

**Engineering Economic Analysis  
for  
Dover High School  
  
Dover, NH**

**October 9, 2015**

**Prepared for:**



**Prepared by:**



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Consulting Engineers, Inc.

# **EXECUTIVE SUMMARY**

## Section 1.0: Executive Summary

The goal of the mechanical lifecycle engineering economic analysis is to assess the performance of various mechanical systems in comparison to a baseline mechanical system.

Each option is compared to the baseline system to determine the lowest combined savings over a 30 year cycle to determine the most advantageous system considering electrical costs, gas costs, maintenance costs, and initial construction costs.

By comparison of each option to the baseline system, the option with the greatest total life-cycle savings is generally recommended. To further enhance controllability and overall system performance, additional options should be considered that will enhance year round temperature control and comfort at a possible marginal increase in capital cost.

## Section 1.1: Mechanical System Analysis

### 1.1.A: Baseline Mechanical System – ASHRAE Baseline Chilled/Hot Water Coil Rooftop Unit Systems with Variable Air Volume Boxes with Reheat Coils

- Hot water coil heating/chilled water coil cooling roof mounted air handling units with energy recovery wheels and terminal variable air volume boxes with hot water reheat coils serving the administration, classroom, auditorium, town square/forum, gymnasium, fitness/locker rooms, media center, and animal science building areas
- Hot water coil heating/chilled water coil cooling roof mounted air handling units with terminal variable air volume boxes with hot water reheat coils serving the stage and some classroom areas
- 100% outside air gas-fired heating roof mounted air handling units with energy recovery wheels serving the CTC shop areas
- Overhead fiberglass insulated supply and return air ductwork distribution system
- Hot water coil heating/chilled water coil cooling roof mounted make-up air handling units and variable air volume exhaust air fan systems serving the kitchen and culinary room
- Limited use of radiant heating panels and unit heaters
- (2) 5,000 MBH standard-efficiency gas-fired boilers
- (2) 495 MBH standard-efficiency gas-fired boilers serving the Animal Science building
- 700 ton code-efficient water-cooled chiller and cooling tower chilled water plant
- Four-pipe hot water/chilled water piping system serving air handling units
- Two-pipe hot water distribution system serving radiant heating panels, unit heaters, and variable air volume boxes with hot water reheat coils
- Chilled and hot water primary pumping with variable frequency drives
- Direct digital controls throughout

### 1.1.B: Mechanical System Option One – Four-Pipe Induction Unit Rooftop Unit Systems

- Multiple four-pipe two coil heating and cooling induction units serving the administration, classroom, and media center areas
- Primary air ducted directly to induction units
- 100% outside air gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels providing ventilation to the induction units of the administration, classroom, and media center areas
- Multiple low wall-mounted displacement diffusers throughout the auditorium, town square/forum, and stage areas
- Dedicated overhead galvanized ventilation distribution system feeding each displacement diffuser
- Variable air volume gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels and demand control ventilation providing fully air conditioned displacement ventilation to the auditorium, town square/forum, and stage areas
- Variable air volume gas-fired heating/direct expansion roof mounted air handling units with energy recovery wheels and demand control ventilation serving the gymnasium area
- 100% outside air gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels with variable air volume boxes with demand control ventilation serving the fitness/locker room areas
- 100% outside air gas-fired heating roof mounted air handling units with energy recovery wheels and demand control ventilation serving the CTC shop areas
- 100% outside air gas-fired heating roof mounted air handling unit with energy recovery wheel providing ventilation to terminal air-source heat pump units located throughout the Animal Science building
- Overhead fiberglass insulated supply and return air ductwork distribution system
- Gas-fired heating/direct expansion cooling roof mounted make-up air handling units and variable air volume exhaust air fan systems serving the kitchen and culinary room
- Limited use of radiant heating panels and unit heaters
- (4) 2,500 MBH high-efficiency condensing gas-fired boilers
- (3) 330 MBH high-efficiency condensing gas-fired boilers serving the Animal Science building
- 300 ton high-efficiency air-cooled chiller chilled water plant
- Four-pipe heating/cooling piping system serving induction units
- Two-pipe hot water distribution system serving radiant heating panels and unit heaters
- Chilled and hot water primary pumping with variable frequency drives

1.1.C: Mechanical System Option Two – Constant Volume Dehumidification Displacement Ventilation Rooftop Unit Systems and Administration/Media Center Four-Pipe Induction Unit Systems

- Multiple low wall-mounted displacement diffusers at approximately 200-300 CFM each (2 per classroom, 1 per support area) for each classroom and support area
- Multiple low wall-mounted displacement diffusers throughout the auditorium, town square/forum, and stage areas
- Dedicated overhead galvanized ventilation distribution system feeding each displacement diffuser
- Constant volume 100% outside air gas-fired heating/direct expansion dehumidification roof mounted air handling units with energy recovery wheels providing dehumidification displacement ventilation to the classroom and support areas
- Variable air volume gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels and demand control ventilation providing fully air conditioned displacement ventilation to the auditorium, town square/forum, and stage areas
- Multiple four-pipe two coil heating and cooling induction units serving the administration and media center areas
- Primary air ducted directly to induction units
- 100% outside air gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels providing ventilation to the induction units of the administration and media center areas
- Variable air volume gas-fired heating/direct expansion roof mounted air handling units with energy recovery wheels and demand control ventilation serving the gymnasium area
- 100% outside air gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels with variable air volume boxes with demand control ventilation serving the fitness/locker room areas
- 100% outside air gas-fired heating roof mounted air handling units with energy recovery wheels and demand control ventilation serving the CTC shop areas
- 100% outside air gas-fired heating roof mounted air handling unit with energy recovery wheel providing ventilation to terminal air-source heat pump units located throughout the Animal Science building
- Overhead fiberglass insulated supply and return air ductwork distribution system
- Gas-fired heating/direct expansion cooling roof mounted make-up air handling units and variable air volume exhaust air fan systems serving the kitchen and culinary room
- Limited use of radiant heating panels and unit heaters
- (4) 2,500 MBH high-efficiency condensing gas-fired boilers

- (3) 330 MBH high-efficiency condensing gas-fired boilers serving the Animal Science building
- 35 ton high-efficiency air-cooled chiller chilled water plant
- Four-pipe heating/cooling piping system serving induction units
- Two-pipe hot water distribution system serving radiant heating panels and unit heaters
- Chilled and hot water primary pumping with variable frequency drives

#### 1.1.D: Mechanical System Option Two (A) – Variable Air Volume Dehumidification Displacement Ventilation Rooftop Unit Systems and Administration/Media Center Four-Pipe Induction Unit Systems

- Multiple low wall-mounted displacement diffusers at approximately 200-300 CFM each (2 per classroom, 1 per support area) for each classroom and support area
- Variable air volume boxes with demand ventilation control and temperature sensor to modulate airflow based on occupancy and space heating/cooling demand for the classrooms and support areas
- Multiple low wall-mounted displacement diffusers throughout the auditorium, town square/forum, and stage areas
- Dedicated overhead galvanized ventilation distribution system feeding each displacement diffuser
- Variable air volume 100% outside air gas-fired heating/direct expansion dehumidification roof mounted air handling units with energy recovery wheels providing dehumidification displacement ventilation to the classroom and support areas
- Variable air volume gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels and demand control ventilation providing fully air conditioned displacement ventilation to the auditorium, town square/forum, and stage areas
- Multiple four-pipe two coil heating and cooling induction units serving the administration and media center areas
- Primary air ducted directly to induction units
- 100% outside air gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels providing ventilation to the induction units of the administration and media center areas
- Variable air volume gas-fired heating/direct expansion roof mounted air handling units with energy recovery wheels and demand control ventilation serving the gymnasium area
- 100% outside air gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels with variable air volume boxes with demand control ventilation serving the fitness/locker room areas

- 100% outside air gas-fired heating roof mounted air handling units with energy recovery wheels and demand control ventilation serving the CTC shop areas
- 100% outside air gas-fired heating roof mounted air handling unit with energy recovery wheel providing ventilation to terminal air-source heat pump units located throughout the Animal Science building
- Overhead fiberglass insulated supply and return air ductwork distribution system
- Gas-fired heating/direct expansion cooling roof mounted make-up air handling units and variable air volume exhaust air fan systems serving the kitchen and culinary room
- Limited use of radiant heating panels and unit heaters
- (4) 2,500 MBH high-efficiency condensing gas-fired boilers
- (3) 330 MBH high-efficiency condensing gas-fired boilers serving the Animal Science building
- 35 ton high-efficiency air-cooled chiller chilled water plant
- Four-pipe heating/cooling piping system serving induction units
- Two-pipe hot water distribution system serving radiant heating panels and unit heaters
- Chilled and hot water primary pumping with variable frequency drives

#### 1.1.E: Mechanical System Option Three – Variable Air Volume Fully Air-Conditioned Displacement Ventilation Rooftop Unit Systems and Administration/Media Center Four-Pipe Induction Unit Systems

- Multiple low wall-mounted displacement diffusers at approximately 325-350 CFM each (2 per classroom, 1 per support area) for each classroom and support area
- Variable air volume boxes with demand ventilation control and temperature sensor to modulate airflow based on occupancy and space heating/cooling demand for the classrooms and support areas
- Multiple low wall-mounted displacement diffusers throughout the auditorium, town square/forum, and stage areas
- Dedicated overhead galvanized ventilation distribution system feeding each displacement diffuser
- Variable air volume gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels and demand control ventilation providing fully air conditioned displacement ventilation to the classroom, auditorium, town square/forum, and stage areas
- Multiple four-pipe two coil heating and cooling induction units serving the administration and media center areas
- Primary air ducted directly to induction units

- 100% outside air gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels providing ventilation to the induction units of the administration and media center areas
- Variable air volume gas-fired heating/direct expansion roof mounted air handling units with energy recovery wheels and demand control ventilation serving the gymnasium area
- 100% outside air gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels with variable air volume boxes with demand control ventilation serving the fitness/locker room areas
- 100% outside air gas-fired heating roof mounted air handling units with energy recovery wheels and demand control ventilation serving the CTC shop areas
- 100% outside air gas-fired heating roof mounted air handling unit with energy recovery wheel providing ventilation to terminal air-source heat pump units located throughout the Animal Science building
- Overhead fiberglass insulated supply and return air ductwork distribution system
- Gas-fired heating/direct expansion cooling roof mounted make-up air handling units and variable air volume exhaust air fan systems serving the kitchen and culinary room
- Limited use of radiant heating panels and unit heaters
- (4) 2,500 MBH high-efficiency condensing gas-fired boilers
- (3) 330 MBH high-efficiency condensing gas-fired boilers serving the Animal Science building
- 35 ton high-efficiency air-cooled chiller chilled water plant
- Four-pipe heating/cooling piping system serving induction units
- Two-pipe hot water distribution system serving radiant heating panels and unit heaters
- Chilled and hot water primary pumping with variable frequency drives

#### 1.1.F: Mechanical System Option Four – Variable Air Volume Dehumidification Displacement Ventilation Rooftop Unit Systems and Partial Geothermal Plant Serving the Fully Air-Conditioned Systems

- Multiple low wall-mounted displacement diffusers at approximately 200-300 CFM each (2 per classroom, 1 per support area) for each classroom and support area
- Variable air volume boxes with demand ventilation control and temperature sensor to modulate airflow based on occupancy and space heating/cooling demand for the classrooms and support areas
- Multiple low wall-mounted displacement diffusers throughout the auditorium, town square/forum, and stage areas
- Dedicated overhead galvanized ventilation distribution system feeding each displacement diffuser

- Variable air volume 100% outside air gas-fired heating/direct expansion dehumidification roof mounted air handling units with energy recovery wheels providing dehumidification displacement ventilation to the classroom and support areas
- Geothermal variable air volume hot water coil heating/chilled water coil cooling roof mounted air handling units with energy recovery wheels and demand control ventilation providing fully air conditioned displacement ventilation to the auditorium, town square/forum, and stage areas
- Multiple four-pipe two coil heating and cooling induction units serving the administration and media center areas
- Primary air ducted directly to induction units
- Geothermal 100% outside air hot water coil heating/chilled water coil cooling roof mounted air handling units with energy recovery wheels providing ventilation to the induction units of the administration and media center areas
- Variable air volume gas-fired heating/direct expansion roof mounted air handling units with energy recovery wheels and demand control ventilation serving the gymnasium area
- 100% outside air gas-fired heating/direct expansion cooling roof mounted air handling units with energy recovery wheels with variable air volume boxes with demand control ventilation serving the fitness/locker room areas
- 100% outside air gas-fired heating roof mounted air handling units with energy recovery wheels and demand control ventilation serving the CTC shop areas
- 100% outside air gas-fired heating roof mounted air handling unit with energy recovery wheel providing ventilation to terminal air-source heat pump units located throughout the Animal Science building
- Overhead fiberglass insulated supply and return air ductwork distribution system
- Gas-fired heating/direct expansion cooling roof mounted make-up air handling units and variable air volume exhaust air fan systems serving the kitchen and culinary room
- Limited use of radiant heating panels and unit heaters
- (3) 2,000 MBH high-efficiency condensing gas-fired boilers
- (3) 330 MBH high-efficiency condensing gas-fired boilers serving the Animal Science building
- (8) 1,500' deep geothermal wells (30 tons each)
- 225 ton high-efficiency water-to-water source modular heat pump chiller plant providing chilled and hot water throughout the building
- Water-to-water titanium heat exchangers
- Four-pipe heating/cooling piping system serving the fully air-conditioned air handling units and induction units

- Two-pipe hot water distribution system serving radiant heating panels and unit heaters
- Chilled and hot water primary pumping with variable frequency drives
- Condenser and geothermal well water primary pumping with variable frequency drives
- Direct digital controls throughout

## Section 1.2: Mechanical System Analysis Conclusion

The variable air volume air handling unit system is selected as the baseline system since it is an ASHRAE Standard 90.1-2010 baseline system that generally results in a low installed cost and is a relatively energy efficient system. Unfortunately, the selection results in overall ownership costs that in some cases are higher when compared to the alternative systems primarily relating to the increased annual operating and maintenance costs. The option comparison of each alternative system to the baseline assesses the benefits of improved systems with potentially reduced combined operating and maintenance costs as well as improved thermal comfort with the goal of selecting the system with the highest ownership savings over the 30 year study period.

