Eco Housing
Building a Better Tomorrow

Eco-housing Assessment Criteria
New Construction

Eco-Housing Program implemented in partnership by

USAID | INDIA
FROM THE AMERICAN PEOPLE

IIEC

University of Pune
SCITECH PARK

1. Site Planning		
1.1	**MANDATORY**	**10**
	Do not select public open spaces such as play grounds, gardens, parkland, forestland, mangroves belt, virgin hills and hill slopes and land within 50m or 150' of wetland as site for housing. Site selection should also adhere to Development control Rules and Regulations and CRZ Rules.	
Submittal Requirement:	Site plan showing site and its surrounding areas up to 2 Km radius	
Intent:	To protect parkland, forest, coastal belt from disturbance due to construction; to protect biodiversity	
Comments:	*Refer Appendix 'Biodiversity Conservation for Eco-Housing'.*	
1.2	NOT MANDATORY	**5**
	Locate eco housing site so that basic amenities namely i) Bank/ATM, ii) childcare, iii) park, iv) library are within ½ km of housing and in case of large sites, locate basic amenities namely i) Convenience shopping ii) healthcare facility (with provisions for first aid, doctor with scheduled timings), iii) community hall within site premises.	
Submittal Requirement:	Site plan showing site and the facilities within 1/2 Km radius Site plan with location of these facilities on site	
Intent:	• To discourage use of vehicles for common chores • Ensure emergency healthcare facilities • Convenience	
Comments:	½ point for each facility mentioned is being located within ½ km of the site and 1 point for each of the amenities provided in case of large projects Large sites are the sites that are larger than or equal to 1.0 hectare	
1.3	**MANDATORY**	**15**
	Implement the measures prescribed in the Appendix – Biodiversity Conservation for Eco-housing for 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 c) Designing the landscaped areas to promote and create habitats conducive to native fauna in the form of 'urban niches' **(As identified in Appendix – Biodiversity Conservation for Eco-housing)**	
Submittal Requirement :	• Inventory Report on existing Flora & Fauna of Mumbai • Narrative and supporting drawings on measures implemented • Landscape Drawings showing the measures implemented.	
Intent:	Biodiversity Conservation and Preservation'	
Comments:	*Refer Appendix 'Biodiversity Conservation for Eco-housing'* *Refer Appendix 'Native Fauna of Mumbai'*	
1.4	NOT MANDATORY	**5**
	Remove topsoil for landscaping, and preserve for re-use on site 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 top-soil 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. • Certificate by the landscape architect on topsoil laying, soil stabilization and adequate primary soil nutrient and PH.	
Intent:	To preserve and reuse nutrient rich topsoil for landscaping	
1.5	**MANDATORY**	**10**
	Prevent soil erosion for large sites by providing sedimentation basin, contour trenching, mulching, as required. Provide plans to show erosion control measures taken.	
Submittal Requirement:	CAD drawing showing site plan details of • Existing buildings • Existing slopes • Site drainage pattern • Erosion and sedimentation control measures	
Intent:	Prevent soil erosion by proper storm water management	
Comments:	Large sites are the sites that are larger than or equal to 1.0 hectare	
1.6	**MANDATORY**	**20**
	Conserve existing vegetation on site; conserve land that is rich in bio diversity; mark all existing vegetation in tree survey plan; follow detailed guidelines of tree conservation as per draft National building code; Part 10: Landscaping, signs, and outdoor display structures **In case conservation of existing trees are not possible,** **a) Do compensatory depository forestation of indigenous species in ratio of 1:2 within site premises for all mature trees removed.** **b) Do compensatory depository forestation of indigenous species in ratio of 1:5 within site premises for all mature trees removed.**	**15** **20**
Submittal Requirement:	• 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). • 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. • 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 1:2/ 1:5 in the proposed landscape design. • List details about species, which existed, and the species that have been replanted on site. • Measures to be validated/cross checked during plinth checking and completion checking.	
Intent:	To protect vegetation; carbon sequestration; reduce soil erosion To compensate for the removed vegetation	
Comments:		
1.7	**MANDATORY**	**25**
	Existing drainage pattern should be surveyed and documented. The proposed drainage pattern of the site should respond to the existing drainage pattern. The proposed development level to be compatible with existing ground level in the locality. Necessary approval from MCGM to show compliance with master drainage plan shall be obtained.	
Submittal Requirement:	• 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 MCGM approval on proposed drainage system has to be taken.	
Intent:	To minimize erosion; design with minimum disruption of site; drainage following existing slopes/contours would minimize addition pumping costs, to avoid local flooding problems	
Comments:		
1.8	NOT MANDATORY	**10**
	During construction, 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 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	
Comments:		
1.9	NOT MANDATORY	**5**
	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 Appendix on 'Handling and Disposal of Hazardous Material at Construction Site' to be followed as applicable	
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	
Comments:	*Refer Appendix 'Handling and Disposal of Hazardous Material at Construction Site'*	
1.10	NOT MANDATORY	**5**
	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)	
Submittal Requirement:	Drawings with cut sections showing adoption of aggregate utility corridor	
Intent:	To facilitate easy maintenance and minimize site disruption	
Comments:	Large sites are the sites that are larger than or equal to 1.0 hectare	
1.11	NOT MANDATORY	**5**
	Site should be properly planned to mitigate the 'heat island effect' (thermal gradient difference between developed and undeveloped areas) by the following – - Provide shade (with the help of trees, pergolas) 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 paving, interlocking concrete or grass-crete blocks (Solar Reflectance index >0.5) for pavements, walkways etc. - Exception: Mandatory side space as per fire regulation and MCGM bylaws shall be exempt for the calculation of impervious areas. - For high-rise buildings create compensatory open spaces at various levels	
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, please 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	
Comments:	Criteria for covered parking should follow existing DCRs	
1.12	**MANDATORY**	**25**
	Restrict net surface run-off of site to 0.4 – 0.7* 0.7 - 0.6 0.6 – 0.5 0.5 - 0.4	 15 20 25

