



CLIMATE CHANGE:

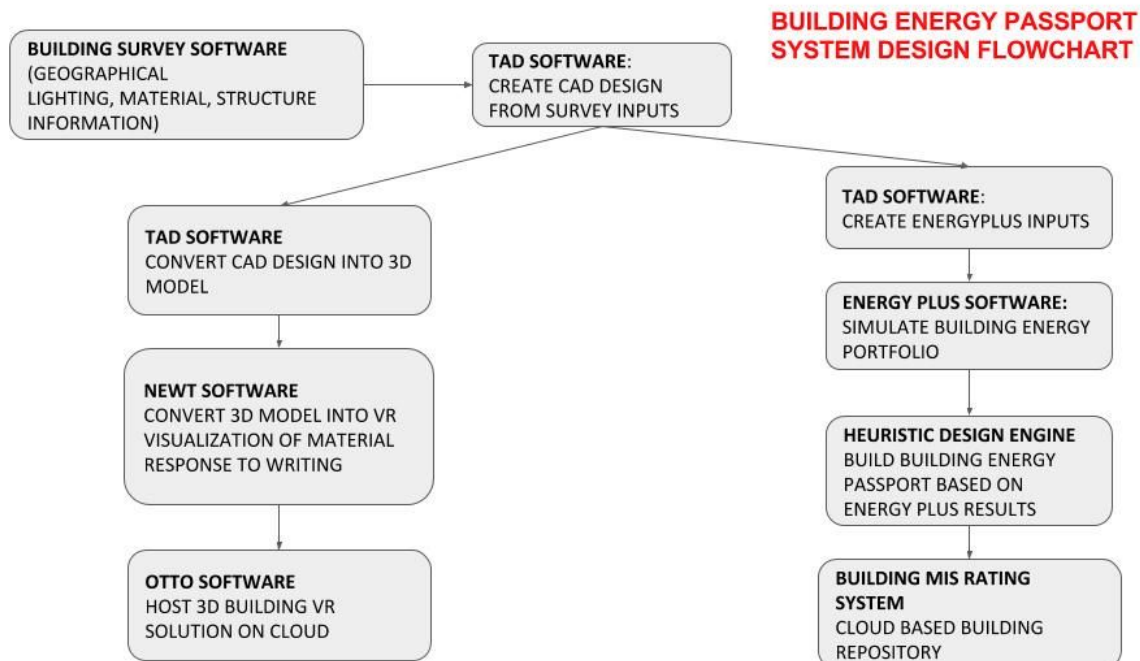
ENERGY CONSERVATION BUILDING CODE



Task I: Development of BEP tool for Energy Conservation Building Code (ECBC) Compliance and BEE star labelling for buildings

The following flowchart describes the flowchart of designing Building Energy Passport System. Each block is a software service which performs the tasks assigned. The description of softwares are as follows:

