Eco Housing
Building a Better Tomorrow

# Eco-housing Assessment Criteria
# Retrofit Construction

Eco-Housing Program implemented in partnership by

USAID | INDIA
FROM THE AMERICAN PEOPLE

IIEC

University of Pune
SCITECH PARK

| | | |
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| **1. Site Planning** | | |
| 1.1 | | **15** |
| | **Implement the measures prescribed in the Appendix – Biodiversity Conservation for Eco-housing for a) Remedial measures to restore and promote the natural biodiversity of the area, especially for sites located in the vicinity of ecologically sensitive areas b) Designing the landscaped areas to promote and create habitats conducive to native fauna in the form of 'urban niches'**<br>**(As identified in Appendix – Biodiversity Conservation for Eco-housing)** | |
| Submittal Requirement : | • Inventory Report on existing Flora & Fauna of the proposed site<br>• Narrative and supporting drawings on existing site condition and the measures implemented to improve the situation<br>• Landscape Drawings showing the measures implemented | |
| Intent: | Biodiversity Conservation and Preservation' | |
| Comments: | *Refer Appendix 'Biodiversity Conservation for Eco-housing'*<br>*Refer Appendix 'Native Fauna of Mumbai'* | |
| 1.2 | | **10** |
| | **Site should be properly designed to mitigate the 'heat island effect' (thermal gradient difference between developed and undeveloped areas) by the following –**<br>- Use light coloured paving, interlocking concrete or grass-crete blocks (Solar Reflectance index >0.5) for pavements, walkways etc. | |
| Submittal Requirement: | • Site drawings showing paved/unpaved areas, parking lots with specifications for surface properties | |
| Intent: | To reduce micro climate temperature rise | |
| Comments: | | |
| 1.3 | | **25** |
| | **Restrict net surface run-off of site to 0.4 – 0.7***<br>0.7 - 0.6<br>0.6 – 0.5<br>0.5 - 0.4 | <br>15<br>20<br>25 |
| Submittal | Run off calculations in specified format (given below) | |
| | **Calculations for restricting the run-off coefficient (c) on site -**<br>Gross site area: **A** sq. m.<br>Ground coverage: **p%**<br>Built-up area on site ($A_b$): **p / 100 X A** (sq m )<br>Open area on site ($A_O$ ): (**A - $A_b$** ) (sq m)<br>Open Area on site planned for perviousness (**Ap**): $\sum A_1 X c_1 + A2 X c_2 +$.<br>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.<br>Average Run-off coefficient = **Ap/ $A_O$** | |
| Intent: | To facilitate ground water recharge, restrict run off to mitigate local flood problems. | |
| Comments: | | |

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| **Sub-total** | | **50** |

## 2. Environmental Architecture

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| **2.1** | | **20** |
| | **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. Strategies may include (but not limited to) the following:** | |
| **2.1.1** | | **10** |
| | **Thermal Comfort**<br>**To Minimize solar gain**<br>▪ Windows can be installed with Energy efficient glazing systems to minimise unwanted solar gains in summer, while maximising the amount of useful daylight in buildings. | |
| **2.1.2** | | **10** |
| | **Day lighting**<br>**To ensure glare free day lighting**<br>▪ The colour of the building should be such that it assists in encouraging diffused lighting and surrounding lighting, pleasant for optimising the visual comfort and increase the daylighting within the deep interiors. (High Albedo index of at least 0.3) | |
| Submittal Requirement: | Narrative (maximum 500 words with supporting drawings and sketches) should include climate responsive strategies for 1) thermal comfort 2) air movement and natural ventilation 3) day lighting 4) solar and rain protection control to ensure maximum thermal and visual comfort | |
| Intent: | To enable energy efficiency, thermal and visual comfort | |
| Comments: | | |
| 2.2 | | **10** |
| | **Roof should be protected against excessive heat gain by:**<br>**appropriate insulation to give U-value as specified by Draft 'Energy Conservation Building Code' 2006.**<br>▪ Alternatively, provide roof garden for 100% of exposed roof area or<br>▪ Provide china mosaic floor finish which offers good reflectance and high emittance | |
| Submittal Requirement: | ▪ Narrative indicating the methods adopted for protecting the roofs from excessive heat gains.<br>▪ Bill of quantities with roof specifications | |
| Intent: | To prevent roof heat gain | |
| Comments: | Applicable only if space under the roof is a regularly occupied space | |
| **Sub-total** | | **30** |