Submittal	Run off calculations in specified format (given below)	
	Calculations for restricting the run-off coefficient (c) on site - Gross site area: **A** sq. m. Ground coverage: **p%** Built-up area on site (A_b): **p / 100 X A** (sq m) Open area on site (A_o): (**A - A_b**) (sq m) Open Area on site planned for perviousness (**Ap)**: ∑**A_1 X c_1** + A2 **X c_2** +. 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. Average Run-off coefficient = **Ap/ A_o**	
Intent:	To facilitate ground water recharge, restrict run off to mitigate local flood problems.	
Comments:		
Sub-total		**140**

2. Environmental Architecture

2.1	NOT MANDATORY	**5**
	Set up an integrated design team with following members: Architect, Structural, Electrical, Mechanical, Plumbing/Water/Waste, Landscape architect, and Energy/Environmental consultant.	

	Thermal Comfort **To Minimize solar gain** ▪ Orient longer axis of the building parallel to E-W direction to minimize solar gain. ▪ Window shading devices to be determined through solar path analysis to provide 100% shading between 9 am to 3 pm in months April to September for at least 90% of windows on south, east and west facades and 50% of windows on North for summer. ▪ Use spaces that can tolerate greater temperature variation as double walls, buffer areas such as staircases, lifts, store, etc. on at least 50% of the south and west wall. ▪ 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.	
2.2.2	**MANDATORY**	**10**
	Air Movement and Ventilation **To facilitate natural cross ventilation in and around buildings** ▪ Provide building shapes for free flow of wind between buildings and floors. ▪ Provide courtyards, verandas, wing walls and wind catchers to enhance air movement within the building. ▪ Position of windows of habitable areas within 0 – 40 degrees of prevalent wind direction; prevalent wind direction to be determined through appropriate wind rose diagram. ▪ Windows should be staggered rater than aligned with perforations for ventilation at lower level and openings at higher level for stack effect and to improve cross ventilation throughout the room. Also, to improve indoor air speed the size of inlets should be smaller than outlets ▪ Separate ventilation shafts behaving as Wind Towers can be provided in the common areas of the building circulating the air internally.	
2.2.3	NOT MANDATORY	**10**
	Day lighting **To ensure glare free day lighting** ▪ Provide glazing that allows natural light from North side with shading devices for controlled daylight while reducing the overall solar heat gain coefficient or heat intake specially from South, West and East side. ▪ Provide adequate natural light through direct or indirect solar radiation with minimum 150 LUX for up to one-third of the livable area. This can be achieved by proper orientation to south and west, or by providing light or reflective wall finishes/ colors. ▪ Total area of openings (inlet and outlet) should be a minimum of 30% of the floor area for adequate lighting and cross ventilation. ▪ 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. ▪ Light shelves can be used as shading devices to cut off the solar radiation, reflect sunlight and daylight towards the ceiling.	
2.2.4	**MANDATORY**	**8**
	Protection from Rains **To protect buildings from leakages** ▪ Provide adequate rain protection on south and west facades. ▪ Provide methodically and scientifically worked out slopes on terrace with adequate number of rainwater down take pipes as per IS code 1172 ▪ Architectural features on vertical surfaces, façade elements of buildings	

