



Indian Institute of Management, Kozhikode

GRIHA V3.1 * – Provisional Rating Report



GRIHA Council

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*GRIHA is an abbreviation for Green Rating for Integrated Habitat Assessment. It is the national rating system for green buildings in India. GRIHA final rating shall be awarded on compliance with GRIHA criterion 32, i.e. Audit & Validation.

For more information

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Background

There has been tremendous growth in the building sector worldwide due to the ever-increasing demand of infrastructure to cater to the growing population. The building sector poses a major challenge to the environment. As per United Nations Environment Programme (UNEP), “More than 30 per cent of global greenhouse gas (GHG) emissions are buildings- related, and emissions could double by 2050 if we carry on business as usual. Not changing increases risks and vulnerability of countries, regions and local communities from climate change.”

Globally, buildings are responsible for at least 40% of energy use. An estimated 25% of the global water consumption and 40% of the global consumption of raw materials is attributed to buildings when taking into account the manufacturing, construction, and operating period of buildings. In addition, building activities contribute an estimated 50% of the world’s air pollution, 42% of its greenhouse gases, 50% of all water pollution, 48% of all solid wastes and 50% of all CFCs (chlorofluorocarbons) to the environment¹.

Rapid urbanization could further accelerate impacts. However, constructing new green buildings and retrofitting existing energy- and resource intensive building stock can help mitigate the negative impact of buildings on the environment. It is estimated that more than half of India’s Infrastructure for 2030 is yet to be built and hence there is a huge potential in the building sector to reduce the emissions. Construction of sustainable buildings will lead to 35% reduction in GHG emissions, 30-50% reduction in energy use, 40% reduction in water use and 70% reduction in waste outputs.¹

The government of India has a comprehensive set of policies to drive the green building movement in the country. These policies include implementation of the mandatory Energy Conservation Building Code (ECBC) and awarding incentives for voluntary market driven green building rating. The National Building Code (NBC) of India established by the Bureau of Indian Standards (BIS) has also introduced a new chapter on “Sustainability” to lay guidelines for green construction in the country.

India, in its “INDIA’S INTENDED NATIONALLY DETERMINED CONTRIBUTION (INDC): WORKING TOWARDS CLIMATE JUSTICE” document submitted to the United Nations Framework Convention on Climate Change (UNFCCC), ahead of the crucial climate meet at Paris in December 2015 (COP21), has highlighted GRIHA, as country’s own green building rating system and a significant strategy in the National Mission of Enhanced Energy Efficiency to reduce emission intensity of its Gross Domestic Product (GDP). Thus, making GRIHA an integral part of our nation’s mitigation strategy for combating global warming and climate change.

¹ GRIHA Manual Volume 1



About GRIHA

GRIHA is the National Rating System for Green buildings in India; it reflects Indian ethos, culture and context, coupled with sensible modern approaches and developments in the domain of built-environment. Furthermore, it helps promote and implement, through its robust and transparent processes, our country’s energy and environmental norms, standards, policies and programs for achieving sustainability in its buildings and habitats.

GRIHA is an evaluation tool having a set of criteria to help design, build, operate, and maintain a green building. GRIHA Version 3.1 is a 100-points rating system consisting 34 criteria.

Different levels of certification (one star to five stars) are awarded based on the number of points earned. The minimum points required for certification are 50.

GRIHA criteria cover the following subjects



GRIHA Rating Thresholds

Points	GRIHA Rating
50-60	★
61-70	★ ★
71-80	★ ★ ★
81-90	★ ★ ★ ★
91 or more	★ ★ ★ ★ ★

All new buildings having a built-up area greater than 2,500 m² are eligible for certification under GRIHA - Version 2015 rating system. All types of habited buildings can be rated in GRIHA. The building types include but are not limited to offices, retail spaces, institutional buildings, hotels, hospital buildings, healthcare facilities, residences and multi-family high-rise buildings.

Implementation of GRIHA benchmarks ensures compliance with various relevant national codes and standards such as the Energy Conservation Building Code (ECBC), the National Building Code (NBC) and contributes to meeting objectives set forth in the National Mission on Sustainable Habitat and the National Solar Mission.

Further, the guidelines/criteria appraisals are revised periodically to take into account the latest scientific developments.



Executive Summary

Project Information	Indian Institute of Management, Kozhikode Location – Kozhikode Site area – 1,02,210 m ² Built up area – 29,599.41 m ² Total number of buildings - 9 buildings
Intent	The above-mentioned project was evaluated according to the benchmarks and guidelines of GRIHA Rating (version 3.1) System and the Provisional Rating is awarded as below. Final rating shall be awarded on compliance with GRIHA criterion 32.
GRIHA Mandates	Compliance with GRIHA mandatory criteria must be demonstrated before a GRIHA Rating is awarded. Non-compliance with mandatory criterion shall disqualify the project from attempting a GRIHA Rating.
Rating Criteria	GRIHA criteria have points assigned to them and project intending to qualify has to comply with the benchmarks and guidelines and submit documentation in the prescribed format. Points are awarded after monitoring, validation and review of documents/photographs submitted.
GRIHA Applicable Points	Some criteria may not be applicable to a project due to technical constraints, site limitations or any other as may be identified by the project team. The project is rated on the applicable points only. A total of 98 points are applicable to the project.
Attempted	The project has attempted 99 points (95 + 4 innovation points).
Achieved	The project has been awarded 90 points (86 + 4 innovation points) by the evaluation committee of GRIHA Council on providing necessary documentation and demonstrating compliance with mandatory criterion under GRIHA v3.1 Three site visits were conducted during the construction of the building. Compliance for site related criteria was verified during these three site visits. Site visit reports shall be shared on request.
Denied	The project has been denied 9 points in particular criteria due to non-compliance with the requirements of the criterion or due to incomplete submission of documents.
GRIHA Rating	 ~92% (90/ 98 Points)- GRIHA Five Star Provisional Rating* * One Star Rating: 51 – 60 %; Two Star Rating: 61 – 70 %; Three Star Rating: 71 – 80 %; Four Star Rating: 81 – 90 %; Five Star Rating: 91 – 100 %



Score chart

Criterion	Appraisal	Compliance	Applicable Points	Awarded
1	Site Selection	Mandatory	1	1
2	Preserve and protect landscape during construction/compensatory depository forestation.	Partly Mandatory	4	4
3	Soil conservation (post construction)	Optional	2	2
4	Design to include existing site features	Optional	4	4
5	Reduce hard paving on site	Partly Mandatory	2	1
6	Enhance outdoor lighting system efficiency	Partly Mandatory	1	1
7	Plan utilities efficiently and optimize on-site circulation efficiency	Optional	3	3
8	Provide minimum level of sanitation/safety facilities for construction workers	Mandatory	2	2
9	Reduce air pollution during construction	Mandatory	2	2
10	Reduce landscape water demand	Optional	3	3
11	Reduce building water use	Partly Mandatory	2	2
12	Efficient water use during construction	Optional	1	1
13	Optimize building design to reduce conventional energy demand	Partly Mandatory	8	7
14	Optimize energy performance of building within specified comfort limits	Partly Mandatory	16	16
15	Utilization of fly-ash in building structures	Optional	6	6
16	Reduce embodied energy of construction is reduced by adopting material efficient technologies and/or low-energy materials	Optional	4	2
17	Use low-energy materials in Interiors	Optional	4	3
18	Renewable energy utilization	Partly Mandatory	8	6
19	Renewable energy based hot water system	Optional	3	1
20	Waste water treatment	Optional	2	2
21	Water recycle and reuse (including rainwater)	Optional	5	3
22	Reduction in waste during construction	Optional	1	1
23	Efficient Waste segregation	Optional	1	1
24	Storage and disposal of wastes	Optional	1	1
25	Resource recovery from waste	Optional	Not applicable	
26	Use of low-VOC paints/adhesives/sealants	Optional	3	2
27	Minimize ozone depleting substances	Mandatory	1	1
28	Ensure water quality	Mandatory	2	2
29	Acceptable outdoor and indoor noise levels	Optional	2	2
30	Tobacco and smoke control	Mandatory	1	1
31	Provide at least the minimum level of accessibility for persons with disabilities	Optional	1	1
32	Energy audit and validation	Mandatory	-	-
33	Operation and Maintenance	Mandatory	2	2
			98	86
34	Innovation (Bonus points)	Optional	-	4
Total			98	90
	Score Percentile		91.8 ≈ 92	



Criteria-wise project information

The section below contains criteria wise explanation of appraisal clauses and compliance for this project. The reason for award or denial of points has been mentioned in each criterion, along with the strategies implemented to attempt points in GRIHA.