## 3. Energy Conservation and Management

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| | **SITE LIGHTING** | |
| 3.1 | | **5** |
| | **Design street lighting (applicable for large sites requiring street lighting) as per IS: 1944 (Parts I & II) - 1970 "Code of practice for lighting of public thoroughfares" of BIS (Bureau of Indian Standards)** | |
| Submittal Req: | Signed template from concerned person that this clause has been | |

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| | complied with | |
| Intent: | | |
| Comments: | Applicable for large sites requiring street lighting; Large sites are the sites that are larger than or equal to 1.0 hectare | |
| 3.2 | | **10** |
| | **The average luminaire efficacy for external lights (all lights outside building premises used for parking, pathways, landscaping) not less than 30 luminaire lumens/ circuit watts. Use HID (high-intensity discharge) lamps for outdoor lighting such as high-pressure sodium lamps, Metal Halides, SON etc. circuit efficacy of 80 lm/W to be used.** | |
| Submittal Requirement: | • Luminous efficacy of each type of lamps used in outdoor lighting.<br>• Luminous efficacy (lm/W) = [{Lamp lumen output (lm)}/ {Lamp wattage (W) + ballast power loss (W)}].<br>• Format given in Table 3.1 on page 6<br>• Outdoor lighting layout with manufacturers' details of lamps, ballasts, luminaires and automatic controls.<br>• Certificate showing that all fittings used are ISI marked/ BIS marked and all the fixtures are 4 star minimum by B.E.E. (Bureau of Energy Efficiency) | |
| Intent: | To reduce energy usage for site lighting | |
| Comments: | | |
| 3.3 | | **10** |
| | **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.** | |
| Submittal Req: | Product cut sheets with cut off specifications as per IESNA. | |
| Intent: | To prevent light pollution of night sky and light trespass into adjacent property | |
| Comments: | | |
| 3.4 | | **25** |
| | **Apply control devices, as appropriate, timers or photocells to turn the lights on and off for minimum 50% of installed lighting fixtures; Provide alternate circuits for groups of adjacent lamps; provide control points for easy accessibility** | |
| | a. between 50-80% of lights on auto-controls | 10 |
| | b. between 80-100% of lights on auto-controls | 15 |
| | c. sensor based control devices for all the light fixtures | 25 |
| Submittal Requirement: | Wiring diagram and layout for the placement of automatic switch (es) for outdoor/ common area lighting. | |
| Intent: | To minimize wastage of lighting during un needed hours | |
| Comments: | | |
| | **COMMON AREA LIGHTING** | |
| 3.5 | | **10** |
| | **Use fluorescent/compact fluorescent lamps operating on low loss ballast, LEDs for general lighting of common/circulation areas namely** | |

