

**Energy Consumption Assessment  
City of Boston  
50 Buildings Report**



# I. Executive Summary

## Overview

This energy consumption assessment study was commissioned to help the City of Boston make sound decisions relating to the evaluation of an Enterprise Energy Management System (EEMS) to best fit its needs. For this report, 50 of the City's top energy consuming buildings are reviewed. This report discusses the general energy use of each building and compares this data with current analytics based on region, building size, and building use.

Overall summaries of the energy use of each of the 50 buildings, including natural gas, electricity, and water use are provided. Ratings based on the energy consumption are generated from data for the same geographical region to match similar climates. The similar building types are grouped together to obtain a closer review of the buildings compared to one another as well as with data from other locations with similar climates and sizes.

## Results and Recommendations

The buildings reviewed all have higher than average energy consumption and costs when compared to similar building types and sizes for the New England region. Electricity accounts for more than half of the energy used, and usually the biggest end consumer is lighting. Also a significant amount of energy consumed is used for space heating.

A thorough audit of all of the buildings would clarify whether these inefficiencies are due to improper measurement, operational practices, or other causes. An audit of each building would yield more detailed information on how it consumes and develop recommendations for how to reduce its energy use.

At this time it appears that the most significant potential savings involve reductions in the amount of energy required to heat buildings. By performing audits according to the American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) procedures for level 2 audits, various methods can be reviewed to obtain significant energy savings. Under a typical level 2 audit, electrical energy consumption is also reviewed, and the audit results define a magnitude of cost associated with each item. The audits would also yield information on the water and electricity performance of each building and where there might be opportunities for savings.



## II. Document Control

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## 1. Foreword

This report is a rapid and high level assessment of the diverse use of energy across the City of Boston's operations. The City of Boston selected 50 sites which have the highest energy cost to be reviewed. This energy consumption study provides a baseline to assist with analyzing the applicability of various EEMS to best meet the City of Boston's needs. Appendix A shows the 50 sites selected by the City of Boston for evaluation.

The energy consumption was reviewed over a 12 month period that matches the City of Boston fiscal 2011 calendar, starting on July 1, 2010 and ending June 30, 2011. The buildings under evaluation were categorized by their respective department into four categories: Administration, Schools, Public Safety, and Libraries. The facilities were each compared against similar buildings in other cities using square footage, primary building activity, year constructed, region, climate zone, and ownership type. Data and information from the Building Owners and Managers Association (BOMA) as well as Commercial Buildings Energy Consumption Survey (CBECS) were employed to categorize and compare each of the buildings in this report.

### 1.1 Building Assessment and Benchmarking

#### **Introduction**

With energy costs rising, and public interest in de-carbonizing the economy increasing, optimizing the energy efficiency and the ecological impact of various buildings and facilities is a top priority. A standard energy audit will evaluate mechanical systems, HVAC equipment, office space and building automation system to determine if they are operating efficiently, if they are properly sized for the application, and if there are opportunities to replace or upgrade equipment with more efficient solutions that demonstrate a feasible return in investment through thermo-economic analysis. Analysis process will also identify a prioritized list of Energy Conservation Measures (ECM's) that will allow a building to run more efficiently. This could include retro-commissioning and upgrades of the mechanical/electrical and building automation systems, as well as replacement of equipment such as lighting, chillers, controls, heat pumps and boilers based on results of the audit.

The Standard Facility Energy Audit Service follows a four-phase process for capturing, analyzing, data reporting, and presentation of strategies and recommendations.

#### **Defined Terms:**

**Energy Use Intensity (EUI)** – Also known as site energy, Energy Use Intensity is



one of the most common ways to compare energy consumption amongst buildings. This metric includes twelve months of utility consumption data in units of kWh or kBtu, divided by the total square footage of the facility.

**Energy Cost Index (ECI)** – Potential to reduce energy costs is a prime motivator for investment in energy efficiency upgrades. This metric includes twelve months of utility costs, divided by the total square footage of the facility. Energy Cost Index is a simple way to normalize and compare how much it costs to operate each of building.

**Energy Cost per Occupant** – Another excellent way to compare the cost of operations and maintenance at buildings is by occupant/resident. This metric includes twelve months of utility costs, divided by the number of residents/occupants in a given facility. Occupancy is a major driver of energy use, and having this reduces the complexity when comparing other buildings to national averages.

## The Finances

Although benchmarking does not necessarily tell you directly what specific equipment or building features need to be improved, or how much it will cost to make the improvements, it can help you determine the general magnitude of the opportunities available and on which buildings/facilities to focus. Comparing the energy performance of your buildings portfolio is the first step toward improving performance, saving money and reducing emissions. Energy efficiency equipment upgrades and operations improvements can have a dramatic financial impact on any property. Energy savings can be realized by taking the implementing conservation measures in the targeted buildings. Benchmarking and tracking can help detect any system issues in the building whether they are plumbing, mechanical or electrical since these issues can lead to high and unnecessary spikes in the energy bills. Tracking energy use via benchmarking can prevent these issues and spikes from getting out of hand and effectively correct any problem areas before they become worse and add up to sizable costs.

It's a growing trend for cities to mandate energy tracking and benchmarking. In the USA, twenty-one states already have or are actively considering a building energy disclosure ordinance. Similar trends globally are also apparent.



## 1.2 Data Sources

The data for the assessments was taken from several sources. The difference sources were used to verify the values as well as fill gaps and make corrections as needed. The data came from the following:

- City of Boston
  - Mass Energy Insight (natural gas and electric use and billing)
  - City Personnel (building information such as area, age, and students; fuel oil use; etc.)
- National Grid (natural gas utility)
- NSTAR (electric utility)
- Boston Water and Sewer Commission (water utility)

From the 50 buildings selected by the City of Boston, the buildings were then compiled per department and the data for each was determined on a monthly cycle. In some cases the data was absent, in which the total for the year was used. Where discrepancies existed between sources, the data from the utility was used.

## 1.3 Building Categories

The 50 buildings have been reviewed according to four main categories: Size, Principal Building Activity, Climate Zone, and other Government-owned buildings. Additionally for schools, the amount of energy consumed per student is also compared.

It should be noted that there are three different metrics used for comparison: kilowatt hours (kWh), thousand British thermal units (kBtu), and gallons of water. The electricity consumption is shown in kWh while the natural gas is shown with kBtu; this was to show the overall use comparisons with the same units for the energy being consumed. The units can be interchanged and have a conversion factor of 3.412 kBtu per kWh. Water is shown in gallons.



### Building Size

The national average energy use is broken into eight categories as shown on Table 1. Each building fits into a category that is used for comparison.

		National Average	
		Electric kWh/SQFT	Natural Gas kBtu/SQFT
Building Floor space (SQFT)	1,001 to 5,000	17.8	81.1
	5,001 to 10,000	12.4	56.5
	10,001 to 25,000	10.5	43.9
	25,001 to 50,000	12.2	42.7
	50,001 to 100,000	13.1	36.5
	100,001 to 200,000	15.7	37.5
	200,001 to 500,000	15.0	36.1
	Over 500,000	19.0	44.3

**Table 1: Building Size and Average Energy Use**

### Principal Building Activity

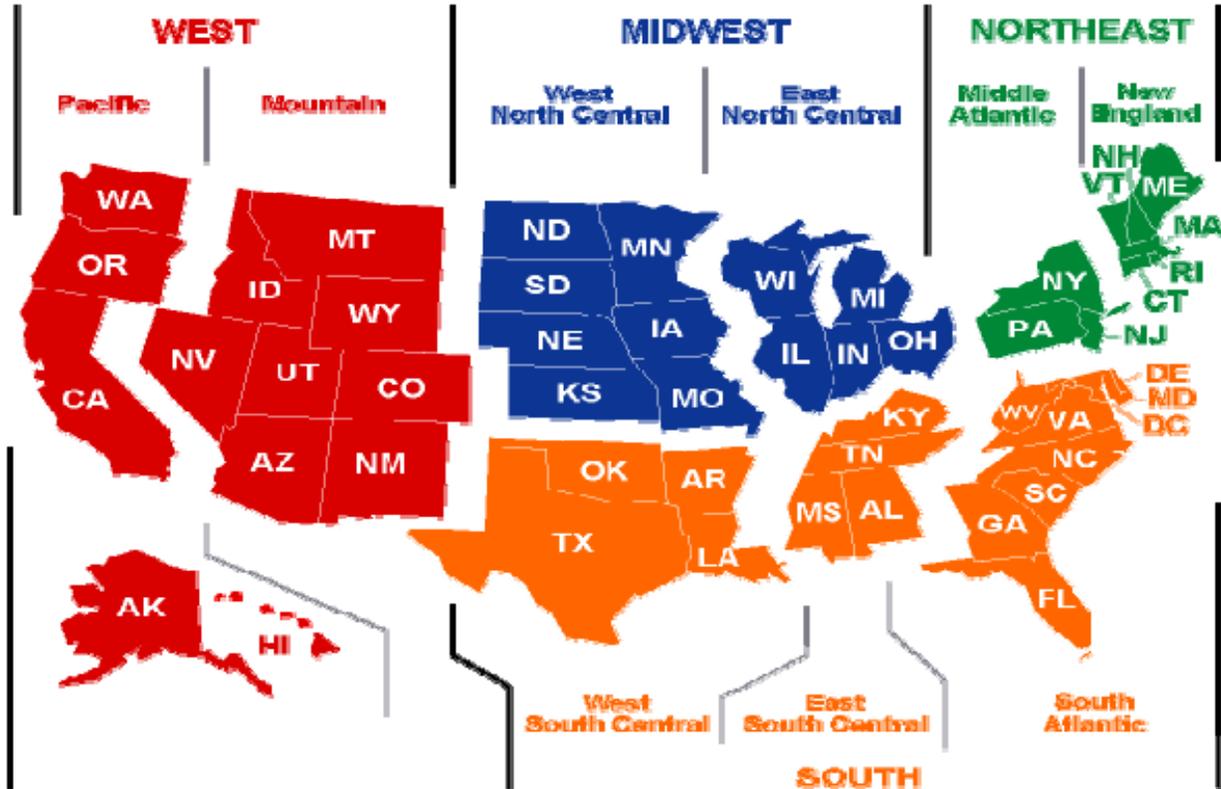
The principal building activity represents the department to which each building belongs. This comparison provides a closer review for each building as it relates to others with the same primary function. Table 2 provides the national averages based on the applicable principal building activity along with the corresponding department.

		Department	National Average	
			Electric kWh/SQFT	Natural Gas kBtu/SQFT
Principal Building Activity	Education	Schools	11.0	38.1
	Office	Administration	17.3	32.8
	Public Assembly	Administration	12.5	37.5
	Public Order and Safety	Public Safety	15.3	45.0
	Other	Libraries	22.5	69.7

**Table 2: Principal Building Activity and Average Energy Use**

### Region and Climate Zone

The Commercial Buildings Energy Consumption Survey (CBECS) provides climate zone and region comparisons from information collected from buildings in the United States. The regional areas are categorized by state and are shown in Figure 1 below.



**Figure 1: Map of United States Regions per CBECS**

The climate zones are groups of climate divisions defined by the National Oceanic and Atmospheric Administration (NOAA), which are regions with a state that are climatically homogeneous. A 30-year average of heating degree-days (HDD) and cooling degree-days (CDD) is given for each of the categories to match is most closely with similar climates. The HDD and CDD are measures of how cold and hot a location was, respectively, over a period of time relative to a base temperature of 65 degrees F. The map of the climatic zones, Figure 2, shows that the City of Boston lies within climatic zone 2.

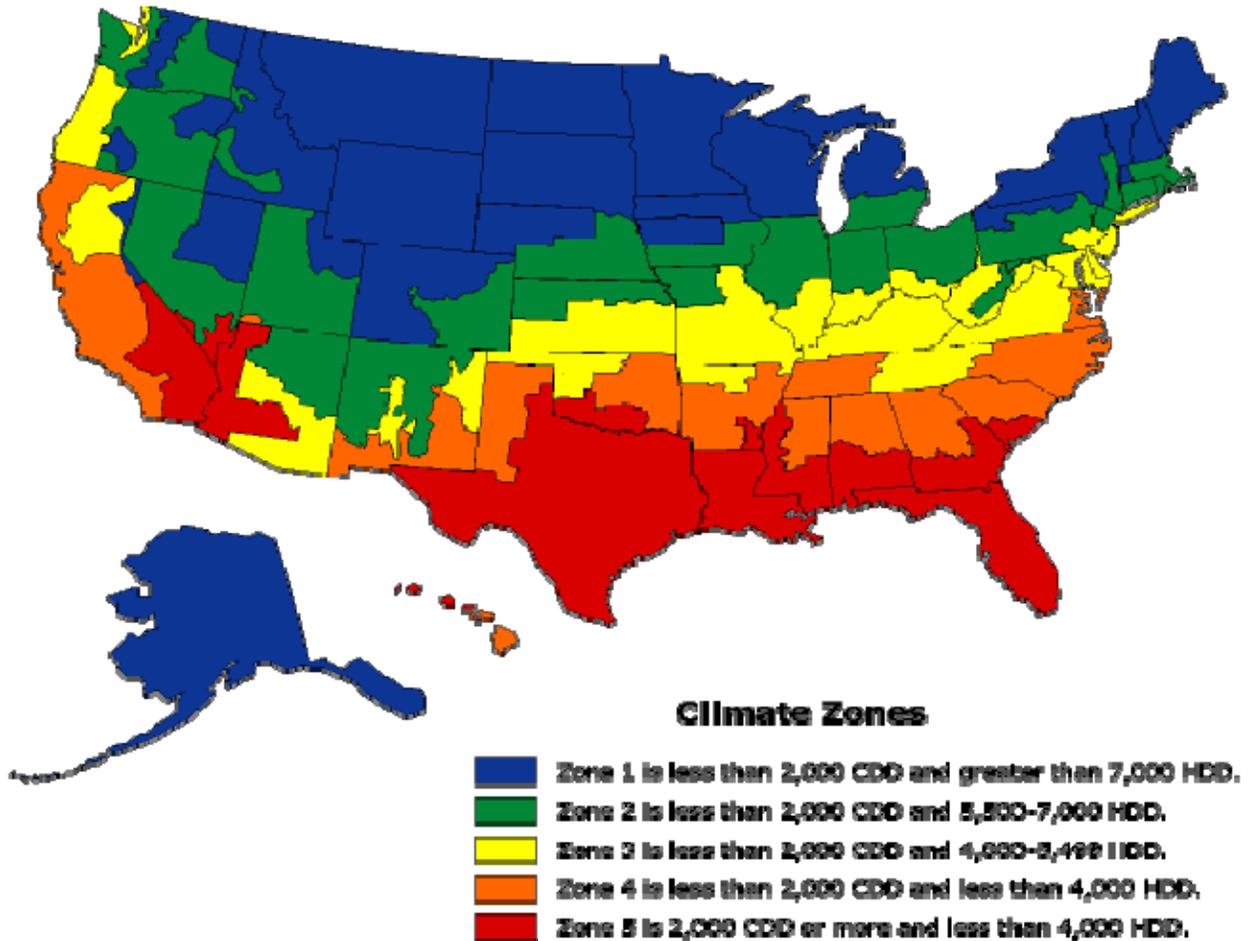


Figure 2: Map of United States Climatic Zones

### Government Buildings

Comparisons are also made with the national average energy use of government buildings, including federal, state, local, and the averaged total.

		National Average	
		Electric kWh/SQFT	Natural Gas kBtu/SQFT
Government Owner	Government Total Average	14.1	41.9
	Federal	19.7	32.4
	State	15.8	40.4
	Local	12.3	43.9

Table 3: Government Ownership and Average Energy Use



## Students

For the schools, the additional information on average energy expenditures per student is compared against the same metric for the City of Boston schools. Since 35 of the 50 buildings with the highest energy costs are schools, this is an important metric to review.

### 1.4 Summaries

Each building is provided with a summary of general observations on the electricity and natural gas consumption. Recommendations based on the energy use data and other factors are also provided.



## 2. Department Energy Consumption Assessments

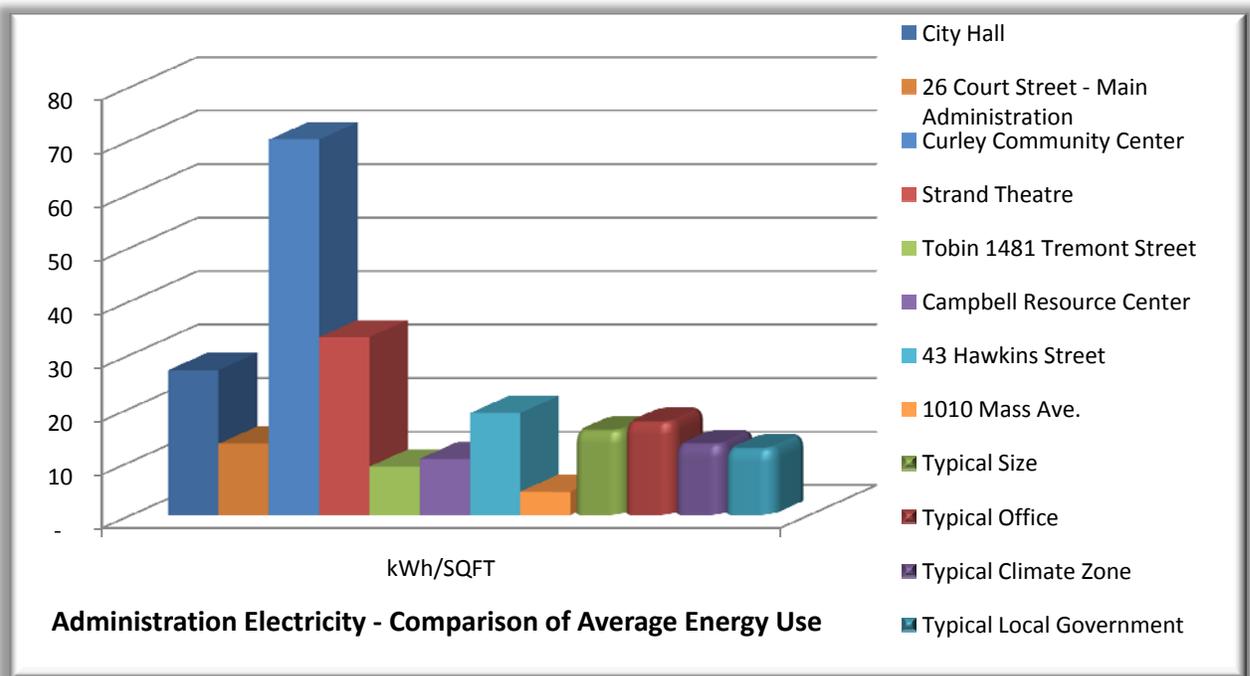
The buildings under review have been categorized per department and an overarching assessment for each department is provided here.

### 2.1 Administration (8 buildings)

For this report there are eight buildings under the Administration department. The group of administrative buildings yielded the most diverse energy use per square foot. While most are occupied primarily with offices, several are utilized for other purposes. The amount of heating required for City Hall and the Curley Community Center indicate that there are possibly significant deficiencies that may be corrected with more thorough examination. For all of the buildings there are potential opportunities to save energy by conducting an audit to understand whether these inefficiencies are due to improper measurement, operational practices, system aging, or other causes. Further details for the administration buildings can be found in the individual building reports in sections 3.1 to 3.8 and Appendix B in section 6.

#### Electricity Consumption

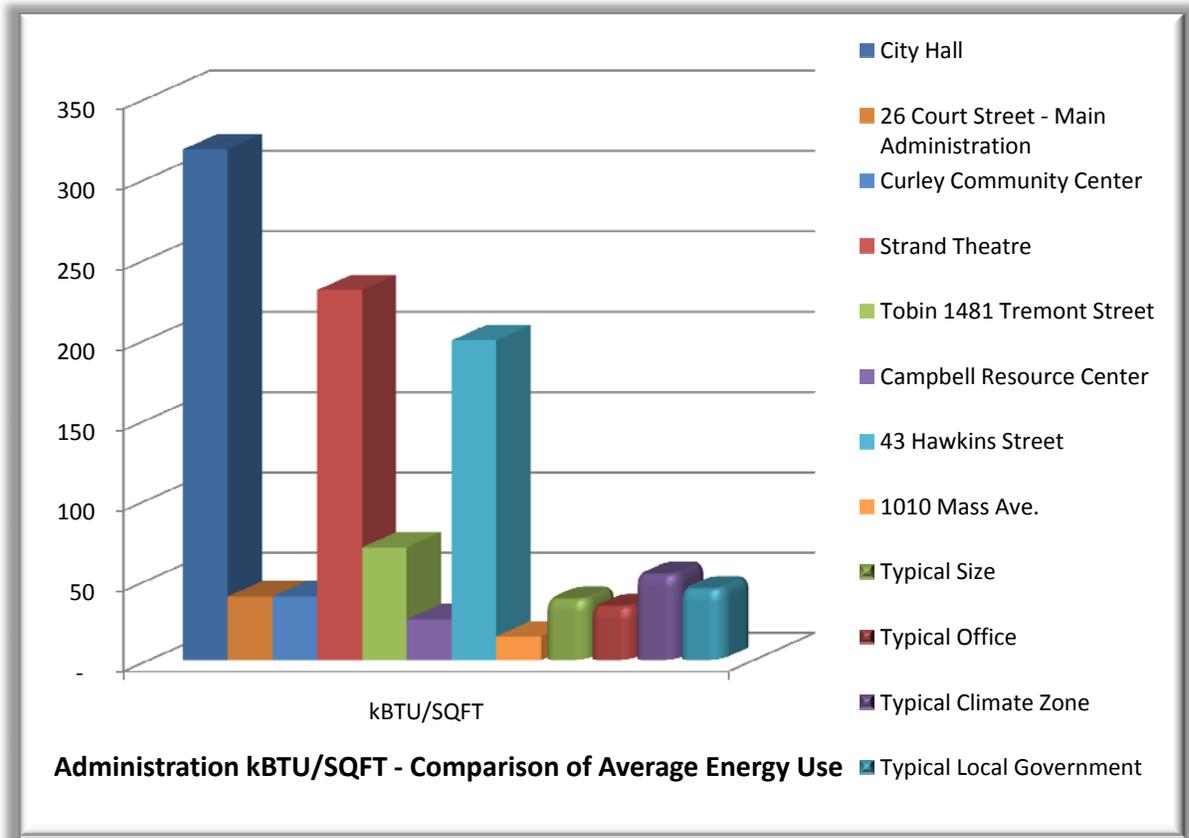
The average amount of electricity that the Administration buildings consume is among the most significant in the City portfolio. City Hall, for example, consumes 40% more electricity than the next largest electricity consuming building. This total average is greater than the averages for similar buildings.





### Natural Gas & Steam Consumption

The Administration buildings consume natural gas and steam for heating and other purposes. These values have been translated from pounds of steam and therms of natural gas to the common value of kBtu. The average value for the Administration buildings is high due to City Hall consuming a great amount of steam energy. Audits at these buildings can reveal more about how this considerable amount of energy is being consumed.

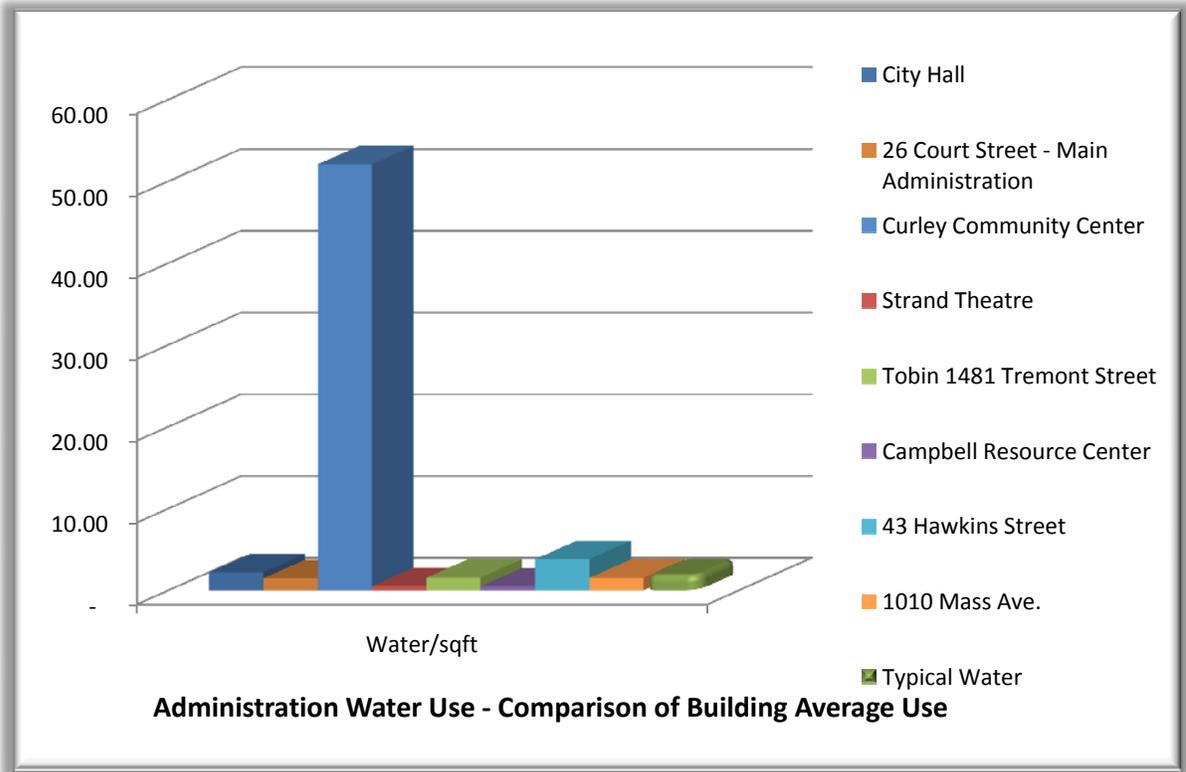


### Water Consumption

The water consumed by the Administration buildings is about the same as the typical average for office spaces, with one exception: the Curley Community Center uses far more than the other buildings. By converting the average to achieve the same units, the baseline for the water comparison is 1.84 cubic feet per square foot. The other buildings in this category range from 0.48 (Campbell Resource Center) to 3.80 (43



Hawkins Street). While there may be an explanation behind this water use, such as a pool, it may be that the building needs further investigation to save water.





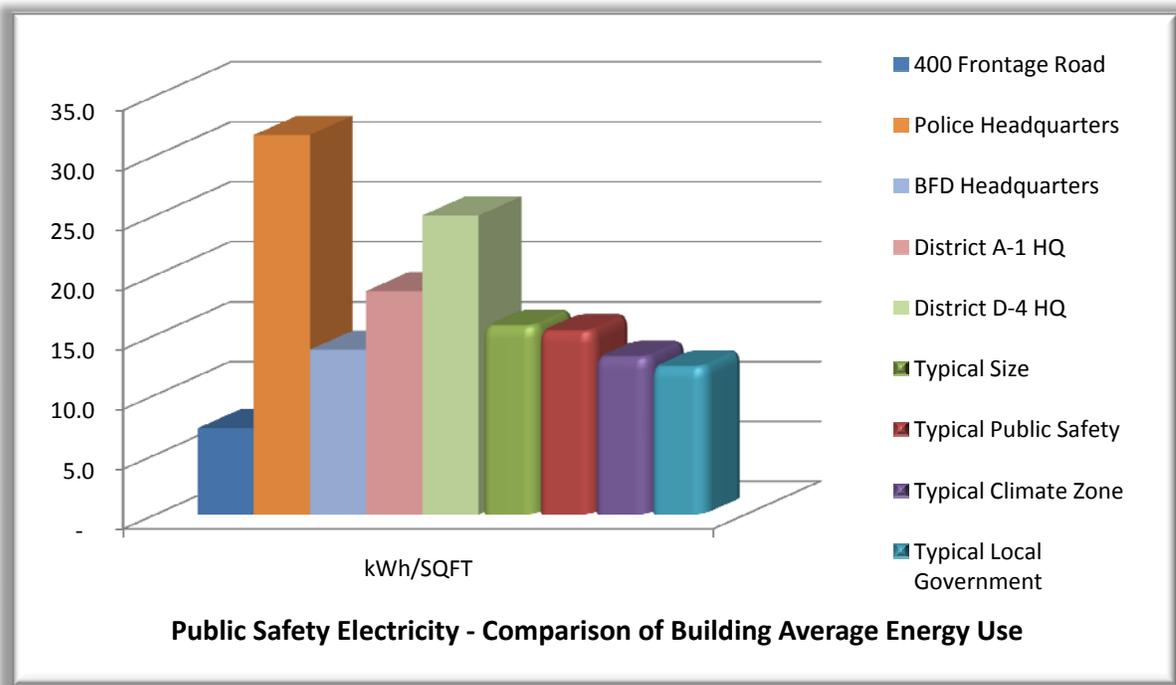
## 2.2 Public Safety (5 buildings)

Five of the Public Safety buildings were among the 50 buildings with the highest energy costs for the City of Boston. As with the other buildings, the Public Safety buildings consumed a lot of energy, likely for heating. This was shown with higher than average natural gas consumption for all five of the buildings. With the public safety buildings, energy consumption is often ignored as compared with emergency preparation and response. Performing an audit on these buildings may yield the need for activity change among the occupants as much as other improvements to save energy.

