International journal of imaging science and engineering

ISSN: 1934- 9955www.ijise.net

Vol-03 Issue-01 June 2008

Green Building Cost Analysis

Swapnaa Narlaa

Tek Yantra Inc, California, USA swapnanarlaa8883@gmail.com

Abstract: These days, green construction concepts are being applied to mitigate or compensate for the issues brought about by the consequences of global warming. Green construction refers to an approach that takes into account a wide range of issues, including research into water and energy conservation, waste reduction, material savings, and more. A "green building" is one that "significantly reduces or eliminates negative impact of buildings on the environment and occupants" via its design and construction methods. Green buildings are those that minimize their impact on the environment by reducing their water and energy use and by producing their own energy from renewable sources. Using an appropriate case study, this article compares green construction with conventional building in terms of economics. Research on preexisting green buildings is also a part of this, and it involves surveys of things like energy savings, operational costs, water savings, indoor air quality, and so on. Additionally, this research is useful for reducing waste, which helps to keep things healthy and safe for the environment.

Keywords: Environmental, Energy, Sustainable, Green, Savings, and Materials

Introduction

A “Green building” is defined as “a building constructed with design and construction processes which significantly reduce or eliminate negative impact of buildings on the environment and occupants.” The term essentially refers to a building which is energy efficient and environment friendly in terms of minimal disturbance to environment during construction and service. It, therefore, encompasses the planning, construction processes and service performance aspects of the building. Green buildings result from integrated design and construction processes which reduce the negative impact of building on the environment and the occupants. Green Buildings are considered to be important component of any model for sustainable urban development.

Benefits of Green Building

Reduces environmental impact through energy efficiency and waste recycling.
Green buildings reduce construction waste by approximately 50% compared with that of similar conventional buildings.
Helps in saving natural resources.
Lower operational cost resulting from efficient resource use through reduction in energy and water requirements.
Improves health through better indoor air quality.

Disadvantages of Green Building

Initial cost of construction of a green building is high.
No locally availability of materials.
Requires advanced technology.
Requirement of skilled labours.

Renewable Energy Sources

Wind energy
Solar hot water heating (also called solar thermal)
Solar electricity
Ground or air source heat pumps
Biomass and Bio fuels

International journal of imaging science and engineering

ISSN: 1934- 9955www.ijise.net

Vol-03 Issue-01 June 2008

Details of Case Study

Here we taken two case study which is Orange county phase 2 (Pune), Adwait House (Ahmednagar) .By taking out suitable case study the various parameters are to be studied.

Name of the project: Orange County, Phase 2.
Location: Baner-Pashan Link Road, Pune. Owner: 1) Mr. Sandip Sonigra Purpose of project: Residential purpose.
Consultant: Viraj Envirozing India Pvt Ltd.
Total Area of construction: 21780 sq.ft.
Project highlights: 100% Green energy, STP Plant, Efficient natural light and ventilation.

Features of Orange County

Innovative design
Architectural planning

Analysis of Case Study

Water Savings through: STP by Root Zone Cleaning System.
Energy Saving through:

Architectural Planning according to Sunlight and ventilation
Hybrid Power System that includes two Wind Mill and 54Solar PV Panals.
One Green Lift.
Energy Efficient Fixtures.
Solar Water Heating System.

Data Analysis

Hybrid Power Systems: The system has two wind mills and produces maximum 60 units per day.
Solar Water Heating System:
The maximum domestic electrical consumption is attributed to water heating. Therefore to minimize this consumption, Orange County has provided fully programmable solar water heating system of 5000 LPD i.e. Thus the “Solar Water Heating” System will save at least 7.2 units/flat/day for average 300 days. i.e. 7.2×27×300+8.7×09×300=81000 units yearly.

STP by Root Zone Cleaning System.

The Orange County has this RZCS STP of capacity 35, 000 liters.
Daily they get treated water of approximately 20, 000 liters without any electricity.
Total Energy Produced and Saved Yearly:

For Green Building:

Solar wind hybrid production system- 60×300=18000
Units.
Energy saving using Solar water heating system-81000 Units. But it is consider that 20% people may use other sources of heating water or cold water for bathing .Therefore, only 80% should be considered.

Therefore energy required for water heating is, 81000x0.80=64800 units.