	to be designed in such a way that no water is accumulated on them and can be accessed for maintenance purpose.	
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:		
2.3	NOT MANDATORY	**5**
	Roof should be protected against excessive heat gain by: **appropriate insulation to give U-value as specified by Draft 'Energy Conservation Building Code' 2006.** ▪ Alternatively, provide roof garden for 100% of exposed roof area ▪ Provide double skin materials for roof with a gap in between to provide convectional air currents or ▪ Provide china mosaic floor finish which offers good reflectance and high emittance	
Submittal Req:	▪ Narrative indicating the methods adopted for protecting the roofs from excessive heat gains. ▪ 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	
2.4	NOT MANDATORY	**10**
	Design for following daylight factors: - Kitchen: 4.0 - Living room: 1 - Study room: 1.9 - Circulation: 0.313 - 1 Daylight Factor = 80 lux - Demonstrate compliance by using an appropriate simulation tool	
Submittal Requirement:	• Daylight based design as per specified values. • Simulated daylight levels under overcast sky conditions for a typical summer day	
Intent:	Adequate daylight	
Comments:		
2.5	NOT MANDATORY	**20**
	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 airflow, daylight, temperature and humidity profiles.	
Submittal Requirement:	• Use of dynamic simulation engine and hourly weather data of Mumbai to predict temperature. • Humidity and airflow pattern inside typical representative spaces. • Show output for typical summer, monsoon days to show compliance	
Intent:	To ensure thermal comfort in regularly occupied spaces	
Comments:		
Sub-total		**80**

3. Energy Conservation and Management

	SITE LIGHTING	
3.1	**MANDATORY**	**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 Requirement:	Signed template from concerned person that this clause has been 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	**MANDATORY**	**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. • Luminous efficacy (lm/W) = [{Lamp lumen output (lm)}/ {Lamp wattage (W) + ballast power loss (W)}]. • Format given in Table 3.1 on page 11 • Outdoor lighting layout with manufacturers' details of lamps, ballasts, luminaires and automatic controls. • 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	NOT MANDATORY	**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	**MANDATORY**	**20**
	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	20