Total	Applicable	Attempted	Awarded	Denied	Criterion
1	1	1	1	-	Criterion 1 – Site selection
					<p>Partly Mandatory The intent of criterion 1 is to select an appropriate site such that the development of a project should not cause damage to the natural surroundings of the site. To attempt a GRIHA rating, the selected site must conform to the development plan and the UDPFI guidelines. To achieve one point in criterion 1, the selected site must be within ½ km radius of an existing transportation service.</p> <p>Compliant – Mandatory: The project is located in Kozhikode, Kerala. Approved sanction drawings, building completion certificates and relevant NOCs have been submitted. A copy of MoEF order has also been submitted to demonstrate that the project being an educational institute is exempted from obtaining Environmental Clearance. Hence, the project complies with the mandatory requirement of the rating.</p> <p>Optional: Google earth image highlighting basic amenities such as convenience store, ATM/Bank, dispensary/ambulance service, post office, park, amphitheater, gym and cafeteria are available within 500m of the site. Site visit compliance report submitted by the project team confirms the same. Hence, 1 point has been awarded.</p>
4	4	4	4	-	Criterion 2 - Preserve and protect landscape during construction
					<p>Partly Mandatory The intent of criterion 2 is to preserve and protect existing vegetation on the site during construction. The project must demonstrate measures to prevent soil erosion, water run-off, protect existing trees and soil on site.</p> <p>Compliant – Mandatory: Narrative has been submitted stating that 1,119 trees were present on site before commencement of construction activity; out of which 107 trees were cut for construction, the remaining 1,012 trees were preserved and protected. 585 new trees have been proposed in place of the 107 trees cut. The trees will be planted in a ratio of 1:4. Copy of the tender highlighting the species of trees has been submitted. Landscape plan has also been submitted, indicating the locations where the new trees are proposed to be planted. Hence, the project complies with the mandatory requirement of the rating and 2 points have been awarded.</p> <p>Narrative has been submitted stating that construction activities were confined to pre-designated area. PERT chart of the project has been submitted indicating that the excavation work for the project was carried out between May and June 2015, which does not coincide with the monsoon season of Kozhikode.</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>Hence, 1 point has been awarded.</p> <p>Narrative and photographs have been submitted to demonstrate that various permanent and temporary methods were implemented on site for erosion control like laying of bhoomi vastra, gabion walls, RCC retaining walls, sedimentation reservoir and sand bags. Staging and spill prevention measures were adopted on site. Site management plan has been submitted to demonstrate compliance. Site visit report compiled by GRIHA Council officials confirms the same.</p> <p>Hence, 1 point has been awarded.</p>
2	2	2	2	-	Criterion 3 - Soil Conservation (till post-construction)
					<p>The intent of criterion 3 is to preserve the fertile top soil on site and re-use it for landscape purposes at a later stage. The minimum quantity of the top soil to be preserved shall be equivalent to the quantity of top soil required for landscaping on the site.</p> <p>Compliant - Optional: Narrative has been submitted stating that top soil was preserved, stabilized and mulched at a location away from the construction site, but within the institute campus. Soil test report has been submitted indicating that the top soil was fertile. Declaration has been submitted stating that the preserved topsoil will be reused for landscaping purposes. Drawing highlighting the areas where it will be applied has also been submitted. Photographs have been submitted to demonstrate compliance. Site visit report submitted by the GRIHA Council officials confirms the same.</p> <p>Hence, 2 points have been awarded.</p>
4	4	4	4	-	Criterion 4 - Design to include existing site features
					<p>To achieve points in criterion 4, the design of the building should complement the existing site conditions such that there is minimum disruption to natural site features. A detailed site analysis is required to ensure sustainable site development.</p> <p>Compliant - Optional: The following passive design strategies have been adopted/implemented in the project:</p> <ul style="list-style-type: none"> • Strategy 1 <i>Use of site contours to implement SUDS:</i> A low lying area for water collection was identified on site and the same was used to create a reservoir which will serve as source of water for the whole project through gravity fed drainage strategies. • Strategy 2 <i>Contour planning:</i> Planning has been done in such a way that cut and fill ratio of the site has been minimized. • Strategy 3 <i>Covered entrances and walkways:</i> The main entrance to all the buildings are fully covered and positioned away from the direct