Further details for the public safety buildings can be found in the individual building reports in section 3.9 to 3.13 and Appendix C in section 6.

### Electricity Consumption

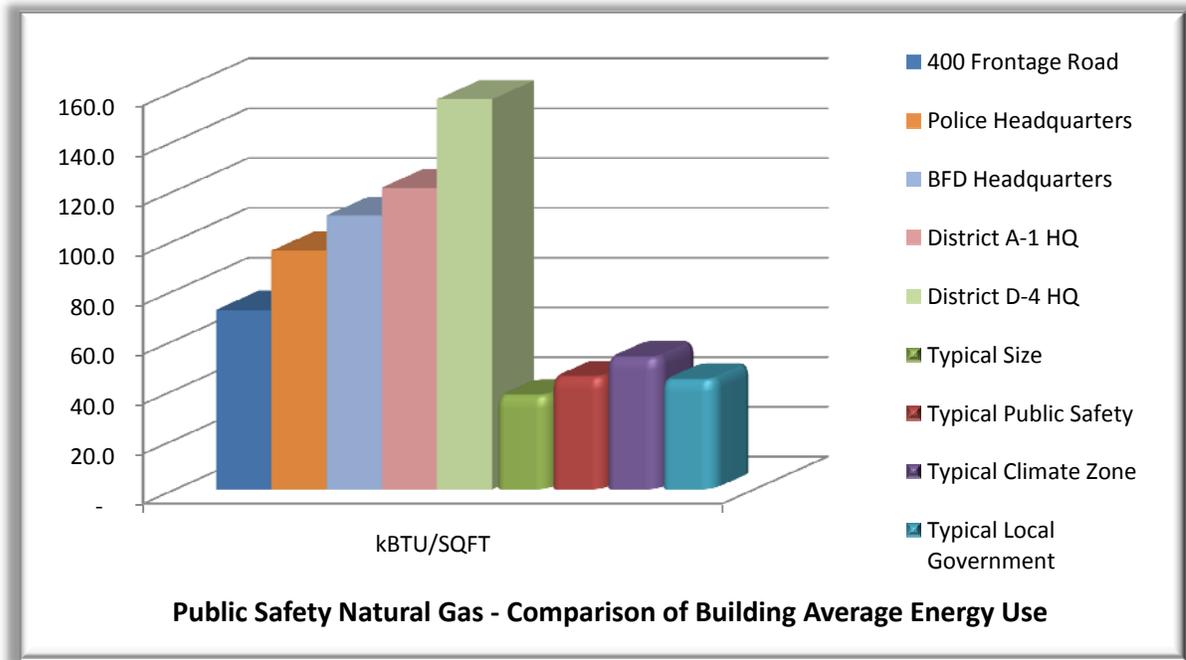
The public safety buildings that were reviewed have a total average energy consumption of about 15 kWh per square foot, which is similar to other buildings in the same categories. However, most of the buildings in this category are above average while 400 Frontage Road has a much lower consumption.





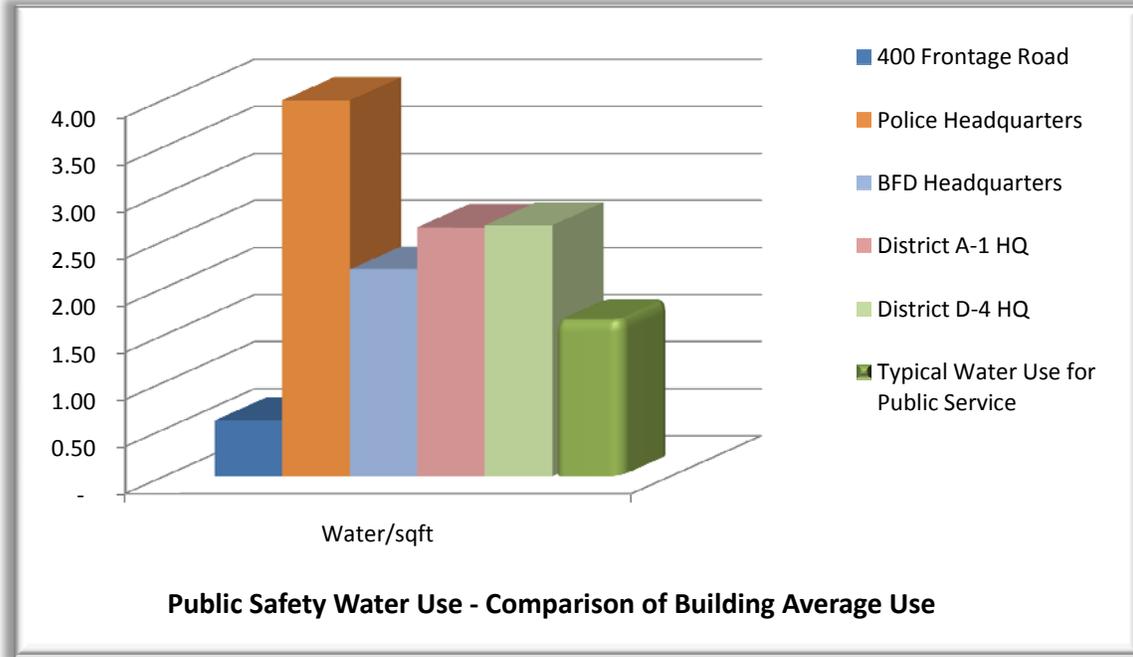
### Natural Gas Consumption

All of the buildings reviewed in the Public Safety category consumed over 70 kBtu per square foot, with the highest being over 150 kBtu per square foot. The highest of the typical categories was 52.8 kBtu per square foot. Overall each of these buildings could be targeted with audits to yield energy savings.



### Water Consumption

For the Public Safety buildings, the water use is higher than average when compared with the average use. 400 Frontage Road uses less, although this may be due to the building being used primarily for other purposes, such as office space or storage. The water use at the other buildings may be reduced by performing an audit to see how this resource is expended.





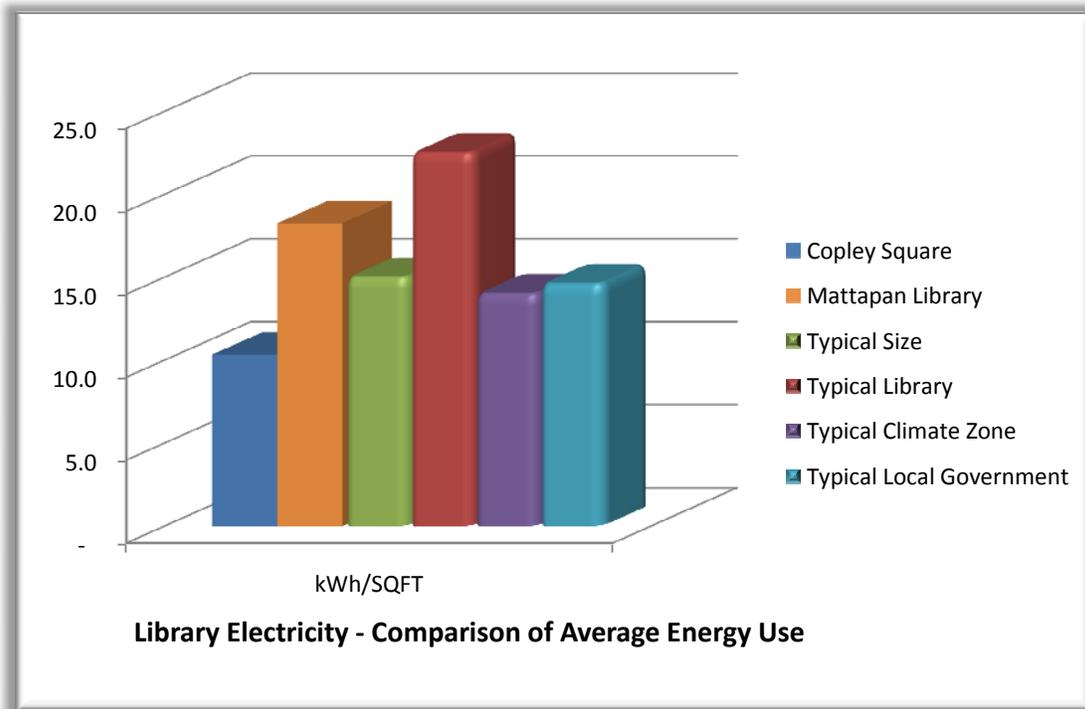
## 2.3 Libraries (2 buildings)

The remaining two buildings that are highest in energy consumption for the City are the Mattapan and Copley Square Libraries. While more than a century separates the construction of the two facilities, they each have significant heating demands. Copley’s heat is currently supplied by steam from a central plant, and it may be that the existing, older system should be replaced to increase efficiency significantly. Mattapan, a much newer building, has a significant amount of exterior glass that may play an important role in the amount of energy consumed.

Further details for the two library buildings can be found in the individual building reports in section 3.14 and 3.15 and Appendix D in section 6.

### Electricity Consumption

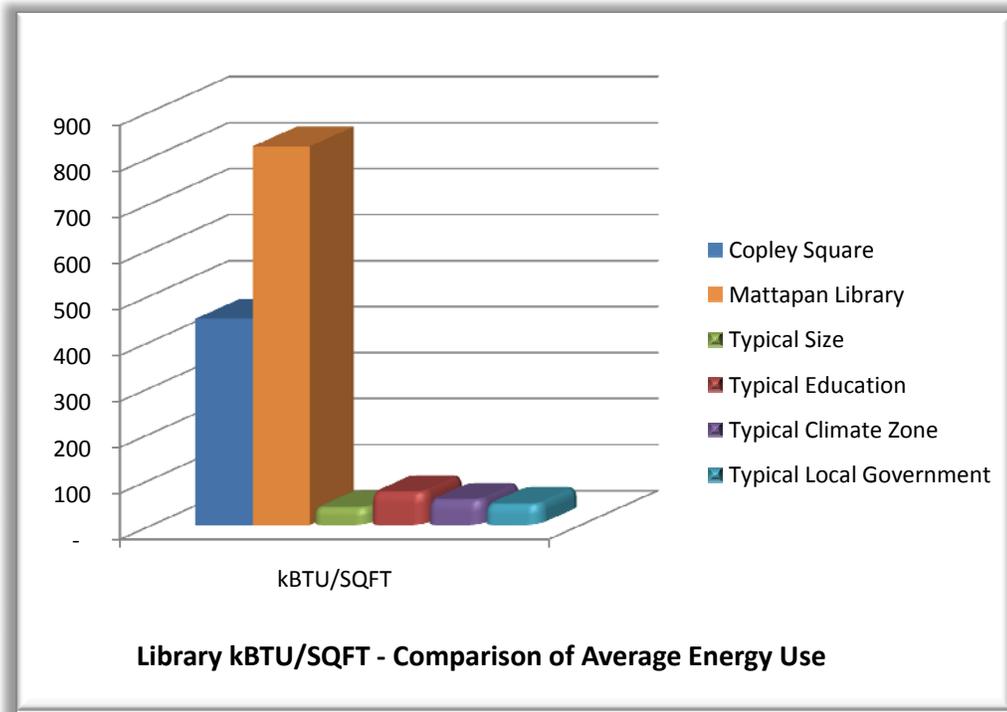
The two Library buildings that were reviewed for this report show a lower amount of electricity consumption. This is a positive sign that the City may be using lighting control measures, such as motion detection, to reduce the amount of lighting energy required. Documenting these electricity savings measures can help to improve the City’s other libraries and possibly other buildings with the same electricity saving methods.





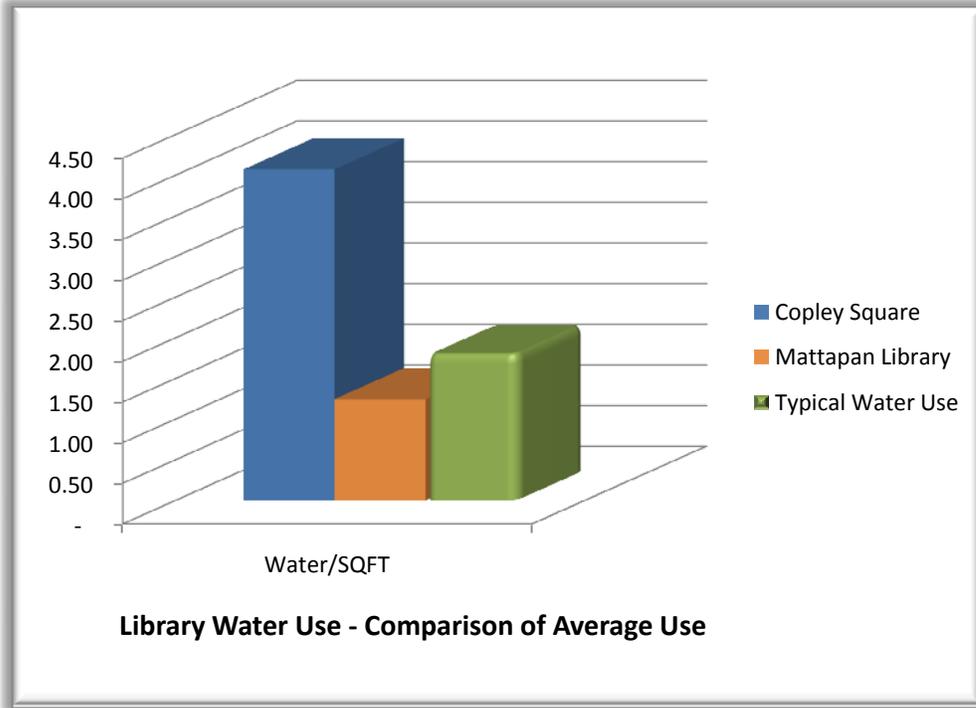
### Natural Gas Consumption

The two libraries consume an exceptional amount of natural gas, presumably for heating purposes. An audit could be conducted to more closely understand why two buildings of such different sizes and ages can both have high energy use.



### Water Consumption

The water use of the two Library buildings performed differently. The older building, Copley, had a much higher water use, and was about twice as high as the average for comparison. It may be due to inefficiencies in the building, process water for cooling, or other reasons. An audit of the Copley Library should be able to determine the reason for the high water use and propose means of reduction.





## 2.4 Schools (35 buildings)

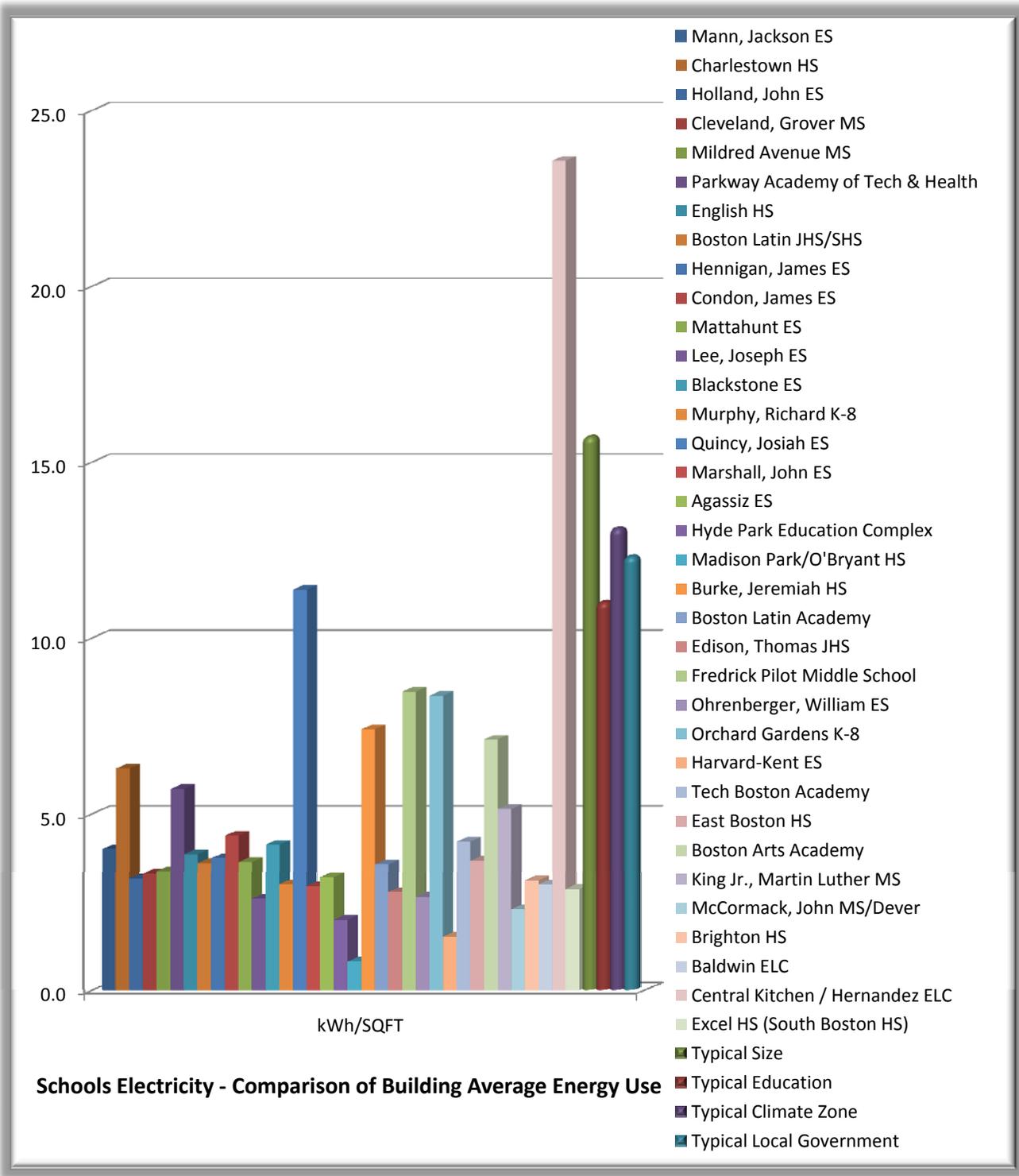
The largest group of buildings under consideration for this report are the School buildings. The School buildings have among the highest energy costs for the City. Although the schools had a higher energy cost, the electrical energy use was found to be within the approximate ranges of average schools for the region. While the electricity costs were generally found to be within the expected average, the natural gas energy consumption was typically higher than average. It was understood that there were discrepancies with the utility over the amount of natural gas used at some sites; however these differences are marginal when compared with the average use data.

As with the administrative buildings above, the amount of energy use can likely be reduced with investigative audits to determine probable losses at each building.

Further details for the School buildings can be found in the individual building reports in section 3.16 to 3.50 and Appendix E in section 6.

### **Electricity Consumption**

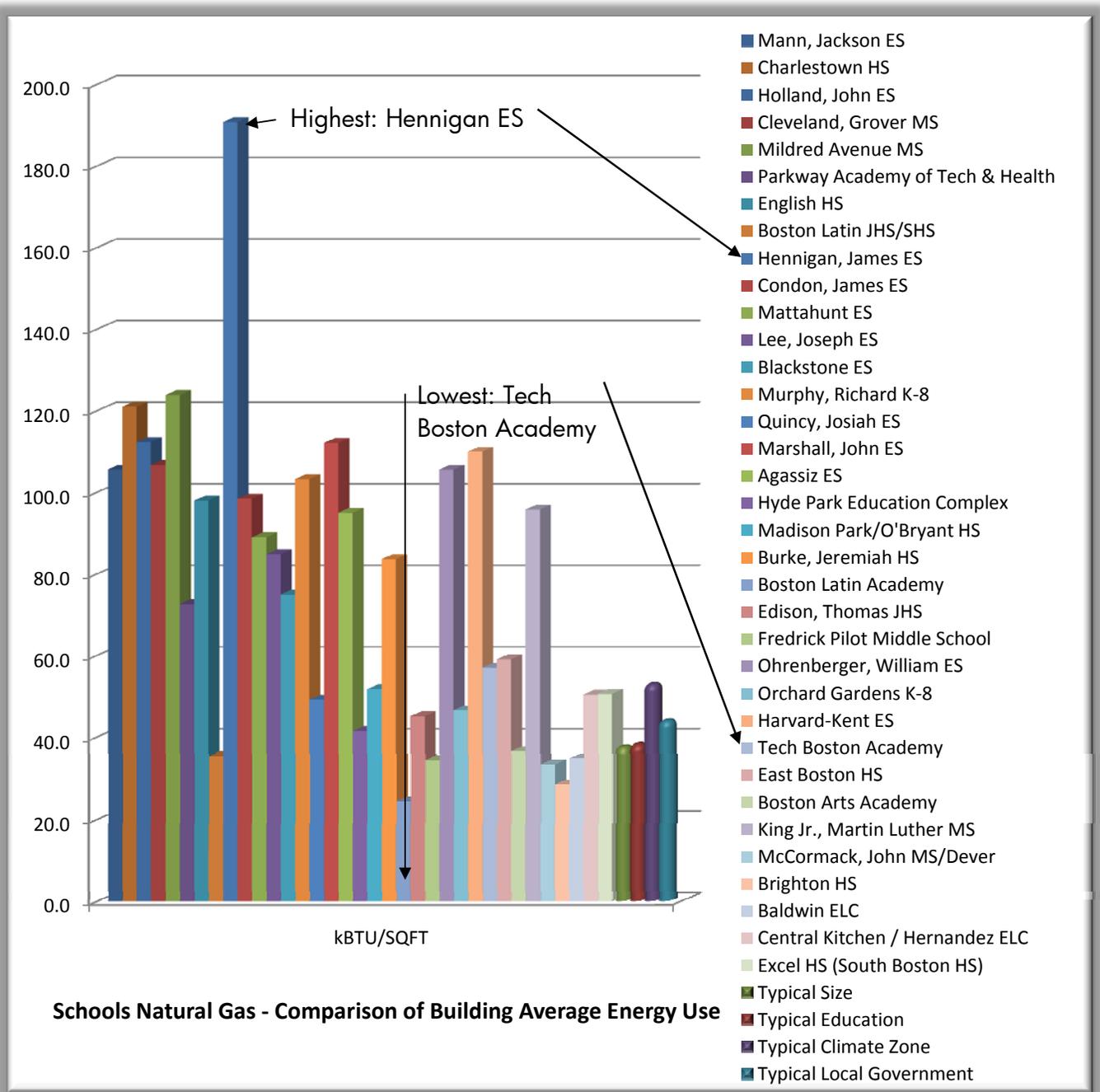
The many School buildings that were reviewed have an average electricity consumption that is less than the average use by comparison. This is likely due to the City of Boston having limited use of the schools all year, as the electrical load profiles suggest. Without a high electricity demand for cooling during the peak summer months, the kWh per square foot average is lower. Compiling and studying the actual load profiles for these buildings may also show that there are other contributing factors to reducing the electrical energy consumption.





### Natural Gas Consumption

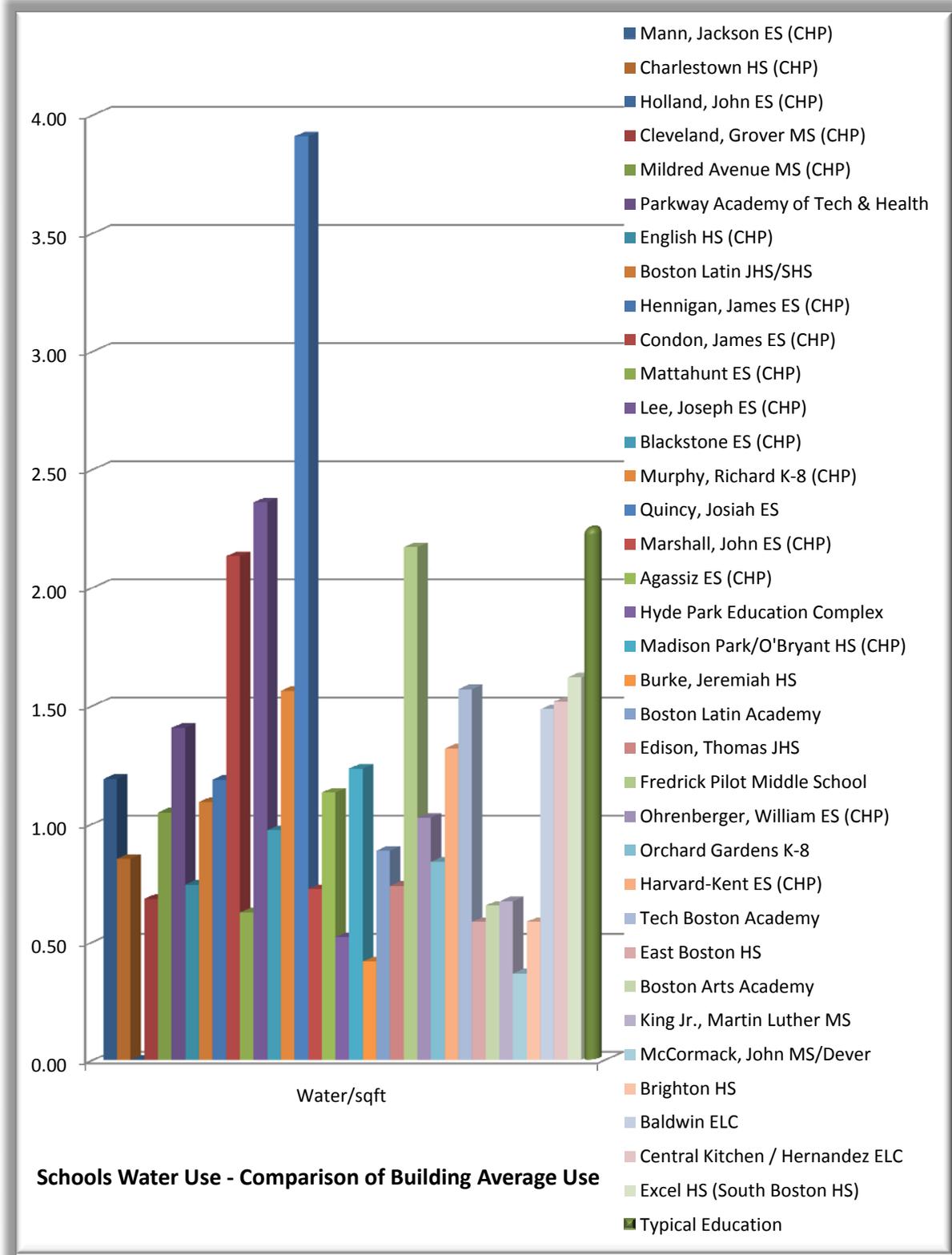
The schools consume a large amount of natural gas, which is likely mostly used for heating. The amount of heating energy suggests that the buildings have potential opportunities to save energy that might be revealed by energy audits.





## Water Consumption

The water use at the City schools was typically lower than the average used for comparison. This may be due to less process water needed for cooling throughout a year. Josiah Quincy Elementary School was the exception to this, however, which may be due to several reasons. An audit of the building would be able to determine whether the water use was for a swimming pool, leaks, equipment losses or other reasons.





## 3. Results Summary and Recommendations

The results of the building energy assessments below indicate of energy consumption above the averages for similar buildings per square foot.

### 3.1 Results Summary

#### **Electricity**

The amount of electrical kWh consumption of the buildings is higher than the typical average. Overall the highest average used for comparison was for buildings with over 500,000 square feet, which had an average 19.0 kWh/SQFT. Many of the buildings outside this category still exceeded this high average electrical energy use. Most of the buildings within each of their categories exceeded all of their categorical averages for electrical consumption for their size, category type, climate zone, and government type. Since the energy cost for these buildings is also considered high, this was not unexpected.

#### **Natural Gas**

Natural gas consumption for the buildings was also excessively high. A significant portion of the buildings that were evaluated (88%) exceeded even the highest kBTU/SQFT average, which was 56.5 kBTU/SQFT for the smaller building size of 5,001 to 10,000 square feet. This high amount of natural gas consumption, vastly consumed for heating, reveals that there may be many system inefficiencies that could be corrected to save energy.

#### **Water Use**

Where the water use per square foot seemed high as compared with the average, it is recommended to perform an audit to determine whether the use is justified. Since the water consumption also relates to the sewer cost, reducing the amount of water should reduce the cost proportionally. There are several buildings that stand out as large consumers of water, and these should be reviewed first to determine savings potential.