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	**MANDATORY**	**10**
	Use fluorescent/compact fluorescent lamps operating on low loss ballast, LEDs for general lighting of common/circulation areas namely passage, staircase, lifts, corridors, lobbies, common areas. **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 11. • Common area lighting layout with manufacturers' details of lamps, ballasts, luminaries and automatic controls. • Wiring diagram and placement of automatic switch(s) for outdoor lighting. • 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	NOT MANDATORY	**15**
	Provide Fixed/pre-wired luminaries to have its sockets that will only accept CFLs/ LEDs **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.** a) pre-wired CFLs **b)** pre-wired LEDs	 10 15
Submittal Requirement:	Luminaire details showing usage of ballasted luminaires	
Intent:	To prevent later retrofit with GLS lamps	
Comments:		
	INDOOR LIGHTING	
3.7	NOT MANDATORY	**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; • 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)	
Comments:		
3.8	NOT MANDATORY	**10**
	Lamp efficacy of CFL - 50 lm/W; Fluorescent (TL) 80 lm/W; & Use Electronic Ballasts Ballast loss for CFL not grater than 3W; for Fluorescent (TL) not grater than 4.5W	
Submittal Requirement:	• 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 page 11 (Table 3.1) • 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	
3.9	**MANDATORY**	**10**
	Demonstrate efficient use of luminaries, lamps, ballasts and energy efficient electronic appliances in sample flat of the project	
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) and promote energy efficiency	
Comments:		
3.10	NOT MANDATORY	**15**
	Pre-wired CFL/ LED fixtures could be provided in all dwellings.	
	@1 fixture per room	5
	@2 fixture per room	10
	@3 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	
Comments:		
	ELECTRICAL SYSTEMS	
3.11	NOT MANDATORY	**10**
	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:		
3.12	NOT MANDATORY	**5**
	Provide electrical charging points for charging of electric vehicles	
Submittal Requirement:	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	
3.13	NOT MANDATORY	**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
Submittal Requirement:	• 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 nos. planned. • Demonstrate compliance with above clause to seek partial or full points • Provide details of the back-up lighting system	
Intent:	To promote use of clean/green sources of energy	
Comments:		
3.14	NOT MANDATORY	**20**
	Out of the total electric consumption (both indoor and outdoor), a) minimum 3% needs to be managed by using renewable sources of energy b) minimum 5% needs to be managed by using renewable sources of energy c) minimum 10% needs to be managed by using renewable sources of energy d) minimum 15% needs to be managed by using renewable sources of energy	5 10 15 20
Submittal Requirement:	Narrative (maximum 500 words with supporting drawings and sketches) should include strategies for utilization of renewable energy	
Intent:	To promote use of clean/green sources of energy	
Comments:		
3.15	**MANDATORY**	**10**
	Power factor should be more than 0.9	
Submittal Requirement:	Certificate from Electric supply authority showing compliance with the criteria	
Intent:	To promote Energy efficiency	
Comments:		
	Water Heating Systems	
3.16	NOT MANDATORY	**25**
	Provide water heating systems using recovered waste heat, heat pumps, Piped Natural Gas (PNG), solar water heaters and other renewable	

	Total hot water requirement for a building can be considered to be 25 liters per person per day. (For all households)	
Submittal Requirement:	• Installation plan for water heating system using above techniques • Sizing calculation for a typical household. • System specifications and purchase proofs	
Intent:	To reduce conventional energy demand for water heating	
Comments:		
3.17	NOT MANDATORY	**10**
	Provide water heaters with non electric booster or electric boosters with heating COP > 3	
Submittal Requirement:	System specification and certificate from manufacturer to show compliance	
Intent:	To reduce use of conventional electric energy for back up heating by 66% electricity saving options	
Comments:		
Notes:	COP is Coefficient of Performance	
3.18	NOT MANDATORY	**5**
	Provide plumbing for hot water to houses with HDPE/ MDPE insulation.	
Submittal Requirement:	Plumbing drawings to show compliance	
Intent:	To make provision for future integration of solar water heating system	
Comments:		
Sub-total		**240**

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:

4.1	**MANDATORY**	**5**
	Base Materials for R.C.C. and Steel Systems	
	Mandatory use of minimum 20% percentage of Pozzolana Material Blended Portland cement (BPC) as per the table given for desired strength of concrete Refer values given in Table 4.1 on page 19	5
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 6.1.1-1	
4.2	NOT MANDATORY	**6**
	Base Materials for R.C.C. and Steel Systems	
	Use Recycled steel forms and bars for reinforcement **Upto75%** **>75%**	 4 6
Submittal Requirement:	• 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	
Notes	Steel reinforcement bars as per IS432, 1785,1786 and high tensile structural steel as per IS961	
	Refer Appendix Eco-friendly Building Materials; *Chapter 3 Section 3.1-2; Chapter 6 Section 6.1.1-2*	
4.3	NOT MANDATORY	**10**
	Use the following base materials for PCC, paving, bedding applications **a. Increase of Pozzolana Material 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 mortar** **25 - 49%,** **50 – 74%** **75% and above** Refer values given in Table 4.1 on page 19	 5 2 3 5
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 3.1-1,3,4 and Chapter 6 Section 6.1.1-3a, 3b	
4.4	NOT MANDATORY	**16**
	Alternative Structural System	
	Design and construct the Structural System using following alternative technologies: **a. Ferro cement and / or Precast components[1] for columns, beams, slabs, staircases, lofts, balconies, roofs etc.** **25-49%** **50-74%** **75 and above** **b. Ready Mix Concrete** **50-74%** **75 and above**	 2 4 6 8 10
Submittal	a. Ferro cement / Pre-cast components need to be measured based	

