</i></p>	<p>Shall provide separate bins/chutes for every block / building for collection and separation of 100% of bio-degradable, non-biodegradable and recyclable wastes. A centralized collection facility at colony level for batteries, drugs, clinical and hazardous wastes.</p>	<p>15</p>
<p>7.2</p> <p>Submittal Requirement: Contact details and agreement</p> <p>Intent: To efficiently manage the wastes and recover resources</p>	<p>Contract with local dealers for collection and transportation of recyclable materials</p>	<p>5</p>
<p>7.3 MANDATORY</p> <p>Submittal Requirement: Details of plant giving the capacity and quantity of waste treated</p> <p>Intent: To efficiently manage the wastes and recover resources</p> <p><i>Refer Appendix M&W Management and Handling Rules of MoEF</i></p>	<p>Set up decentralised (onsite) treatment plant based on non-energy intensive and ecofriendly technology (anaerobic digestion or in-vessel composting/vermicomposting) for the treatment of 100% of organic wastes.</p>	<p>35</p>

7.4	<p>Recover energy and manure from treatment plant and application within the site</p> <p>1) 50% of waste 2) >75% of waste</p>	20
<p>Submittal Requirement: Energy generation level per unit amount of waste processed and consumption rate</p> <p>Intent: Recover resources</p> <p><i>Refer Appendix M&W Management and Handling Rules of MoEF</i></p>		
7.5	<p>Recover manure from bio-degradable waste for 100% utilization (within the site/sale)</p>	5
<p>Submittal Requirement: Total quantity of manure produced per unit amount of waste processed</p> <p>Intent: Recover resources</p>		
Sub-total		80



8. Other Measures

8.1	MANDATORY	Adopt construction safety measures draft National Building Code Part 7: constructional practices and safety	10
Submittal Requirement:		Clause in contract document	
Intent:		To ensure construction safety	
8.2		Adopt measures to control levels of suspended particulate matter during construction	10
Submittal Requirement:		Test results as per CPCB rules to show that SPM levels are not increased due to construction activities	
Intent:		To reduce air pollution loads	
8.3	MANDATORY	Provide minimum level of sanitation on site as per DC Rules	10
Submittal Requirement:		Clause in contract document to demonstrate compliance; onsite photographs shall be submitted at a later date	
Intent:		To prevent contamination of water table and provide minimum standard of living for construction workers	
8.4	MANDATORY	Provide facilities for handicap access as per DC rules	10
Submittal Requirement:		It is already a mandatory criterias per DC rule	
Intent:		To provide unobstructed movement for handicapped persons	

8.5	<p>Adopt measures to ensure the ambient noise standard as specified by the Central Pollution Control Board is not exceeded beyond site limit, due to noise generated by construction activity</p> <p>Submittal Requirement:</p> <ul style="list-style-type: none"> • Narrative of precautions taken to ensure CPCB prescribed indoor and out door noise levels. • Post construction monitoring results to show compliance 	10
8.6	<p>Swimming pool facility with arrangements for recycling and use of renewable sources for heating, if heated</p> <p>Submittal Requirement:</p> <ul style="list-style-type: none"> • Water quality report • Calculations demonstrating use of recycled treated water • Treatment plant drawings and details • Details of solar water heating system <p>Intent:</p> <p>To reduce energy and water consumption</p>	10
8.7	<p>Other innovative eco friendly measures not listed</p> <p>Submittal Requirement:</p> <p>Narrative (not more than 250 words) for each measure, each measure shall carry 1 point</p>	10
8.8	<p>Maintenance manual and public awareness programmes for individuals and eco-housing societies</p> <p>Submittal Requirement:</p> <p>Documentation that shall be provided to the residents and management of society on maintenance guidelines, special instructions to ensure that eco-intent is met</p>	10
Sub-total		80

LIST OF REFERENCE DOCUMENTS

CRITERIA NO.

