ECBC COMPLIANCE AND PASSIVE DESIGN OF ASSAM WATER RESEARCH AND MANAGEMENT INSTITUTE (AWRMI) GUWAHATI, ASSAM

FOR FREMMA, GOVT OF ASSAM,
DHI(WATER AND ENVIRONMENT PVT LTD)

BY CADMETRIC CONSULTING
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CONCEPTUAL 3D VISUALISATION

PROJECT BACKGOUND

BACKGROUND INFORMATION

- The Assam Water Research and Management Institute (AWRMI) is conceived for FREMMA (Flood and River Bank Erosion Management Agency Assam. Govt of Assam) and funded by ADB as part of the greater mandate to improve the management and understanding of Water resources' in the region.
- DHI(I) Water and Environment Pvt Ltd is the Consultant appointed by FREMAA for the entire Institutional Strengthening component of the Project and this building is a key part of it.
- The Building is to house the headquarters of FREMAA and other agencies that will be working in this field.
- The building is conceived as a Green Building and certification from GRIHA is in the process.
- This building will be among one of the few Green Buildings in the region.
- It has a built up area of around 80000 Sqft including a 200 Seat Seminar Hall.
- It is spread over 5 floors with special emphasis on natural lighting and passive shading arrangements.

PRESENTATION POINTS

ECBC CODE AND THE ENERGY EFFICIENCY

- The objective is for improvement in Energy Efficiency of Buildings.
- It can be achieved through a combination of Planning and detailed Building envelope designing.

ROLE OF PASSIVE DESIGN OF BUILDINGS FOR ECBC COMPLIANCE

- The first step is the Building Envelope Design .
- Objective to optimise energy performance of Buildings by Passive means.
- ECBC compliance shall be that much easier with a good envelope and Building design

PROJECT BACKGOUND

SITE FEATURES

- The Site is located in the Southern part of City abutting the NH bypass.
- It had some dilapidated and abandoned quarters, which were dismantled to site this building.
- The existing trees were left undisturbed and only a few trees were effected.

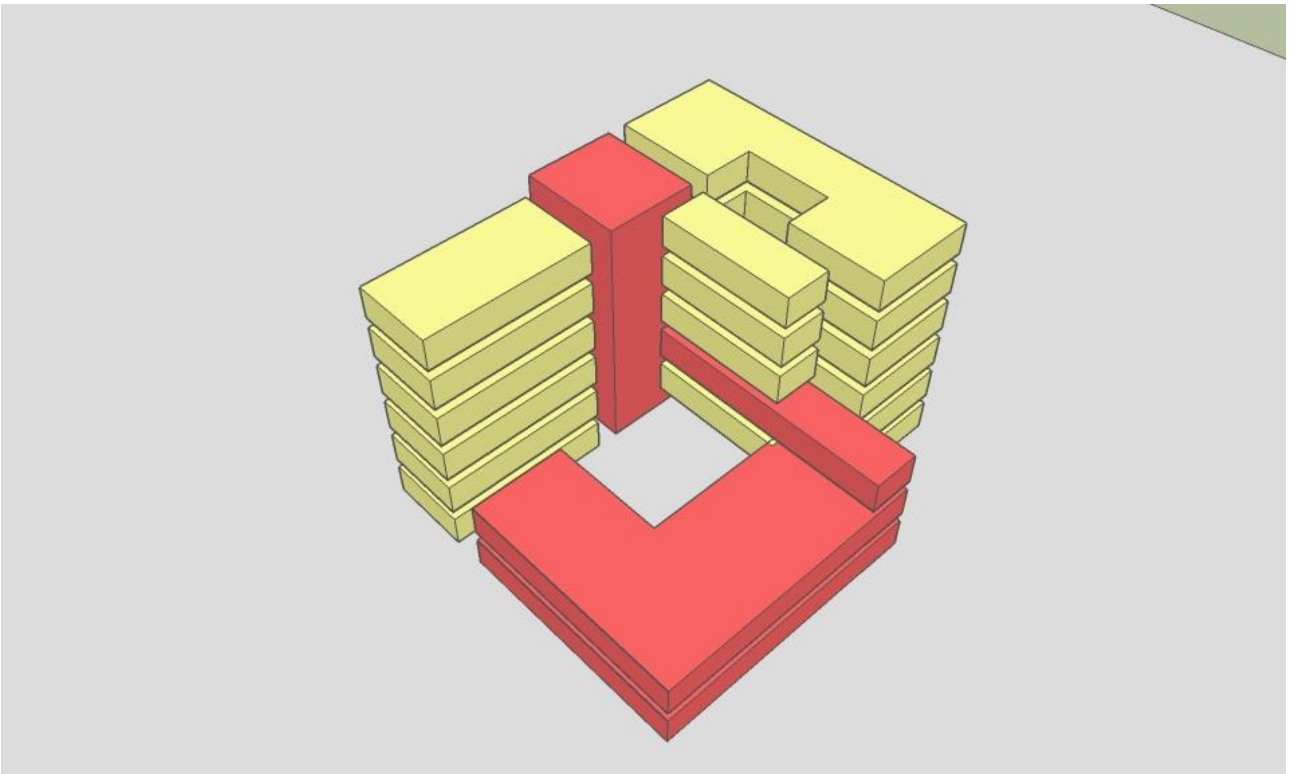
Fig: Site Plan with Site Features Retained