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>impacts of the local site and climatic condition. Sheltering them from winds and direct radiation ensures that the building and its occupants are provided with an adequately sheltered zone to enter the building.</p> <ul style="list-style-type: none"> Strategy 4 Design of architectural elevations: The elevations of the buildings were designed by taking the local climate into consideration. The following climate responsive and locally used design elements are incorporated in the elevation design: <ul style="list-style-type: none"> Sloping roofs for all buildings to allow maximum rainwater run-off generation from the roofs flowing in the reservoir, since the project site receives rainfall for 8 months in a year. <p>Necessary documents have been submitted to demonstrate compliance. Hence, 4 points have been awarded.</p>
2	2	2	1	1	<p>Criterion 5 - Reduce hard paving on-site and/or provide shaded hard paved surfaces</p> <p>Partly Mandatory As a mandatory requirement of criterion 5, the total surface parking must not exceed as permitted by the local bye-laws. To achieve 2 points (optional) in criterion 5, net paved area of the site under parking, roads, paths or any other use should not exceed 25% of the site area or net imperviousness of site cannot exceed the imperviousness factor as prescribed by National Building Code and 50% of paved area must have pervious paving /open grid pavements / grass pavers; or shaded by vegetative roof / pergola; or topped with a material with solar reflectance of 0.5 or higher.</p> <p>Compliant - Mandatory: Narrative and parking layout have been submitted stating that total surface parking did not exceed the parking number permissible by the local bye laws, which was 176 ECS and the project has provided 109 ECS surface parking spaces. Extract of the local bye law has been submitted to demonstrate compliance. Hence, the project complies with the mandatory requirement of the rating.</p> <p>Optional: Calculations and drawings have been submitted to demonstrate that the net paved area on site is 14.4%, which is 13,756.5 m² of total site area. Calculations and drawings have been submitted to demonstrate that the imperviousness factor of the site is 44.9%, where the total effective imperviousness area is 45,884.76 m². Thus, the net paved area of the site does not exceed 25% of site area and the net imperviousness of site does not exceed the imperviousness factor as prescribed by NBC 2005, which is 70-90% for commercial sites. Hence, 1 point has been awarded.</p> <p>Non-compliant - Optional: Calculation has been submitted stating that 83.9% area, i.e., 71,673.77 m² out of a total area of 85,430.27 m² is under pervious paving.</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>However, the calculation submitted is incorrect and the total paved area of the site is 13,756.5 m² as per calculations submitted for 5,3.1. Hence, 1 point has been denied.</p>
1	1	1	1	-	<p>Criterion 6 - Enhance outdoor lighting system efficiency and use renewable energy system for meeting outdoor lighting requirement</p> <p>The intent of criterion 6 is to ensure reduction in energy consumption by outdoor lighting fixtures, to achieve 1 point in criterion 6, the project must ensure that luminous efficacy of external light sources used for external lighting conforms to the minimum standards set by GRIHA. It is mandatory to install automatic controls for all external lighting fixtures.</p> <p>Compliant - Mandatory: Digital timer control has been provided for 100% of the outdoor lighting system. Feeder pillar drawing and purchase order are submitted. Site visit report compiled by GRIHA Council officials confirms the same. Hence, the project complies with the mandatory requirement of GRIHA.</p> <p>Optional: The project has used the following luminaires:</p> <ul style="list-style-type: none"> • Deacon 3m high pole metal halide street lamp 36W (25 nos.) with luminous efficacy of 80 lumens/watt • Wipro LED based bollard lights 8W (15 nos.) with luminous efficacy of 63.34 lumens/watt • Deacon LED wall mounted lights 12W (11 nos.) with luminous efficacy 81.82 lumens/watt • Deacon LED based staircase lights 4W (16 nos.) with luminous efficacy 81.82 lumens/watt • Deacon LED recessed lights 4W (60 nos.) with luminous efficacy 81.82 lumens/watt • Philips LED flood lights / street lights 144W (90 nos.) with luminous efficacy of 90.91 lumens/watt <p>Luminous efficacy of all external lights complies with the GRIHA requirement. Exterior lighting layout has been submitted. Also, purchase orders, specification sheets and photographs of lights have been submitted. Hence, 1 point has been awarded.</p>
3	3	3	3	-	<p>Criterion 7 - Plan utilities efficiently and optimize on-site circulation efficiency</p> <p>To achieve 3 points in criterion 7, transportation and service corridors on site should be minimized to avoid unnecessary cutting and trenching of land. All utilities must be aggregated and consolidated along previously disturbed areas or along new roads to ensure easy maintenance and minimum damage to the site. There is one point allocated to each clause.</p> <p>Compliant -</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>Optional: Narrative has been submitted stating that the site has used natural contours to design transportation corridors and road lengths have been consolidated and kept at a minimum. Drawings have been submitted to demonstrate compliance. The walkways to the buildings are permanently shaded. Site visit report compiled by GRIHA Council officials confirms the same. Hence, 1 point has been awarded.</p> <p>Narrative and drawings have been submitted demonstrating that aggregated utility corridors have been used. Section of the utility corridor and site photographs of the same are submitted for reference. Site visit report compiled by GRIHA Council officials confirms the same. Hence, 1 point has been awarded.</p> <p>Drawing has been submitted indicating that all the utility corridors are consolidated along the services on site have been proposed along the vehicular / pedestrian paths/existing utility corridors in order to minimize unnecessary cutting and trenching. Site photographs of the same have been submitted. Site visit report compiled by GRIHA Council officials confirms the same. Hence, 1 point has been awarded.</p>
2	2	2	2	-	<p>Criterion 8 - Provide minimum level of sanitation/safety facilities for construction workers</p> <p>Mandatory Project Management Consultant (PMC) must ensure health and safety of workers during construction, with effective provisions for the basic facilities such as sanitation, and clean drinking water, and safety of equipment or machinery. To achieve 2 points in criterion 8, compliance with National Building Code norms on construction safety and provision for health and sanitation facilities of construction workers is mandatory.</p> <p>Compliant - Mandatory: Narrative has been submitted indicating that the following measures were adopted on site to ensure labour health, safety and sanitation during construction:</p> <ul style="list-style-type: none"> Workers were provided with necessary safety equipment such as gloves and safety harnesses depending upon the nature of work. Safety signage was displayed at multiple locations. First-aid facility was provided on site. Safety nets were provided at heights. Critical areas such as open slabs, staircases and lift shafts were provided with effective safety barricading. Clean drinking water facility was provided at all the construction sites as well as labour accommodation. Clean and hygienic toilets were provided for the construction workers at the construction site as well as in the labor accommodation. Clean, hygienic, day lit and well-ventilated accommodation was provided for construction workers.



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>Copy of contract highlighting the measures adopted for labour safety has also been submitted. Photographs have been submitted to demonstrate compliance. Site visit report compiled by GRIHA Council officials confirm the same.</p> <p>Hence, the project complies with the mandatory requirement of GRIHA and 2 points have been awarded.</p>
2	2	2	2	-	<p>Criterion 9 - Reduce air pollution during construction</p> <p>Mandatory Project Management Consultant (PMC) must adopt necessary measures to prevent air pollution (dust and smoke) in the vicinity of the site during construction. To achieve 2 points under criterion 9, PMC must demonstrate measures adopted for dust suppression, provision for wheel washing, provision of 3 m high barricading around the site and other necessary measures to control air pollution on site. Necessary documents must be submitted to support compliance.</p> <p>Compliant - Mandatory: Narrative and declaration have been submitted stating that the following measures were taken to reduce air pollution during construction:</p> <ul style="list-style-type: none"> • 3m high barricading was provided around the construction area. • Wheel washing facility was provided at the vehicular entry/exit of the site. • Height of the chimney of the DG set was above human height and it faced away from the working area. • Materials such as fine aggregates and sand which were not in use were kept covered on site. <p>Photographs have been submitted to demonstrate compliance. Site visit report compiled by GRIHA Council officials confirms the same.</p> <p>Hence, the project complies with the mandatory requirement of GRIHA and 2 points have been awarded.</p>
3	3	3	3	-	<p>Criterion 10 - Reduce landscape water requirement</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>To achieve 3 points in criterion 10, the project must demonstrate reduction in the annual water requirement for landscape purposes on site. The intent of the criterion is to minimize depletion of ground water resources and reduce the demand for municipal water. The project shall be awarded 1 – 3 points depending upon the total percentage reduction in water consumption from base case scenario, ranging from 30% to 50%, for landscape purpose on site.</p> <p>Compliant – Optional: Narrative and calculation have been submitted stating that native species have been used for landscaping. Manual irrigation system (hose pipe) was used for irrigation. The annual landscape water consumption in design case is 19,598.56 kL against the base consumption of 84,373.93 kL. Since, most part of the site was left untouched and native vegetation existed, hence, it was possible to achieve high water savings using manual irrigation. Total reduction in water consumption achieved is 76.77 %. Hence, 3 points have been awarded.</p>
2	2	2	2	-	<p>Criterion 11 - Reduce the water use by the building</p> <p>To achieve 2 points in criterion 11, the project must demonstrate reduction in the annual water consumption in the building by using efficient fixtures and sensors. The project shall be awarded 1 – 2 points depending upon the total percentage reduction in water consumption from base case scenario, ranging from 25% to 50%, in the building.</p> <p>Compliant – Optional: Narrative and calculation has been submitted to demonstrate that the project is able to reduce building water consumption by 59.26% by use of water efficient fixtures having the following flow rates:</p> <ul style="list-style-type: none"> • Water Closet (solid) : 4 lpf. However, two of the fixtures had a flow rate of 6 lpf. • Water Closet (liquid) : 2 lpf. However, two of the fixtures had a flow rate of 3 lpf. • Urinal : 0.5 lpm • Kitchen faucet : 4 lpm • Lavatory faucet : 2.5 lpf • Showers : 8 lpf <p>Purchase orders and specification sheets for the plumbing fixtures have been submitted. Site visit reports compiled by GRIHA Council officials confirm the installation of aforementioned low flow fixtures.</p> <p>The annual building water consumption in design case is 21,392.93 kL as compared to the water consumption in base case which is 52,516.9 kL. The reductions in the water consumption of the individual buildings are as follows:</p> <ul style="list-style-type: none"> • Faculty Housing: The building water consumption in design case is 4,533,85 kl per annum as compared to the water consumption in base case which is 10,116.34 kL per annum, hence demonstrating a reduction in building water use by 55.18% for this building. The



