University of Petroleum and Energy Studies, Dehradun

<table>
<thead>
<tr>
<th>Location</th>
<th>Bidoli, Dehradun, Uttarakhand</th>
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<tbody>
<tr>
<td>Site Area</td>
<td>1,08,717 m²</td>
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<tr>
<td>Built up Area</td>
<td>33,787.34 m²</td>
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<tr>
<td>Air-conditioned Area</td>
<td>11,792 m²</td>
</tr>
<tr>
<td>Non Air-conditioned Area</td>
<td>26,476 m²</td>
</tr>
<tr>
<td>Energy Consumption Reduction</td>
<td>42.73% from GRIHA benchmark</td>
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<tr>
<td>Water Consumption Reduction</td>
<td>33.16% from GRIHA benchmark</td>
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<tr>
<td>EPI</td>
<td>35.22 kWh/m²/year</td>
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<tr>
<td>Occupancy hours</td>
<td>24 hours (Residential) &amp; 10 hours (academic)</td>
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<tr>
<td>Renewable energy installed on site</td>
<td>100kWP</td>
</tr>
<tr>
<td>GRIHA final rating</td>
<td>4 Stars</td>
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The following strategies were adopted to reduce the impact of the proposed building on natural environment:

**Sustainable Site Planning:**
- Barricading of the site to prevent air pollution.
- Existing trees preserved and native species of trees planted.
- Top soil preserved and protected for later use.
- Minimum damage to the existing topography of the site.

**Reduction in water consumption (compared to GRIHA benchmark):**
- Reduction in building water consumption by use of low-flow fixtures.
- 33.16% reduction in landscape water consumption by using native species and efficient irrigation systems.
- Waste water treated and re-used for landscape water requirement.
- More than 50% of the paved area topped with lose aggregate to allow penetration of water.

**Reduction in energy consumption (compared to GRIHA benchmark) while maintaining occupant comfort:**
- 40% reduction in annual energy consumption as compared to a conventional building.
- 45% of the total area is day-lighted.
- External shading and efficient glazing systems to reduce solar heat gain and glare-free day-light.
- ECBC Compliant envelope to reduce space conditioning loads.

**Renewable energy technologies installed on site:**
- 30.1% of annual energy requirement for artificial lighting met by solar energy.
- Total installed capacity of 100kWp.
- 95.3% annual energy saved by solar hot water system.

**Use of low-energy/green materials:**
- Use of Portland Pozzolana cement in structural concrete to reduce embodied energy of the building.
- Use of low energy kota stone in flooring.
- Energy savings of 54% in structural application and 22% for non-structural applications.

**Integrated Design Team:**
- Client: University of Petroleum & Energy Studies, Dehradun
- Architect: Design Associates Inc.
- HVAC System: Daikin India
- Electrical Consultant: Design Centre Consulting Engineers Pvt. Ltd.
- Interiors: Godrej Interio, IRGO
- GRIHA Rating Consultant: GreenTree Building Energy (P) Ltd.

**Building performance as per audit report:**

**Energy**
- Energy generated through solar PV - 127,614 KWh/year.
- Final EPI achieved - 34 KWh/m²/year.
- Reduction in EPI from proposed case - 45%.
- Thermal comfort is met as per NBC 2005.

**Water and waste**
- Portable water test report indicates conformity to IS code.
- Treated water test report indicates conformity to IS code.

**Noise level**
- Outdoor noise levels are within acceptable limits as per CPCB.
- Indoor noise levels are within acceptable limits as per NBC 2005.