Energy consumption using efficient fixtures such as

T5 Tub Lights -212Nos×28W×6Hrs×365 days=12999Units. ○ CFL-162Nos×9W×2Hrs×365days=1064 Units.
Power saver fans -117nos×50W×6Hrs×365 days = 12811
Units.
Green lift – 5KW×60%×5Hrs×365 days = 5475 Units.

International journal of imaging science and engineering

ISSN: 1934- 9955www.ijise.net

Vol-03 Issue-01 June 2008

Thus total energy saved
=12999+1064+12811+5475=32349 units.

For Conventional Building:

Production of Electricity within the building- Zero Units.
Energy consumption required for water heating- 81000 Units.

Fixtures:-
Fluorescent Tube Lights-
212Nos×48W×6Hrs×365days=22285 Units.
CFL Bulbs- 162Nos×40W×2Hrs.×365days=4730 Units.
Normal Fans- 117nos×80W×6Hrs.×365 days=20498Units.
Lift- 5KW×5Hrs×365 days =9125 Units.
Total energy consumed due to Fixtures-56278 Units.

Savings:
Saving by energy fixtures: 56278 - 32349 = 23929 Units.
Energy saving in terms of money: 23929 x 6.05
=Rs144700.45

Electricity dependency = consumption using fixtures – electricity production
=32349 – 18000 = 14349`~14350units.

Result

Total saving of energy at the site=106729 units. Amount of coal used to generate 1 unit of electricity =0.00052 Tonne.
Total saving of coal=106729x0.00052=55.50 Tonne.
Saving in CO2 emission=106729x0.085=90 Tonne/year.

Analysis of Result

Sr. No	*Parameters*	*Green Building*	*Conventional Building*
01	Energy production using Wind & Solar energy	18000 Units	------
02	Saving due to Water Heating System	64800 Units.	------
03	Consumption using Fixtures.	32349 Units.	56278 Units
04	Saving by Energy Fixtures	23929 Units.	NA
05	Electricity dependency.	14350 Units.	139078 Units
06	Total energy saved at site	106729 Units.	NA

International journal of imaging science and engineering

ISSN: 1934- 9955www.ijise.net

Vol-03 Issue-01 June 2008

07	Total Saving of Coal.	55.50 Tonne	NA
08	Saving in CO2 Emission	90Tonne/year	NA

Case Study -2 –"Adwait House"

To make the study of economical aspects and environmental friendly features, here project name as "Adwait" which is residential project is taken as a second case study.

Informatics of the project:

Name of the project: Adwait House.
Location: Gulmohar road, Savedi, Ahmednagar.
Owner: Mr. Karandikar Ravindra V.
Purpose of project: Residential purpose.
Architect:-Mr. Ashok Joshi, Nagpur .

Total plot area:-276m^2.
Total built up area:- 183m^2
Cost of the project: - 11.5 Lakh

Salient Features of Case Study:

Inverted Saucer Foundation. Cavity wall.
Narrow and extra large windows.
Brick -jali Filler Slab.
Biogas

For finding out the total quantity of material required, here we use the comparison by using filler slab and concrete RCC slab. And find out the total quantity of material is to be saved.

RCC Slab:

In our case study the area of ground floor as well as the area of first floor is same, the room sizes are as follows,
Living Room-4.24x3.10m, Kitchen-4.24x3.10m, BED1-4.22x3.10m, . BED2-4.29x3.10m

Firstly we have to calculate the total quantity of concrete required for slab without using filler materials.

For ground floor - The total quantity is to be found out by, 2(4.24 x3.10 x0.1)+(4.22 x 3.10 x0.1)+(4.29x3.10 x0.1)=5.96 m3.
Grade of concrete M20=1:2:4

The total quantity should be found out by, 5.96 ÷ (1+2+4)=0.851m3.

Now, Cement 0.851x35=30Bags

Fine Aggregates 0.851x2=1.702m3=1.702 ÷ 2.76=0.6Brass

Coursed Aggregates=0.851x4=3.404m3= 3.404 ÷ 2.76 = 1.2 Brass.
Therefore, (30 x380Rs/bag) + (0.6 x4000 Rs/brass) + (1.2 x3750 Rs/brass) =18, 300 Rs.

International journal of imaging science and engineering

ISSN: 1934- 9955www.ijise.net

Vol-03 Issue-01 June 2008

Therefore the total quantity of concrete required for Normal RCC slab =18, 300 Rs.

Now we have to find out the quantity of concrete required by using filler material.

➢ **Filler Slab:-**

In this case study of Adwait house we use the filler slab instead of RCC slab. By using the filler slab concept we can reduce the weight of the slab and cost of the project.

