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An Empirical comparison of life cycle cost of green school buildings and non-green school buildings

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AN EMPIRICAL COMPARISON OF LIFE CYCLE COST OF GREEN SCHOOL BUILDINGS AND NON-GREEN SCHOOL BUILDINGS

by

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ABSTRACT

An Empirical Comparison of Life Cycle Cost of Green School Buildings And Non-Green School Buildings

by

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One of the major economic concerns today of the world is reduction of energy consumption because of depleting energy sources in the world. The construction sector in the United States is also contributing in reducing the energy consumption and construction cost of the buildings by constructing cost and energy efficient buildings with energy efficient materials and techniques. The U.S Department of Energy introduced the Building Technologies Program that develops techniques, tools and technologies for making buildings more energy efficient. Other private bodies like the Leadership in Energy and Environmental Design (LEED), which is developed by the U.S. Green Building Council (USGBC), have conducted numerous researches on techniques and methods to reduce energy consumption in buildings. Apart from providing certification to the buildings, this program also focuses on using strategies in reducing the energy consumption and improving the life and environment in the building.

This study focuses on comparing the construction cost, speed and energy consumption of Green School Buildings (GSB) with Non-Green School Buildings (NGSB). Similar type of sample size of 30 GSB and 30 NGSB data located under Clark County School District, Las Vegas, Nevada was collected to conduct the

statistical analysis. The final part of the study will compare and the life cycle cost of GSB and NGSB. The results of the statistical analysis showed that the mean energy consumption of GSB is significantly less than the mean energy consumption of NGSB. However, the mean construction cost of GSB is significantly more than the mean construction cost of NGSB. The construction speed of GSB is significantly slower than the construction speed of NGSB. The life cycle cost analysis showed that the life cycle cost of GSB is significantly higher than that of NGSB.

Keywords: Green School Buildings (GSB), Non-Green School Buildings (NGSB), Leadership in Energy and Environmental Design (LEED), U. S. Green Building Council (USGBC).

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CHAPTER 1

INTRODUCTION

Conservation of energy is one of the important issues to be addressed today. Construction of energy efficient buildings not only helps in reduction of energy demand globally, but also generates savings in terms of reduced operational and maintenance costs. The government of the United States is trying to solve some of these issues. One of the solutions for this is to minimize the consumption of energy in the building sector as the construction industry consumes about 40% of the energy in total (U. S. BTP, 2010). The U.S. Environmental Protection Agency initiated a program called as the Energy Star Program. This program encourages the homeowners to install energy star certified home appliances in their homes to reduce the energy consumption. The appliances include refrigerators, televisions, water heaters, air conditioning units, stoves, washers, dryers etc. There are various other products labeled by the Energy Star that are used in transportation, industrial and commercial sectors apart from the residential sector (Kulkarni, 2009). Organizations like the Leadership in Energy and Environmental Design (LEED) program encourage building owners and practitioners to design and construct buildings through energy efficient designs, energy and cost effective materials and construction techniques. The proposed research focuses on the relevance of green buildings in educational sector.

Energy conservation is one of the biggest challenges today. The world today is facing one of the major energy crises; global warming and climate

change. The melting snowcaps in the north and south poles, reduction in the level of water in the seas and oceans and depletion of ozone layer through carbon emissions in the atmosphere are one of the indications for the climate change and global warming (Capadevila, 2008). The government, researchers and practitioners have been trying on innovative ways to control these problems. By reducing the energy consumption in residential, commercial, industrial and transportation sectors is one of the solutions to control the energy consumption (Capadevila, 2008). Also, another better solution to help reduction of the energy consumption is by creating awareness among the people about the climate change. The US Department of Energy has been actively involved in contributing towards energy conservation through Energy Star Program. The energy star program encourages the users to use the energy efficient products. Also, the Building Technologies Program another initiative by the Department of Energy is creating technologies, tools and methods for buildings to consume less energy (U. S. BTP, 2010).

1.1 Green Buildings

Green Buildings also called sustainable buildings are responsive to the environment and to lowering energy consumption and its resources. Green Buildings also promote productivity through environmentally healthy buildings. Finally, initial costs are slightly higher but throughout the life of the building, operational and maintenance cost are greatly reduced. In a broader context, Green Buildings addresses such issues as global warming and recharging the ground water table.

The term “Green Architecture” was first mentioned in one of the British publications, “*The Independent”* in London in early 1990. Later, in mid 1990’s the term “Green Architecture” was coined in American editorial review. The first Green Building program was authorized in 1991, in the city of Austin, Texas. However, sustainable design has been practiced in America for millennia as evidenced by the structures built by Hopi Indians. Today, there are many such programs across the nation but all working towards a consensus definition of what a ‘Green Building’ involves, both in the public and private sector (Kats and Capital E 2003)**.**

Energy efficient buildings consume less energy, and also use renewable sources of energy in the buildings. The Energy Efficiency and Renewable Energy (EERE) under the U.S. Department of Energy (DOE) generate funds to the research and development (R&D) department to develop building codes, mechanical equipments, and its standards for efficient use of energy. This program is called as Building Technologies Program (BTP). The other part of BTP program is to educate to homeowners, builders and practitioners to utilize energy efficiently and encourages using the renewable energy sources in the buildings (U. S. BTP, 2010). The BTP also has been conducting research to focus on improvement of energy efficiency in the existing buildings by distinguishing cost-effective techniques that can enhance the comfort and safety of the existing buildings (U. S. BTP, 2010).

Increasing number of schools, campuses, and institutions in the United States are showing interest in developing buildings with sustainable

environments. Sustainable environments not only improve the quality and life of the building but also cause less impact on the natural environment (Reid, 2008). Generally, schools are designed to meet the building codes but, often do not address such issues providing a comfort, and promoting greater productivity for students, teachers, and staff. Many school buildings across the nation are regarded as having unhealthy environments, which ultimately leads to illness, increasing the rate of absenteeism, slow learning rate, poor test scores among students. The authors studied one of the main reasons for poor indoor environmental quality in schools is that students, faculty and staff spend 85% to 90% of time in school or at home. Which ultimately leads to increase of high amounts of pollutant content in indoor environment than outside and sometimes the pollutant content could go to 10 to 100 times high. There is a need for practitioners to design school buildings that provide a healthy environment. The only solution to this is to build a sustainable building. The authors reviewed The Carnegie Mellon building performance program that is the summarization of 17 different critical studies on the affinity between improved air quality and health. There were positive health impacts like asthma, flu, respiratory problems and headaches of improved indoor air quality from 13.5% to 85%. The only solution to this is to build a sustainable building.

The construction cost of building a Green School is about 2% more than that of the conventional schools. However, the long-term financial benefits are about 20 times more than the initial investment cost, mainly because Green Schools consume 30% less energy when compared to conventional schools on

an average. Building a Green School not only generate benefits through reduced operational and maintenance costs but also provides a healthy environment in the school for its users. The financial savings are in terms of reduced energy consumption and its costs, reduced water consumption and decreased carbon emissions into the atmosphere. Most of Green Buildings generates their own energy, or draw energy from the renewable sources of energy (Kats 2006).

1.2 Purpose and Objectives

In several literature reviews, comparisons have been made between the construction cost, and energy consumption of such Green Buildings as schools, or offices, to non-green buildings of similar size and function. It would be interesting to compare similar types of buildings, for instance, like Green School Buildings v/s. Non-Green School Buildings located in the same climatic location. For example, a study was conducted research comparing the energy consumption of homes having Energy Star appliances versus homes that did not (Kulkarni, 2009). This current study focuses on comparing Green School Buildings and Non-Green School Buildings of the Clark County School District, in Las Vegas, Nevada. Most of the new school construction in Clark County was built with an aim that they be more energy efficient. Also, the newly constructed schools adopted sustainable methods of construction or incorporated sustainable techniques like improved quality of day lighting, better air quality, and utilizing solar energy for heating and cooling systems. These new schools are categorized as GSB. The School buildings that did not receive any kind of LEED certification are categorized under NGSB for this study.

The objectives of this study are:

1. To compare the construction costs of GSB and NGSB.
2. To compare the annual energy consumption (electricity and natural gas) of GSB and NGSB.
3. To determine whether the GSB are built faster when compared to NGSB.
4. To determine whether the Life Cycle Cost (LCC) of GSB is greater than NGSB.

1.3 Research Hypothesis

There are four research hypotheses of this study. The research and null hypotheses are described below.

1. Research Hypothesis: The mean construction cost of GSB is more than the mean construction cost of NGSB.

- Null Hypothesis: The mean construction cost of GSB is not statistically different from the mean construction cost of NGSB.

Statistically it is written as

$$\mu_{Construction\ cost\ of\ GSB} = \mu_{Construction\ cost\ of\ NGSB}$$

2. Research Hypothesis: The mean energy consumption (electricity and natural gas) of GSB is less than the mean energy consumption of NGSB.

- Null Hypothesis: The mean energy consumption (electricity and natural gas) of GSB is not statistically different from the mean energy consumption of NGSB.

$$\mu_{Energy\ Consumption\ of\ GSB} = \mu_{Energy\ Consumption\ of\ NGSB}$$

3. Research Hypothesis: The mean life cycle cost of GSB is greater than the mean life cycle cost of NGSB.

- Null Hypothesis: The mean life cycle cost of GSB is not statistically different from the life cycle cost of NGSB.

$$\mu_{LCC\ of\ GSB} = \mu_{LCC\ of\ NGSB}$$

4. Research Hypothesis: The construction speed of GSB is greater than the construction speed of NGSB.

- Null Hypothesis: The construction speed of GSB is not statistically different from that of NGSB.

$$\mu_{Construction\ Speed\ of\ GSB} = \mu_{Construction\ Speed\ of\ NGSB}$$

CHAPTER 2

LITERATURE REVIEW

For this study, a literature review was conducted on construction costs, energy consumption, and life cycle cost of buildings of Green and Non-Green School Buildings. Although most of the papers did not directly evaluate school buildings, they provide background information that is useful for this study.

2.1 Common Perceptions about Green Buildings

A major misconception is that Green Buildings cost more to construct than non-green buildings. In reality, the construction cost is generally around 2% to 3% greater for Green Buildings, and are called “green premiums” (Qualk and Mc Cown, 2009). Although this “green premium” is one of the main sources of misconception that green buildings are expensive to build, it is actually only slightly more expensive to build than a non-green building. However, long-term savings from reduced operational and maintenance costs generates financial benefits of up to 20 times greater than the costs invested during construction. This section summarizes various research studies conducted to determine the construction costs of GSB and NGSB.

The authors stated that the main source of misunderstanding about construction costs for Green Buildings is from those who have no experience in constructing Green Buildings. There is a 50% annual growth in buildings seeking LEED certification, but the percentage of such new building construction in the United States is only 10%. Also, many companies think that achieving LEED certification is an overwhelmingly hideous task because of the limited funds

awarded for its construction; therefore, they consider LEED certification as an add-on that increase costs. According to the study 85% believe that Green Building costs are greater than conventional buildings, and 1% say that Green Buildings costs less when compared to conventional buildings. The study showed that 32% believe that they are 6% to 10% expensive, 23% believe that they are 3% to 5% more expensive and 18% believe that they are more than 15% expensive whereas 5% believe that they are up to 2% expensive (Qualk and Mc Cown, 2009).

To find a way that would help reduce such misconceptions, Qualk and Mc Cown (2009) suggested conducting a life-cycle assessment of green buildings, which evaluates the performance of the buildings throughout their entire lifespan. Using earlier research findings, the authors conducted a series of cost studies. Another study claimed that by adopting some cost-reduction techniques, many buildings are gaining “Green” certifications even when built within the limited range of money awarded for its construction (Matthiessen and Morris, 2007). Similarly another study determined that the cost of Green School Buildings is $70 per square feet. However, the financial savings during the life cycle of the building is more than 20 times of the initial invested cost (Qualk and Mc Cown, 2009). The savings in the form of reduced energy costs, and water costs is about $12 per square feet, which is about four times more than the extra cost that is required for gaining green certification.

2.2 Construction Cost of Green Buildings

Kats and Capital E (2003) studied the costs and benefits of Green Buildings in California. This study used existing data on cost and financial benefits of Green Buildings collected from architects, and practitioners in the construction industry. A construction cost for 33 LEED registered (25 office and 8 school) buildings, were collected from architects, senior building personnel, California's Sustainable Building Task Force members, USGBC staff, members of Green Building Valuation Advisory Group. The data was sorted with respect to the project name, location, building type, completion data, green premium and level of certification. If the buildings were not certified by the USGBC, then the buildings were given LEED level of certification by the architect or client. The analysis suggested that the average green premium for all 33 LEED-certified buildings was less than 2%. The analysis also suggested that the green premiums for buildings constructed between 2001 and 2002 are less than the green premiums for buildings constructed from 2003 to 2004. This indicates a difference in project experience: for the ones who are constructing a Green Building for the first time, the cost is higher than for those who are experienced. The authors also concluded that the financial benefits of LEED-certified Green Buildings included 70% increased productivity and health benefits, 16% reduced operational and maintenance costs, 11% increase in energy savings, 2% decrease in emissions, 1% decrease of wastage of water (Kats and Capital E, 2003).

Another study conducted by Kats determined the extra cost of Green Schools as well as cost effectiveness of Green School Buildings. Kats states that

most conventional schools designed to meet the building codes, but do not aim at building a productive and healthy environment. The sample size for this research consisted of total of 30 GSB and NGSB constructed during 2001 to 2006 in 10 states across the nation. To analyze the present value's future financial benefits and its costs, the net present value (NPV) analysis is used, with year 2006 as the base year. A positive number for the NPV suggests that it is a good investment. The 20-year term is assumed for the analysis in newly constructed buildings and a 15-year term is assumed for energy-retrofitted buildings; the inflation rate is assumed to be 2% per year, and the discount rate is assumed to be 7%. The LEED-certified school buildings are classified as GSB, National standard schools in California classified as Collaborative for High Performance Schools (CHPS), and have LEED classification, are also considered GSB. The results of the analysis showed that on the average, the cost premium of GSB when compared to NGSB is 1.7% higher. In addition, most of the GSB were built with the same budget of that of NGSB (Kats, 2006).

Research conducted by Matthiessen and Morris (2007) analyzed the actual construction costs of green buildings and non-green buildings. In this study, the authors try to conclude that even with the limited initial budget awarded for LEED certification; many buildings are able to achieve sustainable design. The data was collected from The Davis Langdon Knowledgebase. It is a database which contained information of approximately 600 different projects located in 19 different states across the nation categorized by building type, size, location and program. The types of building projects for this study were classified

as universities and colleges, classrooms, laboratories, and libraries. The total of 138 buildings was studied, out of which 45 were LEED seeking buildings and 93 were non-LEED seeking buildings. The costs of all the buildings were normalized in order to achieve balanced results and the cost per square feet for all the buildings was computed. Results showed that the cost-per-square-feet for the LEED-seeking buildings were distributed throughout the cost range displaying no significant pattern of distribution. A statistical t-test was conducted to analyze the variations in the selected samples; the results showed that between LEED-seeking buildings and non-LEED seeking buildings there was no significant difference, however the standard variation for all the buildings in each category was high because of the variation in the wide range of cost.

This study also compared similar buildings. The total of 52 buildings were identified under the “academic building” category. 15 were LEED-seeking and 37 were non-LEED seeking buildings. The average cost per square feet analysis of LEED versus non-LEED seeking buildings showed that there was no significant difference. Similarly, there was no significant difference between the average cost-per-square feet of laboratory buildings of which 15 were LEED-seeking and 34 were non-LEED seeking buildings. 37 library buildings, 15 were LEED-seeking and 22 were non-LEED seeking buildings. The analysis showed that most of the LEED-seeking buildings came under the lower half range of cost-per-square-feet of the buildings, but this did not necessarily mean that the cost of LEED-seeking buildings cost are less than the cost of non-LEED seeking buildings. The authors determine that most buildings under the same category

displayed a large variation in building costs. The differences in costs existed because of the different program types. There are both low and high cost buildings in both the categories. The analysis for initial budget showed that most of the projects were constructed within the initial budget awarded and gained LEED certification without any extra budget (Matthiessen and Morris, 2007).

Regarding construction costs for green buildings, the literature review suggests that Green Buildings are slightly more expensive to build (about 2% to 3%) when compared to non-green buildings. The initial investment is slightly higher, but green buildings promise to deliver prolonged cost-savings in terms of reduced operational and maintenance costs and generates financial benefits of about 10 times more than the initial investment made. Some studies also suggest that green buildings can be constructed within the money awarded for LEED certification. This may help clear the misconception that green buildings are merely add-on and increase the construction costs.

2.3 Energy Consumption of Green Buildings

Rising global environmental issues are a serious concern today. To overcome the global environmental problems, serious thought must be given to changing the behaviors of public energy consumption and encouraging energy efficient techniques and methods (Filippín, 2000). The building industry consumes about 50% of the world's energy and two-thirds of its electricity, according to the 2009 report of U.S. Energy Information Administration (EIA). Energy has become one of the prime issues in the entire life cycle cost analysis of the building (Flanagan, 2005). Through green building design, minimizing

energy consumption can cut down the operational costs. Producing and utilizing energy efficiently are among the prime functions of a green building. If this cost is reduced, then a substantial amount of savings results for long-term benefits (Flanagan, 2005). A study by the Flex-your-Power campaign, a California program promoting energy efficient and conservation, found that there is a 30% less energy consumed by green buildings, on an average, than conventional buildings. By utilizing minimal energy, this brings about a 20-year current value to energy savings. Generally, green buildings generate energy on site, or else borrow energy from renewable energy sources. A study conducted by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) study predicts that in the near future, green buildings will buy its electricity from the renewable sources; in addition, mean consumption of electricity will be 70% compared to non-green buildings, reducing the emissions by 6% (Kats and Capital E, 2003).

Gregory Kats (2006) claims that green schools use 33% less energy compared to conventional school buildings, on an average. The lower energy consumption has direct financial benefits in the form of reduced market demand resulting in a reduction in market-level energy prices due to lower energy consumption overall. This will have a huge impact on a large scale. In the study, Kats determined that 30 GSB had 33% decreased energy consumption compared to conventional school buildings.

This study also showed that the average energy consumption in schools during the years 2005 – 2006 was $ 1.15/sq ft, 63% of which was electricity and

34% natural gas. There was an increase of 6% in electricity prices from 2006 to 2009; at the same time, natural gas consumption increased to 14%. Kats suggested that there will be a slowdown in average energy prices by 5% per year, with an inflation of 3% projected for 20 years. Kats cites a report from – Platts Research and Consulting that determined that there was a reduction of 1% in natural gas demand, which could significantly reduce long-term direct savings of 100% to 200%. Kats also referred to a study by the State of Massachusetts that claimed there were reduced energy prices through indirect savings. This reduction in energy demand was due to energy consumption from renewable energy sources, which results in 90% direct energy savings. The researchers also determined that the energy demand for thermal heating was more than 80%.

The coefficient value for energy wastage with respect to the number of hours of energy consumption was 0.19, which is very low and not significant at alpha level 0.05. The results also showed significant variation in the energy consumption patterns in the schools. The possible reasons for the variations might be due to excessive energy waste by users due to opening patterns of doors and windows, wind direction, and orientation of the buildings. From the energy consumption data, more than 50% of the total cost is of electricity. To analyze cost efficiency, a cost-per-square-unit per student method was adopted. Results showed that there was less deviation in energy per square meter compared to the energy per student because most of the mechanical control units were controlled by school administrations, based on the type of space and the indoor environment, and not on the number of students present. The

consumption of cost-per-square-unit per student showed that there was more than 70% energy consumption that was 33.8% of total energy cost in schools (Kats, 2006).

Miller, Spivey and Florance compared data between Energy Star and LEED buildings to Non-Energy Star and Non-LEED buildings in the United States. The database used for this study was CoStar. The sample size for this study comprised 1,200 Energy-Star office buildings, out of which more than 900 buildings were office buildings, and 12 “other” buildings. In the CoStar database, Energy Star buildings were categorized as Class A buildings having 353,000 million square feet, 15 floors, built after 1985, and occupied. The authors focused on Class A type office buildings whose areas were more than 200,000 square feet, were more than five stories high, were built after 1970, and were occupied and operational. The final sample included 643 buildings. The general comparison on the absorption rates of energy in buildings was fastest for LEED-certified buildings. The operating charges of energy costs for Energy-Star rated buildings were $1.27 per square feet per year in 2006, compared to $1.81 per square feet for non-Energy-Star rated buildings. The study also analyzed the cost of the buildings with respect to age and location; the results showed that the LEED and Energy-Star buildings generated cumulative benefits. The authors concluded that investing in green buildings does pay off. In addition, tenants and occupants demand green buildings, since they create productive and healthy environments. After this study, the public and private sector started showing

interest in energy conservation by constructing more environmental friendly buildings than before (Miller et al. 2008).

In “The Cost and Financial Benefits of Green Buildings,” Kats and Capital state that on average, green buildings consume 30% less energy when compared to conventional buildings. The study compared the energy consumption of LEED-rated buildings to conventional buildings across the nation. The sample included 60 LEED-rated buildings, of which 5 were located in California. The results of the comparison analysis showed that Green Buildings are 25-30% more energy efficient, consume less energy during the peak hours, and generate renewable energy on site. In addition, the study showed that the estimated value of peak energy demand was $0.025 per square feet per year, projected over a 20-year period with a value of $0.31 per square feet. The financial benefits of energy in Green Buildings from 20 years to present value analysis were determined to be $ 5.79 per square feet (Kats and Capital E, 2003).

2.4 Life Cycle Assessment of Green Buildings

Life cycle assessment is the process of evaluating the energy consumption of buildings over the duration of that building’s lifetime. This is useful in reducing the impact on global warming, ozone depletion, and waste reduction on the environment. Studies assessing total energy usage are necessary to identify the maximum energy users and aim at minimizing the usage. By reducing operational usage of energy through the utilization of technological techniques, energy demand can be reduced. By means of life cycle

energy assessment, energy consumption can be significantly reduced (Ramesh et al. 2010).

The authors of “Lifecycle Assessment for Sustainable Design Options of a Commercial Building in Shanghai” assess the economic benefits of performing life cycle assessment of buildings in Shanghai, China. They suggest that lifecycle assessment, a sustainable tool, results in long-term economic and environmental benefits by considering both the capital design and construction costs and also of operating and maintenance costs. Unfortunately, lifecycle assessment is usually neglected, even though it is as important for sustainability analysis as other methodologies. One of the major disadvantages of the lifecycle assessment technique is that it consumes lot of time and also demands engineering and surveying expertise. The use of life cycle assessment could promote buildings designed in such a way that they reduce the life cycle costs and enhance sustainability (Wang et al. 2010).

In “A Life Cycle Assessment as a Tool in Environmental Impact Assessment,” Tukker claims that life cycle assessment is one of the best tools to evaluate both the long-term environmental benefits and economical benefits of the buildings. Like Wang, Chang, and Nunn, Tukker argues that life cycle cost assessment can be used to compare the initial design and construction costs with the long-term economic performance of the buildings (Tukker, 2000).

2.5 Summary of Literature Review

The literature review regarding construction costs, energy consumption, and life cycle analysis of green buildings to non-green buildings are summarized

here. Green building construction costs are found to be 2% to 3% more than the construction costs of the conventional building. This is a slight increase; however, the long-term benefits justify that slight increase. Also, energy consumption of green buildings is 30% less than conventional buildings. This reduced energy consumption is in the form of lowered operational and maintenance costs, which results in long-term financial benefits that are approximately 10 times more than the initial investment over 20-years. Besides these direct benefits, green buildings create a healthy internal environment, thus improving the productivity.

CHAPTER 3

METHODOLOGY

3.1 Research Methodology

The research methodology used in this study is shown in Figure 1. The study methodology used a statistical comparison of construction costs per square feet, average energy consumption per square feet, mean life cycle analysis, and construction speed for a sample of GSBs and NGSBs under the Clark County School District, at Las Vegas, Nevada.

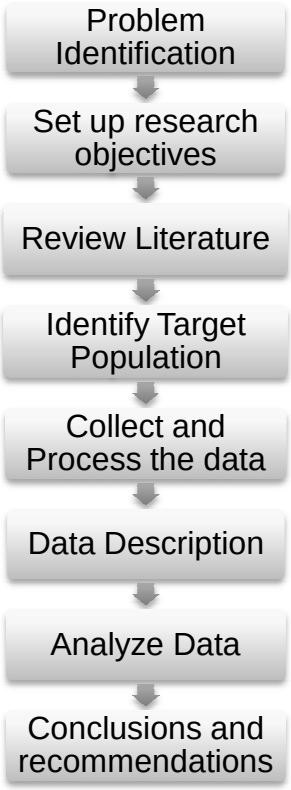

Fig. 1: Research methodology

3.2 Problem Statement

The first step of the research is to formulate a problem statement that describes the objectives, and the research scope. The details such as research background, purpose of the study, objectives and research hypothesis were addressed in Chapter 1.

3.3 Research Objectives

The objectives of this research were discussed in Chapter 1.

3.4 Literature Review

A literature review was done before finalizing the research methodology. The information was compiled by reviewing a series of journal articles, conference proceedings, and books. This review is described extensively in Chapter 2.

3.5 Selecting the Target Population and Data Collection

Identifying the target population is one of the major steps of this study. By means of the literature review and a series of discussions, it was decided to collect the data of school projects constructed by Clark County School District of Las Vegas, Nevada.

3.6 Data Collection

For this study, the data was collected electronically from the Clark County School District (CCSD), Las Vegas, specifically from the CCSD's Department of Energy. The data consisted of a sample size of 60 school buildings, of which 30 were GSB and 30 were NGSB. The data provided for the study included the construction cost and the year of construction of the school buildings. The GSB

were constructed in the years 2005, 2006 and 2007 and the NGSB were constructed between the years 1990 to 2004. In addition, data for energy consumption and usage of energy in terms of costs of these schools were collected from May 2007 to April 2010 and is provided in Appendix A and B.

3.7 Data Processing

The data collected were numeric data. The construction cost was in the value of dollar, the energy (electricity and natural gas) consumption was in terms of Kilo British Thermal Unit (KBTU) as well as in dollar amount, the area of all the schools was measured in square feet, and the construction duration was measured in days for all the school buildings. In order to conduct a statistical analysis, all the data was normalized with area of the buildings and was converted to the year 2010.

3.8 Statistical Analysis

The statistical tools used are Microsoft Excel and Statistical Package for Social Sciences (SPSS). The Analysis of Variance (ANOVA) and descriptive statistical tests were performed to draw conclusions for the study.

The ANOVA test is used to determine the comparison of the mean of construction costs, energy consumption, life cycle cost, and construction speed of GSB and NGSB. There are four null hypotheses and research hypotheses. The research hypothesis is identified by H_1. A null hypothesis we test for, opposite of the research hypothesis, is indicated by H_0. To have significant difference in means of two groups, the null hypothesis should be rejected (Levine

et al. 2007). There are four null and research hypotheses for this study that are discussed in Chapter 1 of Introduction.

In ANOVA test, the comparison of variation among and within the groups is conducted. The variation is represented by total sum of squares (SST). The entire variation is calculated by using the Equation 3.1 or by using Equation 3.2 (Levine et al. 2007).

$$SST = SSA + SSW \quad \text{..... (3.1)}$$

Where, *SSA = Square among group*

SSW = Square within group

$$SST = \sum_{j=1}^{c} \sum_{i=1}^{n_j} (Xij - \bar{\bar{X}})^2 \quad \text{..... (3.2)}$$

Where, $\bar{\bar{X}} = \frac{\sum_{j=1}^{c} \sum_{j=1}^{n_j} Xij}{n}$ = *Grand Mean*

Xij = *ith value in group j*

n_j = *number of values in group j*

n = total number of values in all groups combined

c= number of groups

Sum of square among groups (SSA) is also called as among-group variation. This is calculated by adding the squared difference between the mean of the samples in each group, the grand mean and the weighted sample size in each group. The formula for SSA is given in Equation 3.3 (Levine et al. 2007).

$$SSA = \sum_{j=1}^{c} n_j (\bar{X}_j - \bar{\bar{X}})^2 \quad \text{..... (3.3)}$$

Where, *c = number of groups*

n_j = *number of values in group j*

$\bar{X}_j$= *sample mean of group j*

$\bar{\bar{X}}$ = *grand mean*

Sum of square within groups (SSQ), group variation is calculated using the Equation 3.4 (Levine et al. 2007).

$$SSW = \sum_{j=1}^{c} \sum_{i=1}^{n_j} (Xij - \bar{X}_j)^2 \ldots\ldots\ldots\ldots\ldots \quad (3.4)$$

Where, Xij = *ith value in group j*

$\bar{X}_j$ = *sample mean of group j*

After the calculation of variations, the among and within group variables can be determined by the mean square. There are three types of mean squares.

- Mean square among (MSA)
- Mean square within (MSW)
- Mean square total (MST)

Below are the formulas which are used to describe the mean squares.

$$MSA = \frac{SSA}{c-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.5)$$

Where, *SSA = sum of square among groups;*

c= number of groups

$$MSA = \frac{SSW}{n-c} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.6)$$

Where, *SSW = sum of squares within groups;*

c= number of groups

n = total number of values on all groups combined

$$MST = \frac{SST}{n-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.7)$$

Where, *SST = total variance –one way ANOVA*

n = total number of values on all groups combined

If the results displayed force us to accept the null hypothesis and there are no differences seen in “c” group means, then all the three mean squares provide the overall variation in the data. In order to achieve accuracy, one must take the ratio of MSA and MSW. This ratio is called as F-test (one-way ANOVA test) statistics which is calculated using the Equation 3.8 (Levine et al. 2007).

$$F = \frac{MSA}{MSW} \quad \text{..... (3.8)}$$

Where, *MSA = mean square among*

MSW = mean square within

This F – test follows the F distribution, with (c-1) degree of freedom in the numerator and n-c degree of freedom in the denominator. With the determined level of significance, we reject the null hypothesis if the F test value is greater than the upper tail of the critical value.

Accept H_1 *if* $F > F_u$ (Levine et al. 2007).

The results of the ANOVA test are summarized in the ANOVA Summary Table in found in Chapter 5 This table includes variations, degrees of freedom, the sum of squares, the mean squares, p-value and the calculated F-value. The p-value, judged upon a significance level of 0.05, is generally used to determine the conclusion for the test conducted. If the p-value is less than the significant level, reject the null hypothesis (H_0). If not, accept the null hypothesis (H_0). The findings of the tests are discussed in Chapter 5.

