



ENVIS NEWSLETTER

January 10 - 2014

ENVIS Centre, Environment Department. Government of Maharashtra, Mumbai

Environmental Guidelines for Public Building Projects in Maharashtra

Government Resolution Env-2013/CR -177/TC-1 dated January 10,2014



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Editorial Board

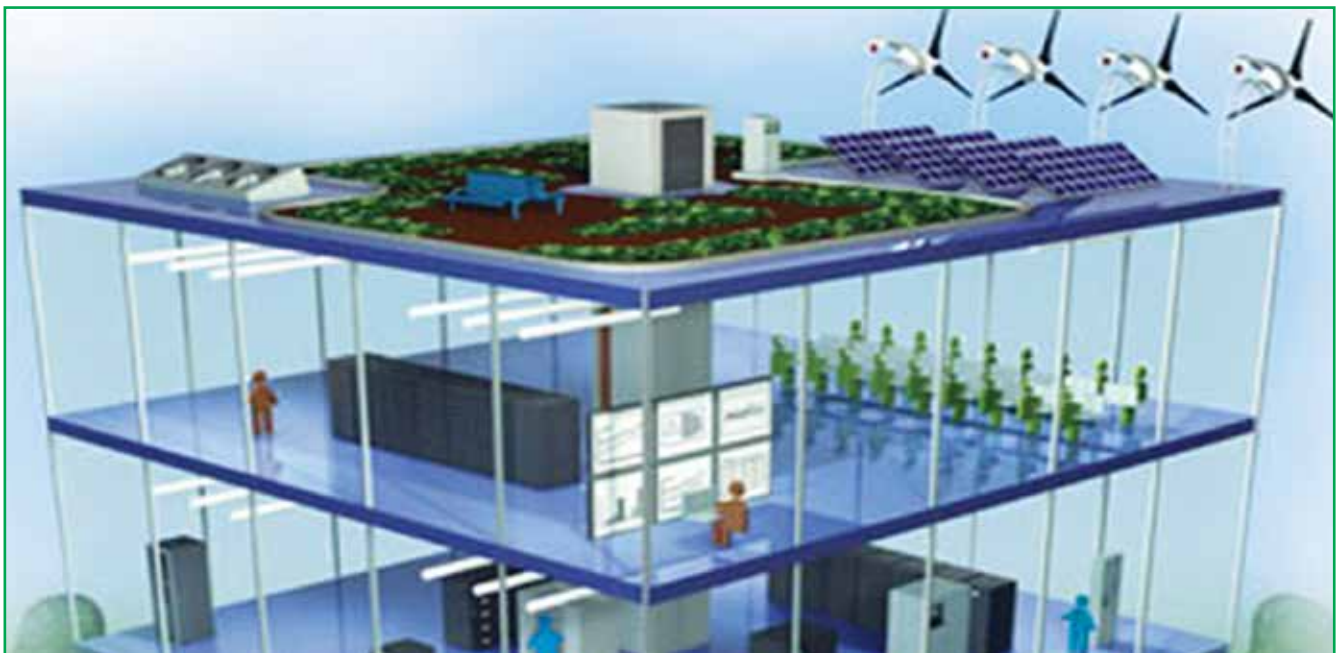
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पर्यावरणपूरक बांधकाम क्षेत्रासाठी
मार्गदर्शक तत्वे

महाराष्ट्र शासन
पर्यावरण विभाग

शासन निर्णय क्रमांक:- इएनव्ही-२०१३/प्र.क्र.१७७/तां.क.१

नवीन प्रशासन भवन, १५ वा मजला, मादाम कामा रोड, मंत्रालय, मुंबई-४०० ०३२.

दिनांक:-१० जानेवारी, २०१४.

प्रस्तावना:-

विकासकामे व मूलभूत सोयीसुविधा पुरविण्याच्या अनुषंगाने बांधकाम क्षेत्रामध्ये झपाट्याने वाढ होत आहे. बांधकाम प्रक्रियेमध्ये मोठ्या प्रमाणात नैसर्गिक संसाधनांचा वापर करण्यात येतो. या प्रक्रियेत नैसर्गिक संसाधनांच्या अनिर्बंध वापरामुळे पर्यावरणाचे संतुलन बिघडत असून त्याचा वातावरणावरही विपरित परिणाम होत आहे.

राज्यात नैसर्गिक संसाधनांचा योग्य वापर, सुयोग्य कचरा व्यवस्थापन, हरितगृह वायू उत्सर्जनात संतुलन साधण्यासाठी तसेच जीवनमानात सुधार करण्याच्या अनुषंगाने पर्यावरणपूरक इमारत बांधकाम क्षेत्रासाठी मार्गदर्शक तत्त्वे कॉन्फीडरेशन ऑफ इंडियन इंडस्ट्री, इंडियन ग्रीन बिल्डींग कौंसिल, सर्व महानगरपालिका, सार्वजनिक बांधकाम विभाग व क्षेत्रिय यंत्रणांबरोबर विचारविनिमय करून तयार करण्यात आल्या आहेत. सदर मार्गदर्शक तत्त्वांच्या अंमलबजावणीमुळे, ऊर्जा वापरात तसेच पाणी वापरात अनुक्रमे २०-३०% व १५-२०% बचत होणे अपेक्षित आहे. तसेच बांधकामाच्या वेळी २०-३०% कमी कचरा उत्पादीत होऊन त्यानुषंगिक प्रदूषणास आळा बसणार आहे.

सदर मार्गदर्शक तत्त्वांची अंमलबजावणी संपूर्ण राज्यभर टप्प्याटप्प्याने करण्यात येणार असून प्रथमतः शासकीय इमारती/ निम-शासकीय इमारती / शासन अखत्यारितील इमारती यांसाठी सदर मार्गदर्शक तत्त्वांची अंमलबजावणी करण्याची बाब शासनाच्या विचाराधीन होती.