Annual electrical and gas consumption is calculated thru the results of a thermal dynamic heat transfer analysis utilizing Department of Energy (DOE-2)/eQuest software with all architectural data provided by HMFH Architects.

The new building envelope reflects HMFH Architects' typical energy efficiency design. The roof has R-30 continuous insulation and the walls have R-12.6 continuous insulation. Windows have a U-Value of 0.35 and a S.C. of 0.40.

Utility cost data for electricity and natural gas were obtained from utility bills of the existing school provided by the town. The rates are \$0.1172/kWh for Electricity and \$1.283/therm for Natural Gas.

The "Building Life-Cycle" analysis included future worth of each system option considered using standard industry discount, inflation, and interest rates.

Our observations of the Mechanical System Payback Summary suggest that Option 2, constant volume dehumidification displacement ventilation rooftop unit systems and administration/media center four-pipe induction unit systems, represents the lowest life cycle cost by yielding an approximate \$5,296,788 savings over the 30 year study period with an instant payback as it has a lower installed cost than the code baseline system.

It should also be noted that Option 2A, variable air volume dehumidification displacement ventilation rooftop unit systems and administration/media center four-pipe induction unit systems, represents the second lowest life cycle cost by yielding an approximate \$5,233,777 savings over the 30 year study period with an instant payback with lower annual energy consumption and operating costs than Option 2.



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DOVER HIGH SCHOOL - MECHANICAL SYSTEM PAYBACK SUMMARY

| Baseline | System                                                                                                                                                                                                                                                                                          | Gross Capital Investment* | Annual Elec. Cons. (kWh) | Annual Gas Cons. (MBTU) | Annual Electric Cost | Annual Gas Cost | Combined Utility Cost | Annual Utility \$/s.f. | Annual kBTU/s.f. (EUI) | Annual Maint. Cost | Combined Annual Expense | Combined Expense Savings** | Total Life-Cycle Savings*** | Discounted Payback (Years)**** |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------|-------------------------|----------------------|-----------------|-----------------------|------------------------|------------------------|--------------------|-------------------------|----------------------------|-----------------------------|--------------------------------|
| -        | 1. Hot water coil heating/chilled water coil cooling VAV AHU system with energy recovery (where code required) and terminal VAV boxes with hot water reheat coils<br>2. Code efficient gas-fired non-condensing boiler plant<br>3. Code efficient water-cooled chiller plant with cooling tower | \$13,764,200              | 2,202,600                | 11,389.0                | \$258,143            | \$146,116       | \$404,259             | \$1.31                 | 61.2                   | \$69,625           | \$473,884               | -                          | -                           | -                              |

| Option | System                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Gross Capital Investment* | Annual Elec. Cons. (kWh) | Annual Gas Cons. (MBTU) | Annual Electric Cost | Annual Gas Cost | Combined Utility Cost | Annual Utility \$/s.f. | Annual kBTU/s.f. (EUI) | Annual Maint. Cost | Combined Annual Expense | Combined Expense Savings** | Total Life-Cycle Savings*** | Discounted Payback (Years)**** |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------|-------------------------|----------------------|-----------------|-----------------------|------------------------|------------------------|--------------------|-------------------------|----------------------------|-----------------------------|--------------------------------|
| 1      | 1. Hot/chilled water coil induction units<br>2. 100% outside air gas-fired heating/direct expansion cooling CV ventilating units with energy recovery serving induction units<br>3. Gas-fired heating/direct expansion cooling VAV RTU's with energy recovery and demand ventilation controls<br>4. High efficiency gas-fired condensing boiler plant<br>5. High efficiency air-cooled chiller plant                                                                                                                                                                                                                                                                                                                          | \$10,817,450              | 2,347,300                | 8,366.9                 | \$275,099            | \$107,347       | \$382,446             | \$1.24                 | 53.0                   | \$69,000           | \$451,446               | \$22,438                   | \$3,247,601                 | Instant*****                   |
| 2      | 1. Dehumidification displacement ventilation diffusers with perimeter hot water heating radiation<br>2. 100% outside air gas-fired heating/direct expansion dehumidification CV ventilating units with energy recovery<br>3. 100% outside air gas-fired heating/direct expansion cooling units with energy recovery with terminal chilled/hot water coil induction units<br>4. Gas-fired heating/direct expansion cooling VAV RTU's with energy recovery and demand ventilation controls<br>5. High efficiency gas-fired condensing central boiler plant<br>6. High efficiency air-cooled chiller plant                                                                                                                       | \$9,113,850               | 2,266,900                | 7,965.2                 | \$265,676            | \$102,194       | \$367,870             | \$1.19                 | 50.8                   | \$56,150           | \$424,020               | \$49,864                   | \$5,296,788                 | Instant*****                   |
| 2A     | 1. Dehumidification displacement ventilation diffusers with perimeter hot water heating radiation<br>2. 100% outside air gas-fired heating/direct expansion dehumidification VAV ventilating units with energy recovery with terminal VAV boxes with CO2 controls<br>3. 100% outside air gas-fired heating/direct expansion cooling units with energy recovery with terminal chilled/hot water coil induction units<br>4. Gas-fired heating/direct expansion cooling VAV RTU's with energy recovery and demand ventilation controls<br>5. High efficiency gas-fired condensing central boiler plant<br>6. High efficiency air-cooled chiller plant                                                                            | \$9,421,950               | 2,067,000                | 7,790.4                 | \$242,255            | \$99,951        | \$342,206             | \$1.11                 | 48.0                   | \$62,550           | \$404,756               | \$69,128                   | \$5,233,777                 | Instant*****                   |
| 3      | 1. Full air-conditioning displacement ventilation diffusers and perimeter hot water heating radiation<br>2. Gas-fired heating/direct expansion cooling VAV ventilating units with energy recovery with terminal VAV boxes with CO2 controls<br>3. 100% outside air gas-fired heating/direct expansion cooling units with energy recovery with terminal chilled/hot water coil induction units<br>4. Gas-fired heating/direct expansion cooling VAV RTU's with energy recovery and demand ventilation controls<br>5. High efficiency gas-fired condensing central boiler plant<br>6. High efficiency air-cooled chiller plant                                                                                                  | \$10,740,450              | 2,131,100                | 7,877.3                 | \$249,770            | \$101,066       | \$350,836             | \$1.14                 | 49.0                   | \$63,050           | \$413,886               | \$59,998                   | \$3,799,836                 | Instant*****                   |
| 4      | 1. Dehumidification displacement ventilation diffusers and perimeter hot water heating radiation<br>2. Gas-fired heating/direct expansion dehumidification VAV ventilating units with energy recovery with terminal VAV boxes with CO2 controls<br>3. 100% outside air geothermal hot water coil heating/chilled water coil cooling units with energy recovery with terminal chilled/hot water coil induction units<br>4. Geothermal hot water coil heating/chilled water coil cooling VAV RTU's with energy recovery and demand ventilation controls<br>5. High efficiency gas-fired condensing central boiler plant<br>6. Geothermal well with water-to-water source heat pump chillers with water-to-water heat exchangers | \$10,962,850              | 2,109,400                | 7,123.8                 | \$247,223            | \$91,399        | \$338,622             | \$1.10                 | 46.3                   | \$63,650           | \$402,272               | \$71,612                   | \$3,728,392                 | Instant*****                   |

\* Gross capital investment based upon in-house cost estimate utilizing cost data from similar past projects and industry standard estimating references. Costs have been estimated for system comparison purposes only and do not necessarily incorporate all supplemental/independent HVAC system costs which would be required for all systems studied (i.e. kitchen exhaust, saltpport HVAC systems, overhead and profit).

\*\* Combined expense savings is the difference between the combined annual expense of the baseline and system in comparison.

\*\*\* Total life-cycle savings is based on a 30 year study period.

\*\*\*\* Discounted payback years is based upon BLCCS Life Cycle Analysis.

\*\*\*\*\* Discounted payback never reached because system is more efficient and/or less expensive than baseline system.

Note 1: Values based on energy model performed for HVAC System Life Cycle Cost Analysis purposes. A 30% safety factor should be applied for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1-2010:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

# **LIFE CYCLE ANALYSES**

# NIST BLCC 5.3-07: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

## Base Case: Baseline - VAV

## Alternative: Option 1 - Induction Units

### General Information

|                         |                                                                                  |
|-------------------------|----------------------------------------------------------------------------------|
| File Name:              | C:\Program Files (x86)\BLCC5\projects\Dover High School.xml                      |
| Date of Study:          | Wed Oct 07 20:47:10 GMT 2015                                                     |
| Project Name:           | Dover High School                                                                |
| Project Location:       | New Hampshire                                                                    |
| Analysis Type:          | OMB Analysis, Non-Energy Project                                                 |
| Analysis Purpose:       | Cost Effectiveness, Lease Purchase, Government Investment or Asset Sale Analysis |
| Analyst:                | Keith Lane                                                                       |
| Base Date:              | September 1, 2017                                                                |
| Service Date:           | September 1, 2017                                                                |
| Study Period:           | 30 years 0 months(September 1, 2017 through August 31, 2047)                     |
| Discount Rate:          | 9.1%                                                                             |
| Discounting Convention: | End-of-Year                                                                      |

## Comparison of Present-Value Costs

### PV Life-Cycle Cost

|                                      | Base Case    | Alternative  | Savings from Alternative |
|--------------------------------------|--------------|--------------|--------------------------|
| Initial Investment Costs:            |              |              |                          |
| Capital Requirements as of Base Date | \$13,764,200 | \$10,817,450 | \$2,946,750              |
| Future Costs:                        |              |              |                          |
| Energy Consumption Costs             | \$5,162,639  | \$4,869,545  | \$293,094                |
| Energy Demand Charges                | \$0          | \$0          | \$0                      |
| Energy Utility Rebates               | \$0          | \$0          | \$0                      |
| Water Costs                          | \$0          | \$0          | \$0                      |

|                                        |              |              |             |
|----------------------------------------|--------------|--------------|-------------|
| Recurring and Non-Recurring OM&R Costs | \$864,164    | \$856,407    | \$7,757     |
| Capital Replacements                   | \$0          | \$0          | \$0         |
| Residual Value at End of Study Period  | \$0          | \$0          | \$0         |
|                                        | -----        | -----        | -----       |
| Subtotal (for Future Cost Items)       | \$6,026,803  | \$5,725,952  | \$300,851   |
|                                        | -----        | -----        | -----       |
| Total PV Life-Cycle Cost               | \$19,791,003 | \$16,543,402 | \$3,247,601 |

Net Savings from Alternative Compared with Base Case

|                              |                  |
|------------------------------|------------------|
| PV of Non-Investment Savings | \$300,851        |
| - Increased Total Investment | -<br>\$2,946,750 |
|                              | -----            |
| Net Savings                  | \$3,247,601      |

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive.