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>occupancy considered for the calculation is 169, split evenly for males and females.</p> <ul style="list-style-type: none"> • Hostel Blocks: The building water consumption in design case is 12,662.58 kl per annum as compared to the water consumption in base case which is 28,253.92 kl per annum, hence demonstrating a reduction in building water use by 55.18% for this building. The occupancy considered for the calculation is 472, split evenly for males and females. • Classroom Block: The building water consumption in design case is 4,196.55 kl per annum as compared to the water consumption in base case which is 14,146.46 kl per annum, hence demonstrating a reduction in building water use by 70.33% for this building. The occupancy considered for the calculation is 534, split evenly for males and females. <p>Hence, 2 points have been awarded.</p>
1	1	1	1	-	<p>Criterion 12 - Efficient water use during construction</p> <p>To achieve 1 point in criterion 12, the project must demonstrate measures adopted to minimize use of potable water during construction activity. To support compliance with criterion 12, the project must submit necessary documents and photographs taken during various stages of construction.</p> <p>Compliant -</p> <p>Optional: Narrative has been submitted stating that the following measures were adopted to minimize the use of potable water during construction:</p> <ul style="list-style-type: none"> • Ponding technique for curing of slabs. • Hessian cloth for curing of columns and beams. • Stormwater was collected and the same was used for ponding. <p>Photographs have been submitted indicating the measures adopted. Site visit report compiled by GRIHA Council officials confirms the same.</p> <p>Hence, 1 point has been awarded.</p>
8	8	7	7	-	<p>Criterion 13 - Optimize building design to reduce conventional energy demand</p> <p>Mandatory</p> <p>To achieve 8 points (6 mandatory and 2 optional) in criterion 13, the building design must be climate responsive, effective SHGC (Solar Heat Gain Coefficient) of the fenestration must conform to the maximum SHGC requirement as prescribed by ECBC 2007, WWR (Window Wall Ratio) shall not exceed 60%, minimum 25% of living areas shall be day-lighted and artificial lighting levels in indoor spaces shall conform to the benchmarks of National Building Code 2005. The project shall be awarded additional 1 - 2 points depending upon the total percentage of day-lighted zone in living areas, ranging from 50% to 75%.</p> <p>Compliant -</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>Mandatory: Narratives and calculations have been submitted indicating that:</p> <ul style="list-style-type: none"> • Window Wall Ratio (WWR) of the blocks are as follows: <ul style="list-style-type: none"> ○ Faculty housing Block A: 15% ○ Faculty housing Block B: 21% ○ Faculty housing Block C & Block D: 18% ○ Hostel Block A & Block B: 14% ○ Hostel Block C & Block D: 15% ○ Classroom block and Dining block: 29% • Skylight was not provided in the project. • Glazing detail: <ul style="list-style-type: none"> ○ Conditioned space (DGU of 6-12 - 6mm): <ul style="list-style-type: none"> ▪ U-value – 1.5 W/m²K, VLT – 60% and SGHC – 0.33 ○ Unconditioned space (SGU – 8mm): <ul style="list-style-type: none"> ▪ U-value – 5.18 W/m²K, VLT – 65% and SGHC – 0.68 • To demonstrate the mandatory compliances, project has adopted a weighted facades average method to calculate effective SHGC calculation in the blocks for each facade. The submitted calculation indicates that the classroom block has an effective SHGC <0.25 and residential blocks have an effective SHGC <0.45 in all facades. <p>Hence, the project complies with the mandatory requirement of the rating and 2 points have been awarded.</p> <p>As per the daylight simulation report and calculations submitted, following percentages of the regularly occupied areas for different blocks are daylight:</p> <ul style="list-style-type: none"> ○ Faculty housing Block A: 69% ○ Faculty housing Block B: 70% ○ Faculty housing Block C: 65% ○ Faculty housing Block D: 65% ○ Hostel Block A: 37% ○ Hostel Block B: 37% ○ Hostel Block C: 41% ○ Hostel Block D: 41% ○ Classroom and Dining block: 66% <p>Therefore, more than 25% of the regularly occupied areas are daylight.</p> <p>Hence, the project complies with the mandatory requirement of the rating and 2 points have been awarded.</p> <p>Artificial lighting simulation and lighting layout has been submitted to demonstrate that visual comfort (lux level) will meet requirements as per NBC 2005. Purchase order and specification sheets of the artificial lighting fixtures have also been submitted to demonstrate compliance.</p> <p>Hence, the project complies with the mandatory requirement of the rating and 2 points have been awarded.</p> <p>Optional: As per the daylight simulation report submitted, weighted daylight area is 52.3% of the regularly occupied area. Hence, 1 point has been awarded.</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
16	16	16	16	-	<p>Criterion 14 – Optimize energy performance of building within specified comfort limits</p> <p>Mandatory The intent of the criterion is to optimize use of energy systems in building that maintain a specified indoor climate conducive to the functional requirements of the building. To achieve 16 points (8 mandatory and 8 optional) in criterion 14, the project must comply with all mandatory requirements of ECBC 2007 of BEE, Government of India (mandatory 6 points) and must achieve the benchmarked EPI (Energy Performance Index) as recommended by GRIHA (mandatory 2 points). In addition to the above, the project shall be awarded 2 – 8 points for every 10% reduction, to a maximum of 40% reduction, in EPI from the benchmarked value.</p> <p>Compliant – Mandatory: The project has demonstrated compliance with all mandatory requirements of ECBC 2007. Details are as follows:</p> <ul style="list-style-type: none"> • Building Envelope <ul style="list-style-type: none"> ○ Hostel blocks: <ul style="list-style-type: none"> ▪ External wall assembly U-value: 0.71W/m²K. ▪ External sloping roof assembly U value: 0.52 W/m²K. ▪ External flat roof assembly U value: 2.29 W/m²K. ○ Classroom block: <ul style="list-style-type: none"> ▪ External wall assembly U-value: 0.71W/m²K. ▪ External sloping roof assembly U value: 1.84 W/m²K. ○ Faculty housing blocks: <ul style="list-style-type: none"> ▪ External wall assembly U-value: 2.69W/m²K. ▪ External sloping roof assembly U value: 1.84 W/m²K. • Glazing detail: <ul style="list-style-type: none"> ○ Hostels and Classroom blocks - Conditioned space (DGU of 6-12 - 6mm): <ul style="list-style-type: none"> ▪ U-value – 1.5 W/m²K, VLT – 60% and SGHC – 0.33 ○ Faculty Housing - Unconditioned space (SGU – 8mm): <ul style="list-style-type: none"> ▪ U-value – 5.18 W/m²K, VLT – 65% and SGHC – 0.68 • Heating, ventilation and air-conditioning <ul style="list-style-type: none"> ○ Minimum equipment efficiency <ul style="list-style-type: none"> ▪ 3 nos. of 235 TR water cooled screw chillers (2 working + 1 standby) have COP of 5.4 ▪ A 45 TR brine chiller (screw chiller) has a COP of 4.7 ▪ Provision for installation of split ACs were made in the faculty housing blocks. Hence, for simulation, 1-star labelled split AC units with COP 2.7 has been considered for the same. ○ Temperature Control: <ul style="list-style-type: none"> ▪ Temperature control for the spaces will be done using remote control. Chillers and AHUs were controlled using BMS. Thermostats were provided



