GRIHA LD V 2015 & GRIHA V 2015

February 2016
GRIHA rating variants

- **SVAGRIHA**
  - Built-up Area: 0 – 2499 sqm

- **GRIHA**
  - Built-up Area: => 2500 sqm

- **GRIHA LD**
  - Site Area: >= 50 hectares
GRIHA LD V 2015
GRIHA LD

All projects with total site area greater than or equal to 50 hectares (125 acres) can be rated under GRIHA LD rating system
Benefits of GRIHA LD rating

• Branding and recognition of the environmental performance of the development

• Addresses fundamental issues around development through carbon footprint analysis, carrying capacity etc.

• Consolidated environmental performance evaluation:
  – The project team can monitor actual performance against projected targets

• It is flexible in approach:
  – Focuses on macro-level parameters

• Designed for future modifications in local regulations:
  – The rating of each phase is kept independent of the other.
Key Concept: Self Sufficiency
GRIHA LD lays special emphasis on concept of NET-ZERO – ENERGY, WATER and ORGANIC WASTE
Sections and Impacts

The impact in each section is evaluated in two parts:

- Self Sufficiency
- Development Quality
## Overall weights

<table>
<thead>
<tr>
<th>Sub-sections</th>
<th>Score available to each section</th>
<th>Overall Weights</th>
<th>Score out of 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy self-sufficiency</td>
<td>100</td>
<td>0.18</td>
<td>18</td>
</tr>
<tr>
<td>Water self-sufficiency</td>
<td>100</td>
<td>0.23</td>
<td>23</td>
</tr>
<tr>
<td>Organic solid waste treatment</td>
<td>100</td>
<td>0.12</td>
<td>12</td>
</tr>
<tr>
<td>Site Planning</td>
<td>100</td>
<td>0.08</td>
<td>8</td>
</tr>
<tr>
<td>Energy</td>
<td>100</td>
<td>0.09</td>
<td>9</td>
</tr>
<tr>
<td>Water</td>
<td>100</td>
<td>0.12</td>
<td>12</td>
</tr>
<tr>
<td>Solid Waste Management</td>
<td>100</td>
<td>0.06</td>
<td>6</td>
</tr>
<tr>
<td>Transport</td>
<td>100</td>
<td>0.06</td>
<td>6</td>
</tr>
<tr>
<td>Social</td>
<td>100</td>
<td>0.06</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
## Rating Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 – 40</td>
<td>1 star</td>
</tr>
<tr>
<td>41 – 55</td>
<td>2 star</td>
</tr>
<tr>
<td>56 – 70</td>
<td>3 star</td>
</tr>
<tr>
<td>71 – 85</td>
<td>4 star</td>
</tr>
<tr>
<td>Above 85</td>
<td>5 star</td>
</tr>
</tbody>
</table>
The rating of the projects will be done in parts:

– Masterplan Rating –
  • One time overall rating for the entire proposed development

– Rating of Each Subsequent Phase –
  • Each phase will undergo its own evaluation and rating as construction progresses
First GRIHA LD rated project

- IIT Gandhinagar – 5 star GRIHA LD Masterplan rating
Key Self-Sufficiency numbers of IIT Gandhinagar

- **Energy reduction**: 37% below GRIHA LD base case
- **Water reduction**: 30% below GRIHA LD base case
- **Organic waste reduction**: 100%
- **Renewable energy installation proposed**: 500 kWp
GRIHA V 2015
Overview of Changes in GRIHA V 2015

- Change in Rating Structure
- Revised Point Weightages
Change in Rating Structure

• The GRIHA V 2015 has 30 criteria + Innovation.