Energy Savings Summary

Energy Savings Summary (in stated units)

| Energy      | -----Average    | Annual          | Consumption----- | Life-Cycle       |
|-------------|-----------------|-----------------|------------------|------------------|
| Type        | Base Case       | Alternative     | Savings          | Savings          |
| Electricity | 2,202,600.0 kWh | 2,347,300.0 kWh | -144,700.0 kWh   | -4,340,405.7 kWh |
| Natural Gas | 113,890.0 Therm | 83,669.0 Therm  | 30,221.0 Therm   | 906,505.9 Therm  |

Energy Savings Summary (in MBtu)

| Energy      | -----Average | Annual       | Consumption----- | Life-Cycle     |
|-------------|--------------|--------------|------------------|----------------|
| Type        | Base Case    | Alternative  | Savings          | Savings        |
| Electricity | 7,515.6 MBtu | 8,009.3 MBtu | -493.7 MBtu      | -14,810.1 MBtu |
| Natural     | 11,389.0     | 8,366.9      | 3,022.1 MBtu     | 90,650.9 MBtu  |

Gas

MBtu

MBtu

# Emissions Reduction Summary

| Energy      | -----Average    | Annual          | Emissions----- | Life-Cycle       |
|-------------|-----------------|-----------------|----------------|------------------|
| Type        | Base Case       | Alternative     | Reduction      | Reduction        |
| Electricity |                 |                 |                |                  |
| CO2         | 2,298,290.72 kg | 2,449,277.13 kg | -150,986.41 kg | -4,528,972.25 kg |
| SO2         | 7,719.77 kg     | 8,226.92 kg     | -507.15 kg     | -15,212.44 kg    |
| NOx         | 3,830.41 kg     | 4,082.04 kg     | -251.64 kg     | -7,548.13 kg     |
| Natural Gas |                 |                 |                |                  |
| CO2         | 601,607.28 kg   | 441,969.26 kg   | 159,638.01 kg  | 4,788,484.84 kg  |
| SO2         | 4,855.16 kg     | 3,566.83 kg     | 1,288.33 kg    | 38,644.58 kg     |
| NOx         | 84.12 kg        | 132.43 kg       | -48.31 kg      | -1,449.04 kg     |
| Total:      |                 |                 |                |                  |
| CO2         | 2,899,898.00 kg | 2,891,246.39 kg | 8,651.60 kg    | 259,512.60 kg    |
| SO2         | 12,574.93 kg    | 11,793.75 kg    | 781.18 kg      | 23,432.15 kg     |
| NOx         | 3,914.53 kg     | 4,214.48 kg     | -299.95 kg     | -8,997.17 kg     |

# NIST BLCC 5.3-07: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

## Base Case: Baseline - VAV

## Alternative: Option 2 - CV Dehumid. Displacement

### General Information

|                         |                                                                                  |
|-------------------------|----------------------------------------------------------------------------------|
| File Name:              | C:\Program Files (x86)\BLCC5\projects\Dover High School.xml                      |
| Date of Study:          | Wed Oct 07 20:47:41 GMT 2015                                                     |
| Project Name:           | Dover High School                                                                |
| Project Location:       | New Hampshire                                                                    |
| Analysis Type:          | OMB Analysis, Non-Energy Project                                                 |
| Analysis Purpose:       | Cost Effectiveness, Lease Purchase, Government Investment or Asset Sale Analysis |
| Analyst:                | Keith Lane                                                                       |
| Base Date:              | September 1, 2017                                                                |
| Service Date:           | September 1, 2017                                                                |
| Study Period:           | 30 years 0 months(September 1, 2017 through August 31, 2047)                     |
| Discount Rate:          | 9.1%                                                                             |
| Discounting Convention: | End-of-Year                                                                      |

## Comparison of Present-Value Costs

### PV Life-Cycle Cost

|                                      | Base Case    | Alternative | Savings from Alternative |
|--------------------------------------|--------------|-------------|--------------------------|
| Initial Investment Costs:            |              |             |                          |
| Capital Requirements as of Base Date | \$13,764,200 | \$9,113,850 | \$4,650,350              |
| Future Costs:                        |              |             |                          |
| Energy Consumption Costs             | \$5,162,639  | \$4,683,448 | \$479,190                |
| Energy Demand Charges                | \$0          | \$0         | \$0                      |
| Energy Utility Rebates               | \$0          | \$0         | \$0                      |
| Water Costs                          | \$0          | \$0         | \$0                      |

|                                        |              |              |             |
|----------------------------------------|--------------|--------------|-------------|
| Recurring and Non-Recurring OM&R Costs | \$864,164    | \$696,917    | \$167,248   |
| Capital Replacements                   | \$0          | \$0          | \$0         |
| Residual Value at End of Study Period  | \$0          | \$0          | \$0         |
|                                        | -----        | -----        | -----       |
| Subtotal (for Future Cost Items)       | \$6,026,803  | \$5,380,365  | \$646,438   |
|                                        | -----        | -----        | -----       |
| Total PV Life-Cycle Cost               | \$19,791,003 | \$14,494,215 | \$5,296,788 |

Net Savings from Alternative Compared with Base Case

|                              |                  |
|------------------------------|------------------|
| PV of Non-Investment Savings | \$646,438        |
| - Increased Total Investment | -<br>\$4,650,350 |
|                              | -----            |
| Net Savings                  | \$5,296,788      |

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive.

Energy Savings Summary

Energy Savings Summary (in stated units)

| Energy      | -----Average    | Annual          | Consumption----- | Life-Cycle        |
|-------------|-----------------|-----------------|------------------|-------------------|
| Type        | Base Case       | Alternative     | Savings          | Savings           |
| Electricity | 2,202,600.0 kWh | 2,266,900.0 kWh | -64,300.0 kWh    | -1,928,735.9 kWh  |
| Natural Gas | 113,890.0 Therm | 79,652.0 Therm  | 34,238.0 Therm   | 1,026,999.4 Therm |

Energy Savings Summary (in MBtu)

| Energy      | -----Average | Annual       | Consumption----- | Life-Cycle    |
|-------------|--------------|--------------|------------------|---------------|
| Type        | Base Case    | Alternative  | Savings          | Savings       |
| Electricity | 7,515.6 MBtu | 7,735.0 MBtu | -219.4 MBtu      | -6,581.1 MBtu |
| Natural     | 11,389.0     | 7,965.2      | 3,423.8 MBtu     | 102,700.3     |

Gas

MBtu

MBtu

MBtu

# Emissions Reduction Summary

| Energy      | -----Average    | Annual          | Emissions----- | Life-Cycle       |
|-------------|-----------------|-----------------|----------------|------------------|
| Type        | Base Case       | Alternative     | Reduction      | Reduction        |
| Electricity |                 |                 |                |                  |
| CO2         | 2,298,290.72 kg | 2,365,384.20 kg | -67,093.48 kg  | -2,012,528.79 kg |
| SO2         | 7,719.77 kg     | 7,945.13 kg     | -225.36 kg     | -6,759.92 kg     |
| NOx         | 3,830.41 kg     | 3,942.23 kg     | -111.82 kg     | -3,354.15 kg     |
| Natural Gas |                 |                 |                |                  |
| CO2         | 601,607.28 kg   | 420,750.05 kg   | 180,857.23 kg  | 5,424,974.16 kg  |
| SO2         | 4,855.16 kg     | 3,395.59 kg     | 1,459.57 kg    | 43,781.25 kg     |
| NOx         | 84.12 kg        | 126.07 kg       | -41.95 kg      | -1,258.32 kg     |
| Total:      |                 |                 |                |                  |
| CO2         | 2,899,898.00 kg | 2,786,134.25 kg | 113,763.75 kg  | 3,412,445.37 kg  |
| SO2         | 12,574.93 kg    | 11,340.71 kg    | 1,234.21 kg    | 37,021.34 kg     |
| NOx         | 3,914.53 kg     | 4,068.30 kg     | -153.77 kg     | -4,612.46 kg     |

# NIST BLCC 5.3-07: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

## Base Case: Baseline - VAV

## Alternative: Option 2A - VAV Dehumid. Displacement

### General Information

|                         |                                                                                  |
|-------------------------|----------------------------------------------------------------------------------|
| File Name:              | C:\Program Files (x86)\BLCC5\projects\Dover High School.xml                      |
| Date of Study:          | Wed Oct 07 20:48:11 GMT 2015                                                     |
| Project Name:           | Dover High School                                                                |
| Project Location:       | New Hampshire                                                                    |
| Analysis Type:          | OMB Analysis, Non-Energy Project                                                 |
| Analysis Purpose:       | Cost Effectiveness, Lease Purchase, Government Investment or Asset Sale Analysis |
| Analyst:                | Keith Lane                                                                       |
| Base Date:              | September 1, 2017                                                                |
| Service Date:           | September 1, 2017                                                                |
| Study Period:           | 30 years 0 months(September 1, 2017 through August 31, 2047)                     |
| Discount Rate:          | 9.1%                                                                             |
| Discounting Convention: | End-of-Year                                                                      |

### Comparison of Present-Value Costs

#### PV Life-Cycle Cost

|                                      | Base Case    | Alternative | Savings from Alternative |
|--------------------------------------|--------------|-------------|--------------------------|
| Initial Investment Costs:            |              |             |                          |
| Capital Requirements as of Base Date | \$13,764,200 | \$9,421,950 | \$4,342,250              |
| Future Costs:                        |              |             |                          |
| Energy Consumption Costs             | \$5,162,639  | \$4,358,925 | \$803,714                |
| Energy Demand Charges                | \$0          | \$0         | \$0                      |
| Energy Utility Rebates               | \$0          | \$0         | \$0                      |
| Water Costs                          | \$0          | \$0         | \$0                      |

|                                        |              |              |             |
|----------------------------------------|--------------|--------------|-------------|
| Recurring and Non-Recurring OM&R Costs | \$864,164    | \$776,351    | \$87,813    |
| Capital Replacements                   | \$0          | \$0          | \$0         |
| Residual Value at End of Study Period  | \$0          | \$0          | \$0         |
|                                        | -----        | -----        | -----       |
| Subtotal (for Future Cost Items)       | \$6,026,803  | \$5,135,276  | \$891,527   |
|                                        | -----        | -----        | -----       |
| Total PV Life-Cycle Cost               | \$19,791,003 | \$14,557,226 | \$5,233,777 |

Net Savings from Alternative Compared with Base Case

|                              |                  |
|------------------------------|------------------|
| PV of Non-Investment Savings | \$891,527        |
| - Increased Total Investment | -<br>\$4,342,250 |
|                              | -----            |
| Net Savings                  | \$5,233,777      |

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive.

Energy Savings Summary

Energy Savings Summary (in stated units)

|             |                 |                 |                  |                   |
|-------------|-----------------|-----------------|------------------|-------------------|
| Energy      | -----Average    | Annual          | Consumption----- | Life-Cycle        |
| Type        | Base Case       | Alternative     | Savings          | Savings           |
| Electricity | 2,202,600.0 kWh | 2,067,000.0 kWh | 135,600.0 kWh    | 4,067,443.1 kWh   |
| Natural Gas | 113,890.0 Therm | 77,904.0 Therm  | 35,986.0 Therm   | 1,079,432.2 Therm |

Energy Savings Summary (in MBtu)

|             |              |              |                  |               |
|-------------|--------------|--------------|------------------|---------------|
| Energy      | -----Average | Annual       | Consumption----- | Life-Cycle    |
| Type        | Base Case    | Alternative  | Savings          | Savings       |
| Electricity | 7,515.6 MBtu | 7,052.9 MBtu | 462.7 MBtu       | 13,878.7 MBtu |
| Natural     | 11,389.0     | 7,790.4      | 3,598.6 MBtu     | 107,943.6     |

Gas

MBtu

MBtu

MBtu

# Emissions Reduction Summary

| Energy      | -----Average    | Annual          | Emissions----- | Life-Cycle      |
|-------------|-----------------|-----------------|----------------|-----------------|
| Type        | Base Case       | Alternative     | Reduction      | Reduction       |
| Electricity |                 |                 |                |                 |
| CO2         | 2,298,290.72 kg | 2,156,799.66 kg | 141,491.07 kg  | 4,244,150.91 kg |
| SO2         | 7,719.77 kg     | 7,244.51 kg     | 475.26 kg      | 14,255.75 kg    |
| NOx         | 3,830.41 kg     | 3,594.59 kg     | 235.81 kg      | 7,073.44 kg     |
| Natural Gas |                 |                 |                |                 |
| CO2         | 601,607.28 kg   | 411,516.49 kg   | 190,090.78 kg  | 5,701,942.87 kg |
| SO2         | 4,855.16 kg     | 3,321.07 kg     | 1,534.09 kg    | 46,016.48 kg    |
| NOx         | 84.12 kg        | 123.31 kg       | -39.18 kg      | -1,175.33 kg    |
| Total:      |                 |                 |                |                 |
| CO2         | 2,899,898.00 kg | 2,568,316.15 kg | 331,581.85 kg  | 9,946,093.78 kg |
| SO2         | 12,574.93 kg    | 10,565.58 kg    | 2,009.35 kg    | 60,272.22 kg    |
| NOx         | 3,914.53 kg     | 3,717.90 kg     | 196.63 kg      | 5,898.11 kg     |

# NIST BLCC 5.3-07: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

## Base Case: Baseline - VAV

## Alternative: Option 3 - VAV AC Displacement

### General Information

|                         |                                                                                  |
|-------------------------|----------------------------------------------------------------------------------|
| File Name:              | C:\Program Files (x86)\BLCC5\projects\Dover High School.xml                      |
| Date of Study:          | Wed Oct 07 20:48:47 GMT 2015                                                     |
| Project Name:           | Dover High School                                                                |
| Project Location:       | New Hampshire                                                                    |
| Analysis Type:          | OMB Analysis, Non-Energy Project                                                 |
| Analysis Purpose:       | Cost Effectiveness, Lease Purchase, Government Investment or Asset Sale Analysis |
| Analyst:                | Keith Lane                                                                       |
| Base Date:              | September 1, 2017                                                                |
| Service Date:           | September 1, 2017                                                                |
| Study Period:           | 30 years 0 months(September 1, 2017 through August 31, 2047)                     |
| Discount Rate:          | 9.1%                                                                             |
| Discounting Convention: | End-of-Year                                                                      |

## Comparison of Present-Value Costs

### PV Life-Cycle Cost

|                                      | Base Case    | Alternative  | Savings from Alternative |
|--------------------------------------|--------------|--------------|--------------------------|
| Initial Investment Costs:            |              |              |                          |
| Capital Requirements as of Base Date | \$13,764,200 | \$10,740,450 | \$3,023,750              |
| Future Costs:                        |              |              |                          |
| Energy Consumption Costs             | \$5,162,639  | \$4,468,160  | \$694,479                |
| Energy Demand Charges                | \$0          | \$0          | \$0                      |
| Energy Utility Rebates               | \$0          | \$0          | \$0                      |
| Water Costs                          | \$0          | \$0          | \$0                      |

|                                        |              |              |             |
|----------------------------------------|--------------|--------------|-------------|
| Recurring and Non-Recurring OM&R Costs | \$864,164    | \$782,557    | \$81,607    |
| Capital Replacements                   | \$0          | \$0          | \$0         |
| Residual Value at End of Study Period  | \$0          | \$0          | \$0         |
|                                        | -----        | -----        | -----       |
| Subtotal (for Future Cost Items)       | \$6,026,803  | \$5,250,717  | \$776,086   |
|                                        | -----        | -----        | -----       |
| Total PV Life-Cycle Cost               | \$19,791,003 | \$15,991,167 | \$3,799,836 |

## Net Savings from Alternative Compared with Base Case

|                              |             |
|------------------------------|-------------|
| PV of Non-Investment Savings | \$776,086   |
| - Increased Total Investment | -           |
|                              | \$3,023,750 |
|                              | -----       |
| Net Savings                  | \$3,799,836 |

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive.