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| | **passage, staircase, lifts, corridors, lobbies, common areas.**<br>**Minimum average luminaire efficacy to be 65 lm/W** | |
| Submittal Requirement: | • Luminous efficacy of each type of lamps used in out-doors lighting. Luminous efficacy (lm/W) = [{Lamp lumen output (lm)}/ {Lamp wattage (W) +ballast power loss (W)}]. Format given in Table 3.1 on page 6.<br>• Common area lighting layout with manufacturers' details of lamps, ballasts, luminaries and automatic controls.<br>• Wiring diagram and placement of automatic switch(s) for outdoor lighting.<br>• Certificate showing that all fittings used are ISI marked/ BIS marked and all the fixtures are 4 star minimum by B.E.E. (Bureau of Energy Efficiency) | |
| Intent: | To reduce energy usage for common area lighting | |
| Comments: | | |
| 3.6 | | **15** |
| | **Provide Fixed/pre-wired luminaries to have its sockets that will only accept CFLs/ LEDs**<br>**Use lamps with an efficacy greater than 40 lm/W. This limit is expressed in 'initial' lamp lumen per circuit watt; includes associated power loss from the control gear.**<br>a) pre-wired CFLs<br>**b)** pre-wired LEDs | 10<br>15 |
| Submittal Req: | Luminaire details showing usage of ballasted luminaires | |
| Intent: | To prevent later retrofit with GLS lamps | |
| Comments: | | |
| | **INDOOR LIGHTING** | |
| 3.7 | | **10** |
| | **Lighting Power density to be restricted to 7.5 W/sq. m for Indoor Lighting** | |
| Submittal Requirement: | • Calculation (using building area method to show compliance) electrical drawings; bill of quantities; provision in tender;<br>• Building Area Method of Calculating Interior Lighting Power Allowance.<br>Use the following steps to determine the interior lighting power allowance by the building area method:<br>a. Determine the gross lighted floor area (square feet) of the building area type.<br>b. Multiply the gross lighted floor areas of the building area type(s) times the *lighting power density (7.5 W/sq.m)*.<br>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) | |
| Comments: | | |
| 3.8 | **Mandatory** | **10** |
| | **Lamp efficacy of**<br>**CFL - 50 lm/W; Fluorescent (TL) 80 lm/W;**<br>**& Use Electronic Ballasts**<br>**Ballast loss for**<br>**CFL not grater than 3W; for Fluorescent (TL) not grater than 4.5W** | |

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| Submittal Requirement: | • Certificate from builder that the lighting fixtures and fittings are being provided by builders<br>• 'The work of replacement' shall be certified by 'Electrical licensed supervisor'<br>• Listing of fixtures, lamp types and ballast type using table on page 6 (Table 3.1)<br>• Certificate from manufacturers certifying the lamp efficacy and ballast loss or certificate for 'Rating of BEE' for the selected lamps. | |
| Intent: | To ensure energy efficiency in installed lighting | |
| Comments: | Applicable only if builder is providing lighting fixtures and fittings, lamps and ballasts in 100% of flats | |
| | **ELECTRICAL SYSTEMS** | |
| 3.9 | **Mandatory** | **15** |
| | **Pre-wired CFL/ LED fixtures could be provided in all dwellings.** | |
| | **@ I fixture per room** | **5** |
| | **@ 2 fixture per room** | **10** |
| | **@ 3 fixture per room** | **15** |
| Submittal Req: | **The work of replacement shall be certified by 'Electrical licensed supervisor'**<br>**Fixtures 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 futue** | |
| 3.10 | **Mandatory** | |
| | **All electrical systems to meet minimum efficiency criteria as specified by Energy Conservation Building Code 2006 (Use of high efficiency pumps, motors, transformers etc.)** | |
| Submittal Requirement: | Certificate from relevant personnel showing compliance with Energy conservation Building Code 2006 of the Bureau of Energy Efficiency (Government of India) (Draft code is ready) | |
| Intent: | Energy efficiency | |
| Comments: | | |
| 3.11 | | **5** |
| | **Provide electrical charging points for charging of electric vehicles** | |
| Submittal Req: | Details of electric charging points | |
| Intent: | Promotion of battery operated vehicles within the site | |
| Comments: | Applicable to large projects only; Large sites are the sites that are larger than or equal to 1.0 hectare | |
| | **USE OF RENEWABLE ENERGY SOURCES** | |
| 3.12 | | **40** |
| | **Use renewable energy based (Solar PV, biomass, wind, fuel cells) lighting system for minimum of 25% external lighting (wattage) requirement in kW on site namely walkways, driveways, and landscaped areas or for common/ circulation areas within a building like passage, staircases, lifts, corridors, lobbies, refuse areas with the provision of backup system for lighting in case of any problems in renewable energy based lighting system.** | |
| | a. between 25-40% of lights on renewable energy | 20 |
| | b. between 41-60% of lights on renewable energy | 30 |
| | c. between 61-100% of lights on renewable energy | 40 |