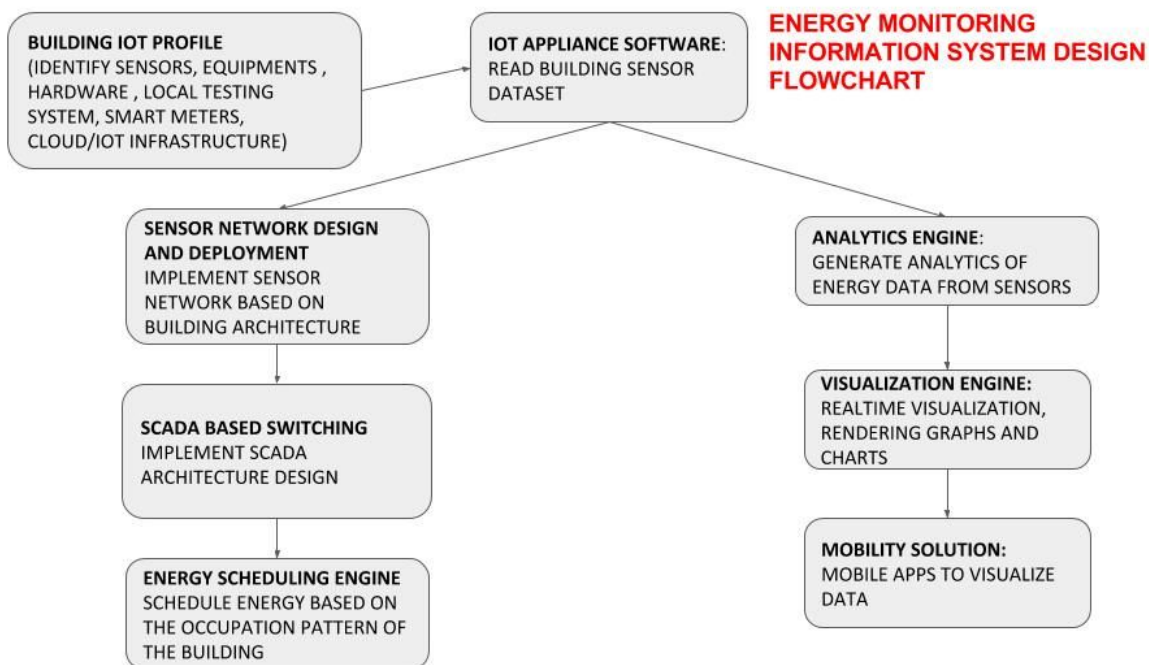
- 1) Building Survey System: Will enable to log building related various survey and make it enable to other systems via cloud infrastructure
- 2) TAD System: Will enable to create CAD design on relevant paraments from previous step.
- 3) Energy Plus Software: Will enable to use CAD design and relevant paraments from previous step 1 to create Energy Passport of building.
- 4) Heuristic Design Engine: Will design rule-based heuristics engine using Energy Passport of building and identify and accommodate various scenario possible.
- 5) Building MIS Engine: Will use previous step to design a objective rating system.
- 6) NEWT System: Will convert CAD design into virtual reality (VR) design elements.
- 7) Otoo System: Will create visualization and render using previous step VR elements.



Task II: Develop Energy Monitoring Information System (EMIS)

The following flowchart describes the flowchart of designing Energy Monitoring Information System. Each block is a software service which performs the tasks assigned. The description of softwares are as follows:

- 1) Building IOT Profile: Will identify the need of H/w component and IoT infrastructure requirement.
- 2) IOT Appliance Software: Will fetch real time data acquisition on cloud from devices.
- 3) Analytics Engine: Will use data from previous step and provide historical analytics with some level of predictive component embedded into analytics.
- 4) Visualization Engine: Will render and create charting etc. for better UX component.
- 5) Mobility Solution Engine: Will provide cloud based analytics into mobile channel
- 6) Sensor Network Design Solution: Will enable to provide low latency and failsafe deployment of sensor and efficient use of communication channels protocols.
- 7) Scada Switching Module: Will cater and enable any switching need and take control action possible for various scenario which may occur.
- 8) Energy Scheduling Engine: Will enable to take some actions based on analytical inferences and results in real time.