SPATIAL PLANNING

PLANNING METHODOLOGY AND ECBC SIGNIFICANCE

- Because of the nature of the working spaces , it was necessary to plan the building such that it can work as fragmented and as a whole also.
- The sizes of office spaces were determined by natural light penetration depth and hence it was mostly linear in nature.
- Emphasis was to have non glare lighting in these areas.
- The design was to enable ease of movement within the complex and also create unhindered movement to all the common areas.
- Common areas overlook the Green spaces and courtyards

Fig: Distribution of Common areas and Office areas



PASSIVE ENVIORNMENTAL DESIGN

PASSIVE DESIGN PROCESS

- The principle design focus was to design the building in such a way that the energy saving can be achieved thru passive means as much as possible.
- The design process involved creating of various models for shading analysis.
- As the building was south facing, the sun path study was used to create the building volumes and shading devices.

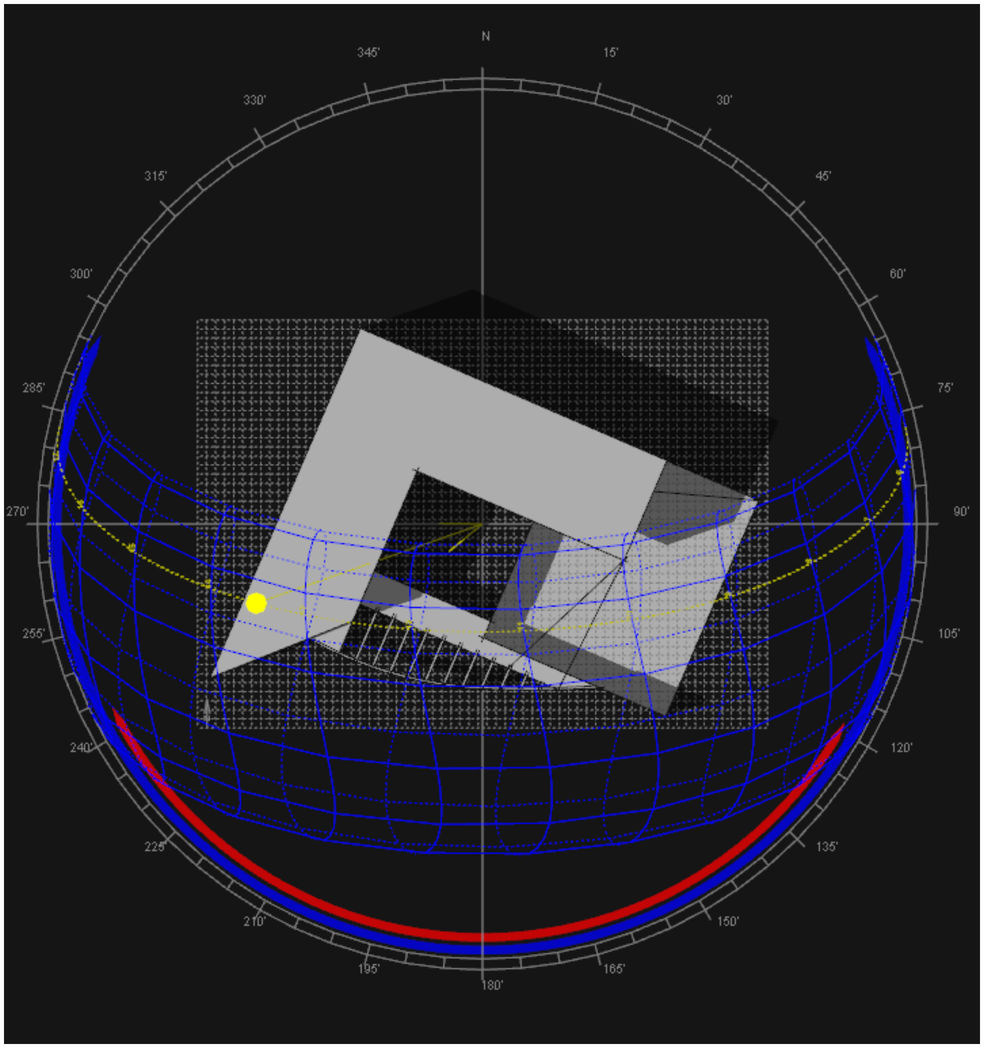


Fig: Pre Design Shading Models

Fig: Sun Path Study Model

BUILDING MASSING AND NATURAL LIGHTING

DESIGN PROCESS- DAY LIGHTING

- The spatial organisation of the building was done as per the office space requirement and with emphasis on day lighting.
- The result was to create the spaces around two courtyards which merge at various levels to create a openness and create glare free lighting