शासन निर्णय:-

स्थायी विकासप्रक्रियेत नैसर्गिक संसाधनांचे महत्त्व लक्षात घेऊन तसेच 'हरित इमारत' संकल्पनेला प्रोत्साहन देऊन, पर्यावरण संवर्धन व शाश्वत विकास साधण्यासाठी पर्यावरणपूरक इमारत बांधकामासाठी मार्गदर्शक तत्त्वे, सदर शासन निर्णयाद्वारे निर्गमित करण्यात येत आहेत.

२. पर्यावरणपूरक मार्गदर्शक तत्त्वांमध्ये खालील सहा घटकांचा समावेश करण्यात आला आहे.

१. बांधकाम स्थळ, परिस्थितीकी आणि वाहतूक
२. पाण्याचे कार्यक्षम व्यवस्थापन, सांडपाणी प्रक्रिया व पुनर्वापर
३. ऊर्जेचा कार्यक्षम वापर
४. अपारंपारिक ऊर्जा वापर
५. कचरा व्यवस्थापन
६. इमारत बांधकाम साहित्य

३. मार्गदर्शक सूचनांमधील प्रमुख बाबी -

- अ) सदर मार्गदर्शक तत्त्वांच्या अंमलबजावणीसाठी खालील इमारतींचा समावेश असेल
- शासकीय / निम-शासकीय इमारती (Government / semi government buildings)
 - शासन अखत्यारितील इमारती (Government undertakings)
 - राज्य नोडल संस्था, जसे संचानालय इ.(State nodal organizations)
 - शासन अनुदानित इमारती (Government aided buildings)



- शासकीय संस्थाद्वारे (Government Institutions) इमारत बांधकामे
- शासन अनुदानित शैक्षणिक संस्था, विद्यापीठे, शाळा, महाविद्यालये इ. (Government aided Educational Institutes, University, Schools, Colleges etc).
- महामंडळे, मंडळे, प्राधिकरणे, स्थानिक स्वराज्य संस्था इत्यादीद्वारे करण्यात येणारी बांधकामे.

ब) सदर मार्गदर्शक तत्त्वे सोबत प्रपत्र अ प्रमाणे असून त्यांचे खालील प्रमाणे भाग करण्यात आले असून ते परिच्छेद ३(अ) मध्ये उल्लेख केलेल्या इमारतींना / बांधकामांना लागू करण्यात आले आहेत.

१. अनिवार्य बाबी (भाग-१)

२. ऐच्छिक बाबी (भाग-२)

सदर मार्गदर्शक तत्त्वे ज्योत्याच्या बांधकामास (Plinth Level) अनुमती देतांना व त्या पूढील इमारतीच्या बांधकामास (Final Level) अनुमती देताना अवलंबविण्याच्या बाबी अशा दोन भागात विभाजीत करण्यात आल्या असून त्यांची प्रत्येक टप्प्यात अंमलबजावणी करण्याची जबाबदारी ही संबंधित स्थानिक स्वराज्य संस्था, प्राधिकरण, महामंडळ, मंडळ, संस्था, शासकीय व निमशासकीय विभाग यांच्यावर असेल. अंतिम भोगवटा पत्र देण्यापूर्वी या निर्णयाद्वारे निर्गमित मार्गदर्शक तत्त्वांची अंमलबजावणी झाल्याची खात्री या संस्थांद्वारे विभागास करण्यात येईल.

क) या तत्त्वांच्या अंमलबजावणीसाठी व संनियंत्रणासाठी संबंधित स्थानिक स्वराज्य संस्था, प्राधिकरण, महामंडळ, मंडळ, संस्था, शासकीय व निमशासकीय विभाग आवश्यकतेनुसार कार्यप्रणाली त्यांच्या स्तरावर ठरवतील.

४. परिच्छेद ३(अ) मधील सर्व प्रशासकीय व क्षेत्रिय यंत्रणांनी आपल्या अधिपत्याखालील कार्यक्षेत्रात सदर मार्गदर्शक तत्त्वांची अंमलबजावणी सत्वर करणे अनिवार्य आहे.

५. अंमलबजावणी यंत्रणा-

५.१ बांधकाम प्रकल्पास प्रशासकीय व तांत्रिक मान्याता देताना संबंधित विभागाने प्रस्तावित बांधकामामध्ये या मार्गदर्शक तत्त्वांचा समावेश असल्याची खात्री करणे त्या विभागावर बंधनकारक आहे. याबाबतची खात्री करण्याची जबाबदारी संबंधित विभागाच्या विभागप्रमुखांची असेल.

५.२ प्रशासकीय व तांत्रिक मान्यतेनंतर अंमलबजावणी करणाऱ्या क्षेत्रीय कार्यालयाच्या विभागप्रमुखावर काम सुरु करण्यापूर्वी या तत्त्वांची अंमलबजावणी झाल्याची खात्री करून तशी नोंद ठेवण्याची जबाबदारी असेल.

५.३ संबंधित स्थानिक स्वराज्य संस्था/ प्राधिकरण / शासकीय मंडळ/ महामंडळ यांनी काम प्रारंभ प्रमाणपत्र/संमतीपत्र व काम पूर्ण झाल्याचे प्रमाणपत्र/ संमतीपत्र देण्यापूर्वी या मार्गदर्शक तत्त्वांची अंमलबजावणी केल्याची खात्री केल्यानंतरच अशा परवानग्या द्याव्यात व प्रमाण पत्रामध्ये/ परवानगीमध्ये याबाबत खात्री केल्याचा स्पष्ट उल्लेख करण्यात यावा.

५.४ सदर मार्गदर्शक तत्त्वांच्या यथायोग्य अंमलबजावणीसाठी संबंधित प्रशासकीय विभाग, क्षेत्रिय यंत्रणांनी त्यांच्या कार्यप्रणाली, तत्संबंधी मॅन्युअल्स, उपविधी, दरसूची, अंदाजपत्रक इ. मध्ये आवश्यक ते बदल करून या तत्त्वांचा त्यामध्ये यथायोग्य समावेश करण्यात यावा व त्यानुसार या निर्णयाची अंमलबजावणी करण्यात यावी.