Total	Applicable	Attempted	Awarded	Dented	Criterion
					<p>for FCUs and the cooling towers fans were controlled through VFD.</p> <ul style="list-style-type: none"> ○ Pipe and duct insulation <ul style="list-style-type: none"> ▪ Expanded polystyrene (EPS) was used for piping insulation. The R-value of the insulation is 1.51 m²K/W. ▪ Nitrile rubber was used for duct insulation. The R-value of the insulation is 0.71 m²K/W. ● Lighting Power <ul style="list-style-type: none"> ○ Lighting Control –Occupancy sensors were installed in the toilets. Manual switches have been provided in the remaining area. ○ Exterior lighting control – Automatic timer control has been installed for external lighting. ○ Exit signs – 2W LED based exit signs were installed on site. ● Electrical Power <ul style="list-style-type: none"> ○ Maximum allowable power transformer losses: <ul style="list-style-type: none"> ▪ 2 oil type transformers of 11kV class with capacities of 1250 kVA and 1000 kVA were installed on site. Transformer load loss certificates were presented during the site visit. The load losses of the 1250 kVA transformer at 50% load is 3.49 kW and at 100% load 10.21 kW respectively. The load losses of the 1000 kVA transformer at 50% load is 2.94 kW and at 100% load is 8.62 kW. ○ Energy efficient motors: <ul style="list-style-type: none"> ▪ IE2 rated motors were installed in the project. ○ Power Factor Correction: <ul style="list-style-type: none"> ▪ Photograph has been submitted to indicate that the PF is being maintained at 0.97 <p>Necessary documents have been submitted to demonstrate compliance. Hence, the project complies with the mandatory requirement of the rating and 6 points have been awarded.</p> <p>Simulation report has been submitted to demonstrate that thermal comfort has been achieved for the entire period of occupied hours. Hence, the project complies with the mandatory requirement of the rating and 2 points have been awarded.</p> <p>The benchmarked weighted EPI of the project is 182 kWh/m²/year. The project has claimed EPI of 61.7 kWh/m²/year. This implies the reduction in EPI from benchmark EPI by 66.11%. Simulation report has been submitted to show the reduction in project EPI. Hence, 8 points have been awarded.</p>
6	6	6	6	-	Criterion 15 – Utilization of fly ash in building structure
					<p>The intent of criterion 15 is to use low embodied energy industrial waste fly ash in the building structure in combination with cement. To achieve points in criterion 15, the project must demonstrate replacement of certain</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>percentage of cement by fly ash in building structure (minimum 15% replacement, 1 point) building blocks of load bearing and non-load bearing walls (40% fly ash content, 2 points) and plaster / masonry mortar (minimum 25% replacement, 2 points). The project shall be awarded additional one point for demonstrating replacement of more than 25% cement by fly ash in structural concrete.</p> <p>Compliant – Optional: Narrative and declaration has been submitted stating that PPC was used for structural concrete application. Test certificate has been submitted indicating that 34.4% replacement of the cement is done with fly ash. Purchase order of PPC has been submitted. Hence, 2 points have been awarded.</p> <p>Narrative has been submitted stating that the project has used fly-ash bricks with fly-ash content more than 50% by volume and AAC blocks have fly-ash content of 60% - 65% by volume, for 100% of load and non-load bearing walls. Purchase orders and test reports have been submitted. The AAC blocks (Renacon) is enlisted in the GRIHA product catalogue. Hence, 2 points have been awarded.</p> <p>Narrative has been submitted stating that PPC was used for plastering and masonry mortar. Test certificate has been submitted indicating that 34.4% replacement of the cement is done with fly ash. Purchase order of PPC has been submitted. Hence, 2 points have been awarded.</p>
4	4	4	2	2	<p>Criterion 16 – Reduce volume and weight, and time of construction by adopting efficient technologies</p> <p>The intent of criterion 16 is to replace a part of energy-intensive materials with less energy-intensive materials and/or utilize low-energy / energy-efficient technologies to reduce the overall embodied energy of the building. To achieve 4 points in criterion 16, the project must demonstrate a minimum 5% reduction in the overall embodied energy for a 100% structural and/or infill wall system used in a building, meeting equivalent strength requirements.</p> <p>Compliant – Optional: <i>Non-structural system:</i> Narrative has been submitted stating that fly ash bricks and AAC blocks have been used for walling in the project. As per the calculation submitted, embodied energy of non-structural blocks in base case is 32,83,209 MJ and design case is 23,45,176.94 MJ. This demonstrates a reduction of 28.5% in non-structural embodied energy. Necessary documents have been submitted to demonstrate compliance. Hence, 2 points have been awarded.</p> <p>Non-compliant – Optional:</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p><i>Structural system:</i> Narrative has been submitted stating that the project has been able to achieve reduction in embodied energy by use of PPC with 34.4% fly ash content. As per the calculation submitted, embodied energy in the base case is 22,23,15,924.8 MJ and design case is 19,25,68,718.0 MJ. This demonstrates a reduction of 13.38% in structural embodied energy. This reduction in embodied energy is calculated on the basis of cement and fly ash. However, calculation demonstrating reduction in embodied energy due to PPC has not been submitted.</p> <p>Hence, 2 points have been denied.</p>
4	4	4	3	1	<p>Criterion 17 – Use of low energy material in interiors</p> <p>The intent of criterion 17 is to use low-energy materials/finishes/products in interiors, which minimize the use of wood as a natural resource. To achieve 4 points in criterion 17, the project must demonstrate use of minimum 70% of total quantity of material as low-energy material in sub assembly/internal partitions/false ceilings/in-built furniture; flooring; and doors/windows frames.</p> <p>Compliant – Optional: Narrative has been submitted stating that the following low energy material have been used for the interiors in the project: Category 1: Sub-assembly/internal partitions/ paneling/false ceiling/in-built furniture</p> <ul style="list-style-type: none"> • Internal partitions - AAC blocks and fly ash bricks were used for partition walls in all the 9 buildings. Toilet partitions were made of pre-laminated particle boards. • False ceiling - Gypsum and metallic open grid panels were used as false ceiling materials in the all toilets and hostel rooms. • Paneling – Plywood was used for paneling in the classrooms. • In-built furniture - MDF wood was used for the in-built wardrobes and cabinets in the hostel buildings. <p>Purchase orders, certificates, specification sheets and photographs have been submitted to show compliance. Calculation and drawings have been submitted to indicate that more than 70% of the materials used for internal partitions/ paneling /false ceiling /in-built furniture is low-energy.</p> <p>Hence, 2 points have been awarded.</p> <p>Category 2: Flooring The following flooring materials were used in the project:</p> <ul style="list-style-type: none"> • Granite in faculty classrooms. • Vitrified tiles in the faculty housing, hostels rooms and corridors and classroom blocks. • Ceramic tiles in staircases. • Kota stone in kitchen. • Mosaic in classroom. • Marble and stone in lift lobby areas of faculty housing blocks.