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| Submittal Requirement: | • Demarcate renewable energy based lighting systems for outdoor lighting in outdoor lighting layout and give details of the same.<br>• Provide product cut sheets and total nos. planned.<br>• Demonstrate compliance with above clause to seek partial or full points<br>• Provide details of the back-up lighting system | |
| Intent: | To promote use of clean/green sources of energy | |
| Comments: | | |
| 3.13 | Out of total electric consumption (both indoor and outdoor) | |
| | Minimum 3% needs to be managed by using renewable sources of energy. | **5** |
| | Minimum 5% needs to be managed by using renewable sources of energy | **10** |
| | Minimum 10% needs to be managed by using renewable sources of energy. | **15** |
| | Minimum 15% needs to be managed by using renewable sources of energy. | **20** |
| Submittal Req: | Narrative (Maximum 500 words with supporting drawings and sketches) should include strategies of utilization of renewable energy. | |
| Intent: | To promote use of clean/ green sources of energy | |
| Comments: | | |
| 3.14 | | **10** |
| | **Power factor should be more than 0.9** | |
| Submittal Req: | Certificate from Electric supply authority showing compliance with the criteria | |
| Intent: | To promote Energy efficiency | |
| Comments: | | |
| | **Water Heating Systems** | |
| 3.15 | | **25** |
| | **Provide water heating systems using recovered waste heat, heat pumps, Piped Natural Gas (PNG), solar water heaters and other renewable energy to cater to**<br>a) Minimum 40% of total hot water requirement<br>b) Between 60%-75% of total hot water requirement<br>c) Between 76%-100% of total hot water requirement<br>**Total hot water requirement for a building can be considered to be 25 liters per person per day. (For all households)** | 15<br>20<br>25 |
| Submittal Requirement: | • Installation plan for water heating system using above techniques<br>• Sizing calculation for a typical household.<br>• System specifications and purchase proofs | |
| Intent: | To reduce conventional energy demand for water heating | |
| Comments: | | |
| 3.16 | | **10** |
| | **Provide water heaters with non electric booster or electric boosters with heating COP > 3** | |
| Submittal Req: | System specification and certificate from manufacturer to show compliance | |
| Intent: | To reduce use of conventional electric energy for back up heating by | |

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| | 66% electricity saving options | |
| Comments: | | |
| Notes: | COP is Coefficient of Performance | |
| 3.17 | | **5** |
| | **Provide plumbing for hot water to houses with HDPE/ MDPE insulation.** | |
| Submittal Req: | Plumbing drawings to show compliance | |
| Intent: | To make provision for future integration of solar water heating system | |
| Comments: | | |
| **Sub-total** | | **200** |

**Table 3.1**

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

# 4. Efficient Building Materials

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| **4.1** | | **15** |
| | **Plastering** | |
| | **Use any of the following alternative plasters individually or in combination,**<br>▪ **Calcium Silicate Plaster**<br>▪ **Cement Plaster [1](sand for plaster as per IS1542)**<br>▪ **Phosphogypsum Plaster (IS: 8272, 1984)**<br>**a. 25- 49%**<br>**b. 50 % and above** | 10<br>15 |
| 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. <u>This criteria is mandatory.</u> | |
| | *Refer Appendix – Eco-friendly Building Materials Chapter 3 Section 3.4; Chapter 6 Section 6.1.4* | |
| **4.2** | | **15** |
| | **Flooring, paving and road work** | |
| | **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)**<br>**50-75%**<br>**>75%**<br>**b. Use the following base materials for paving, bedding applications**<br>**i. Increase of Pozzolana Material content in BPC to 30 - 50% by direct** | 4<br>6 |