६. या मार्गदर्शक तत्त्वांच्या अंमलबजावणीत येणाऱ्या अडचणी- सुधारणांचा, हे आदेश लागू झाल्यापासून एक वर्षानंतर आढावा घेण्यात येईल. सर्व संबंधित यंत्रणा यानुसार त्यांच्या काही सूचना वा सुधारणा असल्यास त्या शासनास या कालावधी दरम्यान कळवतील.

७. खाजगी क्षेत्रातील बांधकामासाठी सध्या ही मार्गदर्शक तत्त्वे ऐच्छिक आहेत. तथापि, सदर मार्गदर्शक तत्त्वे संकेतस्थळावर उपलब्ध असून यावर काही सूचना/ सुधारणा असल्यास संबंधित घटक, प्रकल्प प्रवर्तक, जनता शासनास हे आदेश लागू झाल्याच्या दिनांकापासून एक वर्षाच्या आत शासनास कळवू शकतात.



८. सदर शासन आदेश पर्यावरण (संरक्षण) अधिनियम, १९८६ च्या कलम ५ व पर्यावरण (संरक्षण) नियम, १९८६ च्या नियम ४(५) अन्वये असलेल्या अधिकारांचा वापर करून जारी करण्यात येत आहेत.

हा शासन निर्णय पर्यावरण विभागाच्या www.mahenvis.nic.in व www.envd.maharashtra.gov.in या अधिकृत संकेतस्थळावर उपलब्ध आहे.

महाराष्ट्राचे राज्यपाल यांच्या आदेशानुसार व नावाने.



(डॉ.बी.एन.पाटील)

संचालक (पर्यावरण) महाराष्ट्र शासन.

प्रत,

मा. मुख्य सचिव, महाराष्ट्र शासन
 मा. मुख्यमंत्री यांचे प्रधान सचिव, मंत्रालय, मुंबई.
 मा. उपमुख्यमंत्री यांचे सचिव, मंत्रालय, मुंबई.
 मा. मंत्री, सार्वजनिक बांधकाम (इमारत) यांचे खाजगी सचिव
 मा. राज्यमंत्री, नगर विकास यांचे खाजगी सचिव
 अपर मुख्य सचिव, सार्वजनिक आरोग्य, मंत्रालय, मुंबई.
 प्रधान सचिव, नगर विकास विभाग, मंत्रालय, मुंबई.
 प्रधान सचिव, उच्च व तंत्रशिक्षण, मंत्रालय, मुंबई.
 प्रधान सचिव, गृहनिर्माण विभाग, मंत्रालय, मुंबई.
 सचिव, जलसंपदा, मंत्रालय, मुंबई.
 सचिव, सार्वजनिक बांधकाम, मंत्रालय, मुंबई.
 सचिव, वैद्यकीय शिक्षण, मंत्रालय, मुंबई
 संचालक, नगरपालिका प्रशासन वरळी, मुंबई.
 संचालक, आरोग्य संचालनालय, मुंबई
 संचालक, नगररचना, पुणे
 व्यावस्थापकीय संचालक, महाराष्ट्र राज्य रस्ते विकास महामंडळ, मुंबई
 महानगर आयुक्त, मुंबई महानगर प्रदेश विकास प्राधिकरण, मुंबई.
 सदस्य सचिव, महाराष्ट्र प्रदूषण नियंत्रण मंडळ, मुंबई
 मा. मंत्री (पर्यावरण), यांचे खाजगी सचिव
 मा. राज्यमंत्री (पर्यावरण), यांचे खाजगी सचिव
 सर्व प्रशासकीय विभाग, मंत्रालय, मुंबई
 सर्व आयुक्त, महानगरपालिका सर्व जिल्हाधिकारी
 सर्व मुख्य कार्यकारी अधिकारी, जिल्हापरिषद
 मुख्य अधिकारी, म्हाडा, मुंबई
 मुख्य अधिकारी, एस.आर.ए., मुंबई.
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 निवडनस्ती.



Environmental Guidelines for Public Building Projects in Maharashtra State

Abbreviations

Air Act, 1981 (Prevention and Control of Pollution)	BEE - Bureau of Energy Efficiency
CPCB - Central Pollution Control Board	CFC - Chloro fluoro carbon
CII - Confederation of Indian Industry	CGWB - Central Ground Water Board
EIA - Environmental Impact Assessment	ECBC - Energy Conservation Building Code
FSI /FAR - Floor Space Index / Floor Area Ratio	GHG - Green House Gas Emissions
IGBC - Indian Green Building Council	IVC -In-Vessel composting
LED - Light emitting diode	MoEF - Ministry of Environment and Forestry
MERC - Maharashtra Electricity Regulatory Commission	MPCB - Maharashtra Pollution Control Board
MHADA - Maharashtra Housing & Area Development Authority	NBC - National Building Code of India
STP - Sewage Treatment Plant	VOC - Volatile Organic Compounds
Water Act, 1974 (Prevention and Control of Pollution)	

Glossary of Terms

Adapted Plants: Plants that reliably grow well in a given habitat with minimal attention from humans in the form of winter protection, pest protection, water irrigation, or fertilization once root systems are established in the soil. Adapted plants are considered to be low maintenance but not invasive.

Biodiversity: The variety of life in all forms, levels and combinations, including ecosystems diversity, species diversity, and genetic diversity.

Chlorofluorocarbons (CFCs) are hydrocarbons that deplete the stratospheric ozone layer.

Day lighting is the controlled admission of natural light into a space through glazing with the intent of reducing or eliminating electric lighting. By utilizing solar light, day lighting creates a stimulating and productive environment for building occupants.

Drip Irrigation: A high- efficiency irrigation method in which water is delivered at low pressure through buried mains and sub-mains. From the sub-mains, water is distributed to the solid from a network of perforated emitters. Drip irrigation is a type of micro-irrigation.

Dual flush toilet: A dual-flush toilet is a variation of the flush toilet that uses two handles to flush different levels of water. The smaller level is designed for liquid waste, and the larger is designed for solid waste.



Erosion : A combination of processes in which materials of the earth's surface are loosened, dissolved or worn away, and transported from one place to another by natural agents (such as water, wind or gravel).