Requirement:	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.	
Intent:	To use lesser quantities of material and to reduce site wastages, thus reducing the amount of resource extraction.	
Notes	Some options for Precast components in roofing systems are R.C.C. 'L' panels instead of tiles and sheets for pitched roofs, Precast R.C.C. slab units / waffle units instead of cast in place for flat roofs 1. In case of Ferrocement and Precast cement concrete, 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 & 5.2	
	Refer Appendix Eco-friendly Building Materials Chapter 3 Section 3.1-5,6,7; Chapter 6 Section 4a, 4b	
4.5	NOT MANDATORY	**12**
	Masonry	
	Use bricks/blocks made from the following materials individually or in combination **Fly ash + sand + lime bricks / blocks (IS4139), Pulverized debris + cement bricks / blocks, Industrial waste based bricks / blocks, Aerated lightweight BPC concrete blocks (IS2185), Phospho-Gypsum based blocks (IS12679) and Lato blocks (laterite + cement; IS12440).** **25 – 49%** **50 - 75%** **>75 %**	 4 8 12
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 6.1.2	
4.6	**MANDATORY**	**5**
	Mortar	
	Mandatory use of minimum 23% Pozzolana Material Blended Portland Cement	5
Submittal Req.:	Same as 4.1; Refer values given in Table 4.1 on page 19	
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 6.1.3	
4.7	NOT MANDATORY	**10**
	Mortar	
	a. Sand from pulverized debris and / or sintered flyash[1] **25- 49%** **50 – 74%** **75% and above** **b. Increase of Pozzolana Material[1] content in BPC to 30- 40% by direct addition of raw Pozzolana Material** Refer values given in Table 4.1 on page 19	 2 3 5 5
Submittal Requirement:	a. Same as 4.3 b. Same as 4.1	
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, Chapter 6 Section 6.1.3	
4.8	NOT MANDATORY	**10**
	Plastering	
	Use any of the following alternative plasters individually or in combination **a. Calcium Silicate Plaster** **b. Cement Plaster [1](sand for plaster as per IS1542)** **C. Phosphogypsum Plaster (IS: 8272, 1984)** **25 – 49%** **50% and above**	 5 10
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 3.4; Chapter 6 Section 6.1.4	
4.9	NOT MANDATORY	**10**
	Roofing and ceiling	
	a. Mandatory use of minimum 20% Pozzolana Material Blended Portland Cement in case of Reinforced Concrete Roofing. **Alternately use the following materials for roofing** **b. Fiber Reinforced Polymer (FRP) instead of PVC, Foam PVC, Poly**	3

	Carbonates, Acrylics etc. **up to 50 %** **50% and above** **c. Micro Concrete Roofing Tiles/ Bamboo Matt Corrugated Roofing Sheets** **up to 50%** **51 – 74%** **75 – and above**	2 3 2 3 4
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 representations 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 6.1.5 Refer values given in Table 4.1 on page 19	
4.10	NOT MANDATORY	**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) **50-75%** **>75%** **b. Terrazzo floor for terraces and semi covered areas (IS2114)** **50-75%** **> 75%** **c. Use Ceramic tiles (non-vitrified) (IS13712)/ Mosaic Tiles/ Terrazzo Flooring (IS2114)/ Cement Tiles[1] (IS1237, 3801)/ Phospho-Gypsum Tiles (IS12679)/ Bamboo Board Flooring, individually or in combination for interior spaces.** **50-75%** **> 75%**	 3 5 2 4 4 6
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	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.	
	Refer Appendix – Eco-friendly Building Materials Chapter 3 Section 3.5; Chapter 6 Section 6.1.6	
4.11	NOT MANDATORY	**5**
	Door and Window openings	