- The seminar Hall has north lighting provision to cater for general ambient lighting during seminars etc.

FIG : section Showing Day Lighting Strategy

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Fig: Section Showing Day Lighting Strategy

ENERGY EFFICIENT DESIGN

LOW ENERGY REQUIREMENT

- A large component of any building energy need is its cooling needs.
- This building and its energy needs is considerably reduced by various factors.
- First the passive shading devices and in built insulated walls considerable reduce the energy needs.
- The glass are double glass with air gap in between to further cut down heat gain.

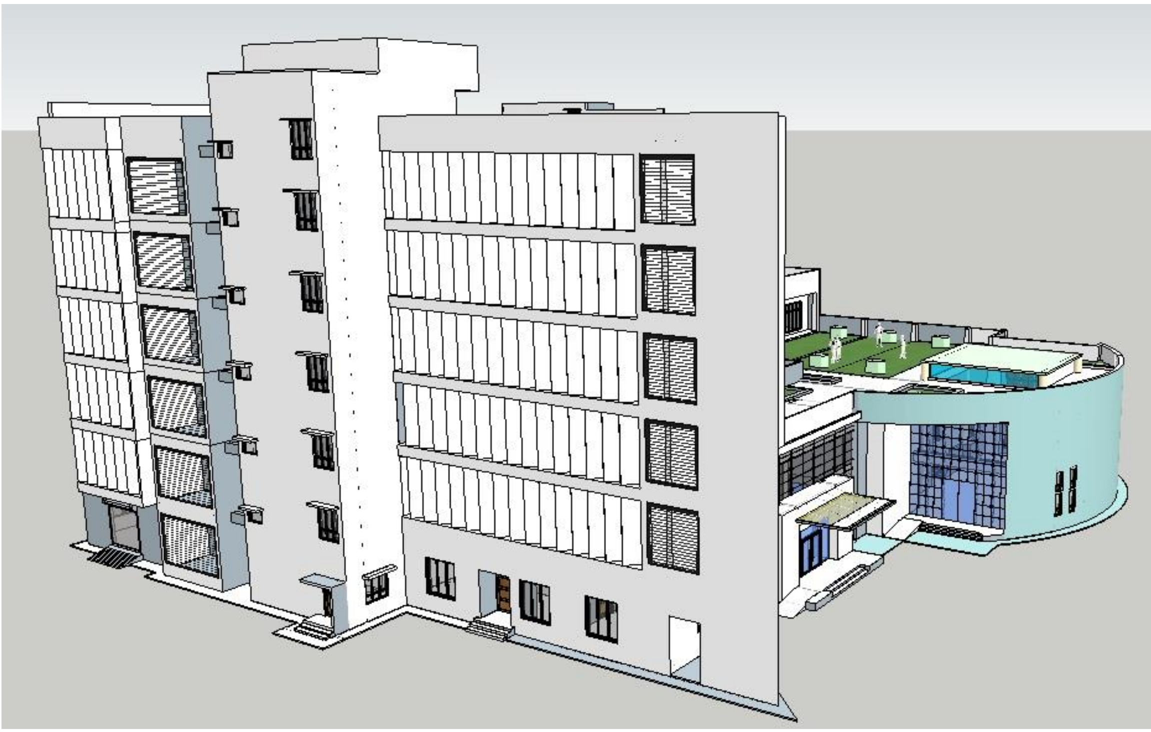

Fig: West side with Vertical concrete louvers

ENERGY EFFICIENT DESIGN

- These measure effectively reduce the installed cooling needs by about 30%
- The operational expenses are also reduced because of the low heat gain fro the walls and glass.
- Additionally the building is equipped with VRF system having multiple compressors. In VRF with low cooling load less numbers of compressors runs at a time. Moreover DC inverter is added to the compressor which supports variable motor speed and thus variable refrigerant flow rather than simply on/off operation. Thus it works on needed rate and allowing considerable energy savings. The system have the capacity to save 30-40% of energy than normal Unitary System