To conduct a statistical test, it is very important to normalize the entire data, including the construction costs, speed, and energy consumption data for

all the school buildings. The data is normalized into unit per square footage of the buildings. The energy consumption data was converted to KBTU/SQFT and the construction cost was converted into $/SQFT for the school buildings. The life cycle cost was projected for 50 years, normalized into the present worth and converted into life cycle cost per square feet ($/SQFT). For the construction speed, the data was converted into days per square feet (days/SQFT).

CHAPTER 4

DATA DESCRIPTION

The Clark County School District provided data for both GSB and NGSB from elementary, middle and high schools. Some of these schools were in session for 9 months and other for 12 months. The data also included the construction year for these schools. The following procedures were involved to convert the values.

The graph in Fig. 4.1 distributes schools that are in session for 9 months and 12 months. The majority of schools run for a nine-month period, hence all the 12-month schools energy consumption and construction costs data were converted to 9 months school.

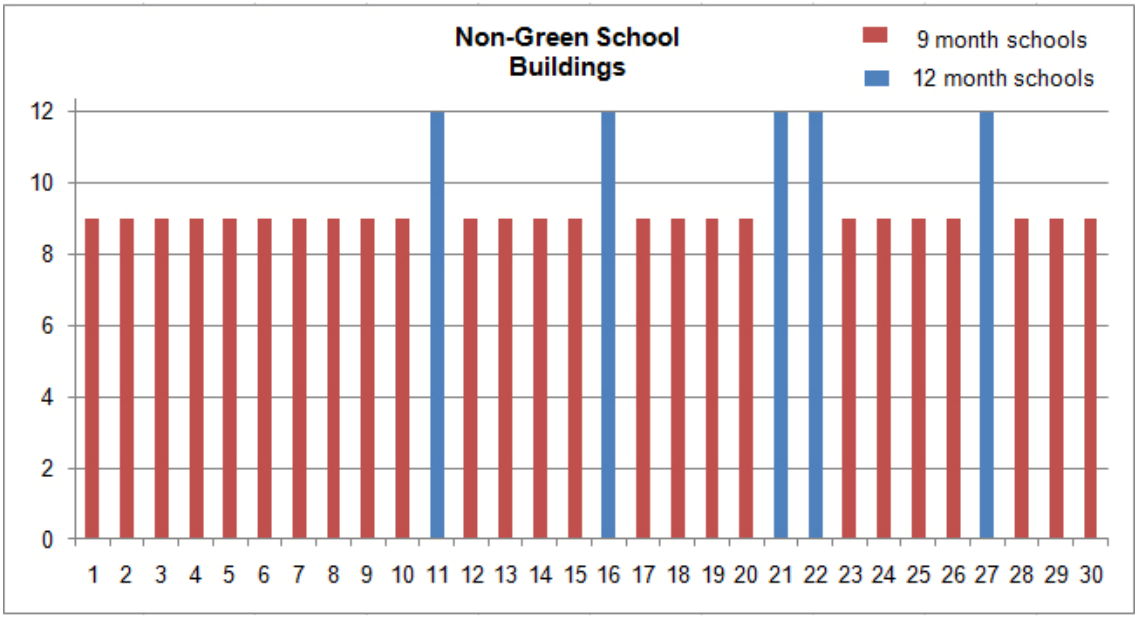

Fig 4.1: Distribution of 12-month and 9-month Green School Buildings

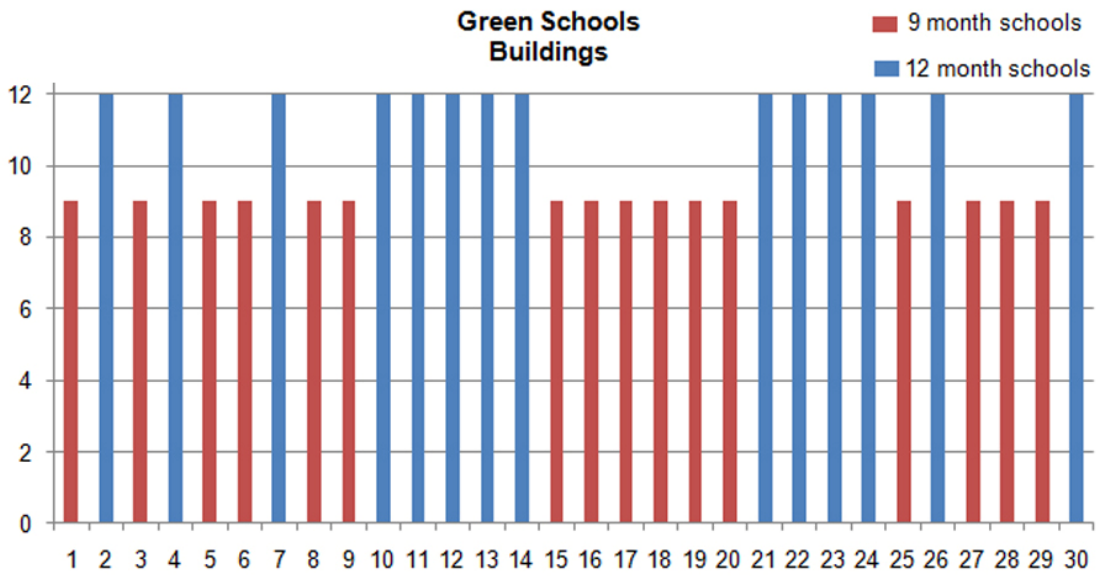

Fig 4.2: Distribution of 12-month and 9-month Non-Green School Buildings.

4.1 Normalization of the Construction Cost

Since the schools were constructed in different years, all the given construction costs were converted to the present year 2010.

The building cost indices of Engineering News Record (ENR), which is given below in the Table 4.1, were used to convert the base cost of 2010.

Table 4.1: Building Cost indices of Engineering News Record (ENR)

Year	Index	Year	Index	Year	Index
1990	2702	1997	3364	2004	3984
1991	2751	1998	3391	2005	4205
1992	2834	1999	3456	2006	4369
1993	2996	2000	3539	2007	4485
1994	3111	2001	3574	2008	4691
1995	3112	2002	3623	2009	4769
1996	3203	2003	3693	2010	4883

Using the Building Cost Indices from the Table 4.1, the construction costs for all the schools were adjusted using the equation given below.

$$\textit{Adjusted construction cost to current year} = \frac{\textit{Given construction cost x current year cost indices}}{\textit{Cost indices of that particular year}}$$

For example, if the construction cost for the year 2005 was $ 20,000,000, then by using the above equation and the cost indices from the Table 4.1, the adjusted construction cost for the current year, (2010) was calculated as

$$\$23,811,442 = \frac{\$20,000,000 \times 8865}{7446}$$

After calculating the adjusted construction cost for the current year, the cost per square feet for all the schools were calculated, as shown below.

$$\textit{Cost per Square feet} = \frac{\textit{Total Construction Cost}}{\textit{Area of the building}}$$

The cost per square feet value has to be adjusted, as shown calculated below.

$$\textit{Adjusted Cost per Square feet} = \frac{\textit{Adjusted Construction Cost}}{\textit{Area of the building}}$$

For example, if the adjusted construction cost of the building is $23,811,442, and the area of the building is 68,000 SQFT, then the adjusted cost per square feet will be calculated as

$$\$350/\text{SQFT} = \frac{\$23,811,442}{68,000\ \text{SQFT}}$$

The graph below shows the adjusted construction cost per square feet for all the school buildings provided.

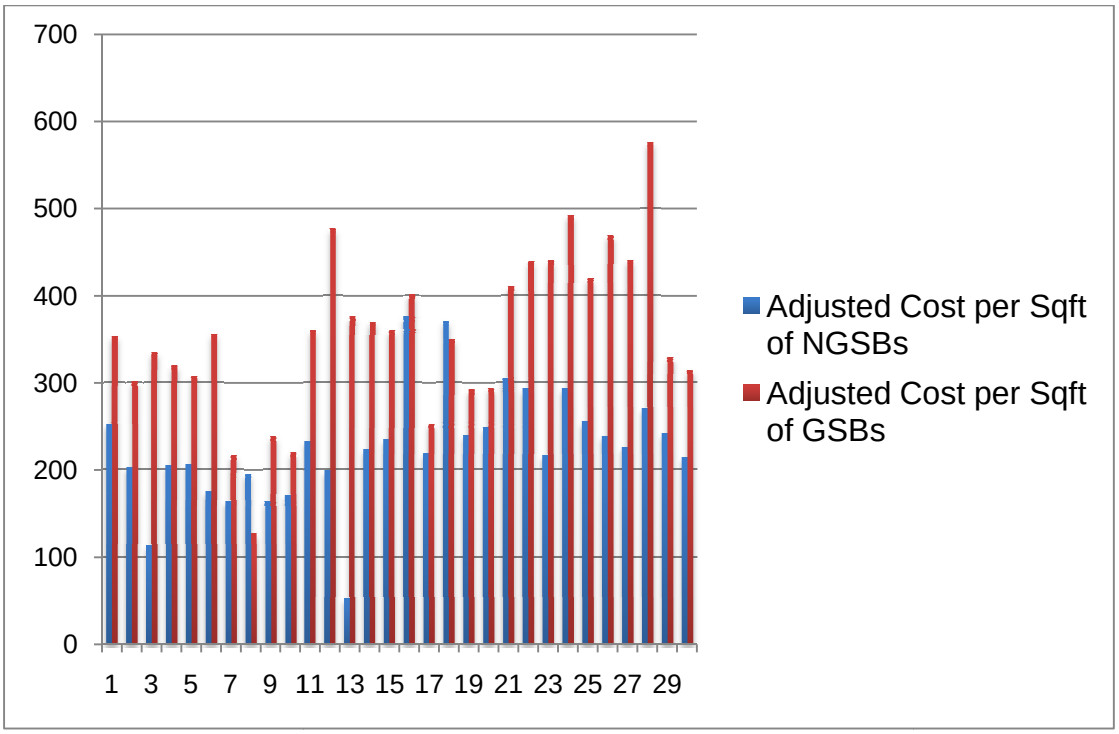

Table 4.3: Construction Cost per Square Feet ($/Sqft) of School Buildings

4.2 Conversion of Energy Consumption

The energy consumption data, in Kilo British Thermal Units (KBTU), was provided in monthly basis for three years. The energy consumption was tabulated into three different years (May 2007 to April 2008, May 2008 to April 2009 and May 2009 to April 2010) breaking them into month. The average for each year was calculated. Then, the average of all the three year's energy consumption was calculated in order to achieve uniformity. The schools on a 12-month schedule were converted to 9-month school figures by multiplying the average yearly energy consumption was multiplied by 0.75.

Adjusted average yearly energy consumption to 9 month school KBTU	=	*average yearly energy consumption KBTU x 0.75 (particular school)*

For example, if the average yearly energy consumption of a particular school is 300,000 KBTU and it is a 12-month school, then the data is converted for 9-months as shown below.

225,000 KBTU = 300,000 KBTU x 0.75

4.2.1 Normalization of Energy Consumption Cost

The conversion of yearly energy consumption costs is similar to the conversion for yearly energy consumption. The cost is given in dollars ($) on a monthly basis for three years. Like energy consumption, the energy consumption costs for all the schools were tabulated for three years - from May 2007 to April 2008, May 2008 to April 2009 and May 2009 to April 2010 - segregating them into twelve month periods. The average for the given years was calculated, and then the average of all the three year's cost of energy consumption in terms of usage was calculated to achieve consistency. The cost of average energy consumption for 12 months was multiplied into 0.75 to convert it into a 9-month school.

Adjusted Cost of average yearly energy consumption to 9 month school ($)	=	*cost of average yearly energy consumption $ x 0.75 (particular school)*

For example, if the cost of average yearly energy consumption of a 12-month school is $ 9,000 the data is converted for a 9-month school is calculated below.

$$\$6{,}750 = \$\ 9{,}000 \times 0.75$$

4.3 Conversion for Life Cycle Cost

For the conversion of life cycle cost per square feet, we will consider the average yearly adjusted energy consumption cost ($) and adjusted average yearly energy consumption (KBTU).Then we calculate the price of energy by the formula below.

$$\text{Price of Energy} = \frac{\text{Average yearly adjusted energy consumption cost}}{\text{Average yearly adjusted energy consumption}}$$

For example, if the average yearly adjusted energy consumption cost for year 2007 is 300,000 KBTU and the average yearly adjusted energy consumption for year 2007 is $ 9,000. Then the price of energy for year 2007 will be calculated as

$$\$\ 0.03/\text{KBTU} = \frac{\$\ 9{,}000}{300{,}000\ \text{KBTU}}$$

Similarly, the unit price for all the remaining years is calculated, and then an average unit price for all the years is computed.

For the life cycle cost analysis, we project the life cycle cost per square feet for 50 years (n). For this we consider an inflation rate of 3% (i) and we calculate the inflation factor, as shown below.

$$\text{Inflation Factor} = 1 \times (1+i)^{n}$$

For example, if we consider the interest rate as 3% and the year as 1, then the inflation factor will be calculated as

$$1.03 = 1 \times (1+0.03)^{1}$$

After the calculation of inflation factor, we calculate the unit price of energy, whose calculation is seen below.

Unit Price of Energy = Inflation factor x Average Energy Price

For example, if the inflation factor is 1.03 and the average energy price is $ 0.03, then the unit energy price will be

$0.0309 = 1.03 x $ 0.03

After the unit price calculation, the total energy cost per year is calculated as seen below.

Total energy cost/year = Unit price energy x Average adjusted energy

For example if the unit price energy is $ 0.031/KBTU and the average adjusted energy is 300,000 KBTU, then the total energy cost/ year will be

$9,300 = $0.031/KBTU x 300,000 KBTU

Then, the present worth energy cost of the building, is calculated, for which we consider inflation rate (i) and inflation factor for that particular year (n). The inflation factor is calculated as:

Inflation Factor = 1 / (1+i)^n

For example, if we consider the interest rate as 5% and the year as 1, then the inflation factor for that considered year will be calculated as

0.9523 = 1 / (1+0.05)^1

Similarly, the inflation factor is calculated for all 50 years. Then we calculate the present worth for all the 50 schools and sum up the total which is calculated as,

Present Worth = Inflation factor x Total energy cost/year

For example, if the inflation factor is 0.9523 and total energy cost/year is $9,300, then the present worth energy cost of the building for that particular year will be

$$\$ 8857 = 0.9523 \times \$9,300$$

After considering the construction costs, and the area of the building, we then calculate the total life cycle cost of the building as shown below

Total Life Cycle Cost = Total Present worth of energy cost + Adjusted Construction cost

For example if the adjusted construction cost of the building is $ 20,000,000 and the total present worth of energy cost of the building for all 50 years is $ 1,000,000 then the total life cycle cost of the building will be calculated as

$$\$ 21,000,000 = \$ 20,000,000 + \$ 1,000,000$$

After this, the total life cycle cost is divided by the area of the building in order to achieve the life cycle cost per square feet of the building, as calculated below.

$$\text{Life cycle energy cost per square feet} = \frac{\text{Total Life cycle cost}}{\text{area of the building}}$$

For example, if the total life cycle cost is $ 21,000,000 and the area of the building is 60,000 sqft, then the life cycle energy cost per square feet will be

$$\$ 350/\text{SQFT} = \frac{\$ 21,000,000}{60,000 \text{ SQFT}}$$

Similarly, we calculate the life cycle cost per square feet of all the GSB and the NGSB, after which an ANOVA test will be conducted for both types of buildings.

The p-value will determine the significance of the test.

4.4 Conversion for Construction Duration per 1,000 Square feet

To check if the GSB takes more time to build when compared to NGSB the construction speed per 1,000 square feet of the building is calculated. The construction cost and duration of all the school buildings were matched with the data collected from a graduate student at UNLV- who studied on the change orders under the Clark County School District, Las Vegas. The calculation is shown below.

$$\text{Construction Speed (Days)} = 1{,}000 \text{ SQFT} \times \frac{\text{Construction Duration}}{\text{Area of the building (SQFT)}}$$

For example, if the construction duration of a school building is 360 days for an area of 60,000 Sqft then, using the above equation the construction speed for 1,000 Sqft will be

$$6 \text{ days} = 1{,}000 \text{ SQFT} \times \frac{360 \text{ days}}{60{,}000 \text{ SQFT}}$$

4.5 Assumptions Tests for the ANOVA

As per the study conducted by Levine et at. 2007, certain assumptions are made to conduct the ANOVA test. There are two types of variables in this study - dependent variables and independent variables.

The dependent variables are the ones on which the statistical test is being performed, whereas the independent variables are the ones that are manipulated in the test. For example, we check how types of school buildings (green and non-green) influence the construction cost, speed, energy consumption and total life cycle cost of the buildings. Here, independent variable is the type of buildings

and construction cost, speed, energy consumption, and total life cycle cost are the dependent variable. There are four assumptions in ANOVA test, they are:

a. The dependent variables are in interval scale, in this case, the construction costs, speed, energy consumption and total life cycle cost.

b. The projects data were provided by the Clark County School District. So it is assumed that the projects were selected randomly.

c. The histogram was plotted for the construction costs, speed, energy consumption, and life cycle cost to check if the data was normally distributed or not. The data were skewed to the right.

d. A test for homogeneity of variances was performed to check if the data has equal variance. If the test significant value is higher than the level of significance, then the variance homogeneity of the variables is accepted.

To conduct the statistical analysis for ANOVA test, the test is conducted in SPSS and Excel spreadsheet. When the mass of the distribution is concentrated on the right of the figure or when the left tail is longer, then the distribution is left skewed. When the mass of the distribution is concentrated on left side or when the right tail is longer, then the data is right skewed. The data is normally distributed when the data is symmetrical (Levine et al. 2007).

4.5.1 Histograms for the Construction Cost per Square Feet

Figure 4.5.1 shows histogram and the normal distribution curve for the construction cost per square feet for all the school buildings.

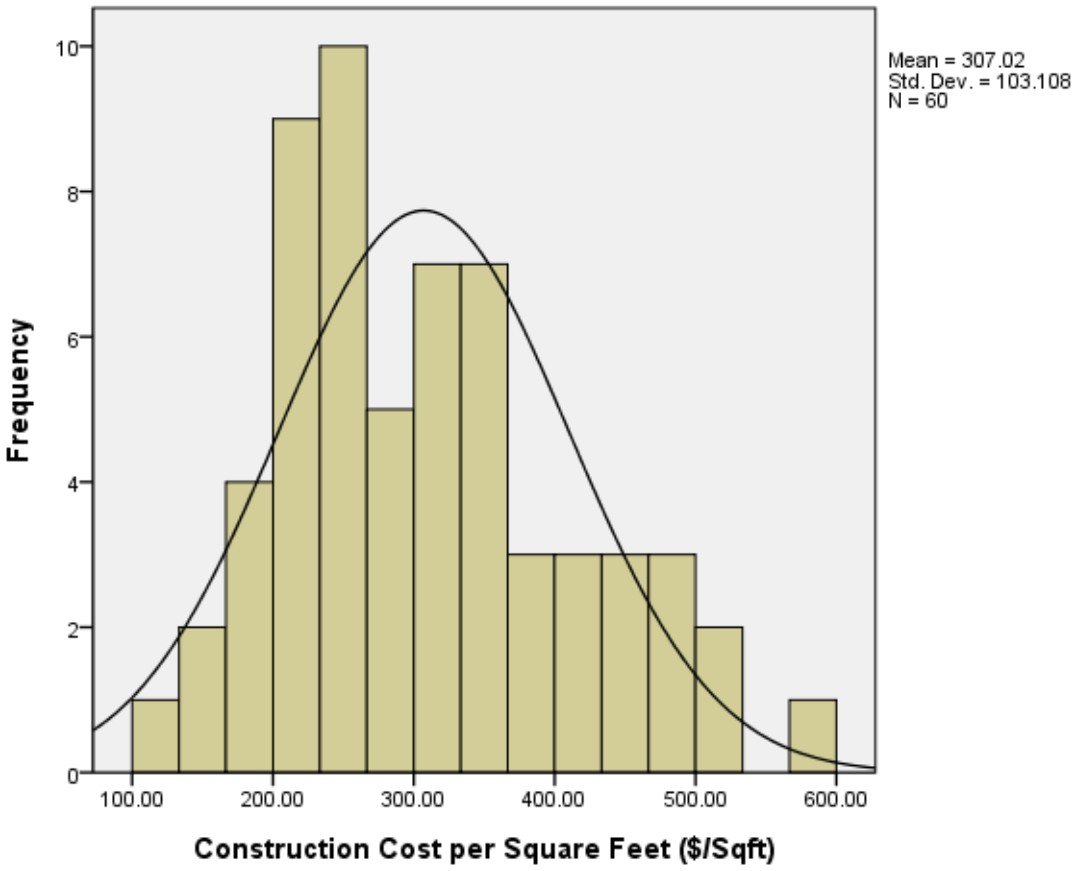

Figure 4.5.1: Histogram for the Construction Cost per Square Feet ($/Sqft)

Figure 4.5.1 shows that the construction cost per square feet of the schools followed a normal distribution curve with a mean of $307.02/sqft. It shows that the distribution is right skewed.

Figure 4.5.2 shows histogram and the normal distribution curve for the construction cost per square feet for all the Green School Buildings. It shows that the construction cost per square feet followed a normal distribution curve with a mean of $ 354.70/sqft. It shows that the distribution is right skewed.

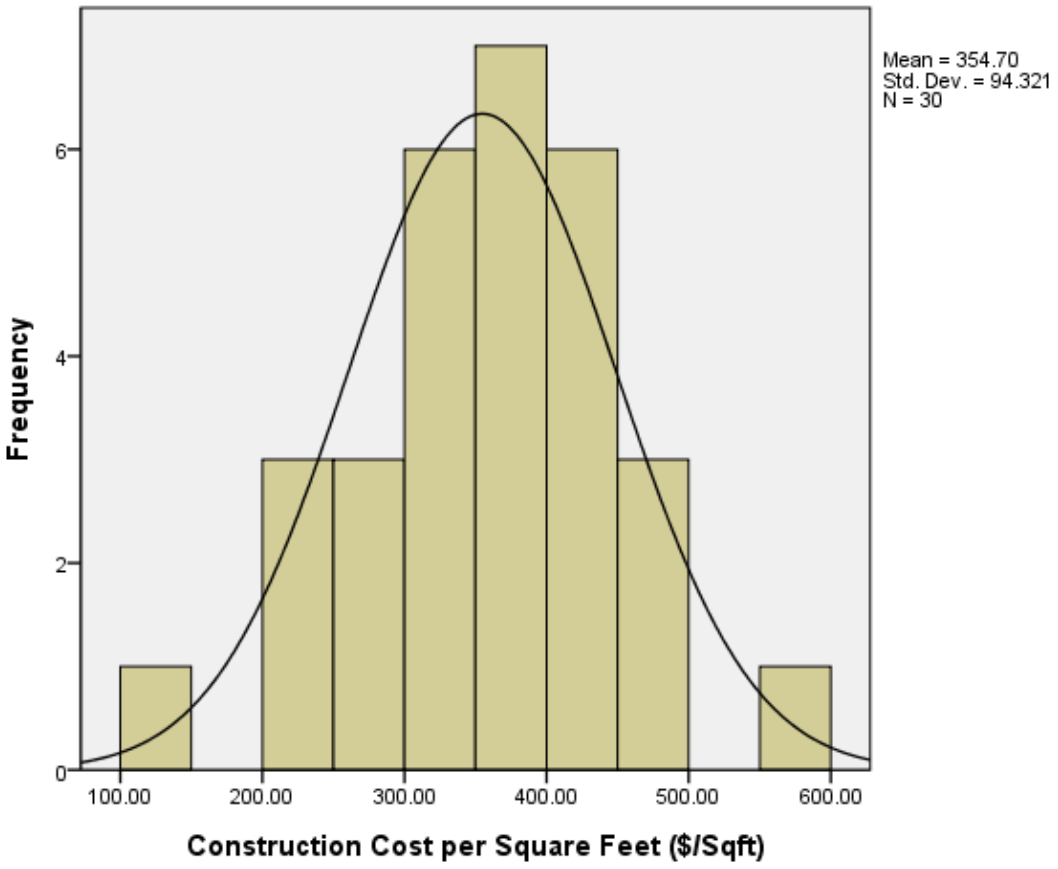

Figure 4.5.2: Histogram for the Construction Cost per Square Feet of Green School Buildings ($/Sqft)

Figure 4.5.3 shows histogram and the normal distribution curve for the construction cost per square feet for all the Non-Green School Buildings. It shows that the construction cost per square feet followed a normal distribution. Figure 4.5.3 shows curve with a mean of $256.61/sqft. It shows that the distribution is right skewed.

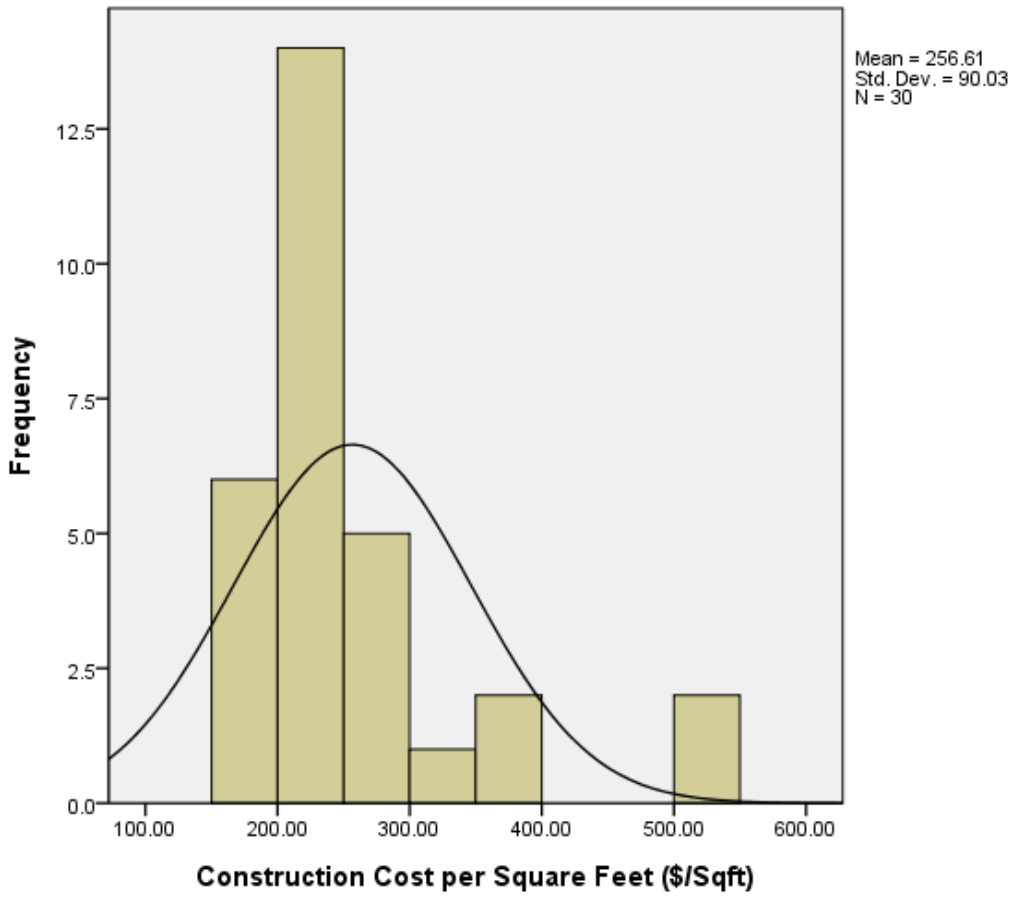

Figure 4.5.3: Histogram for the Construction Cost per Square Feet of Non-Green School Buildings ($/Sqft)

Figure 4.5.4 shows histogram and the normal distribution curve for the average yearly energy consumption per square feet for all the school buildings. It shows that the average yearly energy consumption per square feet of the schools followed a normal distribution curve with a mean of 4.72 KBTU/sqft. It shows that the distribution is right skewed.

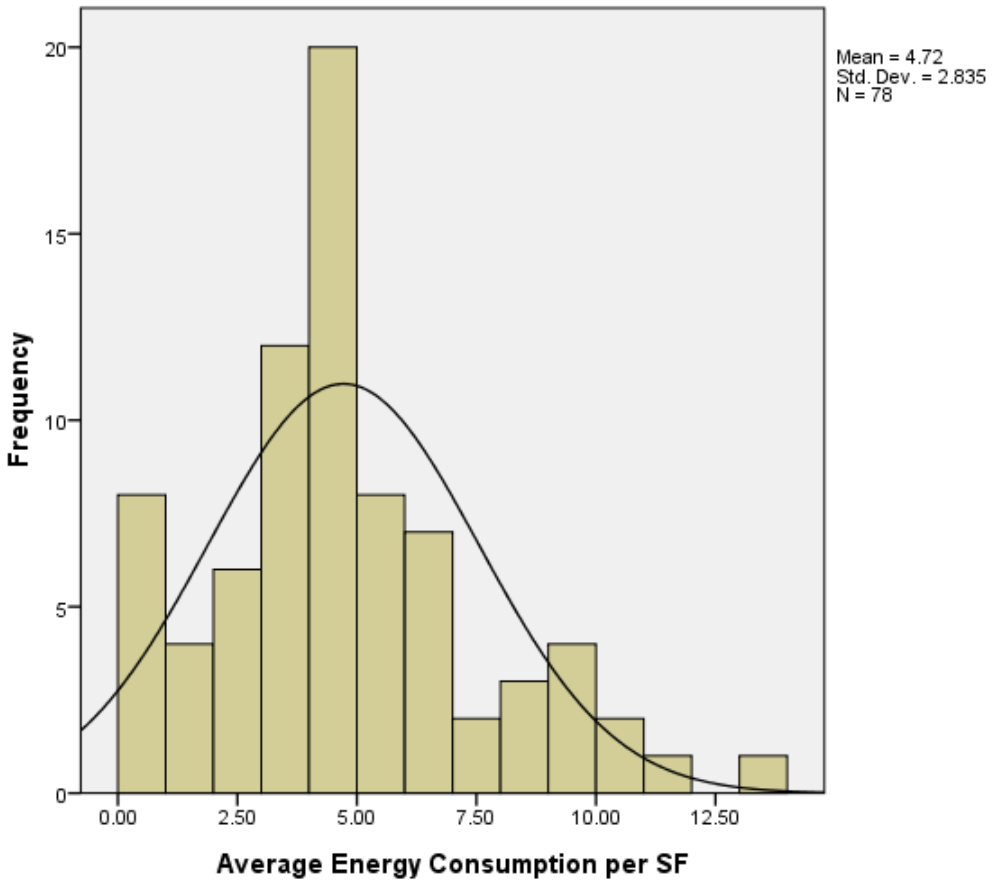

Figure 4.5.4: Histogram for the Average Yearly Energy Consumption per Square Feet (KBTU/Sqft)

Figure 4.5.5 shows histogram and the normal distribution curve for the average yearly energy consumption per square feet for all the Green School Buildings. It shows that the average yearly energy consumption per square feet of the schools followed a normal distribution curve with a mean of 3.76KBTU/sqft. It shows that the distribution is right skewed.