1. Site Planning

1.1

1.4

1.5

1.8

1.12

1.17

1.21

1.23

2.0 Environment Architecture

2.2

2.3

2.5

5.0 Efficient Building Materials

5.1

5.2

5.3

5.4

5.5

5.6

5.7

5.8

5.9

5.10

REFERENCE DOCUMENT

Biodiversity Conservation for Eco-Housing, Section 2.0 -pg 2-5, Annexures -pg 8-12

Biodiversity Conservation for Eco-Housing, Section 3.0 pg 5-7

Native Fauna of Pune, Section 4 – pg. 12-14

National Building Code, Part 10:landscaping, signs and outdoor display structures

Handling and Disposal of Hazardous Material at Construction Sites

IS: 1944 (Parts I & II) – 1970 “Code of practice for lighting of public thoroughfares” of BIS

The IESNA Lighting Handbook (Reference and application) ninth edition, Mark S. Rea, Page no. 22-8

Draft Energy Conservation Building Code 2005 (motors, transformers)

National Building code Part 8, section 1 lighting and ventilation; subsection 5.2.3.1 (under revision).

Draft Energy Conservation Building Code 2005

National Building Code

Eco-friendly Building Materials & Technologies for Pune.

Chapter 3- Section 3.1- 1; Chapter 6 -Section 6.1.1 (a)

Chapter 3- Section 3.1- 1,2,3,4; Chapter 6 -Section 6.1.1(a)(b)& (c)

Chapter 3- Section 3.1-5,7; Chapter 6 -Section 6.1.3 (a) (b)& (c)

Chapter 3- Section 3.2; Chapter 6 -Section 6.2 (a)

Chapter 6 -Section 6.3.1 (a)

Chapter 3 -Section 3.1- 1,2,3; Chapter 6 -Section 6.1.1 (a) &(b)

Chapter 3 -Section 3.3; Chapter 6 -Section 6.1.3 (c); Section 6.4

Chapter 3 -Section 3.4; Chapter 6 -Section 6.5 (a) & (b)

Chapter 3 -Section 3.5; Chapter 6 -Section 6.6

Chapter 3 -Section 3.1- 6; Chapter 6 -Section 6.1.3 (a), Section 6.7.1 (b)

5.11
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6.0 – Water Conservation

6.6
6.7
6.8
6.12
6.14
6.15

7.0 Solid Waste Management

7.1
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7.4

8.0 – Other Innovative Measures

8.1
8.3
8.4
8.5

Chapter 3 -Section 3.1- 6; Chapter 6 -Section 6.1.3 (a), Section 6.7.2 (a)&(b)
Chapter 3 -Section 3.6- 31; Chapter 6 -Section 6.7.3 (a)
Chapter 3 -Section 3.6; Chapter 6 -Section 6.7.4 (c) & Section 6.10
Chapter 3 -Section 3.7; Chapter 6 -Section 6.8
Chapter 6 -Section 6.9.1 (a)
Chapter 6 -Section 6.9.2 (b)&(c)
Chapter 6 -Section 6.7.3 (a), 6.10.1 (b)
Chapter 3 -Section 3.6; Chapter 6 -Section 6.10.2 (a), (b) & (c)
Chapter 6 -Section 6.11.1 (a)
Chapter 6 -Section 6.11.2 (a)
Chapter 3 -Section 3.9; Chapter 6 -Section 6.12

List of Native Plant Species for Landscaping
List of Native Plant Species for Landscaping
Indian water quality standards for various applications
Indian standards for drinking (IS 10500-1991)
Eco-friendly and non energy intensive technologies
Eco-friendly and non energy intensive technologies

MSW management and handling rules of MoEF
MSW management and handling rules of MoEF
MSW management and handling rules of MoEF

National Building Code, Part 7: construction Practices & Safety
Pune DC Rules
Pune DC Rules
Ambient Noise Standards of Central Pollution Control Board (CPCB)