LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

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by

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2019

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CERTIFICATE

This is to certify that the project entitled "**Life Cycle Cost Analysis of Hostel Building using Energy Efficiency Approach :A Case Study"** is a bonafide work of **Rahul Sunil Hasamnis (16DCES66) , Junead Amjad Ali Mansoori (16DCES72), Zoheb Md Nazim Ansari (16DCES60), Firoj Khalil Sayyed (16DCES83)** submitted to the University of Mumbai in fulfilment of the requirement for the award of the degree of "Bachelor of Engineering" in "Civil Engineering".

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APPROVAL SHEET

This dissertation report entitled "**Life Cycle Cost Analysis of Hostel Building using Energy Efficiency Approach :A Case Study**" by Rahul Hasamnis, Junead Mansoori, Zoheb Ansari , Firoj Sayyed is approved for the degree of "Civil Engineering ".

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Place : Panvel

DECLARATION

We declare that this written submission represents our ideas in our own words and where others ideas or words have been included; we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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ABSTRACT

Construction sector is the largest source of greenhouse gas emission around the world. Across the world, people are using a huge amount of resources for construction. Due to the growing environmental problems, it has become a great matter of concern. These environmental issues arising due to construction activities give both an opportunity as well as responsibility for the construction research community to develop eco-friendly buildings. For these, design integrity is an important parameter to be included during the design, construction and operation phase of the building when it is in conceptual stage. Sustainable development can be achieved through Green Building construction, energy conservation through energy analysis & energy management, energy simulation, energy modeling of a building etc. Green Building Certification can be achieved through practicing various green building codes such as LEED, BEE etc. Sustainable development aims to reduce the ever-surmounting pressure of energy production in the country thereby saving raw resources and contributing towards the environmental well-being. This work entirely focuses on investigating the ill-effects of construction sector on environment, the various modern green remedies available to solve such problems. In this work, life cycle cost analysis for 25 years of a proposed hostel building is performed under three different criteria i.e. LCCA of normal traditional building, LLCA by replacing the conventional building envelope materials with advanced construction materials building envelope and lastly LLCA on the basis of best orientation of the building in order to optimize the use of day lighting. Along with the LCCA, Net Present Value is to be calculated for the two criteria by considering the discounted rate method for Payback period of 25years and suggest whether using advanced construction materials and green building principle would be economically viable for the hostel or not. The benefit-cost analysis for the hostel building is performed on the basis of energy saving in terms of electricity. The Electricity consumption for all the three cases is calculated with the help of a well known software called as eQUEST 3-65. This software is accepted and certified by Energy Conservation Buildings Codes of India. Basic rates of electricity and labour have been collected from Wholesale Price Index (WPI) and Consumer Price Index (CPI) for predicting the future rates.

Keywords: - Energy Modeling, Green Building, Sustainability, eQuest, Energy Simulation, Net Present Value ,Life Cycle Cost Analysis

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Chapter 1

Introduction

1.1 General

Construction sector is the second largest source of employment in developing countries like India and hence its rapid enhancement is obviously necessary for the economic growth of the country. On the other hand, construction sector requires a large amount of finished product for which extraction of different types raw material is required. Also, tremendous energy is consumed to process this raw material into finished construction materials and this adds to large carbon footprint. Non-renewable energy resources such as coal, diesel, petrol,, forest etc. get depleted for constructing building. Building industry is the second largest producer of demolition waste and greenhouse gases in the world. Buildings account for more than 40% of global carbon dioxide emission The main problem attributed to the construction industry is pollution/degradation of environment and scarcity of resources due to various construction activities, which starts from the extraction of raw materials to its production, supply of manufactured material to construction site, its use for constructing building till its delivery to occupants, energy utilize for making it comfortable to the occupant through its life span and then at the end scrap generated through its demolition and its disposal. Adopting sustainability in construction of buildings is the only solution to address this issue. Sustainability can be defined as meeting the present need without compromising future

requirement. The main three aspects of sustainable development, i.e, economic, social, and environment sustainability in Construction industry can be achieved through creating green buildings. Green Building is a way of enhancing the environment, which benefits human well being, community, environmental health and life cycle cost (Alder Et al 2006). Green Buildings are buildings that subscribe to the principle of conscientious handling of natural resources, which means causing as little environmental interference as possible, using environment friendly materials, requires low operational energy, utilizes renewable sources of energy to fulfill its requirements, follows high-quality and longevity as a guideline for construction and last but not least, must be economicall2y viable. Green building is the practice of constructing or modifying structures to be environmentally responsible, sustainable and resource-efficient throughout their life cycle. Green building is construction process which uses less energy, water and other natural resources; creates less waste and greenhouse gases emissions .

1.1.1 Life Cycle Cost Analysis:

Life Cycle Cost Analysis(LCCA) is a method of estimating the economic performance of a building over its life period. It is also known as "whole cost accounting" or "total cost of ownership," LCCA balances the initial stage investment with life period costs including owning cost and operating cost of that particular building. LCCA is calculated on the premises that different building design alternatives can accomplish the same functions with the same amount of efficiency. These options having different initial costs, operational costs, maintenance and repair costs and also differ in life cycle periods. Considering a particular alternative, LCCA forecasts the total cost of building, including initial construction cost, operation and maintenance cost, for a particular life of the building, cited as "study period". Life cycle cost analysis helps in maintaining a balance between the initial cost of any alternative process adopted and long term cost saving of that alternative process. LCCA also helps in narrowing the most cost effective alternative and also calculates the "payback" period of the increased cost. To estimate life cycle cost for all applicable alternatives is not feasible, and therefore the guiding principle for LCCA considers the one which affects the long-term expenses

1.1.2 Cost-Benefit Analysis

Cost-benefit analysis (CBA) is the best method of identification of the cost with respect to total benefits of any project or policy of the society. It is the best way to know the economic benefits of a given project. For accurately performing the work, all data in regards with the project or policy must be available .For performing the analysis, the most crucial part is to transform estimation of benefit cost into today's money value. The Net Present Value (NPV) is the relatively easy way to examine a stream of current and future benefits and costs. According to United State Green Building Council (2003), NPV represents the present value of an investment's future financial benefits minus any initial investment. In order to provide a consistent measure of costs and benefits, future costs and benefits are discounted to produce Present Values (PV). These PVs are then used in the NPV calculation

The initial cost of a green building is more often than not higher than the conventional buildings, but the savings accrued in subsequent years during the performance of the building is sufficiently great. In green buildings, there is low consumption of energy, water, and health costs, which gives a quick return on the investment and makes a positive impact in revenue. "The Costs and Financial Benefits of Green Buildings, "reported by the Massachusetts Technology Collaborative for the State of California Taskforce presenting a definitive cost benefit analysis of green building based on a review of LEED-certified buildings, stated that 2% nominal increase in green building design would save 20% of total construction costs over the life of the building which is more than ten times the initial investment (The Business Case for Green Building, 2016)

The payback period is calculated by counting the number of years it will take to recover the cash invested in a project. Assuming that a company invests Rs. 40,00,000 in more efficient equipment, the cash savings from the new equipment is inadvertantly expected to be to the tune of approximately Rs. 10,00,000 per year for the intial 10years. The payback period thus calculate is 4 years, with more profits accruing after the break even point.

1.1.3 Energy Simulation

Energy Simulation involves a process of using computer software to build a virtual replica of a building and then simulate it for energy consumption. It is a process which gives the future energy consumption of a building in its very initial stages. It is divided into two groups, viz., Load Design and Energy Analysis. Load Designs are used to evaluate the amounts of cooling or heating energy required for AC Loads, Volumetric Air Flow and to find out what are the similarities and differences between various heating and cooling equipment. Project site and location, Building Shell, Water & Air Side HVAC and Utility Economics, Internal Loads are four major parts of such simulations. It is performed in energy modeling software by inputting required data into the modeling software. The following is necessary data required for performing energy simulations for any project:

- Climate: ambient air temperature, relative humidity, direct and diffuse solar radiation, wind speed and direction
- Site: location and orientation of the building, shading by topography and surrounding buildings, ground properties
- Geometry: building shape and zone geometry
- Envelope: materials and constructions, windows and shading, thermal bridges, infiltration and openings
- Internal gains: lights, equipment and occupants including schedules for operation/occupancy
- Ventilation system: transport and conditioning (heating, cooling, humidification) of air
- Room units: local units for heating, cooling and ventilation
- Plant: Central units for transformation, storage and delivery of energy to the building
- Controls: for window opening, shading devices, ventilation systems, room units, plant components

1.1.4 Advanced Construction Materials:

Advanced construction Materials for a green building are obtained from natural, renewable sources that have been managed and harvested in a sustainable way; or they are obtained

locally to reduce the embedded energy costs of transportation; or salvaged from reclaimed materials at nearby sites. These are assessed using green specifications that look at their Life Cycle Analysis (LCA) in terms of their embodied energy, durability, recycled content, waste minimization, and their ability to be reused or recycled.

1.2 Motivation for the Present Study

From the previous literature review, it had been cleared that the building Sector is the second largest source of employment in our country but on the other hand it causes various environmental problems such as climate change, greenhouse gas emission, acid rains, depletion of resources. The buildings sector are the major energy consuming sector in the economy and about 30%-40% of the total energy is used by building during construction phase only and later in lighting or in air conditioning system. So it is an essential responsibility of the civil researchers to work out this problem and the only amicable solution is sustainable development. It is well practiced in developed countries, but in India, developers are reluctant to use it due to high its initial investment. Therefore, the main motive to work on this project is to prove to construction clients and contractors that though the initial investment of green building is generally 3% to 10% higher than traditional construction, but if the sustainable development parameters are adopted at the early design phase, it can result into huge savings in the life cycle of a project. Hence, a case study of proposed hostel building for an integrated college campus is selected .

1.3 Scope of the work

The Scope of the research work is quite broad as it encompasses the life cycle costing of traditional building and compares it with the life cycle costing of energy efficient building; NPV is calculated for both options to estimate life cycle cost saving and payback period for both cases. In the study, a deliberate focus towards advanced construction materials locally available in market is envisaged in order to select the most feasible building envelope materials in terms of its initial investment with respect to the saving it provides

1.4 Aim and objectives of the Project:-

The main aim of the project is to compare the results of life cycle costing of a conventional hostel building with life cycle costing of green hostel building with respect to building

envelope, construction materials and using the principle of orientation and to suggest various modifications over conventional methods:

The aim is to be achieved through three main objective set for the project

1) To work out and compare the construction cost of conventional and energy efficient hostel building

2) To estimate the saving in energy between three models using energy simulation method

3) To Compute the NPV and Payback period for the two innovative models and suggests modifications for further enhancement

1.5 Adverse effects of construction activities to environment:

Almost 40% of the waste is generated through Building Industry. After construction of buildings, comfort to occupants is the important aspects which can be achieved by providing adequate lighting, space conditioning, energy efficient HVAC system, interior finishing, internal loadings, water requirement for various systems such as domestic, fire fighting.Water is a vital resources for the occupants and is used during the building construction and operation phase of the building. Several building processes and occupants functions generate large amount of waste. According to the CPCB, India Generates 14.7 million tons of C&D (Construction and demolition) waste annually and this is bound to increase in future. Mumbai Municipal Corporation claims that about 1200 metric tons (MT) of construction wastes is generated daily due to scrap of building material. Hectare of lands is utilized to construct the landfills and after one complete cycle of landfills, the land remains barren for 50 years and cannot be utilize for any other purpose. Hazardous C&D waste is either buried or burned which has a chronic effect over environment, ecosystem and society. Reproduction and recycling of C&D waste by various methods has become a great challenge due to increased generation of waste. One of major drawback of construction industry is contribution towards greenhouse gases. Due to increase in energy consumption a large amount of greenhouse gases such as Carbon dioxide (the primary greenhouse gas associated with climate change), nitrous oxides, sulphur dioxide is generated which causing global warming which contributes towards unexpected climate change throughout the world. According to national Institute of Building Sciences (USA), buildings generates about 35% of the CO_2, 49% of Sulphur dioxide and 25% nitrogen are found in air. The major problems

from climate change is potential decline in rain water which results in reduction in availability of fresh water, damage to agriculture sector resulting in scarcity of foods, damage to ecosystem and its bio-diversity, rising sea levels etc. Due to climate change, rivers like Amazon, the Nile, and the Danube etc. are drying or recede several meters every year. The glaciers of Himalaya is melting very faster. The world Produces about 0.6 tonnes/year/per capita of CO_2 and India is the 5^{th} largest producer of Green House gases in the world. Acid rain is one of major problems caused due to greenhouse gases emission. Hence, we conclude that buildings are the major energy consuming sector in the economy and about 30%-40% of the total energy is used by Building during construction phase only and later in lighting or in air conditioning system

1.6 Summary

Construction industry development is very essential for the economic development of our country and this development should be in the form of sustainable development, so that the present need of the population can be met without compromising the future demand.

Chapter 2

Literature Review

A number of research papers were analysed in order to determine gaps in the research pertaining to life cycle costing of a building using energy efficiency approaches and streamlining the research

Alder *et al.* (2006) stated that Green Building (GB) is a way of enhancing the environment, which benefits human well-being, community growth, environmental health, safety and life-cycle cost. They also suggested that green building should be tailored to fit its placement on the site conforming to the local climate, site conditions, culture and community to reduce resource consumption, augment resource supply and enhance the quality, standard and diversity of life.

Alder *et al.*(2006) concluded that GB comes under the umbrella of sustainable development and is often developed under the guidance of rating systems. Green Building Rating System is designed to assess and evaluate the performance of either a whole building or a specific division of the building from planning, designing, constructing and operations point of view. Rating system can be classified into two groups, viz., specific building components and

building as a whole entity. Among all the codes for green building LEED (leadership in Energy and Environmental design) are the well-known standard across the globe.

Edwards (2006); Mondor *et al.*., (2013); Gabay et al., 2014 concluded that there are various tangible and intangible benefits that drive stakeholders towards GB market investment. An in-depth understanding of these benefits is essential to attract more stakeholders to promote GB, because that could inform decision making on several levels.

Yudelson (2008) inferrred that the GB movement is fuelled by the knowledge that the world has little time to respond to the growing dangers of climate change, especially global warming, and that buildings play a huge role in causing carbon dioxide emissions that drive global climate change.

Yudelson (2009) suggested that the implementation of GB can offer several environmental, economic, and social benefits to the construction industry, which are important for the industry and contribute to sustainable development of the world. GB refers to a building that minimizes its impact on human health and the environment, uses less water and energy than a non-GB, has higher levels of indoor air quality, and accounts for some measure of the life-cycle impact of choices amongst different kinds of building materials, furnishings, and furniture

Chan et al. (2009) argued that in order to make GB more popular, stakeholders would have to be fully and better informed of the reasons why GB should be attractive to them

Intergovernmental Panel on Climate Change (IPCC) (2014) recommended that there is a great need to widely encourage the adoption of GB among construction stakeholders due to the fact that global climate change problem is becoming more serious in recent years

Theodorson (2009) stated that perfect orientation of a building is the prime means of getting maximum day lighting. Orientation is an important parameter which should be considered when it comes to provision of a high quality interior environment of high performance energy

saving school building. Potential benefits of good orientation gives maximum day lighting which ultimately results into reduced operating costs, reduced absenteeism, teacher retention, and improved student performance. He also stated that orientation is recognized as a key architectural strategy in achieving high performance school. Thus, a Well-oriented school will definitely save electricity otherwise required for lighting and cooling in addition to providing psychological and biological benefits of natural light. Thus, designers are learning to consider orientation as generative to a project, optimizing building form and orientation to best utilize the daylight source.

Parkin (2011) described GB as a process that helps all people to realize their potential and improve their quality of life in a way that protects and enhances the earth 's life support system. She also concluded that GBs subscribe to the principle of conscientious handling of natural resources, which means causing as little environmental interference as possible, using environment friendly materials, requires low operational energy, utilizes renewable sources of energy to fulfil its requirements, follows high-quality and longevity as a guideline for construction and last but not least, must be economically viable.

GB has emerged as a viable solution for delivering buildings that are sustainable and have less harmful effects on the natural environment, resource consumption, and human health

more sustainable and their sustainability efforts typically include increasing energy efficiency of new and existing buildings. According to him, there are several strategies for increasing the energy efficiency of buildings and energy models can be used to compare different strategies. He concluded that energy models are widely used during design of new buildings, but are not often used to evaluate actual building performance. He also added that Building Energy Model (BEM) is a computer based simulation tool used to calculate thermal loads and energy use of a building. BEMs can predict a buildings' energy consumption by accounting for actual construction materials and actual HVAC systems.

Ryan & Sanquist (2011) stated that BEMs account for the effects that building's occupants have on energy use by defining occupant schedules. Occupants affect thermal load and ventilation requirements significantly and in turn influence the load on HVAC systems and fans. He had stated that BEMs are used by a variety of professionals including architects, construction managers, engineers, policy makers and energy auditors. Utilities and

municipalities rely on the predictions of building energy models to calculate energy efficiency rebates.

Bianchini *et al. (*2014) stated that green roofs have been used as an environmentally friendly product for many centuries and considered as a sustainable construction practice. Economic and environmental benefits of green roofs are already proven by many researchers. However, a life-cycle net benefit-cost analysis, with the social dimension, is still missing. Sustainable development requires quantitative estimates of the costs and benefits of current green technologies to encourage their use. They provide conclusions of on an extensive literature review in multiple fields and reasonable assumptions for unavailable data. The Net Present Value (NPV) per unit of area of a green roof was assessed by considering the social-cost benefits that green roofs generate over their life cycle. Two main types of green roofs e i.e. extensive and intensive e were analysed. Additionally, an experimental extensive green roof, which replaced roof layers with construction and demolition waste (C&D), was assessed. A probabilistic analysis was performed to estimate the personal and social NPV and payback period of green roofs. the probability of profits out of this technology is much higher than the potential financial losses. It is evident that the inclusion of social costs and benefits of green roofs improves their value.

Zaidi *et al.* (2016) stated that Building Energy Modelling (BEM) tools have been around since the early 1980s. Over the years, they have been vastly improved and expanded to model more complex and detailed energy using systems. With the increase in computational speed and capacity, powerful building energy models can now be used on personal desktops and laptops. He states that many Universities in the US are striving to make their campuses

Naamandadin *et al.* (2016) stated that Building orientation and site planning are amongst the important factor in determining the building eco-friendliness. Accordingly, they can help the designers to determine which area will be affected by receiving direct sunlight to the building façade or atrium design. An important clue in developing energy efficient facades for energy efficient building is the knowledge about the distribution of solar radiation due to orientation. They recommend that orientation of the building should be in accordance to the sun path. It can be specified by two angles: i.)Solar attitude angle (y).. ii) Solar azimuth angle. The data

then will help the designer to arrange the building orientation and determine which side can give the greatest advantages in reducing insulation (and the resulting air-conditioning load). To get the accurate results, the data must be collected in frequently.

"Analysing the life Cycle Energy Saving of DOE Supported Building Technologies" Published by U.S Department of Energy under DE –AC05-76RL01830States the Commercial Buildings Integration approach to designing high-performing buildings is not a

They had conculed that integrity between the construction material and the electronic equipment used plays an important role.

1 high efficient or low consuming electronic should be used as it has indirectly concern with the environment.

2 properties of material such as density, thermal insulation, volume,etc.

Chapter 3

Research and Methodology

Green Building Compliances and Software For Energy Simulations

The methodology adopted

Green Building is constructed by following various codes as discussed below:

3.1.1. Leadership in Energy and Environmental Design (LEED):-

Fig. 3.1 LEED CERTIFICATION SYMBOL

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LEED is an Eco-Friendly Building Certificate developed by the American Green Building Council.

The LEED certificate, which has been issued since 1998, is now the most well-known green building certificate in the world and has been rapidly recognized in our country.

Advantages of LEED Certificate

The LEED certification enables buildings to be designed further than laws and regulations. In this way, buildings become more energy-efficient, water-saving, environmentally-less and healthier.

In addition, LEED certification ensures that the building is recognized in international platforms, its value increases, and the companies and institutions that build the building gain prestige.

The LEED certificate can be obtained for the following building types

New Construction and Major Renovations: The LEED assessment system suitable for new constructions or major renovations of commercial buildings and / or high-rise residential buildings over 4-6 floors, including all interiors.

Existing Buildings: All existing building types (except houses) can be evaluated under this category. The category of existing buildings includes more operation and maintenance of buildings. Therefore, certificates can be obtained by conducting operational issues within the framework of environmentally friendly procedures, without requiring additional investment costs.

Core and Shell (Core & Shell): Within the scope of the project, only the core and shell sections and common areas of the project are designed to evaluate the environmental performance of the system. In particular, commercial centre offices and shopping centre where the construction of the interiors is left to the tenant or the buyer fall within this category.

Retail: Under this category, banks, restaurants, supermarkets, clothing, electronics, etc. can be considered as single or chain stores. This type of stores / chains can be considered LEED Retail-NC or LEED Retail-CI if it is a single building.

Commercial Interiors: LEED is a category that covers interior projects other than shops. It is an ideal system for office interior projects especially in buildings which are built as core and shell. Hurry because the scope of applicability of direct impacts and environmental performance in Turkey and is preferred by many interior office project in the world.

Homes: All residential buildings up to 6 floors can be rated under this category. 4-6 floors can also be evaluated under LEED New Buildings. Within this category, attention has been

given to issues that need to be considered for sustainability and human health / comfort, especially in residential houses. It contains different criteria according to the systems developed for commercial buildings. In this system, unlike other systems, auditors authorized by the USGBC are in charge of auditing the Green Ratings.

Schools: K12 is an evaluation system suitable for new construction and / or major renovations of school buildings, which include education from kindergarten to high school.

Healthcare Centers: All hospitals, patient care centres, private / long-term care centres and nursing homes can be evaluated within this system.

3.1. B) BRE EAM CERTIFICATION SYSTEM: -

Fig. 3.2 BREAM CERTIFICATION SYMBOL

- The BRE Environmental Assessment Method (BREEAM) is an environmentally friendly building certification system that was first introduced in 1990 in the UK, but was later adopted in many countries around the world.

- As with the LEED certificate, the purpose of BREEAM certification is to measure the environmental performance of a building by standards. The essence of the certificate lies in the award of buildings that implement today's environmentally friendly technologies.

There are three different versions of BREEAM that is in Use today:

- BREEAM International

- BREEAM In-Use International
- BREEAM International Bespoke (for buildings other than the above categories)

BREEAM certification can only be taken for the design of the building and can be tailored to the project (Bespoke). Certificate levels are also listed as Good, Very Good, Excellent and Outstanding.

3.2 Different Types of Software Used for Energy Modelling

3.2. A) eQuest :-

- eQuest = Enhanced DOE-2 +Wizards + Graphics
- eQuest is the best suited and primary software used for energy modelling
- eQuest is advanced, futuristic and complex yet User-friendly Building Energy Efficiency analysis tools which provides Professionals levels of Result with an affordable level of Efforts
- The tool was designed in order to perform detailed analysis of today's state of art.
- Building design Technology gives most innovatory energy simulation techniques.
- eQuest has a graphical result display module with an enhanced DOE-2 derived building Energy used Simulation Program.
- eQuest is very popular software when it comes to Energy modelling as it can be used by all the design team members
- It does not require any Special training courses.
- eQuest formed a balanced between the enhancing technologies with design process
- eQuest results are generated quickly; accurately as the software utilize the full capabilities of DOE-2
- DOE-2 is the latest version of a well-respected and popular building Energy Simulation Program development over the last 20 years by U.S .D.O.E
- In eQuest Doe -2 performs an hourly simulation of the building design for a one year period
- Doe -2 calculates heating or cooling loads for each hour of the years.
- During the Simulation, DOE-2 also tabulates simulation building projected energy use foe various end uses
- It allows the advanced user to input additional details to analyze complex buildings
- Results give three dimensional view of the building geometry and HVAC system

- Results are displayed in graphical format of Estimated Overall Building energy on annual or Monthly basis

3.2.B) EDGE "Excellence in Design for Greater Efficiencies system'':-

Fig. 3.3 Edge Software Symbol

- It was developed by IFC (International Finance Corporation), an organization of the World Bank, is a software application, an international standard and a green building certification system. EDGE provides fast, easy and cost-effective solutions for the growth of green structures in developing countries.
- The system, developed by EDGE, allows decision makers to determine the most cost-effective options for green design in the context of their region, which increases the commercial appeal of the relevant investment by ensuring the efficient use of resources.
- The EDGE standard provides a universal definition for the green building.
- The EDGE certificate is also an important step on the road to international financial support provided by IFC under sustainable buildings.
-
- 3.2. C Energy plus:-
- Energy Plus is one of the most known energy simulation software tools. Its development began in 1996, sponsored by the Department of Energy (DOE) from United States of America (USA).
- Initially the U.S. government was developing two different software tools, BLAST and DOE-2, which were abandoned after many discussions and represented a first step and the working basis of the Energy Plus. The Energy Plus has the features and capabilities of BLAST and DOE-2; however is an entirely new software tool that combines the heat balance of BLAST with a generic HVAC system.

- The Energy Plus aims to develop and organize software tools in modules that can easily work together or separately. It is important to outline that in Energy plus does not found a visual interface that allows users to see and concept the building. In this case third-party software tools, i.e., Design Builder need to be used.
- Energy Plus is a thermal simulation software tool that allows the analysis of energy throughout the building and the thermal load and it is used by engineers, architects and researchers to model the energy use and water use in buildings. The software tool simulates models for heating, cooling, lighting, ventilation, other flows of energy and water use.
- 3.2.D) ESP-r (Energy Simulation Software tool):-
- The software tool ESP-r (Energy Simulation Software tool) is intended to support the construction project with regard to energy and environmental performance, in a realistic and accurate way.
- The software tool is mathematical software for a project manager that coordinates the data, simulation, CAD applications, different tools for evaluating performance, display and report generators, etc.
- The ESP-r uses several complex equations to deal with all aspects at the same time (geometry, construction, operation, distribution, heat dissipation, etc.). These equations are integrated in successive time steps in response to the influences of the occupants, and climate control systems.
- The geometry of the building can be set in CAD software tools or other similar tools to allow the specification of the geometry of buildings. The models created in this software can be exported to Energy Plus.
- The operating conditions are determined through database support. Shading, insulation, HVAC systems, areas of computational fluid dynamics (CFD), electricity, renewable energy embedded systems, lighting, natural ventilation, combined heat and power generation, facades photovoltaic systems for control of indoor air quality can also be included in the models pre-determined.
- The time simulation of the building with ESP-r simulation tool can vary in a range from one minute to one hour.