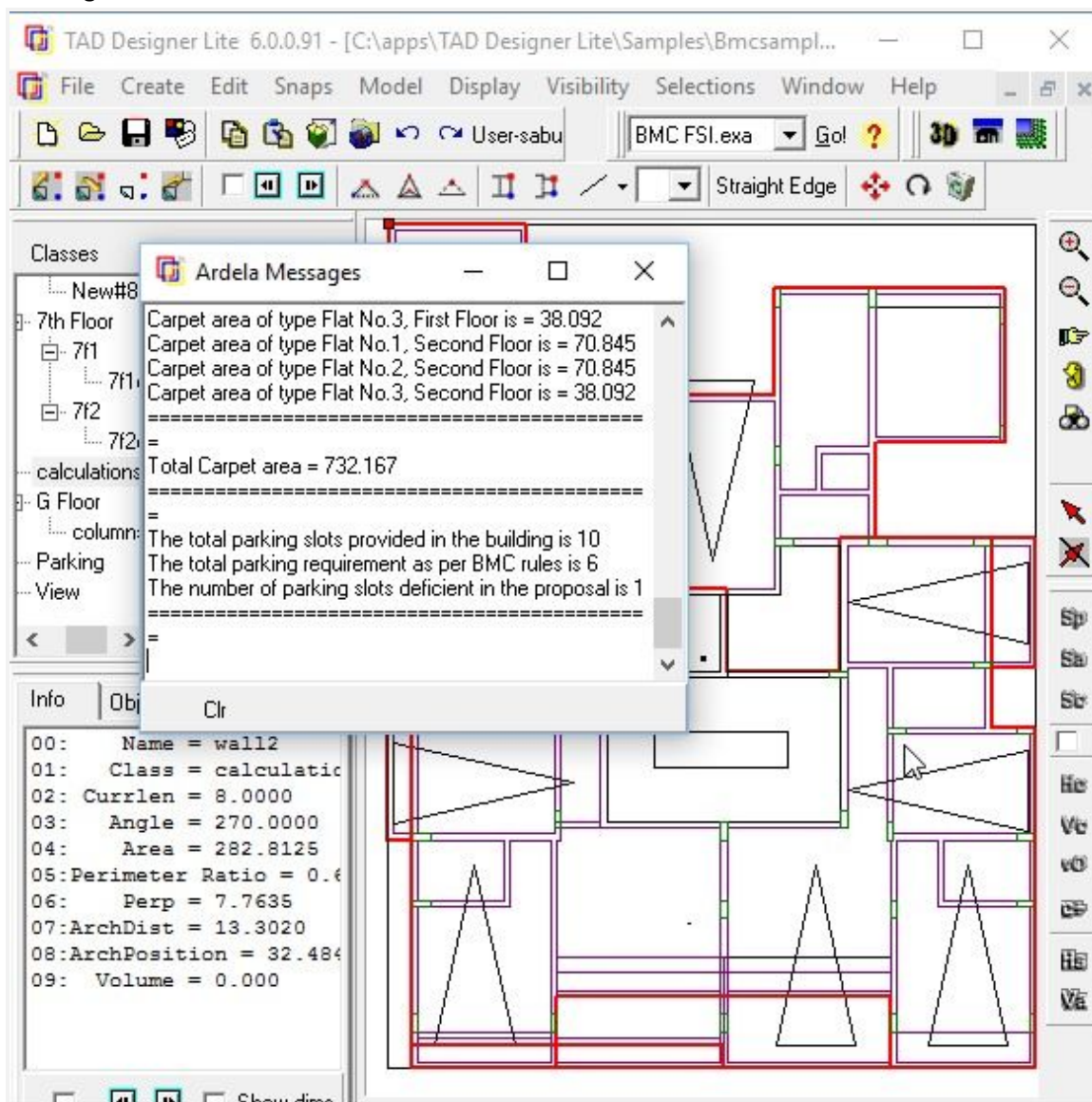
APPLICATIONS TO BUILD SIMULATIONS

1.1 TADSIM TOOL TO MEASURE BUILDING PARAMETERS

(<http://www.teamtad.com/>) -

TAD tool helps in providing building geometry information. The tool has an internal AI language called ARDELA which is a variant of Prolog. The tool output can be used to connect with building simulation softwares like EnergyPlus and Equest for doing energy simulations of the building.