	a. Ferro cement and Precast R.C.C. lintel (IS9893), chajja and jails instead of RCC **50-75%** **>75** **b. Masonry bond combinations for jali work (achievable in rat trap bond)** **50-75%** **>75%**	 2 3 1 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 3.6; Chapter 6 Section 6.1.5	
4.12	NOT MANDATORY	**10**
	Timber and Aluminum / Steel frames to be replaced by **a. Ferrocement and Precast R.C.C. Frames (as per IS6523)/ Frameless Doors (IS15345) and/or Bamboo Reinforced Concrete Frames[1]** **50-75%** **>75%** **b. Hollow recycled steel channels (IS1038, 7452) and Recycled Aluminum Channels (IS1948) and Components** **25-75%** **>75%**	 4 6 2 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	1. 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 *4.1 & 4.2*	
	Refer Appendix – Eco-friendly Building Materials Chapter 3; Chapter 6	
4.13	NOT MANDATORY	**3**
	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	
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 3Section 3.6;	

	Chapter 6.1.7	
4.14	NOT MANDATORY	**12**
	Shutters and Panels	
	Shutters and Panels – instead of timber, plywood, glass, aluminum use the following alternatives **a. Use of MDF Board (IS12406)** **25-50%** **>50%** **b. Use any of the following individually or in combination - Red Mud based Composite door shutters, Laminated Hollow Composite Shutters, Fiber 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, Rubber wood boards (IS 13622) and Aluminum Foil + Paper + Plastic Composite Board** **50-75%** **>75%** **c. Use PVC/ FRP Doors (IS14856)/ or recycled aluminum components in wet areas.** **50-75%** **>75%**	 2 3 4 6 2 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.	
	Refer Appendix – Eco-friendly Building Materials Chapter 3 Section 3.6; Chapter 6 Section 6.1.7	
4.15	NOT MANDATORY	**10**
	Electrical	
	a. Use unplasticised PVC or HDPE products instead of Aluminum, brass, PVC, G.I., S.S. **>75%** **b. Where applicable use products with recycled aluminum and brass components** **>75%** **c. Use of Fire Retardant Low Smoke cables in all the electrical circuits**	5 2 3
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.	
	Refer Appendix – Eco-friendly Building Materials Chapter 3; Chapter 6 Section 6.1.8	
4.16	**MANDATORY**	**5**
	Water supply, Sanitary and Plumbing System	

	Use R.C.C., unplasticised PVC (IS15328), G.I., C.I. pipes, Epoxy based Drip Seal 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	
4.17	NOT MANDATORY	**10**
	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 (as per IS12592)** **50-75%** **>75%**	 2 4 2 3 2 3
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 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 3 Section 3.7; Chapter 6 Section 6.1.9	
4.18	NOT MANDATORY	**5**
	Wood Work	
	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. **b. If Plywood is used, it should be phenol bonded and not urea bonded.**	3 2
Submittal Requirement:	a. Same as 4.13 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 6.10	
4. 19	NOT MANDATORY	**12**
	Wood Work	
	Wood Work – Instead of Plywood and Natural Timber use the following alternatives **a. Use of MDF Board (IS12406)** **25- 50%** **>50%** **b. Use any of the following individually or in combination - Bamboo Ply/Mat Board (IS 13958), Fiber 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, Rubber wood boards (IS: 13622)** **50-75%** **>75%** **c. Use of Mica Laminates and Veneer on Composite boards instead of natural timber.** **50-75%** **>75%**	 1 2 4 6 2 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, to prevent excessive logging of natural timber.	
	Refer Appendix – Eco-friendly Building Materials Chapter 3 Section3.8, Chapter 6 Section 6.1.10	
4.20	**MANDATORY**	**5**
	Water proofing chemicals, additives, sealants and adhesives	
	Use of water based chemicals instead of solvent based for 100% of use	5
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	
4.21	NOT MANDATORY	**4**
	Water proofing chemicals, additives, sealants and adhesives	
	Use Epoxy resins instead of tar felt / pitch **50-75%** **>75%**	 2 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.	
	Refer Appendix – Eco-friendly Building Materials Chapter 6 Section 6.1.11	
4.22	NOT MANDATORY	**10**
	Painting, Polishing, Priming and similar surface finishing	
	a. Use of Cement Paint (IS5410)/ Epoxy Resin Paint for external surfaces **50-75%** **>75%** **b. Use of Water based paints, enamels, primers and polishes.** **50-75%** **>75%**	 3 4 4 6
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		190