• Total points  = 100 (+ 4 for innovation)
GRIHA V 3 – point weightages (previous version)

- Matreials and construction technology: 17%
- Site Planning: 17%
- Energy (end use) and Renewable Energy: 37%
- Water: 17%
- Waste Management: 15%
- Health and well being: 9%
New Point Weightages
Based on AHP survey

- Site Planning: 20%
- Energy: 17%
- Occupant Comfort and Well Being: 14%
- Water: 12%
- Sustainable Building Materials: 8%
- Construction Management: 8%
- Solid Waste Management: 6%
- Socio-Economic Strategies: 6%
- Performance Monitoring and Validation: 9%
- Site Planning: 14%
- Energy: 6%
- Occupant Comfort and Well Being: 6%
- Water: 8%
- Sustainable Building Materials: 6%
- Construction Management: 8%
- Solid Waste Management: 17%
- Socio-Economic Strategies: 8%
- Performance Monitoring and Validation: 9%
Overview of Changes in GRIHA V 2015

- Change in Rating Structure
- Revised Point Weightages
- **Shift towards Sustainable Building Rating System**
Socio-Economic Strategies

• New criteria on Socio-Economic strategies included

• Shift from “Green” building rating system to “Sustainable” building rating system
<table>
<thead>
<tr>
<th>Sections</th>
<th>Cr. No.</th>
<th>Criterion Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-Economic Strategies</td>
<td>24</td>
<td>Labour safety and sanitation</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Design for Universal Accessibility</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>Dedicated facilities for service staff</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>Increase in environmental awareness</td>
</tr>
<tr>
<td>Performance Monitoring and Validation</td>
<td>28</td>
<td>Smart metering and monitoring</td>
</tr>
</tbody>
</table>
Overview of Changes in GRIHA V 2015

- Change in Rating Structure
- Revised Point Weightages
- Shift towards Sustainable Building Rating System
- No points for Mandatory Appraisals
- New Rating Thresholds
New Rating Thresholds

- GRIHA V.3 had 28 points for Mandatory clauses
- In GRIHA V.3, projects could achieve GRIHA 1 star rating at 51 points

<table>
<thead>
<tr>
<th>New Rating Thresholds</th>
<th>GRIHA Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 – 40</td>
<td>1 star</td>
</tr>
<tr>
<td>41 – 55</td>
<td>2 star</td>
</tr>
<tr>
<td>56 – 70</td>
<td>3 star</td>
</tr>
<tr>
<td>71 – 85</td>
<td>4 star</td>
</tr>
<tr>
<td>86 or more</td>
<td>5 star</td>
</tr>
</tbody>
</table>

\[51 - 28 = 23\]
Overview of Changes in GRIHA V 2015

- Change in Rating Structure
- New Rating Thresholds
- Shift towards Sustainable Building Rating System
- No points for Mandatory Appraisals
- Revised Point Weightages
- Non-Linear point distribution
Non-Linear Point Distribution (example)

<table>
<thead>
<tr>
<th>Reduction in Landscape water requirement in design case versus base case</th>
<th>GRIHA V 2015</th>
<th>GRIHA V3 (previous)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>40%</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>50%</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>
Overview of Changes in GRIHA V 2015

- Change in Rating Structure
- New Rating Thresholds
- Shift towards Sustainable Building Rating System
- No points for Mandatory Appraisals
- Revised Point Weightages
- Non-Linear point distribution
- New Criteria
New Criteria

• Criterion 12: Maintaining good indoor air quality
• Criterion 26: Dedicated facilities for service staff
• Criterion 27: Increase in environmental awareness
• Criterion 28: Smart Metering and Monitoring
Overview of Changes in GRIHA V 2015

• Change in Rating Structure
• New Rating Thresholds
• Shift towards Sustainable Building Rating System
• No points for Mandatory Appraisals
• Revised Point Weightages
• Non-Linear point distribution
• New Criteria
• Restructured Criteria
Criterion 21: Use of low-environmental impact materials in building interiors

Appraisals:

21.1.1: Project demonstrates that at least 25% / 50% / 75% of all materials (calculated by surface area) used for building interiors* meets the GRIHA criterion low-impact material requirements – 1/2/4 point(s)

