

ANNEXURE -2

PARTICULAR SPECIFICATION: IGBC

NORMS

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IGBC NORMS - DELETED**1 SCOPE OF WORK**

Metro Stations are quite different from typical buildings so considering this factor and upcoming demand, Indian Green Building Council (IGBC) has launched a dedicated rating system for Metro Stations which is known as Mass Rapid Transit System (MRTS) rating. This rating system is based on key requirements inside and outside of any Metro Station that are required to make world class and sustainable Metro Stations. The services will include complete facilitation for achieving green rating for Metro stations via following:

- a) Sustainable sites
- b) Water Efficiency
- c) Energy Efficiency
- d) Material Conservation
- e) Indoor Environment and Comfort

1.1 Scope of Work and Methodology

The Consultant is required to provide services for IGBC Mass Rapid Transit System (MRTS) rating for 5 Stations which are a part of this contract. The scope of work for the mentioned services has been prepared as per IGBC Mass Rapid Transit System (MRTS) rating guidelines. The Consultant has to provide following services for the project as per the IGBC Mass Rapid Transit system (MRTS) rating:

IGBC MRTS facilitation for 5 categories which includes:

- a) Site Selection & Planning
- b) Water Conservation,
- c) Energy Conservation,
- d) Material Conservation,
- e) Indoor Environment & Comfort
- f) Energy Analysis and Day lighting simulation
- g) Commissioning of Equipment
- h) Energy Monitoring

The scope of work in respect of the above items is discussed in detail in the following sections.

1.2 IGBC MRTS Certification Facilitation

The Green Building consultant will work with the design team, owners and other consultants to coordinate and facilitate IGBC Mass Rapid Transit System for Bangalore Sub-urban Rail Project. This will include:

- 1. Bangalore Sub-urban Rail Project registration
- 2. Coordinate and facilitate IGBC MRTS submittal

3. Communication with IGBC for queries related to the project
4. Coordinate final IGBC MRTS submittal
5. Respond to IGBC queries

The detailed scope for work under IGBC MRTS facilitation is as follows:

1.2.1 Prepare a Preliminary IGBC MRTS Feasibility Report

Preliminary IGBC MRTS report will include credit analysis and target rating level. The Consultant will create and update a project matrix that describes the specific tasks to be implemented by various members of the design team and compile documentation pertinent to IGBC MRTS

1.2.2 IGBC MRTS Design Facilitation and Documentation Scope

Assist the design team in obtaining the highest possible rating as per the Owner's requirements and Architect's design. Review calculations and provide technical support for selected IGBC MRTS points under credits for

- a) Sustainable Selection and Planning (SSP)
- b) Water Efficiency (WE)
- c) Energy Efficiency (EE)
- d) Materials Conservation (MC)
- e) Indoor Environment and Comfort (IEC)
- f) Innovation in Design & Construction (IDC)

1. Provide guidelines for specifications related to critical environmental criteria for the product types selected (e.g. VOC Limits, prohibited compounds, minimum levels of recycled content etc.) and on submittal requirements. Vet the tender document to ensure the tender technical specification meets the IGBC MRTS requirement.
2. Prepare and provide all necessary templates for the design team, so as to meet IGBC MRTS requirements.
3. Facilitate project team in preparing the documentation as stipulated by IGBC MRTS. The documentation process will require collaboration and cooperation from the design and construction teams. Drawings or drawing files, cut sheets, and other information will be provided to the Consultant by the design team. It will be the Consultant's responsibility to communicate with the design team the documentation required, the form required and within the proper timeframe.
4. The Consultancy team will filter, cross validate, verify consistency, add value and consolidate to make the document suitable for submission to IGBC.
5. Scrutinize the documents before submission to IGBC. Provide inputs on previous credit interpretation requests.
6. The Consultant would hand-hold the team right from registration of the project to achievement of the IGBC MRTS rating on all aspects related to rating

1.3 Energy Analysis

The proposed building will be analyzed with respect to traction and non-traction load keeping IGBC MRTS rating as a baseline and suggest the suitable energy conservation measures for improving the energy performance of Stations

1.3.1 Building Level – Façade Analysis

Due to variant solar insulation on the façade, the same façade can be designed for different specifications from bottom to top.