E-waste: It includes discarded materials from a range of electronic devices such as computers, refrigerators, televisions, air-conditioners, personal stereos, mobile phones etc.

Fly Ash: The solid residue derived from incineration processes. Fly ash can be used as substitute for Portland cement in concrete.

Flow rate: Flow rate is a parameter used to mark the efficiency of appliances using liquids. For water fixtures, flow rates give the amount of water (in litres) that flows from a particular fixture in a given time (in minutes)

FSI /FAR: The Floor Space Index (FSI) or Floor Area Ratio (FAR) is the ratio of the total floor area of buildings on a certain location to the size of the land of that location. As a formula:

Floor Area Ratio = (Total covered area on all floors of all buildings on a certain plot)/ (Area of the plot)

Greenfields: Sites that have not been previously developed or graded and remain in a natural state.

Grey water: Grey water is wastewater from lavatories, showers, bathtubs, washing machines and sinks that are not used for disposal of hazardous or toxic ingredients or wastes from food preparation.

Green Energy: The electricity generated by renewable energy sources such as solar, wind, water, biomass & geothermal sources reduce the impact of air pollution.

Greenhouse Gases: Gases such as carbon dioxide, methane and Chlorofluorocarbons CFCs that are relatively transparent to the higher-energy sunlight, but trap lower –energy infrared radiation.

Grass Pavers: Cellular blocks with grass growing in the voids. These are mostly used for external paving, gardens. They need maintenance and have good infiltration capacity.

HVAC systems: Include heating, ventilation and air-conditioning systems used to provide thermal comfort and ventilation for building interiors.

Heat Island Effect: Occurs when warmer temperatures are experienced in urban landscapes compared to adjacent rural areas as a result of solar energy retention on constructed surfaces. Principal surfaces that contribute to the heat island effect include streets, sidewalks, parking lots and buildings.

In-vessel composting is an industrial form of composting biodegradable waste that occurs in enclosed reactors. These generally consist of metal tanks or concrete bunkers in which air flow and temperature can be controlled, using the principles of a "bioreactor". Generally the air circulation is metered in via buried tubes that allow fresh air to be injected under pressure, with the exhaust being extracted through a bio filter, with temperature and moisture conditions monitored using probes in the mass to allow maintenance of optimum aerobic decomposition conditions.

Irrigation: Technique for applying water or wastewater to land areas to supply the water and nutrient needs of plants.

Local Zoning Requirements: Local government regulations imposed to promote orderly development of private lands and to prevent land use conflicts.

Land fill: A waste disposal site for the deposit of solid waste from human activities

Landscape Area: Area of the site equal to the total site area less the building footprint, paved surfaces, water bodies, patios. Etc.,



Lighting Power Density (LPD): the installed lighting power, per unit area.

Low-flow fixtures: Low-flow fixtures use high pressure to produce a comfortable, pleasing flow without using much water.

Native (Indigenous) Plants: Any plant species that occurs and grows naturally in a specific region. Native plant species do not require watering other than during the initial years of establishment.

Open Space Area: The property area minus the development footprint or as defined by local zoning requirements. Open space must be vegetated and pervious, also includes non-vehicular, pedestrian oriented hardscape spaces.

Potable Water: Water suitable for drinking and supplied from wells or municipal water systems.

Refrigerants: Are the working fluids of refrigeration cycles. They absorb heat from a reservoir at low temperatures and reject heat at higher temperatures.

Recycling: The collection, reprocessing, marketing and use of materials that were diverted or recovered from the solid waste stream.

Solar Reflectance Index (SRI): A measure of a material's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and standard white (reflectance 0.80, emittance 0.90) is 100. Materials with highest SRI values are the coolest choices for paving.

Swales: Low tract of land, especially one that is moist and marshy. Kind of open drain system is usually designed to manage runoff.

Total Suspended Solids: Particles or floes that is too small or light to be removed from storm water via gravity settling. Suspended solid concentrations are typically removed via filtration.

Top soil conservation: The process of removing and protecting the top soil from any construction or development site for reusing it onsite later.

Transplantation: The process of digging up a plant / tree and moving it to another location.

Vegetated area: The area in the site which has plantation or greenery on it in any form, such as shrubs, grass, trees etc.

Volatile Organic Compounds (VOCs) are carbon compounds that participate in atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates and ammonium carbonate). The compounds vaporise (become a gas) at normal room temperatures



Introduction

Growth of Building Sector

The building sector in India has witnessed tremendous growth in infrastructure development from the past 3-5 years. As the sector grows rapidly, preserving the environment poses lot of challenges and at the same time presents wonderful opportunities for all stakeholders. The construction sector therefore plays a vital role towards preservation of the environment. Among the preservation measures to be considered for the environment, the energy, water and materials shall be on top priority. The growth in demand for residential & commercial spaces will further stress the need for fast depleting energy & water resources, apart greater requirement of land. Thus, a need has arisen to address the optimization of natural resources in building construction and reduce the negative impact on environment, while sustaining the national growth.

Maharashtra has always been a leader in infrastructure development and in embracing green building concepts. Presently there are more than 450 green buildings coming up in Maharashtra with a green building footprint of more than 350 million sq.ft.

Environmental Guidelines for Public Buildings in Maharashtra

To further advance the green building movement in the state, Government of Maharashtra along with Confederation of Indian Industry (CII) & Indian Green Building Council (IGBC) propose to develop Environmental guidelines for Public Buildings in Maharashtra. These guidelines are intended to promote and encourage the adoption of green building concepts, by design. It is envisaged that the implementation of these guidelines would result in a series of benefits to the state such as:

- ❖ Minimising the demand for Energy and Water usage
- ❖ Better Infrastructure
- ❖ Better Waste Management
- ❖ Quality of Life
- ❖ Reduction of Green House Gas (GHG) Emissions
- **Implementability & Payback for Measures Suggested**

To facilitate wider implementation it is ensured that the guidelines are simple, practical and easily implementable. The economic payback periods for various measures have also been analyzed and grouped based on the following criteria

- a) Measures for immediate payback (less than one year)
- b) Measure for payback within 2-3 years
- c) Measures for payback with more than 5 years

Annexure-II highlights the payback periods for various measures.