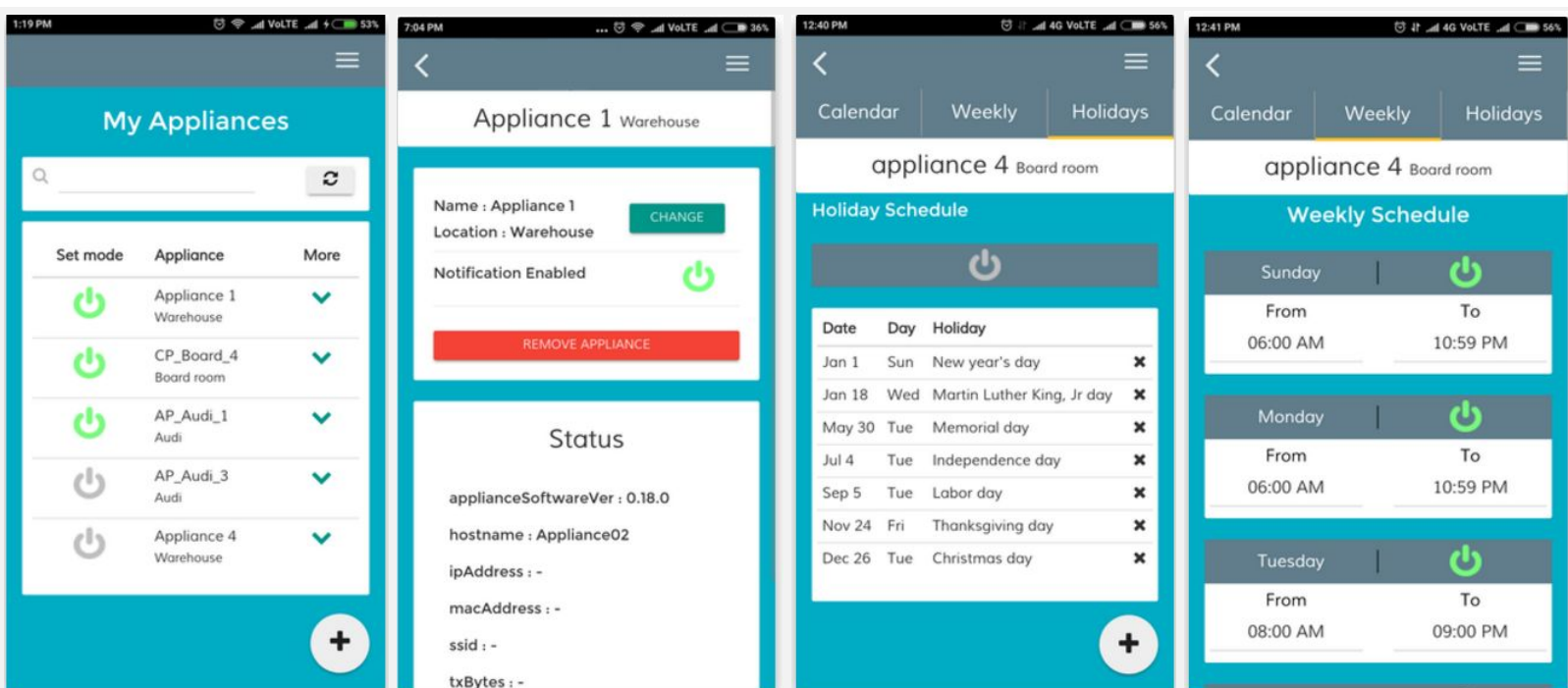
The screenshot shows an ARDELA program that was executed to do some objective calculations of the building model.



1.2 IOT APPLIANCE SOFTWARE

IOT appliance is an android based solution to calculate and manage the building parameters. The following are the features of the application...

- Measure and monitors 15 parameters related to power consumption.
- Manage appliances remotely through iOS and Android app.
- Pushing telemetry data to the cloud and perform analytics.
- Schedule and manage events on appliances through calendar.
- Highly performant & memory efficient software on low powered ARM® based devices.
- Support console designed to cater to large volume of appliances.



1.3 E-QUEST BUILDING MODELLING

A study was conducted for understanding the energy emissions from Le-Meridian hotel in Kochi and research methods to invest into winds and solar technologies to reduce the emissions. The following images show the increase in energy consumptions which was simulated by eQuest simulation software.