Following materials will be accepted as low-environmental impact:

– Stones from the same state as the project or a neighbouring state
– Composite wood based products
– FSC Chain of Custody certified products
– Manufactured products with at least 5% recycled content
– Products with EPD (cradle to gate) analyzed and published as per ISO 21930
– Products with water footprint (cradle to gate) analyzed and published as per ISO 14046

* false ceilings/internal partitions/paneling/in-built furniture/flooring/internal door & window panels & frames
Criterion 5: Air and Water Pollution

Appraisals:

5.1.1: Adopt at least 3 measures (from the list given) on site to curb air pollution during construction – **Mandatory**

- Provision of 3 meter high barricading around the construction area
- Wheel washing facility at the vehicular entrance of the site
- Covering of fine aggregate and excavated earth on site with plastic/geotextile sheets
- Water sprinkling on fine aggregate (sand) and excavated earth
- All diesel gensets on site to have proper chimneys with their outlet facing away from the site

5.1.2: Develop and implement a spill prevention plan (to control effects of spill from hazardous materials like bitumen, diesel etc.) on site – **1 point**

*Criterion 9 in GRIHA V.3
*Part of Criterion 2 in GRIHA V.3*
Overview of Changes in GRIHA V 2015

- Change in Rating Structure
- New Rating Thresholds
- Shift towards Sustainable Building Rating System
- No points for Mandatory Appraisals
- Revised Point Weightages
- Non-Linear point distribution
- New Criteria
  - Restructured Criteria
  - Technical Revisions in the criteria
Some Key Criteria with modifications
Criterion 2: Low-impact design

Maximum Points: 4

Appraisals:

2.1.1: Demonstrate reduction in environmental impact through design by adoption of various passive design and low-impact site planning strategies.

<table>
<thead>
<tr>
<th>No. of strategies adopted</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
Some of the Strategies and Analysis required

**Strategy:**
Use of trees to control heat gain

**Analysis Required:**
Demonstrate, through simulations, that insolation has reduced by at least 25% (as compared to base case of no trees) through planting of dense trees next to critical facades during Summer months (1\textsuperscript{st} April to 30\textsuperscript{th} June) – only in case of up to G+3 structures. Assume tree size at maturity (5 years old).
Some of the Strategies and Analysis required

Strategy:
Control annual Heat Gain through favourable orientation and design of facades

Analysis Required:
Submit analysis demonstrating that the heat gain in design case is lower than GRIHA base case.

Insolation x window area of specific orientation
Various strategies and the respective analysis required are listed in the GRIHA V 2015 Manual
Energy
Criterion 8: Energy Efficiency

Maximum Points: 13

Appraisals:

8.1.1: Ensure that the project meets the mandatory requirements of ECBC & all fans must be BEE star rated – Mandatory

8.1.2: Total heat gain through building envelope should meet the GRIHA thresholds* – 2 points

<table>
<thead>
<tr>
<th>GRIHA Thresholds for Building Envelope Peak Heat Gain Factor (W/sqm)</th>
<th>Climate</th>
<th>Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite/Hot &amp; Dry</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Warm and Humid</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>
8.1.3: Demonstrate that 100% of outdoor lighting lamps meet the luminous efficacy requirements of GRIHA – 1 point

*All lamps must demonstrate luminous efficacy of at least 75 lumens/watt.*

- 8.1.4: Demonstrate (through simulations) that project EPI is below GRIHA benchmark# - Mandatory

- 8.1.5: Additional reduction in EPI will be awarded points as mentioned below:

<table>
<thead>
<tr>
<th>Reduction from EPI benchmark</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>2</td>
</tr>
<tr>
<td>20%</td>
<td>3</td>
</tr>
<tr>
<td>30%</td>
<td>5</td>
</tr>
<tr>
<td>40%</td>
<td>7</td>
</tr>
<tr>
<td>50%</td>
<td>10</td>
</tr>
</tbody>
</table>
### Energy Performance Index Benchmarks (EPI) – (kWh/ m²/year)