The proposed guidelines shall cover all Public Building Projects. These suggested guidelines are classified into six broad categories:

- ❖ Sites, Ecology & Transportation
- ❖ Water Efficiency
- ❖ Energy Efficiency
- ❖ Renewable Energy Sources
- ❖ Waste Management
- ❖ Eco-Friendly Materials



Section 1

Mandatory Requirements

Site Preservation

Plinth level

1. Preserve the top 6 to 8 inches fertile soil from the constructed area of the site and reuse such soil within the site (or) outside the site premises, for landscaping
2. Implement erosion control measures such as temporary plantation and water spray for dust control during construction
3. Plant atleast five saplings for every tree uprooted within the project site, preferably select native plant species. Existing trees which are coming under the proposed construction should be Tran located on the RG area or suitable area on the site or near to the site. Or Undertake compensatory forestation /plantation on designated site.
4. Preserve atleast 15 % of the natural vegetation of the site, to encourage natural habitat. Mandatory RG /open space on ground should be in compliance with the supreme court order dated 17.12.2013 given in the SLP No.33402/2012. In addition to above vegetation over roof or vertical landscape may also be provided, if possible.
5. To maintain the proper environmental conditions and safety, efforts should be made that ground coverage area of the total construction should not exceed 55% of the net plot area of the site. Wherever it is not possible, due reasons for the same should be recorded with the approval of the concerned competent authority. At least 45% of the mother earth under the project site should remain open for proper light and ventilation, ground water percolation, green belt development, heat balance and to maintain balance in the micro climate of the area etc.

During construction stage & final level

1. Provide 50 % of non-roof area such as parking lots, walkways, podiums with open grid / grass pavements.
2. Provide 50 % of roof area with vegetation (or) high albedo materials such as China mosaic / tiles with high SRI* .The net roof area will be considered for implementation
3. Provide 50 % of the allocated parking spaces under roof or basements. This would be applicable for parking spaces which are under the scope of the developer
4. Provide exclusive bicycle lanes with a maximum width of 5 feet all along the main and internal roads. These lanes should be connected to all the amenities and public places within the site premises
5. Parking capacity to be provided as per local byelaws. Provide additional parking spaces for visitors, not exceeding 10 % of the total car parking spaces
6. For residential complexes, provide 2 car parking's per dwelling unit. Provide additional parking spaces for visitors, not exceeding 10 % of the total car parking spaces
7. Implement structural control measures such as (1)sedimentation basin (2) silt fencing ,(3)swales for erosion control post occupancy.

Water Conservation

During construction stage & final level

1. Implement Rainwater harvesting measures, both for roof and non roof areas. In places, where the water tables are high, install structures to capture the rainwater.

* SRI - Solar Reflectance Index is a measure of a material's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and standard white (reflectance 0.80, emittance 0.90) is 100. Materials with highest SRI values are the coolest choices for paving.



The average per day rainfall over the past two years shall be considered for calculations

Harvesting structures should have volumes to capture atleast 30 % of runoff from the site

2. Install water closets with dual flush system, not exceeding a consumption of 3 / 6 liters per flush: Sewage conveyance.
3. Install water flow fixtures namely taps, faucets, showers should not exceed a maximum flow of 10 liters per minute
4. If area of construction is more than 10,000 sq.mt. sewage water should be treated on site and same shall be reused for landscaping construction, gardening, cooling etc. In case of township project maximum treated water should be recycled or reused.
5. Install drip / sprinkler irrigation systems as appropriate, to avoid usage of open-ended hoses for landscape irrigation within project site

Energy Efficiency

During construction stage & final level

1. Install BEE 3 (Bureau of Energy Efficiency, Ministry of Power) star rated lighting fixtures to cover 75 % of all external lighting loads
2. Refrigerants in Heating Ventilation & Air-conditioning for base building systems should not use Chloro Fluoro Carbon (CFC) based refrigerants
3. Compact florescent lamps (CFLs), Fluorescent tubes (T5, T8) light fixtures should be considered for external and internal lighting applications of all buildings. Preference shall be give to LED lights.
4. Install BEE 3-star / Energy star rated equipment/ appliances such as ceiling fans, window air-conditioner, refrigerators, geysers, printers, photo copiers

Renewable Energy

During construction stage & final level

1. Install Solar Hot water system for minimum 70% of the total hot water requirement in the building.
2. Install solar lights in common open areas, passages, gardens and internal roads etc.
3. For commercial buildings solar photo-voltaic (PV) direct to grid or with invertors, solar water heaters, solar street light, solar water pumps, common solar heating system etc should be used. Subsidies available through MNRE and MEDA can be availed for installation of the same.

Waste Management

During construction stage & final level

1. Install colour coded waste bins in all public areas to enable segregation of paper, plastic, e-waste and organic waste within the building premises
2. Allocate dedicated areas for segregation and storage of construction waste material. Reuse atleast 50% (by volume or weight) of such waste either in-situ or ex-situ. Alternatively sell or donate such waste for recycling or reuse
3. Adopt mechanical composting technology / Vermi Composting bins for conversion of organic waste to manure.

Green Building Materials

During construction stage & final level

1. Use locally available eco friendly materials to reduce emissions due to transportation. Ensure that atleast 10% of civil construction materials by value, such as concrete, steel, tiles, glass etc., are sourced within a radius of 400 km from the project site.