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| | addition of raw Pozzolana Material<br>ii. Use Sand & aggregate from pulverized debris and /or sintered flyash for concrete and mortar<br>50 – 74%<br>75% and above<br>c. Terrazzo floor for terraces and semi covered areas (IS2114)<br>50-75%<br>> 75% | <br><br><br>3<br>5<br><br>2<br>4 |
| 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<br>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 as building material and prevent landfills and to use energy efficient building materials. | |
| Notes | 1. 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.<br>2. 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 3.5; Chapter 6 Section 6.1.6* | |
| | *Refer Appendix – Eco-friendly Building Materials Chapter 3 Section 3.7; Chapter 6 Section 6.1.9* | |
| **4.3** | | **10** |
| | **Water proofing chemicals, additives, sealants and adhesives** | |
| | **Use of water based chemicals instead of solvent based for 100% of use** | 10 |
| Submittal Requirement: | 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. | |
| Intent: | To use chemical with low VOC emissions. | |
| | *Refer Appendix – Eco-friendly Building Materials Chapter 6 Section 6.1.11* | |
| **4.4** | | **10** |
| | **Water proofing chemicals, additives, sealants and adhesives** | |
| | **Use Epoxy resins instead of tar felt / pitch**<br>**50-75%**<br>**>75%** | <br>5<br>10 |
| 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. | |

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| | *Refer Appendix – Eco-friendly Building Materials Chapter 6 Section 6.1.11* | |
| **4.5** | | **10** |
| | **Painting, Polishing, Priming and similar surface finishing** | |
| | **a. Use of Cement Paint (IS5410)/ Epoxy Resin Paint for external surfaces**<br>**b. Use of Water based paints, enamels, primers and polishes.**<br>**50-75%**<br>**>75%** | <br><br>5<br>10 |
| 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 | |
| | *Refer Appendix – Eco-friendly Building Materials Chapter 3 Section 3.9, Chapter 6 Section 6.1.12* | |
| **Sub-total** | | **60** |

**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.

| **5. Water Conservation** | | |
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| 5.1 | | **10** |
| | **All faucets and fixtures should be low flow to maintain flow rates not exceeding 8 lpm** | |
| Submittal Requirement: | • Provide cut sheets of the fixtures indicating the flow rates at design pressure of 80 psi.<br>• Purchase proof.<br>• Bill of quantities from the plumbing tender indicating the number and flow rates of various fixtures | |
| Intent: | Minimize water use | |
| Comments: | | |
| 5.2 | | **10** |
| | **All WC to be used with dual flush system with a flow rate of 5 l and 10 l per flush** | |
| Submittal Requirement: | • Provide cut sheets of the flush system indicating the flow rates.<br>• Purchase proof.<br>• Bill of quantities from the plumbing tender document indicating | |

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| | the number of fixtures and the flow rates | |
| Intent: | Reduce water consumption | |
| Comments: | | |
| 5.3 | | **20** |
| | **Harvest, store/recharge rainwater from roof as well as site runoff** (Refer to criteria on site imperviousness)<br>a. minimum 50 % rainwater<br>b. 100% rainwater | <br><br>15<br>20 |
| Submittal Requirement: | • Calculations demonstrating the total quantity of rainwater collected from site and roof based on areas and regional rainfall data<br>• Plan indicating the capacity and location of storage and recharge facilities, drainage channels and water bodies where rainwater is directed<br>• Narrative, drawings indicating implementation of Vector control engineering methods as per Public Health Department of MCGM for the water collection/ recharge system adopted in the project. | |
| Intent: | Preserve the available water resource<br>Utilise the available resource effectively and minimise load on storm water drain and sewage treatment plant at city level<br>Scientific methods for collection, recharge of water from public health point of view. | |
| Comments: | As storing and groundwater recharging is site specific, the criteria includes those initiatives taken for harvesting of the rainwater from the site and directing through various means into suitable aquifers in surrounding areas<br>Refer document on Conditions/ Specifications governing permission to water storage tanks, recharge pits by Public Health Department, MCGM | |
| 5.4 | | **25** |
| | **Install a treatment system based on non energy intensive and eco-friendly technology for treatment of total volume of grey water** (Annexure gives the list of eco-friendly and non energy intensive technologies) | |
| Submittal Requirement: | ▪ Details of treatment plant indicating the capacity, components of system, treatment efficiency, and projected quality of treated water.<br>▪ Narrative, drawings indicating implementation of Vector control engineering methods for designing of storage/ collection tanks as per Public Health Department of MCGM. | |
| Intent: | To improve environmental conditions and adopt scientific methods for collection and storage of water from public health point of view. | |
| Comments: | Grey water is termed as wastewater generated from processes such as showers, baths, spas, hand basins, laundry tubs, washing machines, dishwashers and kitchen sinks etc. | |
| | Refer Appendix 'Eco-Friendly and non energy intensive technologies'<br>Refer document on Conditions/ Specifications governing permission to water storage and collection tanks by Public Health Department, MCGM | |
| 5.5 | | **15** |
| | **Install an eco-friendly treatment system for combined stream of grey** | |