## Energy Savings Summary

### Energy Savings Summary (in stated units)

| Energy      | -----Average    | Annual          | Consumption----- | Life-Cycle        |
|-------------|-----------------|-----------------|------------------|-------------------|
| Type        | Base Case       | Alternative     | Savings          | Savings           |
| Electricity | 2,202,600.0 kWh | 2,131,100.0 kWh | 71,500.0 kWh     | 2,144,706.4 kWh   |
| Natural Gas | 113,890.0 Therm | 78,773.0 Therm  | 35,117.0 Therm   | 1,053,365.8 Therm |

### Energy Savings Summary (in MBtu)

| Energy      | -----Average | Annual       | Consumption----- | Life-Cycle   |
|-------------|--------------|--------------|------------------|--------------|
| Type        | Base Case    | Alternative  | Savings          | Savings      |
| Electricity | 7,515.6 MBtu | 7,271.6 MBtu | 244.0 MBtu       | 7,318.0 MBtu |
| Natural     | 11,389.0     | 7,877.3      | 3,511.7 MBtu     | 105,337.0    |

Gas

MBtu

MBtu

MBtu

# Emissions Reduction Summary

| Energy      | -----Average    | Annual          | Emissions----- | Life-Cycle      |
|-------------|-----------------|-----------------|----------------|-----------------|
| Type        | Base Case       | Alternative     | Reduction      | Reduction       |
| Electricity |                 |                 |                |                 |
| CO2         | 2,298,290.72 kg | 2,223,684.45 kg | 74,606.28 kg   | 2,237,881.93 kg |
| SO2         | 7,719.77 kg     | 7,469.17 kg     | 250.60 kg      | 7,516.86 kg     |
| NOx         | 3,830.41 kg     | 3,706.06 kg     | 124.34 kg      | 3,729.73 kg     |
| Natural Gas |                 |                 |                |                 |
| CO2         | 601,607.28 kg   | 416,106.86 kg   | 185,500.42 kg  | 5,564,250.76 kg |
| SO2         | 4,855.16 kg     | 3,358.11 kg     | 1,497.05 kg    | 44,905.26 kg    |
| NOx         | 84.12 kg        | 124.68 kg       | -40.56 kg      | -1,216.58 kg    |
| Total:      |                 |                 |                |                 |
| CO2         | 2,899,898.00 kg | 2,639,791.30 kg | 260,106.70 kg  | 7,802,132.69 kg |
| SO2         | 12,574.93 kg    | 10,827.28 kg    | 1,747.64 kg    | 52,422.12 kg    |
| NOx         | 3,914.53 kg     | 3,830.75 kg     | 83.78 kg       | 2,513.14 kg     |

# NIST BLCC 5.3-07: Comparative Analysis

Consistent with Federal Life Cycle Cost Methodology in OMB Circular A-94

## Base Case: Baseline - VAV

## Alternative: Option 4 - Geo VAV Dehumid. Displacement

### General Information

|                         |                                                                                  |
|-------------------------|----------------------------------------------------------------------------------|
| File Name:              | C:\Program Files (x86)\BLCC5\projects\Dover High School.xml                      |
| Date of Study:          | Wed Oct 07 20:49:16 GMT 2015                                                     |
| Project Name:           | Dover High School                                                                |
| Project Location:       | New Hampshire                                                                    |
| Analysis Type:          | OMB Analysis, Non-Energy Project                                                 |
| Analysis Purpose:       | Cost Effectiveness, Lease Purchase, Government Investment or Asset Sale Analysis |
| Analyst:                | Keith Lane                                                                       |
| Base Date:              | September 1, 2017                                                                |
| Service Date:           | September 1, 2017                                                                |
| Study Period:           | 30 years 0 months(September 1, 2017 through August 31, 2047)                     |
| Discount Rate:          | 9.1%                                                                             |
| Discounting Convention: | End-of-Year                                                                      |

## Comparison of Present-Value Costs

### PV Life-Cycle Cost

|                                      | Base Case    | Alternative  | Savings from Alternative |
|--------------------------------------|--------------|--------------|--------------------------|
| Initial Investment Costs:            |              |              |                          |
| Capital Requirements as of Base Date | \$13,764,200 | \$10,962,850 | \$2,801,350              |
| Future Costs:                        |              |              |                          |
| Energy Consumption Costs             | \$5,162,639  | \$4,309,757  | \$852,882                |
| Energy Demand Charges                | \$0          | \$0          | \$0                      |
| Energy Utility Rebates               | \$0          | \$0          | \$0                      |
| Water Costs                          | \$0          | \$0          | \$0                      |

|                                        |              |              |             |
|----------------------------------------|--------------|--------------|-------------|
| Recurring and Non-Recurring OM&R Costs | \$864,164    | \$790,004    | \$74,160    |
| Capital Replacements                   | \$0          | \$0          | \$0         |
| Residual Value at End of Study Period  | \$0          | \$0          | \$0         |
|                                        | -----        | -----        | -----       |
| Subtotal (for Future Cost Items)       | \$6,026,803  | \$5,099,761  | \$927,042   |
|                                        | -----        | -----        | -----       |
| Total PV Life-Cycle Cost               | \$19,791,003 | \$16,062,611 | \$3,728,392 |

Net Savings from Alternative Compared with Base Case

|                              |                  |
|------------------------------|------------------|
| PV of Non-Investment Savings | \$927,042        |
| - Increased Total Investment | -<br>\$2,801,350 |
|                              | -----            |
| Net Savings                  | \$3,728,392      |

NOTE: Meaningful SIR, AIRR and Payback can not be computed unless incremental savings and total savings are both positive.

Energy Savings Summary

Energy Savings Summary (in stated units)

| Energy      | -----Average    | Annual          | Consumption----- | Life-Cycle        |
|-------------|-----------------|-----------------|------------------|-------------------|
| Type        | Base Case       | Alternative     | Savings          | Savings           |
| Electricity | 2,202,600.0 kWh | 2,109,400.0 kWh | 93,200.0 kWh     | 2,795,617.2 kWh   |
| Natural Gas | 113,890.0 Therm | 71,238.0 Therm  | 42,652.0 Therm   | 1,279,384.8 Therm |

Energy Savings Summary (in MBtu)

| Energy      | -----Average | Annual       | Consumption----- | Life-Cycle   |
|-------------|--------------|--------------|------------------|--------------|
| Type        | Base Case    | Alternative  | Savings          | Savings      |
| Electricity | 7,515.6 MBtu | 7,197.6 MBtu | 318.0 MBtu       | 9,539.0 MBtu |
| Natural     | 11,389.0     | 7,123.8      | 4,265.2 MBtu     | 127,939.0    |

Gas

MBtu

MBtu

MBtu

# Emissions Reduction Summary

| Energy      | -----Average    | Annual          | Emissions----- | Life-Cycle      |
|-------------|-----------------|-----------------|----------------|-----------------|
| Type        | Base Case       | Alternative     | Reduction      | Reduction       |
| Electricity |                 |                 |                |                 |
| CO2         | 2,298,290.72 kg | 2,201,041.70 kg | 97,249.02 kg   | 2,917,071.27 kg |
| SO2         | 7,719.77 kg     | 7,393.11 kg     | 326.65 kg      | 9,798.20 kg     |
| NOx         | 3,830.41 kg     | 3,668.33 kg     | 162.08 kg      | 4,861.68 kg     |
| Natural Gas |                 |                 |                |                 |
| CO2         | 601,607.28 kg   | 376,304.32 kg   | 225,302.95 kg  | 6,758,163.38 kg |
| SO2         | 4,855.16 kg     | 3,036.89 kg     | 1,818.27 kg    | 54,540.51 kg    |
| NOx         | 84.12 kg        | 112.76 kg       | -28.63 kg      | -858.84 kg      |
| Total:      |                 |                 |                |                 |
| CO2         | 2,899,898.00 kg | 2,577,346.02 kg | 322,551.98 kg  | 9,675,234.65 kg |
| SO2         | 12,574.93 kg    | 10,430.01 kg    | 2,144.92 kg    | 64,338.71 kg    |
| NOx         | 3,914.53 kg     | 3,781.08 kg     | 133.45 kg      | 4,002.84 kg     |

## **COST ESTIMATES**

|                                                                              |            |             |                                   |               |                  |
|------------------------------------------------------------------------------|------------|-------------|-----------------------------------|---------------|------------------|
| <b>Baseline - ASHRAE Standard CHW/HHW Coil VAV Air Handling Unit System</b>  |            |             | <b>PROJECT:</b> Dover High School |               |                  |
|                                                                              |            |             | <b>JOB NO:</b> 83104400           |               |                  |
|                                                                              |            |             | <b>CLIENT:</b> HMFH Architects    |               |                  |
|                                                                              |            |             | <b>DATE:</b> 10/7/2015            | <b>BY:</b> KL |                  |
| ITEM OF WORK                                                                 | NO.        | UNIT PRICE  | AREA                              | PRICE/S.F.    | TOTAL            |
| VAV Box with Hot Water Reheat Coils                                          | 235        | \$1,500     |                                   |               | \$ 352,500.00    |
| RTU-1: Classroom VAV RTU w/ ERV                                              | 25,000 CFM | \$12/CFM    |                                   |               | \$ 300,000.00    |
| RTU-2: Classroom VAV RTU w/ ERV                                              | 25,000 CFM | \$12/CFM    |                                   |               | \$ 300,000.00    |
| RTU-3: Classroom VAV RTU w/ ERV                                              | 25,000 CFM | \$12/CFM    |                                   |               | \$ 300,000.00    |
| RTU-4: Classroom VAV RTU w/ ERV                                              | 25,000 CFM | \$12/CFM    |                                   |               | \$ 300,000.00    |
| RTU-5: Classroom VAV RTU w/ ERV                                              | 25,000 CFM | \$12/CFM    |                                   |               | \$ 300,000.00    |
| RTU-6: Classroom VAV RTU w/ ERV                                              | 25,000 CFM | \$12/CFM    |                                   |               | \$ 300,000.00    |
| RTU-7: Classroom VAV RTU                                                     | 25,000 CFM | \$10/CFM    |                                   |               | \$ 250,000.00    |
| RTU-8: Classroom VAV RTU                                                     | 25,000 CFM | \$10/CFM    |                                   |               | \$ 250,000.00    |
| RTU-9, 10: Gymnasium RTU w/ ERV (2) @ 15,000 CFM ea.                         | 30,000 CFM | \$12/CFM    |                                   |               | \$ 390,000.00    |
| RTU-11: Fitness & Locker Rooms VAV DOAS w/ ERV                               | 8,400 CFM  | \$12/CFM    |                                   |               | \$ 100,800.00    |
| RTU-12: Auditorium VAV RTU w/ ERV                                            | 14,000 CFM | \$12/CFM    |                                   |               | \$ 168,000.00    |
| RTU-13: Stage VAV RTU                                                        | 4,000 CFM  | \$12/CFM    |                                   |               | \$ 48,000.00     |
| RTU-14: Band/Music VAV RTU w/ ERV                                            | 9,000 CFM  | \$12/CFM    |                                   |               | \$ 108,000.00    |
| RTU-15: Admin. VAV RTU w/ ERV                                                | 16,000 CFM | \$12/CFM    |                                   |               | \$ 192,000.00    |
| RTU-16: Media Center VAV RTU w/ ERV                                          | 4,700 CFM  | \$14/CFM    |                                   |               | \$ 65,800.00     |
| RTU-17: Town Square/Forum VAV RTU w/ ERV                                     | 11,000 CFM | \$12/CFM    |                                   |               | \$ 132,000.00    |
| RTU-18: Wood Shop 100% O.A. HV w/ ERV                                        | 6,000 CFM  | \$9/CFM     |                                   |               | \$ 54,000.00     |
| RTU-19: Welding Shop 100% O.A. HV w/ ERV                                     | 3,000 CFM  | \$9/CFM     |                                   |               | \$ 27,000.00     |
| RTU-20: Auto Technology 100% O.A. HV w/ ERV                                  | 3,500 CFM  | \$9/CFM     |                                   |               | \$ 31,500.00     |
| RTU-21: Auto Body Shop 100% O.A. HV w/ ERV                                   | 8,000 CFM  | \$8/CFM     |                                   |               | \$ 64,000.00     |
| RTU-22: Building Tech Shop 100% O.A. HV w/ ERV                               | 6,000 CFM  | \$8/CFM     |                                   |               | \$ 48,000.00     |
| RTU-23: Electrical Tech Shop 100% O.A. HV w/ ERV                             | 6,200 CFM  | \$8/CFM     |                                   |               | \$ 49,600.00     |
| RTU-24: Animal Science VAV RTU w/ ERV                                        | 9,000 CFM  | \$12/CFM    |                                   |               | \$ 108,000.00    |
| HV-1: Custodial HV                                                           | 2,000 CFM  | \$7/CFM     |                                   |               | \$ 14,000.00     |
| MAU-1: Kitchen HVAC Make-Up Air Unit                                         | 4,000 CFM  | \$9/CFM     |                                   |               | \$ 36,000.00     |
| MAU-2: Culinary HVAC Make-Up Air Unit                                        | 2,000 CFM  | \$9/CFM     |                                   |               | \$ 18,000.00     |
| (2) 5,000 MBH Code-Efficient Gas-Fired Boilers                               | 2          | \$92,000    |                                   |               | \$ 184,000.00    |
| Pumps (HHW) including VFD's                                                  | 2          | \$9,000     |                                   |               | \$ 18,000.00     |
| 700 Ton Code-Efficient TurboCor Water-Cooled Chiller Plant and Cooling Tower | 700 tons   | \$1,250/ton |                                   |               | \$ 875,000.00    |
| Pumps (CHW) including VFD's                                                  | 2          | \$9,000     |                                   |               | \$ 18,000.00     |
| Pumps (CW) including VFD's                                                   | 2          | \$9,000     |                                   |               | \$ 18,000.00     |
| (2) 495 MBH Code-Efficient Gas-Fired Boilers (Animal Science)                | 2          | \$13,000    |                                   |               | \$ 26,000.00     |
| Pumps (HHW) including VFD's (Animal Science)                                 | 2          | \$5,000     |                                   |               | \$ 10,000.00     |
| HHW Piping & Insulation including Terminal Heating Units                     |            |             | 309,000                           | \$3.5         | \$ 1,081,500.00  |
| CHW Piping & Insulation and Condensate Piping                                |            |             | 240,000                           | \$5.0         | \$ 1,200,000.00  |
| Ductwork including GRD's, Dampers, & General Exhaust Systems                 |            |             | 309,000                           | \$13.0        | \$ 4,017,000.00  |
| ATC/DDC Controls                                                             |            |             | 309,000                           | \$5.5         | \$ 1,699,500.00  |
| Split System Ductless Cooling Units                                          | 12         | \$7,500     |                                   |               | \$ 90,000.00     |
| Exhaust Fans (Misc. Areas, Dust Collectors, Shops, etc.)                     |            |             |                                   |               | \$ 220,000.00    |
|                                                                              |            |             |                                   |               |                  |
| <b>TOTAL</b>                                                                 |            |             |                                   |               | \$ 13,764,200.00 |
| <b>TOTAL (\$/FT²)</b>                                                        |            |             |                                   |               | \$ 44.54         |