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>Work order, purchase order and certificates have been submitted to show compliance. Calculation has been submitted indicating that 100% of the flooring used in the project is low-energy. Hence, 1 point has been awarded.</p> <p>Non-compliant – Category 3: Internal doors, windows and frames</p> <ul style="list-style-type: none"> Doors: PVC and flush doors have been used in the project Frames: PVC and teak wood door frames have been used in the project <p>Purchase orders, certificates have been submitted. However, since teak wood is not a rapidly renewable tree (>10 years), it cannot be considered as a low energy material. Calculation cannot be ascertained to determine the quantity of low energy material used in the internal doors, windows and frames. Hence, 1 point has been denied.</p>
8	8	6	6	-	Criterion 18 – Renewable energy utilization
					<p>Mandatory</p> <p>The intent of criterion 18 is to use renewable energy sources in buildings to reduce the use of conventional/fossil-fuel-based energy resources. To achieve points in criterion 18, the project must demonstrate installation of renewable energy system on site. The installed capacity of the system must be minimum 1% of the total connected load of internal artificial lighting and space conditioning. The project shall be awarded additional 1 – 4 points if the rated capacity of the proposed RE System meets annual energy requirements of equal to or more than 5% - 30% of internal lighting consumption. Additionally, project will be awarded 2 points if total energy generated by the On-site or Off-site, renewable energy system is equivalent to 100% or more of the total annual energy consumption for artificial lighting</p> <p>Compliant – Mandatory: The project has proposed a PV system of capacity 50 kWp. Load calculations have been submitted indicating that the total lighting (internal & external) and space conditioning load is 1,479.44 kW, of which lighting load is 697.44 kW and space conditioning load is 782 kW. 1% of the total load is 14.79 kW. Therefore, the capacity of the renewable system proposed for the project is greater than 1% of the lighting and space conditioning load. Copy of floated tender and drawing highlighting the location of solar PV panels have been submitted to show compliance. CPWD work order for the installation of 50 kWp on grid solar plant has been submitted. Hence, the project complies with the mandatory requirement of GRIHA and 2 points have been awarded.</p> <p>Optional: As per calculations submitted, total internal lighting energy consumption of the project is 2,38,114 kWh per annum and the energy generated from the 50 kWp capacity solar PV plant is 76,420 kWh per</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					annum. Hence, the project meets 32.09% of internal lighting consumption from the proposed RE system. Hence, 4 points have been awarded.
3	3	3	1	2	Criterion 19 – Renewable-energy-based hot water system
					<p>The intent of criterion 19 is to reduce dependency on conventional sources of energy to meet hot water demand of the site. To achieve 3 points in criterion 19, the project must demonstrate use of solar hot water heaters on site.</p> <p>Compliant – Optional: Solar hot water system (flat plate collector type) of a total of 16,000 lpd capacity was installed in the project. Details pertaining to the project requirement:</p> <ul style="list-style-type: none"> • Occupancy – 1175 • Hot water requirement of the project – 32,980 lpd <p>As per the RET Screen simulation screenshots submitted, project team has claimed that the energy savings in the project is 35,099 kWh and percentage reduction in energy demand due to solar hot water installation is 51.5%. However, the calculation submitted was incorrect. On re-calculating, energy savings was found to be less than 50%. Specification sheet and purchase order for the same have been submitted. Drawing indicating the location of hot water panels and the site photographs of the same is submitted. Site visit report compiled by GRIHA Council officials confirms the installation of solar hot water panels. Hence, 1 point has been awarded.</p>
2	2	2	2	-	Criterion 20 – Waste-water treatment
					<p>The intent of criterion 20 is provide a waste water treatment plant on site to promote re-use of waste water on site and reduce dependency on potable water.</p> <p>Compliant – Optional: Narrative has been submitted stating that Moving Bed Biofilm Reactor (MBBR) type STP of 140kLd capacity has been provided in the project. As per water balance calculations submitted, total inflow of waste water from faculty housing blocks, hostel blocks and classroom block into the STP is estimated to be 56.8 kLd. The STP is oversized. Technical drawing showing the process flow of the STP has been submitted. Sludge generated will be filter pressed and used as manure for horticulture. The expected inlet and outlet characteristics of the water are meeting CPCB standards. Site visit reports compiled by GRIHA Council officials confirm site compliances. Hence, 2 points have been awarded.</p>
5			3	2	Criterion 21 – Water recycle and reuse (including rainwater)



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>The intent of criterion 21 is to utilize treated water and rainwater for various applications (including groundwater recharge) to reduce the load on both the municipal supplies as well as the sewerage system, and to improve the groundwater table. To achieve points under criterion 21, the project must demonstrate use of treated waste water and/or rainwater to meet certain percentage of annual water demand. The project shall be awarded 1 – 3 points to demonstrate minimum 25% - 75% annual water reuse. Additional 2 points shall be awarded to recharge surplus rainwater into the aquifer.</p> <p>Compliant – Optional: As per the calculation submitted:</p> <ul style="list-style-type: none"> • Domestic water demand: 16,638.27 kL • Flushing demand: 4,754.27 kL • Landscape: 19,598.57 kL • HVAC make up water demand: 28,812.9 kL <p>Hence, the total annual water demand of the project is 69,804.45 kL. Quantity of rainwater stored: 55,305.04 kL Quantity of STP treated water available: 19,253.7 kL Total landscape and water demands are 24,352.84 kL, out of which 19,253.7 kL is met through the water treated in the STP, which is 79.06% of the demand. Remaining demand for landscaping and flushing, along with domestic and HVAC make up water demands is met from the stored rainwater in the reservoir, which adds up to 50,205.88 kL. Hence, the project meets 100% of the water demand through reuse of treated water and collected rainwater. Hence, 3 points have been awarded.</p> <p>Non-compliant – Optional: Project team has claimed non-applicability in this part of the criterion. However, this clause cannot be claimed as non-applicable as a natural reservoir of 50 kL capacity is being utilized to store rainwater. The project is not dependent on any other source of water to meet its water demand. Also, the ground water is being recharged through this reservoir. However, details regarding filtration media and grease traps have not been submitted. Hence, 2 points have been denied.</p>
1	1	1	1	-	<p>Criterion 22 – Reduction in waste during construction</p> <p>The intent of criterion 22 is to ensure maximum recovery and safe disposal of wastes generated during construction, and to reduce the burden on landfill. To achieve one point in criterion 22, the project must demonstrate adoption of measures to segregate waste on-site into inert, chemical or hazardous wastes; reuse/recycle of segregated wastes; and safe disposal of inert waste.</p> <p>Compliant –</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>Optional: Narrative has been submitted stating that on-site segregation of the steel and iron scrap, cement bags, stone and marble pieces, packing materials, debris, etc. were done and the recyclable materials were sent for recycling through scrap vendor. It is also stated that empty cement bags, packing materials and waste testing concrete blocks were reused in the project. Challans, gate passes and photographs have been submitted to demonstrate compliance. Site visit reports compiled by GRIHA Council officials confirm site compliance. Hence, 1 point has been awarded.</p>
1	1	1	1	-	Criterion 23 – Efficient waste segregation
					<p>The intent of the criterion is to promote segregation of waste for efficient resource recovery. To achieve one point in criterion 23, multi colored bins must be provided in the building to collect different categories of waste generated at source.</p> <p>Compliant – Optional: Narrative and drawings have been submitted demonstrating provision of multicolored bins at every floor for segregation of non-biodegradable waste (yellow bins), biodegradable waste (green bins) and e-waste / hazardous waste (red bins) in all blocks. Site visit reports compiled by GRIHA Council officials, confirms the above. Hence, 1 point has been awarded.</p>
1	1	1	1	-	Criterion 24 – Storage and disposal of wastes
					<p>The intent of criterion 24 is to prevent the mixing of segregated waste before processing or disposal. To achieve 1 point in criterion 24, a separate space must be allocated for collected waste before transferring it to the recycling/disposal stations.</p> <p>Compliant – Optional: Narrative has been submitted stating that a centralized waste management facility was provided within the site to store segregated waste after door to door collection of waste from building levels is done. Site plan has been submitted indicating the location of storage and segregation shed, incinerator and waste composter. Copy of agreement made with recycler for collecting of recycling and disposal material generated from the buildings has been submitted. Photographs of the facilities have been submitted. Site visit reports compiled by GRIHA Council officials confirm site compliances. Hence, 1 point has been awarded.</p>
2	-	-	-	-	Criterion 25 – Resource recovery from waste