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| | **water and black water** (Refer to the list of eco-friendly and non energy intensive technologies provided) | |
| Submittal Requirement: | ▪ Details of treatment plant indicating the capacity, components of system, treatment efficiency, quality of water<br>▪ Narrative, drawings indicating implementation of Vector control engineering methods for designing of storage/ collection tanks as per Public Health Department of MCGM. | |
| Intent: | To improve environmental conditions and adopt scientific methods for designs of collection /storage tanks from public health point of view. | |
| Comments: | Black water is termed as waste water from toilets | |
| | Refer Appendix 'Eco-Friendly and non energy intensive technologies' Refer document on Conditions/ Specifications governing permission to water storage and collection tanks by Public Health Department, MCGM | |
| 5.6 | | **30** |
| | **A) Use dual plumbing lines for separation and collection of total volume of gray water and black water**<br>**B) Install water meters at every down take pipe carrying treated water and rainwater**<br>**C) Treated water to be used for various non-potable applications like gardening, car/ floor washing and create close loop for discharge of reused water into drainage lines.**<br>**Collected rainwater to be used for flushing, gardening, washing and other building applications and recharge excess rainwater into the ground.** | 10<br>10<br>10 |
| Submittal Requirement: | ▪ Provide plumbing drawings indicating the separation of the grey water and black water lines<br>▪ Plumbing drawings and calculations demonstrating reuse of treated water<br>▪ Calculations demonstrating reuse<br>▪ Narrative, drawings indicating implementation of Vector control engineering methods for designing of storage/ collection tanks as per Public Health Department of MCGM. | |
| Intent: | To improve environmental conditions and meet the growing demand for water and efficient use of available water resources | |
| Comments: | Refer document on Conditions/ Specifications governing permission to water storage and collection tanks by Public Health Department, MCGM | |
| 5.7 | | **5** |
| | **Restrict areas covered by lawn and exotic or ornamental plants which require more water and high maintenance to 40 % of total vegetated area** | |
| Submittal Requirement: | • Provide landscape plan showing the type of species and the areas of plantations of each category of vegetations.<br>• Cut sheets 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' | |
| 5.8 | | **10** |
| | **Plant native/indigenous species with low water requirement so as to form at least 60 % of the vegetated area.** | |

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| Submittal Requirement: | • Provide landscape plan showing the type of species and the areas covered by each of them.<br>• Cut sheets of irrigation equipment with the technical specifications. | |
| Intent: | Efficient water use for gardening | |
| | Refer Appendix 'List of Native Plant Species for Landscaping' | |
| 5.9 | | **10** |
| | **Use sprinklers to water lawns and drip irrigation for trees** | |
| Submittal Requirement: | ▪ Specification sheets of the irrigation equipments indicating the flow rates<br>▪ Provide irrigation layout for the landscaped areas. | |
| Intent: | Reduce water consumption for outdoor use | |
| Comments: | | |
| **Sub-total** | | **135** |
| **6. Solid Waste Management** | | |
| 6.1 | | **15** |
| | **Segregate the waste and provide separate bins for every block / building for collection and separation of 100 % of biodegradable, non-biodegradable and recyclable wastes and shall be stored such that they are not directly visible from the adjoining road.**<br>**A centralized closed collection facility at colony level for dry waste, E-waste, batteries, drugs, clinical and hazardous wastes shall be provided.**<br>**A dry waste management plan with corresponding facilities should be prepared.** | |
| Submittal Requirement: | ▪ Plan showing the capacity and location of bins<br>▪ Narrative (100 words) on dry waste recycling plan<br>▪ Narrative, drawings indicating implementation of Vector control engineering methods for designing of storage/ collection bins as per Public Health Department of MCGM. | |
| Intent: | To efficiently manage the wastes and recover resources<br>Segregation of waste at source/ Reduce the quantity of waste to be collected by MCGM<br>To adopt scientific methods for designs of collection /storage bins from public health point of view. | |
| Comments: | Bins used for separation of wastes and their storage should be as per MCGM specifications and from authorized agencies prescribed by MCGM<br>Refer document on Conditions/ Specifications governing permission to storage and collection bins by Public Health Department, MCGM. | |
| 6.2 | | **10** |
| | **Contract with local dealers for collection and transportation of recyclable materials** | |
| Submittal Req: | Contact details and agreement | |
| Intent: | To efficiently manage the wastes and recover resources | |
| Comments: | | |
| 6.3 | | **30** |
| | **Set up decentralized (onsite) treatment plant based on non-energy intensive and eco-friendly technology (Anaerobic digestion/ in-vessel composting or vermi-composting) for the treatment of 100% of organic** | |