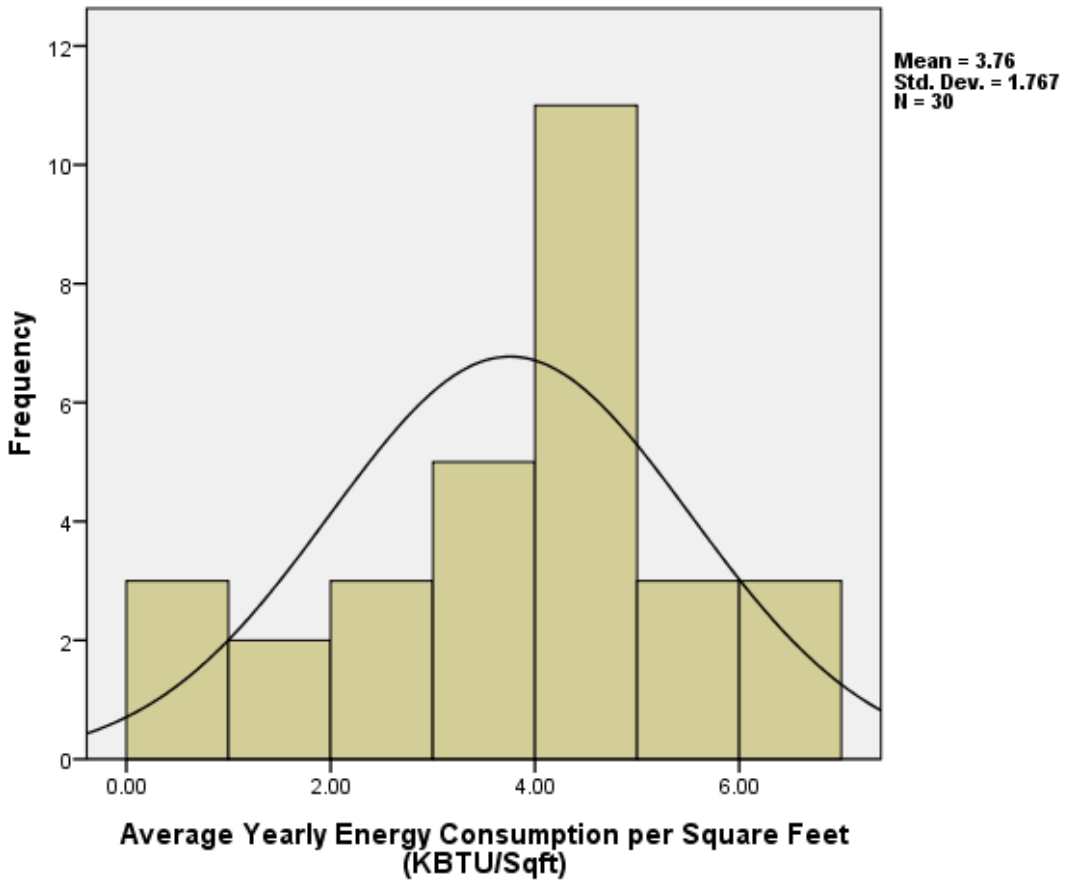

Figure 4.5.5: Histogram for the Average Yearly Energy Consumption per Square Feet of GSB (KBTU/Sqft)

Figure 4.5.6 shows histogram and the normal distribution curve for the average yearly energy consumption per square feet for all the Non-Green School Buildings. It shows that the average yearly energy consumption per square feet of the schools followed a normal distribution curve with a mean of 5.56 KBTU/sqft. It shows that the distribution is right skewed.

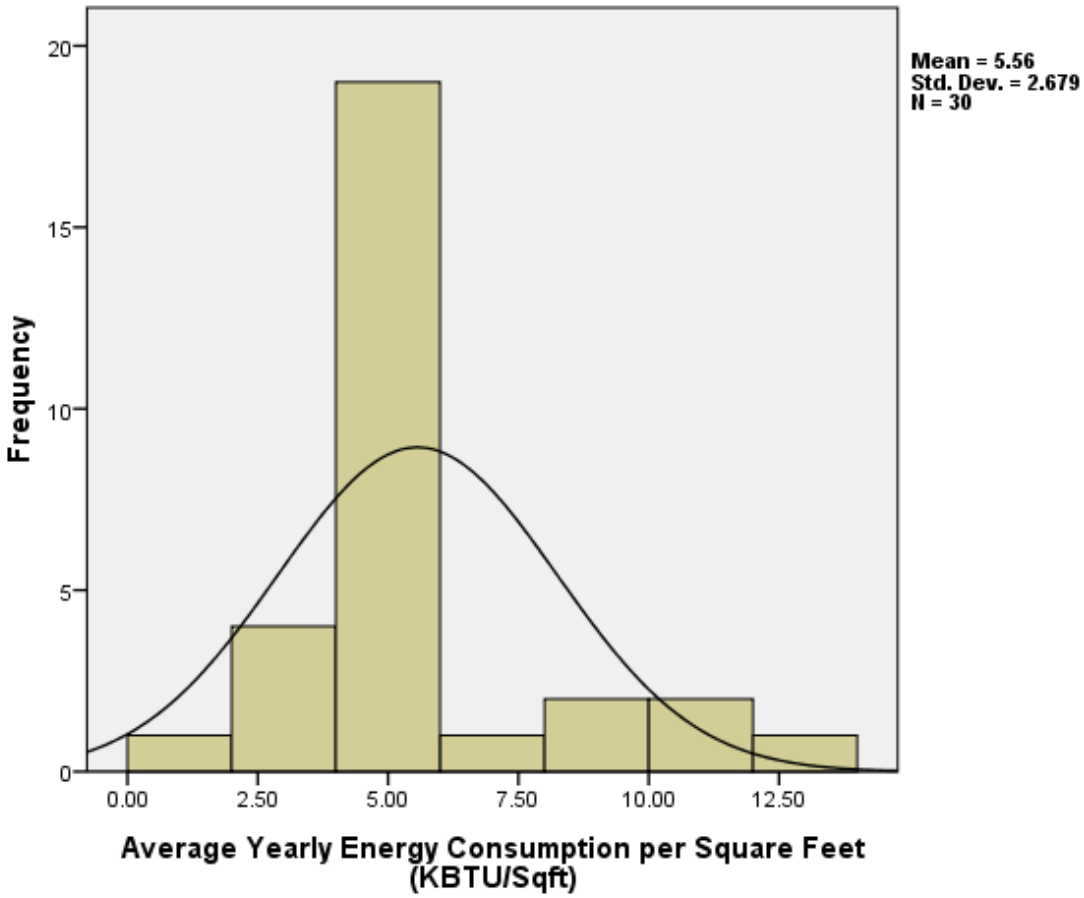

Figure 4.5.6: Histogram for the Average Yearly Energy Consumption per Square Feet of NGSB (KBTU/Sqft)

Figure 4.5.7 shows histogram and the normal distribution curve for the life cycle cost per square feet for all the school buildings. It shows that the life cycle cost per square feet of the schools followed a normal distribution curve with a mean of $311.95/sqft. It shows that the distribution is right skewed.

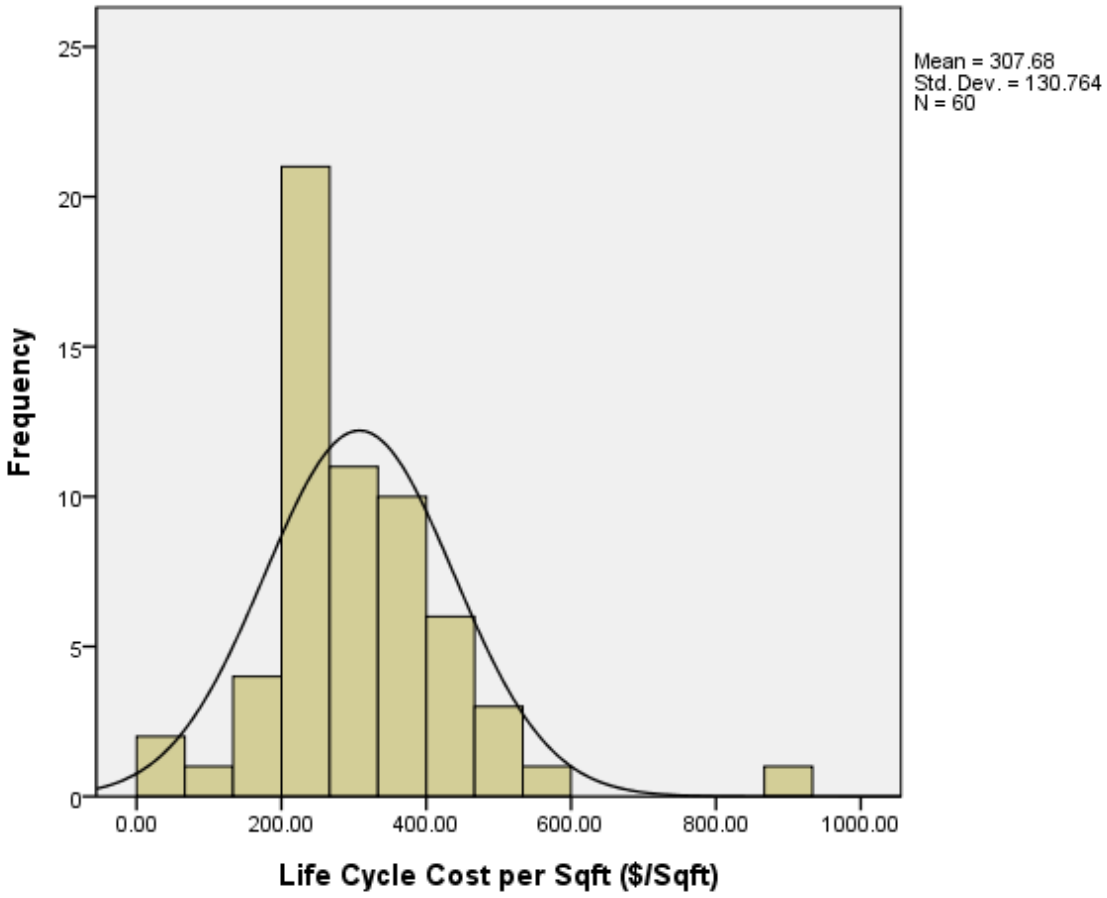

Figure 4.5.7: Histogram for the Life Cycle Cost per Square Feet ($/Sqft)

Figure 4.5.8 shows histogram and the normal distribution curve for the life cycle cost per square feet for all Green School Buildings. It shows that the life cycle cost per square feet of the schools followed a normal distribution curve with a mean of $359.21/sqft. It shows that the distribution is right skewed.

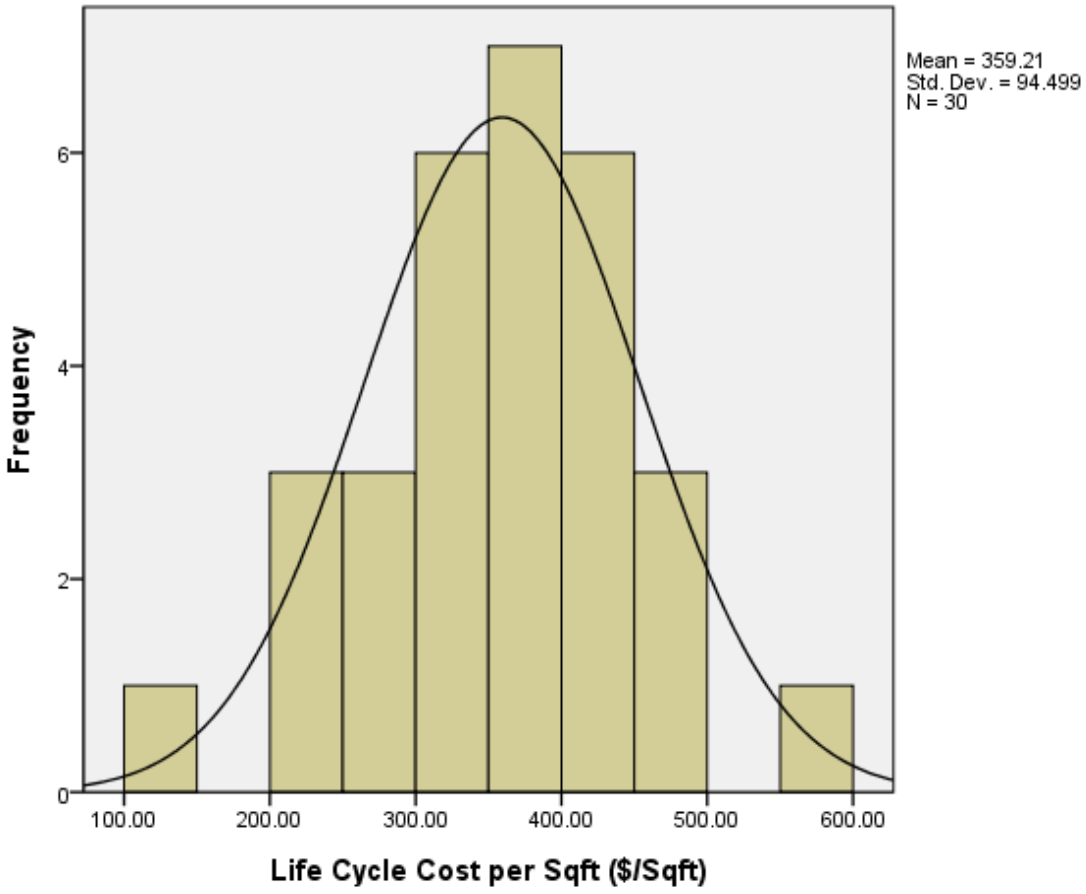

Figure 4.5.8: Histogram for the Life Cycle Cost per Square Feet of GSB ($/Sqft)

Figure 4.5.9 shows histogram and the normal distribution curve for the life cycle cost per square feet for all Non-Green School Buildings. It shows that the life cycle cost per square feet of the schools followed a normal distribution curve with a mean of $264.38/sqft. It shows that the distribution is right skewed.

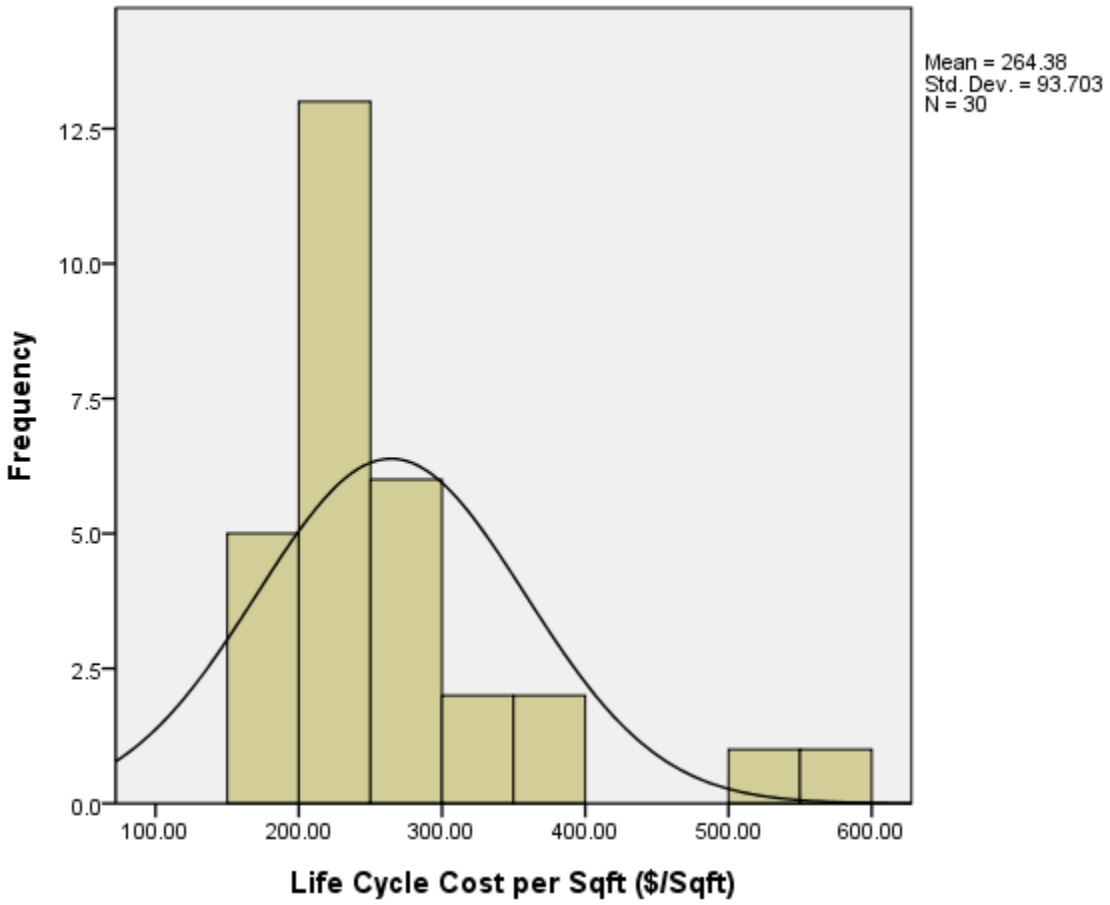

Figure 4.5.9: Histogram for the Life Cycle Cost per Square Feet of NGSB ($/Sqft)

Figure 4.5.10 shows histogram and the normal distribution curve for the construction speed per 1,000 square feet of all the school buildings. It shows that the construction speed per 1,000 Sqft for all the school buildings followed a normal distribution curve with a mean of 3.87 days/1,000 sqft. It shows that the distribution is left skewed.

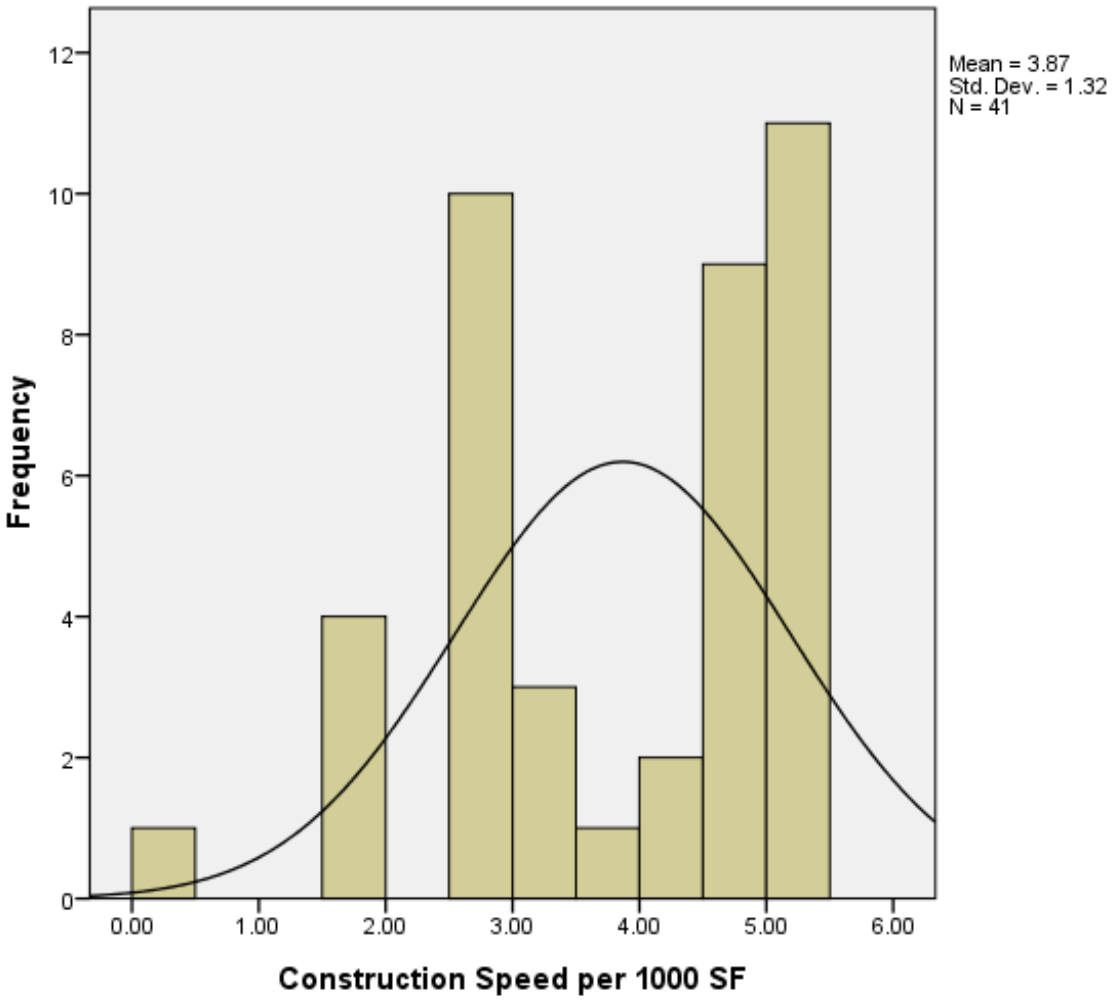

Figure 4.5.10: Histogram for the Construction Speed of all the schools (days/1,000 Sqft)

Figure 4.5.11 shows histogram and the normal distribution curve for the construction speed per 1,000 square feet of all the Green School Buildings. It shows that the construction speed per 1,000 Sqft for all the school buildings followed a normal distribution curve with a mean of 4.20 days/1,000 sqft. It shows that the distribution is left skewed.

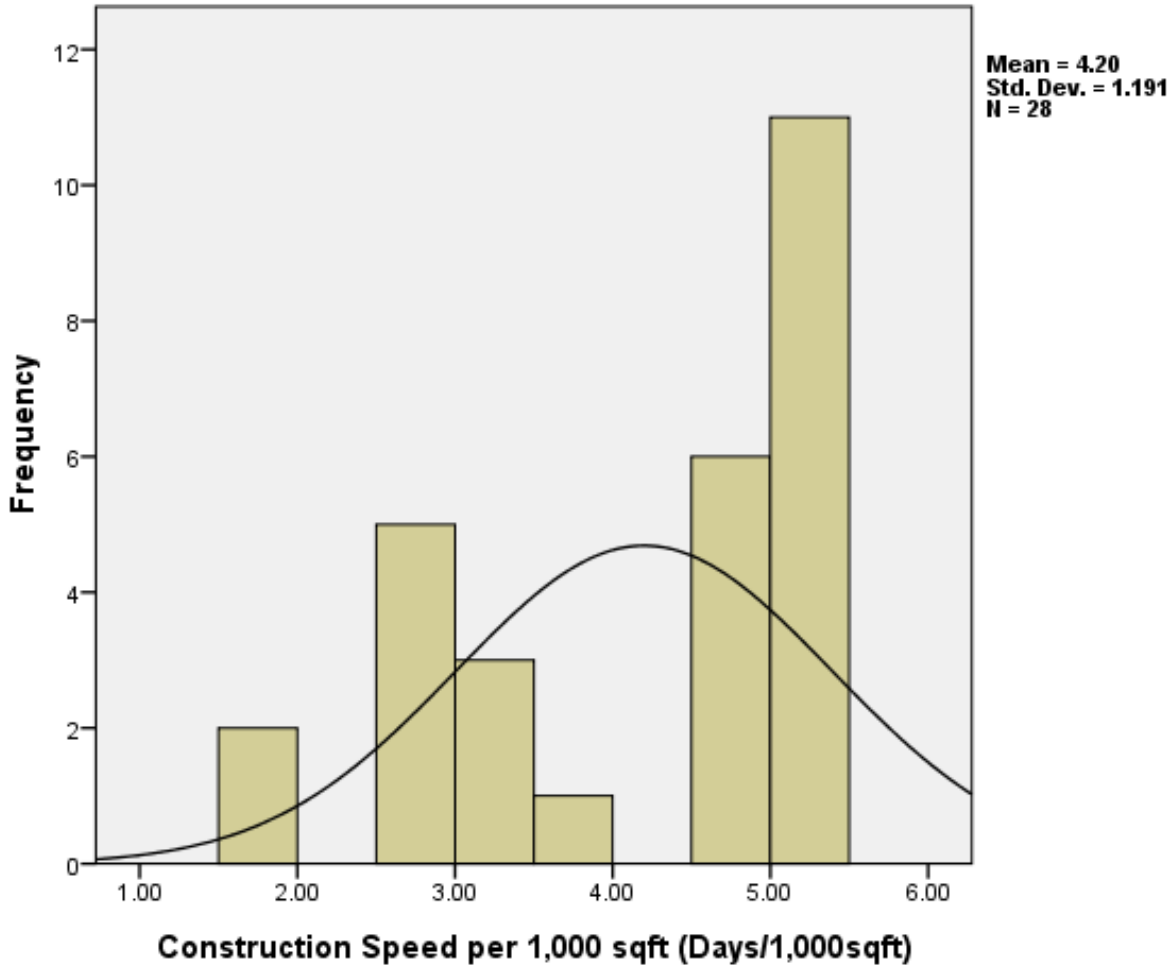

Figure 4.5.11: Histogram for the Construction Speed of GSB (days/1,000 Sqft)

Figure 4.5.12 shows histogram and the normal distribution curve for the construction speed per 1,000 square feet of all the Non-Green School Buildings. It shows that the construction speed per 1,000 Sqft for all the school buildings followed a normal distribution curve with a mean of 3.66 days/1,000 sqft. It shows that the distribution is right skewed.

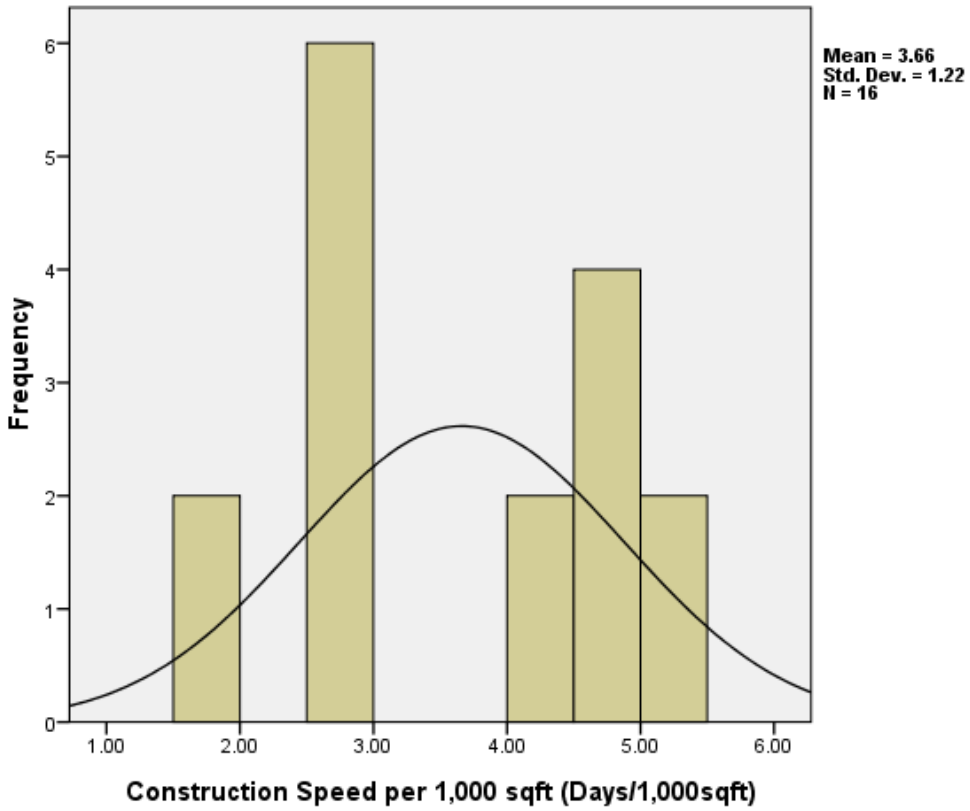

Figure 4.5.12: Histogram for the Construction Speed of NGSB (days/1,000 Sqft)

4.6 Homogeneity Tests

Levene's test is conducted to check the homogeneity of variance that if there is any significant difference in the variance of the construction cost samples collected for both Green School Buildings and Non-Green School Buildings. Levene's test suggests that there should not be any significance difference in the variances of the samples. The data given by the Clark County School District selected the sample data given to us randomly. Table 4.6.1 shows the results of the test of homogeneity of variances of construction cost per square feet of all

the school buildings. The significant value 0.527 is greater than 0.05 which means that the samples do not have equal means.

Table 4.6.1: Test of Homogeneity of Variances of Construction Cost of all the School Buildings ($/Sqft)

Levene Statistic	df1	df2	Sig.
0.405	1	58	0.527

Table 4.6.2 shows the results of the test of homogeneity of variances of average yearly energy consumption per square feet of all the school buildings. The significant value 0.269 is greater than 0.05 which means that the samples do not have equal means.

Table 4.6.2: Test of Homogeneity of Variances of Energy Consumption of all the School Buildings (KBTU/Sqft)

Levene Statistic	df1	df2	Sig.
1.244	1	58	0.269

Table 4.6.3 shows the results of the test of homogeneity of variances of life cycle cost per square feet of all the school buildings. The significant value 0.887 is greater than 0.05 which means that the samples do not have equal means.

Table 4.6.3: Test of Homogeneity of Variances of Life Cycle Costs of all the School Buildings ($/Sqft)

Levene Statistic	df1	df2	Sig.
0.20	1	58	0.887

Table 4.6.4 shows the results of the test of homogeneity of variances of construction speed per 1,000 square feet of all the school buildings. The significant value 0.825 is greater than 0.05 which means that the samples do not have equal means.

Table 4.6.4: Test of Homogeneity of Variances Construction Speed of all the School Buildings (Days/Sqft)

Levene Statistic	df1	df2	Sig.
0.049	1	29	0.825

To conduct the statistical analysis for ANOVA test, the test is conducted in SPSS and EXCEL spreadsheet. When the mass of the distribution is concentrated on the right of the figure or when the left tail is longer, then the distribution is left skewed. When the mass of the distribution is concentrated on the left side or when the right tail is longer, then the data is right skewed. The data is normally distributed when the data is symmetrical (Levine et al. 2007).