Cost estimates have been derived for system comparison purposes only. Estimates do not necessarily include HVAC systems and equipment that would typically be required for all system options studied; example: supplemental cooling systems (for elevator machine rooms, tel/data rooms, etc.) and radiation heating for unoccupied areas (storage rooms, corridors, vestibules etc.). Estimates do not include project general system costs; example: commissioning, coordination, as built drawings etc.



| Option 1 - Induction Unit Systems                                         |            |             | PROJECT: Dover High School |            |                  |
|---------------------------------------------------------------------------|------------|-------------|----------------------------|------------|------------------|
|                                                                           |            |             | JOB NO: 83104400           |            |                  |
|                                                                           |            |             | CLIENT: HMFH Architects    |            |                  |
|                                                                           |            |             | DATE: 10/7/2015            | BY: KL     |                  |
| ITEM OF WORK                                                              | NO.        | UNIT PRICE  | AREA                       | PRICE/S.F. | TOTAL            |
| Induction Units                                                           | 544        | \$1,450     |                            |            | \$ 788,800.00    |
| Displacement Diffuser Assemblies (Large AC)                               | 22         | \$850       |                            |            | \$ 18,700.00     |
| VAV Box with Demand Ventilation Controls                                  | 8          | \$1,200     |                            |            | \$ 9,600.00      |
| Heat Pump Units (Animal Science)                                          | 12         | \$7,500     |                            |            | \$ 90,000.00     |
| RTU-1: Classroom IU DOAS w/ ERV                                           | 9,500 CFM  | \$12/CFM    |                            |            | \$ 114,000.00    |
| RTU-2: Classroom IU DOAS w/ ERV                                           | 9,500 CFM  | \$12/CFM    |                            |            | \$ 114,000.00    |
| RTU-3: Classroom IU DOAS w/ ERV                                           | 9,500 CFM  | \$12/CFM    |                            |            | \$ 114,000.00    |
| RTU-4: Classroom IU DOAS w/ ERV                                           | 9,500 CFM  | \$12/CFM    |                            |            | \$ 114,000.00    |
| RTU-5: Classroom IU DOAS w/ ERV                                           | 9,500 CFM  | \$12/CFM    |                            |            | \$ 114,000.00    |
| RTU-6: Classroom IU DOAS w/ ERV                                           | 9,500 CFM  | \$12/CFM    |                            |            | \$ 114,000.00    |
| RTU-7: Classroom IU DOAS w/ ERV                                           | 9,500 CFM  | \$12/CFM    |                            |            | \$ 114,000.00    |
| RTU-8: Classroom IU DOAS w/ ERV                                           | 9,500 CFM  | \$12/CFM    |                            |            | \$ 114,000.00    |
| RTU-9, 10: Gymnasium RTU w/ ERV & DCV (2) @ 15,000 CFM ea.                | 30,000 CFM | \$12/CFM    |                            |            | \$ 360,000.00    |
| RTU-11: Fitness & Locker Rooms VAV DOAS w/ ERV & DCV                      | 8,400 CFM  | \$12/CFM    |                            |            | \$ 100,800.00    |
| RTU-12: Auditorium Full AC Displacement VAV RTU w/ ERV & DCV              | 11,000 CFM | \$12/CFM    |                            |            | \$ 132,000.00    |
| RTU-13: Stage Full AC Displacement VAV RTU w/ ERV & DCV                   | 4,000 CFM  | \$14/CFM    |                            |            | \$ 56,000.00     |
| RTU-14: Band/Music IU DOAS w/ ERV                                         | 3,000 CFM  | \$14/CFM    |                            |            | \$ 42,000.00     |
| RTU-15: Admin. IU DOAS w/ ERV                                             | 4,500 CFM  | \$13/CFM    |                            |            | \$ 58,500.00     |
| RTU-16: Media Center IU DOAS w/ ERV                                       | 2,000 CFM  | \$14/CFM    |                            |            | \$ 28,000.00     |
| RTU-17: Town Square/Forum Full AC Displacement VAV RTU w/ ERV & DCV       | 7,400 CFM  | \$13/CFM    |                            |            | \$ 96,200.00     |
| RTU-18: Wood Shop 100% O.A. HV w/ ERV & DCV                               | 6,000 CFM  | \$9/CFM     |                            |            | \$ 54,000.00     |
| RTU-19: Welding Shop 100% O.A. HV w/ ERV & DCV                            | 3,000 CFM  | \$9/CFM     |                            |            | \$ 27,000.00     |
| RTU-20: Auto Technology 100% O.A. HV w/ ERV & DCV                         | 3,500 CFM  | \$9/CFM     |                            |            | \$ 31,500.00     |
| RTU-21: Auto Body Shop 100% O.A. HV w/ ERV & DCV                          | 8,000 CFM  | \$8/CFM     |                            |            | \$ 64,000.00     |
| RTU-22: Building Tech Shop 100% O.A. HV w/ ERV & DCV                      | 6,000 CFM  | \$8/CFM     |                            |            | \$ 48,000.00     |
| RTU-23: Electrical Tech Shop 100% O.A. HV w/ ERV & DCV                    | 6,200 CFM  | \$8/CFM     |                            |            | \$ 49,600.00     |
| RTU-24: Animal Science 100% O.A. HV w/ ERV                                | 9,000 CFM  | \$8/CFM     |                            |            | \$ 72,000.00     |
| HV-1: Custodial HV                                                        | 2,000 CFM  | \$7/CFM     |                            |            | \$ 14,000.00     |
| MAU-1: Kitchen HVAC Make-Up Air Unit                                      | 4,000 CFM  | \$9/CFM     |                            |            | \$ 36,000.00     |
| MAU-2: Culinary HVAC Make-Up Air Unit                                     | 2,000 CFM  | \$9/CFM     |                            |            | \$ 18,000.00     |
| (4) 2,500 MBH High-Efficiency Gas-Fired Condensing Boilers                | 4          | \$50,000    |                            |            | \$ 200,000.00    |
| Pumps (HHW) including VFD's                                               | 2          | \$9,000     |                            |            | \$ 18,000.00     |
| 300 Ton High-Efficiency Air-Cooled Chiller Plant                          | 300 tons   | \$1,250/ton |                            |            | \$ 375,000.00    |
| Pumps (CHW) including VFD's                                               | 2          | \$9,000     |                            |            | \$ 18,000.00     |
| (3) 330 MBH High-Efficiency Gas-Fired Condensing Boilers (Animal Science) | 3          | \$9,800     |                            |            | \$ 29,400.00     |
| Pumps (HHW) including VFD's (Animal Science)                              | 2          | \$5,000     |                            |            | \$ 10,000.00     |
| HHW Piping & Insulation including Terminal Heating Units                  |            |             | 309,000                    | \$3.25     | \$ 1,004,250.00  |
| CHW Piping & Insulation and Condensate Piping                             |            |             | 190,000                    | \$5.0      | \$ 950,000.00    |
| Ductwork including GRD's, Dampers, & General Exhaust Systems              |            |             | 309,000                    | \$10.0     | \$ 3,090,000.00  |
| ATC/DDC Controls                                                          |            |             | 309,000                    | \$5.5      | \$ 1,699,500.00  |
| Demand Ventilation Controls                                               | 11         | \$600       |                            |            | \$ 6,600.00      |
| Split System Ductless Cooling Units                                       | 12         | \$7,500     |                            |            | \$ 90,000.00     |
| Exhaust Fans (Misc. Areas, Dust Collectors, Shops, etc.)                  |            |             |                            |            | \$ 220,000.00    |
|                                                                           |            |             |                            |            |                  |
| TOTAL                                                                     |            |             |                            |            | \$ 10,817,450.00 |
| TOTAL (\$/FT²)                                                            |            |             |                            |            | \$ 35.01         |

Cost estimates have been derived for system comparison purposes only. Estimates do not necessarily include HVAC systems and equipment that would typically be required for all system options studied; example: supplemental cooling systems (for elevator machine rooms, tel/data rooms, etc.) and radiation heating for unoccupied areas (storage rooms, corridors, vestibules etc.). Estimates do not include project general system costs; example: commissioning, coordination, as built drawings etc.