Fig: East and south side with horizontal shading

ENERGY EFFICIENCT DESIGN

LOW ENERGY REQUIREMENT

- In the seminar hall heat recovery wheels are to be installed to control the humidity and thus it reduces the latent load generated by the occupants. Moreover the wheel has the capacity to exchange heat with fresh air and exhaust air coming out from the hall and a reasonable amount of energy will be saved.
- The exhaust air coming out from the conditioned area are allowed to flow through the non conditioned ancillary area having sufficient fresh air. This practice will keep the non conditioned area with lesser ambient temperature during summer without any power consumption of additional cooling coil.
- The Building is also equipped with a roof solar energy generation system that is 20% of the load capacity.
- A dedicated battery bank to cater to external lighting thru battery bank in the evening hours helps is cutting down on the energy costs.
- The Electrical fittings are equipped with daylight sensors to restrict use during daylight hours.
- Some rooms are also fitted with occupancy sensors to cut down on the energy needs.

ENERGY EFFICIENCT DESIGN

Fig : Use of Pre Cooled Air Exhaust for Fresh Air

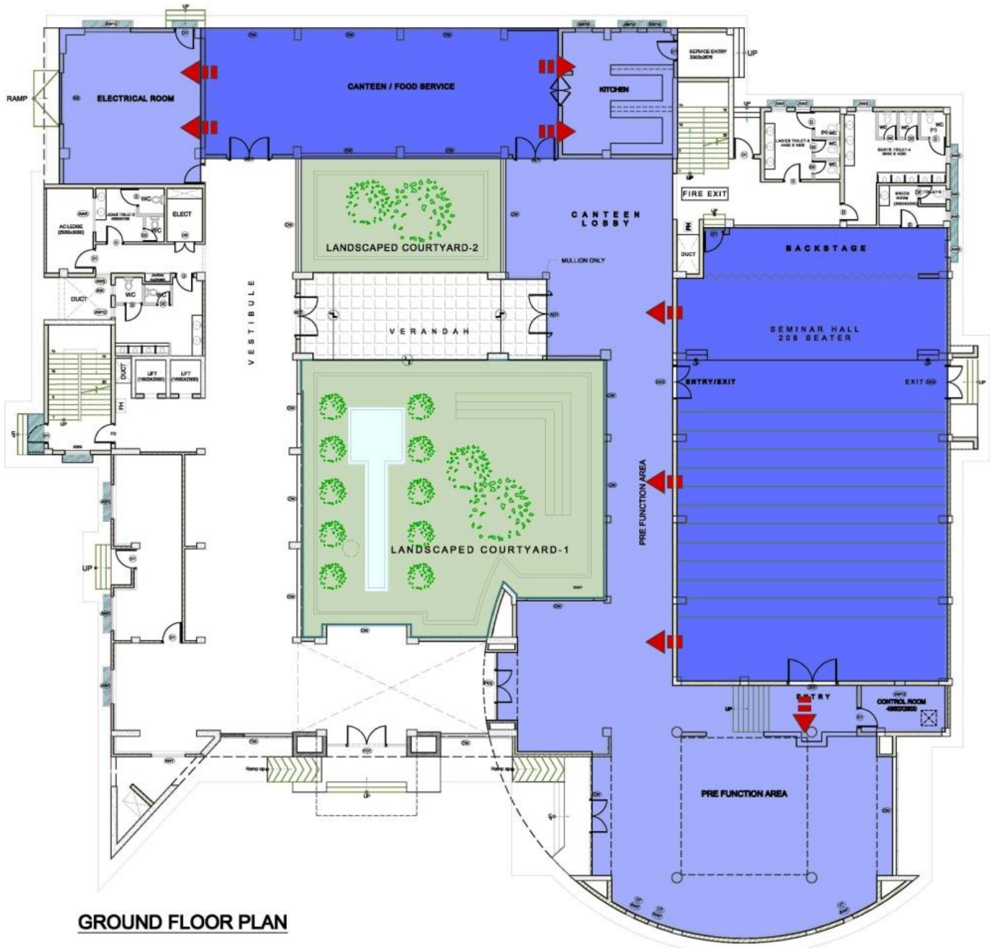

Fig : Solar Energy Use

ENERGY EFFICIENCT DESIGN

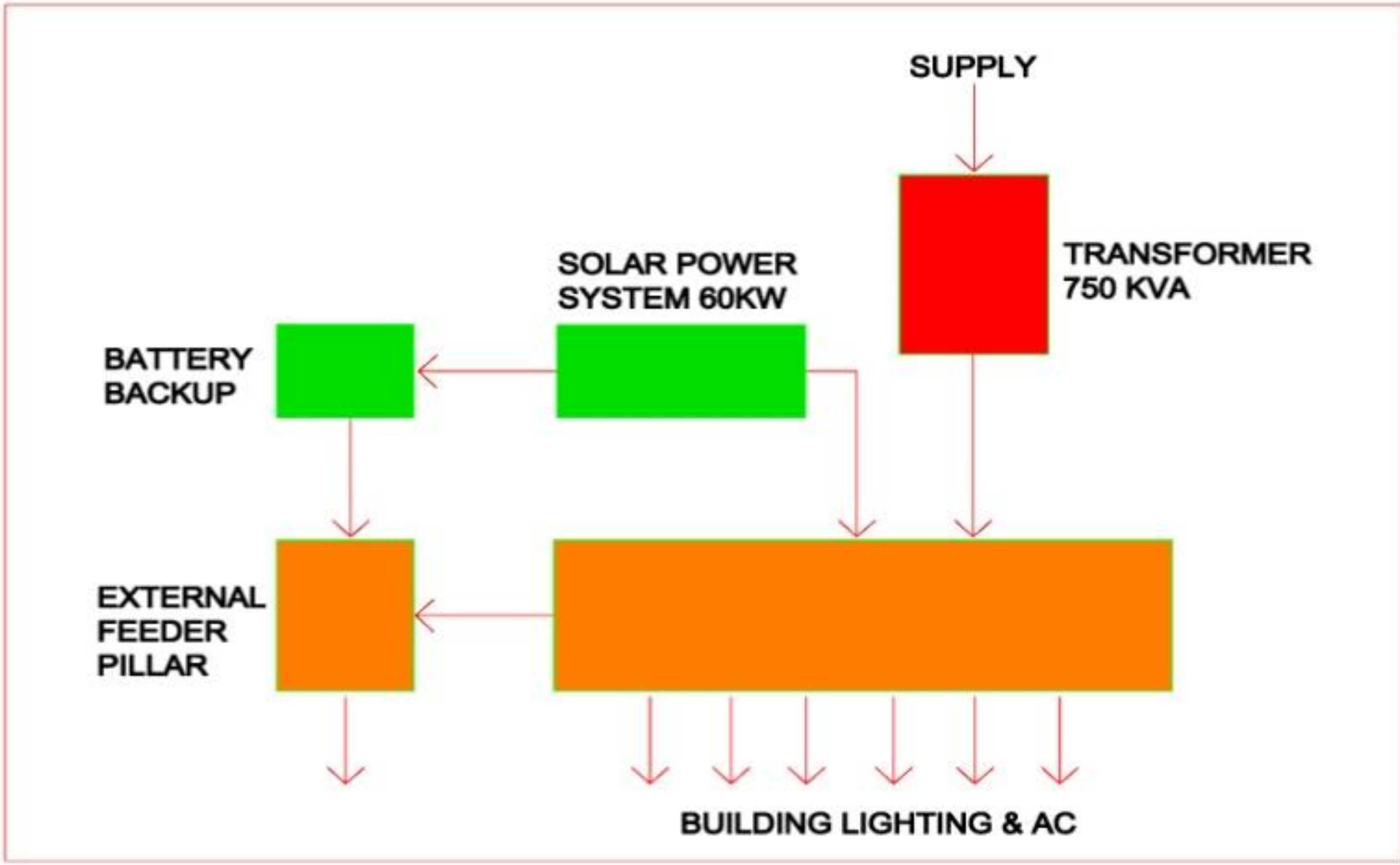

Fig : Solar Energy Use

ENERGY EFFICIENCT DESIGN

KEY BUILDING COMPONENTS

- All external wall are insulated type with **50mm CFC/HCFC Free Polyuretahne Foam Slab Insulation of Lyods-Superfoam**
- **Vapour barrier laid over External Brick Wall on the Inside shall be of 120-150 GSM Plastic Sheet** sensors to cut down on the energy needs.
- Glazed Panel Shutters are 24 mm thick Hermatically Sealed Double Glass Units for Vision Panels and 6 mm thick Single Glass for Spandrel Panels;

SITE MANAGEMENT

SITE MANAGEMENT MEASURES

- The site has large open areas and they have been used for rain water retention and also specific areas for stock yards etc.
- An separate enclosure is kept for keeping the top soil available in the site for future use for green areas.
- Adequate facilities for workers at site including quarters and toilets etc are provided
- Tree guards with Brick enclosures are created around the building for safety of the trees.

Fig: Construction Site and Surroundings

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