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>The intent of criterion 25 is to ensure that organic waste generated on site is treated or disposed properly. To support compliance, the project must demonstrate measures to treat organic waste on site.</p> <p>Not-applicable - Optional: Narrative has been submitted stating that an organic waste converter of 250 kg/day capacity has been installed on site. As per the calculation submitted, for an occupancy of 1175 (641 residential + 534 institutional), total waste generated in the project is 238.23 kg, out of which 95.29 kg is organic waste. Drawing has been submitted highlighting the location of the OWC, along with its technical specifications, purchase order and photographs. By-product from the OWC will be used as manure for landscaping. Site visit reports compiled by GRIHA Council officials confirm the same. However, this criterion will not be applicable to the project, since the organic waste generated per day is less than 100 kg. Hence, 2 points are not applicable.</p>
3	3	3	2	1	<p>Criterion 26 - Use of low VOC Paints/adhesives/sealants</p> <p>The intent of criterion 26 is to select low-VOC (Volatile organic compound) paints, adhesives and sealants to ensure good indoor air quality. To achieve points in criterion 26 the project must demonstrate use of 100% low-VOC paints; use of 100% low-VOC paints adhesives and sealants; and use of composite wood products with no added urea formaldehyde.</p> <p>Compliant - Optional: Narrative, specification sheets and purchase order have been submitted to demonstrate use of 100% low-VOC paints, adhesives and sealants; and use of composite wood products with no added urea formaldehyde. Materials used and their VOC content/resin are as follows: Paints and Primers:</p> <ul style="list-style-type: none"> • Rangoli Total care emulsion = 48.01 g/L • Breathe Easy Enamel ≤50 g/L • Firestone Quick Prime Plus < 664 g/L • BP White Primer = 4.51 g/L <p>Composite wood products:</p> <ul style="list-style-type: none"> • Kitply plyboard has been used in the project. Purchase order of the ply boards is submitted. Link to the website is mentioned for details, as per which, ply boards are Phenol Formaldehyde bonded. <p>Therefore, paints used in the project are low-VOC and the composite wood used has no urea formaldehyde resin. Hence, 2 points have been awarded.</p> <p>Non-compliant - Optional: Adhesives and sealants:</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<ul style="list-style-type: none"> • Pidilite Fevicol = 50 g/L (according to narrative) and 25 g/L as per certificate submitted by Pidilite. Manufacturer certificate has been submitted, however, the same cannot be accepted. • Fixoblock – AAC Adhesive = Technical specification sheet has been submitted; however, VOC level were not mentioned in the same. • Firestone Ultraply – Bonding Adhesive = 633 g/L. However, the VOC level is non-compliant. • Firestone lap sealant < 250 g/L • Firestone water block sealant = 176 g/L <p>Hence, 1 point has been denied.</p>
1	1	1	1	-	<p>Criterion 27 – Minimize ozone depleting substances (ODP)</p> <p>Mandatory The intent of criterion 27 is to eliminate or control the release of ozone-depleting substances (CFCs, HCFCs and Halon) into the atmosphere. To achieve points in criterion 27, the project must demonstrate use of 100% CFC and HCFC free insulation; CFC- free equipment for refrigeration and air conditioning; and Halon-free fire suppression systems in the building.</p> <p>Compliant – Mandatory: Narrative has been submitted stating that the following materials were used in the project: Insulation:</p> <ul style="list-style-type: none"> • Duct insulation: Nitrile rubber • Piping insulation: Extended polystyrene (EPS) • Solar water heater piping insulation: Nitrile rubber <p>Refrigerant:</p> <ul style="list-style-type: none"> • R-134a was used as a refrigerant in the chiller <p>Fire-extinguishers:</p> <ul style="list-style-type: none"> • CO₂ type • Water type <p>The products used in the project are CFC, HCFC and halon free. Specification sheets, photographs and purchase orders have been submitted to demonstrate compliance. Site visit reports compiled by GRIHA Council officials confirm the use of these materials. Hence, the project complies with the mandatory requirement of the rating and 1 point has been awarded.</p>
2	2	2	2	-	<p>Criterion 28 – Ensure water quality</p> <p>Mandatory The intent of criterion 28 is to ensure supply of good quality potable water for drinking/washing purposes and the quality of treated waste water confirms to IS standards. To achieve 2 points in criterion 28, the project must comply with requirements of criterion 28.</p> <p>Compliant –</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>Mandatory: Narrative has been submitted stating that the source of water for the project is from the reservoir of 50 kL capacity. As per the test report submitted, the WTP treated water quality from the reservoir is in compliance with IS 10500-2012. STP treated water test report has been submitted, which conform to the BIS standards. Sampling plan has been submitted as per which, the WTP treated water will be tested every 6 months.</p> <p>Hence, the project complies with the mandatory requirement of the rating and 2 points have been awarded.</p>
2	2	2	2	-	<p>Criterion 29 – Acceptable outdoor and indoor noise levels</p> <p>The intent of the criterion is to enhance comfort by providing acceptable levels of outdoor and indoor noise levels. To achieve 2 points in criterion 29, outdoor noise level must confirm to acceptable limits set in Central Pollution Control Board (CPCB) – Environmental Standards and indoor noise level must confirm to acceptable limits set in NBC 2005.</p> <p>Compliant – Optional: Noise level tests were conducted outside each façade of all the buildings. Noise test report has been submitted, where day time values are less than 55dB and 50 dB for the residential blocks and classrooms (silent zone) respectively and night time noise levels are less than 45 dB and 40 dB for the residential blocks and classrooms (silent zone) respectively. Indoor noise levels recorded at various locations in the building. As per the noise test report submitted, the indoor noise level range for classrooms and residential buildings are 40-45 dB and 35-40 dB respectively. Therefore, the outdoor noise levels recorded in the project are compliant with the standards set by CPCB. Also, indoor noise levels are within acceptable limits as defined in NBC. Hence, 2 points have been awarded.</p>
1	1	1	1	-	<p>Criterion 30 – Tobacco smoke control</p> <p>Mandatory The intent of criterion 30 is to ensure zero-exposure of the non-smoking occupants of a building to passive smoking. To achieve 1 point in criterion 30, the project must provide document to ensure company policy for ban/prohibition of smoking within the building premises. In case there is provision for smoking, separate smoking zones must be designed for both air-conditioned and non-air-conditioned buildings.</p> <p>Compliant – Mandatory: Declaration has been submitted stating that smoking is prohibited in the building premises. 'No smoking' signs were displayed at multiple locations in the building. In addition, a no-smoking policy has been issued. Photographs of the signage and penalty clauses have been submitted. Site visit report compiled by GRIHA Council officials confirms the same.</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					Hence, the project complies with the mandatory requirement of GRIHA and 1 point has been awarded.
1	1	1	1	-	<p>Criterion 31 – Provide at least the minimum level of accessibility for person with disabilities</p> <p>The intent of criterion 31 is to ensure accessibility and usability of the building and its facilities by employees, visitors, and clients with disabilities. To achieve 1 point in criterion 31, the project must comply with planning and design guidelines as outlined in NBC 2005.</p> <p>Compliant – Optional: Declaration has been submitted stating that the project complies with NBC 2005 annex D. The following measures have been adopted to ensure minimum level of accessibility for the differently-abled person:</p> <ul style="list-style-type: none"> • Ramps: Ramps with double height grab bars were provided at the entrance of the hostel blocks and classroom block. • Parking: Reserved parking for DA was provided near the entry of the classroom building. • Toilets: DA toilets were provided on each floor of the classrooms/dining block. It was not provided in the hostel block because rooms for the differently abled were provided in existing hostel blocks, as stated by the project team. • Lifts: Lifts were equipped with braille numbering, audio assistance and grab bars inside the lift car. <p>Necessary documents have been submitted to demonstrate compliance. Site visit report compiled by GRIHA Council officials confirms the same. Hence, 1 point has been awarded.</p>
-	-	-	-	-	<p>Criterion 32 – Audit and validation</p> <p><i>Mandatory (to be evaluated post occupancy)</i> The intent of criterion 32 is to validate performance of the energy and environmental systems in the building as predicted during the design and development stages. There is no point allocation for criterion 32. Audit must be conducted within 2 years of full occupancy of the building and data must be submitted for 12 months. If the audit data corresponds with the data and documents provided at the time of award of provisional rating, the Final GRIHA rating will be awarded to the project. In case audit data does not correspond with the data and documents provided at the time of award of provisional rating, GRIHA Provisional Rating will be taken back from the project.</p>
2	2	2	2	-	<p>Criterion 33 – Operation and maintenance</p> <p>Mandatory</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<p>The intent of criterion 33 is to ascertain efficient functioning of the building's systems through regular monitoring of electrical and mechanical systems after commissioning and implementation of appropriate operation and maintenance program. To achieve 2 points in criterion 33, the project must ensure regular monitoring of building's energy and water consumption by installing digital meters; provision of core facility/service management group responsible for O&M of building's systems; and provision of fully documented O&M manual/CD/Multimedia listing best practices for the building's systems.</p> <p>Compliant – Mandatory: The project has installed energy meters at building levels for hostels and classroom block and at unit level for the faculty housing blocks. Also, water meters were provided to monitor the domestic and flushing water uses in the project at each building level. Site visit report compiled by GRIHA Council officials confirms site compliance. Extracts of tender copies have been submitted for the various electro-mechanical systems (such as HVAC, STP & WTP, PV panels, incinerator, OWC) installed in the project where it is mentioned that supply, installation, commissioning and maintenance would be under the scope of the contractor /vendor. AMC of HVAC has been formed with the contractors for a period of 10 years. O&M manuals for the various systems installed in the project (such as STP, WTP, motors, brine chiller, incinerator, OWC, PV panels, willow pumps, heat recovery wheel, lifts) have been submitted. Site visit report compiled by GRIHA Council officials confirms the same. Hence, the project complies with the mandatory requirement of GRIHA and 2 points have been awarded.</p>
4	4	4	4	-	Criterion 34 – Innovation
					<p>The intent of criterion 34 is to promote awareness/adoption of significant environmental issues that are innovative and contribute to sustainability of the project but not covered under the above 33 criteria of the rating system. The applied measures shall have adequate demonstrated impacts on the owner or the occupants of the building and to the community as a whole. The award of points in criterion 34 is subject to evaluator's discretion.</p> <p>Compliant – Optional: The following strategies have been adopted to demonstrate compliance to this criterion:</p> <ul style="list-style-type: none"> Provision of Electric Vehicle charging points on site: Narrative has been submitted stating that the 5% of the total car parking (6 slots) is reserved for alternate fuel vehicles and are equipped with 16 amp charging points for e-vehicle. Drawing indicating the location of charging points is submitted along with the site photographs confirming the same. <p>Hence, 1 point has been awarded.</p>