Energy Reading Analysis

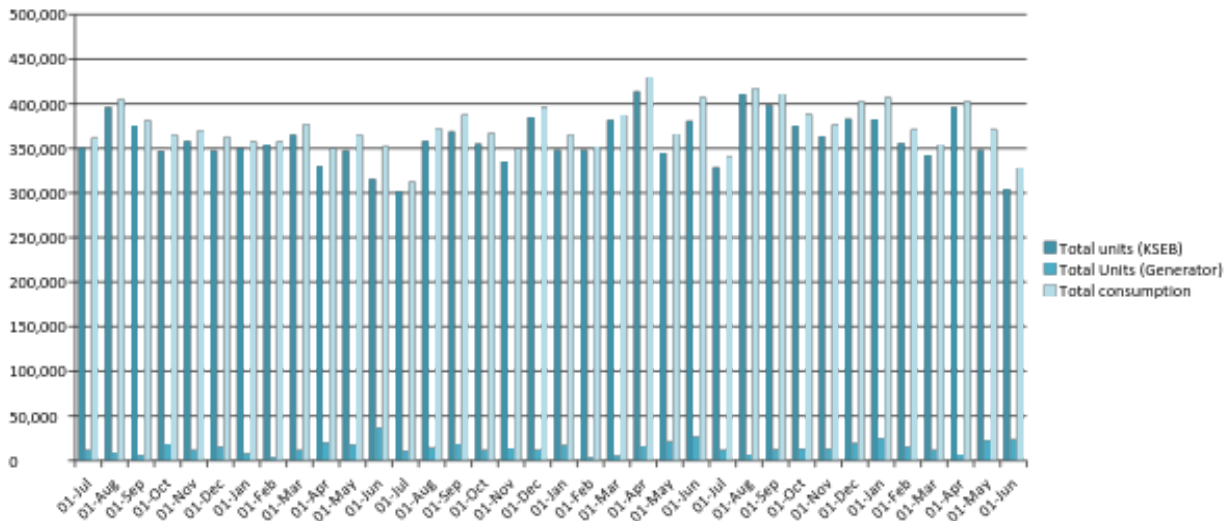
- Contracted Load – 1500 KVA
- Energy Consumption Units at 8.5 INR

Year	From KSEB	Diesel Generator	Total	DG %
2013-14	42,38,413	1,68,544	44,06,957	3.8 %
2014-15	43,22,680	1,70,663	44,93,343	3.8 %
2015-16	43,90,080	1,81,730	45,71,810	4 %

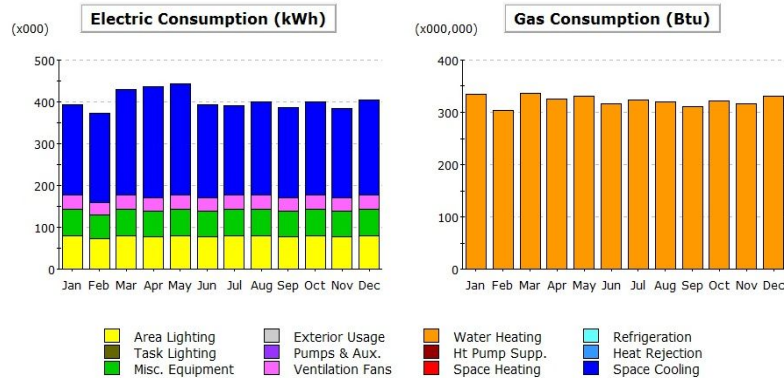
Observations: There has been a constant increase of 80000 units every year. Solutions were found to offset the demands..

Possible Reasons:

- 1) Climate Change
- 2) Change in Equipment Efficiency
- 3) Change in Business.