Chapter 4

Research Methodology

The main objective of the research paper is to provide recommendations and modification to the proposed AIKTC College Hostel buildings in order to have life cycle cost savings

Step1) Site Selection for Case Study work: - AIKTC is proposing a College Hostel building

Step 2) All the Data required for performing LCCA and Energy Simulations is collected. Data required are all architect, Structure, MEP &Finishing Drawings, Building Material Details etc. are collected

Step 3) Properties of Building Envelope Advanced Constructions Materials for wall, Roofs and fenestrations are studied in order to get the best eco-friendly material in terms of cost and future life savings

Step 4) LCCA for two cases has to be formed

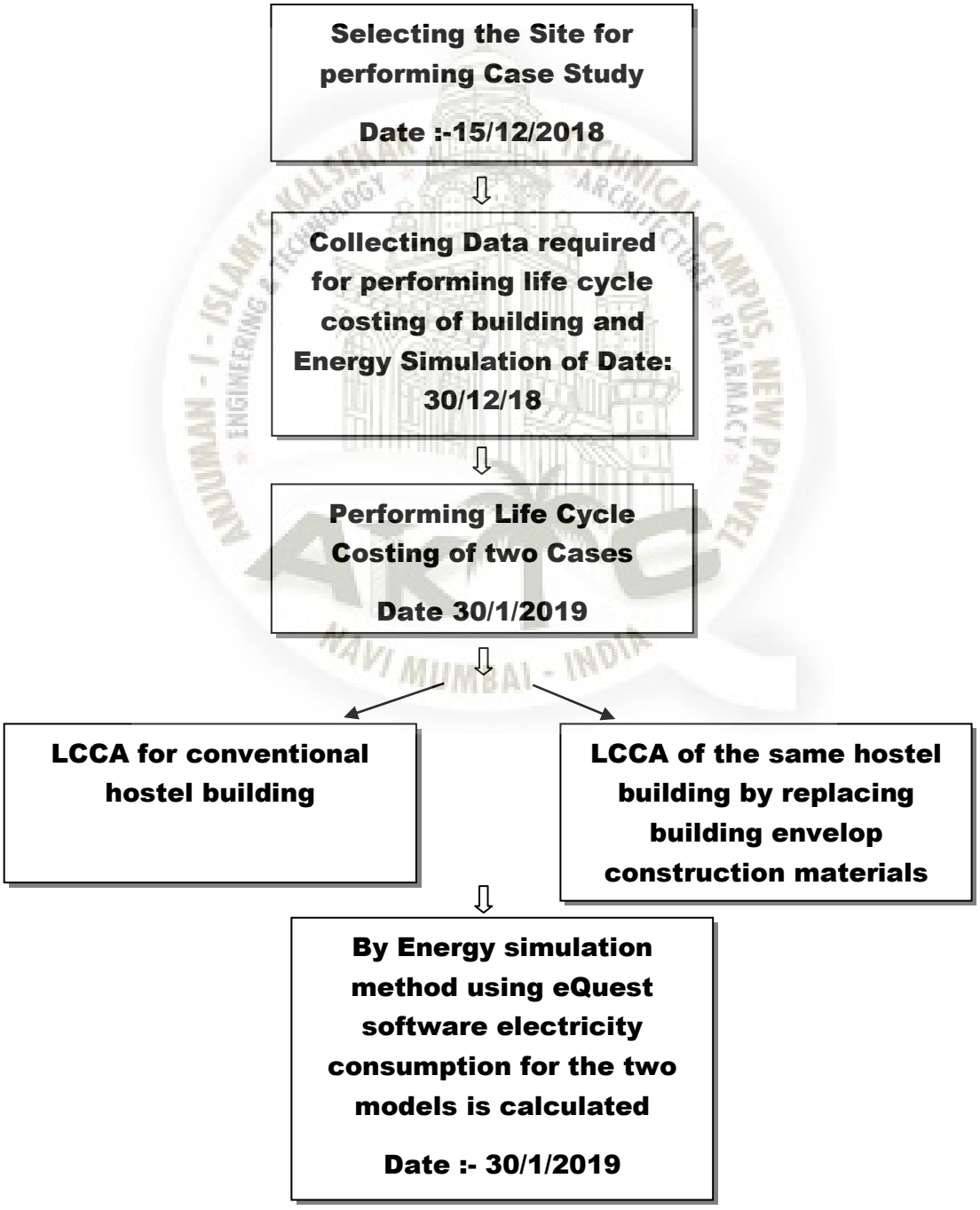
1) LCCA of Conventional Hostel Building

2) LCCA of the Same hostel building using Advanced Construction materials for roof , walls and fenestration

Step 5) LCCA of all two cases is compared in order to know energy savings from green building.

Step 6) simultaneously electricity consumption for all the two cases is derived by energy simulation method using eQuest and present and future cost of electricity is calculated using whole sale price index

Step7) Payback period of all two cases is found and NPV for next 25 years is calculated by taking outflow as (the initial construction cost) – outflow (From the revenue generated and energy saving from electricity)



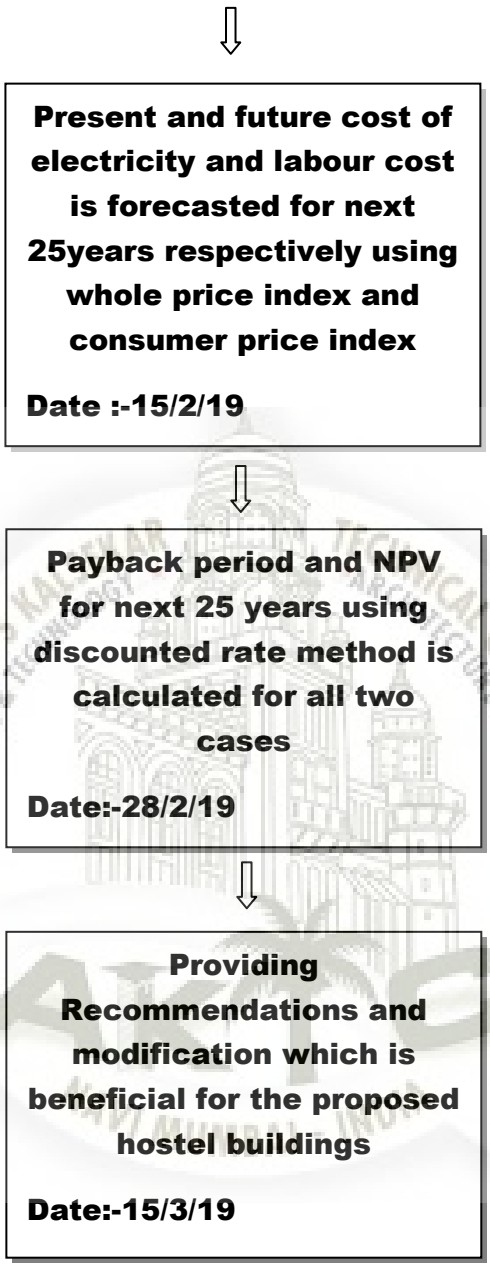


Fig 4.1 Research and Methodology

Chapter 5

Data Collection and Analysis

We have collected layout AutoCad plan of a hostel building from our architecture department on 20 october 2018. As shown in fig.[5.1]

For Case Study work Hostel building proposed by Anjuman-I-Islam's Kalsekar Technical Campus had been Selected .The college is located in Navi Mumbai.

Location :- Plot No. 2 & 3, Sector - 16, Near Thana Naka, Khandagao, New Panvel, Navi Mumbai, Maharashtra 410206

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

Fig no.[5.1] : LAYOUT OF COLLEGE CAMPUS.

We also collected detailed plan of Ground floor fig no.[5.2], First floor, Second floor, Third floor as fig no.[5.3] and fourth floor as shown in fig no.[5.4].

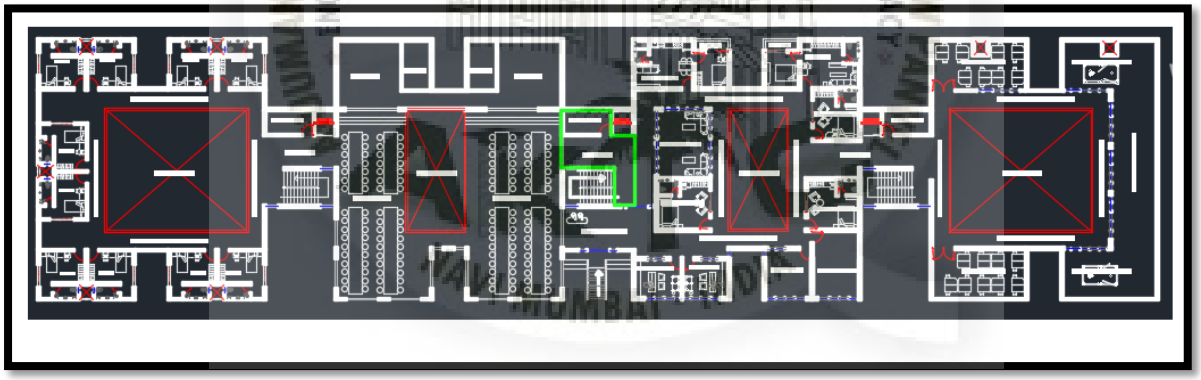


Fig no.[5.2] : Ground floor plan

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

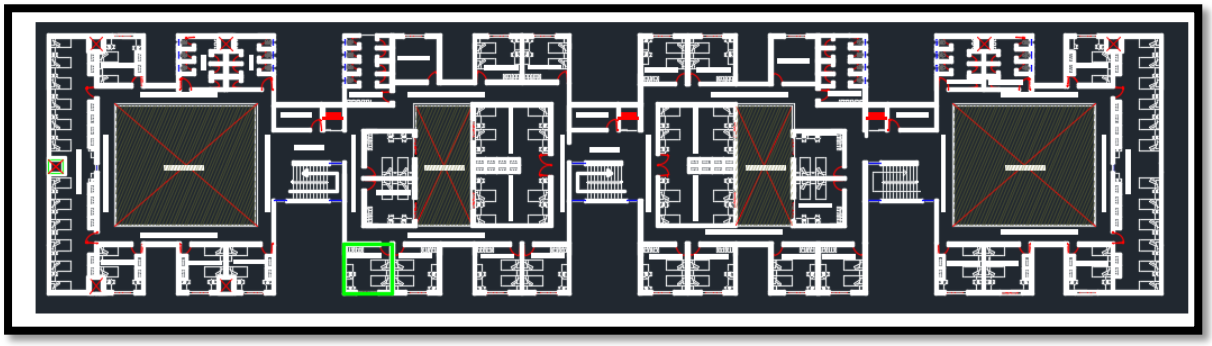


Fig no.[5.3] : First floor, Second floor, Third floor plan

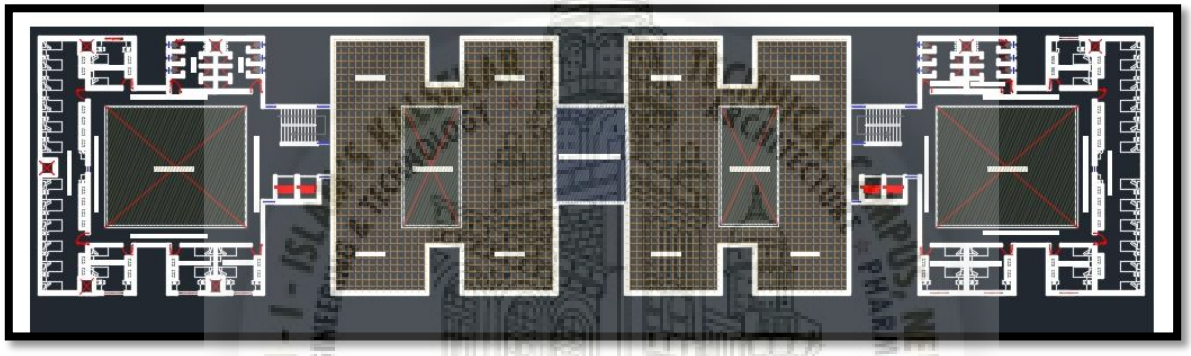


Fig no.[5.4] : Fourth floor plan

After the collection of detailed drawings we have calculated the quantites of Excavation in foundation, Concrete in footings, Block work in walls, Internal flooring and skirting , Plastering and painting, External painting and plastering, Quantitiy of concrete in staircase and slab, Quantity of steel in staircase, beams and columns. Waterproofing in washrooms and terrace etc by conventional method through measurement sheets.

For details of measurement sheets refer to page no.44 to 149 table no.1 to 9 and sheet no.1 & 2 in apppendix I

We assumed ,

Beam size = 230x600mm and Column Size = 300x500mm

For structural details of the hostel kindly refer appendix I fig no.1 on page no.43

rates and we found that :-

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

Total cost of construction of Hostel = 10,10,08,268.8 /-

(Ten crore ten lakh eight thousand two hundred and sixty eight rupees)

Residual cost of hostel after 50 years = 10% of 101008268.8

= 10100826.8 /-

Details of the hostel :-

Life of Structure = 50 yrs

Plot area= 4000 Sq.M

Built up area= 7623.99 Sq.m

FSI = 1.9 < 2.5

Number of storeys = 4

Capacity = 150 students

Fees per year = rs. 100000

Maintenance Cost:- (LCCA for the hostel)

Annual Maintenance @ 3 rs. Per sq.ft for 50 years

Area in Sq.ft =82064.736

Annual Maintenance for 50 years = 147716524.8/-

Non annual maintenance was done after each 10 years.

1)External painting @ 2030,2040,2050 = 4519229.4/-

2)Internal painting @ 2030,2040,2050= 3632689.4/-

3)Gypsum plaster to the walls @2030,2040,2050 = 8763209/-

Total operating and maintenance cost =164631652.6 /-

We had determined the over all construction cost of the structure and also had done the life

cycle costing analysis of the structure for upcoming 50 years.

We also did energy analysis of the structure using e-Quest software. We chose to use this software gave us the electrical consumptions of our structure. Thus we could calculate probable of electrical expenses.

After using e-quest we now had 2 cases to do the comparision .

Case 1 :- Hostel Building using conventional materials and techniques.

Case 2 :- The same hostel building by changing construction materials.

Autoclave Aerated block instead of bricks

Double glazing windows instead of conventional windows.

We also collected the electricity bills from the maintenance dept of the AIKTC, New Panvel, We got electricity bills from June 2013 to December 2018.

We also calculated the current inflation rate for February 2019 and it was found out to be 6.97 % . We got this data from www.inflation.eu .

Chapter 6

Results and Discussion

6.1 Case 1: Analysis for Conventional hostel Building

As mentioned in previous chapter, the results were obtained from e-QUEST 3-65 software. After inscribing appropriate information pertaining to regarding materials used in the construction of hostel, the following results can be summarized :-

- Electrical consumption :- 44692 KW per year

For more details refer page no.163 APPENDEX III Table no.12

Projected Year	Inflow and Outflow (Rs.)	Present Value (Rs)	Net Present Value (NPV) (Rs)
2020	-25252067	-25252067	0
2021	-25252067	-25252067	-50504134
2022	-25252067	-25252067	-75756201
2023	-25252067	-25252067	-101008268

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

2024	17553514.48	16351667.0	-84656601.05
2025	18603368.7	16143120.8	-68513480.27
2026	19722590.46	15942550.8	-52570929.44
2027	20916090.43	15749701.1	-36821228.36
2028	22189289.54	15564427.6	-21256800.77
2029	23547801.36	15386437.3	-5870363.483
2030	16474557.59	10027655.8	4157292.339
2031	26547425.6	15052409.4	19209701.75
2032	28201369.25	14895385.8	34105087.54
2033	29965266.14	14743400.1	48848487.64
2034	31852673.46	14599008.2	63447495.86
2035	33869805.5	14460660.1	77908155.94
2036	36027433.09	14328696.6	92236852.52
2037	38335280.56	14202668.9	106439521.4
2038	40804562.11	14082442.6	120521964
2039	43447381.05	13967890.5	134489854.6
2040	40460600.41	12117066.6	146606921.1
2041	49306942.97	13755335.9	160362257
2042	52553041.29	13657113.8	174019370.8
2043	56031571.78	13564126.5	187583497.2
2044	59760340.09	13476280.3	201059777.6
2045	63758598.79	13393487.9	214453265.5
2046	68047171.4	13315667.9	227768933.4
2047	72648587.52	67674511.0	295443444.4
2048	77587230.33	14142984.9	309586429.3
2049	82889497.32	14074996.2	323661425.5
2050	82570517.49	13060858.9	336722284.4
	1153672509	437730552.4	

6.1.1 Tabulated Result for Case 1

Total Investment	Rs. 10,10,08,268
NPV	Rs. 33,67,22,284.4
Benefit Cost /PI	4.33361111
payback period	7 years and 2 months

For detailed table of all the calculations kindly refer table no :- 12 page no.-163, APPENDEX III

6.2 Case 2: Analysis for hostel building with Autoclave Aerated blocks, Double glazing

As mentioned in previous chapter, the results were obtained from the e-EQUEST software. After inscribing appropriate data regarding materials used in the construction of hostel, the following results can be generalized :-

Electrical consumption :- 35712 KW per year

For more details refer page no.164 appendixIII Table 13

Projected Year	Inflow and Outflow (Rs.)	Present Value (Rs)	Net Present Value (NPV) (Rs)
2020	-25252067	-25252067	0
2021	-25252067	-25252067	-50504134
2022	-25252067	-25252067	-75756201
2023	-25252067	-25252067	-101008268
2024	17461469.48	16265924.1	-84742343.94
2025	18510425.7	16062469.2	-68679874.7
2026	19628749.46	15866695.4	-52813179.26
2027	20821351.43	15678363.1	-37134816.12
2028	22093652.54	15497344.1	-21637472.03
2029	23451266.36	15323360.1	-6314111.961
2030	16377124.59	9968350.8	3654238.804

2031	26449094.6	14996655.7	18650894.46
2032	28102140.25	14842975.1	33493869.53
2033	29865139.14	14694136.0	48188005.52
2034	31751648.46	14552705.5	62740711.03
2035	33767882.5	14417144.2	77157855.25
2036	35924612.09	14287803.0	91445658.24
2037	38231561.56	14164242.5	105609900.8
2038	40699945.11	14046337.3	119656238
2039	43341866.05	13933968.5	133590206.6
2040	40354187.41	12085198.2	145675404.8
2041	49199631.97	13725398.9	159400803.7
2042	52444832.29	13628993.2	173029796.9
2043	55922464.78	13537713.8	186567510.7
2044	59650335.09	13451473.6	200018984.3
2045	63647695.79	13370191.0	213389175.3
2046	67935370.4	13293790.4	226682965.7
2047	72535888.52	67569528.2	294252493.9
2048	77473633.33	14122277.9	308374771.8
2049	82775002.32	14055554.5	322430326.3
2050	82455124.49	13042606.3	335472932.5
	1150872096		

6.2.1 Tabulated Result:- Case 2

Total Investment	Rs. 10,10,08,268
NPV	Rs. 33,54,72,932.5
Benefit Cost /PI	4.321242302
payback period	7 years and 2 months

For detailed table of all the calculations kindly refer table no :- 13 page no.164

Appendix III

Chapter 7

Conclusion and Future Scope

Table 7.1 shows a comparison between the two cases as discussed in previous chapters. One model had just conventional building approach, whereas the other involved energy efficient approach for a hostel building

Table 7.1: Comparison between conventional and energy efficient model

Description	Case 1	Case 2
Total Investment	Rs. 10,10,08,268	Rs. 10,10,08,268
NPV	Rs. 33,67,22,284.4	Rs. 33,54,72,932.5
Benefit Cost /PI	4.33361111	4.321242302
Pay back period	7 years 2 month	7 years 1 months

7.1 Conclusion:

By comparing the result of both cases, as shown in table 7.1 below, following deduction can be made:-

- The Case 2 turns out to be more more efficient as per our research. Two materials were modeified and more savings were obtained. NPV was more than the conventional model.
- Although the difference between the NPV and the beginning of pay back period of both the cases differ much and there is only a minute difference of about Rs. 13 lakh, but our motive of making our structure energy efficient has been fulfilled.
- There is no major difference in the initial investment

7.2 Future Scope

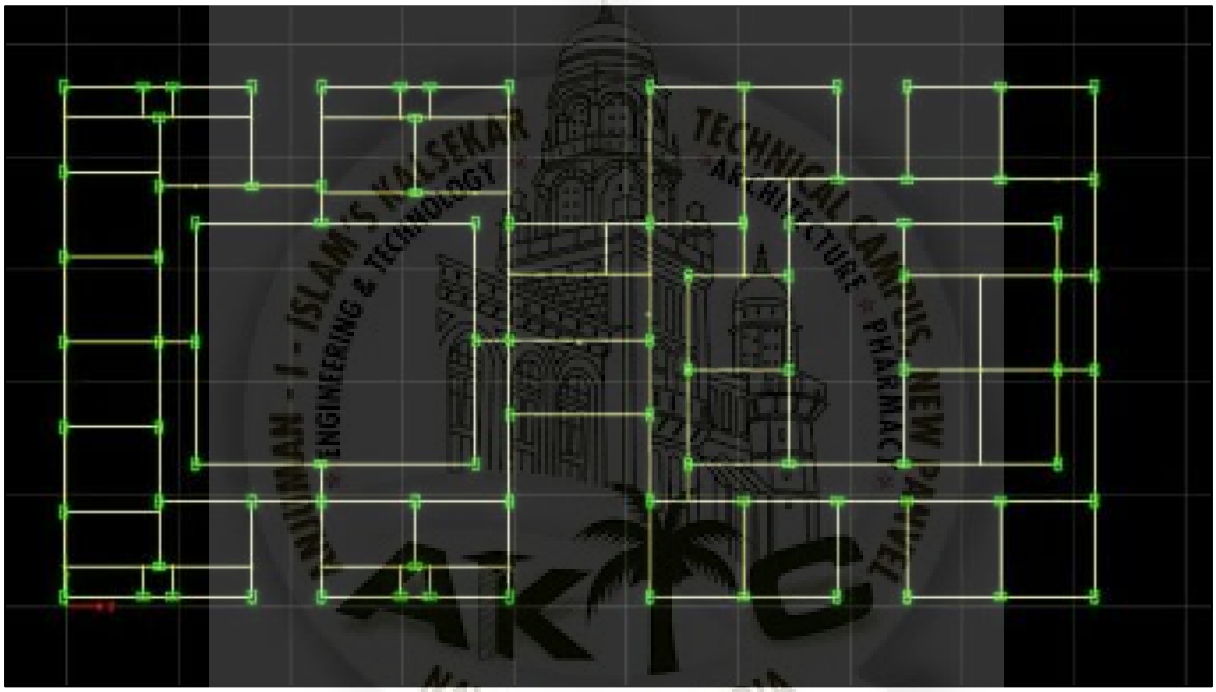
- In this work, only two materials are changed, and just due to it, astonishing savings in life-cycle cost is obtained.
- There is tremendous scope for researchers in future to modify certain conventional materials and methods to obtain substantial savings in life-cycle costs.
- Study of sun-path diagram and hence planning orientation of rooms for deriving maximum advantage of sunlight can also be thought of to bring more savings in cost
- Study of wind-rose diagram and patterns of seasonal variations in humidity and temperature can result to increased degree of conservation, which will also ultimately increase savings in operational cost for the project, leading to a more energy efficient structure.