| | | |
|---|---|---|
| | **wastes.** | |
| Submittal Req: | ▪ Details of plant giving the capacity and quantity of waste treated | |
| Intent: | To promote ' Zero Wet Waste' concept<br>To efficiently manage the wastes and recover resources | |
| Comments: | *Refer Appendix 'MSW Management and Handling Rules of MoEF'* | |
| 6.4 | | **25** |
| | **Recover energy and manure (as byproduct) from anaerobic treatment plant and application within the site**<br>1) Minimum 50 % utilization of waste<br>2) 100% utilization of waste | <br><br>15<br>25 |
| Submittal Req: | Calculations for Energy generation level per unit amount of waste processed and consumption rate | |
| Intent: | To promote ' Zero Wet Waste' concept and Recover resources | |
| | *Refer Appendix 'MSW Management and Handling Rules of MoEF'* | |
| 6.5 | | **10** |
| | **Recover manure from biodegradable waste for 100% utilisation (within the site/sale)** | |
| Submittal Requirement: | Calculations for total quantity of manure produced per unit amount of waste processed | |
| Intent: | Recover resources | |
| Comments: | | |
| **Sub-total** | | **90** |
| **7. Other Measures** | | |
| 7.1 | | **10** |
| | **Designs of all water storage tanks, recharge pits, drainage channels, inspection chambers and cover assembly within the premises, suction tanks, swimming pools, water fountains, constructed water bodies, water treatment facilities, sump rooms along with vermi composting pits, garbage collection bins should be mosquito and rodent proof and should follow the vector control engineering measures as specified by Public Health Department of MCGM.** | |
| Submittal Requirement: | • Narrative, drawings indicating implementation of Vector control engineering methods for designing of storage/ collection and treatment facilities as mentioned above according to Public Health Department of MCGM. | |
| Intent: | To adopt scientific methods for designs of collection /storage and treatment facilities from public health point of view. | |
| Comments: | Refer document on Conditions/ Specifications governing permission to water storage/collection and treatment facilities by Public Health Department, MCGM. | |
| 7.2 | | **5** |
| | **In case, swimming pool facility is provided, arrangements should be made for water recycling and use of renewable sources for heating, if heated** | |
| Submittal Requirement: | • Water quality report.<br>• Calculations demonstrating use of recycled treated water.<br>• Treatment plant drawings and details.<br>• Details of solar water heating system | |
| Intent: | To reduce energy and water consumption | |
| Comments: | | |

| | | |
|---|---|---|
| 7.3 | | **10** |
| | **Other innovative eco friendly measures not listed** | |
| Submittal Req: | Narrative (not more than 250 words) for each measure. Each measure shall carry 2 points. | |
| Intent: | To encourage innovative eco-friendly measures | |
| Comments: | | |
| 7.4 | | **10** |
| | **Maintenance manual and public awareness programs for individuals in Eco-housing societies** | |
| Submittal Req: | Documentation that shall be provided to the residents and management of society on the use and maintenance guidelines for the systems installed, special instructions to ensure that the eco-intent is met with. | |
| Intent: | | |
| Comments: | | |
| Sub-total | | **35** |
| | **Total Weight age of all focus areas** | 600 |