2. Source civil construction materials with recycled content, to reduce the demand for virgin resources. Such recycled materials shall constitute atleast 10 % of total civil construction materials, by value.
Examples
 - Steel with recycled content
 - Use cement with fly ash content for plastering applications
3. Use internal paints & coatings and adhesives & sealants with low or no VOC content for interiors which does not exceed the VOC limits as specified in the table below

Type of Material	VOC Limit (g/L less water)
Paints & Coatings:	
Non-flat (Glossy) paints	150
Flat (Mat) paints	50
Anti-corrosive/Anti-rust paints	250
Varnish	350
Adhesives & Sealants	
Glazing adhesive	100
Tile adhesive	65
Wood adhesive	30
Wood flooring adhesive	100

Safety Measures

During construction stage & final level

1. Provide drinking water facilities for the workmen during construction phase
2. Provide safety and protection equipment for workmen during construction
3. Adequate housing to meet or exceed local/ labour bye-law requirement.
4. Sanitary measures to meet or exceed local/ labour bye-law requirement (OR) provide atleast one toilet seat/ urinal for every 100 workers in any shift, whichever is more stringent.
5. The sanitary measures should be provided separately for men ,women and disabled people.
6. First-aid and emergency facilities.
7. Personal protective equipment (by owner/ contractor).
8. Dust suppression measures.
9. Adequate illumination levels in construction work areas.
10. Provide medical kits at site and identify nearby ambulance call-services to meet any emergency requirements during construction phase.

Existing Building Laws

In addition to the above mandatory green guidelines, project should adhere to the existing bye-laws (as per Annexure I)



Section 2

Voluntary Options:

Sites, Ecology & Transportation:

Plinth level

1. Locate atleast five basic amenities nearby the project site. Such amenities may include any of the following:
 - a. ATM, Clinic, Pharmacy, Post Office, Restaurant, School, Supermarket, Beauty Saloon, Convenience Grocery, Day Care, Fire Station, Hardware, Laundry, Library, Museum, Community Center, Theater, Senior Care Facility, Park, Fitness Center, Medical clinic, Dental clinic, Bus station, Railway station, Metro Rail etc.
2. Preserve or transplant 75 % of the existing trees within the project site

During construction stage & final level

1. Post-development, provide vertical & horizontal landscapes. Such landscapes should cover atleast 20% of the site area.
2. Post-development, provide landscaping (vertical & horizontal), landscaped area being atleast 20% of the site area. (5 % in addition to natural topography)
3. Provide prospective user and occupants with descriptive green guidelines that educate and help them to implement green design features within their buildings in project, which would help them to maintain the facility green throughout its life

Water Consumption

During construction stage & final level

1. Wherever possible treated wastewater should be used in construction phase to reduce the fresh water requirement and micro climate of the area.
2. Landscape Species: Select drought tolerant / native / adaptive species by design for atleast 20% of landscape area, which will result in reducing substantial water requirement
3. Install temporary structures to capture 5% of rainwater which falls within site, which can be used for construction activities such as curing, dust control, landscaping purposes
4. Use captured rainwater or treated recycled grey water for landscaping to cater to a minimum 50 % of the irrigation/gardening water requirement
5. Install water flow meters at various locations, to measure and sustain the water efficiency:
 - a. Overall water consumption within the site
 - b. Individual water meters connected to every building project within Public Building Project
 - c. Cooling tower make-up
 - d. Irrigation water consumption
6. Install low flow urinals, not exceeding a consumption of 2 litres /flush. Standard as per uniform plumbing code of India is given below for various flow & flush fixtures.



Fixture Type	Maximum Flow Rate / Capacity	Duration	Daily Uses per Person/ Day
Water Closets	6 LPF (High flush)	1 Flush	1
	3 LPF (Low flush)	1 Flush	4
Health Faucet/ Bidet, Hand-held spray*	8 LPM	15 Seconds	1
Faucet*	8 LPM	15 Seconds	8
Kitchen Sink*	8 LPM	15 Seconds	6
Showerhead* /			
Hand-held Spray*	10 LPM	8 Minutes	1
Source: Uniform Plumbing Code – India, 2008			

Energy Efficiency

During construction stage & final level

1. Use of Natural Daylighting , Ventilation & Views

- a. Design Façade with glazing factor of 1 for atleast 50% of the regularly occupied spaces Constant Value for windows on wall is 0.2 & Window on roof (skylight) is 1.0

Glazing factor can be calculated using the formula given below:

$$\text{Glazing Factor} = \frac{\text{Window Area [sq.m]} \times \text{Actual Visible Transmittance of Glazing} \times \text{Constant} \times 100}{\text{Floor Area [sq.m]}}$$

- b. Design interior layouts and openings to have a atleast 50 % views to outside nature
2. Ventilation System: Design a ventilation system for air conditioned spaces; to meet 6 cubic feet per minute (CFM) per person for each air conditioned office space and 9 CFM per person for each space meant for assembly of persons like auditoriums, theatres, shops. For non air-conditioned spaces, provide windows with openable areas of at least 10% of the floor area.
3. Install energy sub-metering systems to measure the power consumptions for HVAC and Lighting (Interior & exterior)
4. Commercial & Office buildings should comply with the requirements of Energy Conservation Building Code (ECBC), 2007 of Bureau of Energy Efficiency, Ministry of Power, Government of India with respect to Envelope, Cooling, Heating and Lighting Systems
5. Install lighting design such that the lighting power density (LPD) shall not exceed the following :

Area Type	Lighting Power Density (LPD)
Parking lots and driveways	0.2 Watts / ft ²
Walkways less than 10 feet wide	1.0 Watts / linear foot
Walkways 10 feet wide and greater, plaza areas	0.2 Watts / ft ²
Stairways	1.0 Watts / ft ²
Main entries	30 Watts / linear foot for door width
Building Façade	0.2 Watts / ft ² for each illuminated wall or surface

HVAC - Include heating, ventilation and air-conditioning systems used to provide thermal comfort and ventilation for building interiors.