References

1. Alder et al published "Green Builings and Health in Springer September 2015, Volume 2, Issue 3, pp 250"
2. Benya, J. R. (2001). Lighting for schools. National Clearinghouse for Educational Facilities, p. 1-7. Retrieved September 30, 200 from http://www.edfacilities.org/pubs. ERIC #: ED459598
3. Fallahtafti, Reza Mohammadjavad Mahdavinejad, (2015), Optimisation of building shape and orientation for better energy efficient architecture, International Journal of Energy Sector Management, 9 (4) pp. 593 – 618.
4. Nurul Akmam Naamandadin1,3,a, and Abdul Razak Sapian2,b, Siti Nur Aishah Mohd Noor "Site Planning and Orientation for Energy Efficiency: A Comparative Analysis on Three Office Buildings in Kuala Lumpur to Determine a Location for Building Shading Device"
5. Syed Tabish Zaidi, Hazem Elzarka, Ph.D., PE, Jason M. Park, PE University of Cincinnati Cincinnati, OH had presented a Conference at 52nd ASC Annual International Conference Proceedingspaper on Energy Modeling of University buildings: A Case Study
6. Yeang, K. (1995). Designing With Nature: The Ecological Basis for Architectural Design. McGraw Hill Publication

APPENDIX I

Structural detailing of the hostel building



APPENDIX II

Detailed Measurement sheets of brick work of all floors

APPENDIX II-A

MEASUREMENT SHEET FOR BRICK WORK ON GROUND FLOOR

SR. NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	B	H	QTY	REMARK
	BLOCK 1							
1	NRI ROOMS	M2	10	18.84	1	3.85	725.34	L=3.68+2.93+4.19+(1.2*2)+4.11+(3.06/2)
2	PASSAGE WALLS	M2	1	19.35	1	3.85	74.4975	L=2.57+2.92+4.07+3.85+2.97+2.97
3	COURT YARD PARAPET WALL	M2	2	10.87	1	1.2	26.088	
			2	12.35	1	1.2	29.64	
						TOTAL	**855.5655**	
	DEDUCTION FOR BRICKWORK	M2					0	
1	D1	M2	10	0.7	1	2.1	14.7	
2	D2	M2	10	1	1	2.1	21	
	WINDOW							
1	W1	M2	10	2.01	1	1	20.1	
2	V1	M2	10	0.5	1	0.5	2.5	
		M2				**TOTAL**	**58.3**	
	BRICKWORK AFTER DEDUCTION	M2					**797.2655**	
	BLOCK 2							
1	KITCHEN AND STORAGE	M2	2	27.545	1	3.85	212.0965	
2	PASSAGE WALLAS	M2	2	36.33	1	3.85	279.741	
3	COURTYARD PARAPER WALL	M2	2	10.87	1	1.2	26.088	
		M2	2	4.98	1	1.2	11.952	
	DEDUCTION FOR BRICKWORK	M2	-1	36.65	1	3.85	**-141.1025**	
	BRICKWORK AFTER DEDUCTION						**388.775**	
>>>	BLOCK 3							
1	WARDEN R& VVIP ROOM	M2	6	4.41	1	3.85	101.871	
		M2	4	8.23	1	3.85	126.742	
2	BATH	M2	1	3.37	1	3.85	12.9745	
		M2	1	2.62	1	3.85	10.087	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

3	EXECUTIVE ROOM LOWER	M2	4	9.22	1	3.85	141.988	
		M2	4	3.28	1	3.85	50.512	
4	EXECUTIVE ROOM UPPER	M2	2	4.66	1	3.85	35.882	
			2	4	1	3.85	30.8	
	BATH &WC	M2	2	1.45	1	3.85	11.165	
		M2	2	1.87	1	3.85	14.399	
5	STORE ROOM (LOWER RIGHT)	M2	2	4.01	1	3.85	30.877	
			1	4.33	1	3.85	16.6705	
6	LAUNDRY ROOM	M2	2	6.03	1	3.85	46.431	
		M2	1	4.04	1	3.85	15.554	
7	WARDEN AND ADMIN LOWER RIGHT	M2	3	3.66	1	3.85	42.273	
		M2	2	8.23	1	3.85	63.371	
8	WALL EXTRA	M2	2	0.76	1	3.85	5.852	
9	COURTYARD PARAPER WALL	M2	2	10.87	1	1.2	26.088	
						TOTAL	**783.537**	
	DEDUCTIONS							
	DOORS							
1	D1	M2	-9	1	1	2.1	-18.9	
2	D2	M2	-6	0.7	1	2.1	-8.82	
	WINDOWS						0	
1	W1	M2	-5	1.87	1	1	-9.35	
2	BALCONY WALLS	M2	-2	3.08	1	3.85	-23.716	
			-2	0.68	1	3.85	-5.236	
						TOTAL	**-66.022**	
	BRICKWORK AFTER DEDUCTION						**717.515**	
>>	**BLOCK 4**							
1	LONG-WALL	M2	2	22.84	1	3.85	175.868	
2	SHORT-WALL	M2	2	19.73	1	3.85	151.921	
3	DUCTS (Lower)	M2	4	4.41	1	3.85	67.914	
4	DUCTS (UPPER)	M2	4	1.35	1	3.85	20.79	
		M2	2	1.17	1	3.85	9.009	
4	STUDY-ROOM WALLS	M2	2	6.23	1	3.85	47.971	
5	COURT YARD PARAPET WALL	M2	2	10.87	1	1.2	26.088	
						TOTAL	**499.561**	
	DEDUCTION	M2	-1	3.82	1	3.85	**-14.707**	
	BRICKWORK AFTER DEDUCTION						**484.854**	
	TOTAL BRICKWORK IN						**2388.4095**	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	GROUND FLOOR							

APPENDIX II-B

MEASUREMENT SHEET FOR BRICK WORK ON FIRST FLOOR

SR. NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	B	H	QTY	REMARK
	BLOCK 1							
1	DUCT WALL	M2	8	1.5	1	2.85	34.2	
		M2	8	1.17	1	2.85	26.676	
2	UPPER OCCUPANCY ROOM	M2	1	7.03	1	2.85	20.0355	
			1	7.94	1	2.85	22.629	
	LOWER OCCUPANCY ROOM	M2	3	4.41	1	2.85	37.7055	
			2	2.9	1	2.85	16.53	
			3	3.38	1	2.85	28.899	
			3	4.04	1	2.85	34.542	
3	DORMETRY WALL	M2	1	22.84	1	2.85	65.094	
			2	3.38	1	2.85	19.266	
			1	11.87	1	2.85	33.8295	
4	TOILET	M2	2	4.85	1	2.85	27.645	
			4	3.38	1	2.85	38.532	
			2	3.35	1	2.85	19.095	
			12	1.58	1	2.85	54.036	
5	RIGHT VERTICAL WALL	M2	2	3.65	1	2.85	20.805	
6	COURT YARD PARAPET WALL	M2	2	10.87	1	1.2	26.088	
7	HORIZONTAL WALL	M2	2	2.97	1	2.85	16.929	
						TOTAL	**542.5365**	
	DEDUCTONS							
1	DOORS							
	D1	M2	-8	1	1	2.1	-16.8	
2	WINDOWS	M2	-4	2.01	1	1	-8.04	
3	VENT	M2	-6	0.5	1	0.5	-1.5	
						TOTAL	**-26.34**	
	BRICKWORK AFTER DEDUCTION						**516.1965**	
	BLOCK 2							
1	UPPER OCCUPANCY ROOM	M2	3	4.41	1	2.85	37.7055	
2	MIDDLE OCCUPANCY ROOM	M2	3	4.36	1	2.85	37.278	

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			4	4.18	1	2.85	47.652	
		M2	4	4.04	1	2.85	46.056	
3	LOWER OCCUPANCY ROOM	M2	6	4.41	1	2.85	75.411	
		M2	8	4.03	1	2.85	91.884	
4	STORE ROOM	M2	1	4.41	1	2.85	12.5685	
			2	4.04	1	2.85	23.028	
5	TOILET +BATH	M2	2	6.21	1	2.85	35.397	
		M2	2	4.16	1	2.85	23.712	
		M2	4	1.17	1	2.85	13.338	
6	PASSAGE WALL	M2	1	9.42	1	2.85	26.847	
		M2	1	7.92	1	2.85	22.572	
		M2	2	2.96	1	2.85	16.872	
7	COURTYARD PARAPET WALL	M2	2	4.98	1	1.2	11.952	
		M2	1	2.34	1	1.2	2.808	
8	DORMETRY	M2	2	10.87	1	2.85	61.959	
		M2	2	6.72	1	2.85	38.304	
						TOTAL	**625.344**	
	DEDUCTIONS							
1	DOORS							
	D1	M2	-12	1	1	2.1	-25.2	
	D2	M2	-8	0.7	1	2.1	-11.76	
2	VENT	M2	-4	0.5	1	0.5	-1	
3	WINDOW	M2	-11	2.01	1	1	-22.11	
						TOTAL	**-60.07**	
	BRICKWORK AFTER DEDUCTION						**565.274**	
	TOTAL B.W. ON FIRST FLOOR						**2162.941**	
	TOTAL B.W. ON SECOND FLOOR						**2162.941**	
	TOTAL B.W. ON THIRD FLOOR						**2162.941**	
	TOTAL B.W. ON FOURTH FLOOR						**1032.393**	
	TERRACE							
	ABOVE THIRD FLOOR							
1	**BLOCK 2 & 3**	M2	2	22.84	1	1.2	54.816	
		M2	2	4.26	1	1.2	10.224	
		M2	2	4.41	1	1.2	10.584	
		M2	4	8.23	1	1.2	39.504	
		M2	2	2.97	1	1.2	7.128	
		M2	2	10.87	1	1.2	26.088	
		M2	2	4.98	1	1.2	11.952	
						TOTAL	160.296	

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						TOTAL 2&3	**320.592**	
	ABOVE FOURTH FLOOR							
2	**BLOCK 1 & 4**	M2	2	22.84	1	1.2	54.816	
		M2	2	4.56	1	1.2	10.944	
		M2	2	4.41	1	1.2	10.584	
		M2	2	2.97	1	1.2	7.128	
		M2	4	8.53	1	1.2	40.944	
						TOTAL	124.416	
						TOTAL 1&4	**248.832**	
	Ground Floor						2388.41	
	First floor						2162.941	
	Second Floor						2162.941	
	Third Floor						2162.941	
	Fourth Floor						1032.393	
	Terrace Parapet						569.424	
	Beams And Columns Deduction						1132.95	
	Total Brickwork						9346.1	Cu.m

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APPENDIX III

Detailed Measurement sheet of plastering of all floors

APPENDIX III-A

MEASUREMENT SHEET FOR PLASTERING ON GROUND FLOOR

SR. NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	H	QTY	REMARK
	BLOCK 1						
1	NRI ROOMS						
	W/C	SQ.M	10	2.12	3.85	81.62	
	ROOM		10	4.11	3.85	158.235	
			10	4	3.85	154	
			10	2.9	3.85	111.65	
	DOORS	SQ.M	-10	1	2.1	-21	DEDUCTION
	WINDOWS	SQ.M	-10	2.01	1	-20.1	DEDUCTION
	VENT	SQ.M	-10	0.5	0	0	DEDUCTION
						0	
2	PASSAGE WALLS	SQ.M	2	19.73	3.85	151.921	
		SQ.M	1	13.73	3.85	52.8605	
		SQ.M	2	3.85	3.85	29.645	
	DOORS	SQ.M	-10	1	2.1	-21	DEDUCTION
	WINOWS	SQ.M	-2	2.01	1	-4.02	DEDUCTION
					TOTAL	**673.8115**	
	BLOCK 2						
1	KITCHEN	SQ.M	4	5.83	3.85	89.782	
		SQ.M	2	5.58	3.85	42.966	
	DOOR	SQ.M	-1	1.5	2.1	-3.15	DEDUCTION
2	STORAGE	SQ.M	4	2.25	3.85	34.65	
		SQ.M	4	4.26	3.85	65.604	
		SQ.M	-2	1	1.2	-2.4	DEDUCTION
3	PASSAGE WALL	SQ.M	1	0.57	3.85	2.1945	
		SQ.M	2	0.77	3.85	5.929	
		SQ.M	2	2	3.85	15.4	
		SQ.M	1	7.75	3.85	29.8375	
		SQ.M	1	2.41	3.85	9.2785	

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		SQ.M	2	16.48	3.85	126.896	
		SQ.M	-1	2.79	3.85	-10.7415	DEDUCTION
		SQ.M	2	4.41	3.85	33.957	
		SQ.M	1	3.72	3.85	14.322	
		SQ.M	2	8.23	3.85	63.371	
4	COURTYARD PARAPET	SQ.M	2	10.87	1.2	26.088	
		SQ.M	2	4.98	1.2	11.952	
					TOTAL	**555.936**	
	BLOCK 3						
1	WARDEN ROOM& VVIPROOM	SQ.M	1	5.15	3.85	19.8275	
	WC	SQ.M	2	1.45	3.85	11.165	
		SQ.M	2	1.92	3.85	14.784	
		SQ.M	4	2.11	3.85	32.494	
		SQ.M	2	2.93	3.85	22.561	
		SQ.M	1	3.8	3.85	14.63	
		SQ.M	-2	1	1.2	-2.4	DEUCTION
		SQ.M	-1	0.7	1.2	-0.84	DEUCTION
	WINDOW	SQ.M	-1	1.87	1	-1.87	
2	EXECUTIVE ROOM 1	SQ.M	2	4.32	3.85	33.264	
		SQ.M	2	1.98	3.85	15.246	
		SQ.M	2	1.87	3.85	14.399	
		SQ.M	2	1.3	3.85	10.01	
		SQ.M	1	4.15	3.85	15.9775	
		SQ.M	1	1.17	3.85	4.5045	
	DOOR	SQ.M	-1	1	2.1	-2.1	
	WINDOW	SQ.M	-1	1.87	1	-1.87	
	WC DOOR	SQ.M	-1	0.7	1.2	-0.84	
	EXECUTIVE ROOM 2 & 3	SQ.M	4	4.32	3.85	66.528	
			4	1.98	3.85	30.492	
			4	1.87	3.85	28.798	
			4	1.3	3.85	20.02	
			2	4.15	3.85	31.955	
			2	1.17	3.85	9.009	
			-2	1	1.2	-2.4	
			-2	1.87	1	-3.74	
			-2	0.7	1.2	-1.68	
3	LAUNDRY ROOM	SQ.M	2	4.04	3.85	31.108	
		SQ.M	2	5.86	3.85	45.122	
	DOOR	SQ.M	-1	1	2.1	-2.1	DEUCTION
4	STORE ROOM	SQ.M	2	4.06	3.85	31.262	

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		SQ.M	2	4.18	3.85	32.186	
	DOOR	SQ.M	-1	1	2.1	-2.1	DEDUCTION
5	WARDEN AND ADMIN CABIN	SQ.M	4	3.27	3.85	50.358	
		SQ.M	4	3.97	3.85	61.138	
	DOOR	SQ.M	-2	1	2.1	-4.2	DEDUCTION
6	CORRIDOR WALL	SQ.M	1	13.58	3.85	52.283	
		SQ.M	1	14.45	3.85	55.6325	
	DOOR	SQ.M	-2	1	2.1	-4.2	
		SQ.M	1	4.07	3.85	15.6695	
7	COURTYARD PARAPET WALL	SQ.M	2	10.76	1.2	25.824	
		SQ.M	2	4.98	1.2	11.952	
8	PASSAGE WALL	SQ.M	2	4.17	3.85	32.109	
					TOTAL	809.9685	
	BLOCK 4						
1	STUDY ROOM UPPER	SQ.M	2	4.41	3.85	33.957	
		SQ.M	2	8.23	3.85	63.371	
		SQ.M	2	1.35	3.85	10.395	
	DOOR	SQ.M	-2	1	2.1	-4.2	DEDUCTION
2	STUDY ROOM LOWER	SQ.M	2	4.41	3.85	33.957	
		SQ.M	2	8.23	3.85	63.371	
		SQ.M	2	1.35	3.85	10.395	
		SQ.M	-2	1	1.2	-2.4	DEDUCTION
3	INDOOR GAMES UPPER&LOWER	SQ.M	2	4.3	3.85	33.11	
		SQ.M	2	4.26	3.85	32.802	
		SQ.M	2	8.23	3.85	63.371	
		SQ.M	2	1.35	3.85	10.395	
	VERTCAL WALL RIGHT	SQ.M	1	22.54	3.85	86.779	
	VERTCAL WALL LEFT	SQ.M	1	14.02	3.85	53.977	
4	UPPER &LOWER CORRIDOR	SQ.M	2	13.65	3.85	105.105	
5	CORRIDR WALL LEFTSIDE	SQ.M	1	9.83	3.85	37.8455	
		SQ.M			TOTAL	632.2305	
				Grand Total		2671.9465	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX III-B

MEASUREMENT SHEET FOR PLASTERING ON FIRST FLOOR

SR. NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	H	QTY	REMARK
1	UPPER OCCUPANCY ROOM	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
	DOOR	SQ.M	-1	1	2.1	-2.1	DEDUCTION
	WINDOW	SQ.M	-1	2.01	1	-2.01	DEDUCTION
2	BOTTOM OCCUPANCY ROOM 1	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-1	2.01	1	-2.01	DEDUCTION
	BOTTOM OCCUPANCY ROOM 2	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-1	2.01	1	-2.01	DEDUCTION
	BOTTOM OCCUPANCY ROOM 3	SQ.M	2	3.9	2.85	22.23	
			2	4.26	2.85	24.282	
			-1	1	1.2	-1.2	
			-1	2.01	1	-2.01	
3	DORMETRY WALLS	SQ.M	2	22.54	2.85	128.478	
	DUCT WALL	SQ.M	2	0.73	2.85	4.161	
		SQ.M	2	1.35	2.85	7.695	
	DOOR	SQ.M	-2	1	2.1	-4.2	DEDUCTION
4	TOILET 1 LEFT	SQ.M	2	4.7	2.85	26.79	

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		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	1	3.31	2.85	9.4335	
	VENT	SQ.M	-3	0.5	0.5	-0.75	DEDUCTION
	DOOR D1	SQ.M	-1	1	2.1	-2.1	DEDUCTION
	D2	SQ.M	-6	0.7	2.1	-8.82	DEDUCTION
5	TOILET 2 RIGHT	SQ.M	2	4.7	2.85	26.79	
		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	-3	0.5	0.5	-0.75	DEDUCTION
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-6	0.7	1.2	-5.04	DEDUCTION
6	CORRIDOR WALLS	SQ.M	2	15.47	2.85	88.179	
		SQ.M	2	13.58	2,85	77.406	
	DOORS D1	SQ.M	-8	1	2.1	-16.8	DEDUCTION
	PASSAGE OPENING	SQ.M	-1	6.09	2.85	-17.3565	DEDUCTION
7	COURTYARD PARAPET WALL	SQ.M	2	12.65	1.2	30.36	
		SQ.M	2	10.87	1.2	26.088	
					TOTAL	568.9725	
	BLOCK 2						
SR.NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	H	QTY	REMARK
1	TOILET+ BATH	SQ.M	2	5.95	2.85	33.915	
		SQ.M	2	4.04	2.85	23.028	
		SQ.M	16	1.17	2.85	53.352	
		SQ.M	16	1	2.85	45.6	
		SQ.M	0.45	8	2.85	10.26	
	DOORS D1	SQ.M	-1	1.45	2.1	-3.045	DEDUCTION

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		SQ.M	-8	0.7	2.1	-11.76	DEDUCTION
	VENT	SQ.M	-4	0.5	0.5	-1	DEDUCTION
2	STORE ROOM	SQ.M	2	4.03	2.85	22.971	
		SQ.M	2	3.96	2.85	22.572	
	WINDOW	SQ.M	-1	2.01	1	-2.01	DEDUCTION
	DOORS D1	SQ.M	-1	1	2.1	-2.1	DEDUCTION
3	OCCUPANCY ROOMS UPPER	SQ.M	4	3.96	2.85	45.144	
		SQ.M	4	4.03	2.85	45.942	
	DOORS D1	SQ.M	-2	1	1.2	-2.4	DEDUCTION
	WINDOWS	SQ.M	-2	2.01	1	-4.02	DEDUCTION
4	MIDDLE OCCUPANCY ROOM	SQ.M	4	4.36	2.85	49.704	
		SQ.M	4	4.03	2.85	45.942	
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION
	WINDOWS	SQ.M	-2	2.01	1	-4.02	DEDUCTION
5	OCCUPANCY ROOMS LOWER	SQ.M	8	4.03	2.85	91.884	
		SQ.M	8	4.11	2.85	93.708	
	DOORS D1	SQ.M	-4	1	2.1	-8.4	DEDUCTION
		SQ.M	-4	2.01	1	-8.04	DEDUCTION
		SQ.M	2	6.72	2.85	38.304	
		SQ.M	2	10.57	2.85	60.249	
	WINDOW	SQ.M	-2	2.01	1	-4.02	DEDUCTION
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION
6	CORRIDOR WALLS	SQ.M	1	14.56	2.85	41.496	
		SQ.M	1	7.02	2.85	20.007	
		SQ.M	1	4.51	2.85	12.8535	
		SQ.M	1	4.19	2.85	11.9415	
		SQ.M	1	7.15	2.85	20.3775	
		SQ.M	1	8.52	2.85	24.282	

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		SQ.M	1	10.87	2.85	30.9795	
		SQ.M	1	4.66	2.85	13.281	
		SQ.M	1	7.02	2.85	20.007	
	LOWER CORRIDOR	SQ.M	1	19.72	2.85	56.202	
	VERTICAL LEFT CORRIDOR	SQ.M	1	14.17	2.85	40.3845	
	DOORS D1	SQ.M	-11	2.01	1	-22.11	DEDUCTION
	PASSAGE WAY RIGHT	SQ.M	-1	1.76	2.85	-5.016	DEDUCTION
7	COURTWARD PARAPET WALL	SQ.M	2	5.28	1.2	12.672	
		SQ.M	1	2.34	1.2	2.808	
					TOTAL	903.5255	
	BLOCK 3						
SR.NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	H	QTY	REMARK
1	TOILET+ BATH	SQ.M	2	5.95	2.85	33.915	
		SQ.M	2	4.04	2.85	23.028	
		SQ.M	16	1.17	2.85	53.352	
		SQ.M	16	1	2.85	45.6	
		SQ.M	0.45	8	2.85	10.26	
	DOORS D1	SQ.M	-1	1.45	2.1	-3.045	DEDUCTION
		SQ.M	-8	0.7	2.1	-11.76	DEDUCTION
	VENT	SQ.M	-4	0.5	0.5	-1	DEDUCTION
2	STORE ROOM	SQ.M	2	4.03	2.85	22.971	
		SQ.M	2	3.96	2.85	22.572	
	WINDOW	SQ.M	-1	2.01	1	-2.01	DEDUCTION
	DOORS D1	SQ.M	-1	1	2.1	-2.1	DEDUCTION
3	OCCUPANCY ROOMS UPPER	SQ.M	4	3.96	2.85	45.144	
		SQ.M	4	4.03	2.85	45.942	
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION
	WINDOWS	SQ.M	-2	2.01	1	-4.02	DEDUCTION

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4	MIDDLE OCCUPANCY ROOM	SQ.M	4	4.36	2.85	49.704	
		SQ.M	4	4.03	2.85	45.942	
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION
	WINDOWS	SQ.M	-2	2.01	1	-4.02	DEDUCTION
5	OCCUPANCY ROOMS LOWER	SQ.M	8	4.03	2.85	91.884	
		SQ.M	8	4.11	2.85	93.708	
	DOORS D1	SQ.M	-4	1	2.1	-8.4	DEDUCTION
		SQ.M	-4	2.01	1	-8.04	DEDUCTION
		SQ.M	2	6.72	2.85	38.304	
		SQ.M	2	10.57	2.85	60.249	
	WINDOW	SQ.M	-2	2.01	1	-4.02	DEDUCTION
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION
6	CORRIDOR WALLS	SQ.M	1	14.56	2.85	41.496	
		SQ.M	1	7.02	2.85	20.007	
		SQ.M	1	4.51	2.85	12.8535	
		SQ.M	1	4.19	2.85	11.9415	
		SQ.M	1	7.15	2.85	20.3775	
		SQ.M	1	8.52	2.85	24.282	
		SQ.M	1	10.87	2.85	30.9795	
		SQ.M	1	4.66	2.85	13.281	
		SQ.M	1	7.02	2.85	20.007	
	LOWER CORRIDOR	SQ.M	1	19.72	2.85	56.202	
	VERTICAL LEFT CORRIDOR	SQ.M	1	14.17	2.85	40.3845	
	WINDOWS	SQ.M	-11	2.01	1	-22.11	DEDUCTION
	PASSAGE WAY RIGHT	SQ.M	-1	1.76	2.85	-5.016	DEDUCTION
7	COURTWARD PARAPET WALL	SQ.M	2	5.28	1.2	12.672	
		SQ.M	1	2.34	1.2	2.808	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

					TOTAL	901.7255	
	BLOCK 4						
SR.NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	H	QTY	REMARK
1	UPPER OCCUPANCY ROOM	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
	DOOR	SQ.M	-1	1	2.1	-2.1	DEDUCTION
	WINDOW	SQ.M	-1	2.01	1	-2.01	DEDUCTION
2	BOTTOM OCCUPANCY ROOM 1	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-1	2.01	1	-2.01	DEDUCTION
	BOTTOM OCCUPANCY ROOM 2	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-1	2.01	1	-2.01	DEDUCTION
	BOTTOM OCCUPANCY ROOM 3	SQ.M	2	3.9	2.85	22.23	
			2	4.26	2.85	24.282	
			-1	1	1.2	-1.2	
			-1	2.01	1	-2.01	
3	DORMETRY WALLS	SQ.M	2	22.54	2.85	128.478	
	DUCT WALL	SQ.M	2	0.73	2.85	4.161	
		SQ.M	2	1.35	2.85	7.695	
	DOOR	SQ.M	-2	1	1.2	-2.4	DEDUCTION
4	TOILET 1 LEFT	SQ.M	2	4.7	2.85	26.79	
		SQ.M	1	3.31	2.85	9.4335	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

		SQ.M	1	3.31	2.85	9.4335	
	VENT	SQ.M	-3	0.5	0.5	-0.75	DEDUCTION
	DOOR D1	SQ.M	-1	1	1.2	-1.2	DEDUCTION
	D2	SQ.M	-6	0.7	1.2	-5.04	DEDUCTION
5	TOILET 2 RIGHT	SQ.M	2	4.7	2.85	26.79	
		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	-3	0.5	0.5	-0.75	DEDUCTION
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-6	0.7	1.2	-5.04	DEDUCTION
6	CORRIDOR WALLS	SQ.M	2	15.47	2.85	88.179	
		SQ.M	2	13.58	2.85	77.406	
	DOORS D1	SQ.M	-8	1	2.1	-16.8	DEDUCTION
	PASSAGE OPENING	SQ.M	-1	6.09	2.85	-17.3565	DEDUCTION
7	COURTYARD PARAPET WALL	SQ.M	2	12.65	1.2	30.36	
		SQ.M	2	10.87	1.2	26.088	
					TOTAL	575.4525	
	TOTAL PLASTERING IN G FLOOR					2671.947	
	TOTAL PLASTERING IN 1st FLOOR					2949.676	
	TOTAL PLASTERING IN 2nd FLOOR					2949.676	
	TOTAL PLASTERING IN 3rd FLOOR					2949.676	
	TOTAL PLASTERING IN 4th FLOOR					1137.945	
	TERRACE						
SR.NO	DESCRIPTION OF ITEMS	UNIT	NO	L	H	QTY	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

.							
	ABOVE THIRD FLOOR						
1	**BLOCK 2 & 3**	SQ.M	2	22.84	1.2	54.816	
		SQ.M	2	4.26	1.2	10.224	
		SQ.M	2	4.41	1.2	10.584	
		SQ.M	4	8.23	1.2	39.504	
		SQ.M	2	2.97	1.2	7.128	
		SQ.M	2	10.87	1.2	26.088	
		SQ.M	2	4.98	1.2	11.952	
					TOTAL	160.296	
					TOTAL 2&3	320.592	
	ABOVE FOURTH FLOOR						
2	**BLOCK 1 & 4**	SQ.M	2	22.84	1.2	54.816	
		SQ.M	2	4.56	1.2	10.944	
		SQ.M	2	4.41	1.2	10.584	
		SQ.M	2	2.97	1.2	7.128	
		SQ.M	4	8.53	1.2	40.944	
					TOTAL	124.416	
					TOTAL 1&4	248.832	
			Overall Plastering			13228.344	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX IV

Detailed Measurement sheet of painting of all floors

APPENDIX IV-A

MEASUREMENT SHEET FOR PAINTING ON GROUND FLOOR

SR. NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	H	QTY	REMARK
	BLOCK 1						
1	NRI ROOMS						
	W/C	SQ.M	10	2.12	3.85	81.62	
	ROOM		10	4.11	3.85	158.235	
			10	4	3.85	154	
			10	2.9	3.85	111.65	
	DOORS	SQ.M	-10	1	2.1	-21	DEDUCTION
	WINDOWS	SQ.M	-10	2.01	1	-20.1	DEDUCTION
	VENT	SQ.M	-10	0.5	0	0	DEDUCTION
						0	
2	PASSAGE WALLS	SQ.M	2	19.73	3.85	151.921	
		SQ.M	1	13.73	3.85	52.8605	
		SQ.M	2	3.85	3.85	29.645	
	DOORS	SQ.M	-10	1	2.1	-21	DEDUCTION
	WINOWS	SQ.M	-2	2.01	1	-4.02	DEDUCTION
					TOTAL	**673.8115**	
	BLOCK 2						