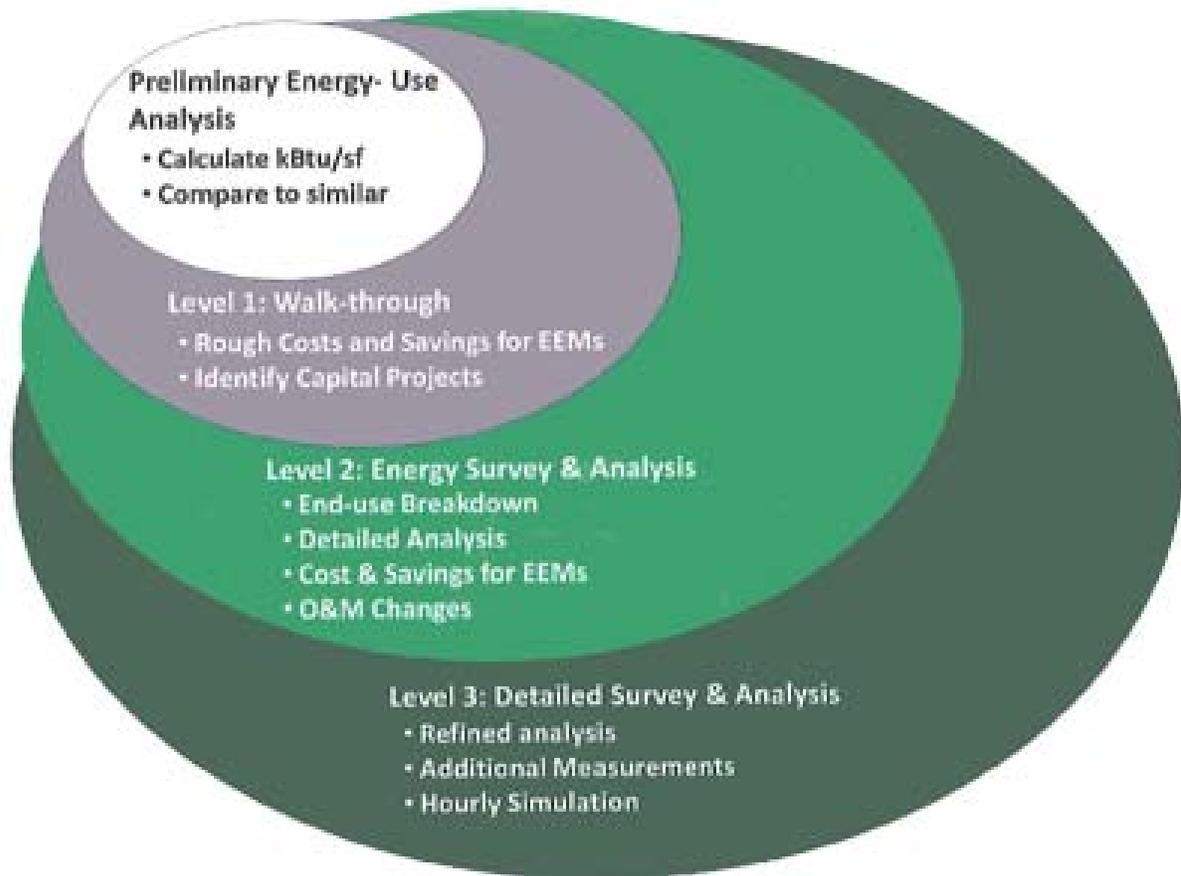
## 3.2 Recommendations

Overall the building assessments below provide a glimpse of how the energy for each building is consumed and potential reasons why the building has a high energy cost. It is recommended that detailed audits of the buildings be performed to make more detailed observations and determinations for energy savings. The American Society of Heating Refrigeration and Air-conditioning Engineers (ASHRAE) has developed a means of performing energy audits based on different levels of depth. **At this time, it appears the best value for the City of Boston would be to conduct ASHRAE level 2 audits for the majority of the buildings above to help resolve high energy use and cost.** Additionally, an audit of the buildings with the highest water consumption may yield opportunities for significant water use reduction.

An ASHRAE level 1 audit is a walk-through analysis that provides a basic starting point for building energy optimization. The audit involves a brief review of the systems and defines their type and how they are operated. It then collects broad potential opportunities for energy improvements and provides very general recommendations for improvements. This level of audit may already be within the purview of operation and maintenance staff.

An energy audit at level 2 reviews the building with more detail to develop a clear and concise report that describes a variety of energy conservation measures (ECMs), usually with rankings based on cost to implement. With a level 2 audit, the City could evaluate the ECMs and decide how and when to proceed with implementation. While some ECMs may be no or low cost, others would need to be further evaluated to determine whether the return-on-investment is feasible.

A detailed analysis of capital intensive modifications usually requires the greater detail of an ASHRAE level 3 audit. When system upgrades or retrofits revealed by a level 2 audit appear to require a much greater investment, the more thorough level 3 audit can assist to step beyond measuring and monitoring by creating a whole-building computer simulation. Data loggers are often used to collect more detailed information over the course of weeks or months to monitor a number of items such as lighting levels, pumps and motors, temperatures, and more. A computer program is used to accurately model the building and how it would consume energy based on difference systems selected. The model can be used to transpose the data, select possible system changes, run complex computations and compare results of cost, energy, maintenance, reliability, flexibility, and other factors as needed. The model is reviewed for accuracy and results are produced to aid with making a decision on how to proceed. Unless the level 2 audit above has been conducted, the City of Boston would not yet need to conduct a level 3 audit.



**Figure 1: Relationship of Energy Audit Levels 1, 2 & 3 (ASHRAE 2011)**



## 4. Building Energy Consumption Assessments

Each of the 50 buildings under review has been given individual comparisons based on their most relevant categories. As described in part 1 above, the 50 buildings have been reviewed according to four main categories: Size, Principal Building Activity, Climate Zone, and other Government-owned buildings. If a use category has two or more that may apply, the higher average energy use of the possible applicable categories has been selected for comparison. For the School buildings the energy consumption per student is also compared.

The assessments and subsequent reports are meant only as a cursory look at the energy use of the buildings. They cannot be viewed as definitive evaluations; further, detailed assessment and analysis is required.



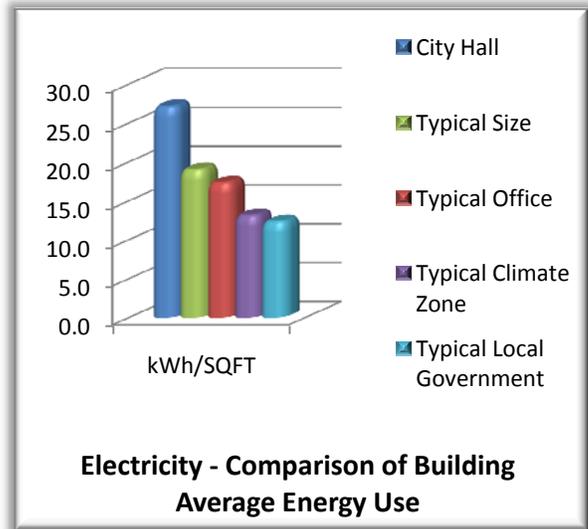
### 4.1 City Hall Building Assessment

The assessment of City Hall shows that the building consumes an excessive amount of heating energy. The total amount spent on energy for this building in FY 2010-2011 was \$798,949.34, the highest for the City.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
City Hall	513,000	13,907,920	27.1	16,295,712	3176.6

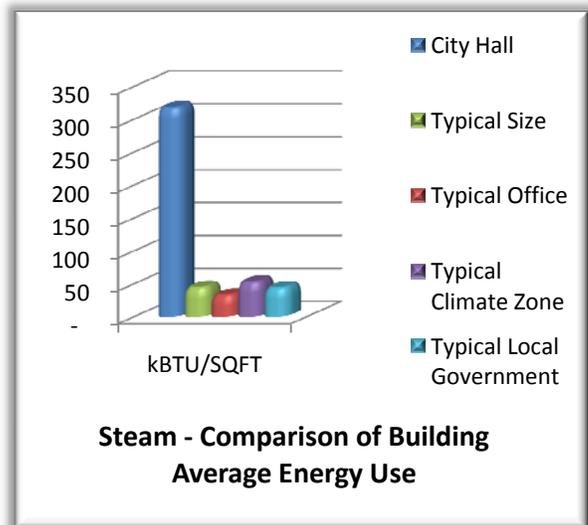
#### Electricity Use - kWh

The electrical energy use for this building exceeds the highest average, typical size, by 157%. This may be caused by the many departments within the building that are open longer and consumer more energy than other office-type buildings of the same size in the region.



#### Steam Use - kBTU

The steam energy use for this building exceeds the highest average in all categories by about 600%. This is likely due several means of heat loss from the building as well as the need for the building to remain in service for extended periods and during times that other offices would not be occupied, such as weekends and holidays. Although this is somewhat expected, the amount of energy use is still excessive.



#### Summary

The City Hall building is a high-traffic, high-use facility that supports many departments. The building has very diverse use, from open offices to a data center that is expected to grow with the consolidation of the City's data centers. An audit and additional means of measuring and monitoring would be useful for this building to help assess the details of the energy uses and specific areas for improvement.



### 4.2 26 Court Street Building Assessment

The assessment of the City building at 26 Court Street shows that the building consumes a large amount of energy.

Facility	AREA - SQFT	Total kWh	kWh /SQFT	Total Therms	kBTU /SQFT
26 Court Street - Main Administration	139,821	1,870,280	13.4	55,182	39.5

#### Electricity Use - kWh

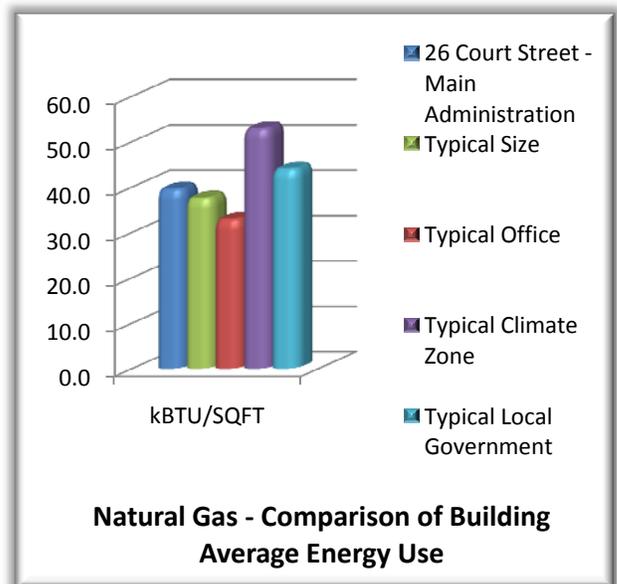
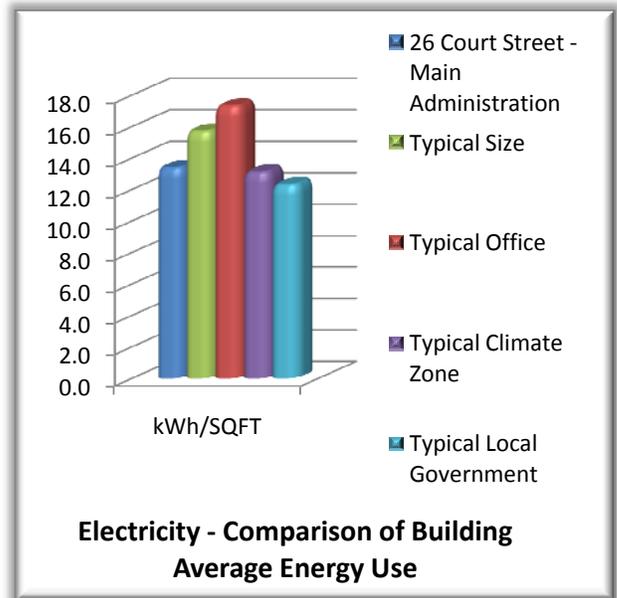
This building uses electricity that is about average when compared to its respective categories. The electrical use cost is the highest for the building. With an average rate of \$0.07 per kWh, this building is has a lower cost per kWh than other City buildings.

#### Natural Gas Use - kBTU

The total average cost of the natural gas was determined to be \$0.48 per therm, which is low compared to the average charge rate of about \$1.04 per therm. This also translates to a lower kBTU per square foot, which is about on par with the typical size and type of building. The gas energy use is even below the averages for the climate zone and local government.

#### Summary

At the current rate of use and cost, 26 Court Street is within the margins of energy use expected for the size and climate. Since the total electrical cost is high, there may be opportunities to save money and energy.





### 4.3 Curley Community Center Building Assessment

The assessment of the City’s Curley Community Center shows that the building consumes a large amount of energy for such a small building.

Facility	AREA - SQFT	Total kWh	kWh /SQFT	Total Therms	kBTU /SQFT
Curley Community Center	7,300	512088	70.1	67,151	919.9

#### Electricity Use - kWh

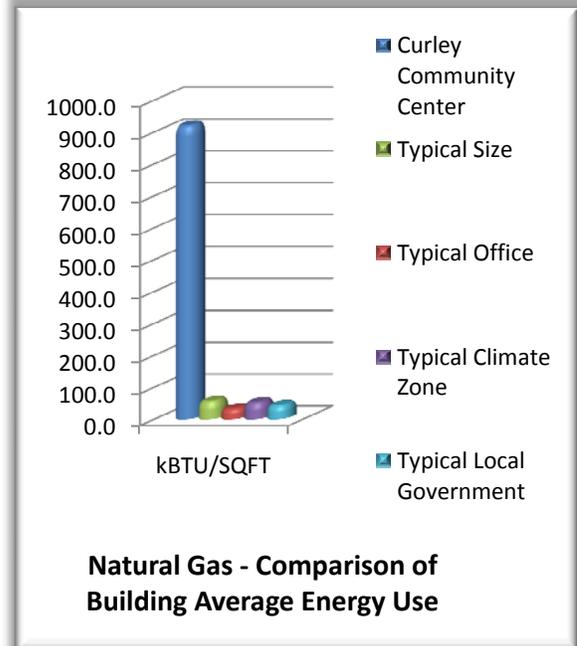
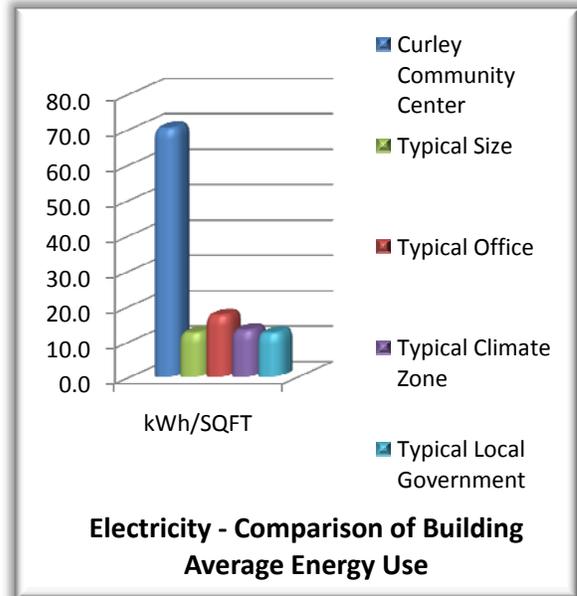
The Community Center electricity use is high for buildings of its type, even when compared to the higher average of a typical office space. This could be due to the building being occupied for extended hours and on weekends, but given the building size it seems that there is opportunity for electrical energy savings.

#### Natural Gas Use - kBTU

The amount of heating for the Community Center is high. As with the electrical use, this may be due to the building being occupied during extended periods. However, since the natural gas use is extremely high, there may be inefficiencies that could be remedied to improve the heating performance.

#### Summary

A building evaluation could be done for the community center to more closely follow the operating hours and uses. This could then justify the higher energy expenditures for the building. Given the high natural gas energy there may be other, more significant losses that can account for a building of this size.





### 4.4 Strand Theater Building Assessment

The assessment of the Strand Theater building shows that the building consumes a large amount of energy when compared to typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Strand Theatre	18,000	598,615	33.3	41,434	230.2

#### Electricity Use - kWh

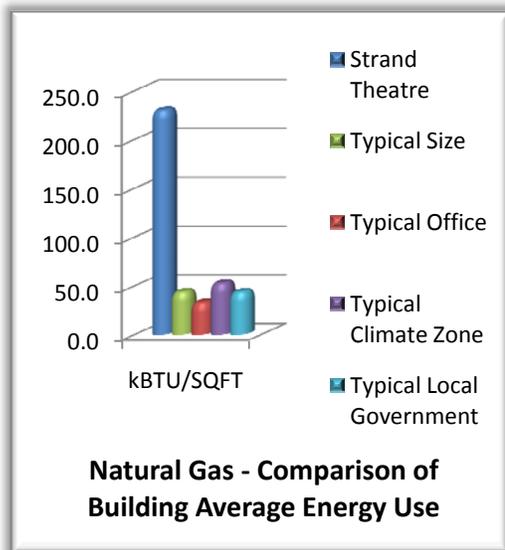
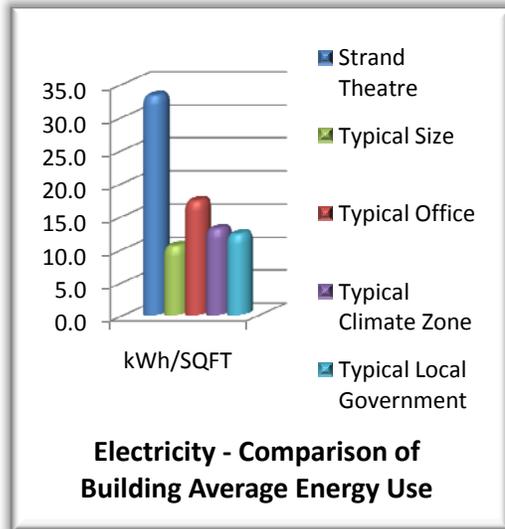
The electricity use for the Strand Theater varies greatly from month-to-month and there may be means to cut down the electricity use during the peak months.

#### Natural Gas Use - kBTU

Heating for the theater is high, and this may be due to the varying range of hours of operation for the building.

#### Summary

Although the building may have unusual hours, there may be operational inefficiencies that could help curtail the amount of energy use. The building's age, originally built in 1918, may also play a significant part in how well it retains heat during the winter months. Further investigation of this building could determine which items cause the largest energy consumption.





### 4.5 Tobin 1481 Tremont Street Building Assessment

The assessment of the Tobin building at 1481 Tremont Street shows that the building consumes a large amount of energy when compared to typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Tobin 1481 Tremont Street	50,000	454,356	9.1	35,023	70.0

#### Electricity Use - kWh

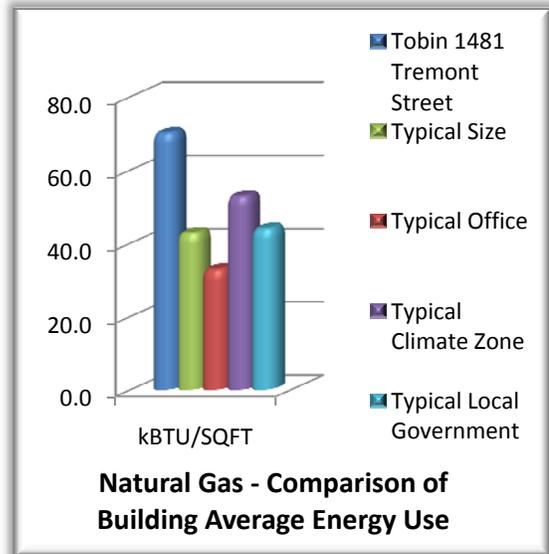
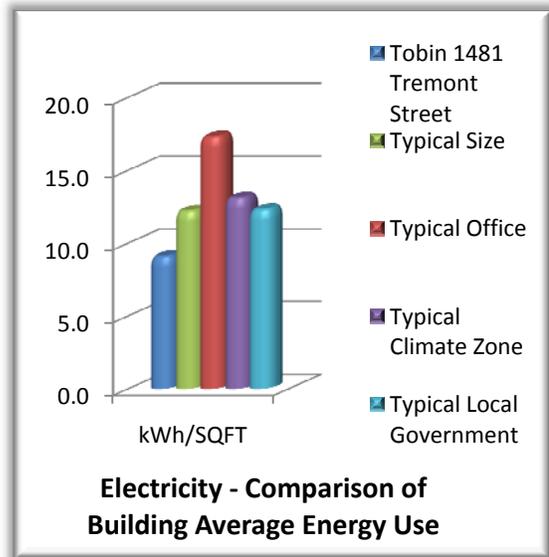
Tobin 1481 Tremont Street uses less electricity than other buildings within the same categories. With an average cost of about \$0.09 per kWh, the building seems to use its electricity efficiently.

#### Natural Gas Use - kBTU

Heating for the building at 1481 Tremont Street is higher than the other averages in its category, but not significantly so. This indicates that energy use in the building is currently satisfactory, but that there may be opportunities to reduce the natural gas use to below average values. Also the cost per therm is about \$1.33, which is about 30% higher than the average given for the therms per month. Reviewing this data further with the utility may yield lower costs in the future.

#### Summary

The Tobin building currently operates at a decent electrical efficiency. The natural gas use is high, and there may be changes from further investigation that could result in bringing the building natural gas use to below the typical averages. Lastly, the discrepancy between the energy use and the higher gas billing should be investigated.





### 4.6 Campbell Resource Center Building Assessment

The assessment of the Campbell Resource Center building reveals that the building is operating relatively efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Campbell Resource Center	97,349	1,026,480	10.5	24,666	25.3

#### Electricity Use - kWh

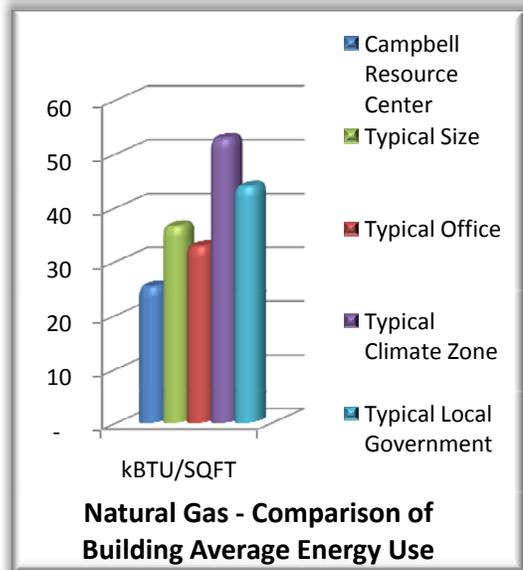
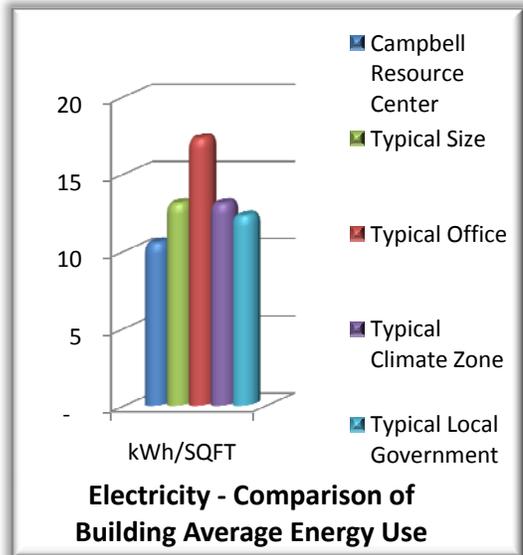
Upon the initial review, it appears that this building is within reasonable expectations for the amount of electrical energy use per square foot.

#### Natural Gas Use - kBTU

The amount of natural gas consumed for this building is about as expected, and there may be items to be learned from how this site is operated.

#### Summary

The first assessment shows that this building is operating at lower energy use but still has a higher relative energy cost. Looking further at the site, the cost per therm of natural gas is about 20% higher than other buildings that were reviewed for the City. This may be due to a higher demand rate, but the specific reason should be established.





### 4.7 43 Hawkins Street Building Assessment

The assessment for the building at 43 Hawkins Street assessment shows that the building consumes a large amount of energy when compared to typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
43 Hawkins Street	23,408	446,292	19.1	46,550	198.9

#### Electricity Use - kWh

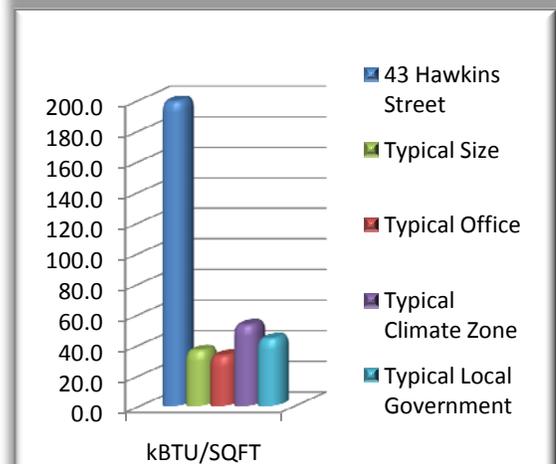
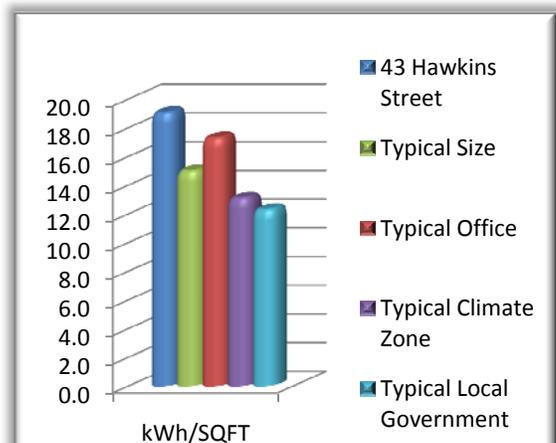
The building at 43 Hawkins Street has a slightly higher than average electricity use. The cost of the electricity is about \$0.15 per kWh, which is higher than average. Reducing energy at this site would be of benefit for cost reductions for the city.

#### Natural Gas Use - kBTU

The amount of natural gas used at this site, presumably for heating, is exceptionally high as compared to the averages of the same categories. The profile of the natural gas use shows that the amount needed for heating is considerable, while ancillary needs such as heating for potable hot water is about 2-3%. This indicates that there may be inefficiencies in the heating system that could be corrected to save natural gas energy.

#### Summary

With electrical energy use near the averages for buildings of the same type and with natural gas use is high, the building is efficient, but the heating system and how it is operated may need investigation to find opportunities to save natural gas.





### 4.8 1010 Massachusetts Avenue Building Assessment

The City building at 1010 Massachusetts Avenue reveals that the building is operating efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
1010 Mass Ave.	195,000	861,520	4.4	28,754	14.7

#### Electricity Use - kWh

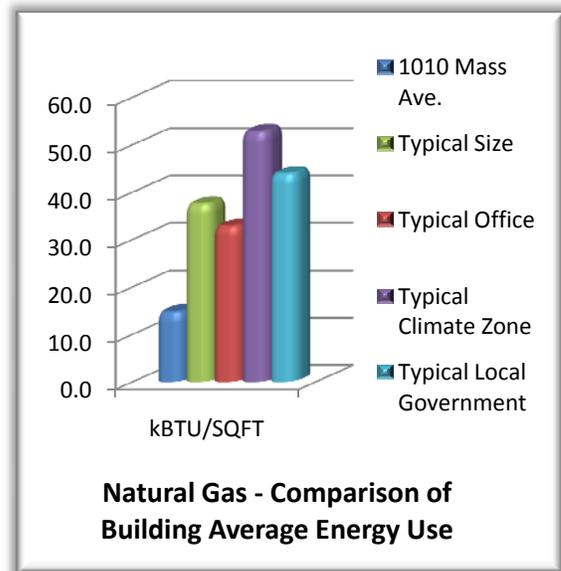
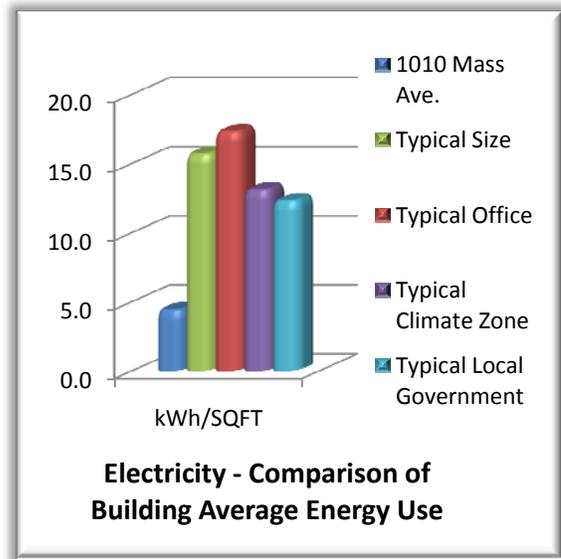
By comparison of square feet, this building uses its electricity in an efficient manner. The results are far below average, which indicates that the building may have recently undertaken energy conservation measures such as lighting upgrades or other equipment replacement to operate using less energy.