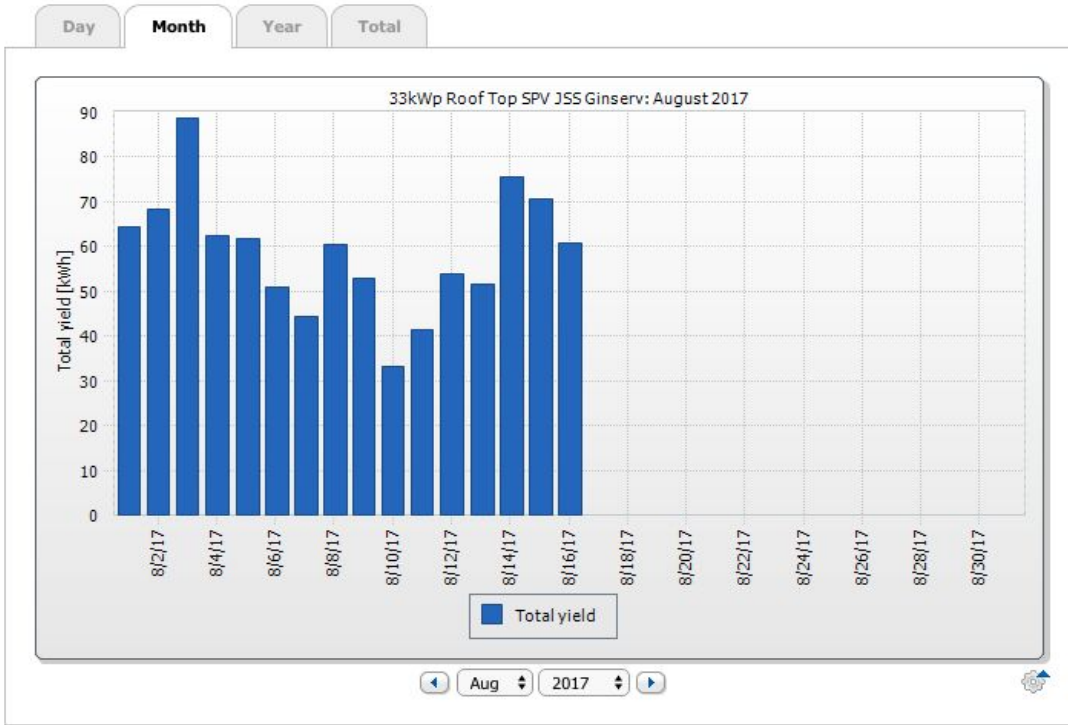
Energy Simulation Results For The Weather Conditions of Cochin



1.4 SOLAR ROOFTOP MODELLING

Consulted Ginserv On Installing Rooftop Solar Based on Their Energy Simulation Results. Based on the size of the rooftop and energy meter reading - the optimal size of solar rooftop and cost of inverters were calculated. The final result was the deployment of a 33KWP unit. This shows the output of solar generation from the unit...