6. Install temporary ventilation systems during construction phase, which would provide adequate fresh air for construction workmen, who are working in basements or interiors.
7. Install LED (Light Emitting Diode) lighting fixtures to cover 25 % of lighting loads used for landscaping
8. Install BEE 3 star equipments in office areas such as (1) printers, (2) Xerox machines

Renewable Energy Sources

During construction stage & final level

1. Install renewable energy sources to encourage green and clean energy.
 - Atleast 5 % of the total consumption of street lighting and traffic lights should be met through renewable energy sources, such as
 - Solar Photo Voltaic (PV),
 - Small sized Wind Mills,
 - Bio-Mass,
 - Bio-gas

Waste Management

During construction stage & final level

1. Allocate dedicated area for segregation and storage of construction waste material. Reuse 50% (by volume or weight) of such waste either in-situ or ex-situ. Identify and sell or donate, segregated construction waste for recycling or reuse
2. Allocate a dedicated area to store the consumer waste generated in buildings. Examples of such waste include organic waste, paper, glass, plastic, cardboard, metal, and e-waste
3. In-Vessel composting (IVC) technology / Vermi Composting bins can be adopted for organic waste from individual residential buildings

Green Building Materials

During construction stage & final level

1. Source civil construction materials with high recycled content :
 - Steel with atleast 25 % recycled content
 - Fly-ash based cement with atleast 15-20% fly-ash
 - Fly-ash based bricks for external walls
 - Finishing materials, such as gypsum board, false ceiling material, glass, composite & agrifibre based wood products with a recycled content of atleast 5-10%



Annexure -I

The existing bye-laws include many green features, few of which are listed below:

- Projects which fall under low lying areas, should comply with Central ground water norms, Government of Maharashtra
- Project should comply with Water (Prevention and Control of pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981
- Fly ash should be used as building material in the construction as per the provisions of Fly Ash Notification of September 1999 and amended as on 27th August, 2003. (The above condition is applicable only if the project site is located within 100 Km of Thermal Power Stations)
- Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase. Adequate measures should be made to reduce ambient air and noise level during construction phase so as to conform to the stipulated standards by CPCB / MPCB
- Install Sewage treatment plant (STP) (for both commercial and residential) to treat waste water generated to tertiary standards as per State or Central Pollution Control Board norms
- Land development / construction work relating to the project shall be taken up only after obtaining clearance from respective authorities
- Construction workers safety and security manual to be provided and ensure implementation of measures
- All the topsoil excavated during construction activities should be stack piled for use in horticulture/landscape development within the project site
- Green Belt Development shall be carried out considering CPCB guidelines including selection of plant species and in consultation with the local experts
- Vehicles hired for construction material to the site should have a pollution check certificate
- Projects which fall under low lying areas, should comply with Central ground water norms, Govt. of Maharashtra
- STP requirement and implementation as per EIA Notification, 2006. Also projects should obtain completion certification of these systems from Maharashtra Pollution Control Board
- Fixtures for showers, toilet flushing and drinking should be of low flow either by use of aerators or sensor based control
- Storm water control and its re-use as per Central ground water board and BIS standards for various applications
- Roof Top Rain Water Harvesting
- The diesel generator sets used during construction phase should be low sulphur diesel type and should conform to Environment (Protection) Rules prescribed for air and noise emission standards
- Use of CFLs and TFLs for the lighting areas outside the building should be integral part of project design
- Opaque wall and Roof should meet prescriptive requirement of ECBC 2007.
- The building should have adequate distance between them to allow movement of fresh air and passage of natural light, air and ventilation
- Integrated Solar / LPG Water Heating
- Municipal Street Lighting using renewable sources
- Disposal of muck during construction phase should not create any adverse effect on the neighboring communities and be disposed taking the necessary precautions for general safety and health aspects of people, only in approved sites with the approval of competent authority
- Fly ash should be used as building material in the construction as per the provisions of Fly Ash Notification of September 1999 and amended as on 27th August, 2003. (The above condition is applicable only if the project site is located within the 100Km of Thermal Power Stations)
- Ready mixed concrete must be used in building construction
- Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase. Adequate measures should be made to reduce ambient air and noise level during construction phase so as to conform to the stipulated standards by CPCB / MPCB
- Orders of Hon'ble High Court and Supreme Court issued in above matters if any, under consideration shall be implemented properly.



Annexure -II

Pay Back Options - Incremental Cost for Measures

S. No	Green Guideline Measures	Indicative Cost (Rs.) OR % Incremental cost	Measures Considered Comments	Mandatory	Immediate (or) No Cost (or) < 1 year	2-3 years	3-5 years	5-10 years
1	Sites, Ecology & Transportation							
a	Preserve the top 6 to 8 inches soil from the constructed area of the site and reuse such soil within the site or outside the site premises, for landscaping		This is mandatory requirement	Y				
b	Preserve the natural topography of the site, to encourage natural habitat		This is mandatory requirement		Y			
c	Installation of open-grid pavers for non-roof landscape areas	No additional cost	This will be in lieu of concrete surfaces		Y			
d	Parking facilities either in multi-level car parking or building basement		To reduce heat island effect		Y			
e	Preservation/ transplantation of existing trees		This is mandatory requirement	Y				
f	Exclusive bicycle parking facilities		This is mandatory requirement	Y				
g	Exclusive lanes for comfortable pedestrian street access				Y			
h	Vegetated roof	Rs. 80/ sq.ft.				Y		
i	High Solar Reflective Index (SRI) material (paints, white tiles, broken china mosaic tiles) for roofing	Rs. 25 to 60/ sq.ft.	Paints : Rs. 40-60/ sq.ft China mosaic tiles : Rs 25-30/ sq.ft		Y			
j	Mobile toilets, water facilities for workmen	Rs.25 to 60/ sq.ft	Paints : Rs. 40-60/ sq.ft china mosaic tiles : Rs 25-30/ sq.ft		Y			
j	Mobile toilets, water facilities for workmen	Negligible	This should be a mandatory requirement		Y			
2	Water Consumption							
a	Install low-flow fixtures and low-flush fixtures	Rs.10,000 /fixture	This should be a mandatory requirement	Y				
b	Implement rainwater harvesting measures, both for roof and non roof areas	Rs. 3/ liter	This is mandatory requirement	Y				
c	Install water flow meters to measure the following consumption: o HVAC Cooling tower make-up o Irrigation water consumption o Sewage conveyance	Negligible			Y			