Table 4.1:

Sr. No.	Strength of Concrete	Application	Optimum % of Fly ash replacement
1	M20 – M40	Structural concrete	Minimum 20% to 25%
2	M15 – M25	Mortar for plaster	Minimum 30% to 40%
3	M15 – M25	Mortar for masonry	Minimum 30% to 40%
4	M15 – M25	PCC, bedding concrete	Minimum 30% to 50%

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		
5.1	NOT MANDATORY	**10**
	Maintain uniform pressure restricted to 25-30 m/head by use of separate distribution down takes for each set of floors and use of orifice flanges or pressure reducing valves	
Submittal Requirement:	• Provide drawings indicating the separate down take, cut sheets of the flanges and valves.	

	• Purchase proof and bill of quantities	
Intent:	Reduce water consumption	
Comments:		
5.2	NOT MANDATORY	**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. • Purchase proof. • Bill of quantities from the plumbing tender indicating the number and flow rates of various fixtures	
Intent:	Minimize water use	
Comments:		
5.3	**MANDATORY**	**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. • Purchase proof. • Bill of quantities from the plumbing tender document indicating the number of fixtures and the flow rates	
Intent:	Reduce water consumption	
Comments:		
5.4	**MANDATORY**	**20**
	Harvest, store/recharge rainwater from roof as well as site runoff (Refer to criteria on site imperviousness) a. Minimum 50% rainwater b. Minimum 75% rainwater c. 100% rainwater	 10 15 20
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 • 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 Utilise the available resource effectively and minimise load on storm water drain and sewage treatment plant at city level Scientific methods for collection and 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 Refer document on Conditions/ Specifications governing permission to water storage tanks, recharge pits by Public Health Department, MCGM	
5.5	**MANDATORY**	**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. ▪ 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' Refer document on Conditions/ Specifications governing permission to water storage and collection tanks by Public Health Department, MCGM	
5.6	NOT MANDATORY	**15**
	Install an eco-friendly treatment system for combined stream of grey 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 ▪ 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	
5.7	**MANDATORY**	**30**
	A) Use dual plumbing lines for separation and collection of total volume of gray water and black water **Provide separate storage tanks (physically separate) for total volume of grey/ black water and treated water.** **B) Install water meters at every down take pipe carrying treated water and rainwater** **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.** **Collected rainwater to be used for flushing, gardening, washing and other Building applications and recharge excess rainwater into the ground.**	10 10 10
Submittal Requirement:	▪ Provide plumbing drawings indicating the separation of the grey water and black water lines	