#### Natural Gas Use - kBTU

The amount of natural gas used at 1010 Massachusetts Avenue is much less than the averages for the same building categories. The building uses the natural gas it consumes in an efficient manner for the region and type. The average cost of the natural gas was \$1.25 per therm, which is higher than average for the City's buildings.

#### Summary

Based on the low electrical and natural gas use, the building at 1010 Massachusetts Avenue is efficient with no need to further review or alter its current operations.





### 4.9 400 Frontage Road Building Assessment

The assessment for 400 Frontage Road shows that the building may have operational conditions that could remedied to save energy.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
400 Frontage Road	422,000	3,044,160	7.21	305,013	72.3

#### Electricity Use - kWh

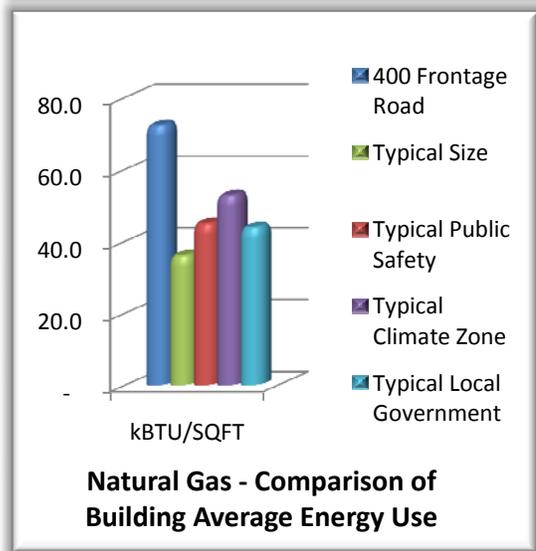
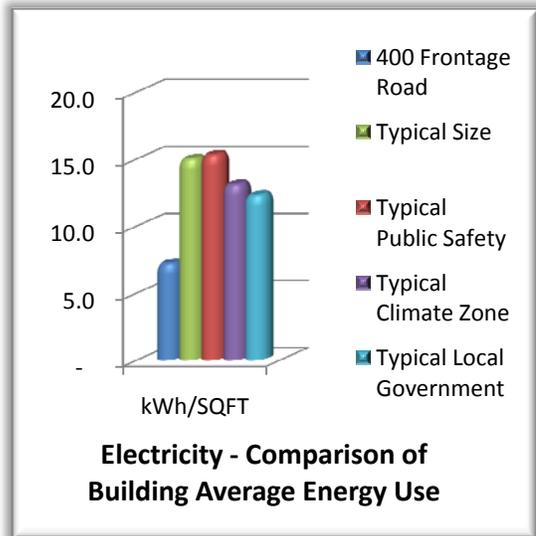
The amount of electricity consumption at this building is relatively low, which indicates that some energy saving measures might be in practice.

#### Natural Gas Use - kBTU

The consumption of natural gas at the site is high which results in a higher amount of cost for the city. The size of the building is another factor, and there may be items that could be reviewed to see if the building could operate more efficiently.

#### Summary

As one of the City of Boston buildings used for public safety, energy savings may not be the top priority. However there may be changes that could help with saving energy at the building while not jeopardizing the critical operations. Further examination could reveal how best to approach this for the City.





### 4.10 Police Headquarters Building Assessment

Upon initial review, the City’s Police Headquarters appears to be operating with both electricity and natural gas deficiencies.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Police Headquarters	180,000	5,711,200	31.73	172,789	96.0

#### Electricity Use - kWh

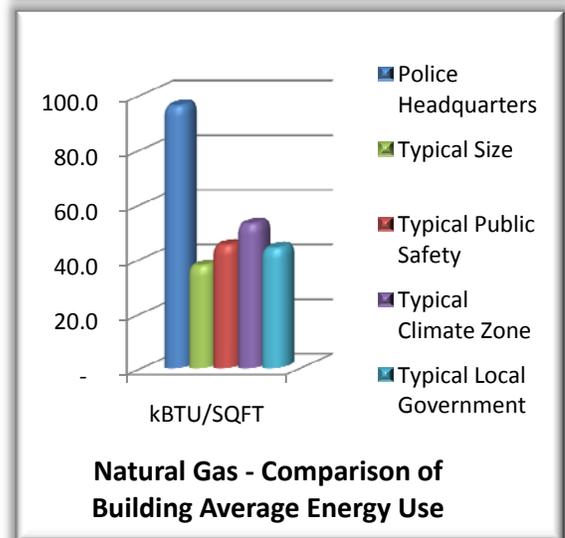
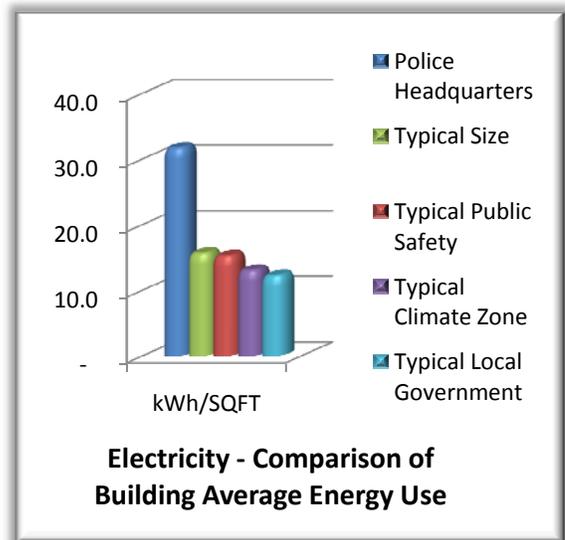
By comparison of square feet, this building consumes a large amount of electricity. This may be due to the necessity of operating 24 hours a day, 7 days a week.

#### Natural Gas Use - kBTU

The amount of natural gas consumed by this building is twice as high as similar public safety buildings. This may be due to operational conditions, but an audit of the facility could help determine whether this energy consumption is related to how the occupants use the building or the building systems themselves.

#### Summary

Despite the challenges of operating a facility at all hours many other public safety buildings have the same needs and still operate more efficiently. It seems as though there are opportunities to reduce the amount of energy consumed at this site.





### 4.11 BFD Headquarters Building Assessment

The assessment of the City’s Fire Department Headquarters reveals that the building may have opportunities to capitalize on energy savings.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
BFD Headquarters	62,432	860,280	13.78	68,765	110.1

#### Electricity Use - kWh

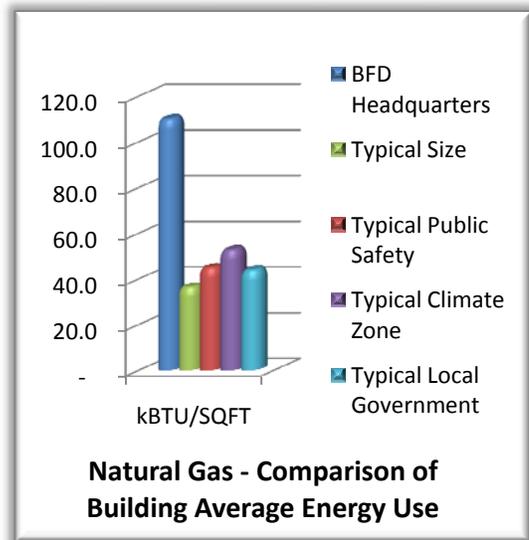
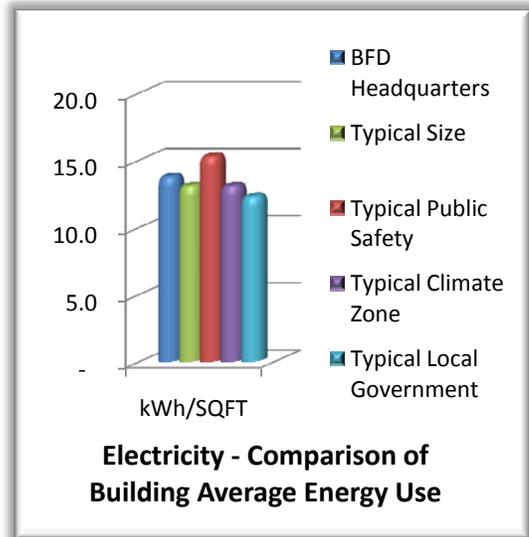
The BFD Headquarters building seems to have a typical energy consumption. If there haven’t been any recent electricity saving measures installed, there is potential that this consumption could be reduced further.

#### Natural Gas Use - kBTU

The amount of natural gas used at the BFD Headquarters building is at least twice as high as any of the other averages. This may be due high heating losses during the winter months.

#### Summary

The high natural gas consumption may be due to the need to heat spaces that might be open to the outside for extended periods. Studying whether this is the case for part of the building or whether there are other causes would be revealed with a detailed audit.





### 4.12 District A-1 Building Assessment

The assessment of the City’s District A-1 building reveals that the building is consumes a higher than average amount of energy.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
District A-1 HQ	37,433	699324	18.68	45,417	121.3

#### Electricity Use - kWh

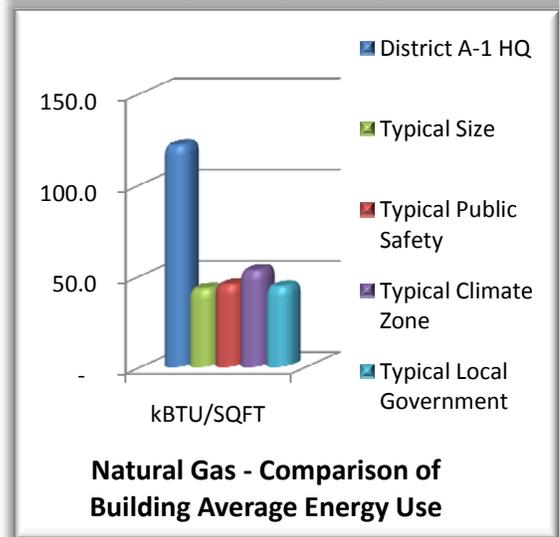
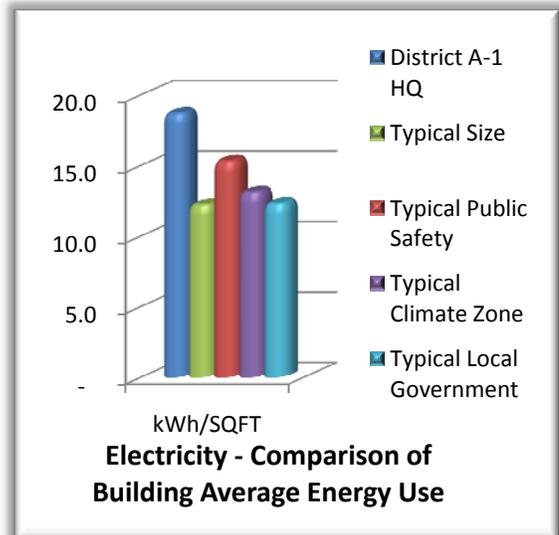
This building has a smaller footprint, but still has higher electrical energy consumption. It may be that there is a cause for the higher energy use, such as a small data center on the site.

#### Natural Gas Use - kBTU

Natural gas consumption at this site is high, which may be due to how the building is utilized. Given that the building is relatively small, there might be operational as well as system deficiencies that could be causing the high use of gas.

#### Summary

Based on the energy consumed at this site, an energy audit may be able to determine specific items that could save energy.





### 4.13 District D-4 Building Assessment

The assessment of the City’s District D-4 building reveals that the building is operating efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
District D-4 HQ	27,224	680316	24.99	42,689	156.8

#### Electricity Use - kWh

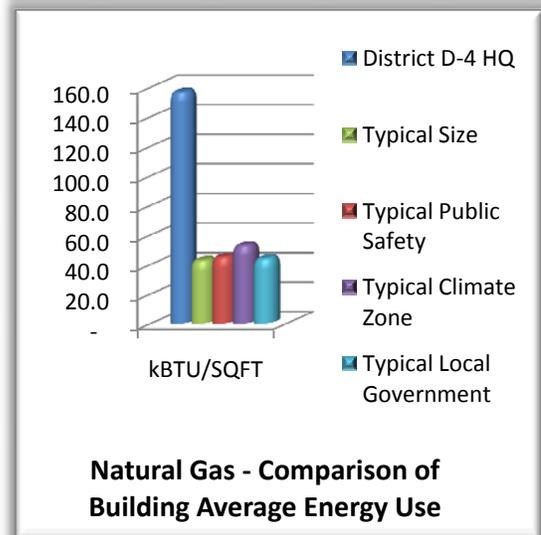
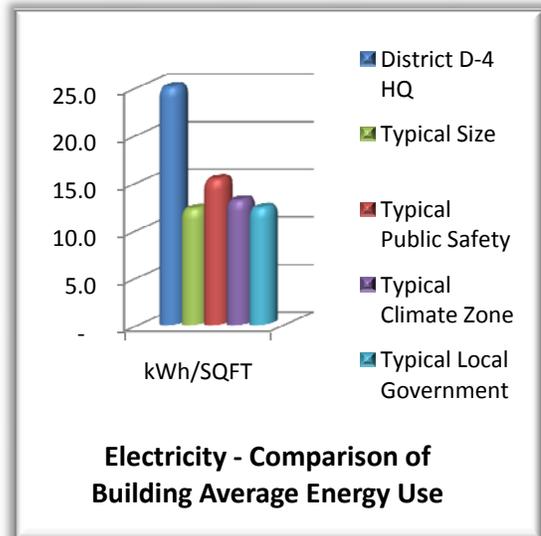
By comparison of square feet, this building uses more energy than similar buildings. As with other public safety buildings, a more thorough review of the building may reveal the causes to be justified to operate needed equipment all day, every day.

#### Natural Gas Use - kBTU

This building has an exceptional amount of natural gas consumption. With a building of this size there may be several causes that combine to drive up the need for more gas consumption.

#### Summary

Based on the high electrical and gas consumption at this site, an energy audit could help determine potential prospects for savings of energy.





### 4.14 Copley Square Library (McKim Building) Assessment

The assessment of the City of Boston’s library at Copley Square shows that the building consumes a large amount of energy.

Facility	AREA - SQFT	Total kWh	kWh /SQFT	Total Therms	kBTU /SQFT
Copley Square	955,000	9898760	10.37	42,788,184	4480.4

#### Electricity Use - kWh

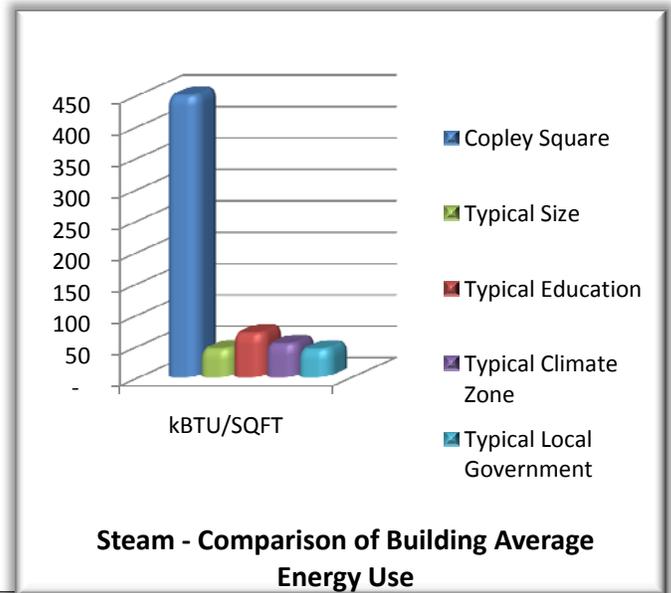
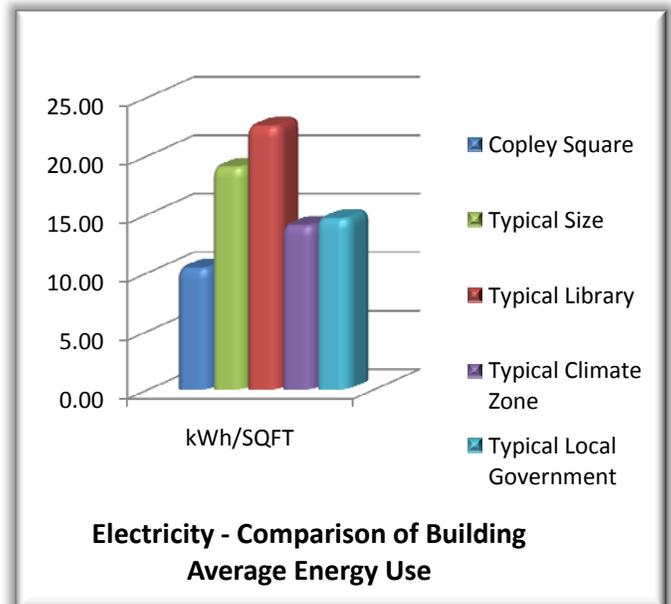
The electrical energy use for this building does not exceed any of the averages for size, climate zone, owner category.

#### Steam Use - kBTU

The steam energy use for this building greatly exceeds the highest average in all categories by over 600%. Many causes may be at the root of this energy use, from year-around heating to using steam to generating cooling for the building. This is evident from the amount of steam used during the summer months; typical steam loads for buildings are lower during the summer months but the building at Copley Square had the highest peak during August. The lowest months were in the spring and fall, which alludes to heating and cooling both supported by steam.

#### Summary

The large library building at Copley Square has a very high steam load. Although the electricity use is efficient, the amount of steam energy used shows that the building should be more closely studied for energy savings, whether or not the building uses steam in the future.





### 4.15 Mattapan Library Assessment

The assessment of the City’s Mattapan Library shows that the building consumes a large amount of energy.

Facility	AREA - SQFT	kWh	kWh /SQFT	Therms	kBTU /SQFT
Mattapan Library	21,000	383760	18.27	172,789	822.8

#### Electricity Use - kWh

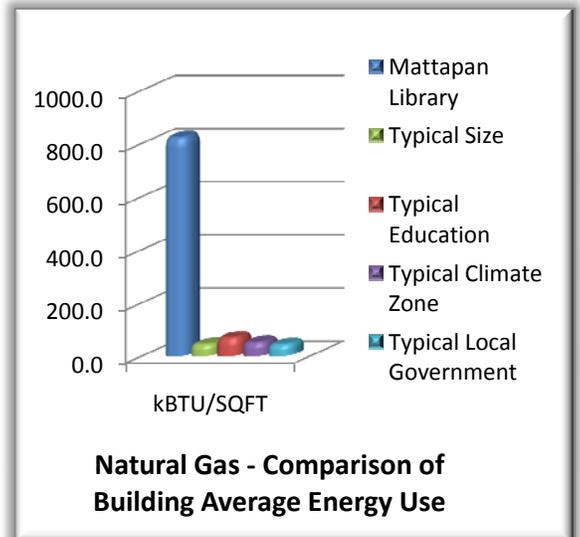
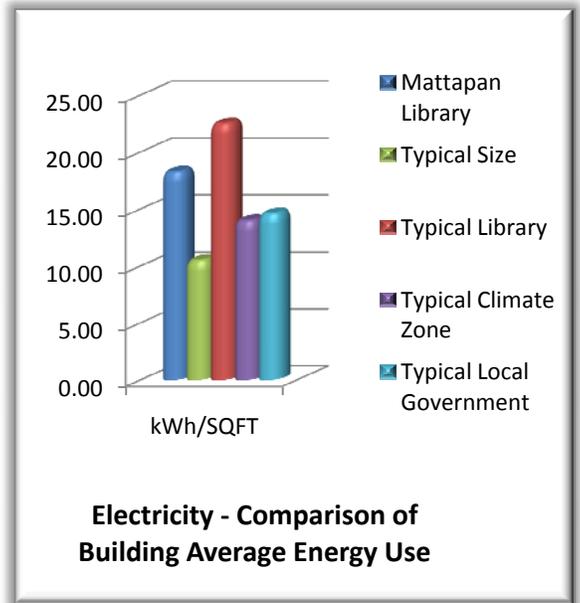
The electrical energy use for this building is around the expected averages for size, climate zone, and owner category.

#### Natural Gas Use - kBTU

The natural gas energy consumption for this building greatly exceeds the highest average in all categories. Although the building is relatively young, the high percentage of externally exposed windows could be part of what drives the amount of natural gas consumption higher.

#### Summary

The Mattapan library building has a high natural gas load, which should be reviewed to see if there are opportunities for reduction.





### 4.16 Mann, Jackson Elementary School Building Assessment

The assessment of the City’s Jackson Mann Elementary School shows that the building consumes a large amount of energy.

Facility	AREA - SQFT	Total kWh	kWh /SQFT	Therms	kBTU /SQFT
Mann, Jackson ES	201,824	806,440	4.0	213,092	105.6

#### Electricity Use - kWh

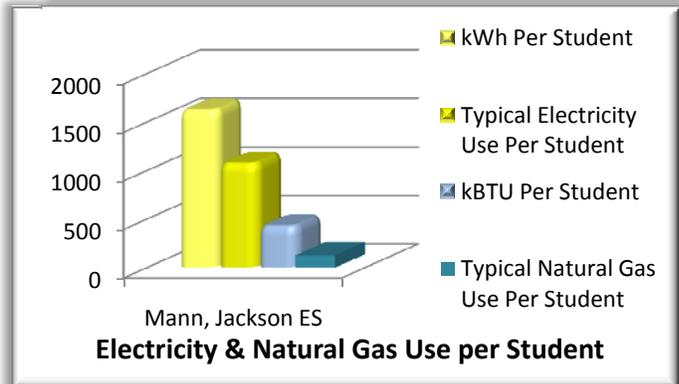
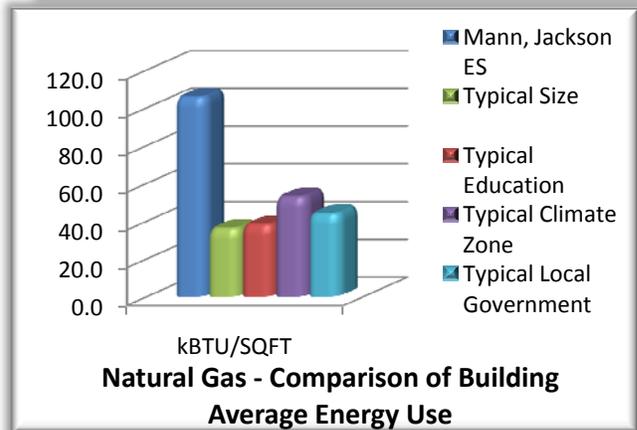
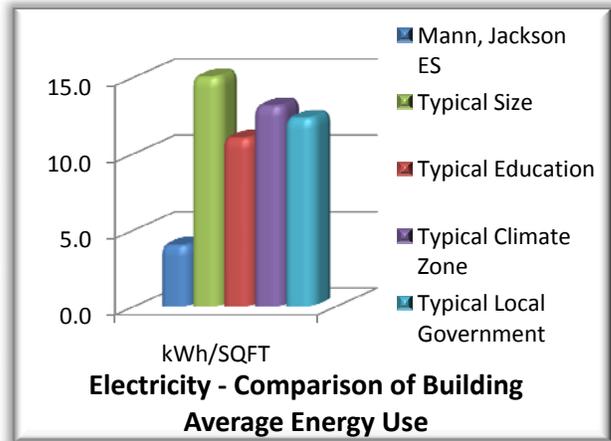
The electrical energy cost for this building is high for this building, with an average of \$0.20 per kWh. The high average cost may be caused by high electrical demands during peak hours, with the highest found to be 919.1 kW during a seasonably cold time of year. Eliminating these peak uses may yield significant savings.

#### Natural Gas Use - kBTU

The cost of natural gas per therm for the school seems to be in alignment with the other buildings; however by comparison the overall heating use is twice as high.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. This school has high energy consumption for natural gas and below average for electricity. To curtail the amount of energy used in this building it is recommended to perform an audit to determine the more specific reasons that the school expends more than twice as much natural gas as similar buildings as well as what causes the high electrical demand charges.





### 4.17 Charlestown High School Building Assessment

The assessment of the City’s Charlestown High School building reveals that the building may have opportunities to save natural gas energy.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Charlestown HS	226,822	1,426,486	6.3	274,447	121.0

#### Electricity Use - kWh

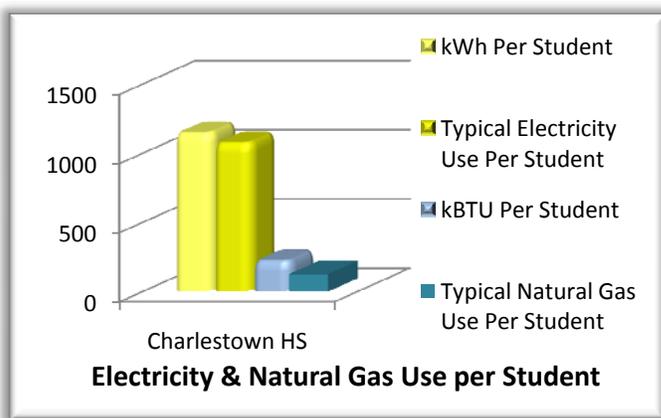
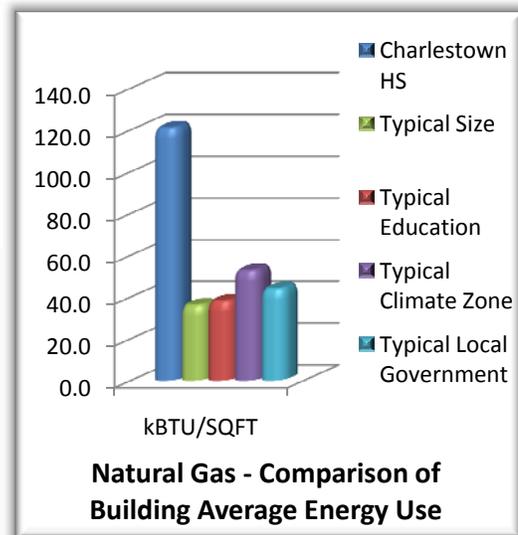
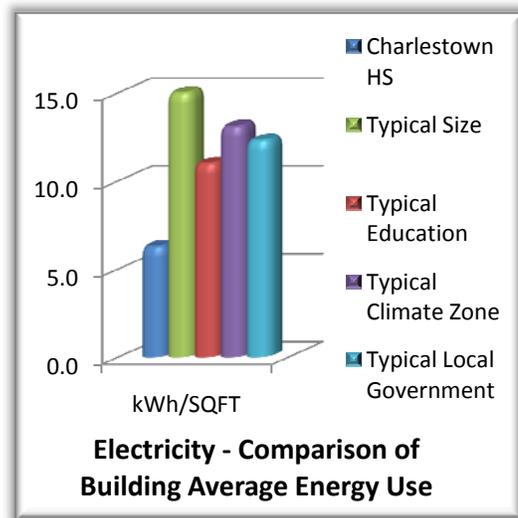
By comparison of square feet, this building has a below average electrical energy consumption. Given that the electricity consumption per student is average, this may mean that the building may have opportunities to drive the electrical energy consumption lower.

#### Natural Gas Use - kBTU

With the higher amount of natural gas consumption, this school may have opportunities to achieve energy savings with its operations.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. With the high natural gas consumption, it is recommended to perform a more detailed review of the building to determine potential energy saving measures for the building.