The size of Kitchen=4.24x3.1=13.144 m^2.The size of one filler block=345x225x70mm.And in one filler block 3 Number of bricks are to be placed.

The area of filler used for kitchen=1.995x2.42=4.82 m^2 .

The total quantity of concrete required for filler =2.14 m^3.

Now find out the quantity of concrete required for joining of filler slab. (Ground floor)

Kitchen:-The size of filler slab used=1.995x2.42m The filler is having Width of filler is 0.07m. And the thickness of the concrete to join the filler is o.1m. There is the arrangement of the filler is - 6 number of filler is in length and 5 number of filler is in its width of area of the filler slab. That is the arrangement is 6 x 5

∴we have, 1.995 x 0.07 x 0.1=0.014m^3.As there are the 6 No. of filler used in the length of the filler slab, 0.014 x 6=0.084m^3.And also 2.42x0.07x0.1=0.016m^3.

As there are the 5 No. of filler used in the width of filler slab, 0.016x5=0.084m^3.∴The total quantity of concrete required of filler for kitchen is 0.084+0.084=0.168m^3.

Another 3 room having same dimension approximately, therefore we can write it as 0.168 x 3=0.50m^3. -Total quantity of concrete for all rooms for joining of filler =0.5m^3.

∴For finding out the total quantity of concrete required for slab by using filler is to be calculated by, Total concrete required for all rooms without using filler -Total quantity of concrete for filler +Total quantity of concrete required for joining of the fillers.
Total concrete required for all rooms without using filler =5.96m^3.
Total quantity of concrete for filler=2.14m^3
Total quantity of concrete required for joining of filler
=0.5m^3
So, 5.96-2.14+0.5= 4.32m^3.
Actual saving by using filler slab= Total quantity of concrete required without using filler slab –Total quantity of concrete required with filler slab.
Therefore we have, 5.96-4.32=1.64m^3.

Now total quantity should be find out by, 1.64 ÷ (1+2+4)=0.22m^3., Now, Cement 0.22x35=8Bags.
Fine Aggregates 0.22xx2=0.44m3=0.15Brass.
Coursed Aggregates=0.22x4=0.88m3=0.30Brass.

∴ **The total quantity of concrete required by using filler slab =4765 Rs. And that of concrete required for the slab without using the filler slab=18, 300 Rs.**

∴ **The total saving in case of slab in ground floor =18300-4765=13, 535 Rs.**

01	Ground floor slab	4765 Rs	18, 300 Rs.
02	Saving by fiiler slab	13, 535 Rs.	NA
The material saving for ground floor is, 13, 535 Rs.			

International journal of imaging science and engineering

ISSN: 1934- 9955www.ijise.net

Vol-03 Issue-01 June 2008

Analysis of Adwait house.

Conclusion

Building an energy efficient home requires dozens of decisions by home designers, builders, and subcontractors. Many decisions affect the cost of construction and the profitability of the project. While energy efficiency requires careful planning and attention to details throughout the construction process, it offers substantial benefits to building professionals.

Economical benefits:

Studies show that installing green building technologies can be cost-efficient in the long run .It can create jobs and expand the local tax base to create economically competitive communities.
Social benefits:

Improving indoor environmental quality creates a healthier environment for the occupants of a building, which may help increase their productivity. Stronger neighborhoods that create a greater sense of community.

References

"Cost and benefits of achieving green building" (Davis Langdon, 2009).
February 2009, Green Build/Prop "Evaluation of potential future markets for environmentally friendly construction materials"
Bigas, Harriet. 2012–2013 InterAction Council "The Global Water Crisis: Tackling an Immediate Security Concern (part 1)"
Northern Ireland Investment I was born in February of 2009. "Analysis of Potential Future Demand for Eco-Friendly Construction Materials"
The law firm Jones Lang The "India Green Buildings Anthology" by LaSalle Meghraj (2008)
"Lasalle Meghraj" via Jones Lang. "The Economic Viability of Eco-Friendly Structures in India" (4 pages) Environmental economics
With Maureen Cropper and Kabir Malik.in the year 2009 "Power and Its Hidden Costs,"
Mittal, Moti L. "Preliminary Assessments of Emissions from Thermal Power Stations in India That Burn Coal"
Government agency responsible for alternative energy (2008). "Energy Conscientious Buildings in India"
manuscript A Collection of Green Buildings