

# Techno-economic analysis of Green building design: A Simulation approach with BE opt 2.0

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## Abstract –

Buildings energy consumption is increasing enormously in recent years. Hence, an immediate action is required in this area to decrease the buildings energy consumption.

A careful analysis with modern approaches will decrease the buildings energy consumption. HVAC load optimization, wall insulation thickness, onsite renewable energy usage are some of the methods to decrease the buildings energy consumption. In this paper an analysis has been made and the results are tested with BE opt simulation. Hence the payback period of such projects can be analyzed and a clear idea is defined to implement such type of projects.

**Key Words:** HVAC, Simulation, Thermal Comfort, BE opt, Conventional VS Green buildings.

## 1. Introduction:

Simulation is the artificial of the operation of a real-world process or arrangement over time. The act of simulating something first involves that a model be developed; this model represents the key appearances or behaviors/functions of the carefully chosen physical or abstract system or process. The model embodies the system itself, whereas the simulation symbolizes the operation of the system over time.

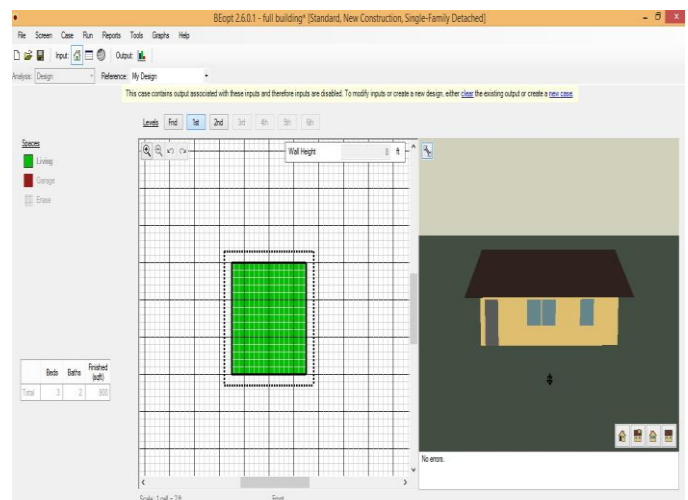
Simulation is used in many circumstances, such as simulation of technology for routine optimization, safety engineering, testing, training, edification, and video games. Often, computer experimentations are used for training simulation representations. Simulation is also cast-off with scientific modelling of natural structures or human structures to gain insight into their operational. Simulation can be castoff to show the eventual real effects of alternative conditions and courses of exploit. Simulation is also used when the real system cannot be promised, because it may not be accessible, or it may be precarious or unacceptable to engage, or it is being considered but not yet built, or it may simply not occur.

Key issues in simulation consist of acquisition of valid source information about the appropriate selection of key characteristics and manners, the use of simplifying approximations and assumptions in the interior the

simulation, and dependability and validity of the simulation outcomes. Measures and protocols for model substantiation and validation are an ongoing field of academic study, refinement, research and change in simulations technology or practice, particularly in the meadow of computer simulation.

In this section we have only considered on the software based simulation and some basic calculation only. Here we used the software BE opt. 2.6.0.1 which is the advance and latest version of the BE opt. 2.0 available in the field of designing of green building.

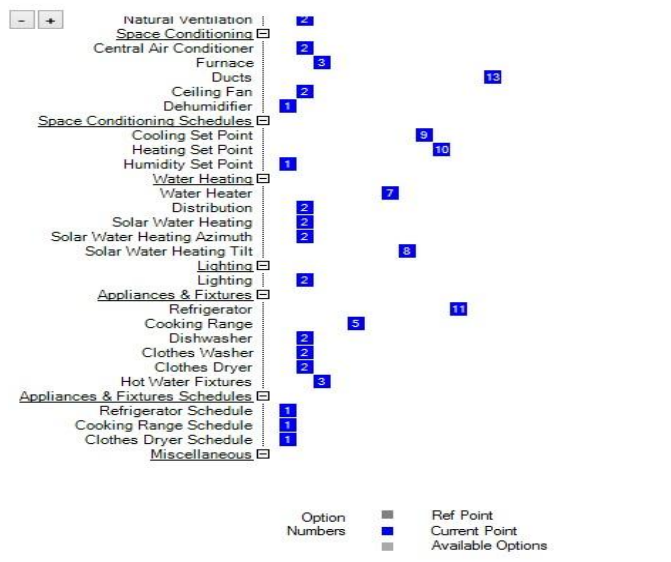
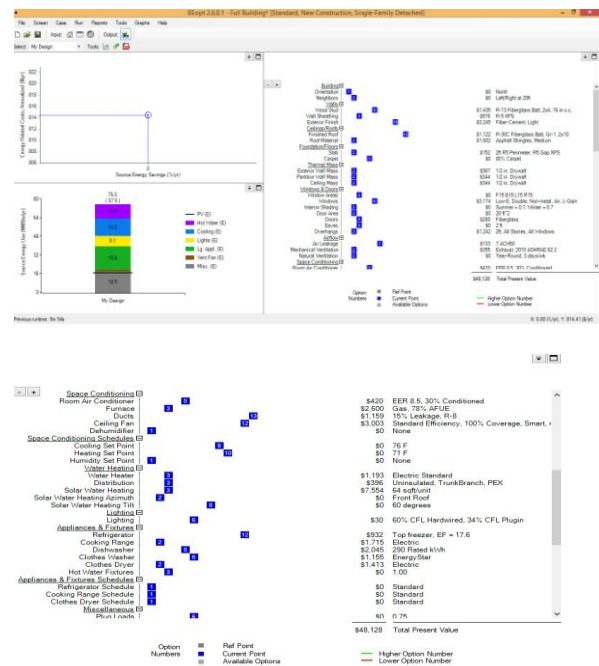
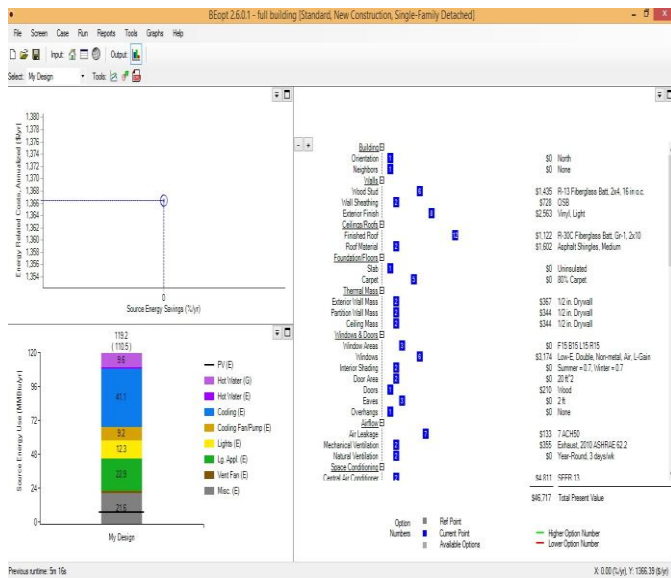
## 2. Simulation Result of a conventional building:



(The basic layout of a conventional building using BE opt 2.6.0.1)

The important consideration for benchmark parameters:

1. Wall to window ratio
2. Glazing of windows
3. Walls insulation thickness
4. Building orientation
5. On site renewable energy sources
6. Neighboring of the buildings
7. Various energy efficient equipments
8. Load usage patterns



(Output graphs and the minutiae of parameters used during simulation)

**5.2.2 Analysis of case study:**

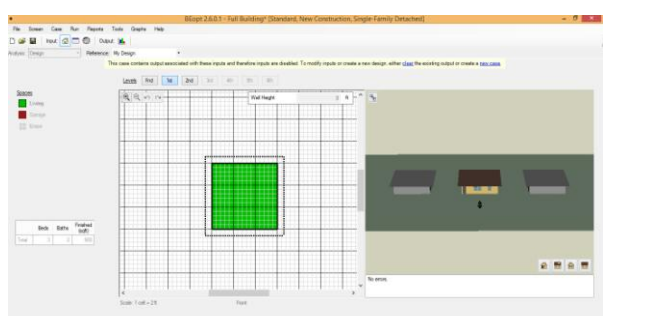
For this simulation we have well-thought-out the area where the green building is to be made as 900 sq. ft. And for translating the American dollar to Indian rupees we have measured 1\$=Rs 60/-

From the conformist building output graph we found out that the over-all cost of the building for the taken conditions and used considerations is \$46,717, which is equivalent to Rs (46,717\*60)= Rs28,03,020/-

Correspondingly from the green building simulation output graph we got the aggregate cost for the given parameters is \$48,128, which is contemporary to Rs (48,128\*60) = Rs 28,87,680/-

(Output graphs and the details of parameters used during simulation)

5.2.2 Simulation results of green building:



(The basic outline of a green building using BE opt 2.6.0.1)

The supplementary cost used to be instigated to construct a same extent green building over a conventional building by bearing in mind and using the efficient and cost effective materials and apparatus is Rs (28, 87,680-28, 03,020) = Rs 84,660/-

As we acquired the annual energy saving of the green building is virtually \$814, which is equals to Rs (814\*60) = Rs 48,840/-

So the repayment period of the extra initial cost on the green building will be Rs (84,660/48,840) = 1.7 years. Approximately about 2 years

#### 4 Conclusion:

Rapid expansion and rising population impose that the world's leaders report the sustainability of the built surroundings. As one of the most ecologically arduous sectors in the world, new building assembly and the operation of remaining buildings hold momentous potential for yielding meaningful energy, emissions and resource drops at least cost. In order to appreciate the full job creation potential and environmental assistances of the buildings sector, the United Nations Environment Program Sustainable Buildings and Climate Initiative invites national governments to embrace green and sustainable buildings as a conduit to swelling resource efficiency and greening their growing financial prudence.

National governments performance a role in prioritizing the buildings sector in national sustainable advance strategies and international negotiations. Proper policy frameworks provide investment foregone conclusion and drive capital streams and innovation in the sector, associate and enabling sustainable urban progress. Through guidance in the construction and act of public buildings, energy efficiency enterprises and financial encouragements for resource efficiency perfections, national governments can produce jobs and encourage green growth. Business and industry play a crucial role in designing, constructing and supervision buildings to take full advantage of resource efficiency and reduce water and energy ingesting, as well as waste generation.

By approving the simulation process by via BE opt 2.6.0.1 we have seen the outcomes as above where we have clearly seen that the initial cost is noticeably high to construct a green building over a conventional building of a equivalent size, but we have seen also by via rated and standard equipment and the materials which are castoff to make the building stand- still the payback period of the added initial cost is too truncated. In our case we have initiated out the payback period is 2 years almost which is controllable and our submission to the individual or group of company who are profitable to construction buildings for commercial or official resolution or whatever it may be, they ought go for the Green Building only, as it is cost effective, eco-friendly, affords healthy atmospheric environments for human being.

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