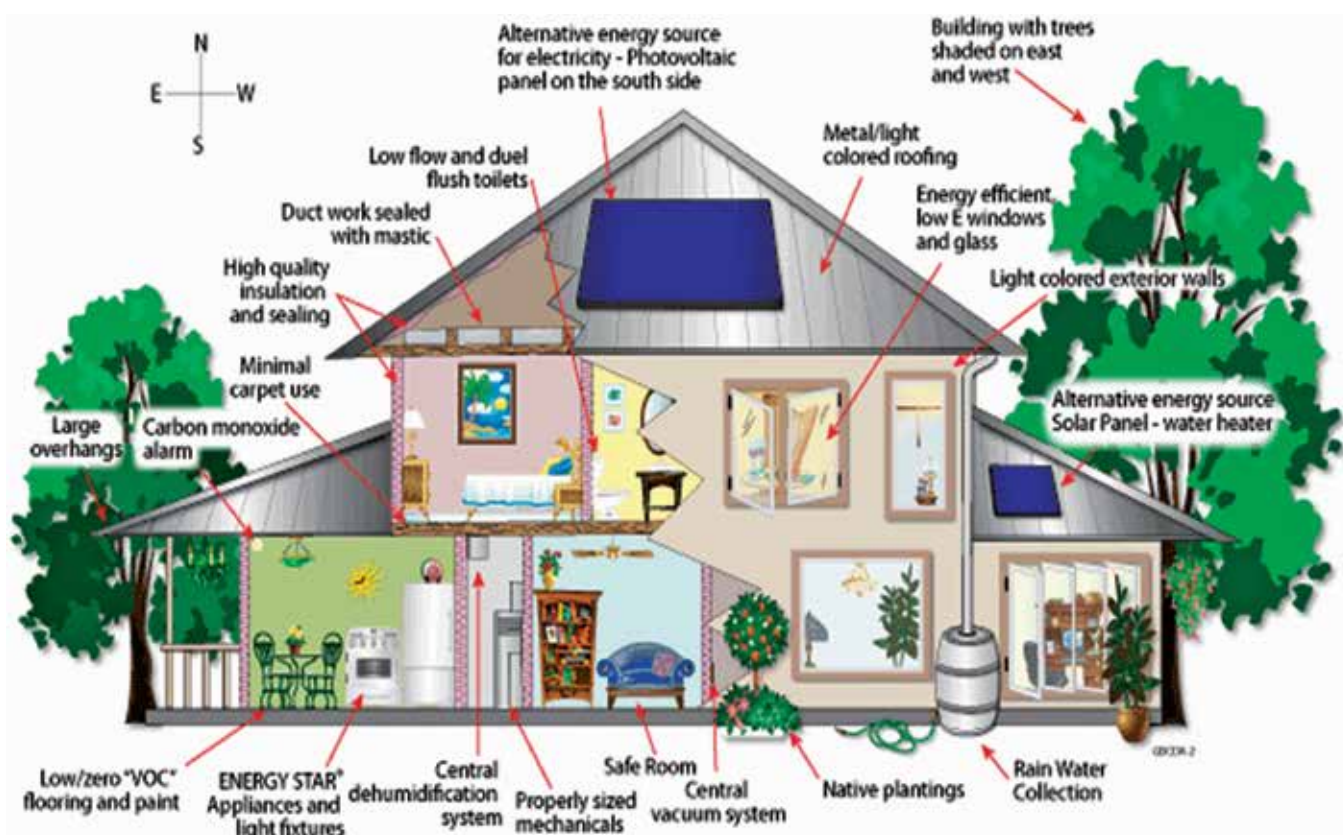
d	Protecting or restoring the existing water bodies		This is measure to preserve and restore flora & fauna		Y			
e	Centralized in-situ waste eater treatment plant to treat waste water generated		Fort of building bye-law	Y				
f	Reuse of treated waste water for landscaping, flushing and air-conditioning make-up requirements	Negligible			Y			
3	Energy Consumption							
a	Install sub-metering systems to measure the energy consumptions for HVAC and lighting (Interior & exterior)	Negligible			Y			
b	Automatic dusk to dawn operation of street lights	Negligible			Y			
c	BEE star rated internal lighting luminaries	Negligible		Y				
d	BEE star rated internal lighting luminaries	Negligible		Y				
e	External LED lighting luminaries for landscaping	Rs 45,000 for 120 W/ fixture(light output equivalent of 250 W conventional lamp)				Y		
4	Waste Management							
a	Allocate dedicated area for segregation and storage of construction waste material Reuse construction waste either in-situ or ex-situ. Identify and sell or donate such waste for recycling or reuse	-	This should be a mandatory requirement	Y				
b	Allocate a dedicated area to store the consumer waste generated in buildings. Examples of such waste include organic waste, paper, glass, plastic, cardboard, metal and e-waste	-	This is during post occupancy	Y				
c	Centralised or unit dependant primary treatment facilities in accordance with State/ Central Pollution Control Board norms		Part of bye-law	Y				
d	Garbage segregation will be as per Solid Waste Rules of 2000		Part of bye-law	Y				
e	Segregation of waste during construction and subsequent reuse or recycling	Negligible			Y			
5	Green Building Materials							
a	Utilization of Fly-ash in construction	No additional cost		Y				
b	Regionally sourced materials	No additional cost		Y				
c	Materials with recycled content	No additional cost			Y			



d	Use bamboo, eucalyptus or rubber wood based products in lieu of hardwood	No additional cost			Y		
6	In-situ Renewable power generation						
a	External Solar Street Lighting (pr fixture)	Rs. 3.5 Lakhs/kW					Y
b	Solar Photovoltaics	Rs 2.5-3 Lakhs/ kW				Y	
c	Windmill	Rs2-2.25 Lakhs/ kW					Y
d	Biomass plant	Rs 30 Lakhs for 50 kW capacity					Y
e	Solar water heating systems	Rs 1 Lakhs/ KLD			Y		

Environmental Guidelines for Public Building Projects in Maharashtra

S. No.	Summary of guidelines	No. of measures	Percentage
1	Measures where payback is not considered as a criteria	14	40%
2	Measures with payback period of less than one year (can be mandatory)	14	40%
3	Measures with payback period of 2-3 year (can be mandatory)	3	9%
4	Measures with payback period of 3-5 years (can be mandatory)	1	3%
5	Measures with payback period of 5-10 years (can be recommendatory and can be implemented in phased manner in 5 years time)	3	9%
		35	100%



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