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

1	KITCHEN	SQ.M	4	5.83	3.85	89.782	
		SQ.M	2	5.58	3.85	42.966	
	DOOR	SQ.M	-1	1.5	2.1	-3.15	DEDUCTION
2	STORAGE	SQ.M	4	2.25	3.85	34.65	
		SQ.M	4	4.26	3.85	65.604	
		SQ.M	-2	1	1.2	-2.4	DEDUCTION
3	PASSAGE WALL	SQ.M	1	0.57	3.85	2.1945	
		SQ.M	2	0.77	3.85	5.929	
		SQ.M	2	2	3.85	15.4	
		SQ.M	1	7.75	3.85	29.8375	
		SQ.M	1	2.41	3.85	9.2785	
		SQ.M	2	16.48	3.85	126.896	
		SQ.M	-1	2.79	3.85	-10.7415	DEDUCTION
		SQ.M	2	4.41	3.85	33.957	
		SQ.M	1	3.72	3.85	14.322	
		SQ.M	2	8.23	3.85	63.371	
4	COURTYARD PARAPET	SQ.M	2	10.87	1.2	26.088	
		SQ.M	2	4.98	1.2	11.952	
					TOTAL	**555.936**	
	BLOCK 3						
1	WARDEN ROOM& VVIPROOM	SQ.M	1	5.15	3.85	19.8275	
	WC	SQ.M	2	1.45	3.85	11.165	
		SQ.M	2	1.92	3.85	14.784	
		SQ.M	4	2.11	3.85	32.494	
		SQ.M	2	2.93	3.85	22.561	
		SQ.M	1	3.8	3.85	14.63	
		SQ.M	-2	1	1.2	-2.4	DEUCTION
		SQ.M	-1	0.7	1.2	-0.84	DEUCTION

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	WINDOW	SQ.M	-1	1.87	1	-1.87	
2	EXECUTIVE ROOM 1	SQ.M	2	4.32	3.85	33.264	
		SQ.M	2	1.98	3.85	15.246	
		SQ.M	2	1.87	3.85	14.399	
		SQ.M	2	1.3	3.85	10.01	
		SQ.M	1	4.15	3.85	15.9775	
		SQ.M	1	1.17	3.85	4.5045	
	DOOR	SQ.M	-1	1	2.1	-2.1	
	WINDOW	SQ.M	-1	1.87	1	-1.87	
	WC DOOR	SQ.M	-1	0.7	2.1	-1.47	
	EXECUTIVE ROOM 2 & 3	SQ.M	4	4.32	3.85	66.528	
			4	1.98	3.85	30.492	
			4	1.87	3.85	28.798	
			4	1.3	3.85	20.02	
			2	4.15	3.85	31.955	
			2	1.17	3.85	9.009	
			-2	1	1.2	-2.4	
			-2	1.87	1	-3.74	
			-2	0.7	1.2	-1.68	
3	LAUNDRY ROOM	SQ.M	2	4.04	3.85	31.108	
		SQ.M	2	5.86	3.85	45.122	
	DOOR	SQ.M	-1	1	2.1	-2.1	DEUCTION
4	STORE ROOM	SQ.M	2	4.06	3.85	31.262	
		SQ.M	2	4.18	3.85	32.186	
	DOOR	SQ.M	-1	1	2.1	-2.1	DEDUCTION
5	WARDEN AND ADMIN CABIN	SQ.M	4	3.27	3.85	50.358	
		SQ.M	4	3.97	3.85	61.138	
	DOOR	SQ.M	-2	1	2.1	-4.2	DEDUCTION

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

6	CORRIDOR WALL	SQ.M	1	13.58	3.85	52.283	
		SQ.M	1	14.45	3.85	55.6325	
	DOOR	SQ.M	-2	1	2.1	-4.2	
		SQ.M	1	4.07	3.85	15.6695	
7	COURTYARD PARAPET WALL	SQ.M	2	10.76	1.2	25.824	
		SQ.M	2	4.98	1.2	11.952	
8	PASSAGE WALL	SQ.M	2	4.17	3.85	32.109	
					TOTAL	809.3385	
	BLOCK 4						
1	STUDY ROOM UPPER	SQ.M	2	4.41	3.85	33.957	
		SQ.M	2	8.23	3.85	63.371	
		SQ.M	2	1.35	3.85	10.395	
	DOOR	SQ.M	-2	1	2.1	-4.2	DEDUCTION
2	STUDY ROOM LOWER	SQ.M	2	4.41	3.85	33.957	
		SQ.M	2	8.23	3.85	63.371	
		SQ.M	2	1.35	3.85	10.395	
		SQ.M	-2	1	1.2	-2.4	DEDUCTION
3	INDOOR GAMES UPPER&LOWER	SQ.M	2	4.3	3.85	33.11	
		SQ.M	2	4.26	3.85	32.802	
		SQ.M	2	8.23	3.85	63.371	
		SQ.M	2	1.35	3.85	10.395	
	VERTCAL WALL RIGHT	SQ.M	1	22.54	3.85	86.779	
	VERTCAL WALL LEFT	SQ.M	1	14.02	3.85	53.977	
4	UPPER &LOWER CORRIDOR	SQ.M	2	13.65	3.85	105.105	
5	CORRIDR WALL LEFTSIDE	SQ.M	1	9.83	3.85	37.8455	
		SQ.M			TOTAL	632.2305	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX IV-B

MEASUREMENT SHEET FOR PAINTING ON FIRST FLOOR

SR.NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	H	QTY	REMARK
	BLOCK 1						
1	UPPER OCCUPANCY ROOM	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
	DOOR	SQ.M	-1	1	2.1	-2.1	DEDUCTION
	WINDOW	SQ.M	-1	2.01	1	-2.01	DEDUCTION
2	BOTTOM OCCUPANCY ROOM 1	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-1	2.01	1	-2.01	DEDUCTION
	BOTTOM OCCUPANCY ROOM 2	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-1	2.01	1	-2.01	DEDUCTION
	BOTTOM OCCUPANCY ROOM 3	SQ.M	2	3.9	2.85	22.23	
			2	4.26	2.85	24.282	
			-1	1	1.2	-1.2	
			-1	2.01	1	-2.01	
3	DORMETRY WALLS	SQ.M	2	22.54	2.85	128.478	
	DUCT WALL	SQ.M	2	0.73	2.85	4.161	
		SQ.M	2	1.35	2.85	7.695	
	DOOR	SQ.M	-2	1	2.1	-4.2	DEDUCTION
4	TOILET 1 LEFT	SQ.M	2	4.7	2.85	26.79	
		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	1	3.31	2.85	9.4335	
	VENT	SQ.M	-3	0.5	0.5	-0.75	DEDUCTION
	DOOR D1	SQ.M	-1	1	2.1	-2.1	DEDUCTION
	D2	SQ.M	-6	0.7	2.1	-8.82	DEDUCTION
5	TOILET 2 RIGHT	SQ.M	2	4.7	2.85	26.79	
		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	-3	0.5	0.5	-0.75	DEDUCTION

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-6	0.7	1.2	-5.04	DEDUCTION
6	CORRIDOR WALLS	SQ.M	2	15.47	2.85	88.179	
		SQ.M	2	13.58	2.85	77.406	
	DOORS D1	SQ.M	-8	1	2.1	-16.8	DEDUCTION
	PASSAGE OPENING	SQ.M	-1	6.09	2.85	-17.3565	DEDUCTION
7	COURTYARD PARAPET WALL	SQ.M	2	12.65	1.2	30.36	
		SQ.M	2	10.87	1.2	26.088	
					TOTAL	568.9725	
	BLOCK 2						
1	TOILET+ BATH	SQ.M	2	5.95	2.85	33.915	
		SQ.M	2	4.04	2.85	23.028	
		SQ.M	16	1.17	2.85	53.352	
		SQ.M	16	1	2.85	45.6	
		SQ.M	0.45	8	2.85	10.26	
	DOORS D1	SQ.M	-1	1.45	2.1	-3.045	DEDUCTION
		SQ.M	-8	0.7	2.1	-11.76	DEDUCTION
	VENT	SQ.M	-4	0.5	0.5	-1	DEDUCTION
2	STORE ROOM	SQ.M	2	4.03	2.85	22.971	
		SQ.M	2	3.96	2.85	22.572	
	WINDOW	SQ.M	-1	2.01	1	-2.01	DEDUCTION
	DOORS D1	SQ.M	-1	1	2.1	-2.1	DEDUCTION
3	OCCUPANCY ROOMS UPPER	SQ.M	4	3.96	2.85	45.144	
		SQ.M	4	4.03	2.85	45.942	
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION
	WINDOWS	SQ.M	-2	2.01	1	-4.02	DEDUCTION
4	MIDDLE OCCUPANCY ROOM	SQ.M	4	4.36	2.85	49.704	
		SQ.M	4	4.03	2.85	45.942	
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION
	WINDOWS	SQ.M	-2	2.01	1	-4.02	DEDUCTION
5	OCCUPANCY ROOMS LOWER	SQ.M	8	4.03	2.85	91.884	
		SQ.M	8	4.11	2.85	93.708	
	DOORS D1	SQ.M	-4	1	2.1	-8.4	DEDUCTION
		SQ.M	-4	2.01	1	-8.04	DEDUCTION
		SQ.M	2	6.72	2.85	38.304	
		SQ.M	2	10.57	2.85	60.249	
	WINDOW	SQ.M	-2	2.01	1	-4.02	DEDUCTION
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION
6	CORRIDOR WALLS	SQ.M	1	14.56	2.85	41.496	
		SQ.M	1	7.02	2.85	20.007	
		SQ.M	1	4.51	2.85	12.8535	
		SQ.M	1	4.19	2.85	11.9415	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

		SQ.M	1	7.15	2.85	20.3775	
		SQ.M	1	8.52	2.85	24.282	
		SQ.M	1	10.87	2.85	30.9795	
		SQ.M	1	4.66	2.85	13.281	
		SQ.M	1	7.02	2.85	20.007	
	LOWER CORRIDOR	SQ.M	1	19.72	2.85	56.202	
	VERTICAL LEFT CORRIDOR	SQ.M	1	14.17	2.85	40.3845	
	DOORS D1	SQ.M	-11	2.01	1	-22.11	DEDUCTION
	PASSAGE WAY RIGHT	SQ.M	-1	1.76	2.85	-5.016	DEDUCTION
7	COURTWARD PARAPET WALL	SQ.M	2	5.28	1.2	12.672	
		SQ.M	1	2.34	1.2	2.808	
					TOTAL	901.7255	
	BLOCK 3						
1	TOILET+ BATH	SQ.M	2	5.95	2.85	33.915	
		SQ.M	2	4.04	2.85	23.028	
		SQ.M	16	1.17	2.85	53.352	
		SQ.M	16	1	2.85	45.6	
		SQ.M	0.45	8	2.85	10.26	
	DOORS D1	SQ.M	-1	1.45	2.1	-3.045	DEDUCTION
		SQ.M	-8	0.7	2.1	-11.76	DEDUCTION
	VENT	SQ.M	-4	0.5	0.5	-1	DEDUCTION
2	STORE ROOM	SQ.M	2	4.03	2.85	22.971	
		SQ.M	2	3.96	2.85	22.572	
	WINDOW	SQ.M	-1	2.01	1	-2.01	DEDUCTION
	DOORS D1	SQ.M	-1	1	2.1	-2.1	DEDUCTION
3	OCCUPANCY ROOMS UPPER	SQ.M	4	3.96	2.85	45.144	
		SQ.M	4	4.03	2.85	45.942	
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION
	WINDOWS	SQ.M	-2	2.01	1	-4.02	DEDUCTION
4	MIDDLE OCCUPANCY ROOM	SQ.M	4	4.36	2.85	49.704	
		SQ.M	4	4.03	2.85	45.942	
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION
	WINDOWS	SQ.M	-2	2.01	1	-4.02	DEDUCTION
5	OCCUPANCY ROOMS LOWER	SQ.M	8	4.03	2.85	91.884	
		SQ.M	8	4.11	2.85	93.708	
	DOORS D1	SQ.M	-4	1	2.1	-8.4	DEDUCTION
		SQ.M	-4	2.01	1	-8.04	DEDUCTION
		SQ.M	2	6.72	2.85	38.304	
		SQ.M	2	10.57	2.85	60.249	
	WINDOW	SQ.M	-2	2.01	1	-4.02	DEDUCTION
	DOORS D1	SQ.M	-2	1	2.1	-4.2	DEDUCTION

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6	CORRIDOR WALLS	SQ.M	1	14.56	2.85	41.496	
		SQ.M	1	7.02	2.85	20.007	
		SQ.M	1	4.51	2.85	12.8535	
		SQ.M	1	4.19	2.85	11.9415	
		SQ.M	1	7.15	2.85	20.3775	
		SQ.M	1	8.52	2.85	24.282	
		SQ.M	1	10.87	2.85	30.9795	
		SQ.M	1	4.66	2.85	13.281	
		SQ.M	1	7.02	2.85	20.007	
	LOWER CORRIDOR	SQ.M	1	19.72	2.85	56.202	
	VERTICAL LEFT CORRIDOR	SQ.M	1	14.17	2.85	40.3845	
	DOORS D1	SQ.M	-11	2.01	1	-22.11	DEDUCTION
	PASSAGE WAY RIGHT	SQ.M	-1	1.76	2.85	-5.016	DEDUCTION
7	COURTWARD PARAPET WALL	SQ.M	2	5.28	1.2	12.672	
		SQ.M	1	2.34	1.2	2.808	
					TOTAL	901.7255	
	BLOCK 4						
1	UPPER OCCUPANCY ROOM	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
	DOOR	SQ.M	-1	1	2.1	-2.1	DEDUCTION
	WINDOW	SQ.M	-1	2.01	1	-2.01	DEDUCTION
2	BOTTOM OCCUPANCY ROOM 1	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-1	2.01	1	-2.01	DEDUCTION
	BOTTOM OCCUPANCY ROOM 2	SQ.M	2	3.9	2.85	22.23	
		SQ.M	2	4.26	2.85	24.282	
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-1	2.01	1	-2.01	DEDUCTION
	BOTTOM OCCUPANCY ROOM 3	SQ.M	2	3.9	2.85	22.23	
			2	4.26	2.85	24.282	
			-1	1	1.2	-1.2	
			-1	2.01	1	-2.01	
3	DORMETRY WALLS	SQ.M	2	22.54	2.85	128.478	
	DUCT WALL	SQ.M	2	0.73	2.85	4.161	
		SQ.M	2	1.35	2.85	7.695	
	DOOR	SQ.M	-2	1	2.1	-4.2	DEDUCTION
4	TOILET 1 LEFT	SQ.M	2	4.7	2.85	26.79	
		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	1	3.31	2.85	9.4335	
	VENT	SQ.M	-3	0.5	0.5	-0.75	DEDUCTION

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	DOOR D1	SQ.M	-1	1	2.1	-2.1	DEDUCTION
	D2	SQ.M	-6	0.7	2.1	-8.82	DEDUCTION
5	TOILET 2 RIGHT	SQ.M	2	4.7	2.85	26.79	
		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	1	3.31	2.85	9.4335	
		SQ.M	-3	0.5	0.5	-0.75	DEDUCTION
		SQ.M	-1	1	1.2	-1.2	DEDUCTION
		SQ.M	-6	0.7	1.2	-5.04	DEDUCTION
6	CORRIDOR WALLS	SQ.M	2	15.47	2.85	88.179	
		SQ.M	2	13.58	2.85	77.406	
	DOORS D1	SQ.M	-8	1	2.1	-16.8	DEDUCTION
	PASSAGE OPENING	SQ.M	-1	6.09	2.85	-17.3565	DEDUCTION
7	COURTYARD PARAPET WALL	SQ.M	2	12.65	1.2	30.36	
		SQ.M	2	10.87	1.2	26.088	
					TOTAL	568.9725	
	TOTAL PAINTING IN 1st FLOOR					2941.396	
	TOTAL PAINTING IN 2nd FLOOR					2941.396	
	TOTAL PAINTING IN 3rd FLOOR					2941.396	
	TOTAL PAINTING IN 4th FLOOR					1137.945	
	TERRACE						
	ABOVE THIRD FLOOR						
1	**BLOCK 2 & 3**	SQ.M	2	22.84	1.2	54.816	
		SQ.M	2	4.26	1.2	10.224	
		SQ.M	2	4.41	1.2	10.584	
		SQ.M	4	8.23	1.2	39.504	
		SQ.M	2	2.97	1.2	7.128	
		SQ.M	2	10.87	1.2	26.088	
		SQ.M	2	4.98	1.2	11.952	
					TOTAL	160.296	
					TOTAL 2&3	320.592	
	ABOVE FOURTH FLOOR						
2	**BLOCK 1 & 4**	SQ.M	2	22.84	1.2	54.816	
		SQ.M	2	4.56	1.2	10.944	
		SQ.M	2	4.41	1.2	10.584	
		SQ.M	2	2.97	1.2	7.128	
		SQ.M	4	8.53	1.2	40.944	
					TOTAL	124.416	
					TOTAL 1&4	248.832	

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APPENDIX V

Measurement Sheet for Plastering on Exterior Walls

GROUND FLOOR							
SR.NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	H	QTY	REMARK
1	**BLOCK 1**	SQ.M	1				
	GROUND FLOOR	SQ.M	4	8.53	4	136.48	
		SQ.M	1	22.84	4	91.36	
		SQ.M	2	2.97	4	23.76	
		SQ.M	2	4.26	4	34.08	
		SQ.M	2	4.26	4	34.08	
		SQ.M	1	6.06	4	24.24	
		SQ.M	1	8.11	4	32.44	
	DUCT	SQ.M	8	1.35	4	43.2	
		SQ.M	4	1.17	4	18.72	
	WINDOWS	SQ.M	-8	2.01	1	-16.08	DEDUCTION
					TOTAL	422.28	
2	**BLOCK 2**						
	GROUND FLOOR	SQ.M	4	8.53	4	136.48	
		SQ.M	1	22.84	4	91.36	
		SQ.M	2	2.97	4	23.76	
		SQ.M	2	4.41	4	35.28	
		SQ.M	2	4.41	4	35.28	
		SQ.M	1	2.71	4	10.84	
		SQ.M	1	6.06	4	24.24	
					TOTAL	357.24	
3	**BLOCK 3**						
	GROUND FLOOR	SQ.M	4	8.53	4	136.48	
		SQ.M	1	22.84	4	91.36	
		SQ.M	2	2.97	4	23.76	
		SQ.M	2	4.41	4	35.28	
		SQ.M	2	4.41	4	35.28	
		SQ.M	1	2.71	4	10.84	
		SQ.M	1	6.06	4	24.24	

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	BALCONY	SQ.M	-2	4.08	2.8	-22.848	DEDUCTION
					TOTAL	334.392	
4	**BLOCK 4**						
		SQ.M	4	8.53	4	136.48	
		SQ.M	1	22.84	4	91.36	
		SQ.M	2	2.97	4	23.76	
		SQ.M	2	4.26	4	34.08	
		SQ.M	2	4.26	4	34.08	
		SQ.M	1	6.06	4	24.24	
		SQ.M	1	8.11	4	32.44	
		SQ.M	8	1.35	4	43.2	
		SQ.M	4	1.17	4	18.72	
					TOTAL	438.36	
			FIRST FLOOR				
SR.NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	H	QTY	REMARK
1	**BLOCK 1**						
		SQ.M	4	8.53	4	136.48	
		SQ.M	1	22.84	4	91.36	
		SQ.M	2	2.97	4	23.76	
		SQ.M	2	4.26	4	34.08	
		SQ.M	2	4.26	4	34.08	
		SQ.M	1	6.06	4	24.24	
		SQ.M	1	8.11	4	32.44	
		SQ.M	8	1.35	4	43.2	
		SQ.M	4	1.17	4	18.72	
		SQ.M	-4	2.01	1	-8.04	DEDUCTION
		SQ.M	-6	0.5	0.5	-1.5	DEDUCTION
					TOTAL	428.82	
2	**BLOCK 2**						
	GROUND FLOOR	SQ.M	4	8.53	4	136.48	
		SQ.M	1	22.84	4	91.36	
		SQ.M	2	2.97	4	23.76	
		SQ.M	2	4.41	4	35.28	
		SQ.M	2	4.41	4	35.28	
		SQ.M	1	2.71	4	10.84	
		SQ.M	1	6.06	4	24.24	
	WINDOWS	SQ.M	-7	2.01	1	-14.07	DEDUCTION
	VENT	SQ.M	-4	0.5	0.5	-1	DEDUCTION
					TOTAL	342.17	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

3	**BLOCK 3**						
	GROUND FLOOR	SQ.M	4	8.53	4	136.48	
		SQ.M	1	22.84	4	91.36	
		SQ.M	2	2.97	4	23.76	
		SQ.M	2	4.41	4	35.28	
		SQ.M	2	4.41	4	35.28	
		SQ.M	1	2.71	4	10.84	
		SQ.M	1	6.06	4	24.24	
	WINDOWS	SQ.M	-7	2.01	1	-14.07	DEDUCTION
	VENT	SQ.M	-4	0.5	0.5	-1	DEDUCTION
					TOTAL	342.17	
4	**BLOCK 4**						
		SQ.M	4	8.53	4	136.48	
		SQ.M	1	22.84	4	91.36	
		SQ.M	2	2.97	4	23.76	
		SQ.M	2	4.26	4	34.08	
		SQ.M	2	4.26	4	34.08	
		SQ.M	1	6.06	4	24.24	
		SQ.M	1	8.11	4	32.44	
		SQ.M	8	1.35	4	43.2	
		SQ.M	4	1.17	4	18.72	
		SQ.M	-4	2.01	1	-8.04	DEDUCTION
		SQ.M	-6	0.5	0.5	-1.5	DEDUCTION
					TOTAL	428.82	
SECOND FLOOR							
1	**BLOCK 1**				TOTAL	428.82	
2	**BLOCK 2**				TOTAL	342.17	
3	**BLOCK 2**				TOTAL	342.17	
4	**BLOCK 4**				TOTAL	428.82	
THIRD FLOOR							
1	**BLOCK 1**				TOTAL	428.82	
2	**BLOCK 2**				TOTAL	342.17	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

3	**BLOCK 2**				TOTAL	342.17	
4	**BLOCK 4**				TOTAL	428.82	
	FOURTH FLOOR						
1	**BLOCK 1**				TOTAL	428.82	
2	**BLOCK 2**				TOTAL	428.82	
	TERRACE ABOVE THIRD FLOOR						
1	**BLOCK 2&3**						
	SQ.M	4	8.53	1.35	46.062		
	SQ.M	1	22.84	1.35	30.834		
	SQ.M	2	2.97	1.35	8.019		
	SQ.M	2	4.41	1.35	11.907		
	SQ.M	2	4.41	1.35	11.907		
	SQ.M	1	2.71	1.35	3.6585		
	SQ.M	1	6.06	1.35	8.181		
				TOTAL	120.5685		
				TOTAL	241.137		
2	**BLOCK 1&4**						
	SQ.M	4	8.53	4	136.48		
	SQ.M	1	22.84	4	91.36		
	SQ.M	2	2.97	4	23.76		
	SQ.M	2	4.26	4	34.08		
	SQ.M	2	4.26	4	34.08		
	SQ.M	1	6.06	4	24.24		
	SQ.M	1	8.11	4	32.44		
	SQ.M	8	1.35	4	43.2		
	SQ.M	4	1.17	4	18.72		
				TOTAL	438.36		
				TOTAL	876.72		

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX VI
Measurement Sheet For Door Rabbet

SR.NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	QTY	REMARK
	GROUND FLOOR					
1	DOOR RABBET	M	27	5.2	140.4	2.1+2.1+1=5.2M
	FIRST FLOOR					
2	DOOR RABBET	M	42	5.2	218.4	
	SECOND FLOOR					
4	DOOR RABBET	M	42	5.2	218.4	2.1+2.1+1=5.2M
	THIRD FLOOR					
5	DOOR RABBET	M	42	5.2	218.4	2.1+2.1+1=5.2M
	FOURTH FLOOR					
6	DOOR RABBET	M	25	5.2	130	2.1+2.1+1=5.2M
			GRAND TOTAL		**925.6**	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX VII
Detailed Measurement sheet of internal flooring of all floors

Internal Flooring							
Sr. No.	**Description**	**No**	**Length (m)**	**Breadth (m)**	**Height (m)**	**Quantity(sq,m)**	**Remark**
	Flooring						
1	**Ground floor**						
	Section 1						
	NRI ROOM	10	15.4			154	Area calculated
	Circulation Area	1	102.6			102.6	directly in CAD
						256.6	
	Section 2						
	Mess and courtyard	1	392			392	
	Courtyard (deduction)	1	57.8			57.8	
						334.2	
	Section 3						
	Warden Cabin	2	13.6			27.2	
	Warden Room	2	32.9			65.8	
	Executive Room	2	19.06			38.12	
	Executive Room	1	17.2			17.2	
	Store room	1	17			17	
	Laundry	1	23.4			23.4	
						188.72	
	Courtyard (deduction)	1	56.8			56.8	
	Seating room (deduction)	1	52.3			52.3	
						79.62	
	Section 4						
	Study + Indoor + Courtyard	1	411			411	
	Courtyard (deduction)	1	137.5			137.5	
						273.5	
	Passage 1	1	33.3			33.3	
	Passage 2	1	33.3			33.3	
	Passage 3	1	33.3			33.3	
	Entrance Lobby	1	24			24	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