### 4.18 John Holland Elementary School Building Assessment

The assessment of the City’s John Holland Elementary School building reveals that the building has the potential to save energy.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Holland, John ES	137,125	436,200	3.2	154,017	112.3

#### Electricity Use - kWh

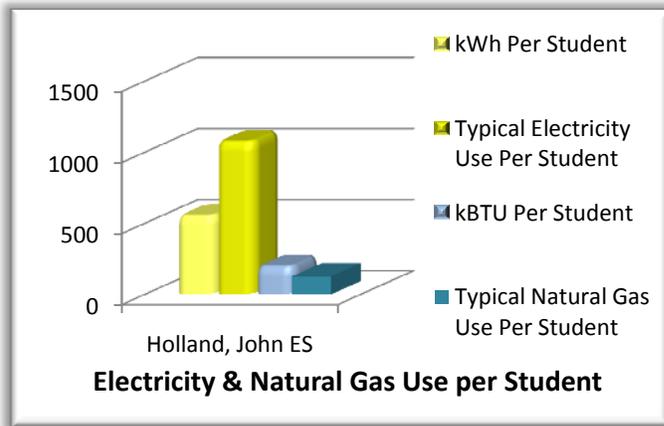
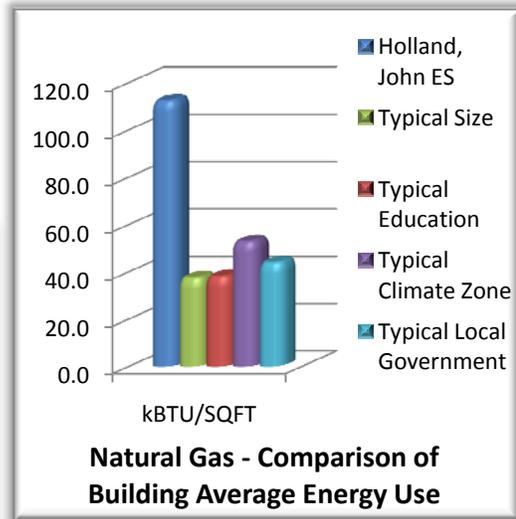
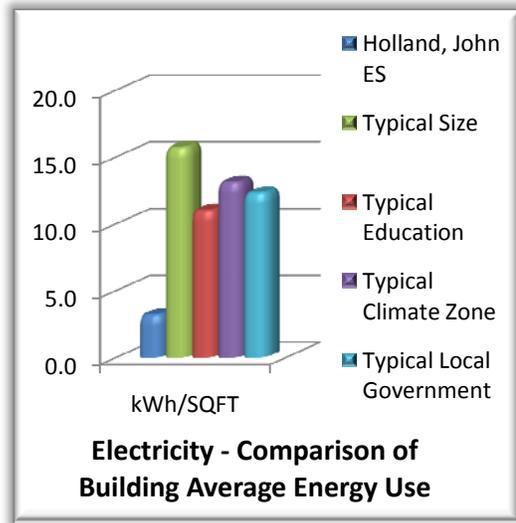
The electrical use for this school is low by comparison with other schools in both square feet and per student.

#### Natural Gas Use - kBTU

The natural gas consumption is high for this building, and there may be operational or other means to save natural gas energy.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. Given the amount of natural gas used for this building, likely for heating, there is likely opportunity for energy savings with a more detailed audit.





### 4.19 Grover Cleveland Middle School Building Assessment

The assessment of the City’s Grover Cleveland Middle School building shows that there may be an opportunity for energy savings.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Cleveland, Grover MS	171,870	568,400	3.3	183,570	106.8

#### Electricity Use - kWh

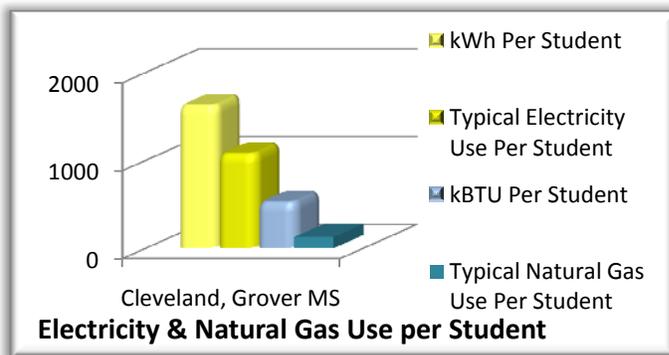
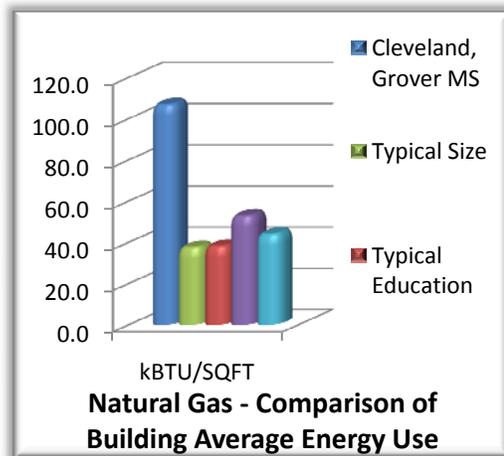
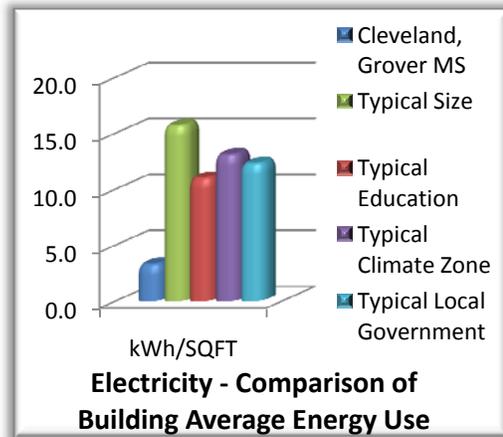
The electrical use for this school is low by comparison with other schools for square feet. However the energy consumption per student is still higher than average, revealing that there may be an opportunity for further study on the electrical energy use.

#### Natural Gas Use - kBTU

The amount of natural gas consumed at this building is high, indicating that there are likely opportunities to save natural gas energy at this building.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. For this site, an energy audit would help to further reveal the electrical and natural gas consumption. Doing an energy audit would show in greater detail how this energy is used in order to aid in energy reduction methods.





### 4.20 Mildred Avenue Middle School Building Assessment

The assessment of the City's Mildred Avenue Middle School building reveals that the building is operating efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Mildred Avenue MS	172,000	579,440	3.4	212,975	123.8

#### Electricity Use - kWh

The electrical use for this school is low by comparison with other schools in both square feet and per student, indicating that the building is using electricity efficiently.

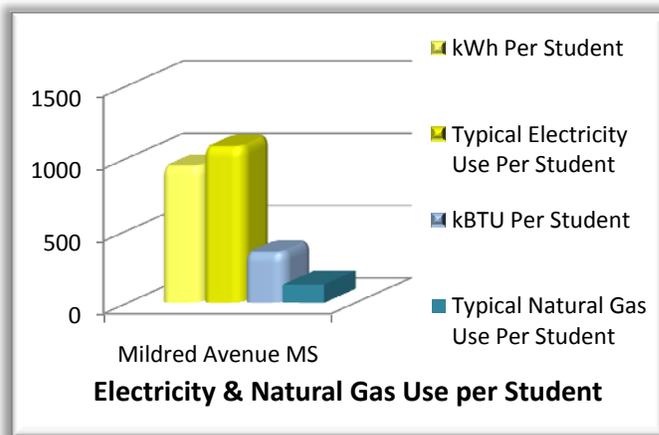
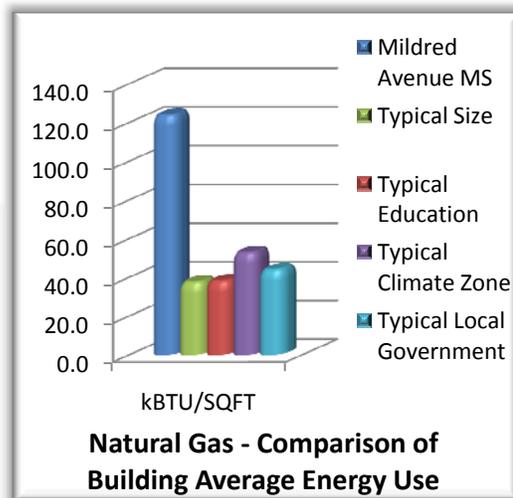
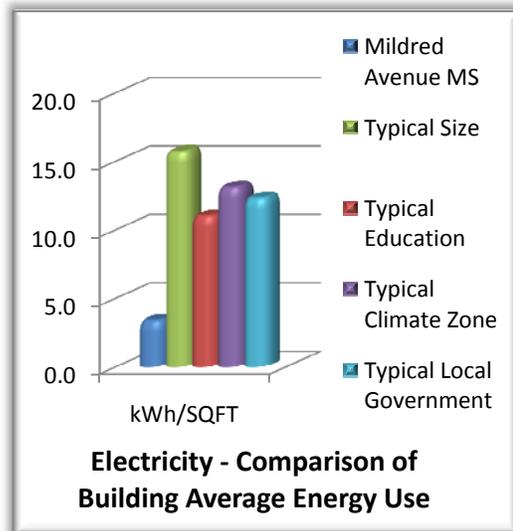
#### Natural Gas Use - kBTU

With the amount of natural gas consumption at a high rate, further study of how this is used is warranted.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. An energy audit would disclose

natural gas consumption for this building. Doing so would aid in reducing the natural gas used for the building and per student.





### 4.21 Parkway Academy of Technology and Health Building Assessment

The assessment of the City’s Parkway Academy of Technology and Health building reveals that the building has the potential to save natural gas energy. Student data was not available for the building at the time of this report.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Parkway Academy of Tech & Health	221,728	1,264,200	5.7	161,054	72.6

#### Electricity Use - kWh

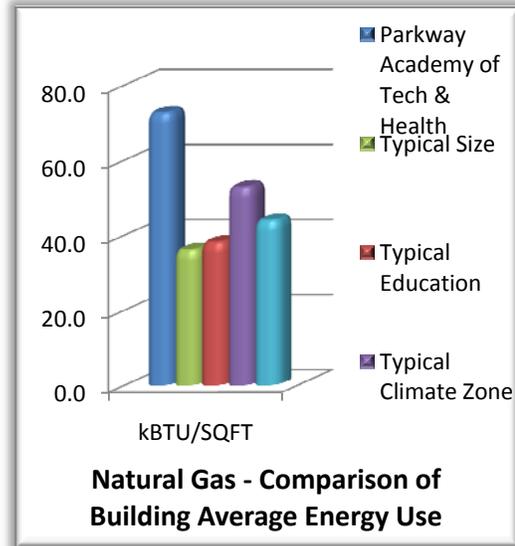
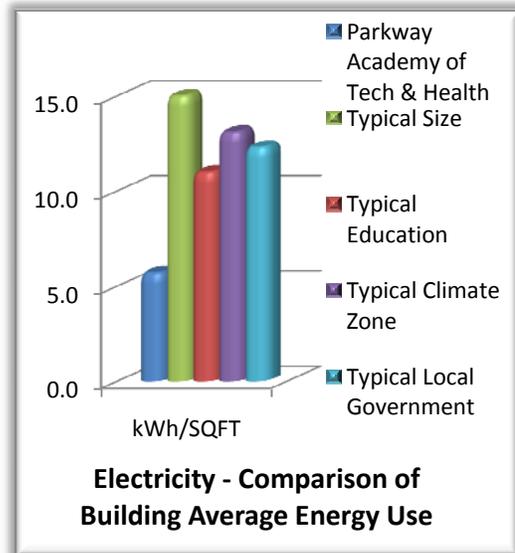
Examination of the electrical energy consumption shows that this building is below the averages of similar types, indicating that energy measures may have already been introduced, such as less operating hours per year.

#### Natural Gas Use - kBTU

The amount of natural gas consumed at this building is high, indicating that there are likely opportunities to save natural gas energy at this building.

#### Summary

While the electrical use may be examined to show how to save energy, the natural gas should be examined closer to reduce energy. An energy audit can assist with documenting the electrical savings as well as potential methods for natural gas energy reductions.





### 4.22 English High School Building Assessment

The assessment of the City’s English High School building shows that the building may have the potential to save natural gas energy.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
English HS	225,600	868,744	3.9	221,047	98.0

#### Electricity Use - kWh

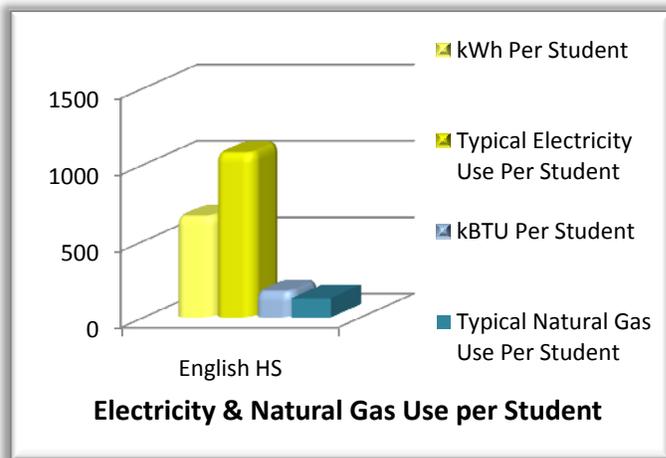
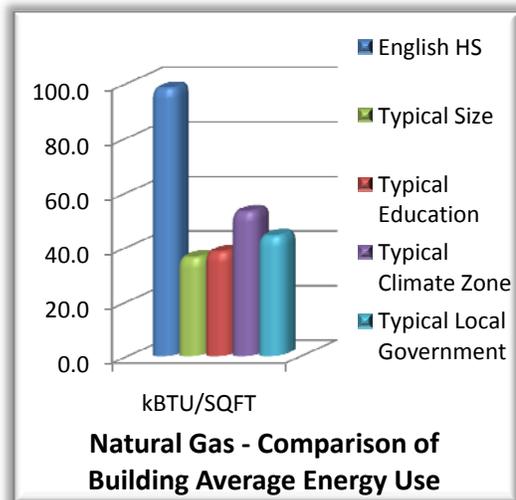
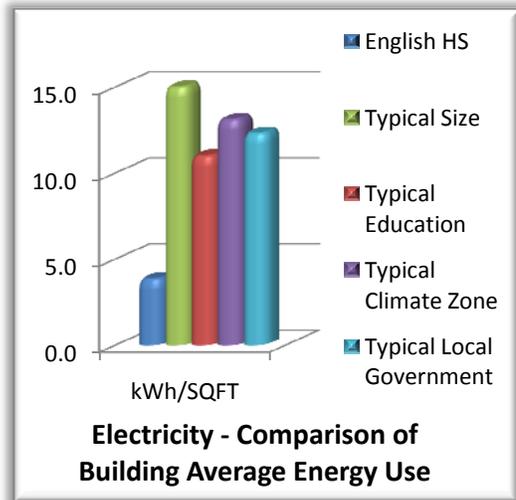
The electrical use for this school is low by comparison with other schools in both square feet and per student.

#### Natural Gas Use - kBTU

The natural gas consumption is high for this building, and there may be operational or other means to save natural gas energy.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. A more detailed examination of this building is recommended to determine the potential for natural gas energy savings and how those savings may be achieved.





### 4.23 Boston Latin Junior/Senior High School Building Assessment

The assessment of the City's Boston Latin Junior/Senior High School building reveals that the building is operating efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Boston Latin JHS/SHS	336,545	1,211,304	3.6	119,221	35.4

#### Electricity Use - kWh

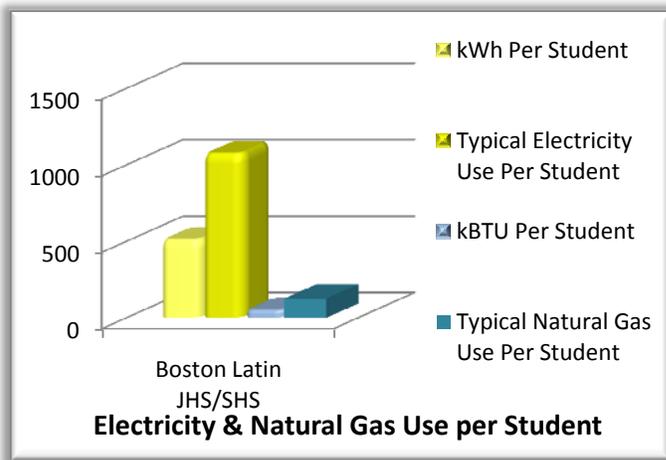
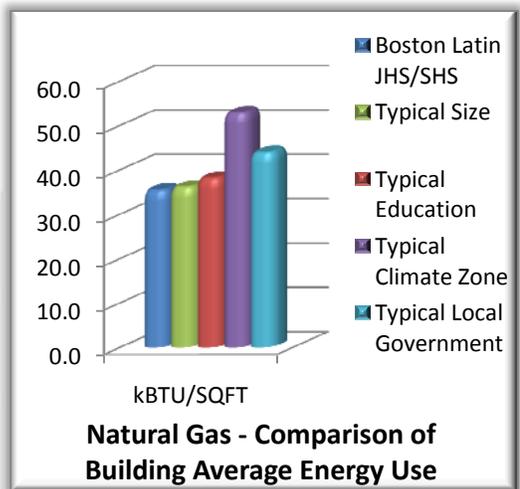
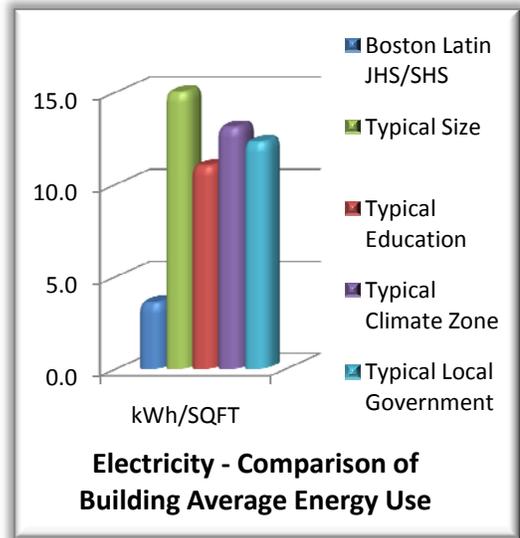
This building appears to operate efficiently for its size.

#### Natural Gas Use - kBTU

The natural gas consumption for the building is lower than the similar buildings.

#### Summary

This building could be used to document changes or operating parameters that save energy. These methods could then be implemented at other schools in the City.





### 4.24 James Hennigan Elementary School Building Assessment

The assessment of the City’s James Hennigan building reveals that the electrical consumption is low while the natural gas consumption is high.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Hennigan, James ES	137,800	515,178	3.7	262,919	190.8

#### Electricity Use - kWh

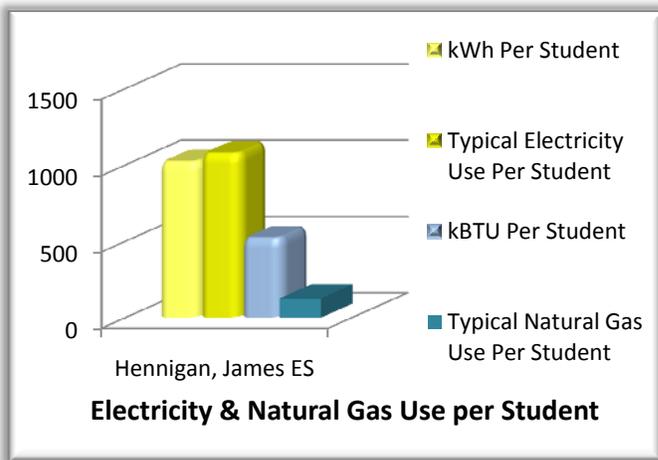
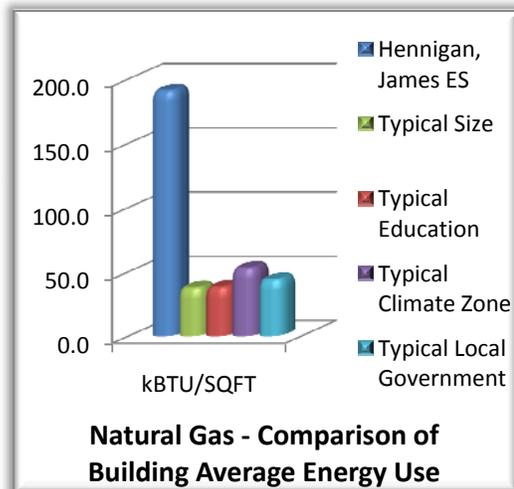
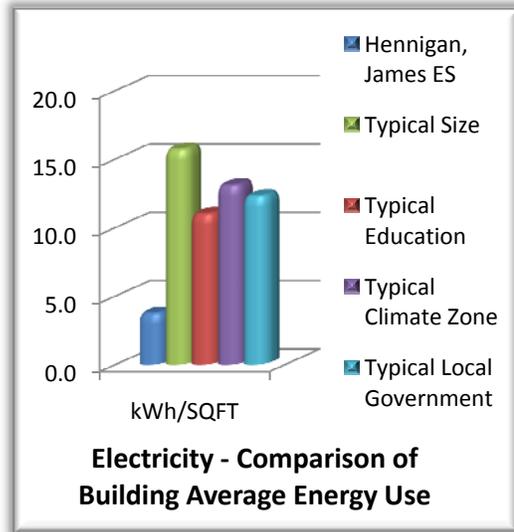
The electrical use for this school is low by comparison with other schools in both square feet and per student. This is an indicator that the building is using electricity efficiently.

#### Natural Gas Use - kBTU

With the high amount of natural gas consumption, studying how this is used may lead to a means to reduce this energy.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. An energy audit is recommended for this building to reveal the causes of the high natural gas energy consumption and how to lower that energy use.





### 4.25 James Condon Elementary School Building Assessment

The assessment of the City’s James Condon building reveals that the building may have the opportunity to reduce natural gas consumption.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Condon, James ES	140,246	614,360	4.4	138,041	98.4

#### Electricity Use - kWh

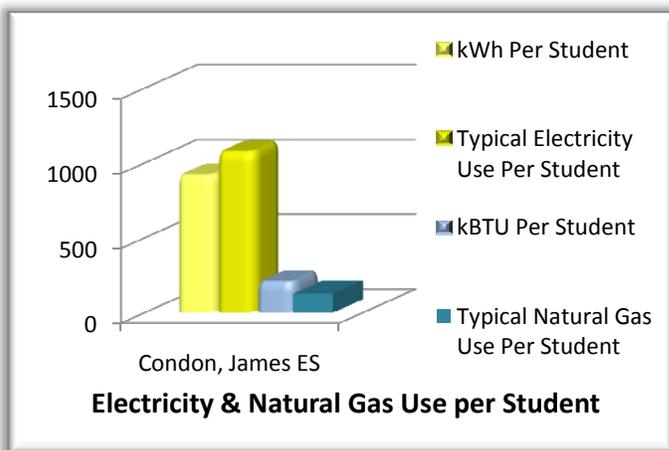
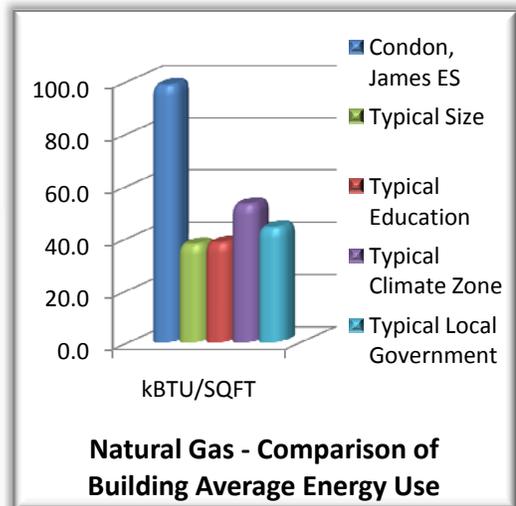
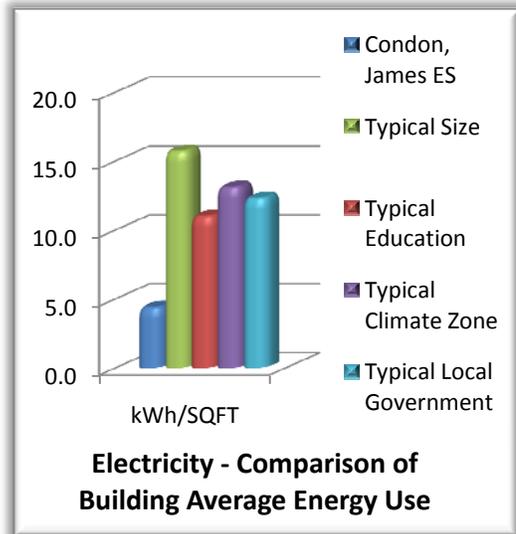
Examination of the electrical energy consumption shows that this building is below the averages of similar types, indicating that energy measures may have already been introduced, such as less operating hours per year.

#### Natural Gas Use - kBTU

The amount of natural gas consumed at this building is high, indicating that there are likely opportunities to save natural gas energy at this building.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. As with many of the other school buildings, there is an opportunity to save natural gas energy by performing a detailed audit on the building.





### 4.26 Mattahunt Elementary School Building Assessment

The assessment of the City’s Mattahunt Elementary School building reveals that the building has the potential to save natural gas energy.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Mattahunt ES	171,025	620,280	3.6	152,105	88.9

#### Electricity Use - kWh

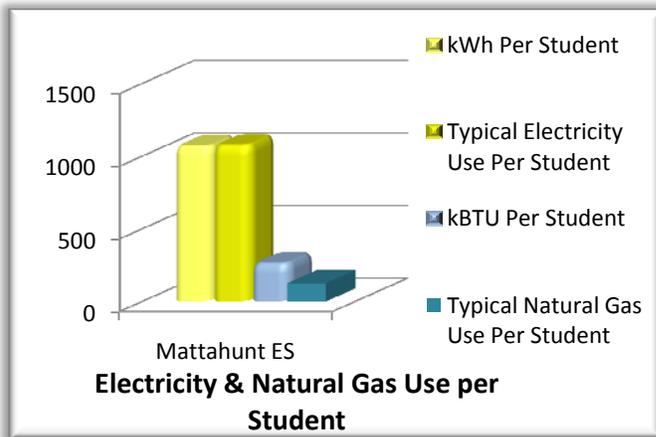
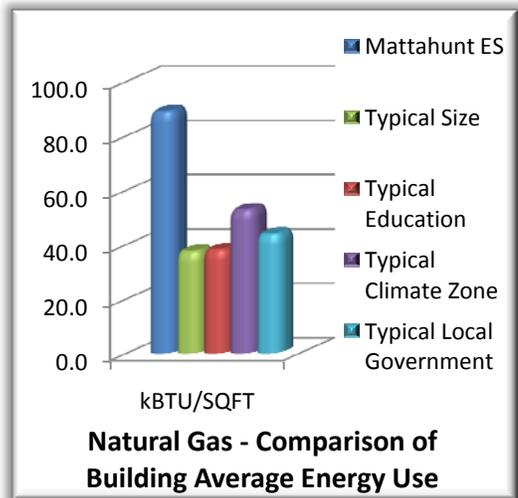
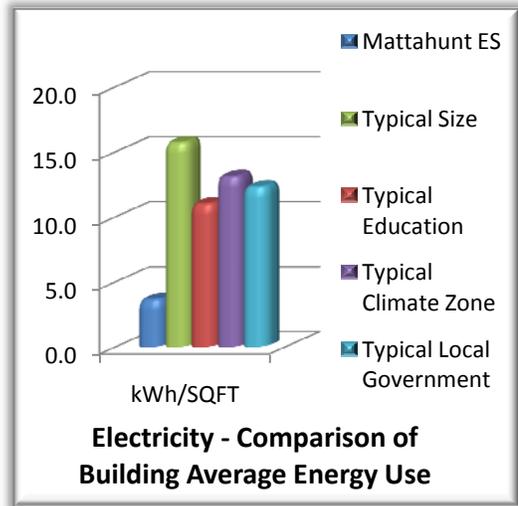
Given the electrical energy consumption is low by comparison the building seems to perform efficiently. The amount of consumption per student is on par with similar buildings.

#### Natural Gas Use - kBTU

The natural gas consumption is high for this building, and there may be operational or other means to save natural gas energy.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. Based on the high natural gas consumption, this building could benefit from a closer energy audit to determine means for savings.





### 4.27 Joseph Lee Elementary School Building Assessment

The assessment of the City's Joseph Lee Elementary building indicates that the electrical energy is efficient while the natural gas use may need to be further reviewed.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Lee, Joseph ES	153,360	400,560	2.6	130,050	84.8

#### Electricity Use - kWh

The electrical use for this school is low by comparison with other schools in both square feet and per student.