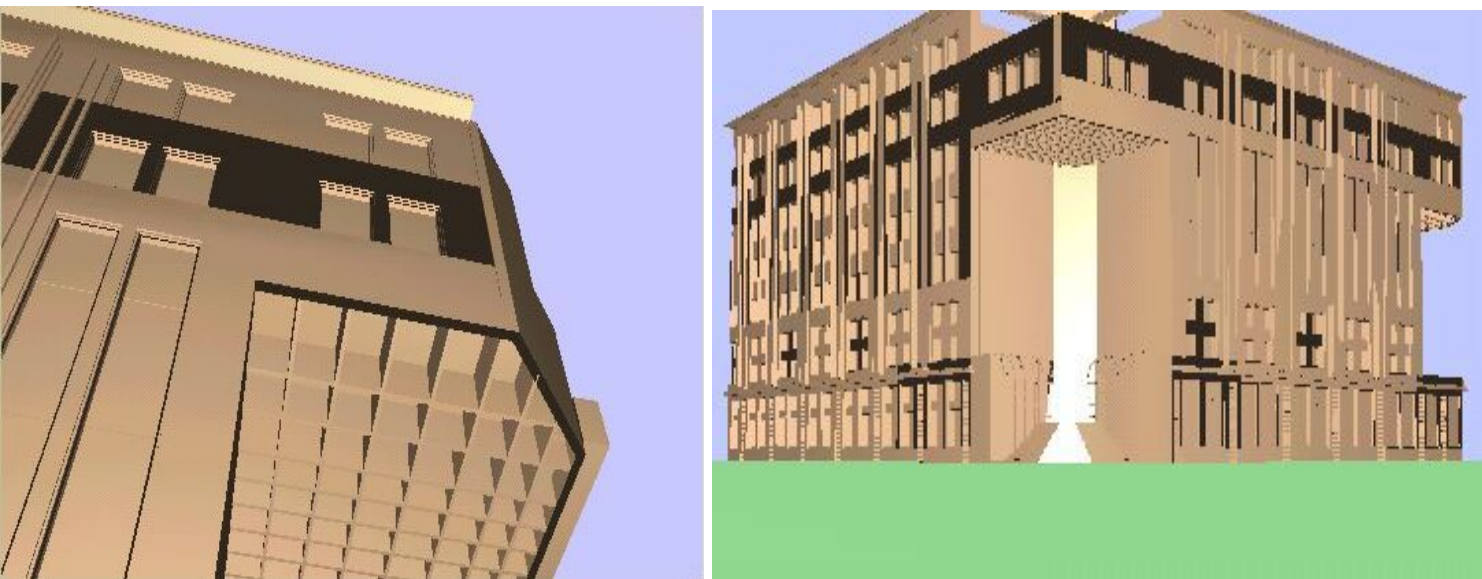


1.5 BUILDING MODELLED WITH TAD SOFTWARE

The entire model is available for analysis in his software, TAD. Here are some images of the model made for the building in TAD as well as the actual building

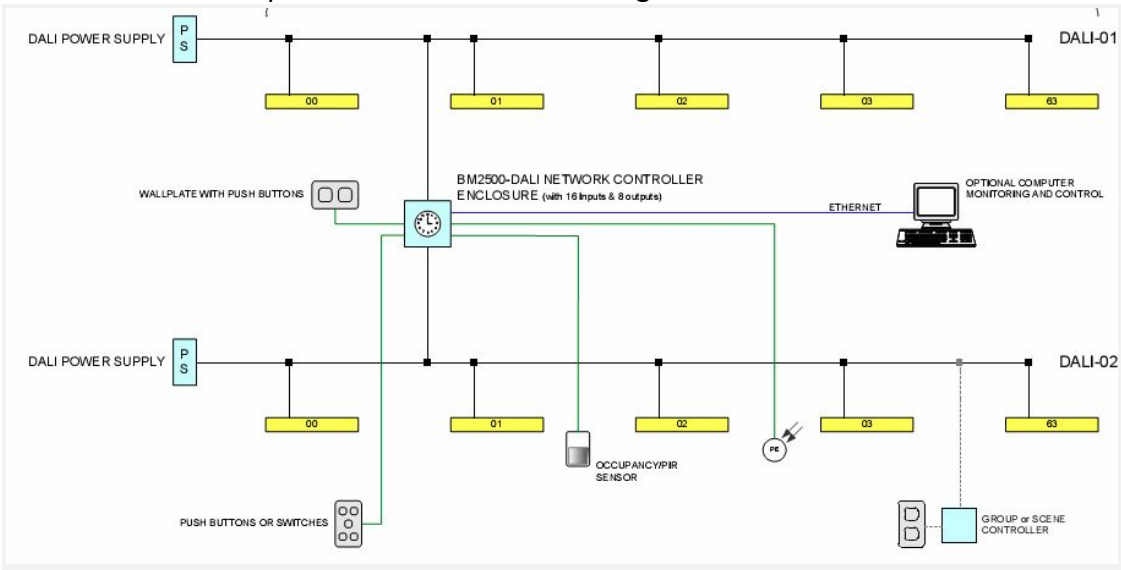


As seen in the next set of images from TAD -- the entire model is available inside the software. It can be queried for both geometrical information as well as non-geometrical information such as quantities of material used, etc.