					123.9		
2	**First Floor**						
	Section 1						Area calculated
	Dormetry	1	88.7			88.7	directly in CAD
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
					261.2		
	Section 2						
	2 Occupancy	2	17.6			35.2	
	2 Occupancy	4	16.8			67.2	
	Store room/ 2 occupancy	3	16.1			48.3	
	Toilet	1	22.6			22.6	
	Dormetry	1	71.3			71.3	
	Circulation Area	1	28.8			28.8	
					273.4		
	Section 3						
	2 Occupancy	2	17.6			35.2	
	2 Occupancy	4	16.8			67.2	
	Store room/ 2 occupancy	3	16.1			48.3	
	Toilet	1	22.6			22.6	
	Dormetry	1	71.3			71.3	
	Circulation Area	1	28.8			28.8	
					273.4		
	Section 4						
	Dormetry	1	88.7			88.7	
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
	Passage 1	1	33.3			33.3	
	Passage 2	1	33.3			33.3	
	Passage 3	1	33.3			33.3	
					361.1		

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

3	**Second Floor**						
	Section 1						Area calculated
	Dormetry	1	88.7			88.7	directly in CAD
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
					261.2		
	Section 2						
	2 Occupancy	2	17.6			35.2	
	2 Occupancy	4	16.8			67.2	
	Store room/ 2 occupancy	3	16.1			48.3	
	Toilet	1	22.6			22.6	
	Dormetry	1	71.3			71.3	
	Circulation Area	1	28.8			28.8	
					273.4		
	Section 3						
	2 Occupancy	2	17.6			35.2	
	2 Occupancy	4	16.8			67.2	
	Store room/ 2 occupancy	3	16.1			48.3	
	Toilet	1	22.6			22.6	
	Dormetry	1	71.3			71.3	
	Circulation Area	1	28.8			28.8	
					273.4		
	Section 4						
	Dormetry	1	88.7			88.7	
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
	Passage 1	1	33.3			33.3	
	Passage 2	1	33.3			33.3	
	Passage 3	1	33.3			33.3	
					361.1		
4	**Third Floor**						
	Section 1						Area calculated

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	Dormetry	1	88.7		88.7	directly In CAD
	2 Occupancy	4	16.3		65.2	
	Toilet	2	16.6		33.2	
	Corridor + Courtyard	1	211.6		211.6	
	Courtyard (deduction)	1	137.5		137.5	
					261.2	
	Section 2					
	2 Occupancy	2	17.6		35.2	
	2 Occupancy	4	16.8		67.2	
	Store room/ 2 occupancy	3	16.1		48.3	
	Toilet	1	22.6		22.6	
	Dormetry	1	71.3		71.3	
	Circulation Area	1	28.8		28.8	
					273.4	
	Section 3					
	2 Occupancy	2	17.6		35.2	
	2 Occupancy	4	16.8		67.2	
	Store room/ 2 occupancy	3	16.1		48.3	
	Toilet	1	22.6		22.6	
	Dormetry	1	71.3		71.3	
	Circulation Area	1	28.8		28.8	
					273.4	
	Section 4					
	Dormetry	1	88.7		88.7	
	2 Occupancy	4	16.3		65.2	
	Toilet	2	16.6		33.2	
	Corridor + Courtyard	1	211.6		211.6	
	Courtyard (deduction)	1	137.5		137.5	
	Passage 1	1	33.3		33.3	
	Passage 2	1	33.3		33.3	
	Passage 3	1	33.3		33.3	
					361.1	
5	**Fourth Floor**					
	Section 1					Area calculated
	Dormetry	1	88.7		88.7	directly in CAD
	2 Occupancy	4	16.3		65.2	
	Toilet	2	16.6		33.2	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	Corridor + Courtyard	1	211.6		211.6	
	Courtyard (deduction)	1	137.5		137.5	
					261.2	
	Section 4					
	Dormetry	1	88.7		88.7	
	2 Occupancy	4	16.3		65.2	
	Toilet	2	16.6		33.2	
	Corridor + Courtyard	1	211.6		211.6	
	Courtyard (deduction)	1	137.5		137.5	
					261.2	
	Open terrace	2	417.2		834.4	
	Court yard	2	57.4		114.8	
					719.6	
			Grand total		**5817.12**	
	Skirting					
	Description	**No**	**Perimeter**	**Height**	**Total**	
6	**Ground floor**					Perimeter calculated
	Section 1					by cad
	NRI ROOM	10	22.1	0.1	22.1	
	Corridor	1	29	0.1	2.9	
					25	
	Section 2					
	Mess and courtyard	1	107.7	0.1	10.77	
	Courtyard (deduction)	1	37.2	0.1	3.72	
					7.05	
	section 3					
	Warden Cabin	2	15.1	0.1	3.02	
	Warden Room	2	38.7	0.1	7.74	
	Executive Room	2	23.3	0.1	4.66	
	Executive Room	1	22.2	0.1	2.22	
	Store room	1	16.7	0.1	1.67	
	Laundry	1	19.7	0.1	1.97	
	Circulation Area	1	70.1	0.1	7.01	
	Courtyard (deduction)	1	32.1	0.1	3.21	
	Seating room (deduction)	1	31.2	0.1	3.12	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

					21.96		
	Section 4						
	Study+indoor+courtyard	1	122.9		0.1	12.29	
	Courtyard (deduction)	1	47		0.1	4.7	
					7.59		
	Passage 1	1	36.2		0.1	3.62	
	Passage 2	1	35.7		0.1	3.57	
	Passage 3	1	35.8		0.1	3.58	
	Entrance Lobby	1	20.2		0.1	2.02	
					12.79		
	First Floor						
	Section 1						Perimeter calculated
	Dormetry	1	56		0.1	5.6	by cad
	2 Occupancy	4	16.6		0.1	6.64	
	Toilet	2	35.3		0.1	7.06	
	Corridor + Courtyard	1	58.6		0.1	5.86	
	Courtyard (deduction)	1	47		0.1	4.7	
					20.46		
	Section 2						
	2 Occupancy	2	17		0.1	3.4	
	2 Occupancy	4	16.6		0.1	6.64	
	Store room/ 2 occupancy	3	16.3		0.1	4.89	
	Toilet	1	45.6		0.1	4.56	
	Dormetry	1	34.9		0.1	3.49	
	Circulation Area	1	12.6		0.1	1.26	
					24.24		
	Section 3						
	2 Occupancy	2	17		0.1	3.4	
	2 Occupancy	4	16.6		0.1	6.64	
	Store room/ 2 occupancy	3	16.3		0.1	4.89	
	Toilet	1	45.6		0.1	4.56	
	Dormetry	1	34.9		0.1	3.49	
	Circulation Area	1	12.6		0.1	1.26	
					24.24		
	Section 4						
	Dormetry	1	56		0.1	5.6	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Second floor					
	Section 1					Perimeter calculated
	Dormetry	1	56	0.1	5.6	by cad
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Section 2					
	2 Occupancy	2	17	0.1	3.4	
	2 Occupancy	4	16.6	0.1	6.64	
	Store room/ 2 occupancy	3	16.3	0.1	4.89	
	Toilet	1	45.6	0.1	4.56	
	Dormetry	1	34.9	0.1	3.49	
	Circulation Area	1	12.6	0.1	1.26	
				24.24		
	Section 3					
	2 Occupancy	2	17	0.1	3.4	
	2 Occupancy	4	16.6	0.1	6.64	
	Store room/ 2 occupancy	3	16.3	0.1	4.89	
	Toilet	1	45.6	0.1	4.56	
	Dormetry	1	34.9	0.1	3.49	
	Circulation Area	1	12.6	0.1	1.26	
				24.24		
	Section 4					
	Dormetry	1	56	0.1	5.6	
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Third floor					Perimeter calculated

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

							by cad
	Section 1						
	Dormetry	1	56		0.1	5.6	
	2 Occupancy	4	16.6		0.1	6.64	
	Toilet	2	35.3		0.1	7.06	
	Corridor + Courtyard	1	58.6		0.1	5.86	
	Courtyard (deduction)	1	47		0.1	4.7	
					20.46		
	Section 2						
	2 Occupancy	2	17		0.1	3.4	
	2 Occupancy	4	16.6		0.1	6.64	
	Store room/ 2 occupancy	3	16.3		0.1	4.89	
	Toilet	1	45.6		0.1	4.56	
	Dormetry	1	34.9		0.1	3.49	
	Circulation Area	1	12.6		0.1	1.26	
					24.24		
	Section 3						
	2 Occupancy	2	17		0.1	3.4	
	2 Occupancy	4	16.6		0.1	6.64	
	Store room/ 2 occupancy	3	16.3		0.1	4.89	
	Toilet	1	45.6		0.1	4.56	
	Dormetry	1	34.9		0.1	3.49	
	Circulation Area	1	12.6		0.1	1.26	
					24.24		
	Section 4						
	Dormetry	1	56		0.1	5.6	
	2 Occupancy	4	16.6		0.1	6.64	
	Toilet	2	35.3		0.1	7.06	
	Corridor + Courtyard	1	58.6		0.1	5.86	
	Courtyard (deduction)	1	47		0.1	4.7	
					20.46		
	Fourth Floor						
	Section 1						Perimeter calculated
	Dormetry	1	56		0.1	5.6	by cad
	2 Occupancy	4	16.6		0.1	6.64	
	Toilet	2	35.3		0.1	7.06	

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	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Section 4					
	Dormetry	1	56	0.1	5.6	
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Terrace	1	101.3	0.1	10.13	
	Court yard	1	32.3	0.1	3.23	
				13.36		
			Total	**396.87**		
	Deduction in Skirting					
	Doors	179	1	0.1	17.9	
	Doors 1	146	0.7	0.1	10.22	
			Deduction	**28.12**		
			Grand total	**368.75**		
	Final Bifurcation					
	Flooring (Rooms+ Circulation)					
	Ground Floor				729.22	Sq.m
	First Floor				1069.2	Sq.m
	Second Floor				1069.2	Sq.m
	Third Floor				1069.2	Sq.m
	Fourth Floor				522.4	Sq.m
	Flooring (Passage + Mess+study)					
	Ground Floor				707.6	Sq.m
	Entrance Lobby				24	Sq.m
	First Floor Passage				99.9	Sq.m
	Second Floor Passage				99.9	Sq.m
	Third Floor Passage				99.9	Sq.m
	Fourth Floor Passage				66.6	Sq.m
	Study + Indoor				273.5	Sq.m

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APPENDIX VIII
Details of Doors and Windows

Sr.no	Deduction	No	Length (m)	Breadth (m)	Height (m)	Quantity(sq,m)	Remark
1	Doors	179	1		2	358	
	Doors 1	146	0.7		2	204.4	
	Window	130	2.01		1	261.3	
	Ventilator	60	0.5		0.5	15	
					Total	**838.7**	

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APPENDIX IX
Detailed Measurement sheet of slabs of all floors

Sr no.	Description	No.	Length (m)	Breadth (m)	Height (m)	Quantity (cu.m)	Remark
			Area (sq.m)				
	Slab						
1	**Ground floor**						
	overall area	1	2251		0.15	337.65	Area is directly
							calculated by cad.
	Deduction						
	Duct	7	1.6		0.15	1.68	No. indicates same size
	Cutout 1	3	12.6		0.15	5.67	of ducts, cutouts and
	Cutout 2	5	13.1		0.15	9.825	courtyards.
	Cutout 3	3	37.3		0.15	16.785	
	Cutout 4	2	49.9		0.15	14.97	
	Cutout 5	1	26.2		0.15	3.93	
	Courtyard 1	2	130.5		0.15	39.15	
	Courtyard 2	1	52.7		0.15	7.905	
	Courtyard 3	1	52.1		0.15	7.815	
	Total deduction					107.73	
	Total Ground floor slab					**229.92**	
2	**First floor**						
	overall area	1	2251		0.15	337.65	Area is directly
							calculated by cad.
	Deduction						
	Duct	7	1.6		0.15	1.68	No. indicates same size
	Cutout 1	3	12.6		0.15	5.67	of ducts, cutouts and
	Cutout 2	5	13.1		0.15	9.825	courtyards.
	Cutout 3	3	37.3		0.15	16.785	
	Cutout 4	2	49.9		0.15	14.97	
	Cutout 5	1	26.2		0.15	3.93	
	Courtyard 1	2	130.5		0.15	39.15	
	Courtyard 2	1	52.7		0.15	7.905	
	Courtyard 3	1	52.1		0.15	7.815	
	Total deduction					107.73	
	Total First floor slab					**229.92**	

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	Second floor					
	overall area	1	2251	0.15	337.65	Area is directly
						calculated by cad.
	Deduction					
	Duct	7	1.6	0.15	1.68	No. indicates same size
	Cutout 1	3	12.6	0.15	5.67	of ducts, cutouts and
	Cutout 2	5	13.1	0.15	9.825	courtyards.
	Cutout 3	3	37.3	0.15	16.785	
	Cutout 4	2	49.9	0.15	14.97	
	Cutout 5	1	26.2	0.15	3.93	
	Courtyard 1	2	130.5	0.15	39.15	
	Courtyard 2	1	52.7	0.15	7.905	
	Courtyard 3	1	52.1	0.15	7.815	
	Total deduction				107.73	
	Total second floor slab				**229.92**	
4	**Third floor**					
	overall area	1	2251	0.15	337.65	Area is directly
						calculated by cad.
	Deduction					
	Duct	7	1.6	0.15	1.68	No. indicates same size
	Cutout 1	3	12.6	0.15	5.67	of ducts, cutouts and
	Cutout 2	5	13.1	0.15	9.825	courtyards.
	Cutout 3	3	37.3	0.15	16.785	
	Cutout 4	2	49.9	0.15	14.97	
	Cutout 5	1	26.2	0.15	3.93	
	Courtyard 1	2	130.5	0.15	39.15	
	Courtyard 2	1	52.7	0.15	7.905	
	Courtyard 3	1	52.1	0.15	7.815	
	Total deduction				107.73	
	Total third floor slab				**229.92**	
5	**Fourth floor**					
	Section 1					
	overall area	1	475	0.15	71.25	Area is directly
						calculated by cad.
	Section 4					
	overall area	1	482.8	0.15	72.42	
	Deduction					
	Courtyard 1	1	130.5	0.15	19.575	No. indicates same size
	Courtyard 4	1	130.5	0.15	19.575	of ducts, cutouts and
	Total deduction				39.15	courtyards.
	Total fourth floor slab				**104.52**	
	Grand total of slab				**1024.2**	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX X
Detailed Measurement sheet of waterproofing of all floors

SR.NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	B	H	QTY	REMARK
	GROUND FLOOR							
	FLOORING WATER PROOFING							
1	W/C NRI ROOM INTERNAL	M2	1	2.1	1.2	-	2.52	2.1X1.2 (INTERNAL DIMENSION)
	SIMILAR W/C OTHER NRI ROOMS	M2	9	2.1	1.2	-	22.68	(INTERNAL DIMENSION)
2	W/C FOR WARDEN ROOM	M2	1	1.2	1.92	-	2.304	(INTERNAL DIMENSION)
3	VVIP ROOM	M2	1	1.87	1.3	-	2.431	(INTERNAL DIMENSION)
4	EXECUTIVE ROOM	M2	3	1.87	1.3	-	7.293	(INTERNAL DIMENSION)
			TOTAL FLOOR WATER PROOFING				37.228	
	WATER PROOFING FOR WALLS							
1	W/C NRI ROOM INTERNAL WALLS	M2	10	2.1	-	3.85	80.85	WALL WATER PROOFING UPTO 3.85M
		M2	10	1.2	-	3.85	46.2	WALL WATER PROOFING UPTO 3.85M
		M2	10	2.1	-	3.85	80.85	WALL WATER PROOFING UPTO 3.85M
		M2	10	1.2	-	3.85	46.2	WALL WATER PROOFING UPTO 3.85M
		M2	-10	0.7	-	1.2	-8.4	DEDUCTION FOR DOOR (D1)
2	W/C FOR WARDEN ROOM	M2	1	1.2	-	3.85	4.62	WALL WATER PROOFING UPTO 3.85M
		M2	1	1.2	-	3.85	4.62	WALL WATER PROOFING UPTO 3.85M
		M2	1	1.92	-	3.85	7.392	WALL WATER PROOFING UPTO 3.85M
		M2	1	1.92	-	3.85	7.392	WALL WATER PROOFING UPTO 3.85M
		M2	-1	0.7	-	1.2	-0.84	DEDUCTION FOR DOOR (D1)
3	VVIP ROOM	M2	1	1.87	-	3.85	7.1995	WALL WATER PROOFING UPTO 3.85M
		M2	1	1.87	-	3.85	7.1995	WALL WATER PROOFING UPTO 3.85M
		M2	1	1.3	-	3.85	5.005	WALL WATER PROOFING UPTO 3.85M
		M2	1	1.3	-	3.85	5.005	WALL WATER PROOFING UPTO 3.85M
		M2	-1	0.7	-	1.2	-0.84	DEDUCTION FOR DOOR (D1)

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

4	EXECUTIVE ROOM	M2	6	1.87	-	3.85	43.197	WALL WATER PROOFING UPTO 3.85M
		M2	6	1.3	-	3.85	30.03	WALL WATER PROOFING UPTO 3.85M
		M2	3	0.7	-	1.2	2.52	DEDUCTION FOR DOOR (D1)
			TOTAL WALL WATER PROOFING				368.2	
	FIRST FLOOR							
SR.NO.	**DESCRIPTION OF ITEMS**	**UNIT**	**NO**	**L**	**B**	**H**	**QTY**	**REMARK**
	BLOCK 1							
	FLOORING WATER PROOFING							
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	1.24	2.75	-	3.41	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	2.24	2.75	-	6.16	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
			TOTAL FLOOR WATER PROOFING				33.7672	
	WATER PROOFING FOR WALLS							
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	3.85	9.24	
			1	2.11	-	3.85	8.1235	
			1	1.28	-	3.85	4.928	
			1	1.76	-	3.85	6.776	
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	1.5	3.6	WALL WATER PROOFING UPTO 1.5M
			1	2.11	-	1.5	3.165	WALL WATER PROOFING UPTO 1.5M

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			1	1.28	-	1.5	1.92	WALL WATER PROOFING UPTO 1.5M
			1	1.76	-	1.5	2.64	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				162.0665	
	BLOCK 2							
	FLOORING WATER PROOFING							
1	W/C	M2	4	1.17	1	-	4.68	
2	BATH	M2	4	1.17	1	-	4.68	
3	FLOORING	M2	1	4.61	1.47	-	6.7767	WALKING AREA
		M2	1	4.01	1.45	-	5.8145	WALKING AREA
			TOTAL FLOOR WATER PROOFING				21.9512	
	WATER PROOFING FOR WALLS							
1	W/C	M2	8	1.17	-	1.5	14.04	DADO 1.5M
		M2	8	1	-	1.5	12	DADO 1.5M
		M2	-4	0.7	-	2.1	-5.88	DEDUCTION FOR DOOR (D1)
2	BATH	M2	8	1.17	-	3.85	36.036	WALL WATER PROOFING UPTO 3.85M
		M2	8	1	-	3.85	30.8	WALL WATER PROOFING UPTO 3.85M
		M2	-4	0.7	-	1.2	-3.36	DEDUCTION FOR DOOR (D1)
		M2	-4	0.5	-	0.5	-1	DEDUCTION FOR VENT (V)
3	TOILET WALL	M2	1	4.04	-	1.5	6.06	WALL WATER PROOFING UPTO 1.5M
		M2	1	1.49	-	1.5	2.235	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				90.931	
	BLOCK 3							
	FLOORING WATER PROOFING							
1	W/C	M2	4	1.17	1	-	4.68	
2	BATH	M2	4	1.17	1	-	4.68	
3	FLOORING	M2	1	4.61	1.47	-	6.7767	WALKING AREA
		M2	1	4.01	1.45	-	5.8145	WALKING AREA
			TOTAL FLOOR WATER PROOFING				21.9512	
	WATER PROOFING FOR WALLS							
1	W/C	M2	8	1.17	-	1.5	14.04	DADO 1.5M
		M2	8	1	-	1.5	12	DADO 1.5M
		M2	-4	0.7	-	2.1	-5.88	DEDUCTION FOR DOOR (D1)
2	BATH	M2	8	1.17	-	3.85	36.036	WALL WATER PROOFING UPTO 3.85M
		M2	8	1	-	3.85	30.8	WALL WATER PROOFING UPTO 3.85M
		M2	-4	0.7	-	1.2	-3.36	DEDUCTION FOR DOOR (D1)
		M2	-4	0.5	-	0.5	-1	DEDUCTION FOR VENT (V)
3	TOILET WALL	M2	1	4.04	-	1.5	6.06	WALL WATER PROOFING UPTO 1.5M
		M2	1	1.49	-	1.5	2.235	WALL WATER PROOFING UPTO 1.5M

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			TOTAL WALL WATER PROOFING				90.931	
	BLOCK 4							
	FLOORING WATER PROOFING							
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	1.24	2.75	-	3.41	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	2.24	2.75	-	6.16	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
			TOTAL FLOOR WATER PROOFING				33.7672	
	WATER PROOFING FOR WALLS							
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	3.85	9.24	
			1	2.11	-	3.85	8.1235	
			1	1.28	-	3.85	4.928	
			1	1.76	-	3.85	6.776	
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	1.5	3.6	WALL WATER PROOFING UPTO 1.5M
			1	2.11	-	1.5	3.165	WALL WATER PROOFING UPTO 1.5M
			1	1.28	-	1.5	1.92	WALL WATER PROOFING UPTO 1.5M
			1	1.76	-	1.5	2.64	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				162.0665	
							1022.8598	

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	SECOND FLOOR							
	BLOCK 1							
	FLOORING WATER PROOFING							
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	1.24	2.75	-	3.41	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	2.24	2.75	-	6.16	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
			TOTAL FLOOR WATER PROOFING				33.7672	
	WATER PROOFING FOR WALLS							
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	3.85	9.24	
			1	2.11	-	3.85	8.1235	
			1	1.28	-	3.85	4.928	
			1	1.76	-	3.85	6.776	
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	1.5	3.6	WALL WATER PROOFING UPTO 1.5M
			1	2.11	-	1.5	3.165	WALL WATER PROOFING UPTO 1.5M
			1	1.28	-	1.5	1.92	WALL WATER PROOFING UPTO 1.5M
			1	1.76	-	1.5	2.64	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				162.0665	
	BLOCK 2							
	FLOORING WATER							

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	PROOFING							
1	W/C	M2	4	1.17	1	-	4.68	
2	BATH	M2	4	1.17	1	-	4.68	
3	FLOORING	M2	1	4.61	1.47	-	6.7767	WALKING AREA
		M2	1	4.01	1.45	-	5.8145	WALKING AREA
			TOTAL FLOOR WATER PROOFING				21.9512	
	WATER PROOFING FOR WALLS							
1	W/C	M2	8	1.17	-	1.5	14.04	DADO 1.5M
		M2	8	1	-	1.5	12	DADO 1.5M
		M2	-4	0.7	-	2.1	-5.88	DEDUCTION FOR DOOR (D1)
2	BATH	M2	8	1.17	-	3.85	36.036	WALL WATER PROOFING UPTO 3.85M
		M2	8	1	-	3.85	30.8	WALL WATER PROOFING UPTO 3.85M
		M2	-4	0.7	-	1.2	-3.36	DEDUCTION FOR DOOR (D1)
		M2	-4	0.5	-	0.5	-1	DEDUCTION FOR VENT (V)
3	TOILET WALL	M2	1	4.04	-	1.5	6.06	WALL WATER PROOFING UPTO 1.5M
		M2	1	1.49	-	1.5	2.235	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				90.931	
	BLOCK 3							
	FLOORING WATER PROOFING							
1	W/C	M2	4	1.17	1	-	4.68	
2	BATH	M2	4	1.17	1	-	4.68	
3	FLOORING	M2	1	4.61	1.47	-	6.7767	WALKING AREA
		M2	1	4.01	1.45	-	5.8145	WALKING AREA
			TOTAL FLOOR WATER PROOFING				21.9512	
	WATER PROOFING FOR WALLS							
1	W/C	M2	8	1.17	-	1.5	14.04	DADO 1.5M
		M2	8	1	-	1.5	12	DADO 1.5M
		M2	-4	0.7	-	2.1	-5.88	DEDUCTION FOR DOOR (D1)
2	BATH	M2	8	1.17	-	3.85	36.036	WALL WATER PROOFING UPTO 3.85M
		M2	8	1	-	3.85	30.8	WALL WATER PROOFING UPTO 3.85M
		M2	-4	0.7	-	1.2	-3.36	DEDUCTION FOR DOOR (D1)
		M2	-4	0.5	-	0.5	-1	DEDUCTION FOR VENT (V)
3	TOILET WALL	M2	1	4.04	-	1.5	6.06	WALL WATER PROOFING UPTO 1.5M
		M2	1	1.49	-	1.5	2.235	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				90.931	
	BLOCK 4							
	FLOORING WATER PROOFING							
1	W/C	M2	3	1.17	1	-	3.51	

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2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	1.24	2.75	-	3.41	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	2.24	2.75	-	6.16	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
			TOTAL FLOOR WATER PROOFING				33.7672	
	WATER PROOFING FOR WALLS							
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	3.85	9.24	
			1	2.11	-	3.85	8.1235	
			1	1.28	-	3.85	4.928	
			1	1.76	-	3.85	6.776	
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	1.5	3.6	WALL WATER PROOFING UPTO 1.5M
			1	2.11	-	1.5	3.165	WALL WATER PROOFING UPTO 1.5M
			1	1.28	-	1.5	1.92	WALL WATER PROOFING UPTO 1.5M
			1	1.76	-	1.5	2.64	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				162.0665	
							617.4318	

	THIRD FLOOR							
	BLOCK 1							
	FLOORING WATER PROOFING							
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	

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3	FLOORING	M2	1	1.24	2.75	-	3.41	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	2.24	2.75	-	6.16	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
			TOTAL FLOOR WATER PROOFING				33.7672	
	WATER PROOFING FOR WALLS							
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	3.85	9.24	
			1	2.11	-	3.85	8.1235	
			1	1.28	-	3.85	4.928	
			1	1.76	-	3.85	6.776	
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	1.5	3.6	WALL WATER PROOFING UPTO 1.5M
			1	2.11	-	1.5	3.165	WALL WATER PROOFING UPTO 1.5M
			1	1.28	-	1.5	1.92	WALL WATER PROOFING UPTO 1.5M
			1	1.76	-	1.5	2.64	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				162.0665	
	BLOCK 2							
SR.NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	B	H	QTY	REMARK
	FLOORING WATER PROOFING							
1	W/C	M2	4	1.17	1	-	4.68	
2	BATH	M2	4	1.17	1	-	4.68	