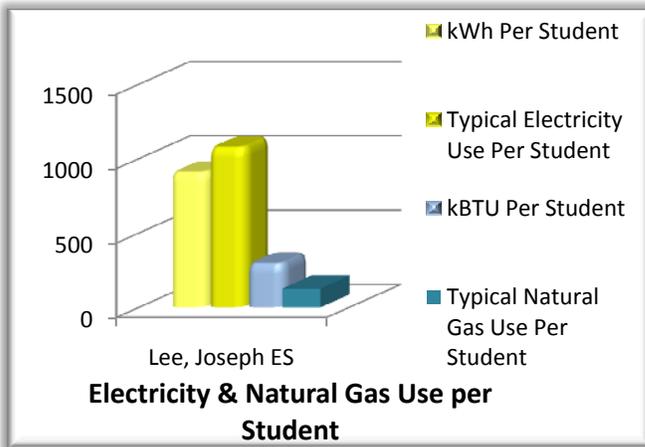
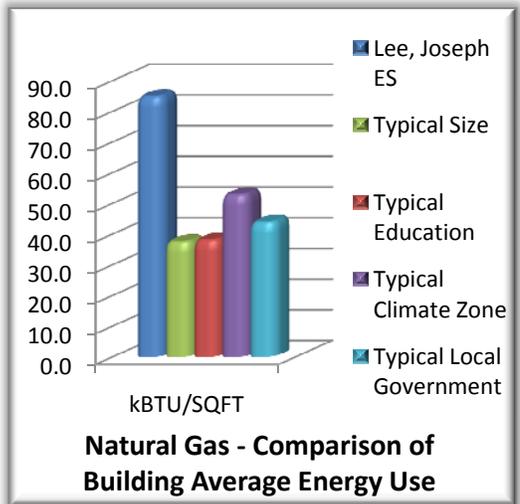
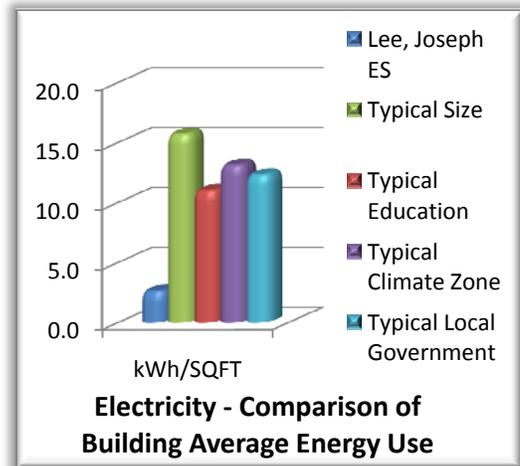
#### Natural Gas Use - kBTU

With the high amount of natural gas consumption, studying how this is used may lead to a means to reduce this energy.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity

consumption. With the high amount of natural gas consumption for this building, it is suggested to perform an energy audit to determine potential methods for energy savings.





### 4.28 Blackstone Elementary School Building Assessment

The assessment of the City’s Blackstone Elementary School building shows that the building has the potential to save more natural gas energy.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Blackstone ES	194,260	801,360	4.1	145,587	74.9

#### Electricity Use - kWh

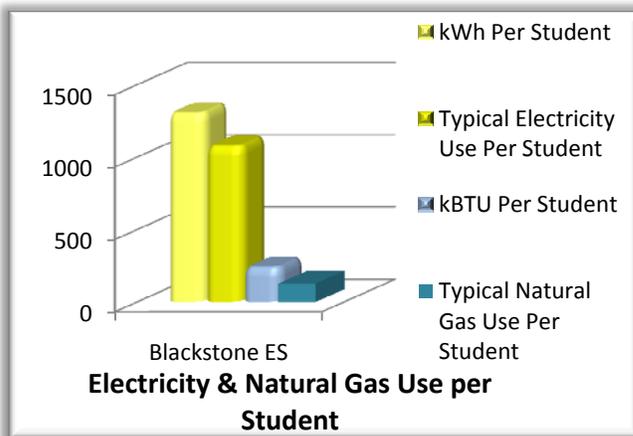
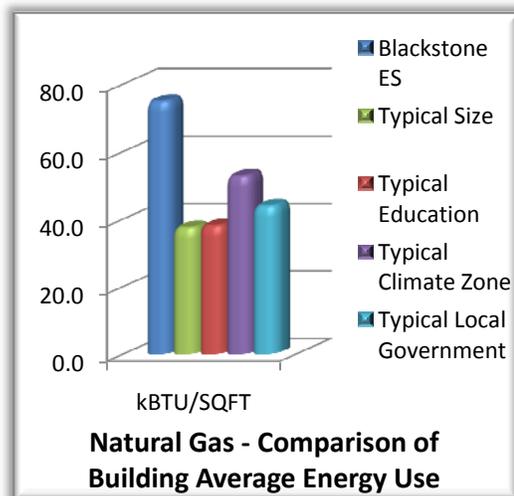
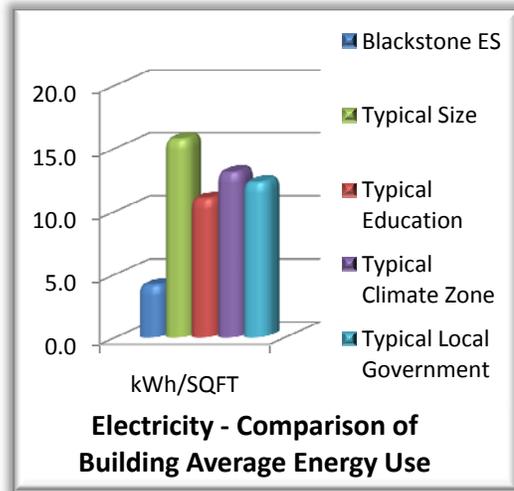
By comparison of square feet, this building has a below average electrical energy consumption. Given that the electricity consumption per student is above average, this may mean that the building may have opportunities to drive the electrical energy consumption lower.

#### Natural Gas Use - kBTU

The amount of natural gas consumption at this school is high, and there is likely potential to save energy.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. With a more thorough audit, this building could identify methods to save energy by reducing natural gas consumption.





### 4.29 Richard Murphy K-8 Building Assessment

The assessment of the City’s Richard Murphy K-8 school building reveals that while the electrical energy may be low, the natural gas consumption is still high.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Murphy, Richard K-8	139,000	419,472	3.0	143,513	103.2

#### Electricity Use - kWh

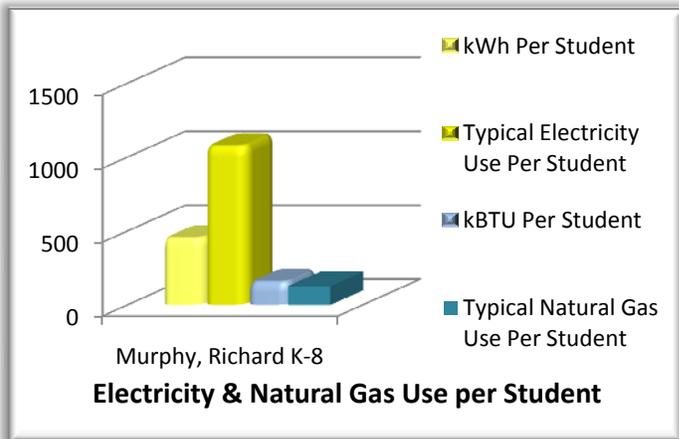
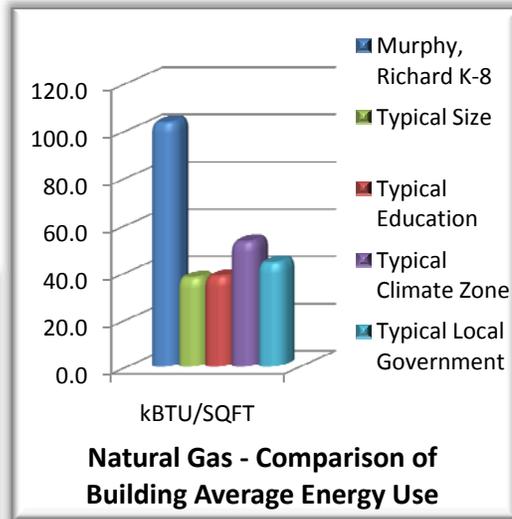
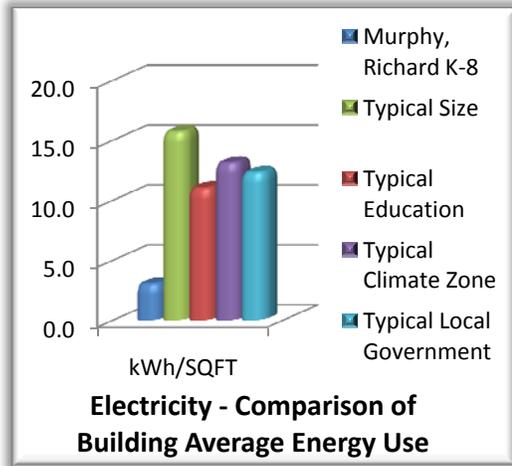
This school consumes a low amount of energy. The calculated cost of the electrical energy is higher than other buildings within the city, and this should be reviewed to see if there is a means to reduce high peak kW demands.

#### Natural Gas Use - kBTU

The natural gas consumption is high for this building, and there may be operational or other means to save natural gas energy.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. The electrical cost per kWh should be reviewed to better determine whether there is energy used that is unaccounted for at this building. The opportunity for natural gas reduction is possible and should be investigated with a further audit.





### 4.30 Josiah Quincy Elementary School Building Assessment

The assessment of the City’s Josiah Quincy Elementary School building reveals that the building is operating at a decent efficiency as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Quincy, Josiah ES	156,630	1,781,800	11.4	76,977	49.1

#### Electricity Use - kWh

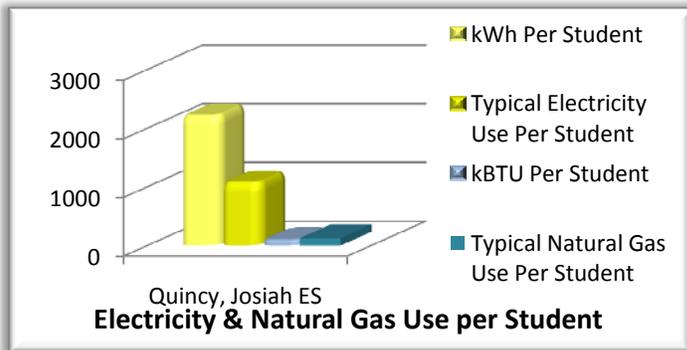
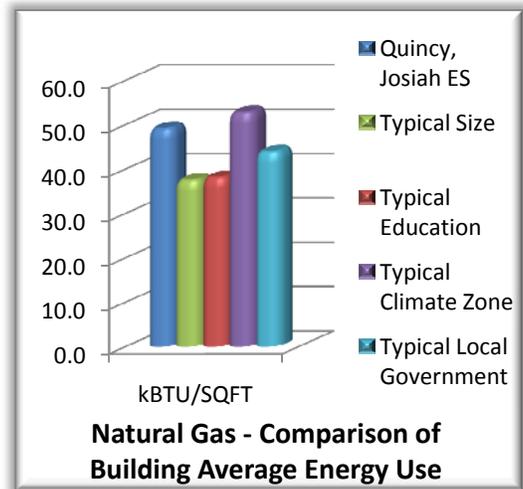
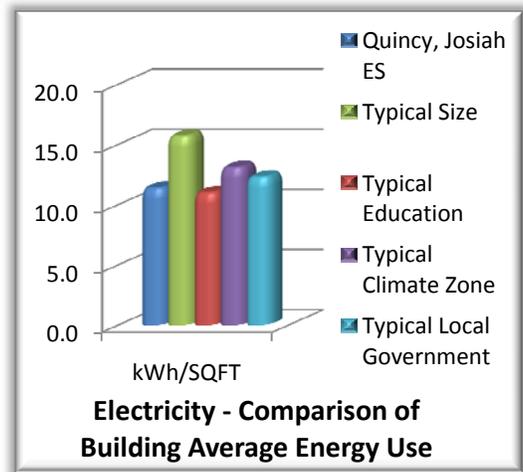
The electrical energy consumption is close to the averages of similar buildings. The electricity use per student is high, and there may be an opportunity to save electrical energy by reviewing the performance of the other buildings.

#### Natural Gas Use - kBTU

The amount of natural gas used this school is a bit above average as compared with other educational facilities, but below the average for the climate zone. This means that the building has a decent performance that may have stemmed from methods that could be replicated to save natural gas energy at other buildings.

#### Summary

This building has energy consumption that is close to the averages of similar building types. An energy audit may help the building with the consumption per student, but otherwise this building may already have implemented energy saving measures that reduces energy use.





### 4.31 John Marshall Elementary School Building Assessment

The assessment of the City’s John Marshall building exposes the high amount of natural gas energy that is used for the building even though the electrical consumption is low.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Marshall, John ES	141,091	417,680	3.0	158,172	112.1

#### Electricity Use - kWh

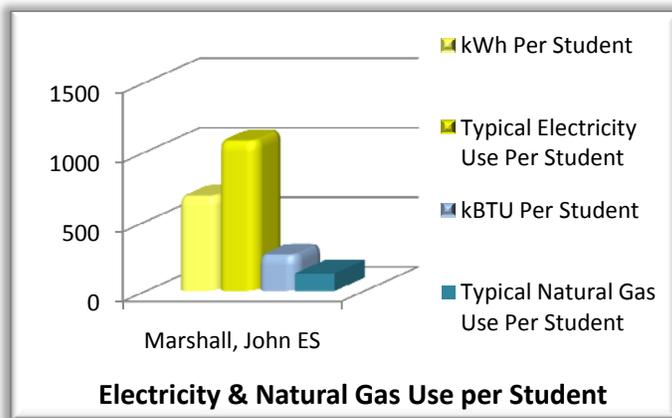
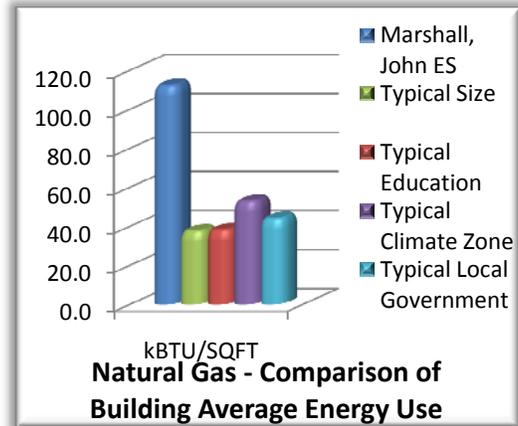
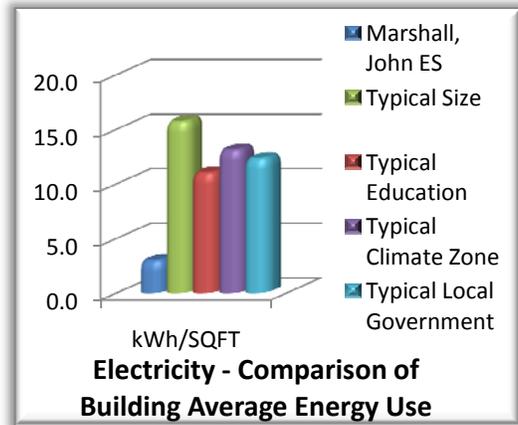
By comparison of square feet, this building has comparatively efficient electrical energy consumption.

#### Natural Gas Use - kBTU

The amount of natural gas consumed at this building is high, indicating that there are likely opportunities to save natural gas energy at this building.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. From the high natural gas consumption, an energy audit may be able to identify where this school could save natural gas to reduce this cost.





### 4.32 Agassiz Elementary School Building Assessment

The assessment of the City’s Agassiz Elementary School building shows the potential for natural gas energy savings.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Agassiz ES	115,400	371,320	3.2	109,631	95.0

#### Electricity Use - kWh

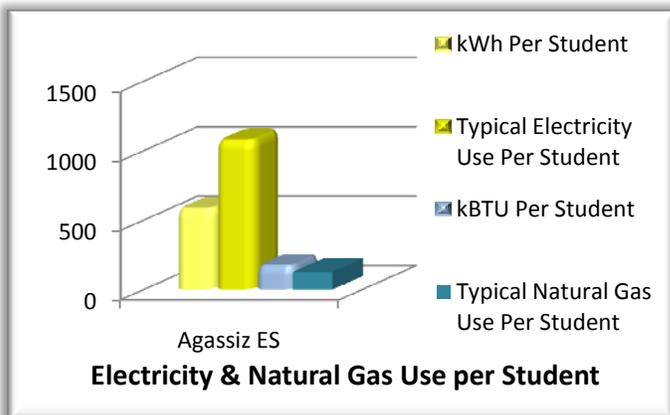
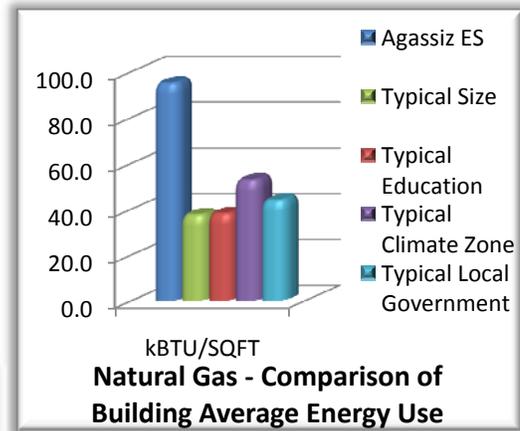
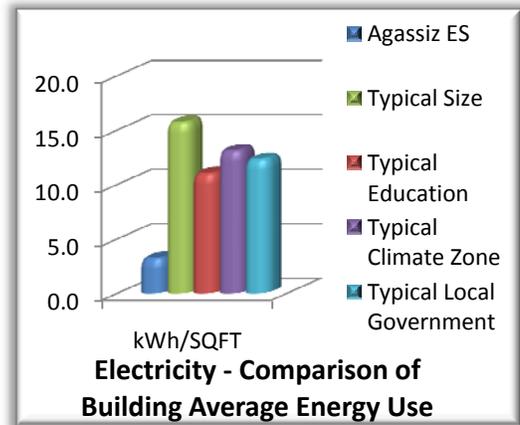
This school consumes a low amount of electricity from the utility. The calculated cost of the electrical energy is higher than other buildings within the city, and this should be reviewed to see if there is a means to reduce high peak kW demands.

#### Natural Gas Use - kBTU

With the high amount of natural gas consumption, studying how this is used may lead to a means to reduce this energy.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. The electrical use should be reviewed to better determine whether there is energy used that is unaccounted for at this building. The opportunity for natural gas reduction is possible and should be investigated with a further audit.





### 4.33 Hyde Park Education Complex Building Assessment

The assessment of the City’s Hyde Park Education Complex building reveals that the building is operating relatively efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Hyde Park Education Complex	191,060	383,760	2.0	79,223	41.5

#### Electricity Use - kWh

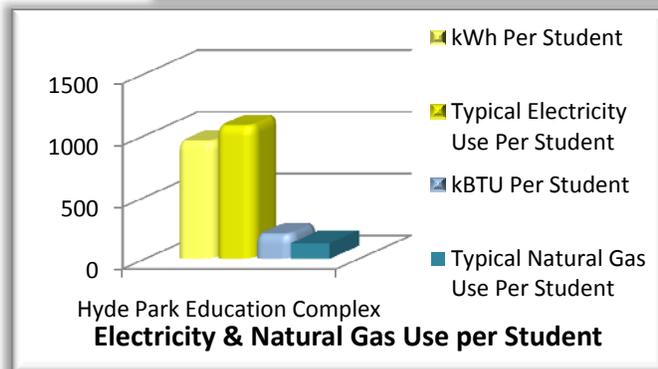
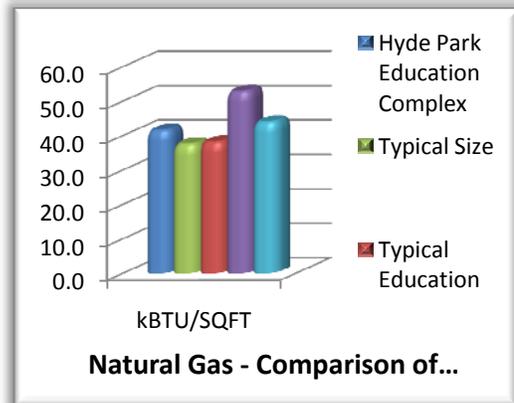
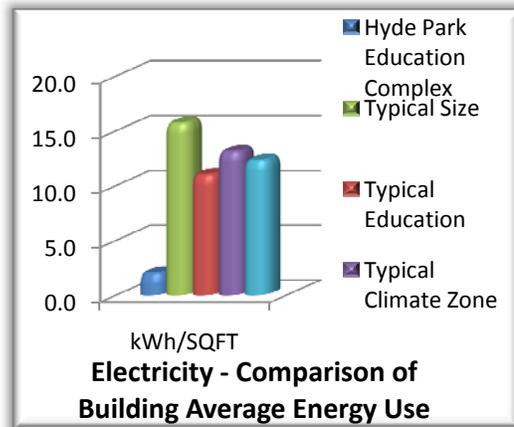
With the low electrical energy used at this location, it may be worthwhile reviewing past measures to repeat at other locations. Since this location has a higher total cost, it may be that the total energy consumed for this site was not reported.

#### Natural Gas Use - kBTU

The amount of natural gas used this school is a bit above average as compared with other educational facilities, but below the average for the climate zone. This means that the building has a decent performance that may have stemmed from methods that could be replicated to save natural gas energy at other buildings.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. Based on the low electrical and natural gas use, this building should be further reviewed to ensure accurate electrical consumption as well as identify past energy efficiency measures against the energy saved for future records.





### 4.34 Madison Park/O'Bryant High School Building Assessment

The assessment of the City's Madison Park/O'Bryant High School building shows the building is operating efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Madison Park/O'Bryant HS	1,014,168	833,620	0.8	524,654	51.7

#### Electricity Use - kWh

The electrical use at this large building seems low. The number of students also seems low for a building with such a large footprint. It may be that only part of the building is being used or that there are more than two meters as the site. This should be reviewed further accuracy.

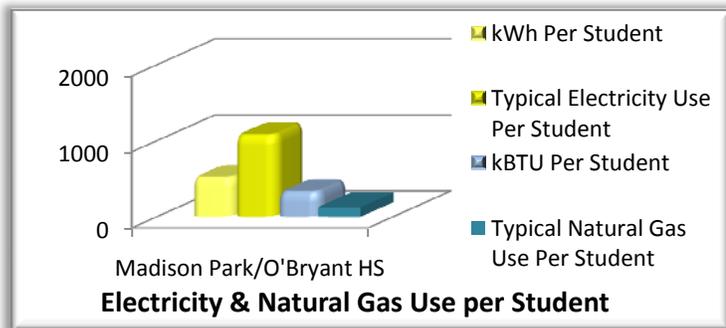
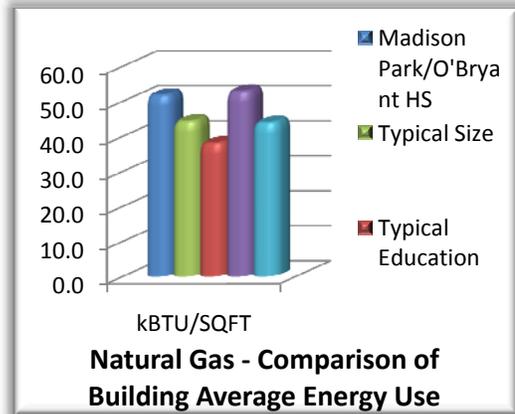
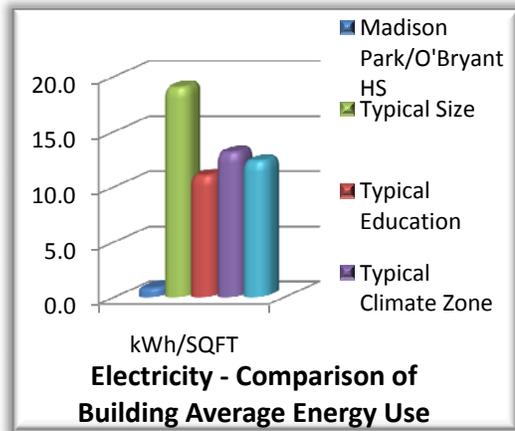
#### Natural Gas Use - kBTU

The amount of natural gas used this school is a bit above average as compared with other educational facilities, but below the average for the climate zone. This means that the building has a decent performance that may have stemmed from methods that could be replicated to save natural gas energy at other buildings.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. Based on the low electrical and natural gas consumption, it may be that only part of the building is being operated. This

should be reviewed more closely to ensure that the electrical consumption is accurate and review for potential natural gas savings.





### 4.35 Jeremiah Burke High School Building Assessment

The assessment of the City’s Jeremiah Burke High School building indicates that the electrical energy consumption is relatively low while there seems to be potential for natural gas energy savings.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Burke, Jeremiah HS	202,304	1,497,780	7.4	169,137	83.6

#### Electricity Use - kWh

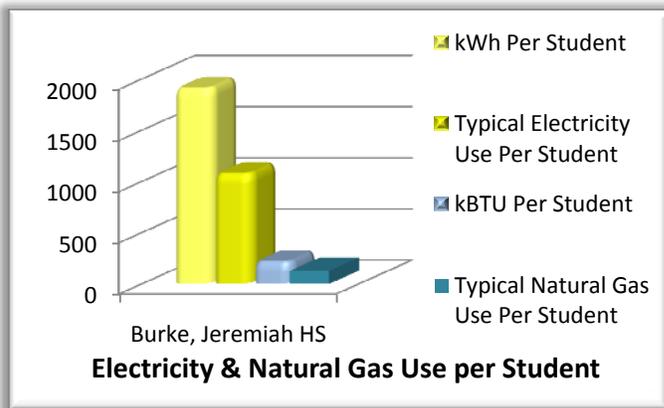
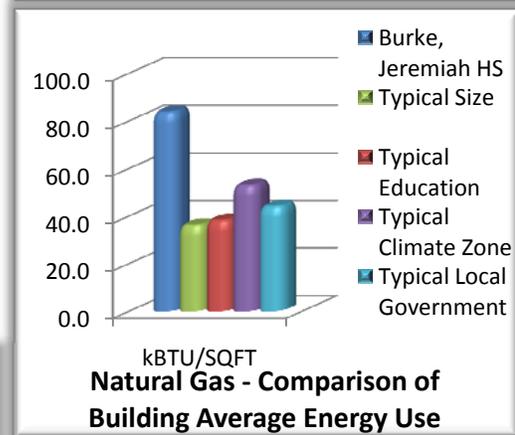
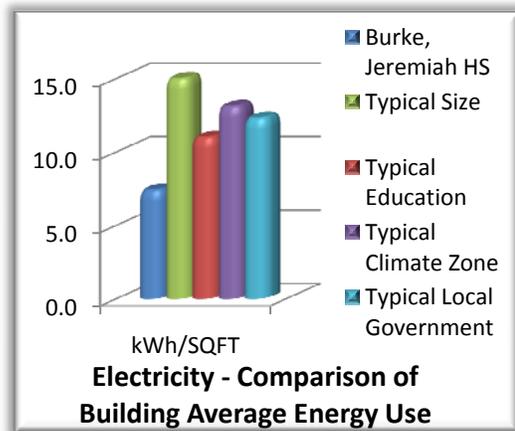
Given the electrical energy consumption is low by comparison the building seems to perform efficiently. The amount of consumption per student is on par with similar buildings.

#### Natural Gas Use - kBTU

The natural gas consumption is high for this building, and there may be operational or other means to save natural gas energy.

#### Summary

Based on the high natural gas consumption, this building could benefit from a closer energy audit to determine means for savings.





### 4.36 Boston Latin Academy Building Assessment

The assessment of the City’s Boston Latin Academy building reveals that the building is operating efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Boston Latin Academy	332,366	1,183,780	3.6	81,283	24.5

#### Electricity Use - kWh

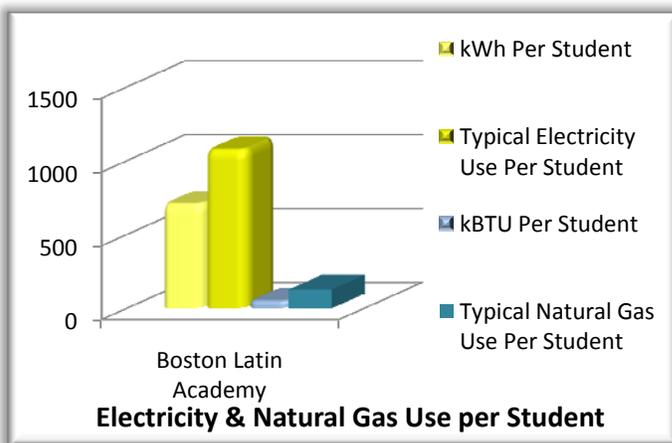
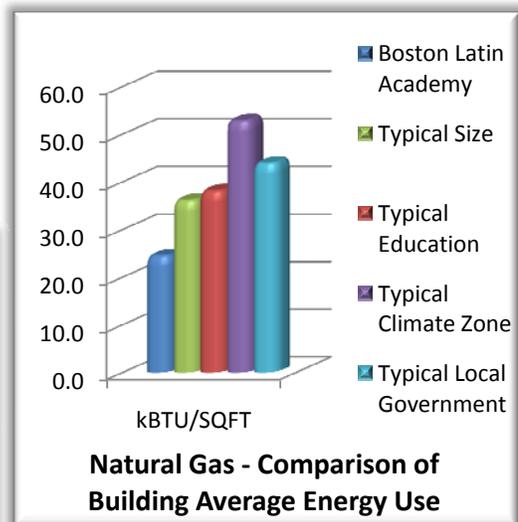
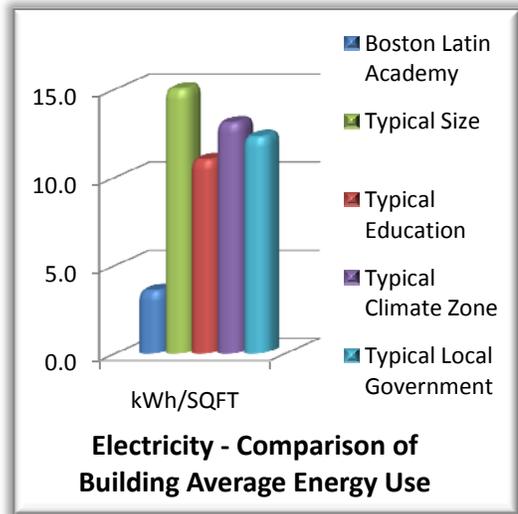
This building appears to operate efficiently for its size.