**GARCIA • GALUSKA • DESOUSA**  
Consulting Engineers  
INC.  
329 Faxon Center Road, Northbrook, MA 02451-4012

**PROJECT:** Dover High School

**JOB NO:** 83104400

**CLIENT:** HMFH Architects

**DATE:** 10/7/2015

**BY:** KL

**Option 2 - Constant Volume Dehumidification Displacement  
Ventilation Systems and Induction Unit Systems**

| ITEM OF WORK                                                              | NO.        | UNIT PRICE  | AREA    | PRICE/S.F. | TOTAL           |
|---------------------------------------------------------------------------|------------|-------------|---------|------------|-----------------|
| Displacement Diffuser Assemblies                                          | 253        | \$650       |         |            | \$ 164,450.00   |
| Displacement Diffuser Assemblies (Large AC)                               | 22         | \$850       |         |            | \$ 18,700.00    |
| VAV Box with Demand Ventilation Controls                                  | 8          | \$1,200     |         |            | \$ 9,600.00     |
| Induction Units                                                           | 50         | \$1,450     |         |            | \$ 72,500.00    |
| Heat Pump Units (Animal Science)                                          | 12         | \$7,500     |         |            | \$ 90,000.00    |
| RTU-1: Classroom Displacement DOAS w/ ERV                                 | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-2: Classroom Displacement DOAS w/ ERV                                 | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-3: Classroom Displacement DOAS w/ ERV                                 | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-4: Classroom Displacement DOAS w/ ERV                                 | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-5: Classroom Displacement DOAS w/ ERV                                 | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-6: Classroom Displacement DOAS w/ ERV                                 | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-7: Classroom Displacement DOAS w/ ERV                                 | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-8: Classroom Displacement DOAS w/ ERV                                 | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-9, 10: Gymnasium RTU w/ ERV & DCV (2) @ 15,000 CFM ea.                | 30,000 CFM | \$12/CFM    |         |            | \$ 360,000.00   |
| RTU-11: Fitness & Locker Rooms VAV DOAS w/ ERV & DCV                      | 8,400 CFM  | \$12/CFM    |         |            | \$ 100,800.00   |
| RTU-12: Auditorium Full AC Displacement VAV RTU w/ ERV & DCV              | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-13: Stage Full AC Displacement VAV RTU w/ ERV & DCV                   | 4,000 CFM  | \$14/CFM    |         |            | \$ 56,000.00    |
| RTU-14: Band/Music Displacement DOAS w/ ERV                               | 3,500 CFM  | \$14/CFM    |         |            | \$ 49,000.00    |
| RTU-15: Admin. IU DOAS w/ ERV                                             | 4,500 CFM  | \$13/CFM    |         |            | \$ 58,500.00    |
| RTU-16: Media Center IU DOAS w/ ERV                                       | 2,000 CFM  | \$14/CFM    |         |            | \$ 28,000.00    |
| RTU-17: Town Square/Forum Full AC Displacement VAV RTU w/ ERV & DCV       | 7,400 CFM  | \$13/CFM    |         |            | \$ 96,200.00    |
| RTU-18: Wood Shop 100% O.A. HV w/ ERV & DCV                               | 6,000 CFM  | \$9/CFM     |         |            | \$ 54,000.00    |
| RTU-19: Welding Shop 100% O.A. HV w/ ERV & DCV                            | 3,000 CFM  | \$9/CFM     |         |            | \$ 27,000.00    |
| RTU-20: Auto Technology 100% O.A. HV w/ ERV & DCV                         | 3,500 CFM  | \$9/CFM     |         |            | \$ 31,500.00    |
| RTU-21: Auto Body Shop 100% O.A. HV w/ ERV & DCV                          | 8,000 CFM  | \$8/CFM     |         |            | \$ 64,000.00    |
| RTU-22: Building Tech Shop 100% O.A. HV w/ ERV & DCV                      | 6,000 CFM  | \$8/CFM     |         |            | \$ 48,000.00    |
| RTU-23: Electrical Tech Shop 100% O.A. HV w/ ERV & DCV                    | 6,200 CFM  | \$8/CFM     |         |            | \$ 49,600.00    |
| RTU-24: Animal Science 100% O.A. HV w/ ERV                                | 9,000 CFM  | \$8/CFM     |         |            | \$ 72,000.00    |
| HV-1: Custodial HV                                                        | 2,000 CFM  | \$7/CFM     |         |            | \$ 14,000.00    |
| MAU-1: Kitchen HVAC Make-Up Air Unit                                      | 4,000 CFM  | \$9/CFM     |         |            | \$ 36,000.00    |
| MAU-2: Culinary HVAC Make-Up Air Unit                                     | 2,000 CFM  | \$9/CFM     |         |            | \$ 18,000.00    |
| (4) 2,500 MBH High-Efficiency Gas-Fired Condensing Boilers                | 4          | \$50,000    |         |            | \$ 200,000.00   |
| Pumps (HHW) including VFD's                                               | 2          | \$9,000     |         |            | \$ 18,000.00    |
| 35 Ton High-Efficiency Air-Cooled Chiller Plant                           | 35 tons    | \$1,350/ton |         |            | \$ 47,250.00    |
| Pumps (CHW) including VFD's                                               | 2          | \$5,000     |         |            | \$ 10,000.00    |
| (3) 330 MBH High-Efficiency Gas-Fired Condensing Boilers (Animal Science) | 3          | \$9,800     |         |            | \$ 29,400.00    |
| Pumps (HHW) including VFD's (Animal Science)                              | 2          | \$5,000     |         |            | \$ 10,000.00    |
| HHW Piping & Insulation including Terminal Heating Units                  |            |             | 309,000 | \$3.25     | \$ 1,004,250.00 |
| CHW Piping & Insulation and Condensate Piping                             |            |             | 25,000  | \$5.5      | \$ 137,500.00   |
| Ductwork including GRD's, Dampers, & General Exhaust Systems              |            |             | 309,000 | \$10.0     | \$ 3,090,000.00 |
| ATC/DDC Controls                                                          |            |             | 309,000 | \$5.0      | \$ 1,545,000.00 |
| Demand Ventilation Controls                                               | 11         | \$600       |         |            | \$ 6,600.00     |
| Split System Ductless Cooling Units                                       | 12         | \$7,500     |         |            | \$ 90,000.00    |
| Exhaust Fans (Misc. Areas, Dust Collectors, Shops, etc.)                  |            |             |         |            | \$ 220,000.00   |
|                                                                           |            |             |         |            |                 |
| <b>TOTAL</b>                                                              |            |             |         |            | \$ 9,113,850.00 |
| <b>TOTAL (\$/FT<sup>3</sup>)</b>                                          |            |             |         |            | \$ 29.49        |

Cost estimates have been derived for system comparison purposes only. Estimates do not necessarily include HVAC systems and equipment that would typically be required for all system options studied; example: supplemental cooling systems (for elevator machine rooms, tel/data rooms, etc.) and radiation heating for unoccupied areas (storage rooms, corridors, vestibules etc.). Estimates do not include project general system costs; example: commissioning, coordination, as built drawings etc.



**GARCIA + GALUSKA + DESOUSA**  
Consulting Engineers  
INC.  
329 Faxon Center Road, Northbrook, MA 02451-4012

**PROJECT:** Dover High School

**JOB NO:** 83104400

**CLIENT:** HMFH Architects

**DATE:** 10/7/2015

**BY:** KL

**Option 2A - VAV Dehumidification Displacement Ventilation  
Systems and Induction Unit Systems**

| ITEM OF WORK                                                                 | NO.        | UNIT PRICE  | AREA    | PRICE/S.F. | TOTAL           |
|------------------------------------------------------------------------------|------------|-------------|---------|------------|-----------------|
| Displacement Diffuser Assemblies                                             | 253        | \$650       |         |            | \$ 164,450.00   |
| Displacement Diffuser Assemblies (Large AC)                                  | 22         | \$850       |         |            | \$ 18,700.00    |
| VAV Box with Demand Ventilation Controls                                     | 136        | \$1,200     |         |            | \$ 163,200.00   |
| Induction Units                                                              | 50         | \$1,450     |         |            | \$ 72,500.00    |
| Heat Pump Units (Animal Science)                                             | 12         | \$7,500     |         |            | \$ 90,000.00    |
| RTU-1: Classroom Displacement VAV DOAS w/<br>ERV                             | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-2: Classroom Displacement VAV DOAS w/<br>ERV                             | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-3: Classroom Displacement VAV DOAS w/<br>ERV                             | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-4: Classroom Displacement VAV DOAS w/<br>ERV                             | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-5: Classroom Displacement VAV DOAS w/<br>ERV                             | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-6: Classroom Displacement VAV DOAS w/<br>ERV                             | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-7: Classroom Displacement VAV DOAS w/<br>ERV                             | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-8: Classroom Displacement VAV DOAS w/<br>ERV                             | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-9, 10: Gymnasium RTU w/ ERV & DCV<br>(2 @ 15,000 CFM ea.)                | 30,000 CFM | \$12/CFM    |         |            | \$ 360,000.00   |
| RTU-11: Fitness & Locker Rooms VAV DOAS w/<br>ERV & DCV                      | 8,400 CFM  | \$12/CFM    |         |            | \$ 100,800.00   |
| RTU-12: Auditorium Full AC Displacement VAV RTU<br>w/ ERV & DCV              | 11,000 CFM | \$12/CFM    |         |            | \$ 132,000.00   |
| RTU-13: Stage Full AC Displacement VAV RTU w/<br>ERV & DCV                   | 4,000 CFM  | \$14/CFM    |         |            | \$ 56,000.00    |
| RTU-14: Band/Music Displacement VAV DOAS w/<br>ERV                           | 3,500 CFM  | \$14/CFM    |         |            | \$ 49,000.00    |
| RTU-15: Admin. IU DOAS w/ ERV                                                | 4,500 CFM  | \$13/CFM    |         |            | \$ 58,500.00    |
| RTU-16: Media Center IU DOAS w/ ERV                                          | 2,000 CFM  | \$14/CFM    |         |            | \$ 28,000.00    |
| RTU-17: Town Square/Forum Full AC Displacement<br>VAV RTU w/ ERV & DCV       | 7,400 CFM  | \$13/CFM    |         |            | \$ 96,200.00    |
| RTU-18: Wood Shop 100% O.A. HV w/ ERV & DCV                                  | 6,000 CFM  | \$9/CFM     |         |            | \$ 54,000.00    |
| RTU-19: Welding Shop 100% O.A. HV w/ ERV &<br>DCV                            | 3,000 CFM  | \$9/CFM     |         |            | \$ 27,000.00    |
| RTU-20: Auto Technology 100% O.A. HV w/ ERV &<br>DCV                         | 3,500 CFM  | \$9/CFM     |         |            | \$ 31,500.00    |
| RTU-21: Auto Body Shop 100% O.A. HV w/ ERV &<br>DCV                          | 8,000 CFM  | \$8/CFM     |         |            | \$ 64,000.00    |
| RTU-22: Building Tech Shop 100% O.A. HV w/ ERV<br>& DCV                      | 6,000 CFM  | \$8/CFM     |         |            | \$ 48,000.00    |
| RTU-23: Electrical Tech Shop 100% O.A. HV w/<br>ERV & DCV                    | 6,200 CFM  | \$8/CFM     |         |            | \$ 49,600.00    |
| RTU-24: Animal Science 100% O.A. HV w/ ERV                                   | 9,000 CFM  | \$8/CFM     |         |            | \$ 72,000.00    |
| HV-1: Custodial HV                                                           | 2,000 CFM  | \$7/CFM     |         |            | \$ 14,000.00    |
| MAU-1: Kitchen HVAC Make-Up Air Unit                                         | 4,000 CFM  | \$9/CFM     |         |            | \$ 36,000.00    |
| MAU-2: Culinary HVAC Make-Up Air Unit                                        | 2,000 CFM  | \$9/CFM     |         |            | \$ 18,000.00    |
| (4) 2,500 MBH High-Efficiency Gas-Fired<br>Condensing Boilers                | 4          | \$50,000    |         |            | \$ 200,000.00   |
| Pumps (HHW) including VFD's                                                  | 2          | \$9,000     |         |            | \$ 18,000.00    |
| 35 Ton High-Efficiency Air-Cooled Chiller Plant                              | 35 tons    | \$1,350/ton |         |            | \$ 47,250.00    |
| Pumps (CHW) including VFD's                                                  | 2          | \$5,000     |         |            | \$ 10,000.00    |
| (3) 330 MBH High-Efficiency Gas-Fired Condensing<br>Boilers (Animal Science) | 3          | \$9,800     |         |            | \$ 29,400.00    |
| Pumps (HHW) including VFD's (Animal Science)                                 | 2          | \$5,000     |         |            | \$ 10,000.00    |
| HHW Piping & Insulation including Terminal Heating<br>Units                  |            |             | 309,000 | \$3.25     | \$ 1,004,250.00 |
| CHW Piping & Insulation and Condensate Piping                                |            |             | 25,000  | \$5.5      | \$ 137,500.00   |
| Ductwork including GRD's, Dampers, & General<br>Exhaust Systems              |            |             | 309,000 | \$10.0     | \$ 3,090,000.00 |
| ATC/DDC Controls                                                             |            |             | 309,000 | \$5.5      | \$ 1,699,500.00 |
| Demand Ventilation Controls                                                  | 11         | \$600       |         |            | \$ 6,600.00     |
| Split System Ductless Cooling Units                                          | 12         | \$7,500     |         |            | \$ 90,000.00    |
| Exhaust Fans (Misc. Areas, Dust Collectors, Shops,<br>etc.)                  |            |             |         |            | \$ 220,000.00   |
|                                                                              |            |             |         |            |                 |
| <b>TOTAL</b>                                                                 |            |             |         |            | \$ 9,421,950.00 |
| <b>TOTAL (\$/FT<sup>3</sup>)</b>                                             |            |             |         |            | \$ 30.49        |

Cost estimates have been derived for system comparison purposes only. Estimates do not necessarily include HVAC systems and equipment that would typically be required for all system options studied; example: supplemental cooling systems (for elevator machine rooms, tel/data rooms, etc.) and radiation heating for unoccupied areas (storage rooms, corridors, vestibules etc.). Estimates do not include project general system costs; example: commissioning, coordination, as built drawings etc.