	▪ Plumbing drawings and calculations demonstrating reuse of treated water ▪ Calculations demonstrating reuse ▪ 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	
5.8	NOT MANDATORY	**5**
	Minimize water use during construction by 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 construction	
Intent:	To reduce the potable water demand	
Comments:		
5.9	NOT MANDATORY	**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. • 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'	
5.10	NOT MANDATORY	**10**
	Plant native/indigenous species with low water requirement so as to form at least 60 % of the vegetated area.	
Submittal Requirement:	• Provide landscape plan showing the type of species and the areas covered by each of them. • Cut sheets of irrigation equipment with the technical specifications.	
Intent:	Efficient water use for gardening	
	Refer Appendix 'List of Native Plant Species for Landscaping'	
5.11	**MANDATORY**	**10**
	Use sprinklers to water lawns and drip irrigation for trees	
Submittal Requirement:	▪ Specification sheets of the irrigation equipments indicating the flow rates ▪ Provide irrigation layout for the landscaped areas.	
Intent:	Reduce water consumption for outdoor use	
Comments:		
Sub-total		150
6. Solid Waste Management		
6.1	**MANDATORY**	**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. **A centralized closed collection facility at colony level for dry waste, E-waste, batteries, drugs, clinical and hazardous wastes shall be provided.** **A dry waste management plan with corresponding facilities should be prepared.**	
Submittal Requirement:	▪ Plan showing the capacity and location of bins ▪ Narrative (100 words) on dry waste recycling plan ▪ 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 Segregation of waste at source/ Reduce the quantity of waste to be collected by MCGM 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 Refer document on Conditions/ Specifications governing permission to storage and collection bins by Public Health Department, MCGM.	
6.2	NOT MANDATORY	**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	**MANDATORY**	**30**
	Set up decentralized (onsite) treatment plant based on non-energy intensive and eco-friendly technology (Anaerobic digestion/ in-vessel composting or vermin-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 To efficiently manage the wastes and recover resources	
Comments:	*Refer Appendix 'MSW Management and Handling Rules of MoEF'*	
6.4	NOT MANDATORY	**35**
	Recover energy and manure (as byproduct) from anaerobic treatment plant and application within the site 1) Minimum 50 % utilization of waste 2) 100% utilization of waste	 25 35
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	**MANDATORY**	**15**
	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:		
6.6	**MANDATORY**	**15**
	In case of redevelopment projects, prepare a debris recycling and reuse plan indicating minimum 70% of debris being recycled and its onsite application during construction.	
Submittal Req:	Narrative (200 words) on debris recycling plan	
Intent:	To efficiently manage the wastes and recover resources for reuse on the site.	
Comments:		
Sub-total		120
	7. Other Measures	
7.1	**MANDATORY**	**10**
	Adopt construction safety measures as per draft National Building code Part 7: Constructional practices & safety and implement best practices for noise mitigation measures.	
Submittal Requirement:	▪ Clause in contract document • Narrative of precautions taken to ensure construction safety measures and noise mitigation measures.	
Intent:	To ensure construction safety measures and noise mitigation measures at construction sites.	
Comments:		
7.2	NOT MANDATORY	**10**
	Adopt measures to control levels of suspended particulate matter and respiratory particulate matter during construction	
Submittal Requirement:	Test results as per CPCB rules to show that SPM/ RPM levels are not increased due to construction activities	
Intent:	To reduce air pollution loads	
7.3	**MANDATORY**	**10**
	All buildings shall comply to IS codes for Earthquake resistance. (IS 1893/ IS4326/ IS13920)	
Submittal Requirement:	▪ Structural design basis report including structural design drawings, software simulated analysis drawings for earthquake vulnerability. ▪ Undertaking from an authorized structural engineer for the safety of construction. ▪ Hazard impact and mitigation statement/ report and management plan	
Intent:	To verify essential component of safe construction practices and assess the compliance of BIS	
Comments:		
7.4	**MANDATORY**	**5**
	Provide minimum level of sanitation on site as per DC Rules during construction.	
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	
Comments:		
7.5	**MANDATORY**	**10**
	Provide facilities for handicap access as per DC rules	
Submittal Requirement:	It is already a mandatory criteria s per DC rule	
Intent:	To provide unobstructed movement for handicapped persons	
Comments:		
7.6	**MANDATORY**	**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.	
7.7	NOT MANDATORY	**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. • Calculations demonstrating use of recycled treated water. • Treatment plant drawings and details. • Details of solar water heating system	
Intent:	To reduce energy and water consumption	
Comments:		
7.8	NOT MANDATORY	**10**
	Other innovative eco friendly measures not listed	
Submittal Requirement:	Narrative (not more than 250 words) for each measure. Each measure shall carry 2 points.	
Intent:	To encourage innovative eco-friendly measures	
Comments:		
7.9	NOT MANDATORY	**10**
	Maintenance manual and public awareness programs for individuals in eco-housing societies	
Submittal Requirement:	Documentation that shall be provided to the residents and management of society on use and maintenance guidelines for the systems installed, special instructions to ensure that the eco-intent is met with.	
Intent:		
Sub-total		80
	Total Weight age of all focus areas	1000