1.6 SENSOR NETWORK DEPLOYMENT IN A BUILDING

A sensor network was designed inside a building to monitor the activities of a greenhouse inside a building using building protocols like DALI etc. The following images show the sensor network and sensor placement inside the buildings.



: 180ft * 160ft * 12ft
 : 100ft * 80ft * 18ft

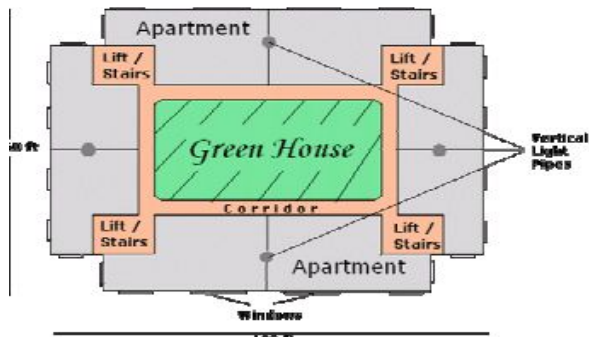


Figure 3 (Top View of a Building Floor)

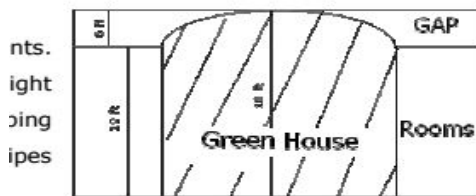
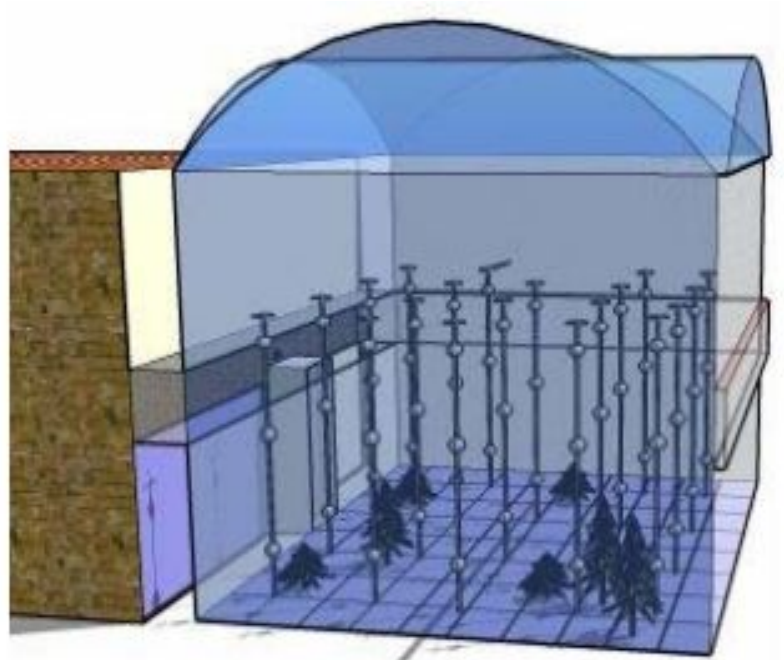


Figure 4 (Side view of a Building Floor)



1.7 DAYLIGHT SIMULATIONS FOR MONARCH AQUA BUILDING

The model shows building Material Response to Sunlight. A 3D simulation model was designed from the basic cad files incorporating the materials inside the building. Autodesk 3DS max was used to simulate the response of material and lighting. This model was developed for a monarch builders of Bangalore. <http://ottoandnewt.com/>



1.8 THREE PHASE SIMULATIONS OF DAYLIGHT

This simulation was designed for Burj Khalifa to showcase the effect of lighting (both internal and external) on the building structure..

