

***PARTICULAR SPECIFICATION –
IGBC NORMS
(DEPOT)***

SCOPE OF WORK

Metro Rail Depots are quite different from typical buildings and operationally are more closure to factory buildings. Considering this factor, it is decided that Depots shall be designed as per the Green Factory Building Rating System developed by IGBC. This rating system is based on key requirements of factory buildings.

1. SCOPE OF WORK AND METHODOLOGY

The DDC /Consultant is required to provide services for IGBC Green Factory Building Rating System for Depots. The scope of work for the mentioned services has been prepared as per IGBC Green Factory Building Rating System guidelines. The DDC /Consultant has to provide following services for the project as per the IGBC Green Factory Building Rating System:

IGBC Green Factory Building Rating System Facilitation for categories which includes

- Site Selection & Planning
- Water conservation,
- Energy Conservation,
- Material Conservation,
- Indoor Environment & Comfort
- Energy Analysis and Day lighting simulation
- Commissioning of Equipment
- Energy Monitoring

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

2. IGBC GREEN FACTORY BUILDING RATING SYSTEM CERTIFICATION FACILITATION

The Green Building consultant will work with the design team, Employer/GC, and other consultants to coordinate and facilitate IGBC Green Factory Building Rating System for Bengaluru Suburban Rail Project. This will inter-alia include:

- Co-ordination for project registration with IGBC
- Co-ordinate with project team and facilitate IGBC submittal
- Communication with IGBC for queries related to the project
- Coordinate final IGBC submittal
- Respond to IGBC queries

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

2.1 PREPARE A PRELIMINARY IGBC GREEN FACTORY BUILDING RATING SYSTEM FEASIBILITYREPORT

Preliminary IGBC 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.

2.2 IGBC DESIGN FACILITATION AND DOCUMENTATION SCOPE

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

- Sustainable Selection and Planning (SSP) Water Efficiency (WE)
- Energy Efficiency (EE)
- Materials Conservation (MC)
- Indoor environment and Comfort (EC) Innovation in Design & Construction (IDC)

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 requirement.

Prepare and provide all necessary templates for the design team, so as to meet IGBC requirements. Facilitate project team in preparing the documentation as stipulated by IGBC. 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.

The Consultancy team will filter, cross validate, verify consistency, add value and consolidate to make the document suitable for submission to IGBC.

Scrutinize the documents before submission to IGBC. Provide inputs on previous credit interpretation requests.

The DDC/Consultant would hand-hold the team right from registration of the project to achievement of the IGBC rating on all aspects related to rating.

3 ENERGY ANALYSIS

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

3.1 BUILDING LEVEL: FACADE 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)

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.

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:

- Fenestration U-value
- Fenestration Shading Coefficient (SC)
- Fenestration coatings
- U-values for wall(s) construction
- R-value for wall insulation
- U-value for roof construction
- R-value roof insulation
- Emissivity of roof finish

3.4 LIGHTING LEVELS AND DAYLIGHTING ANALYSIS

The existing design will be analyzed to incorporate daylighting. Lighting levels will be analyzed both qualitatively and quantitatively to arrive at a daylit 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.

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.

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 modeling.

3.7 SOFTWARE USED

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

4. COMMISSIONING OF EQUIPMENT AND SYSTEM

4.1 RESPONSIBILITY OF THE CONTRACTOR'S CONSULTANT

The DDC/Consultant is responsible for implementation of all fundamental commissioning procedures.

The DDC/Consultant would carry out the following:

- Overall supervision of commissioning process of equipment/systems
- 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.
- 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.

5 ENERGY MONITORING

Demonstrate sub metering for the following energy use:

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

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