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3	FLOORING	M2	1	4.61	1.47	-	6.7767	WALKING AREA
		M2	1	4.01	1.45	-	5.8145	WALKING AREA
			TOTAL FLOOR WATER PROOFING				21.9512	
	WATER PROOFING FOR WALLS							
1	W/C	M2	8	1.17	-	1.5	14.04	DADO 1.5M
		M2	8	1	-	1.5	12	DADO 1.5M
		M2	-4	0.7	-	2.1	-5.88	DEDUCTION FOR DOOR (D1)
2	BATH	M2	8	1.17	-	3.85	36.036	WALL WATER PROOFING UPTO 3.85M
		M2	8	1	-	3.85	30.8	WALL WATER PROOFING UPTO 3.85M
		M2	-4	0.7	-	1.2	-3.36	DEDUCTION FOR DOOR (D1)
		M2	-4	0.5	-	0.5	-1	DEDUCTION FOR VENT (V)
3	TOILET WALL	M2	1	4.04	-	1.5	6.06	WALL WATER PROOFING UPTO 1.5M
		M2	1	1.49	-	1.5	2.235	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				90.931	
	BLOCK 3							
SR.NO.	DESCRIPTION OF ITEMS	UNIT	NO	L	B	H	QTY	REMARK
	FLOORING WATER PROOFING							
1	W/C	M2	4	1.17	1	-	4.68	
2	BATH	M2	4	1.17	1	-	4.68	
3	FLOORING	M2	1	4.61	1.47	-	6.7767	WALKING AREA
		M2	1	4.01	1.45	-	5.8145	WALKING AREA
			TOTAL FLOOR WATER PROOFING				21.9512	
	WATER PROOFING FOR WALLS							
1	W/C	M2	8	1.17	-	1.5	14.04	DADO 1.5M
		M2	8	1	-	1.5	12	DADO 1.5M
		M2	-4	0.7	-	2.1	-5.88	DEDUCTION FOR DOOR (D1)
2	BATH	M2	8	1.17	-	3.85	36.036	WALL WATER PROOFING UPTO 3.85M
		M2	8	1	-	3.85	30.8	WALL WATER PROOFING UPTO 3.85M
		M2	-4	0.7	-	1.2	-3.36	DEDUCTION FOR DOOR (D1)
		M2	-4	0.5	-	0.5	-1	DEDUCTION FOR VENT (V)
3	TOILET WALL	M2	1	4.04	-	1.5	6.06	WALL WATER PROOFING UPTO 1.5M
		M2	1	1.49	-	1.5	2.235	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				90.931	
	BLOCK 4							
	FLOORING WATER							

	PROOFING							
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	1.24	2.75	-	3.41	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	2.24	2.75	-	6.16	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
			TOTAL FLOOR WATER PROOFING				33.7672	
	WATER PROOFING FOR WALLS							
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	3.85	9.24	
			1	2.11	-	3.85	8.1235	
			1	1.28	-	3.85	4.928	
			1	1.76	-	3.85	6.776	
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	1.5	3.6	WALL WATER PROOFING UPTO 1.5M
			1	2.11	-	1.5	3.165	WALL WATER PROOFING UPTO 1.5M
			1	1.28	-	1.5	1.92	WALL WATER PROOFING UPTO 1.5M
			1	1.76	-	1.5	2.64	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				162.0665	

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							617.4318	

	FOURTH FLOOR							
	BLOCK 1							
	FLOORING WATER PROOFING							
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	1.24	2.75	-	3.41	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	2.24	2.75	-	6.16	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
			TOTAL FLOOR WATER PROOFING				33.7672	
	WATER PROOFING FOR WALLS							
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	3.85	9.24	
			1	2.11	-	3.85	8.1235	
			1	1.28	-	3.85	4.928	
			1	1.76	-	3.85	6.776	
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	1.5	3.6	WALL WATER PROOFING UPTO 1.5M
			1	2.11	-	1.5	3.165	WALL WATER PROOFING UPTO 1.5M

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			1	1.28		1.5	1.92	WALL WATER PROOFING UPTO 1.5M
			1	1.76	-	1.5	2.64	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				162.0665	
	BLOCK 4							
	FLOORING WATER PROOFING							
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	1.24	2.75	-	3.41	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
1	W/C	M2	3	1.17	1	-	3.51	
2	BATH	M2	3	1.17	1	-	3.51	
3	FLOORING	M2	1	2.24	2.75	-	6.16	WALKING AREA
		M2	1	2.23	1.46	-	3.2558	WALKING AREA
		M2	1	1.47	1.24		1.8228	WALKING AREA
			TOTAL FLOOR WATER PROOFING				33.7672	
	WATER PROOFING FOR WALLS							
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	3.85	9.24	
			1	2.11	-	3.85	8.1235	
			1	1.28	-	3.85	4.928	
			1	1.76	-	3.85	6.776	
1	W/C	M2	6	1.17	-	1.5	10.53	DADO 1.5M
		M2	6	1	-	1.5	9	DADO 1.5M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
2	BATH	M2	6	1.17	-	3.85	27.027	WALL WATER PROOFING UPTO 3.85M
		M2	6	1	-	3.85	23.1	WALL WATER PROOFING UPTO 3.85M
		M2	-3	0.7	-	2.1	-4.41	DEDUCTION FOR DOOR (D1)
3	INTERIOR WALLS OF TOILET	M2	1	2.4	-	1.5	3.6	WALL WATER PROOFING UPTO 1.5M

			1	2.11	-	1.5	3.165	WALL WATER PROOFING UPTO 1.5M
			1	1.28	-	1.5	1.92	WALL WATER PROOFING UPTO 1.5M
			1	1.76	-	1.5	2.64	WALL WATER PROOFING UPTO 1.5M
			TOTAL WALL WATER PROOFING				162.0665	

APPENDIX XI

Detailed Measurement sheet of quantity of steel of all floors

Sr no.	Description	Quantity (cu.m)	Wt. of steel (kg/cu.m)	Quantity of steel (kg)	Remark
1	Beam	1924	78.5	151034	min. quantity of steel in beam is 1%
					Therefore wt. of steel is 78.5 kg/cu.m
2	Column	383.28	62.8	24069.984	min. quantity of steel in column is 0.8%
					Therefore wt. of steel is 62.8 kg/cu.m
3	Slab	1024.2	55	56331	min. quantity of steel in slab is 0.7%
					Therefore wt. of steel is 55 kg/cu.m
		Total quantity of steel in kg		231434.984	
		Total quantity of steel in metric tonne		231.434984	

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APPENDIX XII
Detailed Measurement sheet of foundation of all floors

	Excavation Height						
Sr.No	Description	No	Length	Breadth	Height	Quantity	Remark
1	Excavation Trench	1	99.57	24.84	2.5	**6183.297**	**Cu.m**
							Offset of 1m on Each side
2	P.C.C in footing	184	2.26	2.26	0.15	**140.96976**	**Cu.m**
	Quantities Of Steel						
1				**wt of steel**			**Clear Cover of 65mm**
	Length of bar=						**12 mm dia Bars**
	(2.07+(2x12)+(2x12))=2.118m						**20- 12 mm bar Bothways**
	For one footing	40	2.118	0.88		**74.5536**	
							wt of steel =0.88 kg/m
	No of Footing	184		74.5536			
						13717.8624	**kg**
						13.7	**tonne**
	Back Fill						
1	Excavation Trench	1	99.57	24.84	2.5	6183.297	**Cu.m**
2	P.C.C	184	2.26	2.26	0.15	140.96976	**Cu.m**
3	Columns (Below G.L)	184	0.3	0.5	1.35	37.26	**Cu.m**
4	Back Fill	6183.297-140.9698-37.26=				**6005.06724**	**Cu.m**
	Black Japan						
1	For Column	2	1.35	0.3		0.81	
		2	1.35	0.5		1.35	
2	For Footing						
	Elevation	4	1	2.2		8.8	
	Top view	1	1.9	1.7		3.23	
3	P.C.C Bed						
	Elevation	4	2.8	0.15		1.68	
	Top view	1	0.6	0.6		0.36	

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			For One Footing	**16.23**	**Sq.m**
			No. of Footing	**184**	
			Total Black Japan	**2986.32**	**Sq.m**

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APPENDIX XIII
Detailed Measurement sheet of Internal Flooring

Sr.no	Description	No	Length (m)	Breadth (m)	Height (m)	Quantity(sq,m)	Remark
	Flooring						
1	**Ground floor**						
	Section 1						
	NRI ROOM	10	15.4			154	Area calculated
	Circulation Area	1	102.6			102.6	directly in CAD
						256.6	
	Section 2						
	Mess and courtyard	1	392			392	
	Courtyard (deduction)	1	57.8			57.8	
						334.2	
	Section 3						
	Warden Cabin	2	13.6			27.2	
	Warden Room	2	32.9			65.8	
	Executive Room	2	19.06			38.12	
	Executive Room	1	17.2			17.2	
	Store room	1	17			17	
	Laundry	1	23.4			23.4	
						188.72	
	Courtyard (deduction)	1	56.8			56.8	
	Seating room (deduction)	1	52.3			52.3	
						79.62	
	Section 4						
	Study + Indoor + Courtyard	1	411			411	
	Courtyard (deduction)	1	137.5			137.5	
						273.5	
	Passage 1	1	33.3			33.3	
	Passage 2	1	33.3			33.3	
	Passage 3	1	33.3			33.3	
	Entrance Lobby	1	24			24	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

					123.9		
2	**First Floor**						
	Section 1						Area calculated
	Dormetry	1	88.7			88.7	directly in CAD
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
					261.2		
	Section 2						
	2 Occupancy	2	17.6			35.2	
	2 Occupancy	4	16.8			67.2	
	Store room/ 2 occupancy	3	16.1			48.3	
	Toilet	1	22.6			22.6	
	Dormetry	1	71.3			71.3	
	Circulation Area	1	28.8			28.8	
					273.4		
	Section 3						
	2 Occupancy	2	17.6			35.2	
	2 Occupancy	4	16.8			67.2	
	Store room/ 2 occupancy	3	16.1			48.3	
	Toilet	1	22.6			22.6	
	Dormetry	1	71.3			71.3	
	Circulation Area	1	28.8			28.8	
					273.4		
	Section 4						
	Dormetry	1	88.7			88.7	
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
	Passage 1	1	33.3			33.3	
	Passage 2	1	33.3			33.3	
	Passage 3	1	33.3			33.3	
					361.1		

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

3	**Second Floor**						
	Section 1						Area calculated
	Dormetry	1	88.7			88.7	directly in CAD
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
					261.2		
	Section 2						
	2 Occupancy	2	17.6			35.2	
	2 Occupancy	4	16.8			67.2	
	Store room/ 2 occupancy	3	16.1			48.3	
	Toilet	1	22.6			22.6	
	Dormetry	1	71.3			71.3	
	Circulation Area	1	28.8			28.8	
					273.4		
	Section 3						
	2 Occupancy	2	17.6			35.2	
	2 Occupancy	4	16.8			67.2	
	Store room/ 2 occupancy	3	16.1			48.3	
	Toilet	1	22.6			22.6	
	Dormetry	1	71.3			71.3	
	Circulation Area	1	28.8			28.8	
					273.4		
	Section 4						
	Dormetry	1	88.7			88.7	
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
	Passage 1	1	33.3			33.3	
	Passage 2	1	33.3			33.3	
	Passage 3	1	33.3			33.3	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

					361.1		
4	**Third Floor**						
	Section 1						Area calculated
	Dormetry	1	88.7			88.7	directly in CAD
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
					261.2		
	Section 2						
	2 Occupancy	2	17.6			35.2	
	2 Occupancy	4	16.8			67.2	
	Store room/ 2 occupancy	3	16.1			48.3	
	Toilet	1	22.6			22.6	
	Dormetry	1	71.3			71.3	
	Circulation Area	1	28.8			28.8	
					273.4		
	Section 3						
	2 Occupancy	2	17.6			35.2	
	2 Occupancy	4	16.8			67.2	
	Store room/ 2 occupancy	3	16.1			48.3	
	Toilet	1	22.6			22.6	
	Dormetry	1	71.3			71.3	
	Circulation Area	1	28.8			28.8	
					273.4		
	Section 4						
	Dormetry	1	88.7			88.7	
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
	Passage 1	1	33.3			33.3	
	Passage 2	1	33.3			33.3	
	Passage 3	1	33.3			33.3	
					361.1		

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

5	**Fourth Floor**						
	Section 1						Area calculated
	Dormetry	1	88.7			88.7	directly in CAD
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
					261.2		
	Section 4						
	Dormetry	1	88.7			88.7	
	2 Occupancy	4	16.3			65.2	
	Toilet	2	16.6			33.2	
	Corridor + Courtyard	1	211.6			211.6	
	Courtyard (deduction)	1	137.5			137.5	
					261.2		
	Open terrace	2	417.2			834.4	
	Court yard	2				#VALUE!	
					#VALUE!		
			Grand total			**#VALUE!**	
	Skirting						
	Description	**No**	**Perimeter**		**Height**	**Total**	
6	**Ground floor**						Perimeter calculated
	Section 1						by cad
	NRI ROOM	10	22.1		0.1	22.1	
	Corridor	1	29		0.1	2.9	
					25		
	Section 2						
	Mess and courtyard	1	107.7		0.1	10.77	
	Courtyard (deduction)	1	37.2		0.1	3.72	
					7.05		
	section 3						
	Warden Cabin	2	15.1		0.1	3.02	
	Warden Room	2	38.7		0.1	7.74	
	Executive Room	2	23.3		0.1	4.66	
	Executive Room	1	22.2		0.1	2.22	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	Store room	1	16.7	0.1	1.67	
	Laundry	1	19.7	0.1	1.97	
	Circulation Area	1	70.1	0.1	7.01	
	Courtyard (deduction)	1	32.1	0.1	3.21	
	Seating room (deduction)	1	31.2	0.1	3.12	
				21.96		
	Section 4					
	Study+indoor+courtyard	1	122.9	0.1	12.29	
	Courtyard (deduction)	1	47	0.1	4.7	
				7.59		
	Passage 1	1	36.2	0.1	3.62	
	Passage 2	1	35.7	0.1	3.57	
	Passage 3	1	35.8	0.1	3.58	
	Entrance Lobby	1	20.2	0.1	2.02	
				12.79		
	First Floor					
	Section 1					Perimeter calculated
	Dormetry	1	56	0.1	5.6	by cad
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Section 2					
	2 Occupancy	2	17	0.1	3.4	
	2 Occupancy	4	16.6	0.1	6.64	
	Store room/ 2 occupancy	3	16.3	0.1	4.89	
	Toilet	1	45.6	0.1	4.56	
	Dormetry	1	34.9	0.1	3.49	
	Circulation Area	1	12.6	0.1	1.26	
				24.24		
	Section 3					
	2 Occupancy	2	17	0.1	3.4	
	2 Occupancy	4	16.6	0.1	6.64	
	Store room/ 2 occupancy	3	16.3	0.1	4.89	
	Toilet	1	45.6	0.1	4.56	
	Dormetry	1	34.9	0.1	3.49	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	Circulation Area	1	12.6	0.1	1.26	
				24.24		
	Section 4					
	Dormetry	1	56	0.1	5.6	
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Second floor					
	Section 1					Perimeter calculated
	Dormetry	1	56	0.1	5.6	by cad
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Section 2					
	2 Occupancy	2	17	0.1	3.4	
	2 Occupancy	4	16.6	0.1	6.64	
	Store room/ 2 occupancy	3	16.3	0.1	4.89	
	Toilet	1	45.6	0.1	4.56	
	Dormetry	1	34.9	0.1	3.49	
	Circulation Area	1	12.6	0.1	1.26	
				24.24		
	Section 3					
	2 Occupancy	2	17	0.1	3.4	
	2 Occupancy	4	16.6	0.1	6.64	
	Store room/ 2 occupancy	3	16.3	0.1	4.89	
	Toilet	1	45.6	0.1	4.56	
	Dormetry	1	34.9	0.1	3.49	
	Circulation Area	1	12.6	0.1	1.26	
				24.24		
	Section 4					
	Dormetry	1	56	0.1	5.6	
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Third floor					Perimeter calculated
						by cad
	Section 1					
	Dormetry	1	56	0.1	5.6	
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Section 2					
	2 Occupancy	2	17	0.1	3.4	
	2 Occupancy	4	16.6	0.1	6.64	
	Store room/ 2 occupancy	3	16.3	0.1	4.89	
	Toilet	1	45.6	0.1	4.56	
	Dormetry	1	34.9	0.1	3.49	
	Circulation Area	1	12.6	0.1	1.26	
				24.24		
	Section 3					
	2 Occupancy	2	17	0.1	3.4	
	2 Occupancy	4	16.6	0.1	6.64	
	Store room/ 2 occupancy	3	16.3	0.1	4.89	
	Toilet	1	45.6	0.1	4.56	
	Dormetry	1	34.9	0.1	3.49	
	Circulation Area	1	12.6	0.1	1.26	
				24.24		
	Section 4					
	Dormetry	1	56	0.1	5.6	
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Fourth Floor					
	Section 1					Perimeter calculated

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	Dormetry	1	56	0.1	5.6	by cad
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Section 4					
	Dormetry	1	56	0.1	5.6	
	2 Occupancy	4	16.6	0.1	6.64	
	Toilet	2	35.3	0.1	7.06	
	Corridor + Courtyard	1	58.6	0.1	5.86	
	Courtyard (deduction)	1	47	0.1	4.7	
				20.46		
	Terrace	2	101.3	0.1	20.26	
	Court yard	2	32.3	0.1	6.46	
				13.8		
			Total		**397.31**	
	Deduction					
	Doors	179	1	0.1	17.9	
	Doors 1	146	0.7	0.1	10.22	
			Deduction		**28.12**	
			Grand total		**369.19**	

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XIV
Detailed Measurement sheet of terrace waterproofing

Sr.no	Description	No	Length	Breadth	Height	Quantity	Remark
1	**Japan coat**						
	Terrace + Courtyard	2	417.2			834.4	
	Courtyard	2	5.4			10.8	
						823.6	
	On walls upto 300mm						
	Perimeter						
	(Terrace+Courtyard)	2	101.3		0.3	60.78	
	Courtyard	2	32.3		0.3	19.38	
						41.4	
	Terrace above passage	1	55.94			55.94	
	On walls upto 300mm						
	Perimeter	1	30.39		0.3	9.117	
						65.057	
					Total	**930.057**	**Sq.m**
2	**Brick Bat**						
	Terrace + Courtyard	2	417.2			834.4	
	Courtyard	2	57.4			114.8	
						719.6	
	Terrace above passage	1	55.94			**55.94**	
					Total	**775.54**	**Sq.m**

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XV
Detailed Measurement sheet of miscellaneous items of work

Sr no	Description	No	Length	Breadth	Height	Quantity	Remark
	Ground floor						
1	Concrete for steps						T= 300 mm
	v= (0.5x.18x.3x1.5)						R=180 mm
	=0.0405	60		0.0405			F-F = 4 m
	no of steps 10					**2.43**	Width=1.5m
2	Base slab	6	3.6	1.5	0.15	**4.86**	Pythagoras Thm.
3	Railing	6	3.6	0.1	1.5	**3.24**	
					Total	**10.53**	**cu.m**
4	Flooring						
	Tread	60	1.5	0.3		**27**	**Sq.m**
	Riser	66	1.5	0.18		**17.82**	**Sq.m**
5	Skirting						
	For riser	132	0.19	0.1		**2.508**	**Sq.m**
	For tread	120	0.3	0.1		**3.6**	**Sq.m**
					Total	**50.928**	**Sq.m**
	First ,Second ,Third Floor						
1	Concrete for steps						T=300 mm
							R= 130 mm
	v=(0.5x0.13x.3x1.5)						F-F= 3 m
	=0.02925	180		0.02925			Width= 1.5 m
					Total	**5.265**	**cu.m**

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

2	Base Slab	18	2.12	1.5	0.15		Pythagoras Thm.
					Total	**8.586**	**cu.m**
3	Railing	18	2.12	1.5	1.5		
					Total	**85.86**	**cu.m**
4	Flooring						
	For Tread	180	0.3	1.5		81	
	For Riser	198	0.13	1.5		38.61	
					Total	**119.61**	**Sq.m**
5	Skirting						
	For Tread	396	0.3	0.1		11.88	
	For Riser	360	0.14	0.1		5.04	
					Total	**16.92**	**Sq.m**
	Total Quantities						
	Total Concrete				=	**110.241**	**Cu.m**
	Flooring				=	**164.43**	**Sq.m**
	Skirting				=	**23.028**	**Sq.m**

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XVI
Detailed Measurement sheet of staircase

Sr no	Description	No	Length	Breadth	Height	Quantity	Remark
	Ground floor						
1	Concrete for steps						T= 300 mm
	v= (0.5x.18x.3x1.5)						R=180 mm
	=0.0405	60		0.0405			F-F = 4 m
	no of steps 10					**2.43**	Width=1.5m
2	Base slab	6	3.6	1.5	0.15	**4.86**	Pythagoras Thm.
3	Railing	6	3.6	0.1	1.5	**3.24**	
					Total	**10.53**	**cu.m**
4	Flooring						
	Tread	60	1.5	0.3		**27**	**Sq.m**
	Riser	66	1.5	0.18		**17.82**	**Sq.m**
5	Skirting						
	For riser	132	0.19	0.1		**2.508**	**Sq.m**
	For tread	120	0.3	0.1		**3.6**	**Sq.m**
					Total	**50.928**	**Sq.m**
	First ,Second ,Third Floor						
1	Concrete for steps						T=300 mm
							R= 130 mm
	v=(0.5x0.13x.3x1.5)						F-F= 3 m
	=0.02925	180		0.02925			Width= 1.5 m
					Total	**5.265**	**cu.m**

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

2	Base Slab	18	2.12	1.5	0.15		Pythagoras Thm.
					Total	**8.586**	**cu.m**
3	Railing	18	2.12	1.5	1.5		
					Total	**85.86**	**cu.m**
4	Flooring						
	For Tread	180	0.3	1.5		81	
	For Riser	198	0.13	1.5		38.61	
					Total	**119.61**	**Sq.m**
5	Skirting						
	For Tread	396	0.3	0.1		11.88	
	For Riser	360	0.14	0.1		5.04	
					Total	**16.92**	**Sq.m**
	Total Quantities						
	Total Concrete				=	**110.241**	**Cu.m**
	Flooring				=	**164.43**	**Sq.m**
	Skirting				=	**23.028**	**Sq.m**

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XVII
Detailed Abstract sheet of construction costs

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

	Description	ITEM NO.	REF. NO.	DESCRIPTION AS PER DSR	Unit	Qty	Rate/Unit	LBR cost	Total /-
1	Excavation Trench	21.04	BDA 1	Excavation for foundation in earth, soils of all types, sand,gravel and soft murum, including removing the excavated material upto a distance of 50 metres beyond the building area and stacking and spreading as directed, dewatering, preparing the bed for the foundation and necessary back filling, ramming, watering including shoring and strutting etc. complete. (Lift from 1.5m to 3.0m) By Mechanical Means	Cu.m	6183.3	117	12	723445.749
2	P.C.C for Footing	24.05	BDE 2	Providing and casting in situ cement concrete in M15 of trap/ granite/quartzite/gneiss metal for steps including steel centering, plywood/steel formwork, compacting, roughening them if special finish is to be provided, finishing uneven and honeycombed surface and curing etc. complete. The Cement Mortar 1:3 plaster is considered for rendering uneven and honeycombed surface, only. Newly laid concrete shall be covered by gunny bag, plastic, tarpaulin etc. (Wooden centering will not be allowed.), with fully automatic micro processor based PLC with SCADA enabled reversible Drum Type mixer .. With Crushed sand	CU.M	140.96	885		124749.6

4	footing work	25.07	BDF 3	Providing and laying in situ cement concrete M35of trap /granite /quartzite/ gneiss metal for R.C.C. work in foundationslike raft, strip foundations, grillage and footings of R.C.C.columns and steel stanchions etc. including bailing out water,formwork, cover blocks compaction and curing roughening thesurface if special finish is to be provided (Excludingreinforcement and structural steel) etc. etc. complete, With fullyautomatic micro processor based PLC with SCADA enabledreversible drum type concrete mixer. With natural sand.		890.96	6070	1060	5408127.2
6	Steel Cost for footing			steel material cost		13718	45		617303.808
8	Stub Column B GF	25.66	BDF 8	Providing and casting in situ cement concrete M35 of trap/ granite / quartzite/ gneiss metal for R.C.C. slabs and landings canopy as per detailed designs and drawings including centering, formwork,cover blocks compaction finishing the formed surfaces with cement mortar 1:3 of sufficient minimum thickness to give a smooth and even surface or roughening if special finish is to be provided and curing etc. complete, (Excluding reinforcement and structural steel). With fully automatic micro processor based PLC with SCADA enabled reversible drum type concrete mixer With natural sand.	cu.m	37.26	9485	1505	353411.1
9	Steel				Kg	2339.9	45		105296.76
11	Back Fill				Cu.m	5114.5	40		204580.28

12	Antitermite Treatment	21.23	BDW	Providing preconstructional antitermite treatment as per I.S.6313 (PartII)treatment by treating the backfill in immediatecontact with foundation at the rate of 5 litres of emulsionconcentrate of 0.5 percent of clorophyrifos per square metre ofvertical surface area covering 10 years guarantee on bondpaper. (AS per Item no. 22.42 of schedule of rates of NBO)	Sqmt	2986.3	72		215015.04
13	Concrete in Columns	25.26	BDF 5	Providing and casting in situ cement concrete M30 of trap / granite /quartzite/ gneiss metal for R.C.C. columns as per detailed designs and drawings or as directed including centering, formwork, cover blocks compacting and roughening if special finish is to be provided and curing etc. complete. (Excluding reinforcement and structural steel). With fully automatic micro processor based PLC with SCADA enabled reversible drum type concrete mixer With Crushed sand	Cu.m	383.28	8270	1505	3169725.6
14	Steel				Kg	24070	45	1083142.8	1083142.8
15	Concrete in Beams	25.45	BDF 6	Providing & casting in situ cement concrete M30 of trap / granite /quartzite/ gneiss metal for R.C.C. beams and lintels as per detailed designs & drawings or as directed including centering, formwork, cover blocks compaction & roughening the surface if special finish is to be provided & curing etc. complete. (Excluding reinforcement and structural steel).With fully automatic micro processor based PLC with SCADA enabled reversible drum type concrete mixer With Crushed sand.	Cu.m	442.17	8315	1505	3676643.55
16	steel				kg	151034	45	6796530	6796530