Total	Applicable	Attempted	Awarded	Denied	Criterion
					<ul style="list-style-type: none"> Green Education: Narrative has been submitted stating that green education program has been developed to impart green education to the occupants. The program consists of green posters and green tour for visitors. Posters, map indicating the tour route and the program details were submitted. Hence, 1 point has been awarded. Using raw material from site: Narrative has been submitted stating that reservoirs have been constructed on site in earlier phases, during the excavation of which, huge boulders were extracted. The stones were reused to construct the gabion retaining wall of the reservoir in phase V. 1400 m³ stones were extracted which constituted 75.2% of the requirement for the retaining wall. Purchase order of the remaining quantity of stones, measurement challans of extracted stones and photographs indicating the same has been submitted. Hence, 1 point has been awarded. Green housekeeping materials: Green cleaning policy for housekeeping has been developed indicating the use of bio-degradable chemicals for cleaning. List of materials and the policy for the same are submitted. Hence, 1 point has been awarded.
100	98	95+4 (Innovation points)	86+4 (Innovation points)	9	Score - 92% (90/98 Points) The project has been awarded GRIHA Five Star Provisional Rating. Break up of points - 86 + 4 (innovation points) Please note: 4 Points of criterion 34 are not considered in the total marks. They are innovation points.



List of abbreviations used

➤ AHU	Air Handling Unit
➤ BEE	Bureau of Energy Efficiency
➤ CD	Compact Disc
➤ CFC	Chlorofluorocarbon
➤ COP	Coefficient of Performance
➤ CO ₂	Carbon di Oxide
➤ CPCB	Central Pollution Control Board
➤ DG	Diesel Generator
➤ ECBC	Energy Conservation Building Code
➤ EPI	Energy Performance Index
➤ EPS	Expanded polystyrene
➤ GRIHA	Green Rating for Integrated Habitat Assessment
➤ HCFC	Hydro chlorofluorocarbons
➤ HVAC	Heating, Ventilation and Air conditioning
➤ HPSV	High Pressure Sodium Vapour
➤ MDF	Medium-Density Fibreboard
➤ MNRE	Ministry of New and Renewable Energy
➤ NBC	National Building Code
➤ ODP	Ozone Depleting Potential
➤ O&M	Operation and Maintenance
➤ PERT	Program Evaluation and Review Technique
➤ PMC	Project Management Consultant
➤ PPC	Portland Pozzolana Cement
➤ PV	Photovoltaic
➤ RE	Renewable Energy
➤ RMC	Ready-Mix Concrete
➤ SHGC	Solar Heat Gain Coefficient
➤ TERI	The Energy And Resources Institute
➤ UDPFI	Urban Development Plans Formulation and Implementation
➤ VAM	Vapour Absorption Machine
➤ VFD	Variable Frequency Drive
➤ VLT	Visible Light Transmittance
➤ VOC	Volatile Organic Compound
➤ WWR	Window to wall ratio
➤ WTP	Water Treatment Plant
➤ XPS	Extruded polystyrene

List of units used

➤ bgl	below ground level
➤ KLD	Kilo Litre Per Day
➤ km/h	Kilometre Per Hour
➤ kW	Kilo Watt
➤ kWh	Kilo Watt Hour
➤ kWh/m ² /yr	Kilo Watt Hour/ meter ² /year
➤ kWh/yr	Kilo Watt Hour/year
➤ kWp	Kilo Watt Peak
➤ LPD	Litre Per Day
➤ LPF	Litre Per Flush
➤ LPM	Litre Per Minute



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