CHAPTER 5

FINDINGS OF THE STUDY

5.1 Analysis of Data

The construction cost data for all 60 schools was collected from the Clark County School District. The data consisted of 30 GSBs and 30 NGSBs. The construction cost and, energy consumption for all the provided schools data were normalized with cost indices and square feet area, respectively. The assumptions made for the statistical tests, presented in Chapter 4, were clarified and proved worthwhile. This chapter concentrates on the conclusions drawn from the descriptive statistics using the ANOVA test.

5.2 Descriptive Statistics

The outcome of the descriptive statistics of construction cost per square feet area of all school buildings is shown in Table 5.2.1. The construction cost was adjusted to the current year. The adjusted average construction cost of each school was divided by its square feet, and then the average was computed. Descriptive statistics analysis then was performed. Table 5.2.1 shows that the mean, median, and standard deviation of the adjusted construction cost per square feet for Green School Buildings were greater than those for Non-Green School Buildings. The mean, median and standard deviation of adjusted construction cost-per-square-feet of Green School Buildings was $354.70/sqft, $340.46/sqft and $94.32/sqft whereas the mean, median and standard deviation of adjusted construction cost per square feet of Non-Green School Buildings was $256.61/sqft, $234.16/sqft and $88.96/sqft.

Table 5.2.1: Adjusted Construction Cost per Square Feet ($/Sqft) of all School Buildings.

Statistics	*Adjusted Cost per Sqft*	
	Green School Buildings	*Non-Green School Buildings*
Mean	354.70	256.61
Median	340.46	234.16
Standard Deviation	94.32	88.96

Table 5.2.2 shows the descriptive statistics of the average yearly energy consumption per square feet for the Green School Buildings and Non-Green School Buildings. Table 5.2.2 shows the mean, median and standard deviation values of Green School Buildings - 3.77 KBTU/sqft, 4.10 KBTU/sqft and 1.77 KBTU/sqft are less than the mean, median and standard deviation of Non-Green School Buildings - 5.59 KBTU/sqft, 4.91 KBTU/sqft and 2.68 KBTU/sqft, respectively. The mean energy consumption per square feet for years May 2007 to May 2010 for Green School Buildings and Non-Green School Buildings are 3.77 KBTU/sqft and 5.59 KBTU/sqft, respectively.

Table 5.2.2: Descriptive Statistics of Average Yearly Energy Consumption per Square Feet (KBTU/Sqft)

Statistics	*Average Yearly Energy Consumption per Sqft*		
	Green School Buildings		*Non-Green School Buildings*
Mean	3.77	Mean	5.59
Median	4.10	Median	4.91
Standard Deviation	1.77	Standard Deviation	2.68

Table 5.2.3 shows the descriptive statistics of the life cycle cost of Green School Buildings and Non-Green School Buildings. It shows the mean, median and standard deviation values of life cycle assessment of Green School Buildings – 359.21, 358.55, 94.50 ($/sqft), respectively - and the mean, median and standard deviation values of Non-Green School Buildings – 264.38, 238.03, 93.70 ($/sqft). Clearly, the life cycle assessment of Green School Buildings is more than the life cycle assessment of Non-Green School Buildings. This shows that the Green School Buildings delivers more savings than Non-Green School Buildings.

Table 5.2.3: Descriptive Statistics of the Life Cycle Cost ($/Sqft)

Statistics	*Life Cycle Cost per Sqft*	
	Green School Buildings	*Non-Green School Buildings*
Mean	359.21	264.38
Median	358.55	238.03
Standard Deviation	94.50	93.70

Table 5.2.4 shows the descriptive statistics of how long it takes to construct Green School Buildings and Non-Green School Buildings. It shows the mean, median and standard deviation values of Green School Buildings – 4.19, 4.80, 1.15 days/1,000 sqft, respectively - and the mean, median, and standard deviation values of non-Green School Buildings – 3.49, 3.20, and 1.10 days/1,000 sqft, respectively. Clearly, the mean construction speed of Green School Buildings, 4.19 days/sqft, is more than the construction speed of Non-Green School Buildings, 3.49 days/sqft. This means that the Green Schools take more time to construct.

Table 5.2.4: Descriptive Statistics of Construction Speed per 1,000 Sqft

(Days/1,000 Sqft)

Statistics	*Construction Speed per 1,000 sqft*	
	Green School Buildings	*Non-Green School Buildings*
Mean	4.19	3.49
Median	4.80	3.20
Standard Deviation	1.15	1.10

5.3 Single Factor Analysis of Variance

The ANOVA test was performed to determine whether the construction cost per square feet of GSBs were statistically different from that of the NGSBs.

Figure 5.3.1 shows the box plot for the construction cost per square feet of the GSBs and NGSBs. It shows that the variation of construction costs per square feet varies with respect to each sample. There are certain outlier's seen in this plot; "An outlier is characterized as being more than 1.5 times the inter quartile rage above the third quartile or below the first quartile" (Weisstein 2009). Four outlier samples are seen under NGSBs category, whereas there are no outliers seen under GSBs category. The box plot also show that the construction cost per square feet of Green School Buildings is greater than that of NGSB.

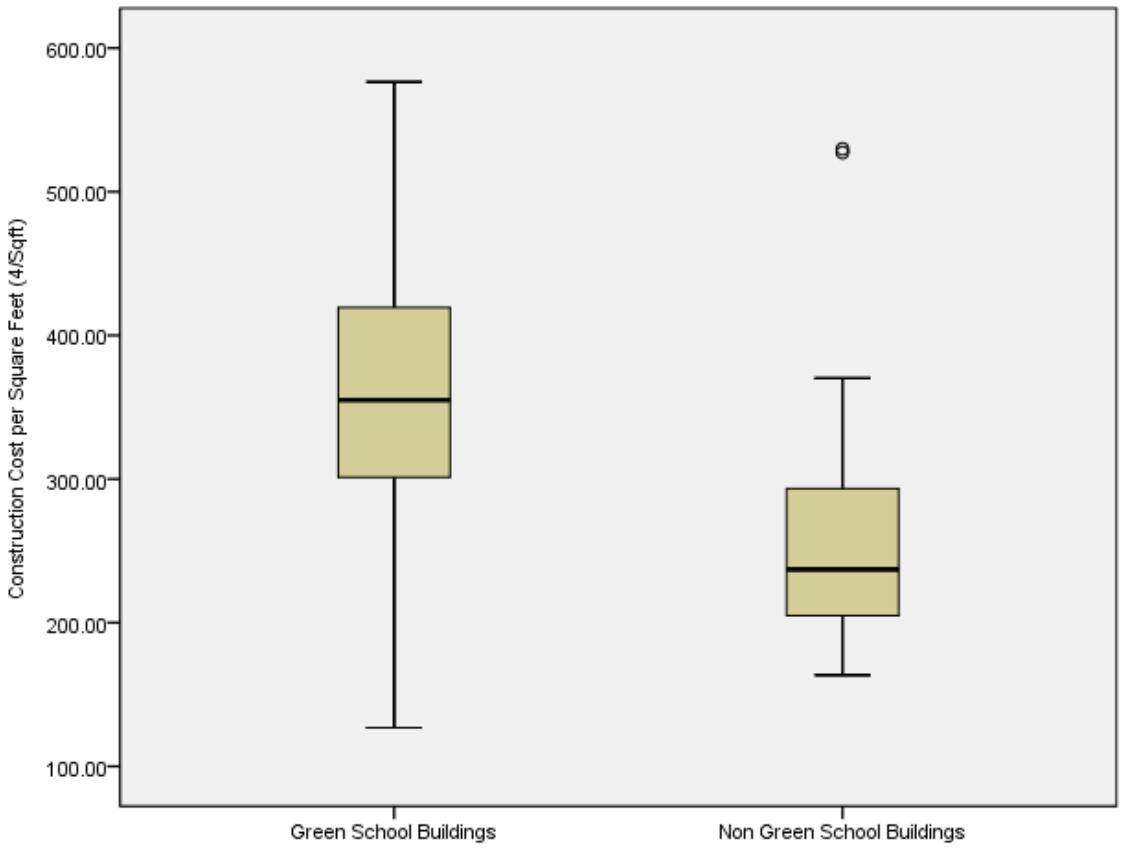

Figure 5.3.1: Box Plot for the construction cost per square feet ($/Sqft)

Table 5.3.1.1 shows the results of the ANOVA test for the construction cost per square feet of GSBs and NGSBs. The results show that the p-value for the average construction cost per square feet is 0.001, which is less than the significant alpha level of 0.05. Therefore the construction cost per square foot of GSBs is significantly higher than that of NGSBs.

Table 5.3.1.1: ANOVA Test Results for the Construction Cost ($/Sqft)

Groups	*Sample Size*	*Average*	*F value*	*P-value*	*F critical*
Adjusted Cost/sqft of GSB	30	354.70	16. 98	0.001	4.01
Adjusted Cost/sqft of NGSB	30	256.61			

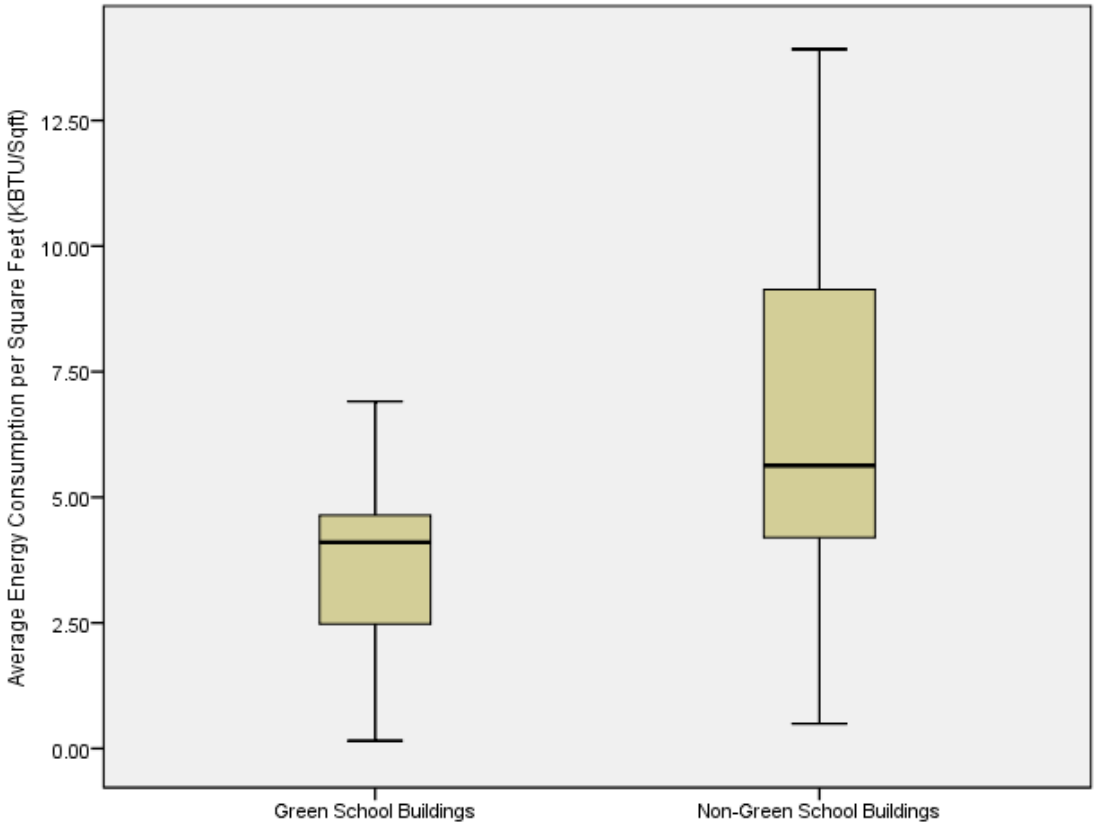

Figure 5.3.2: Box plot of energy consumption per square feet (KBTU/Sqft)

Figure 5.3.2 shows the box for the average energy consumption per square feet of GSBs and NGSBs. The plot shows no outliers for both the GSBs and NGSBs. The figure also shows that the average energy consumption per square feet of GSBs is less than the energy consumption of NGSBs. This box plot clearly indicates that the GSBs consume less energy when compared to that of the NGSBs.

Table 5.3.2.1 shows the results of the ANOVA test conducted for the average energy consumption per square feet of GSBs and NGSBs. The results showed that the p-value of 0.003 is less than the significant alpha level of 0.05. Therefore, the average energy consumption per square foot of GSBs is significantly lower than that of NGSBs.

Table 5.3.2.1: ANOVA Test Results for the Energy Consumption (KBTU/Sqft)

Groups	*Sample Size*	*Average*	*F value*	*P-value*	*F-critical*
Average Yearly Energy Consumption/Sqft of GSB	30	3.76	9.52	0.003	4.01
Average Yearly Energy Consumption/Sqft of NGSB	30	5.56			

Figure 5.3.3 shows box plot for the life cycle cost of energy consumption per square for GSBs and NGSBs projected for 50 years. It shows that there is variation present within the data samples. There are five outliers present in NGSBs, whereas there are no outliers in GSBs. This plot indicates that the life

cycle cost of energy cost per square feet of the GSBs is greater than that of the NGSBs.

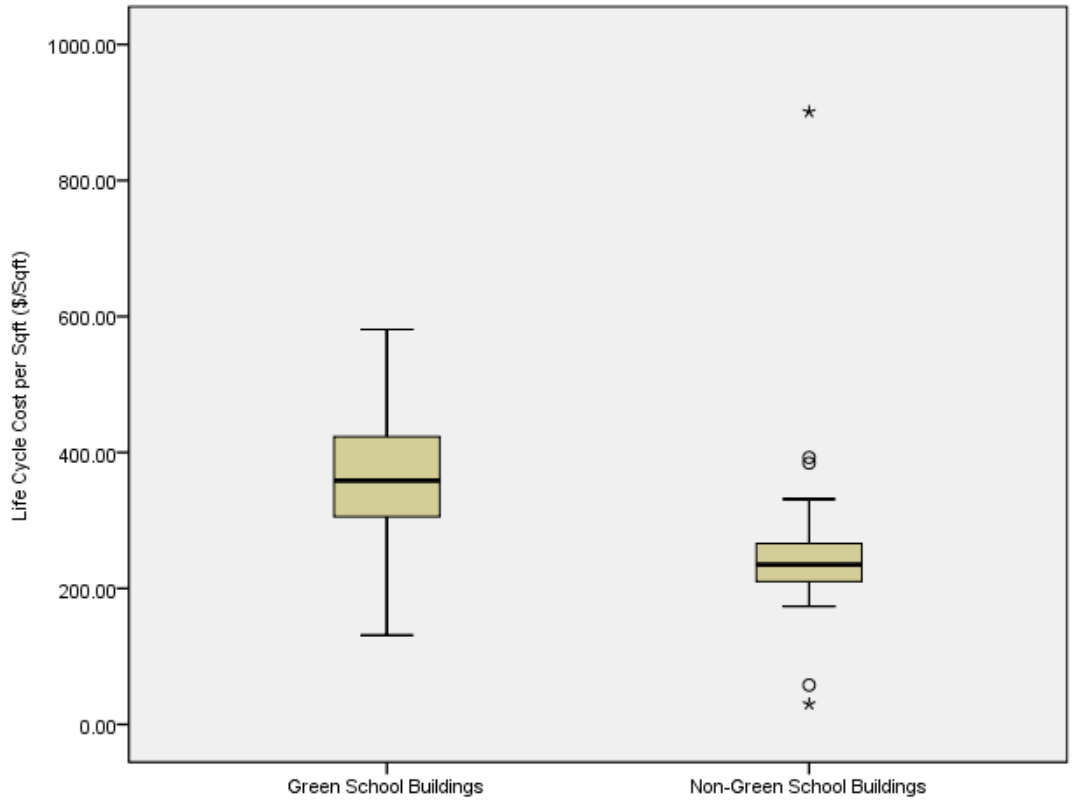

Figure 5.3.3: Life Cycle Cost of Energy Cost per Square feet ($/Sqft)

Table 5.3.3.1 shows the results of the ANOVA test conducted for the life cycle cost of GSBs and NGSBs. The results showed that the p-value for the life cycle analysis of energy consumption cost-per-square-feet is 0.0003, which is less that the significant level of 0.05. The life cycle cost of GSBs is significantly higher than NGSBs.

Table 5.3.3.1: ANOVA Test Results for Life Cycle Cost ($/Sqft)

Groups	*Sample Size*	*Average*	*F value*	*P-value*	*F critical*
GSB LCC/sqft	30	359.21	15.23	0.0003	4.01
NGSB LCC/sqft	30	264.38			

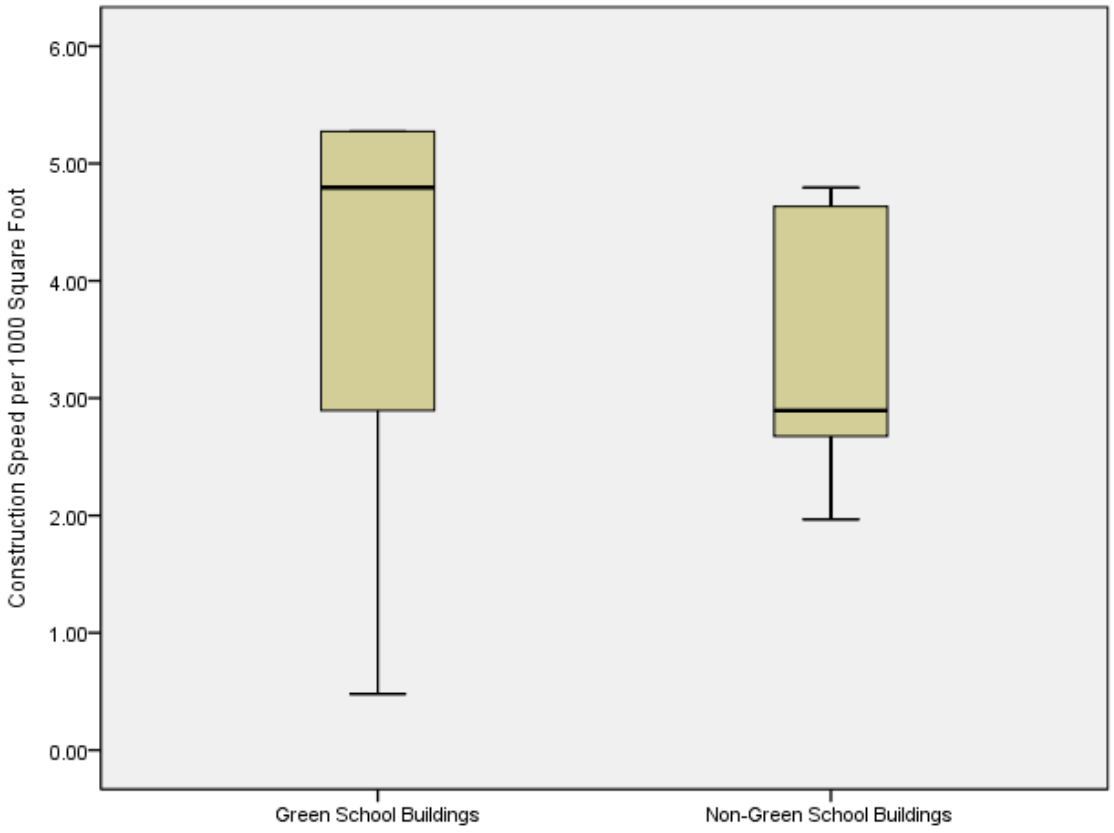

Figure 5.3.4: Construction Speed per 1,000 Square Feet (days/1,000 Sqft)

Figure 5.3.4 shows box plot for the construction speed per 1,000 square feet for GSBs and NGSBs projected for 50 years. It shows that there is variation

present within the data samples. There are no outliers present in NGSBs or GSBs. The figure shows that the construction speed per 1,000 square feet of the GSBs is less than that of the NGSBs.

Table 5.3.4.1 shows the results of the ANOVA test for the construction speed per 1,000 square feet of GSBs and NSBs. The results showed that the p-value for the construction speed per 1000 square feet is 0.06 which is less that the significant level of 0.05. Therefore, the construction speed of GSBs is significantly higher than that of NGSBs.

Table 5.3.4.1: ANOVA Test Results for Construction Speed (Days/1,000 Sqft)

Groups	*Sample size*	*Average*	*F value*	*P-value*	*F critical*
Construction Speed of GSB per 1,000 sqft	28	4.19	3.62	0.06	4.07
Construction Speed of NGSB per 1,000 sqft	13	3.49			

5.4 Limitations of the Study

This study has the following limitations:

1. The sample size used in this study is small. The data for 60 schools was collected to conduct the statistical analysis of Green School Buildings and Non-Green School Buildings in Las Vegas.
2. The cost of the projects collected was the final construction cost not the total of the buildings.

3. Energy consumption data was collected on a monthly basis for three years, i.e., May 2007 to April 2010.
4. The year of construction for each school was provided by the Clark County School District. A data collected by the graduate student at UNLV, who conducted research on construction change orders in schools of Clark County School District, Las Vegas, provided data of construction schedule of the schools.
5. The results are based on data being provided from the Clark County School District, the validity of which is not tested.
6. This study did not include the preconstruction cost and maintenance cost while analyzing the total life cycle costs.

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 Review of Research Hypothesis

The objective of the study was to compare the construction cost, energy consumption, life cycle cost and the construction speed of GSBs and NGSBs. This research consisted of four hypotheses.

1. Research Hypothesis: The mean construction cost of GSBs is higher than the mean construction cost of NGSBs.

2. Research Hypothesis: The mean energy consumption of GSBs is less than the mean energy consumption of NGSBs.

3. Research Hypothesis: The mean life cycle cost of GSBs is less than the life cycle cost of NGSBs.

4. Research Hypothesis: The construction speed of Green School Buildings is slow than construction speed of Non-Green School Buildings.

6.2. Conclusions

For this study, the average construction cost per school building was $304.58/Sqft. The average energy consumption per school building was 4.72 KBTU/Sqft. The analysis of the data indicates that there is not one exact solution to the question of how much Green School Buildings cost to build. Most new construction is built with an aim to be more energy efficient and to avoid any modifications like the replacement of mechanical units. These kinds of buildings are labeled as Green Buildings by the Clark County School District, Las Vegas.

The analysis also shows that the range of Green Buildings falls within the cost range of similar building types in the Non-Green Buildings category. The outcome of the tests showed that the mean construction cost-per-square-feet of Green School Buildings were greater than the mean construction cost-per-square- feet of the Non-Green School Buildings. The ANOVA test results show that the mean construction cost-per–square-feet of Green School Buildings is significantly higher than that of Non-Green School Buildings. The results showed that Green School Building cost 38% more than the Non-Green School Buildings for this sample (Table 6.2.1).

Table 6.2.1: Construction Cost Consumption ($/Sqft)

Variable	Green School Building ($/Sqft)	Non-Green School Building ($/Sqft)	Difference in Percentage (%)
Construction Cost ($/Sqft)	354.70	256.61	38.41

For this study, the average yearly energy consumption per square feet was around 4.72 KBTU/Sqft for all the school buildings. The test results showed that the average energy consumption per square feet of Green School Buildings was lower than the average yearly energy consumption per square feet of Non-

Green School Buildings. Table 6.2.2 below shows the potential savings resulting from the energy consumption per square feet of Green School Buildings over Non-Green School Buildings. The results showed that the yearly energy consumption savings of Green School Buildings is 48% more than that of Non-Green School Buildings.

Table 6.2.2: Energy Consumption Comparison (KBTU/Sqft)

Variable (KBTU/Sqft)	Green School Buildings (KBTU/Sqft)	Non-Green Buildings (KBTU/Sqft)	Difference in Percentage (%)
Yearly Energy Consumption (KBTU/Sqft)	3.76	5.56	48.11

In this study, the average life cycle cost per square feet was around $ 309.95/sqft for all the school buildings. The test results showed that the average life cycle cost per square feet of NGSBs was significantly lower than the average life cycle energy cost per square feet of NGSBs. The ANOVA test results also showed that there was significant difference between the mean life cycle cost of GSBs and NGSBs. The results showed that the life cycle cost of GSBs is 38.69% higher than that of NGSBs (Table 6.2.3).

Table 6.2.3: Life Cycle Cost Comparison ($/Sqft)

Variable ($/Sqft)	Green School Buildings ($/Sqft)	Non Green School Buildings ($/Sqft)	Percentage (%)
Life Cycle Cost ($/Sqft)	367.74	265.16	38.69

In this study, the average construction speed per 1,000 square feet was around 3.68 days for all the school buildings. The test results showed that the average construction speed per 1,000 square feet of the GSBs was significantly lower than the average construction speed of NGSBs. Table 6.2.4 below shows the construction speed of NGSBs over the GSBs per 1,000 sqft. It shows that NGSBs were built 21% faster than GSBs for this sample.

Table 6.2.4: Comparison of Construction Speed (days/1,000sqft)

Variable	Green School Building (Days/1,000 Sqft)	Average Construction Speed of NGSB (Days/1,000 Sqft)	Difference in Percentage (%)
Construction Speed (Days/1,000Sqft)	4.19	3.49	20.39

6.3 Recommendation for Further Study

The following recommendations are provided for further study:

1. The data collected for this study consisted of 30 samples each for Green School Buildings and Non-Green School Buildings. To validate the findings of this study, it is recommended to conduct the study with a larger of sample size.

2. This study compared construction cost per square feet, yearly energy consumption per square feet, life cycle cost analysis, and construction speed between Green School Buildings and Non-Green School Buildings. Further study is recommended to compare a greater number of variables that might play an important role in energy reduction. Some examples include, conducting correlation tests on energy consumption with respect to number of students per square feet, use of mechanical equipments, and ways of operating the mechanical equipment.

3. The energy consumption with respect to summer and winter temperatures can play a major role. For this study, the energy consumption was considered as a whole.

4. The breakdown of energy consumption with respect to electricity, natural gas and water can also lead to more accurate conclusions.

5. It is recommended that energy consumption be compared for a greater number of years. This study focused on energy consumption for the years 2007, 2008, and 2009.

6. It is also recommended construction cost analysis involve a breakdown of the construction costs, including change orders. This will give a clearer picture on whether Green School Buildings or the Non-Green School Buildings have a greater amount of change orders, which makes the entire project more expensive.

7. Finally, it is recommended that design cost and, mechanical equipment cost be included in the final budgeted construction cost. This would help to determine whether a Green School Building is more expensive than a Non-Green School Building.