<table>
<thead>
<tr>
<th>Climate Classification</th>
<th>Day time occupancy</th>
<th>24 hours Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 Days a week</td>
<td>7 Days a week</td>
</tr>
<tr>
<td><strong>Commercial/Institutional/Academic/Hospital buildings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>75</td>
<td>225</td>
</tr>
<tr>
<td>Composite / Warm and humid / hot and dry</td>
<td>90</td>
<td>300</td>
</tr>
<tr>
<td><strong>Residential buildings/Hostels</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Composite / Warm and humid / hot and dry</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>
Criterion 9: Renewable Energy Utilization

Maximum Points: 7

Appraisals:

9.1.1: On-site/Off-site renewable energy system installation to offset a part of the annual energy consumption of internal artificial lighting and HVAC systems as mentioned in the table below

<table>
<thead>
<tr>
<th>Daytime Commercial Buildings</th>
<th>Residential Buildings</th>
<th>24 X 7 occupied buildings</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5% (only On-site)</td>
<td>-</td>
<td>0.5% (only On-site)</td>
<td>Mandatory</td>
</tr>
<tr>
<td>5%</td>
<td>5%</td>
<td>1%</td>
<td>1</td>
</tr>
<tr>
<td>10%</td>
<td>10%</td>
<td>3%</td>
<td>2</td>
</tr>
<tr>
<td>15%</td>
<td>15%</td>
<td>5%</td>
<td>4</td>
</tr>
<tr>
<td>20%</td>
<td>20%</td>
<td>7%</td>
<td>5</td>
</tr>
<tr>
<td>25%</td>
<td>25%</td>
<td>10%</td>
<td>7</td>
</tr>
</tbody>
</table>
9.1.2: Off-site renewable energy system to offset 100% building energy demand – Mandatory +7 points
Occupant comfort & Well-being
Criterion 11: Achieving indoor comfort requirements (visual/thermal/acoustic)

Maximum Points: 6

Appraisals:

11.1.1: Demonstrate compliance with either of the two Paths to demonstrate reduction in heat gain through fenestrations and provision of sufficient daylight in indoor living areas – Partly Mandatory
Alternative 1:

- WWR <= 60%
- SRR <= 5%

- All fenestrations must comply with one of the following:
  - SHGC requirement of ECBC-2007/Weighted Façade average SHGC (for each orientation) meets SHGC requirements of ECBC-2007
  - Shading as per SP-41
  - Shading to ensure that the window is completely shaded for the duration between 10:00 am on 1st April to 15:00 on 30th September

- At least 25% of living area should achieve Daylight Factors as mentioned in SP 41

- More than 50%/75% of living areas meet DF as per SP 41 – 2/4 points

Alternative 2:

- Demonstrate that the mean DA requirements (300* lux or more) are met over the total living area for at least 25% of total annual analysis hours (annual analysis hours – 800 to 1800 each day) – Mandatory

- Demonstrate that the mean DA requirements (3000 lux or more) are never exceeded over the total living area for across the total annual analysis hours (annual analysis hours – 800 to 1800 each day) – Mandatory

- Demonstrate that the mean DA requirements (300* lux or more) are met over the total living area for at least 50%/75% of total annual analysis hours (annual analysis hours – 800 to 1800 each day) – 2/4 points

* For residential typologies, the DA limit is 100 lux
11.1.2: Artificial lighting design to fall within limits (minimum and maximum) as recommended space/task specific lighting levels as per NBC and to meet a minimum uniformity ratio of 0.4 – Mandatory

11.1.3: Demonstrate that project can achieve the thermal comfort requirements of NBC 2005 OR ASHRAE 55 OR requirement of *Indian Adaptive Comfort Model* as mentioned in Appendix 1 – Mandatory