17	Concrete in Slab	25.65	BDF 8	Providing and casting in situ cement concrete M30 of trap/ granite/ quartzite/ gneiss metal for R.C.C. slabs and landings canopy as per detailed designs and drawings including centering, formwork,cover blocks compaction finishing the formed surfaces with cement mortar 1:3 of sufficient minimum thickness to give a smooth and even surface or roughening if special finish is to be provided and curing etc. complete, (Excluding reinforcement and structural steel).With fully automatic micro processor based PLC with SCADA enabled reversible drum type concrete mixer With Crushed sand	Cu.m	1024.2	9020	1505	9238284
18	steel				kg	56331	45	2534895	2534895
19	Concrete in Stair Case	25.65	BDF 8	Providing and casting in situ cement concrete M30 of trap/ granite/ quartzite/ gneiss metal for R.C.C. slabs and landings canopy as per detailed designs and drawings including centering, formwork,cover blocks compaction finishing the formed surfaces with cement mortar 1:3 of sufficient minimum thickness to give a smooth and even surface or roughening if special finish is to be provided and curing etc. complete, (Excluding reinforcement and structural steel).With fully automatic micro processor based PLC with SCADA enabled reversible drum type concrete mixer With Crushed sand	Cu.m	1024.2	9020	1505	9238284
20	steel					56331	45	2534895	2534895
21	Steel (labour Cost)					82064	60	4923840	4923840
22	blockwork	29.02	BDI 1	Providing and laying masonry of I.S. Standard C.C. hollow block 200 x 200 x 400 with 200mm thick mm in cement mortar 1:6 proportion for superstructure including curing, scaffolding etc. complete.		9346.1	540	310	5046894

23	Internal Plastering	32.03	BDL 2	Providing internal cement plaster 12mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	Sq.m	13228	110	48	1455117.4
24	External Plastering	32.13	BDL 9	Providing rough cast cement plaster externally in two coats with coloured cement finish to concrete/ brick/ stone masonry surfaces in all positions with base coat 12 to 15 mm. thick in C.M. 1:4 using gray cement and rough cast treatment 12 mm thick in proportion of 1:1 1/2:3 using colour pigment including scaffolding and fourteen days curing etc. complete.	Sq.m	5883.5	350	114	2059221.15
25	Water Proofing				Sq.m				0
26	toilet coating	115.418 TOI		Chemical coating for waterproofing by applying 2K Acryflex 2K Strong with all Surface Preparation, opeining of joints and loose material application of Crystal Flex Component aaalong with bondflex Chemical	Sq.m	1779	335		595965
27	toilet plaster	115.420 TOI		Provideing protection Coat of 12-15 mm on chemical coating with cement mortar 1:4 using bondflex as admixture	Sq.m	1339	262		350818
28	toilet brickbat	115.422 TOI		Providing 100mm to 125mm brickbat in cement :Sand mortar with IPS of 25mm thick on top using Bondflex as chemical For Waterproofing	Sq.m	439.05	1176		516322.8
29	Terrace Chemical Coating	115.415 TERR		Providing rough cast cement plaster externally in two coats with coloured cement finish to concrete/ brick/ stone masonry surfaces in all positions with base coat 12 to 15 mm. thick in C.M. 1:4 using gray cement and rough cast treatment 12 mm thick in proportion of 1:1 1/2:3 using colour pigment including scaffolding and fourteen days curing etc. complete.	Sq.m	968.82	301.305		291909.4062
30	Brick Bat Terrace	114.422 TERR		Providing 100mm to 125mm brickbat in cement :Sand mortar with IPS of 25mm thick on top using Bondflex as chemical For Waterproofing	Sq.m	775.54	884.694		686115.5848

31	terrace chinachips	115.454 TERR		Providing and applying china chips on the top of cement mortar screed with neat finishing etc complete for terrace area	Sq.m	775.54	544.393		422198.5472
34	Rooms + circulation	33.4	BDM 12	Providing and laying vitrified mirror / glossy finish tiles decorative type RAK/ Kajaria/ Nitco/ Asian or equivalent make having size 590 mm to 605 mm x 590 mm to 605 mm of 8 to 10 mm thickness and confirming to IS. 156222006 (group Bla) of approved make, shade and pattern for flooring in required position laid on a bed of 1:4 cement mortar including neat cement float, filling joints, curing and clearing etc. complete. a) Flooring	Sq.m	4195	850	124	3565750
35	Skirting of all item	33.41	BDM 12	Providing and laying vitrified mirror / glossy finish tiles of RAK/ Kajaria/ Nitco/ Asian or equivalent make having size 590 mm to 605 mm x 590 mm to 605 mm of 8 to 10 mm thickness and confirming to IS. 156222006 (group Bla) of approved make, shade and pattern for flooring in required position laid on a bed of 1:4 cement mortar including neat cement float, filling joints, curing and clearing etc. complete.b) Skirting	Sq.m	368.75	1190	122	438812.5
36	Passage + Mess+study	33.4	BDM 12	Providing and laying vitrified mirror / glossy finish tiles decorative type RAK/ Kajaria/ Nitco/ Asian or equivalent make having size 590 mm to 605 mm x 590 mm to 605 mm of 8 to 10 mm thickness and confirming to IS. 156222006 (group Bla) of approved make, shade and pattern for flooring in required position laid on a bed of 1:4 cement mortar including neat cement float, filling joints, curing and clearing etc. complete. a) Flooring	Sq.m	1371	850	124	1165350

37	flooring in toilets	33.42	BDM 12	Providing and laying vitrified matt fininsh tiles of RAK/ Kajaria/ Nitco/ Asian or equivalent make having size 590 mm to 605 mm x to 605 mm of 8 to 10 mm thickness and confirming IS. 156222006 (Group Bla) of approved make, shade and pattern for flooring in required position laid on a bed of 1:4 cement morar including neat cement float, filling joints, curing and cleaning etc. complete. a) Flooring	Sq.m	415	1240	209	514600
38	dado in toilets	33.42	BDM 12	Providing and laying vitrified matt fininsh tiles of RAK/ Kajaria/ Nitco/ Asian or equivalent make having size 590 mm to 605 mm x to 605 mm of 8 to 10 mm thickness and confirming IS. 156222006 (Group Bla) of approved make, shade and pattern for flooring in required position laid on a bed of 1:4 cement morar including neat cement float, filling joints, curing and cleaning etc. complete. a) Flooring	Sq.m	2209	1240	209	2739160
39	Flooring on Stairs	33.18	BDM 22B	Providing and laying machine cut machine polished machine cut Kota stone slabs 20 to 25 mm thick for treads and risers of steps and staircases, with rounded nosing for the treads on a bed of 1:4 cement mortar including cement float, filling joints with neat cement slurry, curing, polishing and cleaning etc. complete.	Sq.m	163.43	950	155258.5	155258.5
40	Skirting on Stairs	33.41	BDM 12	Providing and laying vitrified mirror / glossy finish tiles of RAK/ Kajaria/ Nitco/ Asian or equivalent make having size 590 mm to 605 mm x 590 mm to 605 mm of 8 to 10 mm thickness and confirming to IS. 156222006 (group Bla) of approved make, shade and pattern for flooring in required position laid on a bed of 1:4 cement mortar including neat cement float, filling joints, curing and clearing etc. complete.b) Skirting	Sq.m	23.028	1190	122	27403.32

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

42	Dado	33.24	BDM 13	Providing and laying ceramic tiles of RAK/Kajaria / Nitco /Asian or equivalent make having size 30 cm. x 30 cm. for dado andskirting in required position with readymade adhesive mortar ofskirting in required position with readymade adhesive mortar of approved quality on plaster of 1:2 cement mortar including joint filling with white/ colour cement slurry cleaning curing etc. complete.	Sqm	1526	940	300	1434393
43	kitchen dado	33.24	BDM 13	Providing and laying ceramic tiles of RAK/Kajaria / Nitco /Asian or equivalent make having size 30 cm. x 30 cm. for dado andskirting in required position with readymade adhesive mortar ofskirting in required position with readymade adhesive mortar ofapproved quality on plaster of 1:2 cement mortar includingjoint filling with white/ colour cement slurry cleaning curingetc. complete.	Sqm	226.11	940	300	212538.7
45	external painting	8A.012.5		Providing and applying two coats of cement putty of thickness upto 1.5mm of Eureka / Pioneer make, 1 coat of Jotun Acrylic Emulsion primer of thickness upto 30-35 microns , 1 coat of jota shield Water Xtreme base coat of thickness 110-120 microns and 2 coats of jota shield water extreme top coat on external walls of 50-70 microns with blade /roller/ Spray application including surface preparation,all material with wastage, cleaning , providing , erection and dismantling of bamboo Scaffoldings , supportings, fillings up crcaks etc	Sq mt	6113.9	244.88	0	1497177.219

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46	internal painting	8A.012		Providng and applying of 2coats of Wall putty with 1.5mm thick with blade application , 1coat of Primer of 15-20microns with brush/ roller application and 2 coats of tractor Emulsion paint of thickness 40-50 microns with brush / roller application on Gypsum Surfaces with surface prepartion, all material with wastage, labours , tools and tackles,consumables, cleaning and watering the surface , filling cracks, scaffolding etc. product name:(putty:- Asian paints professional wall putty) primer :- Asian Paints Professional Decoprime cement Primer (IWT) Paint:-Asian paints Tractor Emulsion Paint	Sqmt	12633	95.261	0	1203475.033
47	Gypsum Plaster	6B2.5		Supplying and Applying 12-15mm thick Gypsum Plaster on RCC wall/ blockwork masonary surfaces using approved quality gypsum of make Supreme or approved equivalent for all plain/curved surfaces	Sqmt	12633	220	0	2779359
48	gypsum bond it	6b2.8		Supplying and applying gypsum bond it before application of gypsum plaster on Rcc Surface	Sqmt	2526.7	49		123807.81
49	Aluminium window Frame and Shutter	39.4	BDT		Sqmt	368.55	3915	1258	1442873.25
50	aluminium ventilator frame and Shutter			Providing and Fixing of partly fixed with partly openable window with exhaust fan provision with 5mm frosted glass of saint gobain make by using aluminium section of Z series with 60-80 microns powder coating of approved shade with all required accessories like wool pile, locks, handles,friction hinges etc size (0.62x1.2) m	Sqmt	43.2	3515	0	151848

51	green marble frame for Winows and ventilators and kitchen frame	33.48	BDM 12	Providing and fixing green marble of 18 to 20 mm thick for	Sqmt	20.89	1570	510	32797.3
				door frame/ dado/ window boxing etc. On C.M. 1:6 including					
				filling joints with polymer base filler nosing the sharp edges					
				wherever necessary, curing, etc. complete					
				total cost of construction					79857335.01
				Cost of Solar System					1186600
				Extra for Water Supply and Sanitation i.e plumbing cost (7% of total cost)					5590013.451
				Extra for Electric Installation (8% of total cost)					6388586.801
				Contingencies Cost 5% and Work Charged Establishment 5% on total Construction Cost					7985733.501
				Grand total cost of hostel construction work					101008268.8

Grand Total Operation and Maintenance Cost for 50 years	115382589.1
Residual Cost Of Hostel After 50 years(10% of Construction Cost)	10100826.88

APPENDIX XVIII
Detailed Abstract sheet of Maintenance cost

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

Sr no	Item	Code	Description	unit	Qty	basic Rate	year	RATE OF INFLATION IN 2019	rate of nflation preceding 10 yrs	Difference in Inflation	Rate as per Inflation	Amount
47	Gypsum Plaster	6B2.5	Supplying and Applying 12-15mm thick Gypsum Plaster on RCC wall/ blockwork masonary surfaces using approved quality gypsum of make Supreme or approved equivalent for all plain/curved surfaces	Sqmt	12633.45	220	2020	5.97	5.97	0	220.00	2779359
48	gypsum bond it	6b2.8	Supplying and applying gypsum bond it before application of gypsum plaster on Rcc Surface	Sqmt	2526.69	49	2020	5.97	5.97	0	49.00	123807.81
47	Gypsum Plaster	6B2.5	Supplying and Applying 12-15mm thick Gypsum Plaster on RCC wall/ blockwork masonary surfaces using approved quality gypsum of make Supreme or approved equivalent for all plain/curved surfaces	Sqmt	12633.45	220	2030	5.97	6.27	0.3	220.66	2787697.1
48	gypsum bond it	6b2.8	Supplying and applying gypsum bond it before application of gypsum plaster on Rcc Surface	Sqmt	2526.69	49	2030	5.97	6.27	0.3	49.15	124179.23
47	Gypsum Plaster	6B2.5	Supplying and Applying 12-15mm thick Gypsum Plaster on RCC wall/ blockwork masonary surfaces using approved quality gypsum of make Supreme or approved equivalent for all plain/curved surfaces	Sqmt	12633.45	220	2040	5.97	6.58	0.61	221.34	2796313.1
48	gypsum bond it	6b2.8	Supplying and applying gypsum bond it before application of gypsum plaster on Rcc Surface	Sqmt	2526.69	49	2040	5.97	6.58	0.61	49.30	124563.04

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47	Gypsum Plaster	6B2.5	Supplying and Applying 12-15mm thick Gypsum Plaster on RCC wall/ blockwork masonary surfaces using approved quality gypsum of make Supreme or approved equivalent for all plain/curved surfaces	Sqmt	12633.45	220	2050	5.97	6.91	0.94	222.07	2805485
48	gypsum bond it	6b2.8	Supplying and applying gypsum bond it before application of gypsum plaster on Rcc Surface	Sqmt	2526.69	49	2050	5.97	6.91	0.94	49.46	124971.6
									Gypsum and bond it Repairing Cost in 50 years @2020,2030,2040 and 2050			8763209

Sr no	Item	Code	Description	unit	Qty	basic Rate	year	RATE OF INFLATION IN 2019	rate of nflation preceding 10 yrs	Difference in Inflation	Rate as per Inflation	Amount
47	internal painting	8A.012	Providng and applying of 2coats of Wall putty with 1.5mm thick with blade application , 1coat of Primer of 15-20microns with brush/ roller application and 2 coats of tractor Emulsion paint of thickness 40-50 microns with brush / roller application on Gypsum Surfaces with surface prepartion, all material with wastage, labours , tools and tackles,consumables, cleaning and watering the surface , filling cracks, scaffolding etc. product name:(putty:- Asian paints professional wall putty) primer :- Asian Paints Professional Decoprime cement Primer (IWT) Paint:-Asian paints Tractor Emulsion Paint	Sqmt	12633.45	95.261	2020	5.97	5.97	0	95.26	1203475
48	internal painting	8A.013	Providng and applying of 2coats of Wall putty with 1.5mm thick with blade application , 1coat of Primer of 15-20microns with brush/ roller application and 2 coats of tractor Emulsion paint of thickness 40-50 microns with brush / roller application on Gypsum Surfaces with surface	Sqmt	12633.45	95.261	2030	5.97	6.27	0.3	95.55	1207085.5

			prepartion, all material with wastage, labours , tools and tackles,consumables, cleaning and watering the surface , filling cracks, scaffolding etc. product name:(putty:- Asian paints professional wall putty) primer :- Asian Paints Professional Decoprime cement Primer (IWT) Paint:-Asian paints Tractor Emulsion Paint									
47	internal painting	8A.014	Providng and applying of 2coats of Wall putty with 1.5mm thick with blade application , 1coat of Primer of 15-20microns with brush/ roller application and 2 coats of tractor Emulsion paint of thickness 40-50 microns with brush / roller application on Gypsum Surfaces with surface prepartion, all material with wastage, labours , tools and tackles,consumables, cleaning and watering the surface , filling cracks, scaffolding etc. product name:(putty:- Asian paints professional wall putty) primer :- Asian Paints Professional Decoprime cement Primer (IWT) Paint:-Asian paints Tractor Emulsion Paint	Sqmt	12633.45	95.261	2040	5.97	6.58	0.61	95.84	1210816.2
48	internal painting	8A.015	Providng and applying of 2coats of Wall putty with 1.5mm thick with blade application , 1coat of Primer of 15-20microns with brush/ roller application and 2 coats of tractor Emulsion paint of thickness 40-50 microns with brush / roller application on Gypsum Surfaces with surface prepartion, all material with wastage, labours , tools and tackles,consumables, cleaning and watering the surface , filling cracks, scaffolding etc. product name:(putty:- Asian paints professional wall putty) primer :- Asian Paints Professional Decoprime cement Primer (IWT) Paint:-Asian paints Tractor Emulsion Paint	Sqmt	12633.45	95.261	2050	5.97	6.91	0.94	96.16	1214787.7
									Internal Painting Repairing Cost in 50 years @2020,2030,2040 and 2050			3632689.4

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

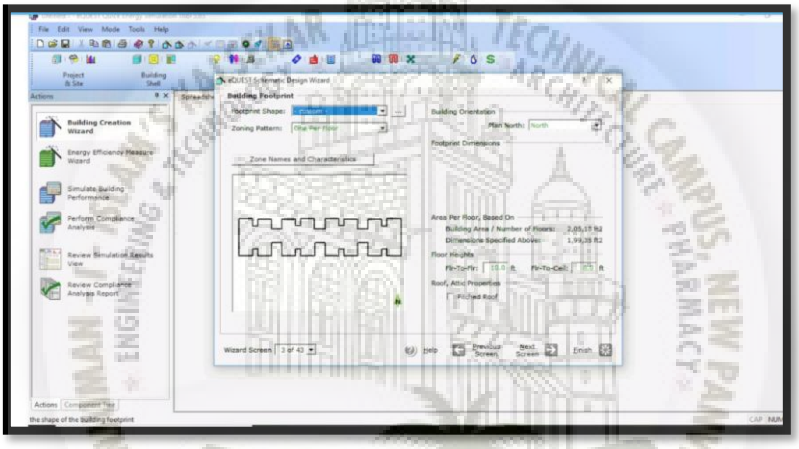
Sr no	Item	Code	Description	unit	Qty	basic Rate	year	RATE OF INFLATION IN 2019	rate of nflation preceding 10 yrs	Difference in Inflation	Rate as per Inflation	Amount
47	external painting	8A.012.5	Providing and applying two coats of cement putty of thickness upto 1.5mm of Eureka / Pioneer make, 1 coat of Jotun Acrylic Emulsion primer of thickness upto 30-35 microns , 1 coat of jota shield Water Xtreme base coat of thickness 110-120 microns and 2 coats of jota shield water extreme top coat on external walls of 50-70 microns with blade /roller/ Spray application including surface preparation,all material with wastage, cleaning , providing , erection and dismantling of bamboo Scaffoldings , supportings, fillings up crcaks etc	Sq mt	6113.922	244.88	2020	5.97	5.97	0	244.88	1497177.2
48	external painting	8A.012.5	Providing and applying two coats of cement putty of thickness upto 1.5mm of Eureka / Pioneer make, 1 coat of Jotun Acrylic Emulsion primer of thickness upto 30-35 microns , 1 coat of jota shield Water Xtreme base coat of thickness 110-120 microns and 2 coats of jota shield water extreme top coat on external walls of 50-70 microns with blade /roller/ Spray application including surface preparation,all material with wastage, cleaning , providing , erection and dismantling of bamboo Scaffoldings , supportings, fillings up crcaks etc	Sq mt	6113.922	244.88	2030	5.97	6.27	0.3	245.61	1501668.8
47	external painting	8A.012.5	Providing and applying two coats of cement putty of thickness upto 1.5mm of Eureka / Pioneer make, 1 coat of Jotun Acrylic Emulsion primer of thickness upto 30-35 microns , 1 coat of jota shield Water Xtreme base coat of thickness 110-120 microns and 2 coats of jota shield water extreme top coat on external walls of 50-70 microns with blade /roller/ Spray application including surface preparation,all material with	Sq mt	6113.922	244.88	2040	5.97	6.58	0.61	246.37	1506310

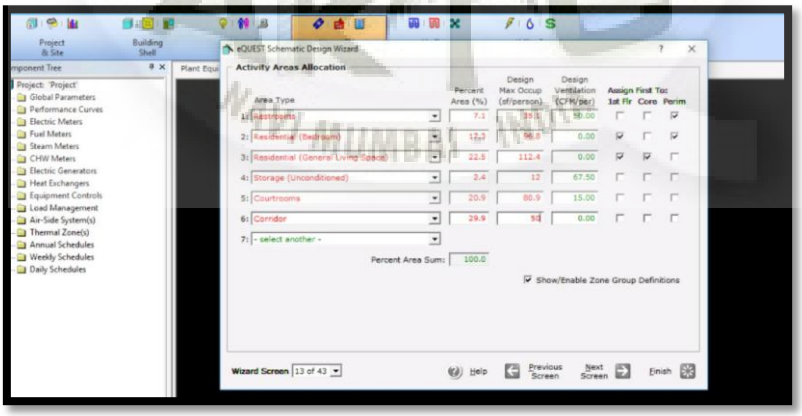
			wastage, cleaning , providing , erection and dismantling of bamboo Scaffoldings , supportings, fillings up crcaks etc									
48	external painting	8A.012.5	Providing and applying two coats of cement putty of thickness upto 1.5mm of Eureka / Pioneer make, 1 coat of Jotun Acrylic Emulsion primer of thickness upto 30-35 microns , 1 coat of jota shield Water Xtreme base coat of thickness 110-120 microns and 2 coats of jota shield water extreme top coat on external walls of 50-70 microns with blade /roller/ Spray application including surface preparation,all material with wastage, cleaning , providing , erection and dismantling of bamboo Scaffoldings , supportings, fillings up crcaks etc	Sq mt	6113.922	244.88	2050	5.97	6.91	0.94	247.18	1511250.7
									External Painting Repairing Cost in 50 years @2020,2030,2040 and 2050			4519229.4

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

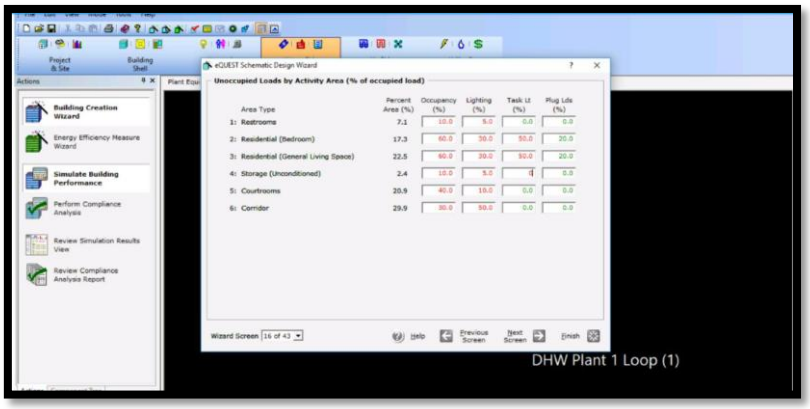
APPENDIX XIX

Snapshots of working eQUEST models for the hostel building project





LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

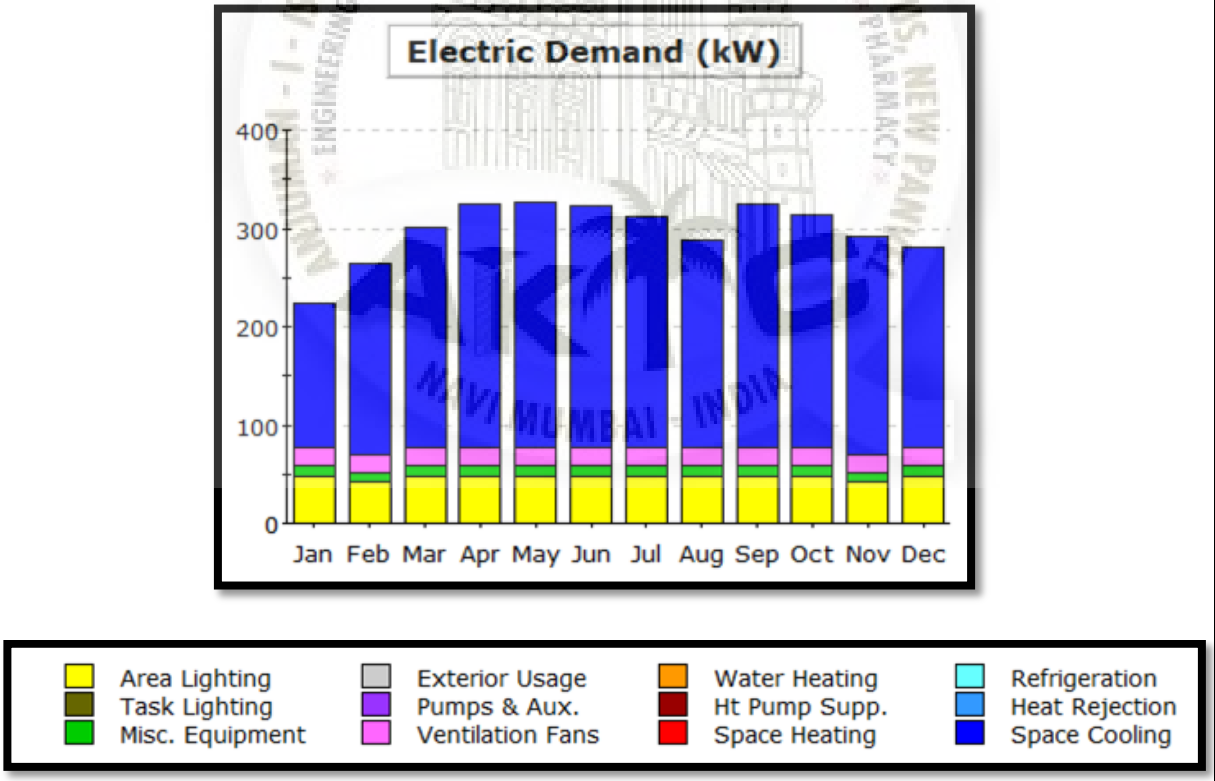


LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XX

APPENDIX XX-A: ELECTRICAL CONSUMPTION (MODEL 1)