APPENDIX A

CONSTRUCTION COST DATA

Construction Cost per Square Feet for Green School Buildings

Green School Buildings Adjusted Construction Cost per Square Feet ($/sqft)								
S. No.	Total Cost ($)	Adjusted Cost to 2010 ($)	Size (Sqft)	Cost per Sqft ($/Sqft)	Adjusted Cost per Sqft ($/Sqft)	Built in the Year	Cost Indices	
1	19,065,580	22,139,650	62,568	304.72	353.85	2005	Year	Index
2	16,226,862	18,843,226	62,568	259.35	301.16	2005	1990	2702
3	18,038,115	20,946,520	62,568	288.30	334.78	2005	1991	2751
4	17,229,784	20,007,856	62,568	275.38	319.78	2005	1992	2834
5	16,578,330	19,251,364	62,568	264.96	307.69	2005	1993	2996
6	23,052,855	26,769,819	75,226	306.45	355.86	2005	1994	3111
7	62,172,073	72,196,488	333,160	186.61	216.70	2005	1995	3112
8	16,226,862	18,843,226	148,569	109.22	126.83	2005	1996	3203
9	30,528,708	35,451,054	148,569	205.49	238.62	2005	1997	3364
10	28,133,810	32,670,011	148,569	189.37	219.90	2005	1998	3391
11	20,156,507	22,527,861	62,568	322.15	360.05	2006	1999	3456
12	26,700,387	29,841,609	62,568	426.74	476.95	2006	2000	3539
13	21,045,817	23,521,795	62,568	336.37	375.94	2006	2001	3574
14	20,713,647	23,150,547	62,568	331.06	370.01	2006	2002	3623
15	20,156,507	22,527,861	62,568	322.15	360.05	2006	2003	3693
16	22,484,351	25,129,569	62,568	359.36	401.64	2006	2004	3984
17	75,360,509	84,226,451	333,160	226.20	252.81	2006	2005	4205
18	104,358,450	116,635,915	333,160	313.24	350.09	2006	2006	4369
19	38,802,387	43,367,374	148,569	261.17	291.90	2006	2007	4485
20	39,073,271	43,670,126	148,569	263.00	293.94	2006	2008	4691
21	23,594,582	25,688,371	62,568	377.10	410.57	2007	2009	4769
22	25,266,610	27,508,775	62,568	403.83	439.66	2007	2010	4883
23	25,671,516	27,949,613	63,485	404.37	440.26	2007		
24	28,725,467	31,274,572	63,485	452.48	492.63	2007		
25	24,103,217	26,242,142	62,568	385.23	419.42	2007		
26	27,347,836	29,774,690	63,485	430.78	469.00	2007		
27	87,835,455	95,629,995	217,000	404.77	440.69	2007		
28	60,565,338	65,939,921	114,386	529.48	576.47	2007		
29	44,871,877	48,853,818	148,569	302.03	328.83	2007		
30	42,984,625	46,799,091	148,569	289.32	315.00	2007		

Construction Cost per Square Feet of Non-Green School Buildings

Non-Green School Buildings Adjusted Construction Cost per Square Feet ($/Sqft)								
S. No.	Total Cost ($)	Adjusted cost to 2010 ($)	Size (Sqft)	Cost per Sqft ($/Sqft)	Adjusted Cost per Sqft ($/Sqft)	Built in the Year	Cost Indices	
1	7,383,418	13,343,164	52,806	$139.82	$252.68	1990	Year	Index
2	11,458,368	20,707,332	101,848	$112.50	$203.32	1990	1990	2702
3	63,661,655	115,048,061	217,157	$293.16	$529.79	1990	1991	2751
4	14,060,176	25,409,267	123,976	$113.41	$204.95	1990	1992	2834
5	5,743,023	10,378,676	50,214	$114.37	$206.69	1990	1993	2996
6	12,551,214	22,682,301	129,180	$97.16	$175.59	1990	1994	3111
7	26,883,325	47,717,658	290,219	$92.63	$164.42	1991	1995	3112
8	12,182,312	21,623,493	110,562	$110.19	$195.58	1991	1996	3203
9	5,790,449	10,277,994	62,879	$92.09	$163.46	1991	1997	3364
10	5,177,871	9,190,674	53,910	$96.05	$170.48	1991	1998	3391
11	7,161,835	12,712,192	54,445	$131.54	$233.49	1991	1999	3456
12	16,928,695	29,168,249	146,330	$115.69	$199.33	1992	2000	3539
13	9,438,619	15,383,437	29,177	$323.50	$527.25	1993	2001	3574
14	9,251,416	13,428,854	60,046	$154.07	$223.64	1997	2002	3623
15	44,439,509	64,505,982	274,700	$161.77	$234.82	1997	2003	3693
16	17,033,899	23,502,834	62,568	$272.25	$375.64	2000	2004	3984
17	23,608,986	32,574,930	148,569	$158.91	$219.26	2000	2005	4205
18	16,953,715	23,163,120	62,568	$270.96	$370.21	2001	2006	4369
19	48,326,094	66,025,830	274,700	$175.92	$240.36	2001	2007	4485
20	27,068,291	36,982,223	148,569	$182.19	$248.92	2001	2008	4691
21	14,182,502	19,114,865	62,568	$226.67	$305.51	2002	2009	4769
22	13,616,995	18,352,687	62,568	$217.64	$293.32	2002	2010	4883
23	23,852,097	32,147,334	148,569	$160.55	$216.38	2002		
24	13,904,116	18,384,457	62,568	$222.22	$293.83	2003		
25	53,093,170	70,201,448	274,700	$193.28	$255.56	2003		
26	49,724,018	65,746,650	274,700	$181.01	$239.34	2003		
27	25,445,711	33,645,114	148,569	$171.27	$226.46	2003		
28	13,829,612	16,950,300	62,568	$221.03	$270.91	2004		
29	54,291,570	66,542,604	274,700	$197.64	$242.24	2004		
30	26,027,319	31,900,451	148,569	$175.19	$214.72	2004		

APPENDIX B

ENERGY CONSUMPTION DATA

Energy Consumption data for Green Schools Buildings

1. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,250,395	1,092,090	1,136,651	1,101,857
June	944,365	741,733	772,790	0
July	775,023	634,024	693,075	0
August	1,026,026	891,059	821,875	0
September	1,364,947	1,272,229	1,289,015	0
October	1,169,362	1,283,787	1,145,041	0
November	1,223,635	1,127,717	1,196,605	0
December	1,757,730	1,685,120	1,640,182	0
January	1,929,532	1,673,283	1,890,548	
February	1,756,194	1,793,378	1,698,504	
March	1,286,663	1,253,674	1,196,591	
April	1,233,701	1,156,779	1,117,690	

2. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	668,397	571,100	676,696	585,352
June	577,245	400,745	520,332	0
July	546,237	350,634	462,969	0
August	640,856	477,104	535,586	0
Septmeber	876,200	602,418	835,900	0
October	729,398	672,642	1,056,269	0
November	986,380	763,687	869,440	0
December	908,096	968,127	1,634,440	0
January	777,104	786,291	1,546,917	
February	709,341	879,284	1,482,424	
March	577,520	793,510	853,679	
April	533,816	669,690	552,647	

3. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	326,651	281,115	267,896	292,212
June	372,686	390,724	274,159	0
July	341,027	350,402	284,528	0
August	362,304	339,239	319,419	0
September	306,549	292,757	265,924	0
October	210,866	252,205	276,097	0
November	215,910	261,139	299,444	0
December	413,081	376,536	367,611	0
January	431,763	427,516	395,241	
February	432,612	386,075	354,344	
March	295,498	271,520	286,506	
April	312,464	306,238	273,066	

4. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,881	508,578	537,188	436,635
June	1,881	422,137	421,976	0
July	700,194	468,768	272,730	0
August	685,299	545,283	316,491	0
September	700,138	608,153	644,564	0
October	543,473	576,565	530,005	0
November	529,372	420,740	445,467	0
December	558,930	421,581	449,487	0
January	532,319	449,822	465,272	
February	504,363	434,066	441,849	
March	433,617	409,959	405,446	
April	464,892	364,815	355,375	

5. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	0	310,283	302,402	271,204
June	0	237,152	188,398	0
July	0	191,968	218,432	0
August	0	318,532	273,040	0
September	87,300	296,238	259,719	0
October	26,400	269,817	238,930	0
November	0	290,954	245,863	0
December	132,800	263,564	312,325	0
January	206,000	394,794	352,082	
February	183,300	329,218	336,593	
March	325,771	248,190	304,464	
April	291,458	266,480	269,919	

6. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	0	276,368	304,574	244,763
June	0	313,397	287,792	0
July	181,572	173,940	289,269	0
August	380,226	306,228	305,320	0
September	331,894	284,538	277,146	0
October	251,555	254,548	249,815	0
November	268,636	258,170	251,582	0
December	385,806	327,175	326,401	0
January	493,520	445,346	413,397	
February	416,436	393,479	354,255	
March	330,738	78,455	286,702	
April	290,517	302,831	244,190	

7. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	0	588,225	685,262	639,768
June	0	444,024	506,118	0
July	0	356,021	538,390	0
August	32,600	618,545	674,125	0
September	724,835	626,938	873,429	0
October	539,511	541,934	586,064	0
November	738,635	488,595	554,429	0
December	881,786	637,679	912,265	0
January	895,811	864,614	1,057,072	
February	948,041	829,391	909,001	
March	625,751	541,874	671,558	
April	515,478	530,862	813,438	

8. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	0	627,723	635,085	503,682
June	0	568,506	410,965	0
July	0	382,155	520,809	0
August	1,105,454	607,882	596,951	0
September	675,085	657,776	577,035	0
October	622,973	623,542	603,426	0
November	671,662	611,410	617,870	0
December	686,840	777,142	760,685	0
January	969,217	802,263	729,063	
February	805,792	848,103	699,475	
March	651,773	636,697	61,049	
April	630,968	654,293	591,831	

7. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	0	588,225	685,262	639,768
June	0	444,024	506,118	0
July	0	356,021	538,390	0
August	32,600	618,545	674,125	0
September	724,835	626,938	873,429	0
October	539,511	541,934	586,064	0
November	738,635	488,595	554,429	0
December	881,786	637,679	912,265	0
January	895,811	864,614	1,057,072	
February	948,041	829,391	909,001	
March	625,751	541,874	671,558	
April	515,478	530,862	813,438	

8. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	0	627,723	635,085	503,682
June	0	568,506	410,965	0
July	0	382,155	520,809	0
August	1,105,454	607,882	596,951	0
September	675,085	657,776	577,035	0
October	622,973	623,542	603,426	0
November	671,662	611,410	617,870	0
December	686,840	777,142	760,685	0
January	969,217	802,263	729,063	
February	805,792	848,103	699,475	
March	651,773	636,697	61,049	
April	630,968	654,293	591,831	

9. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	0	284,929	277,734	240,330
June	2,300	270,497	271,071	0
July	64,000	326,860	316,426	0
August	364,513	325,464	294,484	0
September	423,212	312,614	312,982	0
October	390,408	334,966	302,327	0
November	310,659	297,213	333,879	0
December	484,890	457,557	469,088	0
January	484,801	411,467	475,348	
February	446,043	427,454	445,318	
March	299,208	350,349	351,390	
April	256,728	287,090	271,468	

10. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	354,163	340,173	357,331	240,330
June	383,476	370,616	361,686	0
July	469,311	420,164	396,840	0
August	427,744	412,277	362,624	0
September	412,774	375,829	415,748	0
October	348,817	379,099	314,051	0
November	323,769	280,572	285,989	0
December	401,864	385,439	378,871	0
January	507,762	507,498	475,348	
February	446,370	408,820	445,318	
March	337,733	328,544	351,390	
April	328,006	333,645	271,468	

11. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	253,412	348,108	251,640	265,584
June	269,142	277,565	261,722	0
July	322,720	302,880	277,893	0
August	299,334	294,105	249,784	0
September	287,183	265,432	299,050	0
October	247,966	265,312	219,449	0
November	244,375	206,110	238,441	0
December	281,528	250,991	307,268	0
January	353,946	318,057	365,661	
February	306,074	308,022	328,453	
March	223,608	219,964	282,925	
April	258,151	213,488	220,942	

12. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	299,699	283,204	353,563	236,939
June	269,323	346,931	310,293	0
July	171,476	461,752	388,683	0
August	265,675	467,284	360,444	0
September	392,260	421,103	399,843	0
October	301,833	334,024	422,626	0
November	370,014	301,806	507,625	0
December	527,572	437,728	615,352	0
January	567,835	455,518	497,592	
February	518,582	449,069	495,203	
March	297,018	376,635	341,701	
April	263,465	329,535	222,148	

13. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	500	284,132	275,078	313,061
June	203,715	302,798	268,146	0
July	365,748	327,457	322,395	0
August	399,408	357,413	332,699	0
September	439,416	314,692	346,044	0
October	401,891	271,395	286,376	0
November	472,191	319,997	369,301	0
December	445,140	411,169	408,385	0
January	404,020	363,571	374,138	
February	321,624	346,469	316,662	
March	245,557	272,681	311,756	
April	251,391	241,914	292,986	

14. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	736,694	717,410	755,054	558,296
June	578,424	647,516	407,526	0
July	588,479	439,738	384,612	0
August	814,551	797,911	552,578	0
September	1,046,537	912,710	640,434	0
October	891,320	740,937	625,268	0
November	801,989	942,069	793,242	0
December	890,033	833,755	836,697	0
January	880,240	835,357	838,788	
February	737,277	776,481	552,237	
March	539,201	626,744	411,237	
April	534,991	558,315	483,554	

15. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	303,457	342,279	292,651	295,743
June	323,583	360,177	284,272	0
July	360,597	417,447	307,313	0
August	355,153	387,587	281,675	0
September	357,283	340,849	326,877	0
October	300,337	378,350	346,729	0
November	434,938	415,175	407,887	0
December	531,287	514,345	468,798	0
January	447,714	413,950	506,329	
February	314,054	437,217	420,772	
March	333,638	360,689	276,425	
April	387,056	291,952	233,927	

16. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	717,491	657,789	718,097	628,360
June	552,987	482,407	541,745	0
July	509,216	438,161	444,230	0
August	593,681	558,409	562,109	0
September	743,342	696,702	783,968	0
October	651,073	783,647	575,487	0
November	584,068	880,505	506,674	0
December	716,885	1,141,505	775,899	0
January	810,567	931,994	795,219	
February	693,084	853,594	745,455	
March	660,885	702,872	759,400	
April	658,495	629,490	568,700	

17. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	278,118	288,230	335,728	426,767
June	202,687	191,430	225,986	0
July	171,411	200,029	178,073	0
August	254,802	375,350	275,611	0
September	335,940	438,780	379,547	0
October	326,105	491,429	278,466	0
November	306,759	454,032	256,692	0
December	383,714	665,582	383,231	0
January	458,370	721,324	442,077	
February	393,400	408,683	399,869	
March	294,552	309,890	352,701	
April	294,211	297,527	316,796	

18. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,160,099	1,045,530	1,097,695	1,124,543
June	709,991	699,431	848,731	0
July	637,855	751,843	799,871	0
August	900,056	875,709	843,468	0
September	1,194,708	1,145,529	1,224,997	0
October	1,079,845	1,164,688	979,423	0
November	1,388,963	1,050,702	909,239	0
December	700,068	1,258,529	1,292,932	0
January	1,396,513	1,399,366	1,278,597	
February	1,205,501	1,418,055	1,459,430	
March	875,236	1,119,409	1,142,614	
April	987,269	993,085	863,523	

19. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	0	787,301	774,791	743,447
June	560,181	420,122	444,271	0
July	1,427,234	371,675	493,138	0
August	1,447,777	646,135	786,661	0
September	978,572	777,993	922,364	0
October	918,233	719,008	729,579	0
November	920,021	651,503	692,900	0
December	797,971	652,990	668,852	0
January	867,778	695,265	664,003	
February	746,815	712,750	677,589	
March	726,179	608,150	566,837	
April	818,881	660,619	683,422	

20. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,421,824	1,324,258	1,328,345	1,305,983
June	1,161,434	896,462	1,025,265	0
July	1,315,938	1,079,936	1,183,408	0
August	1,170,938	1,217,534	1,099,386	0
September	1,452,450	1,375,060	1,585,440	0
October	1,288,393	1,371,641	1,384,646	0
November	1,340,715	1,328,232	1,371,706	0
December	1,893,748	1,942,065	1,642,518	0
January	1,922,474	1,876,598	1,661,129	
February	1,705,740	1,583,821	1,529,701	
March	1,209,625	1,424,760	1,181,264	
April	1,301,657	1,116,313	1,098,643	

21. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	0	279,078	300,050	248,982
June	0	325,110	301,627	0
July	0	326,638	308,870	0
August	660,396	324,965	326,351	0
September	356,331	293,596	320,976	0
October	273,173	240,193	302,157	0
November	281,119	244,494	302,707	0
December	376,216	301,732	418,274	0
January	453,785	393,640	478,708	
February	393,774	363,731	416,985	
March	290,005	270,788	331,874	
April	284,260	302,797	285,327	

22. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	470,255	360,165	386,991	381,627
June	402,769	237,545	335,839	0
July	401,369	229,354	366,556	0
August	479,185	352,222	321,505	0
September	415,703	333,791	306,068	0
October	382,652	302,783	295,709	0
November	393,056	313,196	326,340	0
December	406,975	407,727	384,537	0
January	477,096	442,044	413,696	
February	436,992	409,405	378,629	
March	411,908	289,006	321,134	
April	304,588	286,423	373,190	

23. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	0	288,023	327,965	265,661
June	0	300,733	324,836	0
July	0	232,101	352,228	0
August	363,143	314,976	342,133	0
September	416,386	276,958	307,045	0
October	315,361	265,357	276,553	0
November	249,832	255,579	315,036	0
December	240,275	214,845	423,682	0
January	230,719	240,934	398,665	
February	218,432	244,262	331,980	
March	225,258	414,383	244,765	
April	303,033	246,989	250,299	

24. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	363,966	375,362	486,145	357,082
June	402,819	438,830	418,973	0
July	407,239	309,279	469,543	0
August	458,414	412,383	426,881	0
September	381,877	380,877	368,795	0
October	343,946	311,925	355,061	0
November	369,739	360,013	363,417	0
December	495,519	495,803	578,520	0
January	571,634	463,620	572,367	
February	476,509	543,924	547,674	
March	378,432	448,148	422,645	
April	334,656	514,834	391,618	

25. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	663,614	569,135	581,871	734,665
June	406,605	421,174	371,393	0
July	453,349	380,792	392,021	0
August	725,454	669,565	599,763	0
September	702,664	691,363	586,155	0
October	708,188	659,386	606,370	0
November	1,009,193	774,647	654,126	0
December	1,202,814	1,064,229	873,414	0
January	1,179,124	829,698	777,770	
February	877,575	739,724	877,486	
March	622,041	585,448	881,624	
April	607,566	602,251	832,926	

26. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	362,331	311,204	283,766	275,039
June	369,669	338,829	299,276	0
July	396,287	377,853	329,324	0
August	398,444	344,218	288,020	0
September	368,169	317,528	330,897	0
October	414,681	291,764	251,097	0
November	387,237	235,974	260,111	0
December	449,653	319,628	371,403	0
January	549,677	480,722	428,468	
February	416,602	373,278	351,826	
March	313,776	256,874	301,301	
April	315,787	253,594	234,297	

27. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	375,274	276,901	326,796	273,978
June	280,414	300,018	245,697	0
July	328,716	195,115	242,997	0
August	332,216	288,953	372,478	0
September	364,513	400,582	339,633	0
October	257,671	321,279	343,963	0
November	321,801	257,123	358,375	0
December	432,310	367,293	450,100	0
January	413,632	396,084	424,717	
February	384,736	378,762	370,594	
March	396,453	316,184	327,818	
April	301,527	300,575	308,360	

28. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	375,274	276,901	326,796	273,978
June	280,414	300,018	245,697	0
July	328,716	195,115	242,997	0
August	332,216	288,953	372,478	0
September	364,513	400,582	339,633	0
October	257,671	321,279	343,963	0
November	321,801	257,123	358,375	0
December	432,310	367,293	450,100	0
January	413,632	396,084	424,717	
February	384,736	378,762	370,594	
March	396,453	316,184	327,818	
April	301,527	300,575	308,360	

29. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	822,415	561,690	593,450	641,773
June	560,525	439,877	384,160	0
July	488,087	379,911	346,515	0
August	673,343	853,045	550,897	0
September	684,740	759,220	590,099	0
October	909,915	555,568	589,700	0
November	1,130,237	520,252	614,859	0
December	803,293	752,397	799,322	0
January	833,888	840,300	871,843	
February	731,638	780,116	784,016	
March	474,193	631,931	651,802	
April	513,233	527,072	665,588	

30. Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	431,510	367,976	340,090	412,550
June	462,886	438,717	376,655	0
July	470,127	308,559	409,816	0
August	462,991	371,164	359,164	0
September	383,923	336,351	314,842	0
October	311,047	282,999	413,923	0
November	351,367	295,021	381,640	0
December	489,028	380,836	428,241	0
January	547,074	388,211	425,659	
February	478,430	456,232	412,458	
March	384,378	315,439	323,910	
April	351,474	331,914	358,703	

Green School Buildings Energy Consumption (KBTU)

Green School Buildings - Energy Consumption (KBTU)					
S. No	Type of School	Area (Sqft)	Average Energy Consumption May 2007 - April 2007 (KBTU)	Average Energy Consumption May 2008 - April 2008 (KBTU)	Average Energy Consumption May 2009 - April 2009 (KBTU)
1	9 month	333,160	1,309,797.75	1,217,072.75	1,216,547.25
2	12 month	62,568	533,161.88	495,952.00	689,206.19
3	9 month	148,569	335,117.58	327,955.50	305,352.92
4	12 month	62,568	353,522.44	351,904.19	330,365.63
5	9 month	114,386	179,004.14	284,765.83	275,180.58
6	9 month	63,485	333,090.00	549,234.77	299,203.58
7	12 month	62,568	491,870.67	441,793.88	548,821.94
8	9 month	148,569	757,751.56	1,208,567.46	1,112,956.00
9	9 month	148,569	320,614.73	4,086,460.00	343,459.58
10	12 month	63,485	296,361.81	283,917.25	276,041.50
11	12 month	62,568	209,214.94	204,377.13	206,451.75
12	12 month	62,568	265,297.00	291,536.81	307,192.06
13	12 month	62,568	246,912.56	238,355.50	243,997.88
14	9 month	62,568	753,311.33	735,745.25	606,768.92
15	9 month	148,569	370,758.08	388,334.75	346,137.92
16	9 month	62,568	657,647.83	729,756.25	648,081.92
17	9 month	333,160	308,339.08	403,523.83	318,731.42
18	9 month	148,569	1,019,675.33	1,076,823.00	1,061,710.00
19	9 month	217,000	928,149.27	628,746.36	666,328.73
20	9 month	333,160	1,432,078.00	1,378,056.67	1,340,954.25
21	12 month	62,568	280,754.92	229,172.63	255,869.13
22	12 month	62,568	311,409.25	247,728.81	263,137.13
23	12 month	63,485	213,536.58	205,946.25	243,449.19
24	12 month	62,568	311,546.88	315,937.38	337,602.44
25	9 month	148,569	763,182.25	665,617.67	669,576.58
26	12 month	62,568	296,394.56	243,841.63	233,111.63
27	9 month	75,226	349,105.25	316,572.42	342,627.33
28	9 month	62,568	349,105.25	316,572.42	342,627.33
29	9 month	148,569	718,792.25	633,448.25	620,187.58
30	12 month	62,568	320,264.69	267,088.69	284,068.81

Energy Consumption data for Non-Green Schools Buildings

1. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,044,227	561,253	619,142	507,938
June	491,628	424,235	350,575	
July	307,171	292,260	389,806	
August	570,878	597,193	582,837	
September	637,515	634,882	613,941	
October	584,353	746,405	698,952	
November	850,669	1,042,313	819,122	
December	1,207,304	1,411,221	1,081,604	
January	1,262,686	964,527	1,089,619	
February	946,722	910,938	920,670	
March	766,258	715,282	587,930	
April	648,211	470,640	678,725	

2. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	388,761	397,980	423,700	364,901
June	543,981	494,076	448,813	0
July	627,524	406,720	532,797	0
August	489,086	497,134	464,520	0
September	412,000	484,202	390,890	0
October	336,696	333,852	330,019	0
November	328,369	285,896	370,221	0
December	402,486	472,231	407,449	0
January	410,300	455,473	462,140	
February	350,886	407,855	385,006	
March	320,839	368,881	351,815	
April	329,303	349,255	327,268	

3. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,740,040	1,626,333	1,505,547	1,230,746
June	1,294,569	1,077,361	924,909	0
July	1,197,848	932,288	1,057,225	0
August	1,960,428	1,889,527	1,810,703	0
September	1,669,628	1,756,687	1,694,708	0
October	1,259,133	1,277,212	1,265,443	0
November	1,687,961	1,186,660	1,352,323	0
December	2,397,894	1,834,997	1,759,950	0
January	2,035,399	2,045,716	1,404,229	
February	1,659,400	1,943,185	1,077,781	
March	1,299,488	1,113,784	916,437	
April	1,300,092	1,196,547	1,230,023	

4. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	739,076	1,266,332	660,992	811,840
June	432,911	1,253,594	383,527	0
July	363,599	465,624	281,458	0
August	466,748	591,930	462,785	0
September	656,347	638,381	714,238	0
October	580,211	720,068	535,753	0
November	478,316	672,146	461,697	0
December	636,687	883,730	912,092	0
January	972,426	998,846	1,077,144	
February	1,004,283	1,020,728	921,237	
March	928,528	826,574	886,892	
April	828,649	778,347	741,758	

5. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	303,891	231,787	258,451	223,197
June	194,030	206,914	126,753	0
July	221,749	264,703	120,253	0
August	331,065	319,076	293,957	0
September	282,100	291,383	280,003	0
October	244,315	247,985	232,917	0
November	260,047	233,725	226,053	0
December	354,790	303,395	263,903	0
January	402,821	285,499	265,211	
February	315,385	262,575	259,597	
March	235,083	207,841	221,000	
April	255,136	238,118	222,148	

6. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	954,205	718,124	804,857	682,300
June	1,069,439	719,795	801,837	0
July	684,798	691,931	495,599	0
August	893,516	625,861	560,875	0
September	1,283,984	974,832	998,333	0
October	1,033,738	929,767	884,315	0
November	933,967	832,654	983,970	0
December	1,943,448	2,016,131	1,721,884	0
January	2,113,769	1,201,715	1,581,568	
February	1,137,235	1,023,462	1,324,474	
March	771,966	820,459	901,524	
April	677,639	614,582	581,204	

7. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	517,493	336,754	365,312	332,328
June	605,828	428,942	389,130	0
July	577,592	463,339	529,288	0
August	442,632	407,488	418,810	0
September	349,597	352,208	358,261	0
October	363,232	263,736	320,077	0
November	416,266	219,265	374,922	0
December	528,266	383,254	429,698	0
January	524,932	399,063	477,455	
February	512,013	380,792	442,265	
March	420,424	333,512	400,580	
April	277,634	311,347	409,074	

8. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	444,077	365,758	446,140	391,294
June	387,017	303,449	353,386	0
July	372,352	188,005	272,353	0
August	376,863	296,804	340,191	0
September	500,246	421,989	485,493	0
October	357,239	385,253	402,328	0
November	361,750	302,133	400,697	0
December	654,557	503,268	499,952	0
January	681,275	407,919	519,558	
February	541,616	465,213	458,560	
March	370,062	329,632	372,955	
April	251,413	257,742	283,699	

9. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	224,010	175,067	233,201	214,404
June	146,418	149,942	107,610	0
July	142,622	49,647	333,791	0
August	195,565	204,156	203,756	0
September	230,930	225,034	207,235	0
October	177,844	185,805	184,899	0
November	178,200	182,185	165,861	0
December	141,549	163,259	183,707	0
January	206,931	182,396	190,059	
February	177,655	181,827	190,466	
March	150,907	159,527	205,285	
April	165,457	188,739	177,676	

10. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	363,114	304,241	332,931	269,391
June	429,384	243,093	250,082	0
July	394,001	160,275	153,727	0
August	246,682	221,445	245,253	0
September	506,910	354,096	387,886	0
October	331,378	398,858	345,273	0
November	529,744	370,929	361,610	0
December	417,518	442,907	389,385	0
January	303,323	303,638	336,603	
February	298,729	318,027	337,322	
March	259,235	259,491	294,050	
April	261,179	227,121	241,543	

11. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	321,170	335,514	323,893	269,391
June	363,969	369,356	331,182	0
July	615,896	390,369	380,904	0
August	380,645	335,290	374,802	0
September	346,983	347,106	412,239	0
October	274,800	300,493	278,143	0
November	223,176	230,901	279,321	0
December	337,632	325,313	355,505	0
January	468,960	432,094	336,603	
February	422,965	391,203	337,322	
March	320,638	289,918	294,050	
April	296,110	287,578	241,543	

12. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	573,061	549,240	496,414	449,151
June	513,166	485,789	376,615	0
July	356,314	327,000	413,448	0
August	655,898	624,655	557,040	0
September	632,778	566,633	509,205	0
October	510,607	374,579	433,567	0
November	554,750	331,083	511,009	0
December	1,158,141	845,369	966,123	0
January	1,098,192	608,905	790,336	
February	798,192	575,296	781,879	
March	336,773	376,843	489,975	
April	385,635	371,237	394,505	

13. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	823,428	776,545	680,543	563,765
June	460,909	430,168	374,471	0
July	481,692	408,988	357,248	0
August	691,936	723,473	621,869	0
September	708,718	737,497	609,287	0
October	715,263	1,056,947	627,039	0
November	865,549	987,875	673,109	0
December	824,400	1,294,018	1,111,568	0
January	942,126	1,035,098	1,106,079	
February	1,198,105	938,230	898,252	
March	1,272,146	681,148	708,350	
April	1,219,438	787,592	701,687	

14. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,131,593	916,774	998,864	966,974
June	791,336	583,535	533,216	0
July	713,154	600,331	572,684	0
August	1,094,346	973,714	923,283	0
September	1,100,716	1,011,599	1,001,496	0
October	1,159,310	877,088	1,012,188	0
November	1,093,950	1,025,927	1,336,711	0
December	1,476,079	1,401,095	1,742,776	0
January	1,636,620	1,786,339	1,714,822	
February	1,647,653	1,654,637	1,627,459	
March	1,152,740	1,151,783	1,295,967	
April	1,032,865	1,077,421	1,025,000	

15. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	282,264	230,726	288,474	193,473
June	208,777	252,282	191,032	0
July	184,694	254,924	193,022	0
August	298,037	353,594	299,409	0
September	261,024	277,948	233,436	0
October	180,820	189,401	157,879	0
November	200,230	138,104	163,865	0
December	448,584	216,293	309,784	0
January	428,682	428,345	309,368	
February	544,599	462,213	394,749	
March	324,578	253,142	261,386	
April	196,099	234,786	168,151	

16. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	30,837	31,292	29,178	29,937
June	35,664	33,281	34,215	0
July	30,014	32,370	28,354	0
August	38,673	35,934	40,093	0
September	52,366	43,589	57,263	0
October	27,925	28,680	26,270	0
November	26,555	24,040	24,212	0
December	36,449	24,456	22,982	0
January	31,902	33,573	26,170	
February	32,044	29,327	25,042	
March	34,528	26,657	24,874	
April	31,348	24,645	25,199	

17. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	299,508	279,982	329,109	318,502
June	268,566	197,009	193,845	0
July	293,743	154,056	131,302	0
August	382,058	320,064	248,350	0
September	421,983	371,450	419,728	0
October	291,314	310,067	291,827	0
November	294,051	260,334	316,081	0
December	365,432	377,567	350,655	0
January	0	361,496	289,812	
February	300,705	317,489	305,948	
March	245,064	252,311	294,946	
April	267,696	245,501	257,362	

18. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	368,086	281,892	325,642	334,029
June	204,616	221,081	223,708	0
July	167,398	160,315	201,563	0
August	279,260	329,075	296,240	0
September	331,815	321,483	316,201	0
October	320,492	366,828	285,522	0
November	401,843	432,894	465,556	0
December	473,250	489,961	542,873	0
January	468,281	404,797	530,170	
February	384,854	466,816	501,523	
March	275,302	379,651	423,078	
April	242,269	316,482	407,374	

19. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	260,938	264,330	272,040	286,139
June	333,075	244,562	293,600	0
July	551,384	189,834	171,681	0
August	470,451	210,381	220,603	0
September	400,294	355,228	371,887	0
October	309,836	326,929	293,692	0
November	239,992	274,063	283,288	0
December	374,037	385,450	521,706	0
January	410,162	363,292	681,862	
February	368,515	355,243	442,106	
March	264,022	277,609	354,489	
April	242,302	236,229	246,473	

20. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	796,738	669,167	732,297	612,760
June	511,973	626,690	495,026	0
July	438,642	611,724	460,306	0
August	653,874	705,507	651,263	0
September	796,519	721,420	693,713	0
October	753,496	850,116	667,689	0
November	845,994	827,633	910,899	0
December	906,913	930,211	900,662	0
January	905,117	811,021	934,908	
February	825,631	852,337	803,859	
March	716,739	718,409	685,156	
April	654,100	643,810	646,865	

21. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	625,762	644,687	595,835	496,813
June	324,822	400,500	351,853	0
July	357,335	259,927	339,565	0
August	595,607	591,559	580,498	0
September	620,231	610,026	580,571	0
October	482,267	644,159	479,782	0
November	464,062	646,599	779,995	0
December	708,554	1,198,624	959,048	0
January	904,086	1,491,362	1,035,327	
February	932,328	1,411,888	935,612	
March	809,562	972,055	644,800	
April	814,486	891,913	497,729	

22. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,061,739	977,016	1,077,373	1,068,956
June	681,513	619,192	678,427	0
July	589,668	601,919	547,540	0
August	951,881	797,622	760,512	0
September	1,180,395	1,133,732	1,150,937	0
October	975,751	1,132,288	879,540	0
November	1,090,358	998,050	1,204,175	0
December	1,561,182	1,470,011	1,694,395	0
January	1,929,408	1,731,904	2,039,735	
February	1,777,905	1,677,522	1,692,891	
March	910,933	1,162,369	1,382,097	
April	1,171,217	1,136,052	1,074,501	

23. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,250,240	1,236,270	1,149,266	899,102
June	720,241	687,654	566,425	0
July	806,001	759,027	690,020	0
August	1,339,750	1,225,286	1,035,559	0
September	1,227,788	1,269,060	1,055,168	0
October	1,154,929	1,084,296	1,012,419	0
November	1,554,083	1,319,858	1,713,392	0
December	2,149,755	1,967,881	1,940,099	0
January	2,525,405	2,200,221	2,055,836	
February	2,041,199	2,360,585	2,078,388	
March	1,136,364	1,495,158	1,173,107	
April	1,074,742	1,038,707	866,240	

24. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	425,537	358,453	289,670	278,041
June	291,963	375,510	289,796	0
July	169,575	401,805	312,286	0
August	213,900	399,344	270,562	0
September	314,604	376,660	309,723	0
October	308,045	310,605	259,226	0
November	357,538	203,469	329,991	0
December	422,942	252,461	418,048	0
January	535,963	458,884	562,869	
February	202,981	435,262	464,446	
March	350,557	329,033	386,501	
April	357,125	312,941	255,354	

25. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,021,878	950,101	958,255	796,147
June	1,052,915	887,858	801,570	0
July	918,098	779,043	710,773	0
August	997,779	889,416	896,753	0
September	1,323,223	1,184,287	1,068,202	0
October	1,100,529	1,038,682	988,346	0
November	1,084,306	1,008,009	1,104,073	0
December	1,805,881	1,785,820	1,654,970	0
January	1,589,483	1,304,179	1,361,863	
February	1,531,191	1,335,755	928,352	
March	1,042,017	945,964	1,056,532	
April	777,443	791,600	802,507	

26. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	683,201	602,506	630,613	572,259
June	568,517	526,038	443,513	0
July	496,157	483,604	414,434	0
August	541,924	610,917	548,329	0
September	759,682	729,121	673,514	0
October	690,573	693,475	520,194	0
November	803,475	694,192	514,022	0
December	848,923	527,437	599,705	0
January	743,898	660,954	700,081	
February	623,088	607,461	620,554	
March	543,724	491,661	547,786	
April	540,171	494,817	514,598	

27. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	1,940,286	1,539,690	2,004,013	2,268,998
June	1,418,195	1,257,673	1,385,286	0
July	1,574,784	1,396,477	1,919,044	0
August	1,839,957	2,050,308	1,825,567	0
September	1,699,963	1,799,395	1,841,799	0
October	1,693,020	1,689,821	1,448,546	0
November	2,258,393	1,679,570	1,614,155	0
December	2,255,135	2,259,669	2,393,425	0
January	2,296,651	1,670,946	2,038,099	
February	1,607,385	1,505,449	2,197,310	
March	1,303,435	1,462,203	1,435,860	
April	1,325,771	1,456,557	1,845,894	

28. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	746,807	690,185	774,318	608,362
June	739,464	470,852	530,124	0
July	723,435	294,881	271,351	0
August	664,176	476,261	384,809	0
September	792,924	1,048,491	724,318	0
October	721,429	881,172	608,972	0
November	705,303	636,665	669,006	0
December	1,152,870	801,872	835,766	0
January	1,195,012	878,763	1,027,516	
February	1,091,342	890,588	980,436	
March	932,779	924,464	862,568	
April	777,681	909,244	574,090	

29. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	563,760	500,795	670,728	454,191
June	329,857	320,558	273,733	0
July	286,280	233,522	292,410	0
August	442,772	566,765	463,336	0
September	502,259	547,149	495,912	0
October	417,336	468,251	448,054	0
November	433,505	381,689	398,232	0
December	648,558	250,101	739,957	0
January	875,870	324,542	854,038	
February	778,081	519,612	705,916	
March	582,364	460,433	613,476	
April	427,932	459,892	531,601	

30. Non-Green School Building - Energy Consumption Data (KBTU)				
Months	2007	2008	2009	2010
May	254,891	217,585	234,627	238,128
June	321,286	252,215	296,521	0
July	448,910	352,940	320,793	0
August	403,352	377,741	340,282	0
September	373,263	356,826	360,549	0
October	347,208	279,432	281,872	0
November	243,989	208,321	241,670	0
December	283,688	258,314	249,853	0
January	281,273	281,666	265,794	
February	294,571	256,685	278,348	
March	226,730	223,402	233,585	
April	204,847	185,984	194,511	

Energy Consumption Cost data for Non- Green Schools Buildings

Non-Green School Buildings - Energy Consumption (KBTU)					
S. No	Type of School	Area (Sqft)	Average Energy Consumption May 2007 - April 2007 (KBTU)	Average Energy Consumption May 2008 - April 2008 (KBTU)	Average Energy Consumption May 2009 - April 2009 (KBTU)
1	12 month	148,569	582,351.38	548,196.81	527,057.69
2	12 month	625,685	308,764.44	309,597.19	305,914.88
3	9 month	290,219	1,625,156.67	1,490,024.75	1,333,273.17
4	9 month	148,569	673,981.75	843,025.00	669,964.42
5	9 month	54,445	283,367.67	257,750.08	230,853.83
6	9 month	291,779	1,124,808.67	930,776.08	970,036.67
7	12 month	62,568	345,994.31	267,481.25	307,179.50
8	9 month	101,848	441,538.92	352,263.75	402,942.67
9	9 month	53,910	178,174.00	170,632.00	198,628.83
10	9 month	62,879	361,766.42	300,343.42	306,305.42
11	12 month	62,568	273,309.00	252,195.94	246,594.19
12	9 month	123,976	631,125.58	503,052.42	560,009.67
13	9 month	148,569	850,309.17	821,464.92	705,791.83
14	9 month	274,700	1,169,196.83	1,088,353.58	1,148,705.50
15	9 month	50,214	296,532.33	274,313.17	247,546.25
16	9 month	274,700	34,025.45	30,653.72	30,321.16
17	9 month	62,568	311,829.09	287,277.17	285,747.08
18	9 month	60,046	326,455.50	347,606.25	376,620.83
19	9 month	62,568	352,084.00	290,262.50	346,118.92
20	9 month	148,569	733,811.33	747,337.08	715,220.25
21	9 month	148,569	636,591.83	813,608.25	648,384.58
22	9 month	274,700	1,156,829.17	1,119,806.42	1,181,843.58
23	9 month	274,700	1,415,041.42	1,387,000.25	1,277,993.25
24	9 month	62,568	329,227.50	351,202.25	345,706.00
25	9 month	274,700	1,187,061.92	1,075,059.50	1,027,683.00
26	9 month	146,330	653,611.08	593,515.25	560,611.92
27	9 month	217,157	1,767,747.92	1,647,313.17	1,829,083.17
28	9 month	62,568	853,601.83	741,953.17	686,939.50
29	9 month	110,562	524,047.83	419,442.42	540,616.08
30	12 month	52,806	230,250.50	203,194.44	206,150.31

Energy Consumption Cost data for Green Schools Buildings

1. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	30,177.97	26,950.19	28,401.15	25,014.34
June	37,415.14	29,708.28	32,600.61	0.00
July	26,022.98	24,098.76	30,593.78	0.00
August	42,005.65	36,857.86	44,246.87	0.00
September	51,390.24	45,251.37	57,277.99	0.00
October	29,894.58	31,379.01	26,609.34	0.00
November	28,716.34	24,839.45	24,461.35	0.00
December	31,228.54	29,368.85	26,984.55	0.00
January	33,037.64	29,517.73	30,339.02	
February	31,719.57	32,997.91	29,214.64	
March	26,478.33	25,930.80	24,733.01	
April	27,733.25	25,737.56	22,860.95	

2. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	57.20	7,905.19	7,653.53	8,270.56
June	7,094.22	12,338.33	11,166.22	0.00
July	11,880.01	13,007.24	14,618.68	0.00
August	12,567.85	12,968.89	14,969.33	0.00
September	12,834.19	11,696.86	14,997.73	0.00
October	9,227.45	7,074.06	6,690.83	0.00
November	9,844.46	7,114.01	7,216.93	0.00
December	9,084.63	7,574.93	7,380.44	0.00
January	8,472.83	7,655.94	7,439.46	
February	7,656.62	7,438.70	6,980.82	
March	6,744.66	6,633.41	6,795.90	
April	7,134.98	6,538.54	6,909.99	

3. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	16,826.05	15,127.29	17,663.06	14,260.13
June	21,597.67	15,851.84	20,876.33	0.00
July	18,115.92	13,529.13	17,975.66	0.00
August	25,172.21	19,718.73	24,048.51	0.00
September	32,259.63	23,113.57	32,041.83	0.00
October	19,274.77	17,091.06	23,083.41	0.00
November	21,192.48	15,848.45	20,588.11	0.00
December	18,170.95	17,314.07	23,900.05	0.00
January	15,645.89	16,230.38	22,735.74	
February	15,569.88	17,932.41	23,467.21	
March	13,788.33	17,292.42	16,994.89	
April	13,616.52	16,504.03	12,569.04	

4. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	10,792.86	9,827.12	9,118.09	10,915.68
June	14,647.92	15,171.55	12,895.74	0.00
July	13,722.99	13,924.29	14,042.10	0.00
August	15,451.56	13,155.83	14,851.32	0.00
September	10,899.21	9,704.43	10,332.49	0.00
October	6,437.34	6,460.39	6,726.64	0.00
November	6,545.02	6,465.32	6,557.57	0.00
December	8,632.34	7,226.33	6,875.12	0.00
January	8,804.59	8,205.81	7,571.35	
February	8,609.82	7,821.99	7,010.62	
March	7,164.39	6,435.33	6,138.44	
April	7,929.02	7,356.71	6,433.41	

5. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	99.82	13,864.19	14,169.34	11,150.98
June	92.21	15,401.09	15,438.62	0.00
July	22,249.03	18,832.63	10,618.28	0.00
August	25,626.69	20,102.40	17,403.43	0.00
September	26,330.20	22,683.03	28,554.41	0.00
October	17,282.98	17,163.47	17,743.94	0.00
November	14,465.87	10,998.46	11,180.94	0.00
December	15,360.65	11,083.41	11,293.02	0.00
January	14,837.95	11,930.03	11,788.10	
February	13,967.72	11,677.44	11,408.26	
March	12,070.54	11,182.77	10,705.69	
April	12,427.10	10,239.02	9,551.12	

6. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	0.00	9,977.85	8,858.62	7,845.54
June	0.00	9,333.84	6,360.28	0.00
July	0.00	9,344.44	6,835.41	0.00
August	0.00	11,273.23	8,942.99	0.00
September	1,092.76	9,872.66	10,775.05	0.00
October	442.31	6,942.98	5,984.62	0.00
November	0.00	7,204.99	5,763.27	0.00
December	1,438.65	6,073.52	6,034.28	0.00
January	2,160.63	7,811.92	6,610.10	
February	1,943.90	7,082.85	6,547.11	
March	9,502.43	6,315.17	6,215.63	
April	8,790.27	6,852.54	6,136.29	

7. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	0.00	8,779.43	9,552.65	8,501.40
June	0.00	12,414.89	12,419.09	0.00
July	6,713.29	12,062.54	12,830.71	0.00
August	12,116.15	11,488.00	13,516.82	0.00
September	11,001.76	9,491.98	10,297.55	0.00
October	7,130.35	6,795.61	6,368.20	0.00
November	7,317.10	6,545.55	6,386.10	0.00
December	8,359.38	7,281.80	6,845.76	0.00
January	52,638.03	8,731.82	7,764.27	
February	9,629.81	8,259.72	7,019.76	
March	8,627.06	6,669.71	6,216.92	
April	7,647.55	7,580.24	6,299.95	

8. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	0.00	627,723.00	635,085.00	503,682.00
June	0.00	568,506.00	410,965.00	0.00
July	0.00	382,155.00	520,809.00	0.00
August	1,105,454.00	607,882.00	596,951.00	0.00
September	675,085.00	657,776.00	577,035.00	0.00
October	622,973.00	623,542.00	603,426.00	0.00
November	671,662.00	611,410.00	617,870.00	0.00
December	686,840.00	777,142.00	760,685.00	0.00
January	969,217.00	802,263.00	729,063.00	
February	805,792.00	848,103.00	699,475.00	
March	651,773.00	636,697.00	61,049.00	
April	630,968.00	654,293.00	591,831.00	

9. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	0.00	17,888.76	18,859.73	14,832.18
June	0.00	21,218.44	16,717.98	0.00
July	0.00	19,557.23	21,616.11	0.00
August	32,859.03	22,661.21	25,817.70	0.00
September	22,355.86	21,372.69	21,914.38	0.00
October	16,074.89	14,990.85	14,156.07	0.00
November	16,176.49	14,477.83	13,454.78	0.00
December	14,695.12	15,510.53	14,388.25	0.00
January	18,245.99	16,629.09	14,218.66	
February	15,897.00	17,177.38	14,593.72	
March	14,387.04	14,252.31	12,472.69	
April	14,841.49	16,019.73	12,850.29	

10. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	0.00	7,541.81	7,610.65	6,469.51
June	65.25	9,607.06	10,016.96	0.00
July	744.44	12,908.36	14,216.80	0.00
August	11,404.90	12,314.48	14,156.68	0.00
September	13,051.30	11,909.86	14,600.88	0.00
October	12,234.43	9,753.40	9,960.31	0.00
November	7,923.48	7,188.30	7,333.58	0.00
December	9,538.76	8,696.56	8,493.58	0.00
January	9,370.88	8,332.86	8,596.14	
February	9,174.93	8,808.74	8,492.00	
March	7,113.94	7,891.16	7,399.20	
April	6,613.94	7,198.56	6,500.38	

11. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	9,113.60	9,138.57	9,791.18	9,212.71
June	15,637.73	15,013.13	15,250.89	0.00
July	18,589.66	16,951.87	19,145.12	0.00
August	17,240.68	16,063.11	18,636.18	0.00
September	16,894.45	15,217.07	20,038.83	0.00
October	9,742.93	10,320.01	8,665.35	0.00
November	8,725.03	7,358.88	7,563.16	0.00
December	8,865.90	8,231.20	7,823.89	0.00
January	10,013.77	9,605.41	8,922.62	
February	9,513.14	9,197.51	8,380.21	
March	8,193.42	8,312.36	7,694.61	
April	8,371.41	8,616.96	7,286.57	

12. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	6,772.76	8,758.57	6,953.37	6,575.10
June	11,056.03	11,200.29	10,789.72	0.00
July	12,887.68	12,272.47	13,239.23	0.00
August	12,115.67	11,361.28	12,193.92	0.00
September	11,933.03	10,639.50	13,660.92	0.00
October	7,218.84	7,299.62	6,040.75	0.00
November	6,794.24	5,505.56	5,897.54	0.00
December	6,865.30	5,928.99	6,383.58	0.00
January	7,623.54	6,700.07	7,360.41	
February	6,999.55	7,145.31	6,854.62	
March	5,943.84	5,692.27	6,288.60	
April	6,772.32	5,863.08	5,517.96	

13. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	7,725.34	7,728.81	9,472.06	6,389.53
June	10,277.05	13,119.74	12,416.71	0.00
July	6,326.57	16,939.32	16,693.87	0.00
August	11,051.98	16,361.79	16,157.73	0.00
September	15,050.43	15,024.86	16,848.58	0.00
October	8,933.24	9,416.50	10,621.64	0.00
November	8,375.53	7,164.33	8,933.86	0.00
December	9,380.04	8,122.75	9,703.85	0.00
January	9,826.34	8,771.45	8,623.14	
February	10,082.96	9,026.13	9,153.19	
March	7,937.84	8,538.61	7,588.87	
April	7,190.81	8,516.53	5,779.59	

14. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	7,911.56	8,896.23	8,136.87	7,520.66
June	12,517.80	13,741.20	11,595.76	0.00
July	13,916.11	15,994.36	14,442.15	0.00
August	13,756.51	14,555.69	14,043.74	0.00
September	14,012.10	13,320.08	15,356.53	0.00
October	8,390.36	9,776.74	8,329.29	0.00
November	9,560.48	8,431.56	7,733.05	0.00
December	9,874.91	9,218.64	8,354.88	0.00
January	9,067.35	8,412.22	9,131.42	
February	6,931.55	8,931.19	8,388.16	
March	7,698.17	8,302.43	6,918.48	
April	9,161.77	7,768.93	6,280.32	

15. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	17,858.32	16,201.87	18,462.56	14,639.57
June	22,247.04	18,621.63	21,097.90	0.00
July	17,673.61	16,143.77	17,566.19	0.00
August	24,301.57	22,087.98	26,410.19	0.00
September	29,302.34	25,739.27	33,806.97	0.00
October	17,805.94	19,737.14	14,923.34	0.00
November	15,385.30	18,910.92	12,658.80	0.00
December	15,721.82	20,871.93	14,485.30	0.00
January	16,707.77	17,640.46	15,443.81	
February	14,973.06	18,204.48	15,226.62	
March	15,122.41	15,883.87	15,297.62	
April	15,995.77	15,005.43	13,074.14	

16. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	7,304.12	7,504.54	8,981.90	9,429.27
June	9,080.92	8,446.01	9,898.17	0.00
July	6,921.02	7,994.46	7,055.35	0.00
August	10,972.10	13,740.61	14,210.69	0.00
September	13,670.33	15,630.05	17,340.02	0.00
October	8,728.91	11,631.63	7,576.88	0.00
November	7,973.88	9,653.38	6,795.35	0.00
December	8,068.34	11,714.36	7,521.85	0.00
January	8,797.57	11,811.66	8,441.89	
February	8,139.64	8,894.84	8,075.46	
March	6,994.03	7,540.80	7,521.21	
April	7,384.33	7,598.93	7,281.65	

17. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	28,195.78	26,545.81	27,445.52	24,391.86
June	31,526.23	29,731.73	34,897.13	0.00
July	26,691.14	30,600.80	38,812.78	0.00
August	39,524.52	35,840.86	45,891.48	0.00
September	47,141.13	42,884.38	55,907.13	0.00
October	28,364.03	29,064.84	23,979.84	0.00
November	28,437.32	23,679.08	20,166.61	0.00
December	20,238.09	24,027.36	22,369.37	0.00
January	26,454.62	25,646.89	23,704.57	
February	24,846.63	27,353.00	25,493.43	
March	21,653.75	23,257.78	21,974.98	
April	24,808.16	22,696.69	19,710.26	

18. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	20,348.66	19,629.25	21,014.55	16,404.07
June	21,595.26	22,758.40	17,053.41	0.00
July	20,936.98	19,496.98	17,203.21	0.00
August	30,282.95	28,434.22	27,219.03	0.00
September	33,939.04	29,753.42	27,458.73	0.00
October	193,861.55	17,029.19	14,143.35	0.00
November	17,684.53	18,867.63	15,109.65	0.00
December	16,857.51	15,457.66	14,378.64	0.00
January	17,074.40	17,385.63	15,300.86	
February	15,781.16	16,276.63	12,718.81	
March	14,055.56	14,661.01	10,839.37	
April	14,055.56	14,628.56	12,363.52	

19. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	0.00	21,853.66	21,251.79	20,633.16
June	26,684.59	20,139.52	19,513.22	0.00
July	50,982.39	15,846.31	19,289.35	0.00
August	51,416.86	26,524.19	36,689.91	0.00
September	36,665.44	28,351.62	36,538.52	0.00
October	32,295.99	18,122.73	18,062.31	0.00
November	23,890.21	16,510.04	17,156.12	0.00
December	21,543.14	16,664.03	16,636.48	0.00
January	22,934.68	18,351.06	17,185.64	
February	20,018.92	18,386.67	17,182.88	
March	19,773.99	16,331.17	14,882.58	
April	21,499.16	17,621.55	17,054.27	

20. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	35,646.35	34,126.26	34,475.21	31,498.59
June	46,573.80	36,891.01	42,268.27	0.00
July	49,482.01	41,291.48	51,266.57	0.00
August	48,551.04	46,429.44	53,660.65	0.00
September	57,952.20	50,838.15	66,991.66	0.00
October	35,437.38	35,330.68	31,640.47	0.00
November	32,872.16	28,956.77	28,099.18	0.00
December	35,614.25	33,431.97	28,066.68	0.00
January	39,367.05	34,486.21	30,385.32	
February	34,460.29	32,149.92	29,021.32	
March	29,078.16	29,929.51	25,389.04	
April	32,387.85	28,031.30	25,752.49	

21. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	0.00	9,307.30	9,828.01	8,804.18
June	0.00	13,077.14	12,958.31	0.00
July	0.00	12,806.10	13,979.56	0.00
August	21,648.16	12,499.35	14,514.62	0.00
September	11,759.88	9,711.69	11,256.01	0.00
October	7,776.71	6,351.65	7,362.22	0.00
November	7,952.33	6,403.10	6,827.45	0.00
December	8,500.78	6,725.61	7,619.80	0.00
January	9,329.38	8,169.44	8,561.60	
February	8,299.61	8,027.22	7,887.43	
March	7,343.52	6,702.42	6,761.48	
April	7,500.48	7,677.99	6,879.07	

22. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	13,765.90	11,194.56	11,865.33	10,315.12
June	12,348.92	7,518.11	10,770.55	0.00
July	11,967.35	7,171.96	11,572.09	0.00
August	14,703.12	10,291.94	10,759.68	0.00
September	12,997.10	9,815.59	12,906.00	0.00
October	12,027.26	9,055.12	7,294.73	0.00
November	11,943.31	9,133.91	7,376.73	0.00
December	9,652.87	9,195.66	7,328.33	0.00
January	10,749.26	10,176.40	7,918.85	
February	10,851.77	9,690.24	7,538.83	
March	11,954.73	7,716.10	6,820.93	
April	9,593.46	8,801.91	8,164.96	

23. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	0.00	8,466.21	9,677.95	8,579.06
June	0.00	12,114.79	13,302.69	0.00
July	0.00	11,599.39	15,069.43	0.00
August	11,472.08	11,705.33	14,921.20	0.00
September	12,647.21	9,827.85	12,403.92	0.00
October	10,174.62	6,768.30	6,699.23	0.00
November	8,220.42	6,604.58	6,784.86	0.00
December	7,791.21	5,778.64	7,372.36	0.00
January	7,268.08	6,529.37	7,727.49	
February	7,470.62	6,599.81	6,881.33	
March	7,610.67	8,911.99	5,671.89	
April	7,917.46	6,750.11	6,138.37	

22. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	13,765.90	11,194.56	11,865.33	10,315.12
June	12,348.92	7,518.11	10,770.55	0.00
July	11,967.35	7,171.96	11,572.09	0.00
August	14,703.12	10,291.94	10,759.68	0.00
September	12,997.10	9,815.59	12,906.00	0.00
October	12,027.26	9,055.12	7,294.73	0.00
November	11,943.31	9,133.91	7,376.73	0.00
December	9,652.87	9,195.66	7,328.33	0.00
January	10,749.26	10,176.40	7,918.85	
February	10,851.77	9,690.24	7,538.83	
March	11,954.73	7,716.10	6,820.93	
April	9,593.46	8,801.91	8,164.96	

23. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	0.00	8,466.21	9,677.95	8,579.06
June	0.00	12,114.79	13,302.69	0.00
July	0.00	11,599.39	15,069.43	0.00
August	11,472.08	11,705.33	14,921.20	0.00
September	12,647.21	9,827.85	12,403.92	0.00
October	10,174.62	6,768.30	6,699.23	0.00
November	8,220.42	6,604.58	6,784.86	0.00
December	7,791.21	5,778.64	7,372.36	0.00
January	7,268.08	6,529.37	7,727.49	
February	7,470.62	6,599.81	6,881.33	
March	7,610.67	8,911.99	5,671.89	
April	7,917.46	6,750.11	6,138.37	

24. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	11,151.18	11,275.78	14,162.56	11,059.73
June	15,784.93	16,462.48	17,084.82	0.00
July	15,959.97	16,971.41	19,348.88	0.00
August	17,436.04	14,850.06	17,333.45	0.00
September	13,453.67	12,556.69	13,753.03	0.00
October	9,316.22	7,950.62	8,844.28	0.00
November	9,473.52	8,841.24	8,351.74	0.00
December	9,886.48	9,252.63	10,285.38	0.00
January	11,187.62	10,015.92	10,267.05	
February	10,110.27	10,346.17	10,395.56	
March	9,088.46	9,801.18	8,793.55	
April	8,799.29	11,886.46	8,999.56	

25. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	19,874.16	16,865.20	17,541.59	18,726.98
June	16,116.92	15,567.58	14,204.90	0.00
July	16,535.74	19,469.86	18,644.26	0.00
August	27,841.51	24,858.53	27,630.78	0.00
September	23,770.74	21,792.42	22,463.47	0.00
October	17,833.51	15,436.58	13,924.27	0.00
November	21,424.19	16,409.21	13,612.80	0.00
December	21,800.85	18,469.28	15,498.31	0.00
January	22,433.17	16,729.33	14,913.60	
February	17,730.39	15,316.87	16,907.85	
March	14,970.53	13,570.83	16,317.19	
April	14,838.60	15,164.04	16,397.71	

26. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	9,114.86	8,319.90	7,971.31	6,891.90
June	15,013.26	13,799.22	12,144.04	0.00
July	16,242.32	15,425.39	15,149.95	0.00
August	16,064.93	13,632.28	14,367.80	0.00
September	16,019.81	12,547.86	15,415.86	0.00
October	10,460.41	8,176.34	6,853.21	0.00
November	9,424.18	6,299.91	6,281.43	0.00
December	9,287.57	6,990.47	6,884.36	0.00
January	10,447.06	8,735.48	7,678.05	
February	9,098.71	7,950.38	6,880.87	
March	7,650.23	6,449.77	6,380.34	
April	8,118.15	6,769.88	5,817.96	

27. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	10,627.53	8,798.51	10,063.79	9,219.10
June	8,689.99	8,957.06	7,752.20	0.00
July	9,459.83	6,338.03	8,242.85	0.00
August	9,500.14	7,964.48	11,833.51	0.00
September	10,582.92	11,321.78	8,135.34	0.00
October	8,027.87	9,041.83	7,719.31	0.00
November	8,970.12	8,023.13	7,487.75	0.00
December	9,578.83	8,293.68	7,575.69	0.00
January	9,051.52	9,074.62	7,884.84	
February	9,119.47	9,243.66	7,317.27	
March	9,867.33	8,561.68	6,832.74	
April	8,866.90	8,912.55	7,024.02	

28. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	6,456.57	7,180.20	7,490.90	6,689.63
June	8,881.70	7,942.01	9,620.90	0.00
July	62,220.29	6,069.10	9,133.70	0.00
August	6,336.40	7,622.87	10,300.03	0.00
September	12,316.31	11,533.58	13,496.62	0.00
October	9,981.79	10,206.50	10,900.07	0.00
November	6,689.95	6,788.53	6,630.49	0.00
December	8,101.79	7,717.98	6,861.44	0.00
January	7,408.20	7,667.97	6,561.13	
February	7,743.53	7,769.09	6,680.64	
March	6,943.10	6,864.66	6,592.52	
April	6,391.85	6,820.34	5,896.15	

29. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	22,026.69	16,387.96	17,728.53	18,176.89
June	19,142.14	16,643.35	15,704.23	0.00
July	18,045.61	18,199.54	15,108.88	0.00
August	26,679.71	28,809.90	28,441.27	0.00
September	24,182.31	24,416.76	24,886.63	0.00
October	20,754.76	13,652.83	13,602.34	0.00
November	23,166.12	12,395.14	13,349.15	0.00
December	17,091.46	13,630.87	14,274.38	0.00
January	17,130.95	16,033.33	15,736.20	
February	15,237.18	15,245.38	15,035.07	
March	12,262.61	13,778.64	13,487.04	
April	13,278.43	14,887.22	14,479.24	

30. Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	13,010.01	11,326.66	10,666.47	12,382.22
June	18,307.76	17,177.21	15,571.38	0.00
July	18,628.46	17,579.93	17,843.31	0.00
August	18,016.48	13,723.61	16,191.86	0.00
September	14,013.33	11,541.09	12,941.53	0.00
October	8,574.49	7,436.30	9,644.53	0.00
November	9,113.62	7,557.71	7,796.97	0.00
December	10,279.31	8,172.14	8,051.31	0.00
January	11,423.53	8,756.53	8,390.66	
February	10,340.22	9,801.20	8,339.06	
March	9,304.44	7,748.10	7,054.54	
April	9,018.93	8,593.80	8,372.69	

Energy Consumption Cost data for Green Schools Buildings

Green School Buildings - Energy Consumption (KBTU)					
S. No	Type of School	Area (Sqft)	Average Energy Consumption May 2007 - April 2007 (KBTU)	Average Energy Consumption May 2008 - April 2008 (KBTU)	Average Energy Consumption May 2009 - April 2009 (KBTU)
1	9 month	333,160	1,309,797.75	1,217,072.75	1,216,547.25
2	12 month	62,568	533,161.88	495,952.00	689,206.19
3	9 month	148,569	335,117.58	327,955.50	305,352.92
4	12 month	62,568	353,522.44	351,904.19	330,365.63
5	9 month	114,386	179,004.14	284,765.83	275,180.58
6	9 month	63,485	333,090.00	549,234.77	299,203.58
7	12 month	62,568	491,870.67	441,793.88	548,821.94
8	9 month	148,569	757,751.56	1,208,567.46	1,112,956.00
9	9 month	148,569	320,614.73	4,086,460.00	343,459.58
10	12 month	63,485	296,361.81	283,917.25	276,041.50
11	12 month	62,568	209,214.94	204,377.13	206,451.75
12	12 month	62,568	265,297.00	291,536.81	307,192.06
13	12 month	62,568	246,912.56	238,355.50	243,997.88
14	9 month	62,568	753,311.33	735,745.25	606,768.92
15	9 month	148,569	370,758.08	388,334.75	346,137.92
16	9 month	62,568	657,647.83	729,756.25	648,081.92
17	9 month	333,160	308,339.08	403,523.83	318,731.42
18	9 month	148,569	1,019,675.33	1,076,823.00	1,061,710.00
19	9 month	217,000	928,149.27	628,746.36	666,328.73
20	9 month	333,160	1,432,078.00	1,378,056.67	1,340,954.25
21	12 month	62,568	280,754.92	229,172.63	255,869.13
22	12 month	62,568	311,409.25	247,728.81	263,137.13
23	12 month	63,485	213,536.58	205,946.25	243,449.19
24	12 month	62,568	311,546.88	315,937.38	337,602.44
25	9 month	148,569	763,182.25	665,617.67	669,576.58
26	12 month	62,568	296,394.56	243,841.63	233,111.63
27	9 month	75,226	349,105.25	316,572.42	342,627.33
28	9 month	62,568	349,105.25	316,572.42	342,627.33
29	9 month	148,569	718,792.25	633,448.25	620,187.58
30	12 month	62,568	320,264.69	267,088.69	284,068.81