| Option 3 - VAV Full Air Conditioning Displacement<br>Ventilation Systems and Induction Unit Systems |            |             | PROJECT: Dover High School |            |                  |
|-----------------------------------------------------------------------------------------------------|------------|-------------|----------------------------|------------|------------------|
|                                                                                                     |            |             | JOB NO: 83104400           |            |                  |
|                                                                                                     |            |             | CLIENT: HMFH Architects    |            |                  |
|                                                                                                     |            |             | DATE: 10/7/2015            | BY: KL     |                  |
| ITEM OF WORK                                                                                        | NO.        | UNIT PRICE  | AREA                       | PRICE/S.F. | TOTAL            |
| Displacement Diffuser Assemblies (Large AC)                                                         | 275        | \$850       |                            |            | \$ 233,750.00    |
| VAV Box with Demand Ventilation Controls                                                            | 136        | \$1,200     |                            |            | \$ 163,200.00    |
| Induction Units                                                                                     | 50         | \$1,450     |                            |            | \$ 72,500.00     |
| Heat Pump Units (Animal Science)                                                                    | 12         | \$7,500     |                            |            | \$ 90,000.00     |
| RTU-1: Classroom Full AC Displacement VAV RTU w/ ERV                                                | 19,000 CFM | \$12/CFM    |                            |            | \$ 228,000.00    |
| RTU-2: Classroom Full AC Displacement VAV RTU w/ ERV                                                | 19,000 CFM | \$12/CFM    |                            |            | \$ 228,000.00    |
| RTU-3: Classroom Full AC Displacement VAV RTU w/ ERV                                                | 19,000 CFM | \$12/CFM    |                            |            | \$ 228,000.00    |
| RTU-4: Classroom Full AC Displacement VAV RTU w/ ERV                                                | 19,000 CFM | \$12/CFM    |                            |            | \$ 228,000.00    |
| RTU-5: Classroom Full AC Displacement VAV RTU w/ ERV                                                | 19,000 CFM | \$12/CFM    |                            |            | \$ 228,000.00    |
| RTU-6: Classroom Full AC Displacement VAV RTU w/ ERV                                                | 19,000 CFM | \$12/CFM    |                            |            | \$ 228,000.00    |
| RTU-7: Classroom Full AC Displacement VAV RTU w/ ERV                                                | 19,000 CFM | \$12/CFM    |                            |            | \$ 228,000.00    |
| RTU-8: Classroom Full AC Displacement VAV RTU w/ ERV                                                | 19,000 CFM | \$12/CFM    |                            |            | \$ 228,000.00    |
| RTU-9, 10: Gymnasium RTU w/ ERV & DCV (2 @ 15,000 CFM ea.)                                          | 30,000 CFM | \$12/CFM    |                            |            | \$ 360,000.00    |
| RTU-11: Fitness & Locker Rooms VAV DOAS w/ ERV & DCV                                                | 8,400 CFM  | \$12/CFM    |                            |            | \$ 100,800.00    |
| RTU-12: Auditorium Full AC Displacement VAV RTU w/ ERV & DCV                                        | 11,000 CFM | \$12/CFM    |                            |            | \$ 132,000.00    |
| RTU-13: Stage Full AC Displacement VAV RTU w/ ERV & DCV                                             | 4,000 CFM  | \$14/CFM    |                            |            | \$ 56,000.00     |
| RTU-14: Band/Music Full AC Displacement VAV RTU w/ ERV                                              | 6,100 CFM  | \$14/CFM    |                            |            | \$ 85,400.00     |
| RTU-15: Admin. IU DOAS w/ ERV                                                                       | 4,500 CFM  | \$13/CFM    |                            |            | \$ 58,500.00     |
| RTU-16: Media Center IU DOAS w/ ERV                                                                 | 2,000 CFM  | \$14/CFM    |                            |            | \$ 28,000.00     |
| RTU-17: Town Square/Forum Full AC Displacement VAV RTU w/ ERV & DCV                                 | 7,400 CFM  | \$13/CFM    |                            |            | \$ 96,200.00     |
| RTU-18: Wood Shop 100% O.A. HV w/ ERV & DCV                                                         | 6,000 CFM  | \$9/CFM     |                            |            | \$ 54,000.00     |
| RTU-19: Welding Shop 100% O.A. HV w/ ERV & DCV                                                      | 3,000 CFM  | \$9/CFM     |                            |            | \$ 27,000.00     |
| RTU-20: Auto Technology 100% O.A. HV w/ ERV & DCV                                                   | 3,500 CFM  | \$9/CFM     |                            |            | \$ 31,500.00     |
| RTU-21: Auto Body Shop 100% O.A. HV w/ ERV & DCV                                                    | 8,000 CFM  | \$8/CFM     |                            |            | \$ 64,000.00     |
| RTU-22: Building Tech Shop 100% O.A. HV w/ ERV & DCV                                                | 6,000 CFM  | \$8/CFM     |                            |            | \$ 48,000.00     |
| RTU-23: Electrical Tech Shop 100% O.A. HV w/ ERV & DCV                                              | 6,200 CFM  | \$8/CFM     |                            |            | \$ 49,600.00     |
| RTU-24: Animal Science 100% O.A. HV w/ ERV                                                          | 9,000 CFM  | \$8/CFM     |                            |            | \$ 72,000.00     |
| HV-1: Custodial HV                                                                                  | 2,000 CFM  | \$7/CFM     |                            |            | \$ 14,000.00     |
| MAU-1: Kitchen HVAC Make-Up Air Unit                                                                | 4,000 CFM  | \$9/CFM     |                            |            | \$ 36,000.00     |
| MAU-2: Culinary HVAC Make-Up Air Unit                                                               | 2,000 CFM  | \$9/CFM     |                            |            | \$ 18,000.00     |
| (4) 2,500 MBH High-Efficiency Gas-Fired Condensing Boilers                                          | 4          | \$50,000    |                            |            | \$ 200,000.00    |
| Pumps (HHW) including VFD's                                                                         | 2          | \$9,000     |                            |            | \$ 18,000.00     |
| 35 Ton High-Efficiency Air-Cooled Chiller Plant                                                     | 35 tons    | \$1,350/ton |                            |            | \$ 47,250.00     |
| Pumps (CHW) including VFD's                                                                         | 2          | \$5,000     |                            |            | \$ 10,000.00     |
| (3) 330 MBH High-Efficiency Gas-Fired Condensing Boilers (Animal Science)                           | 3          | \$9,800     |                            |            | \$ 29,400.00     |
| Pumps (HHW) including VFD's (Animal Science)                                                        | 2          | \$5,000     |                            |            | \$ 10,000.00     |
| HHW Piping & Insulation including Terminal Heating Units                                            |            |             | 309,000                    | \$3.25     | \$ 1,004,250.00  |
| CHW Piping & Insulation and Condensate Piping                                                       |            |             | 25,000                     | \$5.5      | \$ 137,500.00    |
| Ductwork including GRD's, Dampers, & General Exhaust Systems                                        |            |             | 309,000                    | \$11.5     | \$ 3,553,500.00  |
| ATC/DDC Controls                                                                                    |            |             | 309,000                    | \$5.5      | \$ 1,699,500.00  |
| Demand Ventilation Controls                                                                         | 11         | \$600       |                            |            | \$ 6,600.00      |
| Split System Ductless Cooling Units                                                                 | 12         | \$7,500     |                            |            | \$ 90,000.00     |
| Exhaust Fans (Misc. Areas, Dust Collectors, Shops, etc.)                                            |            |             |                            |            | \$ 220,000.00    |
|                                                                                                     |            |             |                            |            |                  |
| TOTAL                                                                                               |            |             |                            |            | \$ 10,740,450.00 |
| TOTAL (\$/FT²)                                                                                      |            |             |                            |            | \$ 34.76         |

Cost estimates have been derived for system comparison purposes only. Estimates do not necessarily include HVAC systems and equipment that would typically be required for all system options studied; example: supplemental cooling systems (for elevator machine rooms, tel/data rooms, etc.) and radiation heating for unoccupied areas (storage rooms, corridors, vestibules etc.). Estimates do not include project general system costs; example: commissioning, coordination, as built drawings etc.



|                                                                                                                             |            |             | <b>PROJECT:</b> Dover High School |               |                  |
|-----------------------------------------------------------------------------------------------------------------------------|------------|-------------|-----------------------------------|---------------|------------------|
|                                                                                                                             |            |             | <b>JOB NO:</b> 83104400           |               |                  |
|                                                                                                                             |            |             | <b>CLIENT:</b> HMFH Architects    |               |                  |
| <b>Option 4 - Partial Geothermal Plant VAV Dehumidification Displacement Ventilation Systems and Induction Unit Systems</b> |            |             | <b>DATE:</b> 10/7/2015            | <b>BY:</b> KL |                  |
| ITEM OF WORK                                                                                                                | NO.        | UNIT PRICE  | AREA                              | PRICE/S.F.    | TOTAL            |
| Displacement Diffuser Assemblies                                                                                            | 253        | \$650       |                                   |               | \$ 164,450.00    |
| Displacement Diffuser Assemblies (Large AC)                                                                                 | 22         | \$850       |                                   |               | \$ 18,700.00     |
| VAV Box with Demand Ventilation Controls                                                                                    | 136        | \$1,200     |                                   |               | \$ 163,200.00    |
| Induction Units                                                                                                             | 80         | \$1,450     |                                   |               | \$ 116,000.00    |
| Heat Pump Units (Animal Science)                                                                                            | 12         | \$7,500     |                                   |               | \$ 90,000.00     |
| RTU-1: Classroom Displacement VAV DOAS w/ ERV                                                                               | 11,000 CFM | \$12/CFM    |                                   |               | \$ 132,000.00    |
| RTU-2: Classroom Displacement VAV DOAS w/ ERV                                                                               | 11,000 CFM | \$12/CFM    |                                   |               | \$ 132,000.00    |
| RTU-3: Classroom Displacement VAV DOAS w/ ERV                                                                               | 11,000 CFM | \$12/CFM    |                                   |               | \$ 132,000.00    |
| RTU-4: Classroom Displacement VAV DOAS w/ ERV                                                                               | 11,000 CFM | \$12/CFM    |                                   |               | \$ 132,000.00    |
| RTU-5: Classroom Displacement VAV DOAS w/ ERV                                                                               | 11,000 CFM | \$12/CFM    |                                   |               | \$ 132,000.00    |
| RTU-6: Classroom Displacement VAV DOAS w/ ERV                                                                               | 11,000 CFM | \$12/CFM    |                                   |               | \$ 132,000.00    |
| RTU-7: Classroom Displacement VAV DOAS w/ ERV                                                                               | 11,000 CFM | \$12/CFM    |                                   |               | \$ 132,000.00    |
| RTU-8: Classroom Displacement VAV DOAS w/ ERV                                                                               | 11,000 CFM | \$12/CFM    |                                   |               | \$ 132,000.00    |
| RTU-9, 10: Gymnasium RTU w/ ERV & DCV (2 @ 15,000 CFM ea.)                                                                  | 30,000 CFM | \$12/CFM    |                                   |               | \$ 360,000.00    |
| RTU-11: Fitness & Locker Rooms VAV DOAS w/ ERV & DCV                                                                        | 8,400 CFM  | \$12/CFM    |                                   |               | \$ 100,800.00    |
| RTU-12: Auditorium Full AC Displacement VAV RTU w/ ERV & DCV                                                                | 11,000 CFM | \$12/CFM    |                                   |               | \$ 132,000.00    |
| RTU-13: Stage Full AC Displacement VAV RTU w/ ERV & DCV                                                                     | 4,000 CFM  | \$14/CFM    |                                   |               | \$ 56,000.00     |
| RTU-14: Band/Music Displacement VAV DOAS w/ ERV                                                                             | 3,500 CFM  | \$14/CFM    |                                   |               | \$ 49,000.00     |
| RTU-15: Admin. IU DOAS w/ ERV                                                                                               | 4,500 CFM  | \$13/CFM    |                                   |               | \$ 58,500.00     |
| RTU-16: Media Center IU DOAS w/ ERV                                                                                         | 2,000 CFM  | \$14/CFM    |                                   |               | \$ 28,000.00     |
| RTU-17: Town Square/Forum Full AC Displacement VAV RTU w/ ERV & DCV                                                         | 7,400 CFM  | \$13/CFM    |                                   |               | \$ 96,200.00     |
| RTU-18: Wood Shop 100% O.A. HV w/ ERV & DCV                                                                                 | 6,000 CFM  | \$9/CFM     |                                   |               | \$ 54,000.00     |
| RTU-19: Welding Shop 100% O.A. HV w/ ERV & DCV                                                                              | 3,000 CFM  | \$9/CFM     |                                   |               | \$ 27,000.00     |
| RTU-20: Auto Technology 100% O.A. HV w/ ERV & DCV                                                                           | 3,500 CFM  | \$9/CFM     |                                   |               | \$ 31,500.00     |
| RTU-21: Auto Body Shop 100% O.A. HV w/ ERV & DCV                                                                            | 8,000 CFM  | \$8/CFM     |                                   |               | \$ 64,000.00     |
| RTU-22: Building Tech Shop 100% O.A. HV w/ ERV & DCV                                                                        | 6,000 CFM  | \$8/CFM     |                                   |               | \$ 48,000.00     |
| RTU-23: Electrical Tech Shop 100% O.A. HV w/ ERV & DCV                                                                      | 6,200 CFM  | \$8/CFM     |                                   |               | \$ 49,600.00     |
| RTU-24: Animal Science 100% O.A. HV w/ ERV                                                                                  | 9,000 CFM  | \$8/CFM     |                                   |               | \$ 72,000.00     |
| HV-1: Custodial HV                                                                                                          | 2,000 CFM  | \$7/CFM     |                                   |               | \$ 14,000.00     |
| MAU-1: Kitchen HVAC Make-Up Air Unit                                                                                        | 4,000 CFM  | \$9/CFM     |                                   |               | \$ 36,000.00     |
| MAU-2: Culinary HVAC Make-Up Air Unit                                                                                       | 2,000 CFM  | \$9/CFM     |                                   |               | \$ 18,000.00     |
| (3) 2,000 MBH High-Efficiency Gas-Fired Condensing Boilers                                                                  | 3          | \$47,800    |                                   |               | \$ 143,400.00    |
| Pumps (HHW) including VFD's                                                                                                 | 2          | \$9,000     |                                   |               | \$ 18,000.00     |
| 225 Ton High-Efficiency Modular Water-to-Water Heat Pump Chiller Plant                                                      | 225 tons   | \$1,350/ton |                                   |               | \$ 303,750.00    |
| Plate Frame Heat Exchanger & Filtration System                                                                              | 2          | \$30,000    |                                   |               | \$ 60,000.00     |
| 1,500' Deep Geothermal Wells (30 Tons ea.) including Well Head Pump & VFD                                                   | 8          | \$60,000    |                                   |               | \$ 480,000.00    |
| Underground Piping, Coring, Sleeves for Geothermal System                                                                   |            |             |                                   |               | \$ 450,000.00    |
| Pumps (CHW) including VFD's                                                                                                 | 2          | \$5,000     |                                   |               | \$ 10,000.00     |
| Pumps (CW & Geothermal) including VFD's                                                                                     | 4          | \$7,500     |                                   |               | \$ 30,000.00     |
| (3) 330 MBH High-Efficiency Gas-Fired Condensing Boilers (Animal Science)                                                   | 3          | \$9,800     |                                   |               | \$ 29,400.00     |
| Pumps (HHW) including VFD's (Animal Science)                                                                                | 2          | \$5,000     |                                   |               | \$ 10,000.00     |
| HHW Piping & Insulation including Terminal Heating Units                                                                    |            |             | 309,000                           | \$3.25        | \$ 1,004,250.00  |
| CHW Piping & Insulation and Condensate Piping                                                                               |            |             | 60,000                            | \$5.5         | \$ 330,000.00    |
| Indoor Heat Pump Chiller Main CHW/CW Piping, Insulation, and Valves                                                         |            |             |                                   |               | \$ 85,000.00     |
| Ductwork including GRD's, Dampers, & General Exhaust Systems                                                                |            |             | 309,000                           | \$10.0        | \$ 3,090,000.00  |
| ATC/DDC Controls                                                                                                            |            |             | 309,000                           | \$5.5         | \$ 1,699,500.00  |
| Demand Ventilation Controls                                                                                                 | 11         | \$600       |                                   |               | \$ 6,600.00      |
| Split System Ductless Cooling Units                                                                                         | 12         | \$7,500     |                                   |               | \$ 90,000.00     |
| Exhaust Fans (Misc. Areas, Dust Collectors, Shops, etc.)                                                                    |            |             |                                   |               | \$ 220,000.00    |
|                                                                                                                             |            |             |                                   |               |                  |
| <b>TOTAL</b>                                                                                                                |            |             |                                   |               | \$ 10,962,850.00 |
| <b>TOTAL (\$/FT²)</b>                                                                                                       |            |             |                                   |               | \$ 35.48         |