#### Natural Gas Use - kBTU

The natural gas consumption for the building is lower than the similar buildings.

#### Summary

This building could be used to document changes or operating parameters that save energy. These methods could then be implemented at other schools in the City.





### 4.37 Thomas Edison Junior High School Building Assessment

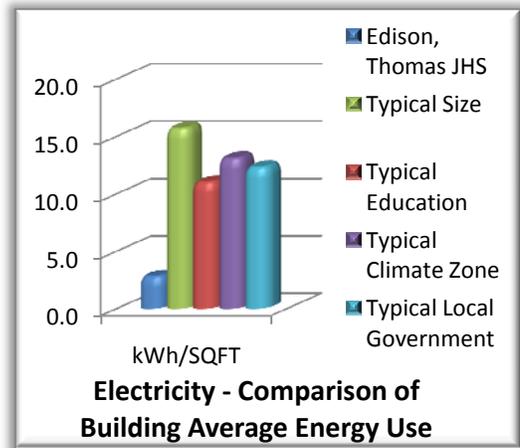
The assessment of the City's Thomas Edison Junior High School building shows that the building is operating relatively efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Edison, Thomas JHS	100,500	281,280	2.8	45,326	45.1

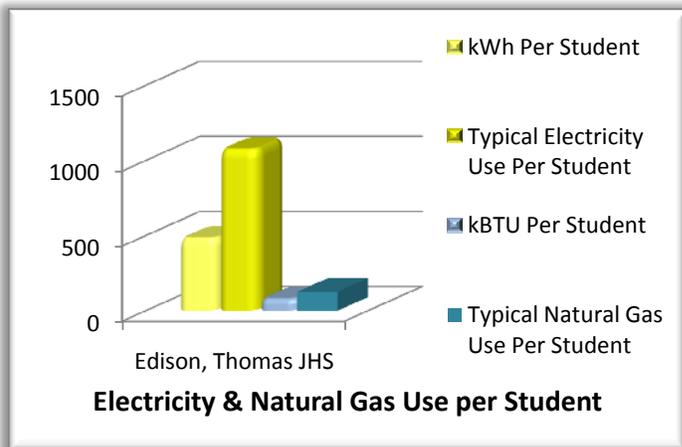
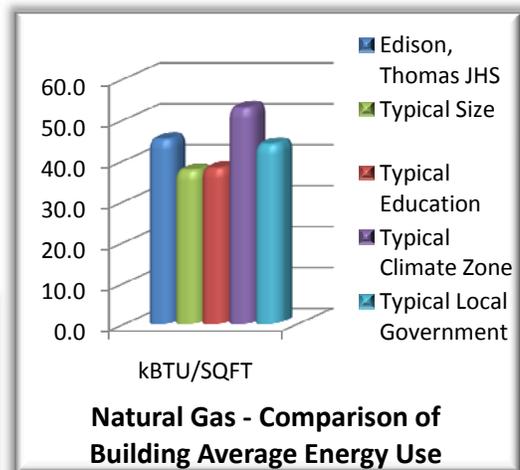
#### Electricity Use - kWh

The electrical use at this large building seems low. The number of students also seems low for a building with such a large footprint. It may be that only part of the building is being used or that there are more than two meters as the site. This may need to be reviewed further accuracy.

#### Natural Gas Use - kBTU



The amount of natural gas used this school is a bit above average as compared with other educational facilities, but below the average for the climate zone. This means that the building has a decent performance that may have stemmed from methods that could be replicated to save natural gas energy at other buildings.



#### Summary

Based on the low electrical energy use, this building may need to be reviewed for accuracy of consumption.



### 4.38 Fredrick Pilot Middle School Building Assessment

The assessment of the City’s District Fredrick Pilot Middle School demonstrates the lower than average consumption for both electrical and natural gas. The number of students was not provided for this building at the time of this report.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Fredrick Pilot Middle School	144,008	1,220,020	8.5	49,700	34.5

#### Electricity Use - kWh

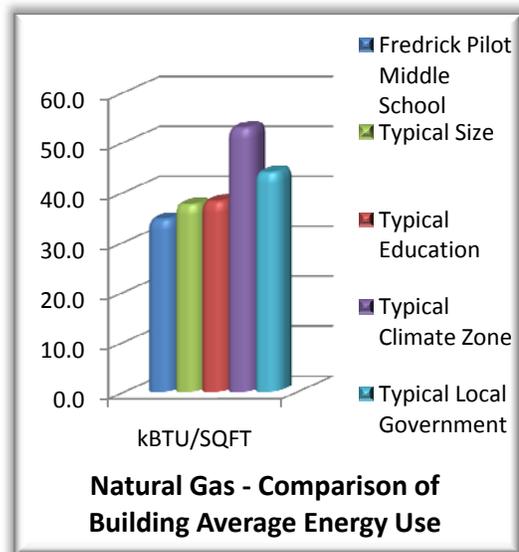
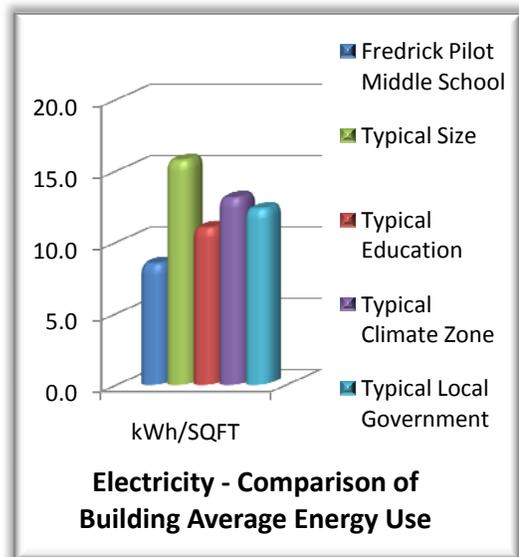
By comparison of square feet, this building seems to operate efficiently.

#### Natural Gas Use - kBTU

The amount of natural gas used at this school is less than other similar buildings.

#### Summary

This building could be used to document changes or operating parameters that save energy. These methods could then be implemented at other schools in the City.





### 4.39 William Ohrenburger Elementary School Building Assessment

The assessment of the City’s William Ohrenburger Elementary School building shows that the building may be electrically efficient while still showing the potential for natural gas energy savings.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Ohrenberger, William ES	111,592	296,952	2.7	117,793	105.6

#### Electricity Use - kWh

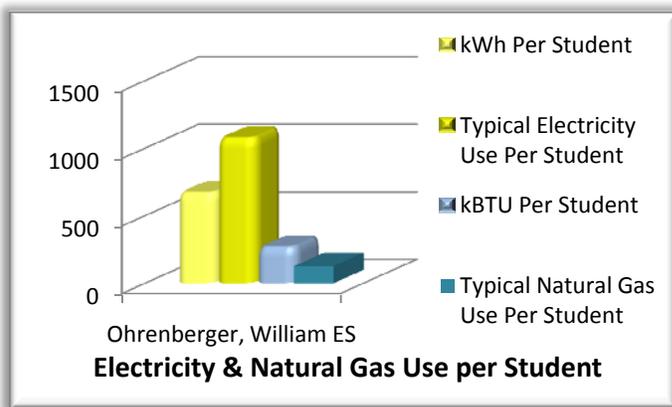
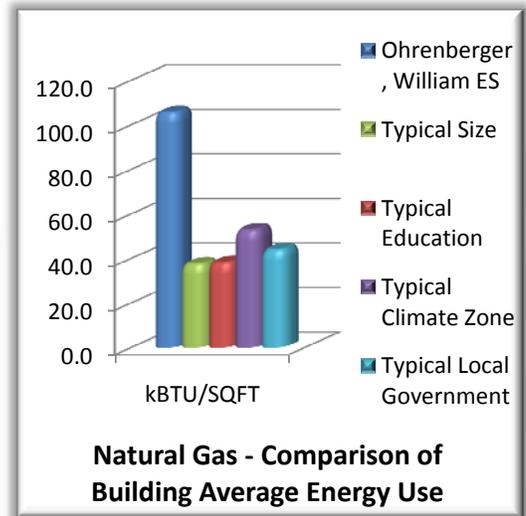
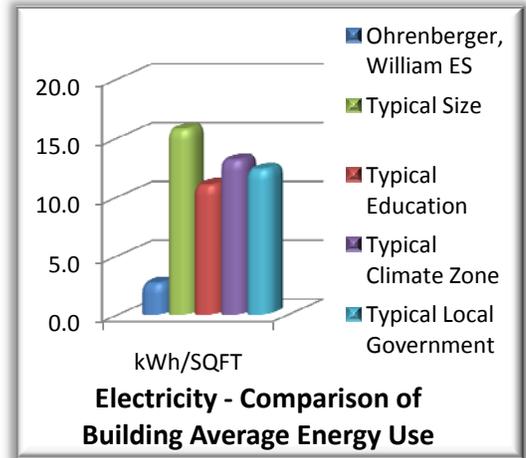
The electrical use at this large building seems low. This may need to be reviewed further accuracy.

#### Natural Gas Use - kBTU

The amount of natural gas consumed is high by comparison with other sites. There are likely measures that could be found to reduce the amount of gas consumed.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. It would be advised to perform an energy audit at this site to identify the electrical accuracy as well as review the natural gas consumption to look for areas of improvement.





### 4.40 Orchard Gardens K-8 Building Assessment

The assessment of the City’s Orchard Gardens K-8 building reveals that the building is operating relatively efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Orchard Gardens K-8	141,872	1,186,110	8.4	66,051	46.6

#### Electricity Use - kWh

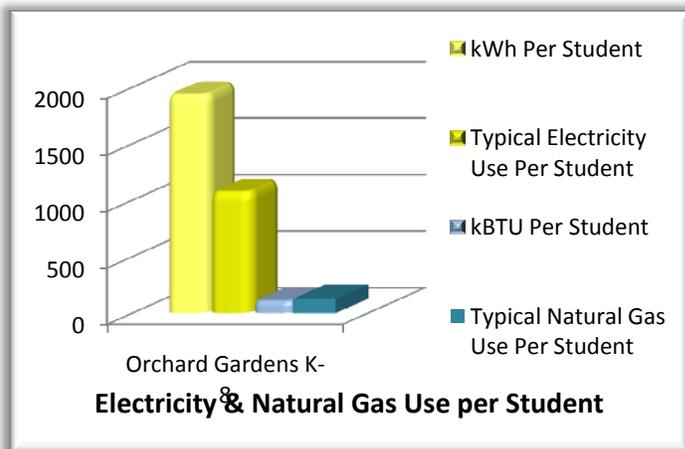
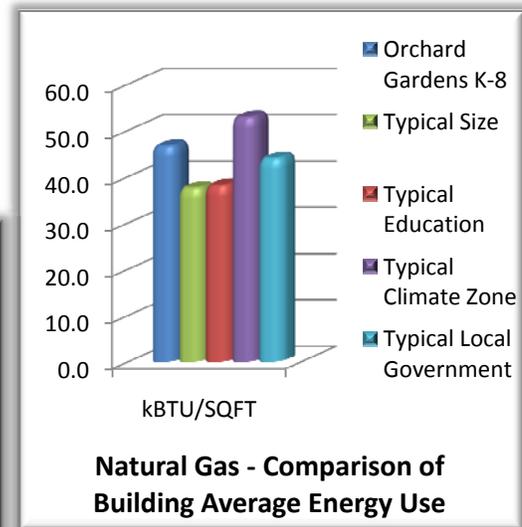
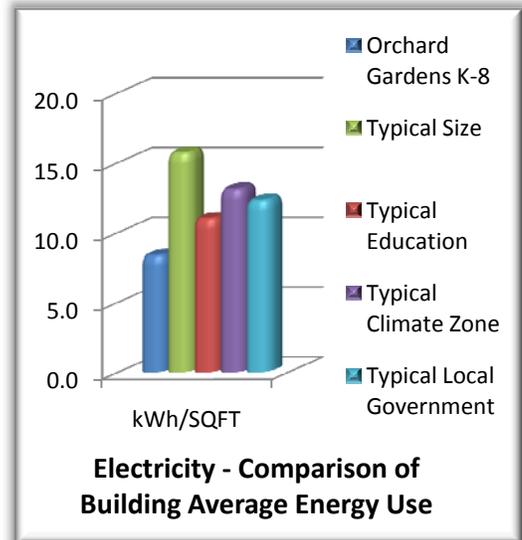
By comparison of square feet, this building appears to be operating efficiently. The electrical energy use per student, however, is high and may warrant further review.

#### Natural Gas Use - kBTU

The amount of natural gas used this school is a bit above average as compared with other educational facilities, but below the average for the climate zone. This means that the building has a decent performance that may have stemmed from methods that could be replicated to save natural gas energy at other buildings.

#### Summary

It seems that this building is operating in an efficient manner. If there were recent changes or upgrades they should be reviewed to determine the effectiveness of the results.





### 4.41 Harvard-Kent Elementary School Building Assessment

The assessment of the City’s Harvard-Kent Elementary School building shows that although the electrical consumption is low the natural gas use is high.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Harvard-Kent ES	93,350	142,836	1.5	102,657	110.0

#### Electricity Use - kWh

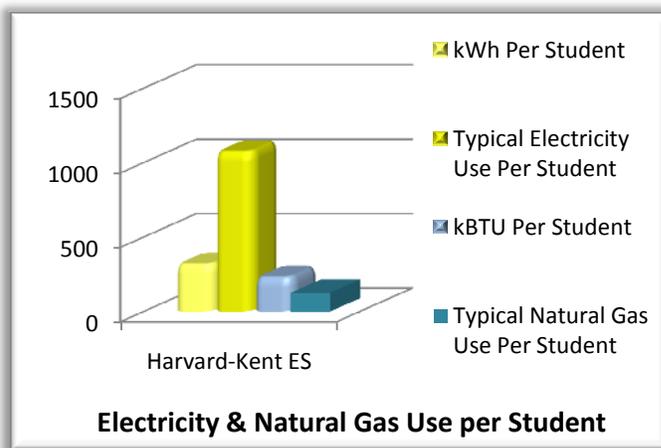
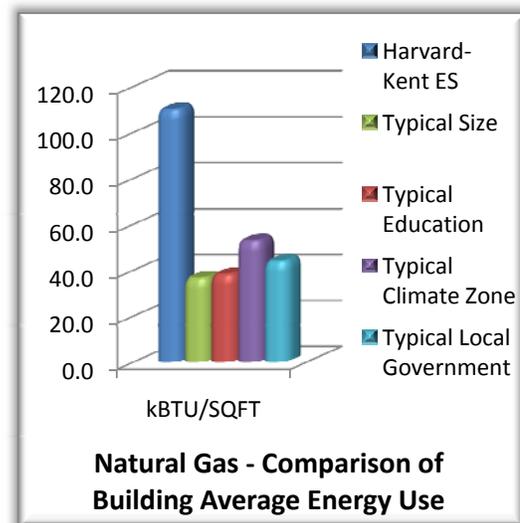
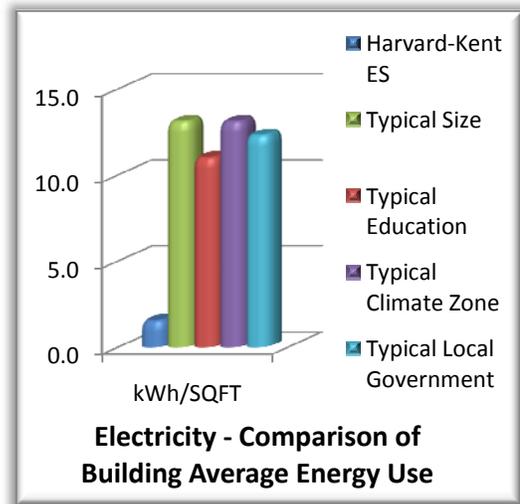
The electrical use at this large building seems low. This may need to be reviewed further accuracy.

#### Natural Gas Use - kBTU

The amount of natural gas consumed is high by comparison with other sites. There are likely measures that could be found to reduce the amount of gas consumed.

#### Summary

Since this building has a combined heat and power unit, the gas use offsets the electricity consumption. It would be advised to perform an energy audit at this site to identify the electrical accuracy as well as review the natural gas consumption to look for areas of improvement.





### 4.42 Tech Boston Academy Building Assessment

Examining the City’s Tech Boston Academy building shows that the building is consuming energy at a decent level with potential to review for more natural gas savings.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Tech Boston Academy	153,460	646,412	4.2	87,458	57.0

#### Electricity Use - kWh

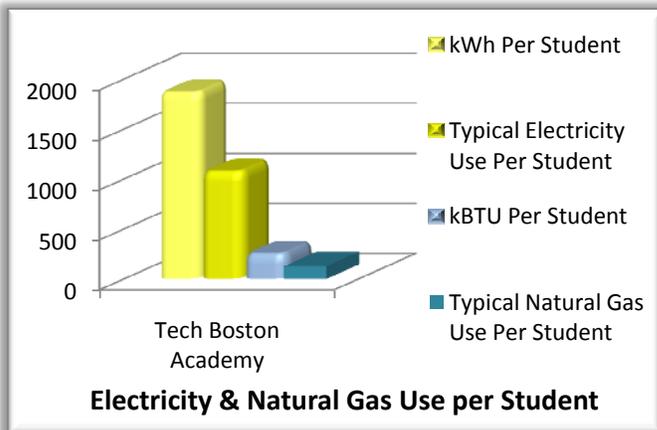
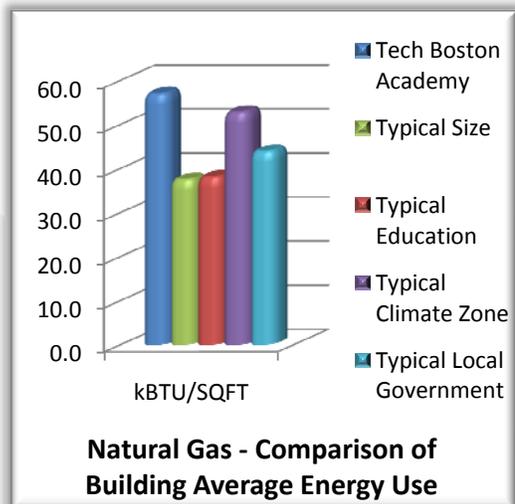
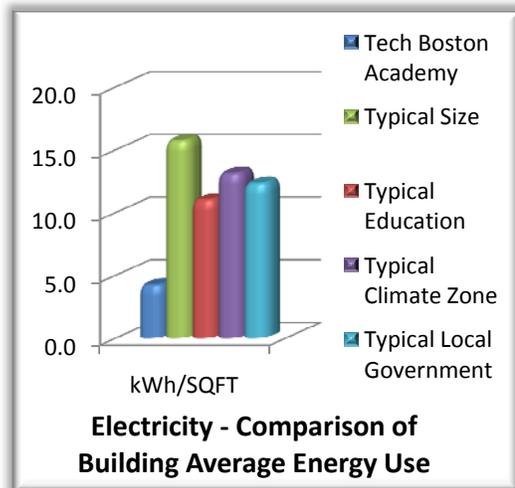
By comparison of square feet, this building appears to be operating efficiently. The electrical energy use per student, however, is high and may warrant further review.

#### Natural Gas Use - kBTU

The amount of natural gas used at this school is a bit higher than average. There may be an opportunity to improve upon this performance; especially if there have not been any recent audits or changes.

#### Summary

From the electrical consumption, it seems like the building is operating in a more efficient manner for the electrical systems. The natural gas consumption, however, might be reviewed to see if there are measures that can easily reduce the amount of consumption.





### 4.43 East Boston High School Building Assessment

The assessment of the City’s East Boston High School building reveals that the building is operating efficiently electrically, but with possible areas of improvement for the natural gas consumption.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
East Boston HS	208,826	764,330	3.7	123,309	59.0

#### Electricity Use - kWh

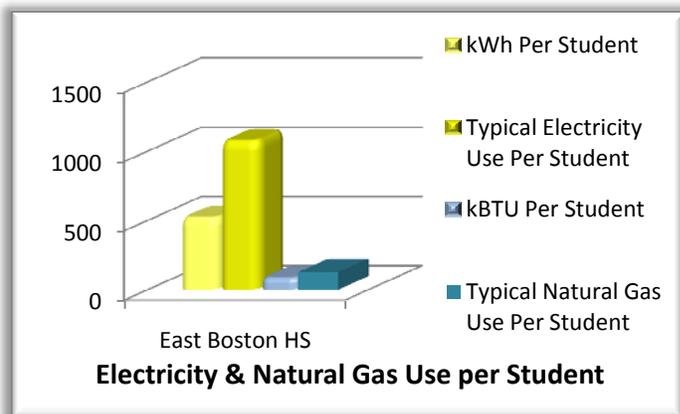
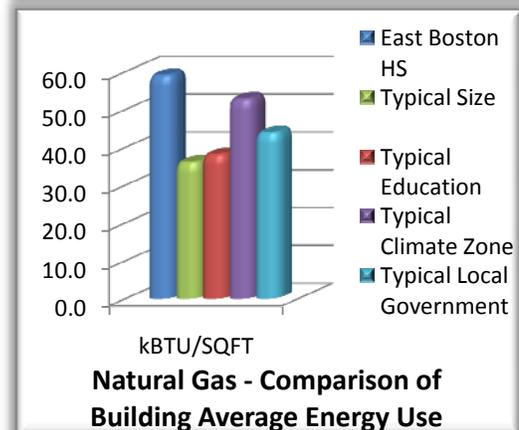
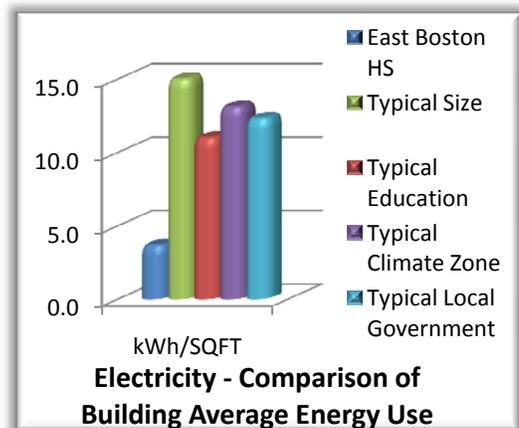
By comparison of square feet, this building appears to be operating efficiently. The electrical energy use per student, however, is high and may warrant further review.

#### Natural Gas Use - kBTU

The amount of natural gas used at this school is a bit higher than average. There may be an opportunity to improve upon this performance; especially if there have not been any recent audits or changes.

#### Summary

From the electrical consumption, it seems like the building is operating in a more efficient manner for the electrical systems. The natural gas consumption, however, might be reviewed to see if there are measures that can easily reduce the amount of consumption.





### 4.44 Boston Arts Academy Building Assessment

The assessment of the City’s Boston Arts Academy building shows that the building is operating relatively efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Boston Arts Academy	129,800	923,250	7.1	47,460	36.6

#### Electricity Use - kWh

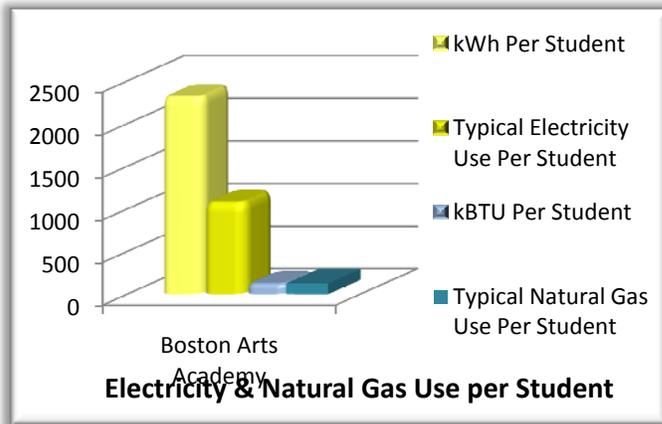
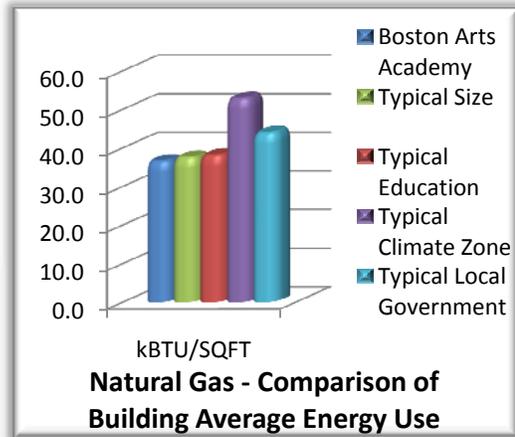
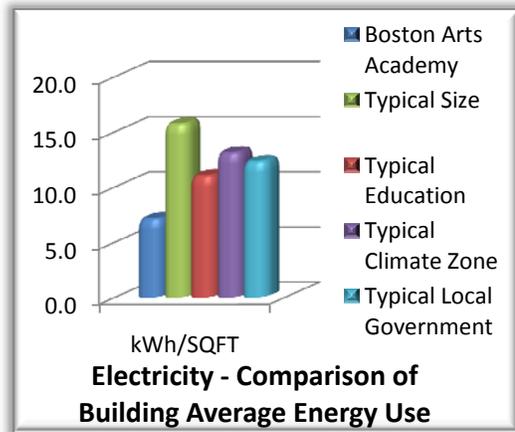
By comparison of square feet, this building seems to operate efficiently.

#### Natural Gas Use - kBTU

The amount of natural gas used at this school is less than other similar buildings. If there have been recent changes, these results should be measured to determine the overall impact.

#### Summary

This building could be used to document changes or operating parameters that save energy. These methods could then be implemented at other schools in the City.





### 4.45 Martin Luther King Jr Middle School Building Assessment

The assessment of the City’s Martin Luther King Jr. Middle School building reveals that while the building electrical energy use is low, there is the possibility to improve the natural gas consumption.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
King Jr., Martin Luther MS	71,095	365,400	5.1	68,088	95.8

#### Electricity Use - kWh

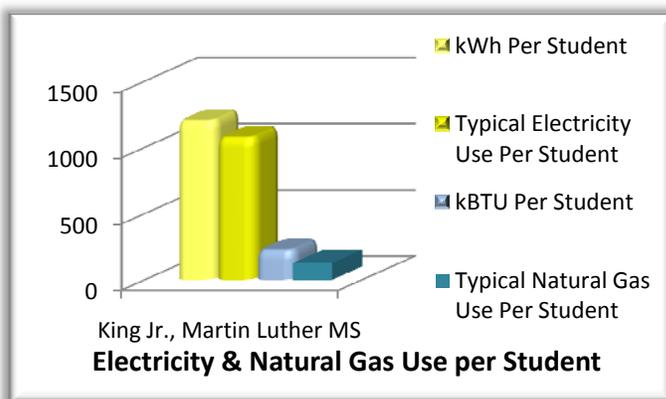
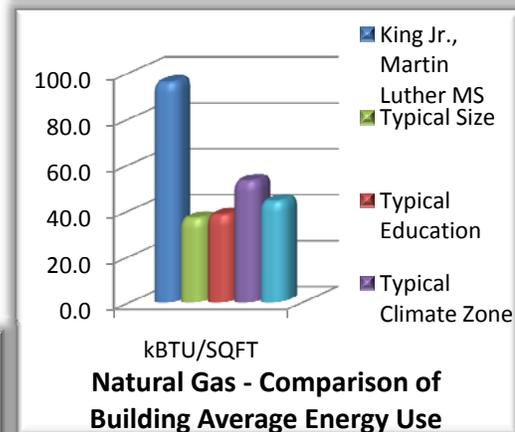
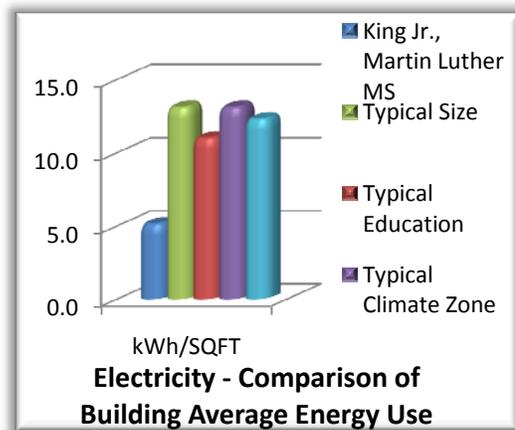
This school appears to have an efficient electrical consumption.