Energy Consumption Cost data for Non-Green Schools Buildings

1. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	24,335.73	15,848.43	17,601.03	14,969.85
June	18,453.23	16,457.89	14,906.05	
July	11,379.00	13,138.25	15,148.90	
August	24,178.12	22,686.30	27,543.74	
September	24,305.34	22,458.91	25,812.23	
October	15,248.38	16,291.32	14,830.54	
November	17,533.92	20,097.68	15,455.59	
December	20,557.81	22,580.81	17,055.60	
January	21,230.85	17,723.38	18,064.50	
February	17,747.73	17,404.51	16,154.44	
March	16,320.79	14,971.62	12,585.48	
April	15,039.55	12,994.76	13,957.20	

2. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	11,726.72	11,559.19	12,441.99	11,622.63
June	21,456.26	19,974.43	19,563.47	0.00
July	23,115.36	19,956.47	24,130.09	0.00
August	19,354.41	19,020.43	21,526.09	0.00
September	16,014.74	17,110.59	18,663.06	0.00
October	9,507.72	8,899.60	8,542.39	0.00
November	8,992.00	7,773.82	8,700.96	0.00
December	9,242.14	9,496.85	8,132.71	0.00
January	9,477.35	10,376.88	9,436.33	
February	8,889.09	9,647.48	8,659.59	
March	8,969.08	9,259.60	8,220.17	
April	9,124.03	9,373.62	8,325.75	

1. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	24,335.73	15,848.43	17,601.03	14,969.85
June	18,453.23	16,457.89	14,906.05	
July	11,379.00	13,138.25	15,148.90	
August	24,178.12	22,686.30	27,543.74	
September	24,305.34	22,458.91	25,812.23	
October	15,248.38	16,291.32	14,830.54	
November	17,533.92	20,097.68	15,455.59	
December	20,557.81	22,580.81	17,055.60	
January	21,230.85	17,723.38	18,064.50	
February	17,747.73	17,404.51	16,154.44	
March	16,320.79	14,971.62	12,585.48	
April	15,039.55	12,994.76	13,957.20	

2. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	11,726.72	11,559.19	12,441.99	11,622.63
June	21,456.26	19,974.43	19,563.47	0.00
July	23,115.36	19,956.47	24,130.09	0.00
August	19,354.41	19,020.43	21,526.09	0.00
September	16,014.74	17,110.59	18,663.06	0.00
October	9,507.72	8,899.60	8,542.39	0.00
November	8,992.00	7,773.82	8,700.96	0.00
December	9,242.14	9,496.85	8,132.71	0.00
January	9,477.35	10,376.88	9,436.33	
February	8,889.09	9,647.48	8,659.59	
March	8,969.08	9,259.60	8,220.17	
April	9,124.03	9,373.62	8,325.75	

3. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	50,369.70	46,987.05	44,951.17	38,236.35
June	45,778.57	42,075.30	36,935.82	0.00
July	44,215.93	45,968.78	44,884.10	0.00
August	72,901.94	66,251.86	77,051.32	0.00
September	58,126.30	57,105.24	62,582.58	0.00
October	34,569.47	32,473.95	30,757.84	0.00
November	37,282.51	30,561.12	30,427.27	0.00
December	42,796.20	35,553.81	32,143.46	0.00
January	39,981.38	40,323.97	30,063.82	
February	35,669.53	38,760.18	27,029.21	
March	33,145.27	28,941.27	24,636.62	
April	34,486.12	32,452.59	30,276.42	

4. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	17,328.77	25,352.11	16,888.67	16,889.41
June	19,347.68	28,160.87	17,683.37	0.00
July	14,121.91	15,466.98	11,027.19	0.00
August	21,038.39	22,768.77	24,724.07	0.00
September	26,909.87	24,619.37	31,989.24	0.00
October	16,215.69	17,457.19	14,051.79	0.00
November	13,469.99	14,330.74	14,969.34	0.00
December	14,906.40	16,075.85	15,406.54	0.00
January	18,329.92	17,360.95	17,748.81	
February	18,061.71	18,677.74	16,170.20	
March	17,483.02	16,081.42	15,509.18	
April	16,871.27	16,389.89	14,510.37	

5. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	9,542.12	7,418.17	8,191.71	7,913.16
June	7,932.34	8,120.24	5,021.31	0.00
July	8,209.06	9,865.86	4,959.47	0.00
August	13,287.10	12,034.03	13,686.55	0.00
September	10,062.40	9,959.09	10,916.84	0.00
October	6,635.51	6,284.26	5,795.71	0.00
November	6,772.41	5,886.94	5,352.34	0.00
December	7,213.99	6,305.10	5,413.52	0.00
January	8,033.11	6,347.40	5,625.76	
February	6,739.28	6,136.25	5,755.31	
March	5,983.42	5,363.17	5,130.15	
April	6,615.06	6,314.25	5,517.54	

6. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	23,926.57	19,058.25	20,904.10	16,793.02
June	33,931.72	23,950.68	26,533.47	0.00
July	27,654.56	27,455.13	21,679.47	0.00
August	33,903.47	26,309.14	29,320.65	0.00
September	48,094.89	36,781.55	45,793.34	0.00
October	33,844.59	29,044.10	31,367.68	0.00
November	21,643.97	18,609.31	19,469.74	0.00
December	30,994.79	30,127.64	25,967.23	0.00
January	31,790.66	21,450.45	24,052.52	
February	22,526.37	20,335.36	23,085.59	
March	18,277.54	18,929.26	18,522.39	
April	17,280.84	15,922.11	14,693.51	

7. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	13,765.53	9,855.55	10,660.26	10,901.99
June	21,519.04	17,472.75	17,399.01	0.00
July	21,207.10	18,179.81	23,558.08	0.00
August	17,819.45	15,935.56	19,860.80	0.00
September	13,823.20	13,476.56	16,605.48	0.00
October	9,130.27	7,228.39	7,692.30	0.00
November	9,108.04	6,359.11	8,106.38	0.00
December	9,307.56	7,793.48	7,891.72	0.00
January	9,492.32	8,448.99	8,946.12	
February	9,788.80	8,219.23	8,574.30	
March	9,135.71	7,753.63	8,042.34	
April	7,690.89	7,900.41	8,581.33	

8. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	11,122.76	9,683.03	11,502.03	9,609.02
June	14,312.94	11,361.54	13,230.63	0.00
July	13,253.92	7,781.36	10,138.44	0.00
August	13,292.52	12,094.91	15,735.97	0.00
September	19,368.19	15,876.65	21,009.65	0.00
October	10,663.47	10,849.41	11,912.41	0.00
November	8,973.15	7,661.58	9,177.29	0.00
December	11,983.63	9,641.36	9,529.60	0.00
January	12,082.82	8,928.23	9,956.11	
February	10,810.20	9,947.00	9,536.60	
March	9,142.19	8,336.08	8,781.13	
April	7,063.33	7,194.43	7,413.32	

7. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	13,765.53	9,855.55	10,660.26	10,901.99
June	21,519.04	17,472.75	17,399.01	0.00
July	21,207.10	18,179.81	23,558.08	0.00
August	17,819.45	15,935.56	19,860.80	0.00
September	13,823.20	13,476.56	16,605.48	0.00
October	9,130.27	7,228.39	7,692.30	0.00
November	9,108.04	6,359.11	8,106.38	0.00
December	9,307.56	7,793.48	7,891.72	0.00
January	9,492.32	8,448.99	8,946.12	
February	9,788.80	8,219.23	8,574.30	
March	9,135.71	7,753.63	8,042.34	
April	7,690.89	7,900.41	8,581.33	

8. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	11,122.76	9,683.03	11,502.03	9,609.02
June	14,312.94	11,361.54	13,230.63	0.00
July	13,253.92	7,781.36	10,138.44	0.00
August	13,292.52	12,094.91	15,735.97	0.00
September	19,368.19	15,876.65	21,009.65	0.00
October	10,663.47	10,849.41	11,912.41	0.00
November	8,973.15	7,661.58	9,177.29	0.00
December	11,983.63	9,641.36	9,529.60	0.00
January	12,082.82	8,928.23	9,956.11	
February	10,810.20	9,947.00	9,536.60	
March	9,142.19	8,336.08	8,781.13	
April	7,063.33	7,194.43	7,413.32	

9. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	7,061.22	5,851.36	7,610.32	6,872.25
June	5,091.62	5,248.01	4,235.30	0.00
July	4,762.85	2,691.85	8,608.54	0.00
August	6,679.23	6,345.60	6,341.53	0.00
September	7,533.94	6,815.30	7,810.86	0.00
October	5,852.56	5,484.56	5,816.63	0.00
November	5,702.56	5,269.83	5,435.22	0.00
December	4,282.36	4,762.40	4,870.40	0.00
January	5,069.75	4,785.92	5,097.82	
February	4,961.12	5,056.22	5,378.23	
March	4,793.58	4,838.49	5,714.75	
April	5,410.18	6,087.22	5,756.36	

10. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	9,732.23	8,859.88	9,487.81	7,535.61
June	14,515.46	9,538.55	10,061.23	0.00
July	14,807.34	6,502.83	7,078.75	0.00
August	9,360.08	9,725.49	11,048.13	0.00
September	19,348.42	14,215.63	18,897.69	0.00
October	10,916.88	11,469.82	11,930.01	0.00
November	10,617.52	8,437.57	7,987.95	0.00
December	8,875.08	8,683.61	7,589.36	0.00
January	7,012.63	6,954.55	7,070.64	
February	7,521.37	7,634.82	7,498.81	
March	7,200.63	7,160.57	7,183.60	
April	7,513.08	6,809.26	6,708.78	

11. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	8,769.98	8,788.88	9,003.18	8,797.11
June	15,418.05	15,387.20	13,786.33	0.00
July	22,574.23	16,421.03	18,217.64	0.00
August	15,952.36	13,971.60	18,127.75	0.00
September	14,918.31	14,461.80	19,334.96	0.00
October	8,041.19	8,640.34	7,687.65	0.00
November	6,590.79	6,349.93	7,001.15	0.00
December	7,040.10	6,793.96	7,023.66	0.00
January	8,863.94	8,306.23	8,118.21	
February	8,466.30	8,297.83	7,617.40	
March	7,392.10	6,998.27	7,365.21	
April	7,474.30	7,354.98	6,843.45	

12. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	18,552.11	17,784.40	17,127.87	16,548.60
June	15,449.06	18,274.38	15,826.14	0.00
July	14,614.11	16,357.76	17,521.52	0.00
August	25,098.61	23,115.11	26,465.80	0.00
September	22,222.64	19,745.42	22,762.18	0.00
October	14,342.54	11,331.52	12,443.76	0.00
November	14,119.04	10,126.57	12,466.66	0.00
December	19,510.63	14,911.85	15,518.33	0.00
January	18,955.20	13,044.21	14,812.25	
February	15,040.61	12,670.27	15,101.47	
March	10,290.85	10,618.69	12,009.10	
April	11,829.12	11,677.46	11,629.54	

13. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	23,328.25	20,554.04	20,768.84	17,821.57
June	17,735.90	14,420.10	15,891.04	0.00
July	18,323.97	16,910.14	18,370.09	0.00
August	27,779.21	26,874.29	28,791.64	0.00
September	24,554.59	24,090.76	23,570.47	0.00
October	17,362.42	21,745.51	14,427.03	0.00
November	18,885.63	20,405.57	14,192.64	0.00
December	5,213.11	21,061.39	17,888.89	0.00
January	18,668.94	18,763.67	18,087.00	
February	21,690.40	47,829.53	16,393.63	
March	23,059.89	15,072.59	14,235.43	
April	23,193.40	18,725.53	14,783.57	

14. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	30,028.85	24,557.69	27,236.36	25,918.47
June	28,903.65	22,822.35	22,569.46	0.00
July	27,004.61	25,508.47	27,309.39	0.00
August	42,193.18	37,651.07	46,588.04	0.00
September	38,664.40	35,091.81	44,269.12	0.00
October	26,946.21	20,892.03	21,533.73	0.00
November	24,319.17	21,586.06	23,489.81	0.00
December	26,031.72	23,867.69	25,482.53	0.00
January	28,478.49	29,774.67	26,748.60	
February	28,889.56	28,612.85	25,981.78	
March	24,413.87	23,229.73	22,302.89	
April	23,151.89	23,082.31	20,766.20	

15. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	8,804.90	7,431.50	8,840.00	6,969.75
June	8,498.48	10,045.31	8,519.21	0.00
July	7,523.16	9,676.15	8,544.08	0.00
August	12,275.87	12,925.75	14,156.45	0.00
September	10,012.85	9,900.89	10,615.35	0.00
October	5,392.67	5,323.77	4,578.74	0.00
November	5,840.97	4,239.83	4,682.03	0.00
December	7,812.67	5,197.18	5,517.97	0.00
January	7,857.84	7,616.40	6,020.13	
February	8,936.99	7,702.59	6,661.57	
March	6,548.11	5,510.50	5,237.50	
April	5,501.86	6,117.89	4,726.21	

16. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	1,044,227.00	561,253.00	619,142.00	507,938.00
June	491,628.00	424,235.00	350,575.00	0.00
July	307,171.00	292,260.00	389,806.00	0.00
August	570,878.00	597,193.00	582,837.00	0.00
September	637,515.00	634,882.00	613,941.00	0.00
October	584,353.00	746,405.00	698,952.00	0.00
November	850,669.00	1,042,313.00	819,122.00	0.00
December	1,207,304.00	1,411,221.00	1,081,604.00	0.00
January	0.00	1,262,686.00	964,527.00	
February	946,722.00	910,938.00	920,670.00	
March	766,258.00	715,282.00	587,930.00	
April	648,211.00	470,640.00	678,725.00	

17. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	8,311.61	7,993.08	9,106.53	8,131.98
June	12,248.83	9,366.04	9,804.91	0.00
July	13,430.01	6,344.57	5,698.06	0.00
August	16,100.05	13,673.30	15,720.38	0.00
September	18,069.99	15,218.10	20,222.25	0.00
October	8,718.75	8,905.93	7,955.98	0.00
November	7,942.95	6,874.70	7,369.06	0.00
December	8,000.09	7,802.73	7,177.31	0.00
January	8,037.69	6,942.40	7,700.32	
February	0.00	7,490.58	7,700.50	
March	7,002.68	6,899.99	7,060.30	
April	7,675.14	7,016.99	6,633.18	

18. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	9,977.50	8,254.43	9,687.54	9,839.59
June	8,558.48	8,625.35	9,232.44	0.00
July	6,681.39	6,256.03	7,953.45	0.00
August	11,482.03	12,142.96	13,704.58	0.00
September	11,699.47	11,171.51	12,441.95	0.00
October	7,740.63	8,215.23	7,275.78	0.00
November	8,460.99	8,716.87	8,782.08	0.00
December	8,690.33	8,642.36	8,962.38	0.00
January	8,742.90	8,381.89	9,460.38	
February	8,022.61	9,182.03	9,134.81	
March	7,165.79	8,196.28	8,510.89	
April	6,760.79	7,914.64	8,781.57	

19. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	7,280.45	7,546.81	7,876.26	7,809.51
June	11,566.04	9,147.11	10,368.97	0.00
July	21,085.37	7,354.14	6,742.03	0.00
August	18,757.58	9,502.34	11,950.90	0.00
September	17,109.52	14,647.18	17,674.83	0.00
October	11,516.71	11,374.42	12,181.78	0.00
November	7,174.82	7,223.21	7,018.78	0.00
December	8,138.71	8,242.65	8,680.80	0.00
January	8,257.38	7,562.88	11,379.30	
February	8,119.40	7,967.18	8,542.50	
March	7,068.11	7,328.15	7,691.24	
April	6,938.90	6,677.14	6,609.85	

20. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	19,208.89	17,351.29	18,793.05	15,342.16
June	21,985.50	23,296.08	21,320.19	0.00
July	15,563.28	20,569.86	17,724.92	0.00
August	25,460.81	25,250.91	29,888.91	0.00
September	29,512.04	26,293.15	31,475.06	0.00
October	18,112.80	19,792.28	15,128.17	0.00
November	18,477.69	17,345.92	16,623.51	0.00
December	17,835.05	16,835.26	15,596.64	0.00
January	17,763.50	16,348.18	17,147.58	
February	17,086.12	17,879.17	15,637.89	
March	16,195.35	15,791.69	14,242.88	
April	15,995.08	15,923.69	14,199.35	

21. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	18,854.50	17,937.01	17,773.28	16,863.71
June	11,869.03	15,129.51	13,616.42	0.00
July	12,767.27	16,204.81	17,973.90	0.00
August	24,326.25	23,101.64	28,465.14	0.00
September	21,718.73	21,100.50	22,745.41	0.00
October	13,252.57	15,018.05	13,729.92	0.00
November	12,923.70	15,389.30	14,787.53	0.00
December	14,482.75	19,852.96	16,081.07	0.00
January	17,108.61	24,197.33	17,268.97	
February	17,253.90	22,960.29	16,630.00	
March	16,424.27	18,762.61	13,291.82	
April	17,301.72	18,051.58	12,741.78	

22. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	26,163.48	24,237.35	27,026.66	22,724.86
June	29,669.81	26,450.61	29,252.13	0.00
July	22,460.00	24,666.46	26,347.65	0.00
August	38,230.51	32,577.17	40,316.97	0.00
September	45,999.13	40,337.71	51,236.48	0.00
October	26,093.16	27,582.16	21,945.16	0.00
November	25,820.94	21,719.93	22,696.17	0.00
December	28,447.10	25,804.99	25,614.02	0.00
January	31,982.51	28,586.86	29,357.46	
February	30,865.99	29,540.92	26,812.84	
March	25,629.53	23,599.00	23,369.88	
April	25,667.37	24,518.01	20,664.58	

23. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	36,411.81	35,042.50	33,712.42	27,743.89
June	26,919.73	26,418.82	23,712.42	0.00
July	28,214.91	28,147.58	32,597.00	0.00
August	52,981.28	45,334.12	47,777.98	0.00
September	43,123.35	40,881.88	40,985.36	0.00
October	29,205.69	25,995.82	22,792.58	0.00
November	32,230.38	26,455.70	27,664.22	0.00
December	35,466.99	31,458.59	28,862.42	0.00
January	40,619.38	36,054.75	30,687.69	
February	34,920.18	38,223.47	31,559.44	
March	26,381.63	28,398.46	22,504.16	
April	27,259.81	26,537.27	20,873.60	

24. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	9,617.66	8,300.00	7,905.29	7,101.86
June	10,745.84	12,897.00	14,794.39	0.00
July	6,274.46	14,626.33	19,110.37	0.00
August	10,186.63	13,765.67	18,037.71	0.00
September	13,424.37	19,894.92	19,184.85	0.00
October	8,344.50	8,152.69	6,814.22	0.00
November	8,420.87	5,859.22	7,005.10	0.00
December	8,379.68	6,249.45	7,314.18	0.00
January	9,513.26	8,567.83	9,218.86	
February	8,311.97	8,714.42	8,321.56	
March	7,539.39	7,367.41	7,404.71	
April	7,952.08	7,497.11	6,219.00	

25. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	24,431.96	24,064.03	24,301.84	18,865.53
June	33,182.74	29,000.96	27,549.95	0.00
July	34,221.23	27,321.51	27,945.09	0.00
August	35,833.46	31,889.19	38,561.58	0.00
September	47,857.01	41,468.33	46,796.54	0.00
October	33,006.72	30,866.51	31,492.97	0.00
November	24,628.70	22,942.74	22,759.93	0.00
December	31,419.46	29,770.51	26,041.80	0.00
January	27,167.43	23,548.17	22,861.79	
February	28,176.77	25,475.92	23,522.19	
March	22,993.70	21,217.14	20,741.65	
April	20,189.70	19,573.26	17,351.14	

26. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	18,573.28	16,530.94	17,431.86	14,961.91
June	23,454.46	20,314.45	18,235.19	0.00
July	18,277.97	17,000.17	16,183.63	0.00
August	22,326.03	22,536.83	25,210.05	0.00
September	27,776.23	25,061.64	28,947.05	0.00
October	17,908.93	17,141.06	14,038.60	0.00
November	18,691.26	16,050.36	13,243.51	0.00
December	18,048.27	16,015.93	13,158.36	0.00
January	16,497.31	14,923.74	14,754.39	
February	0.00	15,091.69	14,431.20	
March	14,395.94	12,648.84	12,742.48	
April	14,628.22	13,718.93	12,891.73	

27. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	49,262.74	39,236.88	48,771.26	45,906.73
June	52,185.48	46,733.60	52,951.30	0.00
July	56,946.69	50,585.30	69,795.25	0.00
August	66,557.39	68,297.79	79,354.00	0.00
September	60,824.88	62,268.53	76,447.45	0.00
October	40,145.49	38,523.93	33,600.61	0.00
November	46,412.29	37,306.14	31,617.76	0.00
December	42,454.07	39,441.58	38,171.83	0.00
January	43,128.50	35,914.50	43,319.39	
February	34,561.35	33,145.82	38,612.40	
March	31,177.33	31,634.42	29,527.05	
April	32,816.66	34,922.97	35,452.98	

28. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	18,382.83	17,693.74	19,265.92	14,829.36
June	24,817.21	16,730.60	19,174.83	0.00
July	25,629.40	11,225.00	13,117.28	0.00
August	23,287.12	18,787.18	21,478.32	0.00
September	29,907.44	34,939.66	32,850.96	0.00
October	21,169.86	23,314.78	18,630.48	0.00
November	17,310.05	15,914.41	13,855.00	0.00
December	19,136.91	16,196.46	15,389.02	0.00
January	19,181.14	15,984.28	17,110.61	
February	18,255.85	16,976.63	17,472.86	
March	17,342.51	17,959.08	16,786.30	
April	17,332.35	18,419.08	12,891.55	

29. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	16,055.51	14,491.73	18,952.91	14,217.78
June	12,736.27	11,180.90	9,861.32	0.00
July	11,699.55	12,105.14	14,196.26	0.00
August	18,497.79	21,061.36	22,492.46	0.00
September	17,615.38	18,535.92	19,875.33	0.00
October	11,399.63	11,963.27	11,039.81	0.00
November	11,657.49	10,199.65	9,817.11	0.00
December	12,310.13	7,764.54	12,087.80	0.00
January	15,044.65	9,565.57	13,171.06	
February	13,781.45	11,355.04	11,944.13	
March	12,128.38	10,297.70	10,873.95	
April	11,238.35	12,414.15	10,891.92	

30. Non-Green School Building - Energy Consumption Cost Data ($)				
Months	2007	2008	2009	2010
May	6,880.60	6,441.77	6,625.55	6,287.39
June	11,258.40	8,960.38	9,859.31	0.00
July	17,800.52	14,351.04	14,760.87	0.00
August	15,897.87	14,542.95	16,503.45	0.00
September	14,786.22	13,440.30	17,054.81	0.00
October	11,653.11	9,452.23	11,128.13	0.00
November	6,954.41	5,541.62	6,233.38	0.00
December	7,113.31	6,084.24	6,064.04	0.00
January	6,753.27	6,258.82	6,060.30	
February	7,160.67	6,229.44	6,569.86	
March	6,151.34	5,958.57	5,915.44	
April	5,971.78	5,331.80	5,325.25	

Summary of the Energy Consumption of 9-Month and 12-Month Schools (KBTU)

Non-Green School Buildings - Energy Consumption (KBTU)					
S. No	Type of School	Area (Sqft)	Average Energy Consumption May 2007 - April 2007 (KBTU)	Average Energy Consumption May 2008 - April 2008 (KBTU)	Average Energy Consumption May 2009 - April 2009 (KBTU)
1	12 month	148,569	582,351.38	548,196.81	527,057.69
2	12 month	62,568	308,764.44	309,597.19	305,914.88
3	9 month	290,219	1,625,156.67	1,490,024.75	1,333,273.17
4	9 month	148,569	673,981.75	843,025.00	669,964.42
5	9 month	54,445	283,367.67	257,750.08	230,853.83
6	9 month	291,779	1,124,808.67	930,776.08	970,036.67
7	12 month	62,568	345,994.31	267,481.25	307,179.50
8	9 month	101,848	441,538.92	352,263.75	402,942.67
9	9 month	53,910	178,174.00	170,632.00	198,628.83
10	9 month	62,879	361,766.42	300,343.42	306,305.42
11	12 month	62,568	273,309.00	252,195.94	246,594.19
12	9 month	123,976	631,125.58	503,052.42	560,009.67
13	9 month	148,569	850,309.17	821,464.92	705,791.83
14	9 month	274,700	1,169,196.83	1,088,353.58	1,148,705.50
15	9 month	50,214	296,532.33	274,313.17	247,546.25
16	9 month	274,700	34,025.45	30,653.72	30,321.16
17	9 month	62,568	311,829.09	287,277.17	285,747.08
18	9 month	60,046	326,455.50	347,606.25	376,620.83
19	9 month	62,568	352,084.00	290,262.50	346,118.92
20	9 month	148,569	733,811.33	747,337.08	715,220.25
21	9 month	148,569	636,591.83	813,608.25	648,384.58
22	9 month	274,700	1,156,829.17	1,119,806.42	1,181,843.58
23	9 month	274,700	1,415,041.42	1,387,000.25	1,277,993.25
24	9 month	62,568	329,227.50	351,202.25	345,706.00
25	9 month	274,700	1,187,061.92	1,075,059.50	1,027,683.00
26	9 month	146,330	653,611.08	593,515.25	560,611.92
27	9 month	217,157	1,767,747.92	1,647,313.17	1,829,083.17
28	9 month	62,568	853,601.83	741,953.17	686,939.50
29	9 month	110,562	524,047.83	419,442.42	540,616.08
30	12 month	52,806	230,250.50	203,194.44	206,150.31

APPENDIX C

CONSTRUCTION DURATION COMPLETION DATA

Green School Buildings Construction Duration

No	Area (Sqft)	Construction Duration (Days)
1	333,160	400
2	62,568	300
3	148,569	N/A
4	62,568	430
5	114,386	N/A
6	62,485	N/A
7	62,568	300
8	148,569	N/A
9	148,569	N/A
10	63,485	N/A
11	62,568	258
12	62,568	N/A
13	62,568	400
14	62,568	N/A
15	148,569	N/A
16	62,568	N/A
17	333,160	300
18	148,569	N/A
19	217,000	280
20	333,160	395
21	62,568	400
22	62,568	540
23	63,485	N/A
24	62,568	300
25	148,569	540
26	62,568	N/A
27	75,226	N/A
28	62,568	N/A
29	148,569	N/A
30	62,568	N/A

Non-Green School Buildings Construction Duration

No	Area (Sqft)	Construction Duration (Days)
1	148,569	400
2	62,568	300
3	290,219	N/A
4	148,569	430
5	54,445	N/A
6	29,177	N/A
7	62,568	300
8	101,848	N/A
9	53,910	N/A
10	62,879	N/A
11	62,568	258
12	123,976	N/A
13	148,569	400
14	274,700	N/A
15	50,214	N/A
16	274,700	N/A
17	62,568	300
18	60,046	N/A
19	62,568	280
20	148,569	395
21	148,569	400
22	274,700	540
23	274,700	N/A
24	62,568	300
25	274,700	540
26	129,180	N/A
27	217,157	N/A
28	146,330	N/A
29	110,562	N/A
30	52,806	N/A

APPENDIX D

HISTOGRAMS FOR THE ASSUMED ANOVA TEST

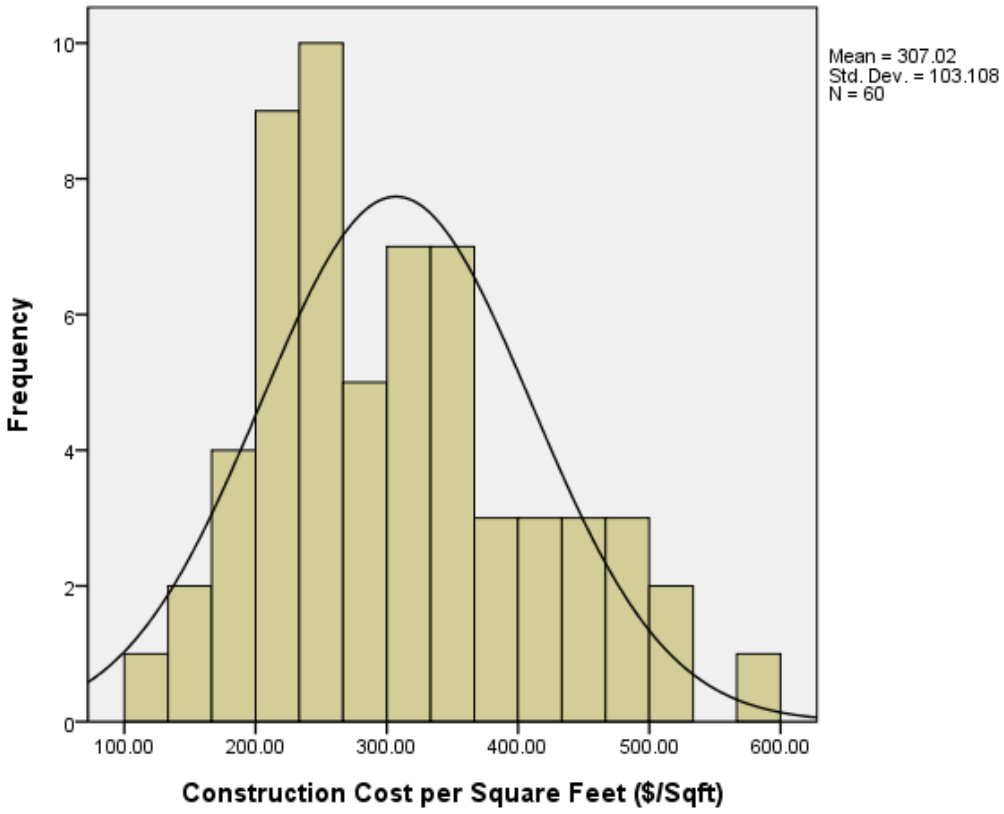

Figure 4.5.1: Histogram for the Construction Cost per Square Feet of all school buildings ($/Sqft)