The following may vary:

Fenestration area and percentage, shading strategies, Organization of regularly occupies spaces e.g. occasionally used spaces like conference rooms can be placed near the top receiving more solar radiation. Selection of glass type, (heat resistance glass near top and high visibility glass near the base)

1.3.2 Combining ECMs (Energy Conservation Measures) For Maximizing Energy

Prioritizing and evaluation of combined ECMs. Cases prioritized based on the resultant savings from each ECM. Eventually, all ECMs that yield satisfactory results will be combined into a single case. Several configurations of Base Case + ECMs need to be defined and stimulated before arriving at the best or optimum combination of ECMs.

1.3.3 Developing Thermal Specifications

As a result of the simulation exercise, thermal specifications will be provided for building envelope materials to enhance the energy performance of the building. Examples of thermal specifications include:

- 1 Fenestration U-value
- 2 Fenestration Shading Coefficient (SC)
- 3 Fenestration coatings
- 4 U-values for wall(s) construction
- 5 R-value for wall insulation
- 6 U-value for roof construction
- 7 R-value roof insulation
- 8 Emissivity of roof finish

1.3.4 Lighting Levels and Daylighting Analysis

The existing design will be analyzed to incorporate day lighting. Lighting levels will be analyzed both qualitatively and quantitatively to arrive at a day-lit building. Electrical lighting design will be optimized through recommendations on illumination levels and light source. A daylighting analysis for all perimeter zones will be performed using the daylighting module of Visual DOE 3.0. Recommendations regarding fenestration VLT (Visual Light Transmittance), U-factor, and shading Coefficient will be

based on trade-offs within lighting energy and heating & cooling energy components as demonstrated by the simulating software.

1.3.5 Output Reports from Simulation Software

Summarize the results through spreadsheet-based post-simulation processing and tabulate electrical and fuel-end-use total and energy savings by source energy.

1.3.6 Final Analysis and Summary Report

The entire process of simulation and energy analysis as well as water efficiency calculations will be included in a summary report. This will include a description of the project, a record of all modelling.

1.3.7 Software Used

- 1 Ecotect (Preliminary design, site analysis, solar radiation, shading, and sun path analysis).
- 2 DOE 2.1 E (Visual DOE 4.1 Interface and manual editing for advanced options)
- 3 DOE 2.2 (eQUEST interface with manual editing for advanced options)
- 4 Energy Plus (Design Builder interface with manual editing as needed)
- 5 Radiance (For detailed daylighting design)
- 6 Ansys Fluent (CFD software for advanced HVAC and natural ventilation analysis)
- 7 Dialux and Calculux (for landscape and exterior lighting analysis)
- 8 Any other software that may be required to carry out day lighting simulation that is acceptable to the rating body.

1.4 Commissioning of Equipment and System

1.4.1 Responsibility of the Consultant

The Consultant is responsible for implementation of all fundamental commissioning procedures. The Consultant would carry out the following:

- a) Overall supervision of commissioning process of equipment/systems
- b) Report to the owner regarding the performance of the building system/equipment Introduce standard procedures and strategies to ensure implementation of Owner's Post Occupancy Evaluation.
- c) After the commissioning of project, when the data for energy performance is available for the building, the energy simulation model will be modified and calibrated. This can be used for troubleshooting building performance issues and for future upgrades and retrofits.

1.5 Energy Monitoring

Demonstrate sub metering for the following energy use:

- a) HVAC equipment and system – Lighting
- b) Elevators and Escalators
- c) Onsite Renewable energy systems
- d) Power back up systems

- e) Develop Measurements and Verification (M&V) plan in place for the below applications
- f) HVAC equipment and systems
- g) Lighting
- h) Elevators and Escalators
- i) Onsite Renewable energy systems
- j) Power back up system

The certification work shall be completed along with the commissioning of the section.