#### Natural Gas Use - kBTU

The amount of natural gas consumed is high by comparison with other sites. There are likely measures that could be found to reduce the amount of gas consumed.

#### Summary

It would be advised to perform an energy audit at this site to identify the electrical accuracy as well as review the natural gas consumption to look for areas of improvement.





### 4.46 John McCormack Middle School Building Assessment

The assessment of the City's John McCormack Middle School building reveals that the building is operating efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
McCormack, John MS/Dever	234,625	540,960	2.3	78,650	33.5

#### Electricity Use - kWh

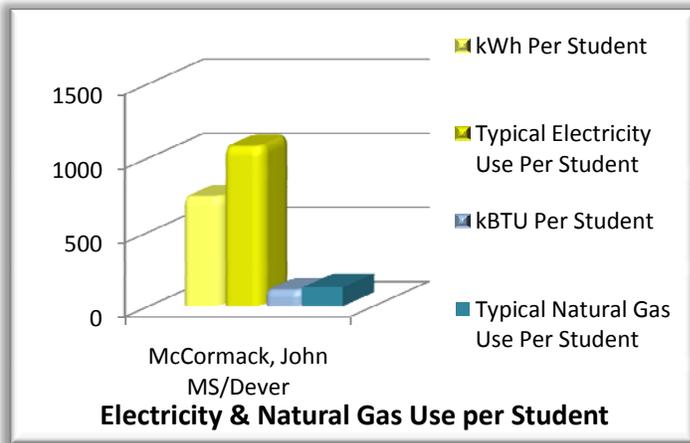
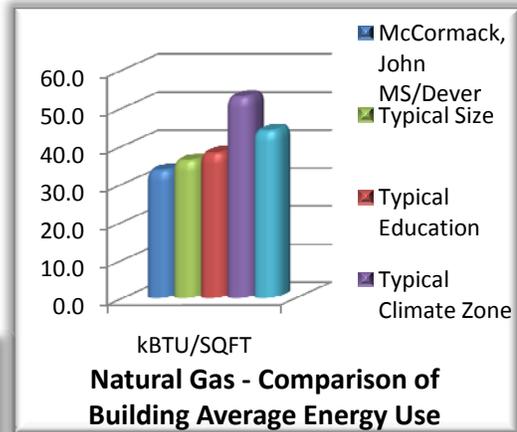
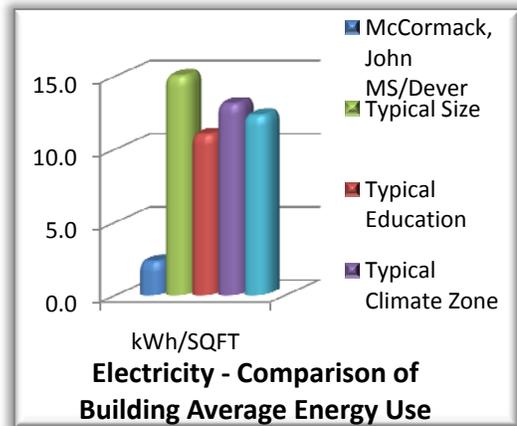
The electrical use at this large building seems low. This may need to be reviewed further accuracy.

#### Natural Gas Use - kBTU

The amount of natural gas used at this school is less than other similar buildings. If there have been recent changes, these results should be measured to determine the overall impact.

#### Summary

From the data given, the electrical consumption may be reviewed under a more in-depth audit. The natural gas use could be reviewed to determine if any additional savings could be achieved and possibly how to replicate to other sites.





### 4.47 Brighton High School Building Assessment

The assessment of the City’s Brighton High School building reveals that the building is operating efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Brighton HS	216,213	676,760	3.1	61,869	28.6

#### Electricity Use - kWh

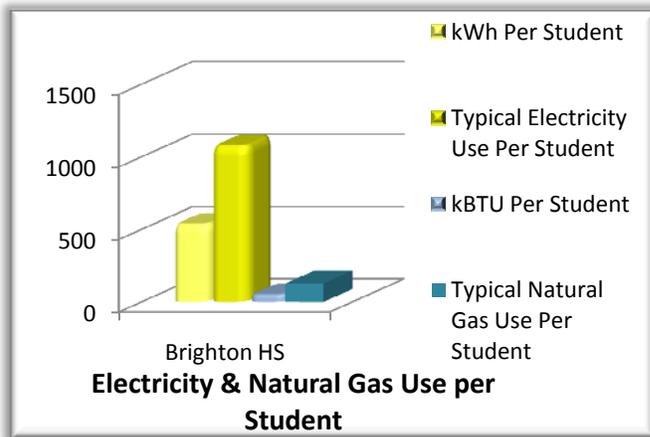
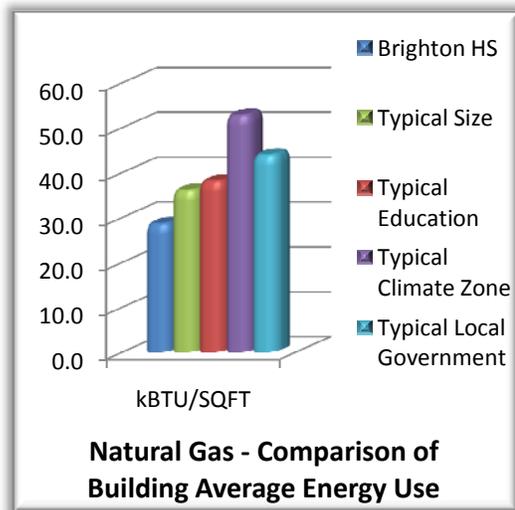
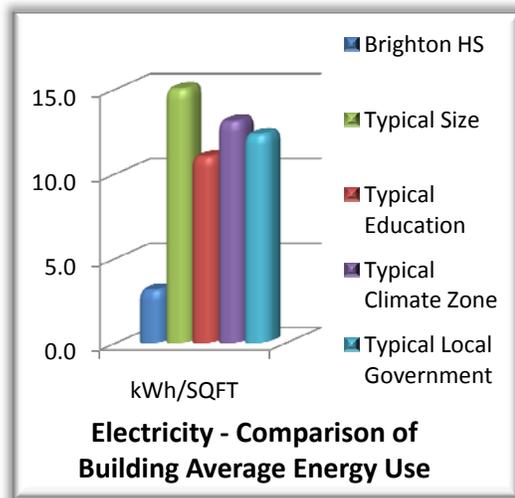
The electrical use at this large building seems low. This may need to be reviewed further accuracy.

#### Natural Gas Use - kBTU

The amount of natural gas used at this school is less than other similar buildings. If there have been recent changes, these results should be measured to determine the overall impact.

#### Summary

From the data given, the electrical consumption may be reviewed under a more in-depth audit. The natural gas use could be reviewed to determine if any additional savings could be achieved and possibly how to replicate to other sites.





### 4.48 Baldwin ELC Building Assessment

The assessment of the City's Baldwin ELC building shows that the building is operating efficiently as compared to the typical averages.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Baldwin ELC	27,879	84,000	3.0	9,743	34.9

#### Electricity Use - kWh

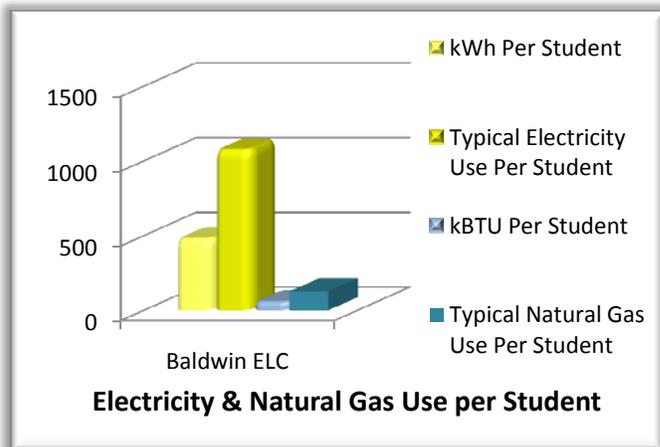
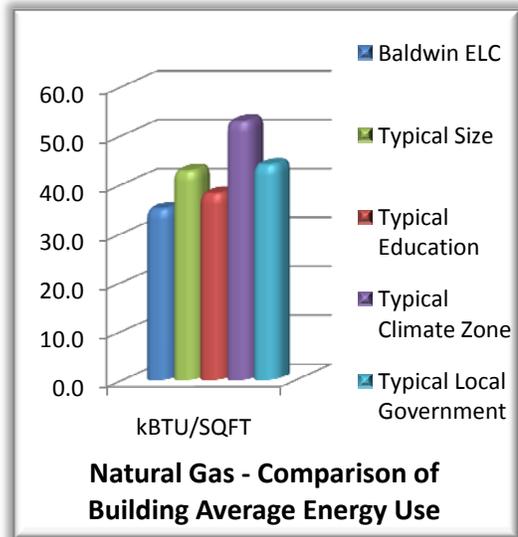
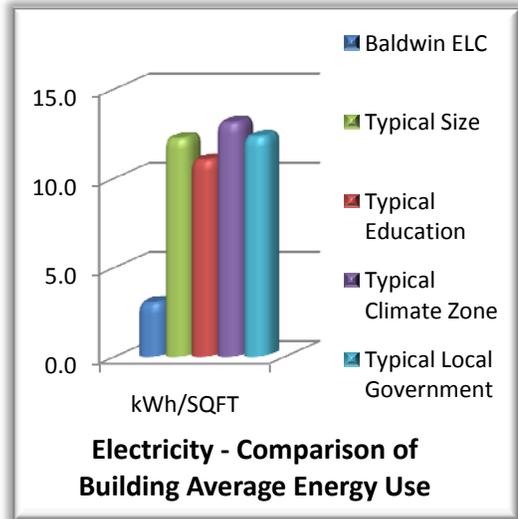
The electrical use at this large building seems low. This may need to be reviewed further accuracy.

#### Natural Gas Use - kBTU

The amount of natural gas used at this school is less than other similar buildings. If there have been recent changes, these results should be measured to determine the overall impact.

#### Summary

From the data given, the electrical consumption may be reviewed under a more in-depth audit. The natural gas use could be reviewed to determine if any additional savings could be achieved and possibly how to replicate to other sites.





### 4.49 Central Kitchen / Hernandez ELC Building Assessment

The assessment of the City’s Central Kitchen / Hernandez ELC building indicates that the building may have areas where the energy consumption can be reduced. The number of students enrolled at this building was not given at the time of this report.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Central Kitchen / Hernandez ELC	44,750	1,054,568	23.6	22,539	50.4

#### Electricity Use - kWh

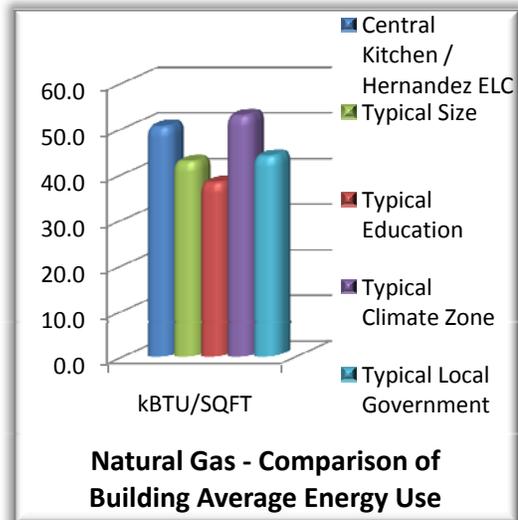
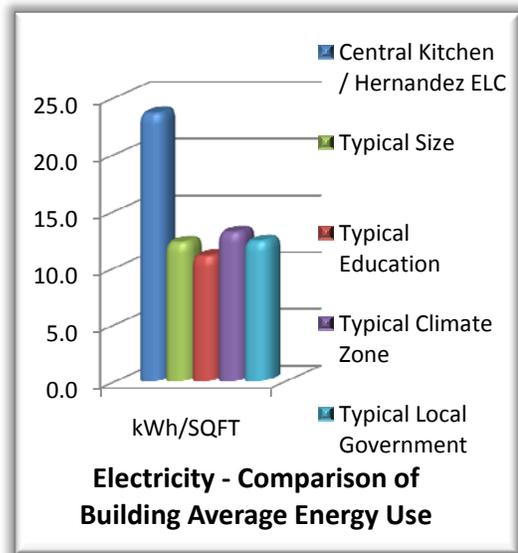
The amount of electrical use at this school is over 40% higher than the similar buildings. It is possible that this building operates year-round or on a longer schedule than other schools.

#### Natural Gas Use - kBTU

The natural gas consumption is close to other averages of similar buildings. A review of the use could reveal items that might reduce the gas usage below similar averages.

#### Summary

An energy audit of this building would be able to identify the sources of the energy used an potential opportunities for savings.





### 4.50 Excel High School (South Boston) Building Assessment

The assessment of the City’s Excel High School (South Boston) building reveals that a decent electrical efficiency with the potential to save natural gas energy.

Facility	AREA - SQFT	Total kWh	kWh/SQFT	Total Therms	kBTU/SQFT
Excel HS (South Boston HS)	159,320	460,200	2.9	80,577	50.6

#### Electricity Use - kWh

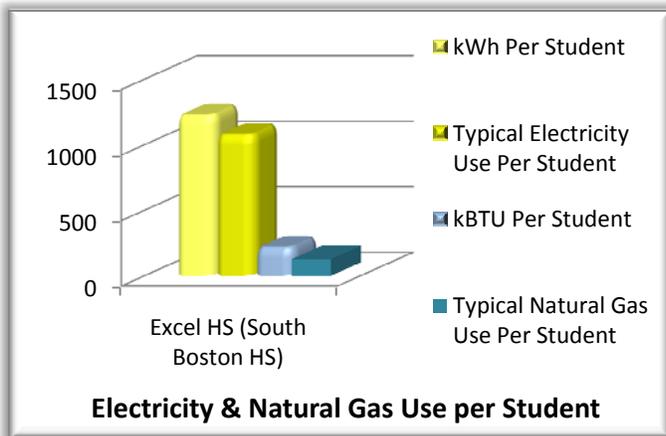
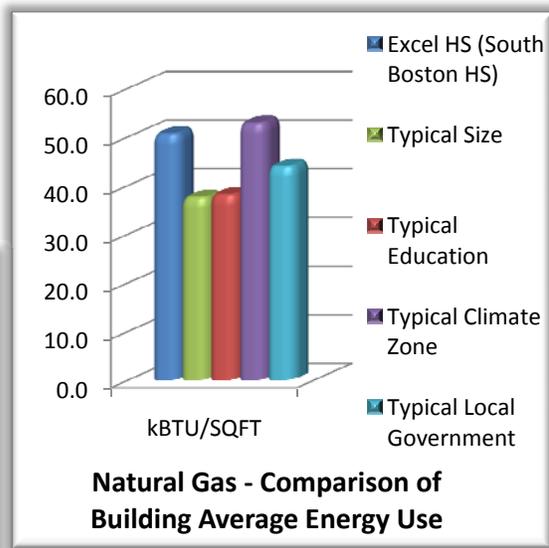
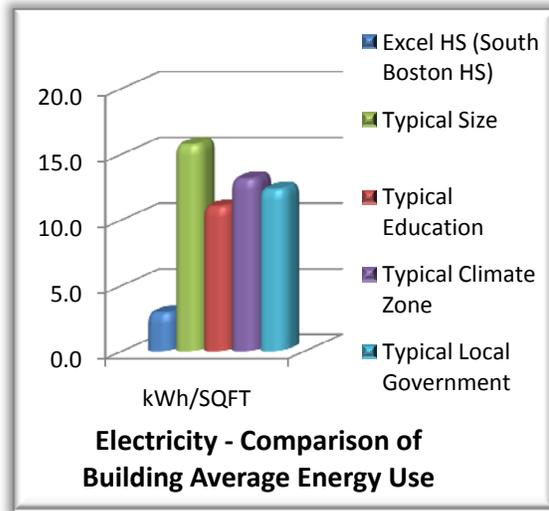
The electrical use at this large building seems low. This may need to be reviewed further accuracy.

#### Natural Gas Use - kBTU

The natural gas consumption is close to other averages of similar buildings. A review of the use could reveal items that might reduce the gas usage below similar averages.

#### Summary

From the data given, the electrical consumption may be reviewed under a more in-depth audit. The natural gas use could be reviewed to determine if any additional savings could be achieved and possibly how to replicate to other sites.





## 5. References

1. Commercial Buildings Energy Consumption Survey (CBECS);  
<http://www.buildingbenchmarks.com/>
2. Building Operations and Maintenance Association International (BOMA);  
[www.boma.org](http://www.boma.org)
3. American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) Procedures for Commercial Building Energy Audits, second edition;  
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4. National Oceanic and Atmospheric Administration (NOAA) climate divisions;  
[www.cdc.noaa.gov](http://www.cdc.noaa.gov)
5. Association of Energy Engineers (AEE); Commercial Energy Auditing Reference Handbook; [www.aeecenter.org](http://www.aeecenter.org)
6. International Standards Organization (ISO) 50001:2011;  
[http://www.iso.org/iso/iso\\_50001\\_energy.pdf](http://www.iso.org/iso/iso_50001_energy.pdf)



## 6. Appendices

### Contents:

- Appendix A: Buildings Selected for Review
- Appendix B: Administration Buildings Summary
- Appendix C: Public Safety Buildings Summary
- Appendix D: Library Buildings Summary
- Appendix E: Schools Buildings Summary



### 6.1 Appendix A: Buildings Selected for Review

The list of 50 buildings below shows the facility, the department category, and address(es) for each.

Facility	Category	Address
City Hall	Administration	1 City Hall Sq.
Copley Square	Library	700 Boylston St.
400 Frontage Road	Public Safety	400 Frontage Road
Police Headquarters	Public Safety	1199 Tremont St.
Mann, Jackson ES	School	40 Armington St.
Charlestown HS	School	255 Medford St.
		Terminal St.
		240 Medford St.
Holland, John ES	School	85 Olney St.
Cleveland, Grover MS	School	11 Charles St.
Mildred Avenue MS	School	1 Mildred Ave.
Parkway Academy of Technology and Health (West Roxbury HS)	School	1205 VFW Pkwy.
English HS	School	144 McBride St.
Boston Latin JHS/SHS	School	78 Louis Pasteur Ave.
Hennigan, James ES	School	200 Heath St.
Condon, James ES	School	200 D St.
Mattahunt ES	School	100 Hebron St.
Lee, Joseph ES	School	155 Talbot Ave.
Blackstone ES	School	380 Shawmut Ave.
Murphy, Richard K-8	School	1 Worrell St.
Quincy, Josiah ES	School	885 Washington St.
		900 Washington St.
Marshall, John ES	School	35 Westville St.
Agassiz ES	School	20 Child St.
Hyde Park Education Complex	School	655 Metropolitan Ave.
Madison Park/O'Bryant HS	School	55 Malcolm X Blvd.
		75 Malcolm X Blvd.
Burke, Jeremiah HS	School	60 Washington St.
Boston Latin Academy	School	205 Townsend St.
Edison, Thomas JHS	School	60 Glenmont Rd.
26 Court Street - Main Administration	Administration	26 Court St.
BFD Headquarters	Public Safety	115 Southampton St.
		920 Massachusetts Ave.
Fredrick Pilot Middle School	School	272 Columbia Rd.



Ohrenberger, William ES	School	1 Willers St.
Curley Community Center	Indoor Recreation	1665 William J. Day Blvd.
Orchard Gardens K-8	School	906 Albany St.
District A-1 HQ	Public Safety	40 New Sudbury St.
Strand Theatre	Other	543 Columbia Rd.
Harvard-Kent ES	School	50 Bunker Hill St.
Tech Boston Academy (Dorchester HS)	School	9 Peacevale Rd.
East Boston HS	School	86 White St.
Boston Arts Academy	School	174 Ipswich St.
Tobin 1481 Tremont Street	Administration	1481 Tremont St.
Campbell Resource Center	Administration	1216 Dorchester Ave.
Mattapan Library	Library	10 Hazelnut St.
		1350 Blue Hill Ave.
King Jr., Martin Luther MS	School	100 Maxwell St.
		77 Lawrence Ave.
District D-4 HQ	Public Safety	656 Harrison Ave
McCormack, John MS/Dever	School	315 Mount Vernon St.
		325 Mount Vernon St.
43 Hawkins Street	Administration	43 Hawkins St.
Brighton HS	School	25 Warren St.
		27 Warren St.
Baldwin ELC	School	15 Washington St.
1010 Mass Ave.	Administration	1010 Massachusetts Ave.
Central Kitchen / Hernandez ELC	School	370 Columbia Rd.
Excel HS (South Boston HS)	School	95 G St.



### 6.2 Appendix B: Administration Buildings Summary

Below are the eight buildings that compose the Administration category. The total electricity and natural gas consumptions are used to derive the energy per square foot. The national average for similar office buildings is 17.3 kWh (electric) and 32.8 kBtu (natural gas).

Facility	AREA - SQFT	Total kWh	kWh/ SQFT	Total Therms	kBTU/ SQFT	Gallons	Gallons/ SQFT
City Hall	513,000	13,907,920	27	1,629,571	318	1,133,400	2.21
26 Court Street - Main Administration	139,821	1,870,280	13	55,182	39	206,540	1.48
Curley Community Center	7,300	512,088	70	67,151	920	380,180	52.08
Strand Theatre	18,000	598,616	33	41,434	230	9,230	0.51
Tobin 1481 Tremont Street	50,000	454,356	9	35,023	70	77,110	1.54
Campbell Resource Center	97,349	1,026,480	11	24,666	25	46,337	0.48
43 Hawkins Street	23,408	446,292	19	46,550	199	88,910	3.80
1010 Mass Ave.	195,000	861,520	4	28,754	15	298,542	1.53
<b>City of Boston Administration Average</b>	<b>130,485</b>	<b>2,459,694</b>	<b>19</b>	<b>241,041</b>	<b>185</b>	<b>280,031</b>	<b>2.15</b>



### 6.3 Appendix C: Public Safety Buildings Summary

Below are the five public safety buildings that were reviewed. The total electricity and natural gas consumptions are used to derive the energy per square foot. The national average for similar public safety buildings is 15.3 kWh (electric) and 45.0 kBtu (natural gas).

Facility	AREA - SQFT	Total kWh	kWh/ SQFT	Total Therms	kBTU/ SQFT	Water	Gallons/ SQFT
400 Frontage Road	422,000	3,044,160	7.2	305,013	72.3	250,340.0	0.59
Police Headquarters	180,000	5,711,200	31.7	172,789	96.0	718,675.0	3.99
BFD Headquarters	62,432	860,280	13.8	68,765	110.1	137,200.0	2.20
District A-1 HQ	37,433	699,324	18.7	45,417	121.3	99,010.0	2.64
District D-4 HQ	27,224	680,316	25.0	42,689	156.8	72,600.0	2.67
<b>City of Boston Public Safety Average</b>	<b>145,818</b>	<b>2,199,056</b>	<b>15.1</b>	<b>126,935</b>	<b>87.1</b>	<b>255,565</b>	<b>1.75</b>

### 6.4 Appendix D: Library Buildings Summary

Below are the two library buildings that were reviewed. The total electricity and natural gas consumptions are used to derive the energy per square foot. The national average for similar library buildings is 22.5 kWh (electric) and 69.7 kBtu (natural gas).

Facility	AREA - SQFT	kWh	kWh/ SQFT	Therms	kBTU/ SQFT	Gallons	Gallons/ SQFT
Copley Square	955,000	9,898,760	10.4	4,278,818	448	3,889,387	4.07
Mattapan Library	21,000	383,760	18.3	172,789	823	26,200	1.25
<b>City of Boston Library Average</b>	<b>488,000</b>	<b>5,141,260</b>	<b>10.5</b>	<b>2,225,804</b>	<b>456</b>	<b>1,957,794</b>	<b>4.01</b>





### 6.5 Appendix E: School Buildings Summary

Below are the 35 buildings that compose the Schools category. The total electricity and natural gas consumptions are used to derive the energy per square foot. The national average for similar school buildings is 11.0 kWh (electric) and 38.1 kBtu (natural gas).

Facility	AREA - SQFT	Total kWh	kWh/ SQFT	Therms	kBTU/ SQFT	Gallons	Gallons/ sqft
Mann, Jackson ES (CHP)	201,824	806,440	4.0	213,092	105.6	239,950	1.19
Charlestown HS (CHP)	226,822	1,426,486	6.3	274,447	121.0	193,000	0.85
Holland, John ES (CHP)	137,125	436,200	3.2	154,017	112.3	-	0.00
Cleveland, Grover MS (CHP)	171,870	568,400	3.3	183,570	106.8	117,170	0.68
Mildred Avenue MS (CHP)	172,000	579,440	3.4	212,975	123.8	180,170	1.05
Parkway Academy of Tech & Health	221,728	1,264,200	5.7	161,054	72.6	311,690	1.41
English HS (CHP)	225,600	868,744	3.9	221,047	98.0	167,380	0.74
Boston Latin JHS/SHS	336,545	1,211,304	3.6	119,221	35.4	367,415	1.09
Hennigan, James ES (CHP)	137,800	515,178	3.7	262,919	190.8	163,500	1.19
Condon, James ES (CHP)	140,246	614,360	4.4	138,041	98.4	299,100	2.13
Mattahunt ES (CHP)	171,025	620,280	3.6	152,105	88.9	106,760	0.62
Lee, Joseph ES (CHP)	153,360	400,560	2.6	130,050	84.8	361,930	2.36
Blackstone ES (CHP)	194,260	801,360	4.1	145,587	74.9	188,860	0.97
Murphy, Richard K-8 (CHP)	139,000	419,472	3.0	143,513	103.2	217,200	1.56
Quincy, Josiah ES	156,630	1,781,800	11.4	76,977	49.1	612,400	3.91
Marshall, John ES (CHP)	141,091	417,680	3.0	158,172	112.1	102,000	0.72
Agassiz ES (CHP)	115,400	371,320	3.2	109,631	95.0	130,630	1.13
Hyde Park Education Complex	191,060	383,760	2.0	79,223	41.5	99,360	0.52



Madison Park/O'Bryant HS (CHP)	1,014,168	833,620	0.8	524,654	51.7	1,250,575	1.23
Burke, Jeremiah HS	202,304	1,497,780	7.4	169,137	83.6	84,360	0.42
Boston Latin Academy	332,366	1,183,780	3.6	81,283	24.5	294,244	0.89
Edison, Thomas JHS	100,500	281,280	2.8	45,326	45.1	74,020	0.74
Fredrick Pilot Middle School	144,008	1,220,020	8.5	49,700	34.5	312,610	2.17
Ohrenberger, William ES (CHP)	111,592	296,952	2.7	117,793	105.6	114,420	1.03
Orchard Gardens K-8	141,872	1,186,110	8.4	66,051	46.6	119,020	0.84
Harvard-Kent ES (CHP)	93,350	142,836	1.5	102,657	110.0	123,040	1.32
Tech Boston Academy	153,460	646,412	4.2	87,458	57.0	240,750	1.57
East Boston HS	208,826	764,330	3.7	123,309	59.0	122,010	0.58
Boston Arts Academy	129,800	923,250	7.1	47,460	36.6	84,810	0.65
King Jr., Martin Luther MS	71,095	365,400	5.1	68,088	95.8	47,700	0.67
McCormack, John MS/Dever	234,625	540,960	2.3	78,650	33.5	85,700	0.37
Brighton HS	216,213	676,760	3.1	61,869	28.6	126,350	0.58
Baldwin ELC	27,879	84,000	3.0	9,743	34.9	41,390	1.48
Central Kitchen / Hernandez ELC	44,750	1,054,568	23.6	22,539	50.4	67,860	1.52
Excel HS (South Boston HS)	159,320	460,200	2.9	80,577	50.6	258,050	1.62
<b>City of Boston Schools Average</b>	<b>189,129</b>	<b>732,721</b>	<b>3.9</b>	<b>133,484</b>	<b>70.6</b>	<b>208,726</b>	<b>1.10</b>