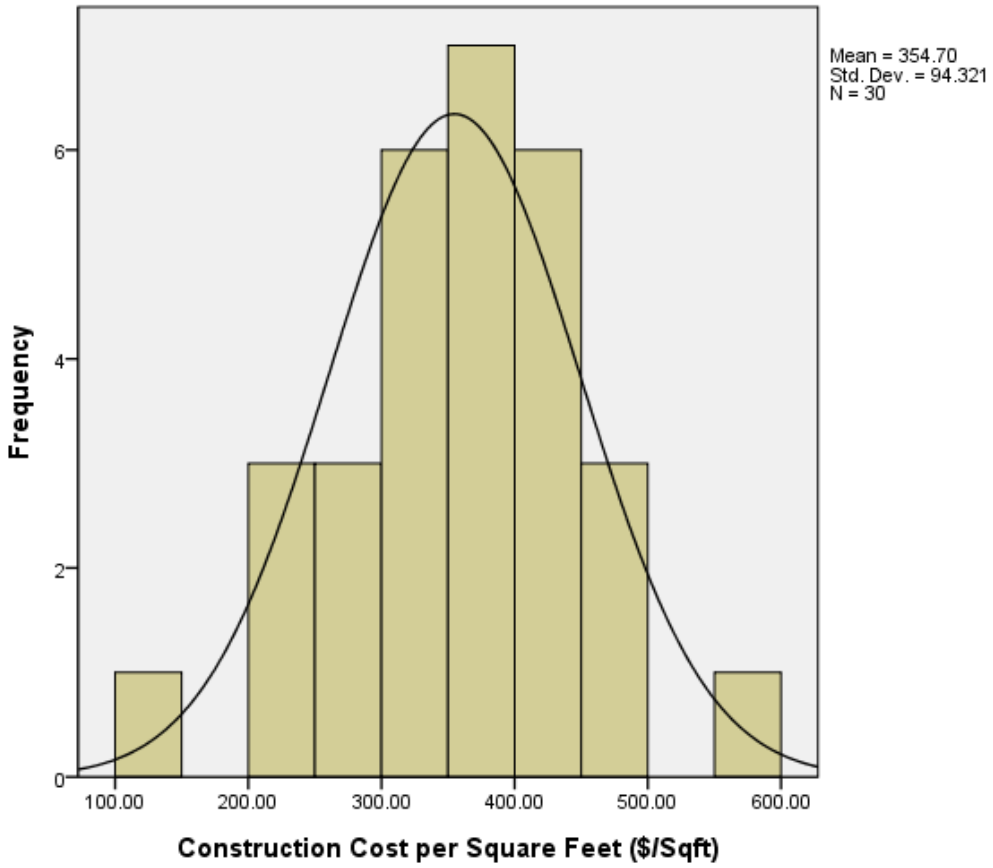

Figure 4.5.2: Histogram for the Construction Cost per Square Feet of Green School Buildings ($/Sqft)

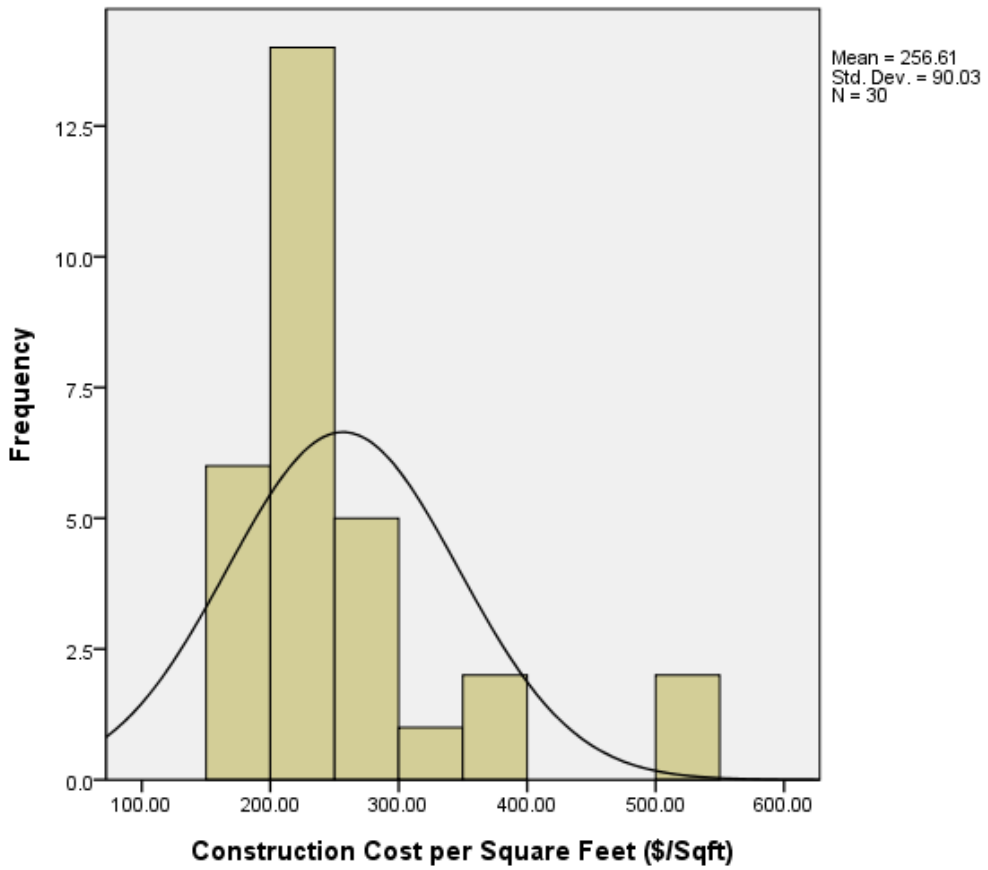

Figure 4.5.3: Histogram for the Construction Cost per Square Feet of Non-Green School Buildings ($/Sqft)

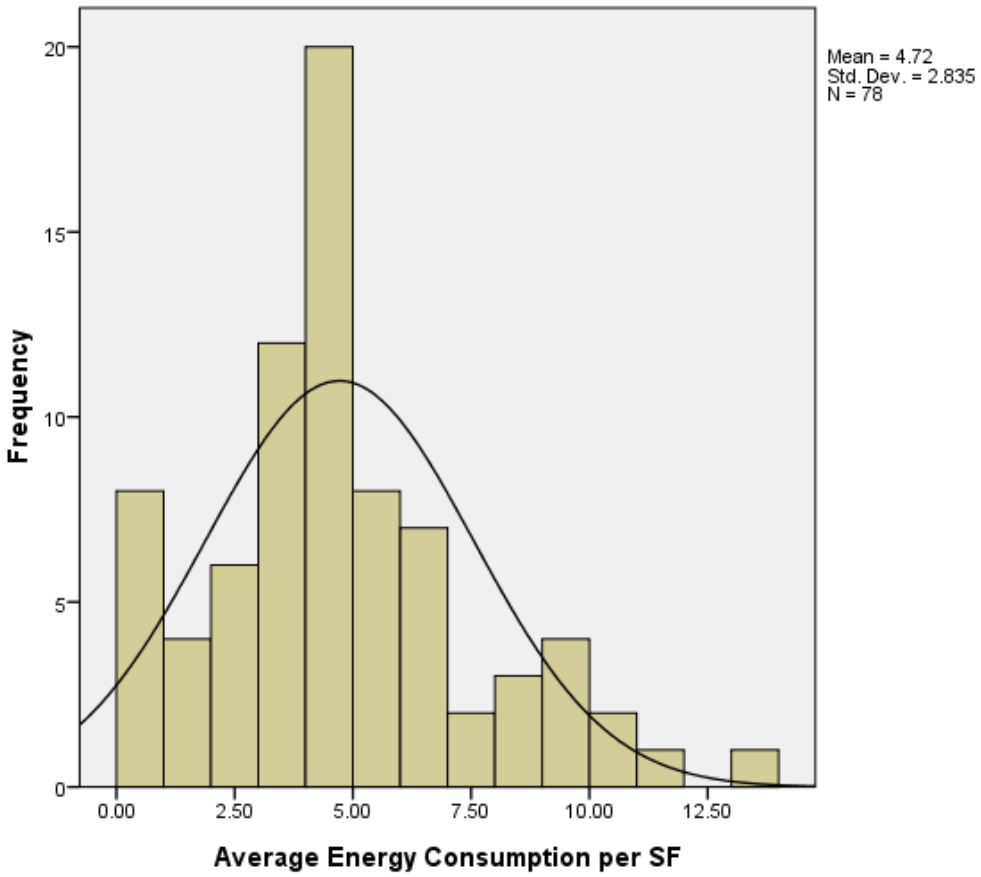

Figure 4.5.4: Histogram for the Average Yearly Energy Consumption per Square Feet of all school buildings (KBTU/Sqft)

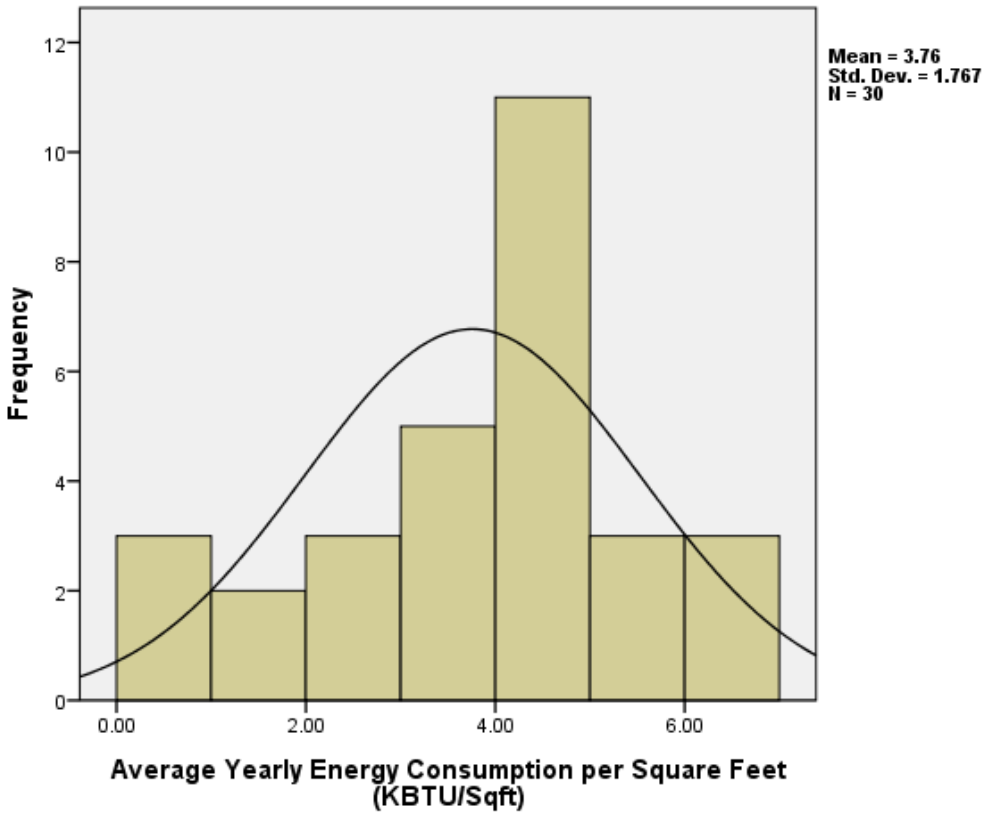

Figure 4.5.5: Histogram for the Average Yearly Energy Consumption per Square Feet of Green School Buildings (KBTU/Sqft)

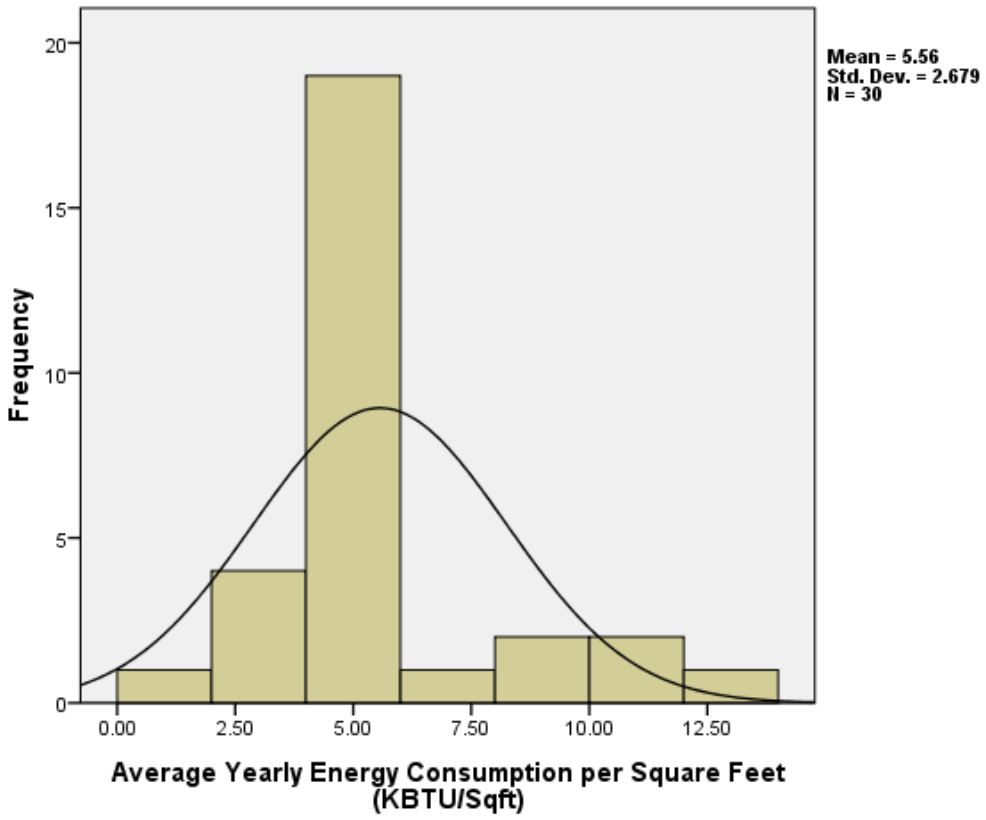

Figure 4.5.6: Histogram for the Average Yearly Energy Consumption per Square Feet of Non-Green School Buildings (KBTU/Sqft)

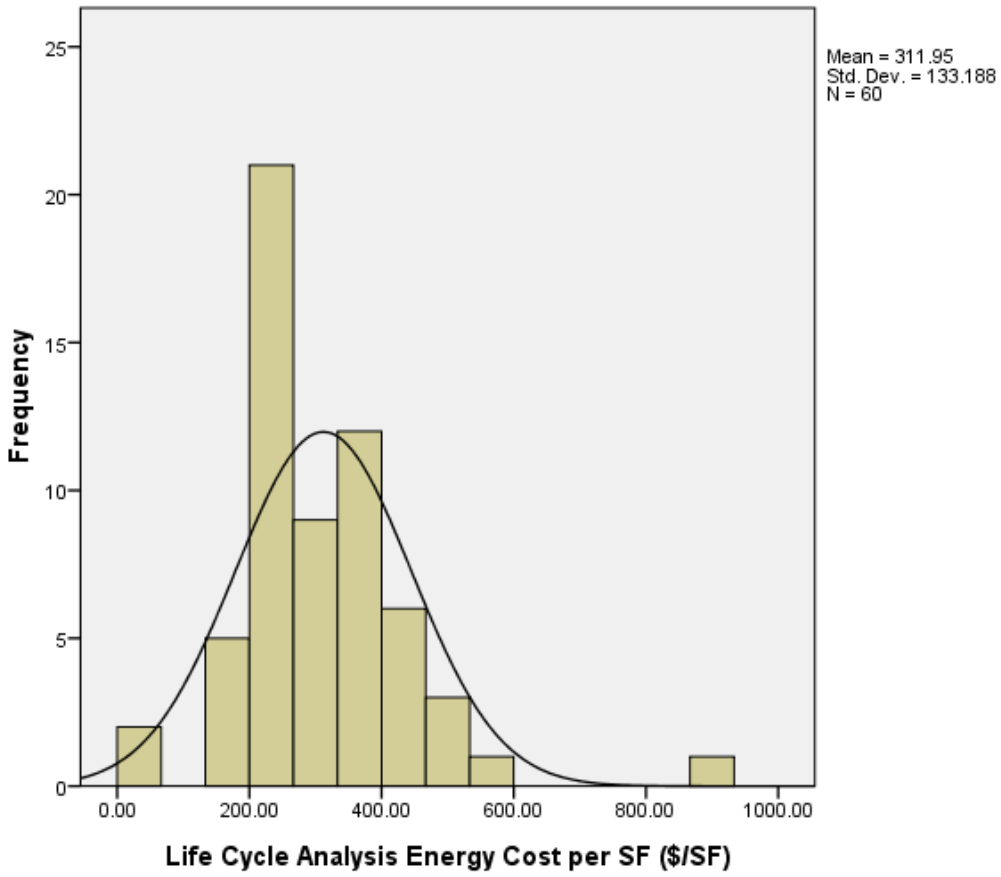

Figure 4.5.7: Histogram for the Life Cycle Cost per Square Feet of all school buildings ($/Sqft)

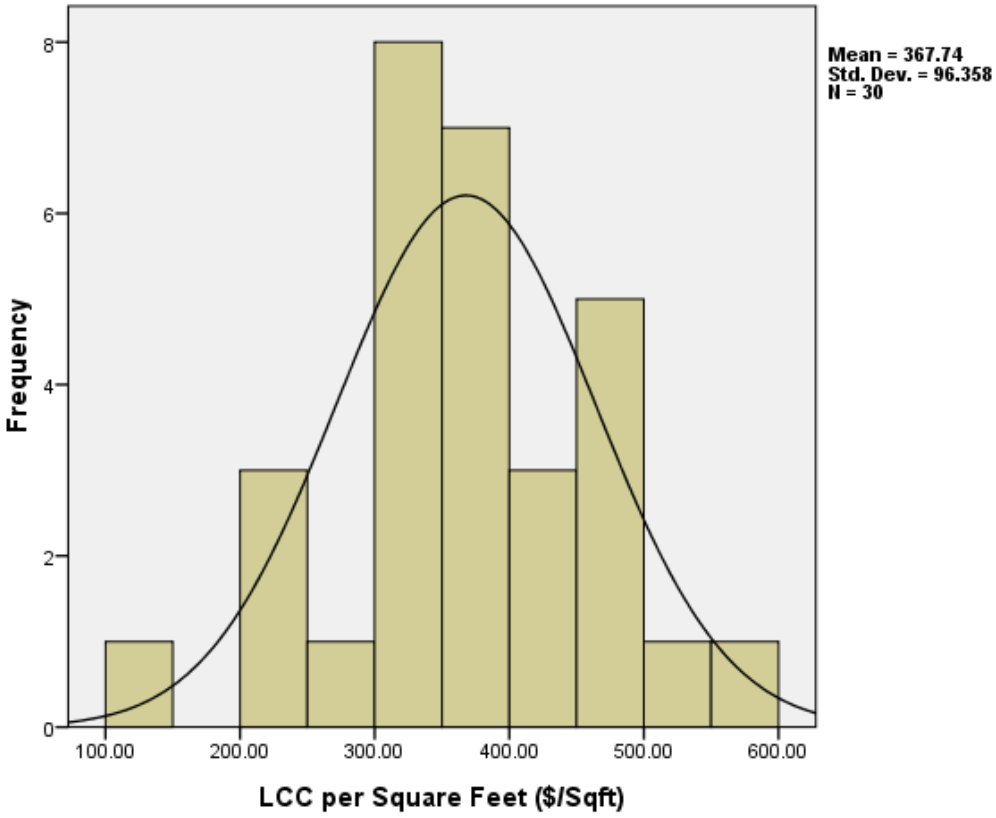

Figure 4.5.8: Histogram for the Life Cycle Cost per Square Feet of Green School Buildings ($/Sqft)

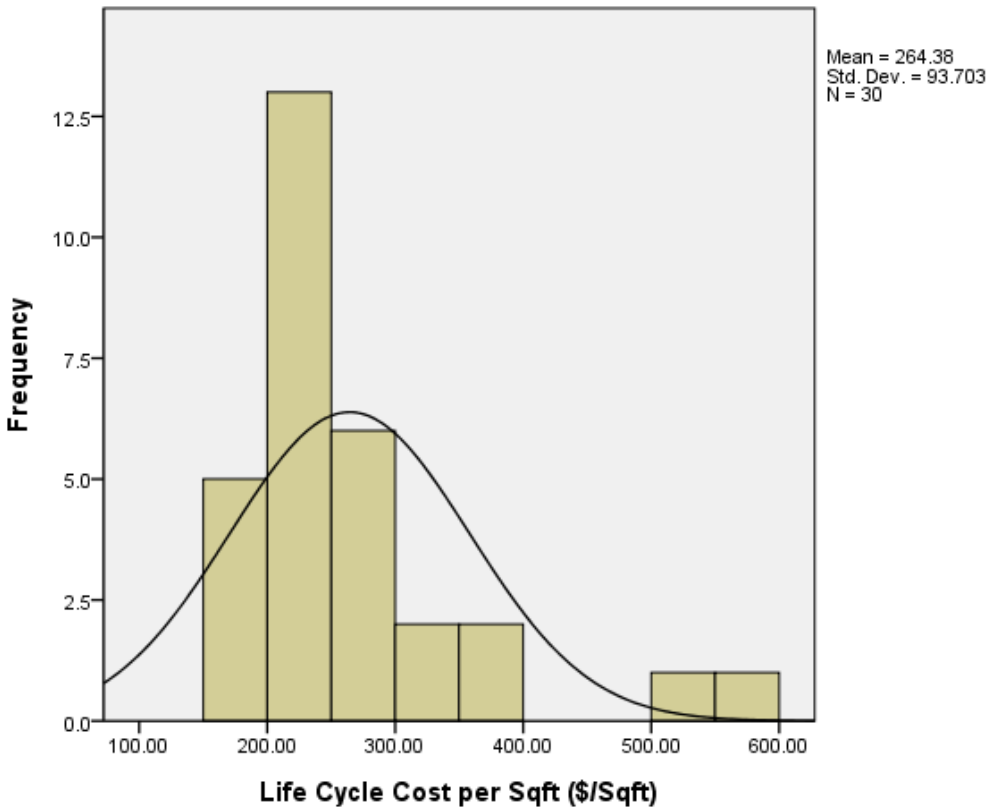

Figure 4.5.9: Histogram for the Life Cycle Cost per Square Feet of Non-Green School Buildings ($/Sqft)

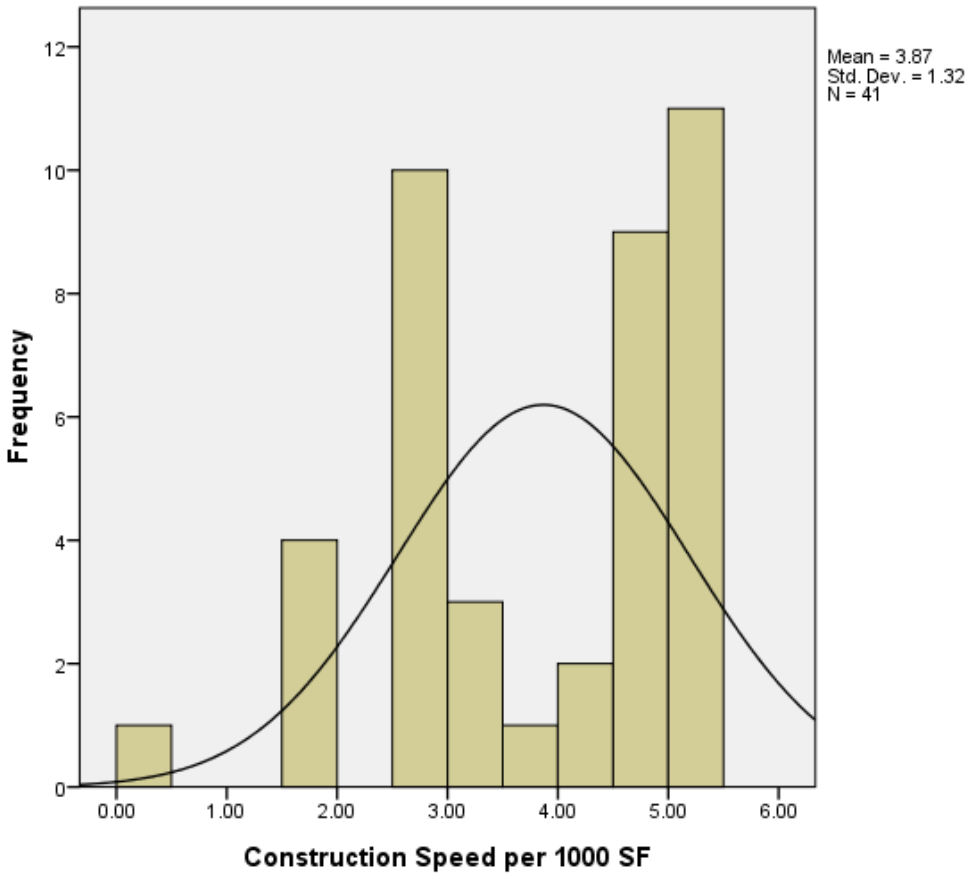

Figure 4.5.10: Histogram for the Construction Speed per 1,000 Sqft (days/1,000 Sqft)

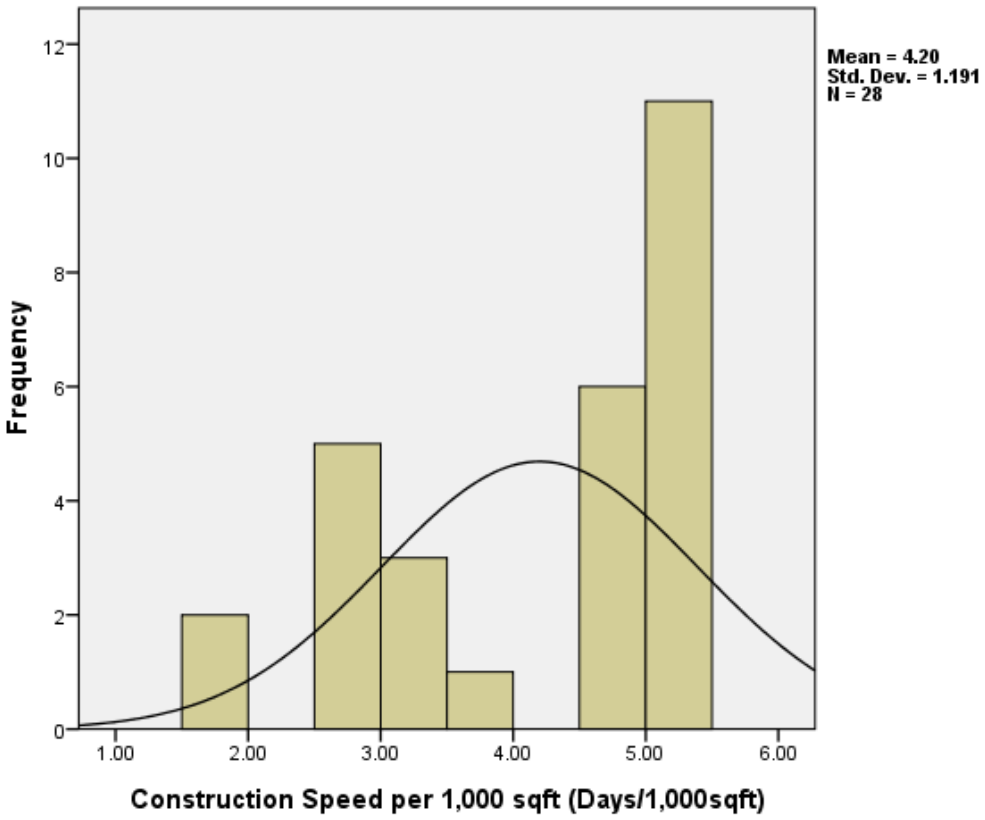

Figure 4.5.11: Histogram for the Construction Speed per 1,000 Sqft of Green School Buildings (days/1,000 Sqft)

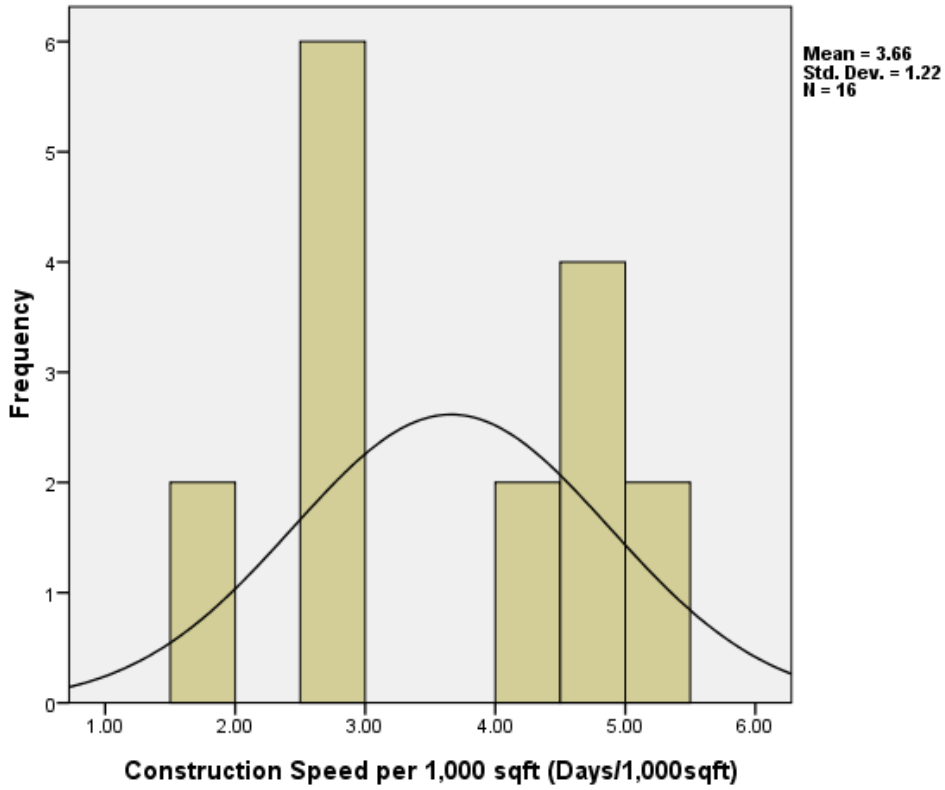

Figure 4.5.12: Histogram for the Construction Speed per 1,000 Sqft of Non-Green School Buildings (days/1,000 Sqft)

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