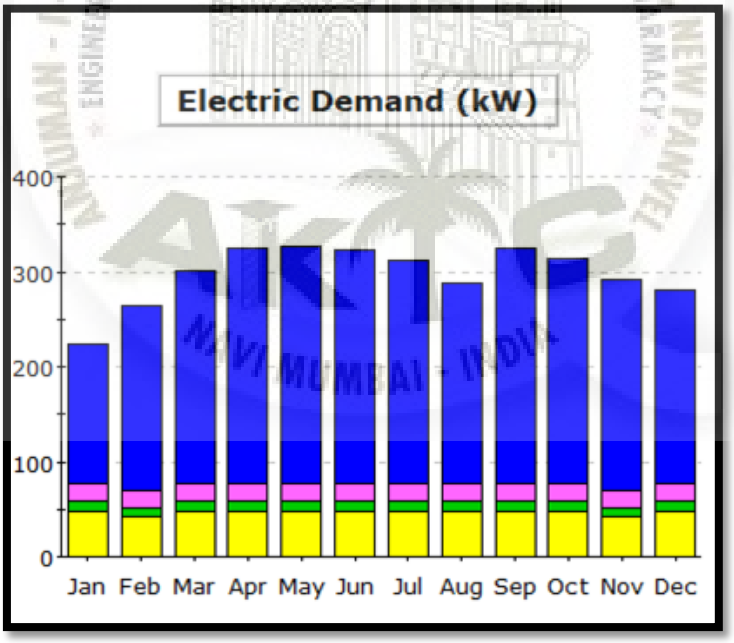
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	183.2	240	278	310.1	311.6	306.7	294.3	265.8	308.6	297	278.2	258.2	33,31.7
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	257.7
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	12.9	11.5	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	11.5	12.9	151.9
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	61.7	55.2	61.7	61.7	61.7	61.7	61.7	61.7	61.7	61.7	55.2	61.7	727.8
Total	2794	3280	3744	4062	4077	4028	3904	3619	4047	3931	3663	3543	44692

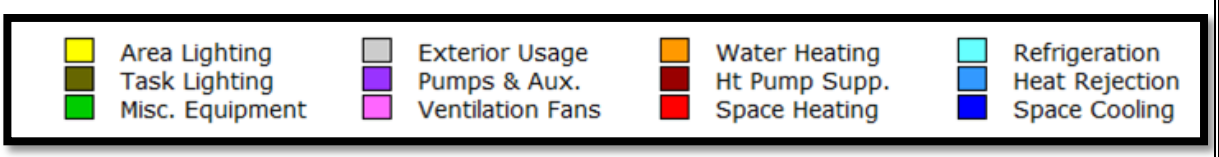


LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XX-B: ELECTRICAL CONSUMPTION (MODEL 2)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	1475	193.3	224	248	250	247	234.7	211	248	237	221.5	205	26,67.2
Heat Reject.	0	0	0	0	0	0	0	0	0	0	0	0	0
Refrigeration	0	0	0	0	0	0	0	0	0	0	0	0	0
Space Heat	0	0	0	0	0	0	0	0	0	0	0	0	0
HP Supp.	0	0	0	0	0	0	0	0	0	0	0	0	0
Hot Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Vent. Fans	178	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	214.1
Pumps & Aux.	0	0	0	0	0	0	0	0	0	0	0	0	0
Ext. Usage	0	0	0	0	0	0	0	0	0	0	0	0	0
Misc. Equip.	103	9.2	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	9.2	10.3	121.6
Task Lights	0	0	0	0	0	0	0	0	0	0	0	0	0
Area Lights	482	43.1	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	43.1	48.2	568.2
Total	2239	2634	3005	3246	3261	3229	3110	2877	3241	3137	2917	2816	35712





APPENDIX XXI

Details of electricity tariff by MSEB per unit

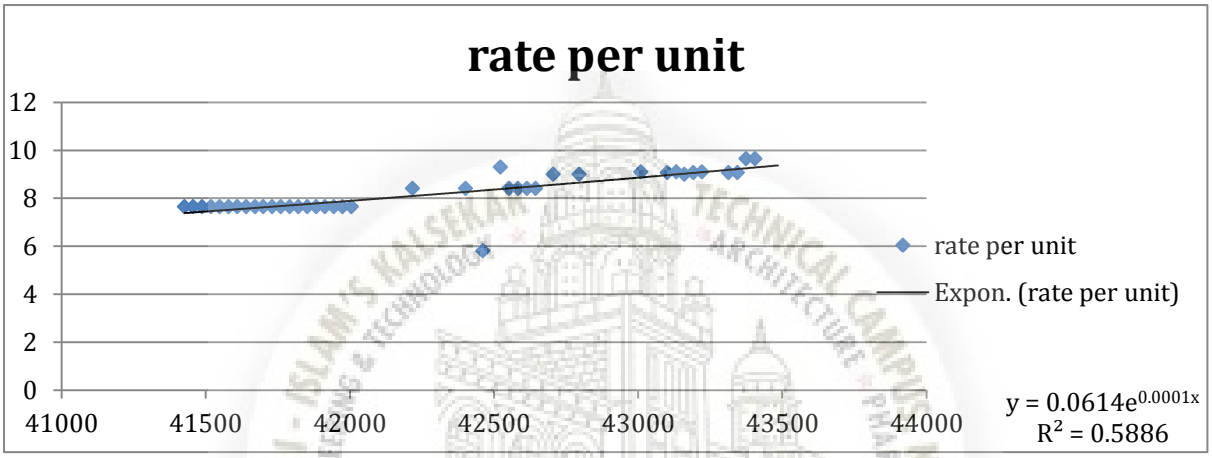
Sr. No.	Year and Month	Rate Per Unit	Sr. No	Year and Month	Rate Per Unit
1	Jul-13	7.65	36	Jun-16	9.3
2	Aug-13	7.65	37	Jul-16	8.41
3	Sep-13	7.65	38	Aug-16	8.41
4	Oct-13	7.65	39	Sep-16	8.41
5	Nov-13	7.65	40	Oct-16	8.41
6	Dec-13	7.65	41	Nov-16	9
7	Jan-14	7.65	42	Dec-16	9
8	Feb-14	7.65	43	Jan-17	9
9	Mar-14	7.65	44	Feb-17	9
10	Apr-14	7.65	45	Mar-17	9
11	May-14	7.65	46	Apr-17	9
12	Jun-14	7.65	47	May-17	9
13	Jul-14	7.65	48	Jun-17	9
14	Aug-14	7.65	49	Jul-17	9
15	Sep-14	7.65	50	Aug-17	9
16	Oct-14	7.65	51	Sep-17	9
17	Nov-14	7.65	52	Oct-17	9.1
18	Dec-14	7.65	53	Nov-17	9.1
19	Jan-15	7.65	54	Dec-17	9.1
20	Feb-15	7.65	55	Jan-18	9.07
21	Mar-15	7.65	56	Feb-18	9.1
22	Apr-15	7.65	57	Mar-18	9
23	May-15	7.65	58	Apr-18	9.07
24	Jun-15	7.65	59	May-18	9.1
25	Jul-15	7.65	60	Jun-18	9.1
26	Aug-15	8.41	61	Jul-18	9.1
27	Sep-15	8.41	62	Aug-18	9.07
28	Oct-15	8.41	63	Sep-18	9.07
29	Nov-15	8.41	64	Oct-18	9.65
30	Dec-15	8.41	65	Nov-18	9.65
31	Jan-16	8.41	66	Dec-18	9.65
32	Feb-16	8.41			
33	Mar-16	5.81			
34	Apr-16	5.81			
35	May-16	5.81			

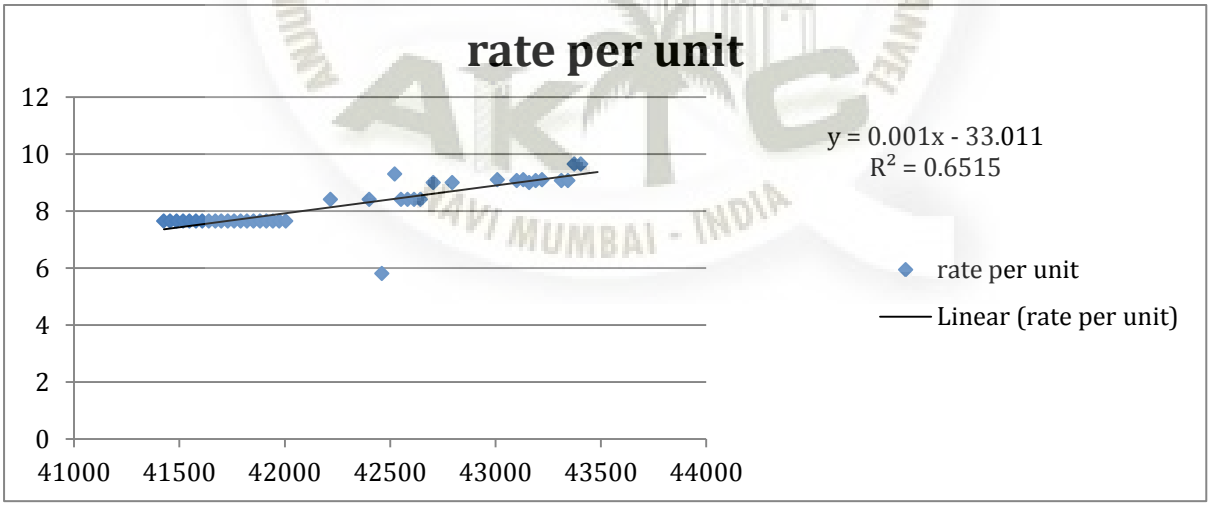
LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XXII

Simulation of electricity consumption over next 30 years

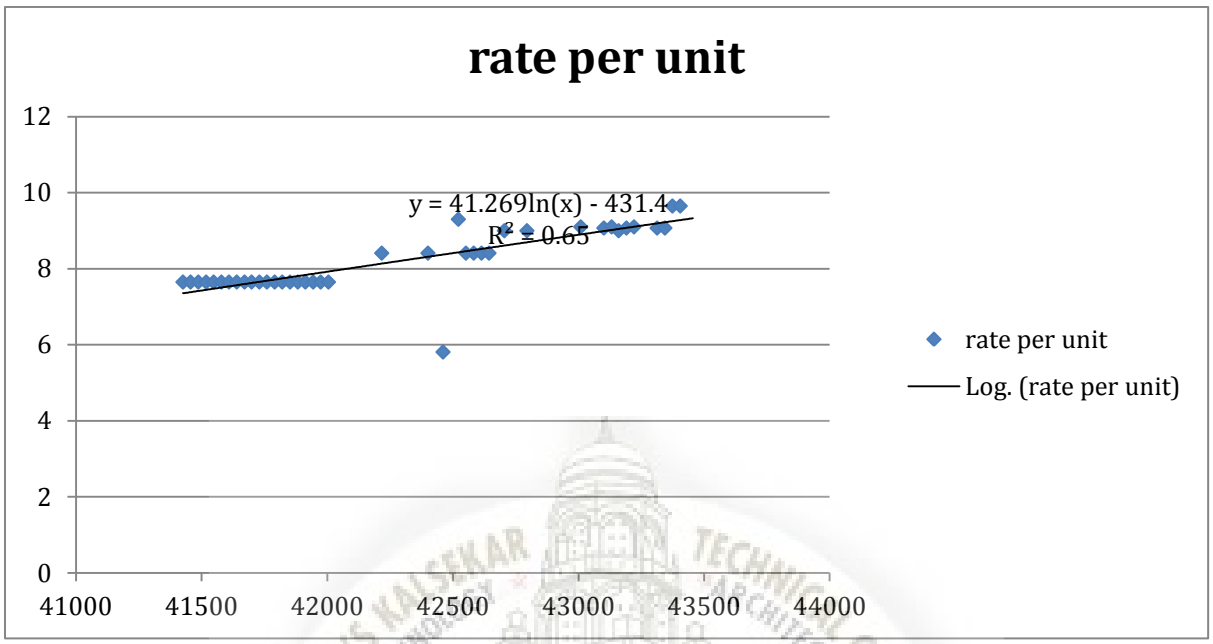
APPENDIX XXII-A: Electrical consumption graph (model 1)





LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XXII-B: Electrical consumption graph (model 2)



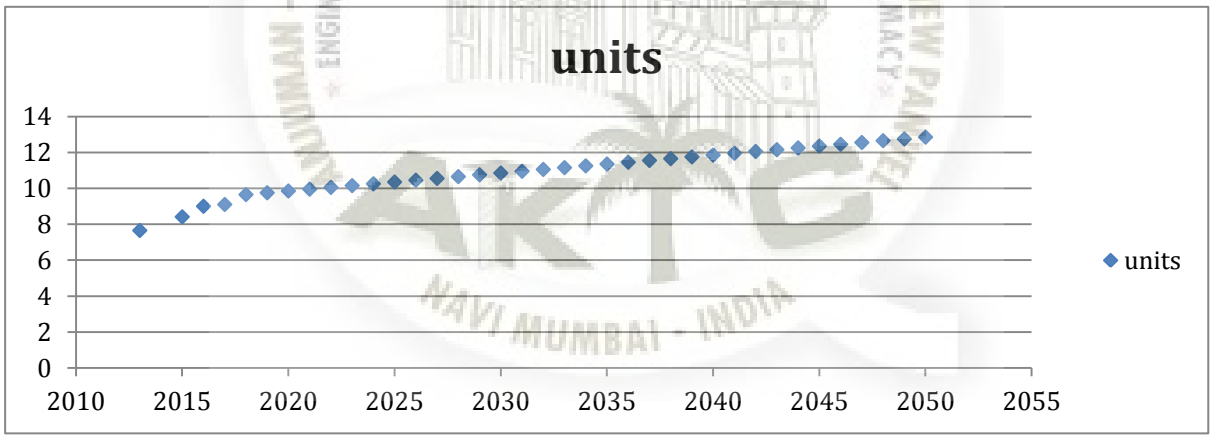


Fig no.9: Electrical consumption graph (model 1)

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XXIII

APPENDIX XXIII-A: NPV of model 1

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

year	units	Increased in unit	Electricity Consumed	Inflation rate increase wrt 2020	Maintenance Cost	Annual Maintenace Cost With Inflation	Annual Maintenace Cost deducting Electricity	Non Annual Maintenance	total maintenace	revenue	revenue wrt inflation	Revenue after all deductions
2013	7.65											
2015	8.41	0.76										
2016	9	0.59										
2017	9.1	0.1										
2018	9.65	0.55										
2019	9.75	0.1										
2020	9.85	0.1										
2021	9.95	0.1										
2022	10.05	0.1										
2023	10.15	0.1										
2024	10.25	0.1	458093	1.42	2954304	4192789.86	3734696.86		3734696.9	15000000	21288211.34	17553514.5
2025	10.35	0.1	462562	1.51	2954304	4449178.96	3986616.76		3986616.8	15000000	22589985.46	18603368.7
2026	10.45	0.1	467031	1.60	2954304	4722581.007	4255549.607		4255549.6	15000000	23978140.07	19722590.5
2027	10.55	0.1	471501	1.70	2954304	5014200.384	4542699.784		4542699.8	15000000	25458790.21	20916090.4
2028	10.65	0.1	475970	1.80	2954304	5325366.618	4849396.818		4849396.8	15000000	27038686.36	22189289.5
2029	10.75	0.1	480439	1.91	2954304	5657456.48	5177017.48		5177017.5	15000000	28724818.84	23547801.4
2030	10.85	0.1	484908	2.04	2954304	6012179.001	5527270.801	8524037	14051307	15000000	30525864.98	16474557.6
2031	10.95	0.1	489377	2.16	2954304	6390946.278	5901568.878		5901568.9	15000000	32448994.48	26547425.6
2032	11.05	0.1	493847	2.30	2954304	6795493.178	6301646.578		6301646.6	15000000	34503015.83	28201369.2
2033	11.15	0.1	498316	2.45	2954304	7227006.995	6728691.195		6728691.2	15000000	36693957.33	29965266.1
2034	11.25	0.1	502785	2.60	2954304	7688812.742	7186027.742		7186027.7	15000000	39038701.2	31852673.5
2035	11.35	0.1	507254	2.77	2954304	8182434.52	7675180.32		7675180.3	15000000	41544985.82	33869805.5
2036	11.45	0.1	511723	2.95	2954304	8710513.964	8198790.564		8198790.6	15000000	44226223.66	36027433.1

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

2037	11.55	0.1	516193	3.14	2954304	9275436.042	8759243.442		8759243.4	15000000	47094524	38335280.6
2038	11.65	0.1	520662	3.34	2954304	9879951.13	9359289.33		9359289.3	15000000	50163851.44	40804562.1
2039	11.75	0.1	525131	3.56	2954304	10527027.66	10001896.66		10001897	15000000	53449277.71	43447381
2040	11.85	0.1	529600	3.80	2954304	11219870.39	10690270.19	5816204	16506474	15000000	56967074.4	40460600.4
2041	11.95	0.1	534069	4.05	2954304	11961940.22	11427870.82		11427871	15000000	60734813.79	49306943
2042	12.05	0.1	538539	4.32	2954304	12756975.88	12218437.28		12218437	15000000	64771478.58	52553041.3
2043	12.15	0.1	543008	4.61	2954304	13609017.4	13066009.6		13066010	15000000	69097581.38	56031571.8
2044	12.25	0.1	547477	4.92	2954304	14522431.77	13974954.77		13974955	15000000	73735294.86	59760340.1
2045	12.35	0.1	551946	5.25	2954304	15501940.82	14949994.62		14949995	15000000	78708593.42	63758598.8
2046	12.45	0.1	556415	5.60	2954304	16552651.7	15996236.3		15996236	15000000	84043407.7	68047171.4
2047	12.55	0.1	560885	5.98	2954304	17680089.97	17119205.37		17119205	15000000	89767792.89	72648587.5
2048	12.65	0.1	565354	6.39	2954304	18890235.81	18324882.01		18324882	15000000	95912112.34	77587230.3
2049	12.75	0.1	569823	6.83	2954304	20189563.4	19619740.4		19619740	15000000	102509237.7	82889497.3
2050	12.85	0.1	574292	7.31	2954304	21585084.01	21010791.81	6013458	27024250	15000000	109594767.5	82570517.5

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XXIII-A: NPV of model 2

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

year	units	Increased in unit	Electricity Consumed	Inflation rate increase wrt 2020	Maintenance Cost	Annual Maintenace Cost With Inflation	Annual Maintenace Cost deducting Electricity	Non Annual Maintenance	total maintenace	revenue	revenue wrt inflation	Revenue after all deductions
2013	7.65											
2015	8.41	0.76										
2016	9	0.59										
2017	9.1	0.1										
2018	9.65	0.55										
2019	9.75	0.1										
2020	9.85	0.1										
2021	9.95	0.1										
2022	10.05	0.1										
2023	10.15	0.1										
2024	10.25	0.1	366048	1.42	2954304	4192789.86	3826741.86		3826741.9	15000000	21288211.34	17461469
2025	10.35	0.1	369619	1.51	2954304	4449178.96	4079559.76		4079559.8	15000000	22589985.46	18510426
2026	10.45	0.1	373190	1.60	2954304	4722581.01	4349390.61		4349390.6	15000000	23978140.07	19628749
2027	10.55	0.1	376762	1.70	2954304	5014200.38	4637438.78		4637438.8	15000000	25458790.21	20821351
2028	10.65	0.1	380333	1.80	2954304	5325366.62	4945033.82		4945033.8	15000000	27038686.36	22093653
2029	10.75	0.1	383904	1.91	2954304	5657456.48	5273552.48		5273552.5	15000000	28724818.84	23451266
2030	10.85	0.1	387475	2.04	2954304	6012179	5624703.8	8524037	14148740	15000000	30525864.98	16377125
2031	10.95	0.1	391046	2.16	2954304	6390946.28	5999899.88		5999899.9	15000000	32448994.48	26449095
2032	11.05	0.1	394618	2.30	2954304	6795493.18	6400875.58		6400875.6	15000000	34503015.83	28102140
2033	11.15	0.1	398189	2.45	2954304	7227006.99	6828818.19		6828818.2	15000000	36693957.33	29865139
2034	11.25	0.1	401760	2.60	2954304	7688812.74	7287052.74		7287052.7	15000000	39038701.2	31751648
2035	11.35	0.1	405331	2.77	2954304	8182434.52	7777103.32		7777103.3	15000000	41544985.82	33767883
2036	11.45	0.1	408902	2.95	2954304	8710513.96	8301611.56		8301611.6	15000000	44226223.66	35924612

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

2037	11.55	0.1	412474	3.14	2954304	9275436.04	8862962.44		8862962.4	15000000	47094524	38231562
2038	11.65	0.1	416045	3.34	2954304	9879951.13	9463906.33		9463906.3	15000000	50163851.44	40699945
2039	11.75	0.1	419616	3.56	2954304	10527027.7	10107411.7		10107412	15000000	53449277.71	43341866
2040	11.85	0.1	423187	3.80	2954304	11219870.4	10796683.2	5816204	16612887	15000000	56967074.4	40354187
2041	11.95	0.1	426758	4.05	2954304	11961940.2	11535181.8		11535182	15000000	60734813.79	49199632
2042	12.05	0.1	430330	4.32	2954304	12756975.9	12326646.3		12326646	15000000	64771478.58	52444832
2043	12.15	0.1	433901	4.61	2954304	13609017.4	13175116.6		13175117	15000000	69097581.38	55922465
2044	12.25	0.1	437472	4.92	2954304	14522431.8	14084959.8		14084960	15000000	73735294.86	59650335
2045	12.35	0.1	441043	5.25	2954304	15501940.8	15060897.6		15060898	15000000	78708593.42	63647696
2046	12.45	0.1	444614	5.60	2954304	16552651.7	16108037.3		16108037	15000000	84043407.7	67935370
2047	12.55	0.1	448186	5.98	2954304	17680090	17231904.4		17231904	15000000	89767792.89	72535889
2048	12.65	0.1	451757	6.39	2954304	18890235.8	18438479		18438479	15000000	95912112.34	77473633
2049	12.75	0.1	455328	6.83	2954304	20189563.4	19734235.4		19734235	15000000	102509237.7	82775002
2050	12.85	0.1	458899	7.31	2954304	21585084	21126184.8	6013458	27139643	15000000	109594767.5	82455124

APPENDIX XXIIV

Inflation graph (From RBI site)

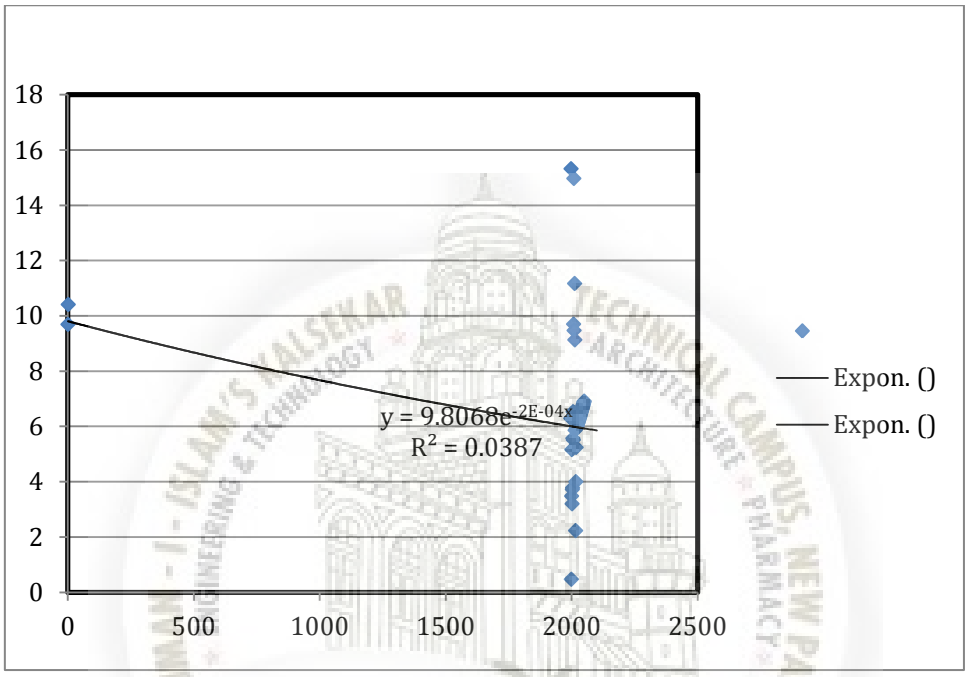
ANNUAL INFLATION (DEC. VS DEC.)	Inflation %	increase in inflation wrt 2020 (In Percentage)	
1	9.69		
2	10.41		
1997	6.29		
1998	15.32		
1999	0.47		
2000	3.48		
2001	5.16		
2002	3.2		
2003	3.72		
2004	3.78		
2005	5.57		
2006	6.53		
2007	5.51		
2008	9.7		
2009	14.97		
2010	9.47		
2011	6.49		
2012	11.17		
2013	9.13		
2014	5.86		
2015	6.32		
2016	2.23		
2017	4		
2018	5.24	100	
2019	5.93	105.93	1.0593

LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

2020	5.967	112.2508431	1.122508
2021	5.99	118.9746686	1.189747
2022	6.025	126.1428924	1.261429
2023	6.055	133.7808445	1.337808
2024	6.085	141.9214089	1.419214
2025	6.115	150.5999031	1.505999
2026	6.145	159.8542671	1.598543
2027	6.175	169.7252681	1.697253
2028	6.2057	180.2579091	1.802579
2029	6.236	191.4987923	1.914988
2030	6.27	203.5057665	2.035058
2031	6.3	216.3266298	2.163266
2032	6.33	230.0201055	2.300201
2033	6.35	244.6263822	2.446264
2034	6.39	260.258008	2.60258
2035	6.42	276.9665721	2.769666
2036	6.45381815	294.841491	2.948415
2037	6.48551946	313.9634933	3.139635
2038	6.51737649	334.4256762	3.344257
2039	6.54939001	356.3285181	3.563285
2040	6.58156077	379.780496	3.797805
2041	6.61388956	404.8987586	4.048988
2042	6.64637715	431.8098572	4.318099
2043	6.67902432	460.6505426	4.606505
2044	6.71183185	491.5686324	4.915686
2045	6.74480053	524.7239561	5.24724
2046	6.77793116	560.2893846	5.602894
2047	6.81122452	598.4519526	5.98452
2048	6.84468143	639.4140823	6.394141
2049	6.87830267	683.3949182	6.833949
2050	6.91208906	730.6317836	7.306318

APPENDIX XXV

INFLATION TRENDLINE GRAPH



LIFE CYCLE COST ANALYSIS OF A HOSTEL BUILDING WITH ENERGY EFFICIENT APPROACH: A CASE STUDY

APPENDIX XXVI:

SNAPSHOTS OF eQUEST 3-D MODELING