11.1.4: The indoor noise levels should be within the acceptable limits as specified in NBC 2005 and key noise source on site (like DG sets, chiller plants etc.) should have sufficient acoustic insulation as per NBC 2005 norms - 2 points
Criterion 12: Maintaining good IAQ

Maximum Points: 4

Appraisals:

• 12.1.1: Meet the minimum requirements of
  • CPCB National Ambient Air Quality Standard (NAAQS) for quality of fresh air (for PM 10, Ozone and CO₂); and
  • ASHRAE Standard 62.1–2010, Sections 4–7, Ventilation for Acceptable Indoor Air Quality (with errata), or a NBC-2005 for quantity of fresh air – 2 points

• 12.1.2: Monitoring the CO₂, temperature and RH at the occupied spaces or at AHUs for the air conditioned spaces – 2 points

• Non-applicability: Appraisal 12.1.1 is not applicable for non-AC spaces/residential spaces with operable windows
Performance Monitoring & Validation
## Criterion 28: Smart metering and monitoring

### Maximum Points: 8

#### Appraisals:

28.1.1: Comply with following Basic metering requirements of GRIHA – Mandatory

<table>
<thead>
<tr>
<th>Basic Metering Requirements</th>
<th>Energy</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td>Ensure regular monitoring of project’s energy consumption by installing digital meters* at the following point sources at the project level for:</td>
<td>Ensure regular monitoring of project’s water consumption by installing digital meters* at the following point sources at the project level for:</td>
</tr>
<tr>
<td></td>
<td>• Utility grid</td>
<td>• Municipal Supply</td>
</tr>
<tr>
<td></td>
<td>• On-site renewable energy system</td>
<td>• Bore well</td>
</tr>
<tr>
<td></td>
<td>• Diesel Genset, Gas Genset etc.</td>
<td>• Treated water outlet from STP</td>
</tr>
<tr>
<td></td>
<td>• Each building level</td>
<td>• Captured rainwater</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Each building level</td>
</tr>
</tbody>
</table>
28.1.2: Comply with Extended metering requirements as mentioned in the table – **2 points**

### Table: Extended Metering Requirements

<table>
<thead>
<tr>
<th>Energy</th>
<th>Water</th>
</tr>
</thead>
</table>
| Sub-meter* the following points to monitor energy consumption:  
  - **Commercial/Institutional:**  
    - HVAC central plant - AHU, Cooling tower, Chillers (BTU meters) and/or distributed units (split/window ACs)  
    - Lighting (Indoor and outdoor)  
    - UPS  
  - **Residential:**  
    - For Basement Parking Lighting, Community/Recreation center, Water pumping, Outdoor Lighting  
    - Lifts and common areas | Sub-meter* at the following points to monitor water consumption:  
  - Irrigation  
  - Cooling Tower  
  - STP/WTP/ETP  
  - Each apartment/commercial tenant |
28.1.3: Installation of **one-way communicable** Smart metering* and monitoring system capable tracking energy and water consumption through a web hosted portal and also capable of the following, for at least all meters mentioned in 28.3.1 – 3 points

- Hourly data reporting in near-real-time (no more than 15 minute delay)
- Energy mix breakdown and consumption patterns
- Water consumption patterns from various sources
- Ability to set energy & water consumption targets, alarms and pricing
- Ability to compare historical trends and benchmark data
- Real time monitoring with user interface which operates even in mobile devices
28.1.4: Connect to GRIHA Benchmarking platform (linked to smart metering) to allow for two way communication on the following: – 3 points

– Monthly energy consumption (with fuel mix) and water consumption (with source split) with GRIHA IT platform

– Receive, average energy and water consumption (normalized for building typologies, location and area) for display to building occupants to assess building energy and water efficiency
• The projects’ registration for GRIHA V 2015 will begin in March 2016

• The fees structure remains unchanged

• Projects can continue to register with GRIHA V 3 till June 2016
Thank You

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