Cost estimates have been derived for system comparison purposes only. Estimates do not necessarily include HVAC systems and equipment that would typically be required for all system options studied, example: supplemental cooling systems (for elevator machine rooms, tel/data rooms, etc.) and radiation heating for unoccupied areas (storage rooms, corridors, vestibules etc.). Estimates do not include project general system costs, example: commissioning, coordination, as built drawings etc.



**GARCIA • GALUSKA • DESOUSA**  
Consulting Engineers Inc.

370 Faunce Corner Road, Dartmouth, MA 02747-1217

**DOVER HIGH SCHOOL - ANNUAL MAINTENANCE COSTS**

**BASELINE - VAV**

| UNIT TYPE                      | QUANTITY | COST/UNIT    | ANNUAL COST     |
|--------------------------------|----------|--------------|-----------------|
| VAV Box w/ Reheat Coil         | 235      | \$75         | \$17,625        |
| Large CHW/HW RTU's             | 16       | \$2,000      | \$32,000        |
| Small CHW/HW RTU's             | 4        | \$1,500      | \$6,000         |
| Gas HV's                       | 7        | \$1,500      | \$10,500        |
| Boiler Plants                  | 1        | \$2,000      | \$2,000         |
| Chiller Plant w/ Cooling Tower | 1        | \$1,500      | \$1,500         |
|                                |          | <b>TOTAL</b> | <b>\$69,625</b> |

**OPTION 1 - INDUCTION UNITS**

| UNIT TYPE          | QUANTITY | COST/UNIT    | ANNUAL COST     |
|--------------------|----------|--------------|-----------------|
| Induction Units    | 544      | \$25         | \$13,600        |
| VAV Box            | 8        | \$50         | \$400           |
| Large DX/Gas RTU's | 14       | \$2,200      | \$30,800        |
| Small DX/Gas RTU's | 6        | \$1,700      | \$10,200        |
| Gas HV's           | 7        | \$1,500      | \$10,500        |
| Boiler Plants      | 1        | \$2,000      | \$2,000         |
| Chiller Plant      | 1        | \$1,500      | \$1,500         |
|                    |          | <b>TOTAL</b> | <b>\$69,000</b> |

**OPTION 2 - CV DISP w/ IU**

| UNIT TYPE          | QUANTITY | COST/UNIT    | ANNUAL COST     |
|--------------------|----------|--------------|-----------------|
| Induction Units    | 50       | \$25         | \$1,250         |
| VAV Box            | 8        | \$50         | \$400           |
| Large DX/Gas RTU's | 14       | \$2,200      | \$30,800        |
| Small DX/Gas RTU's | 6        | \$1,700      | \$10,200        |
| Gas HV's           | 7        | \$1,500      | \$10,500        |
| Boiler Plants      | 1        | \$2,000      | \$2,000         |
| Chiller Plant      | 1        | \$1,000      | \$1,000         |
|                    |          | <b>TOTAL</b> | <b>\$56,150</b> |

**OPTION 2A - VAV DISP w/ IU**

| UNIT TYPE          | QUANTITY | COST/UNIT    | ANNUAL COST     |
|--------------------|----------|--------------|-----------------|
| Induction Units    | 50       | \$25         | \$1,250         |
| VAV Box            | 136      | \$50         | \$6,800         |
| Large DX/Gas RTU's | 14       | \$2,200      | \$30,800        |
| Small DX/Gas RTU's | 6        | \$1,700      | \$10,200        |
| Gas HV's           | 7        | \$1,500      | \$10,500        |
| Boiler Plants      | 1        | \$2,000      | \$2,000         |
| Chiller Plant      | 1        | \$1,000      | \$1,000         |
|                    |          | <b>TOTAL</b> | <b>\$62,550</b> |

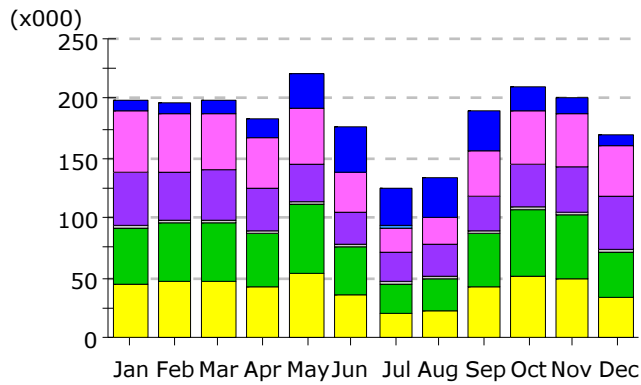
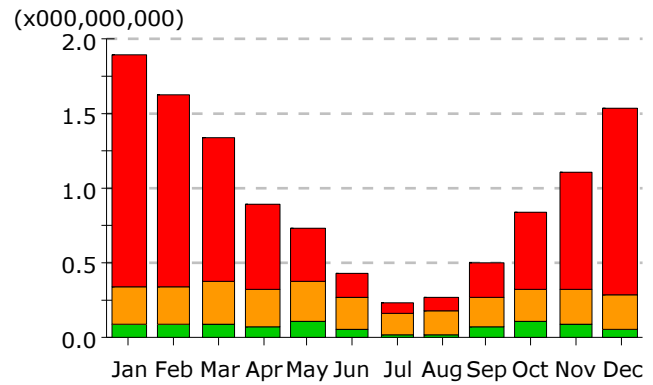
**OPTION 3 - AC VAV DISP w/ IU**

| UNIT TYPE          | QUANTITY | COST/UNIT    | ANNUAL COST     |
|--------------------|----------|--------------|-----------------|
| Induction Units    | 50       | \$25         | \$1,250         |
| VAV Box            | 136      | \$50         | \$6,800         |
| Large DX/Gas RTU's | 15       | \$2,200      | \$33,000        |
| Small DX/Gas RTU's | 5        | \$1,700      | \$8,500         |
| Gas HV's           | 7        | \$1,500      | \$10,500        |
| Boiler Plants      | 1        | \$2,000      | \$2,000         |
| Chiller Plant      | 1        | \$1,000      | \$1,000         |
|                    |          | <b>TOTAL</b> | <b>\$63,050</b> |

**OPTION 4 - GEO VAV DISP w/ IU**

| UNIT TYPE          | QUANTITY | COST/UNIT    | ANNUAL COST     |
|--------------------|----------|--------------|-----------------|
| Induction Units    | 50       | \$25         | \$1,250         |
| VAV Box            | 136      | \$50         | \$6,800         |
| Large DX/Gas RTU's | 10       | \$2,200      | \$22,000        |
| Small DX/Gas RTU's | 3        | \$1,700      | \$5,100         |
| Large CHW/HW RTU's | 4        | \$2,000      | \$8,000         |
| Small CHW/HW RTU's | 3        | \$1,500      | \$4,500         |
| Gas HV's           | 7        | \$1,500      | \$10,500        |
| Boiler Plants      | 1        | \$2,000      | \$2,000         |
| Geothermal Plant   | 1        | \$3,500      | \$3,500         |
|                    |          | <b>TOTAL</b> | <b>\$63,650</b> |

# **ENERGY PROFILES**

**Electric Consumption (kWh)****Gas Consumption (Btu)****Electric Consumption (kWh x000)**

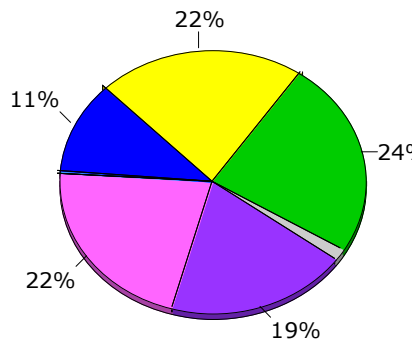
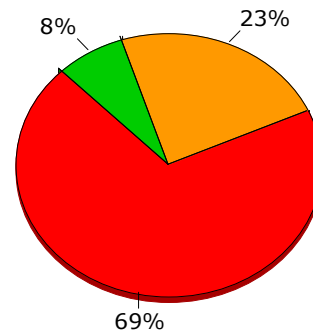
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 9.9          | 9.1          | 10.8         | 15.5         | 27.1         | 36.7         | 32.2         | 31.6         | 33.5         | 20.4         | 13.9         | 10.1         | 250.9          |
| Heat Reject.  | 0.0          | -            | -            | 0.1          | 0.5          | 1.1          | 1.1          | 1.1          | 0.9          | 0.3          | 0.1          | -            | 5.1            |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 0.0          | 0.0          | 0.0          | 0.0          | 0.0          | -            | -            | -            | 0.0          | 0.0          | 0.0          | 0.0          | 0.0            |
| HP Supp.      | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 50.5         | 47.2         | 46.1         | 41.7         | 46.6         | 32.9         | 20.4         | 23.1         | 37.6         | 45.7         | 44.8         | 42.8         | 479.3          |
| Pumps & Aux.  | 45.0         | 40.0         | 43.0         | 35.7         | 32.5         | 26.9         | 26.2         | 25.6         | 28.3         | 34.2         | 37.2         | 43.9         | 418.4          |
| Ext. Usage    | 3.0          | 2.3          | 2.5          | 2.4          | 1.7          | 1.7          | 1.7          | 2.8          | 2.7          | 2.8          | 2.9          | 3.0          | 29.5           |
| Misc. Equip.  | 46.7         | 49.6         | 49.2         | 45.1         | 57.1         | 39.4         | 23.4         | 25.9         | 45.1         | 54.9         | 52.3         | 36.5         | 525.3          |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 44.3         | 47.3         | 46.3         | 42.6         | 54.5         | 36.6         | 20.8         | 22.8         | 42.6         | 52.3         | 50.0         | 34.0         | 494.1          |
| <b>Total</b>  | <b>199.3</b> | <b>195.5</b> | <b>197.9</b> | <b>183.1</b> | <b>220.0</b> | <b>175.3</b> | <b>125.9</b> | <b>132.9</b> | <b>190.6</b> | <b>210.6</b> | <b>201.1</b> | <b>170.2</b> | <b>2,202.6</b> |

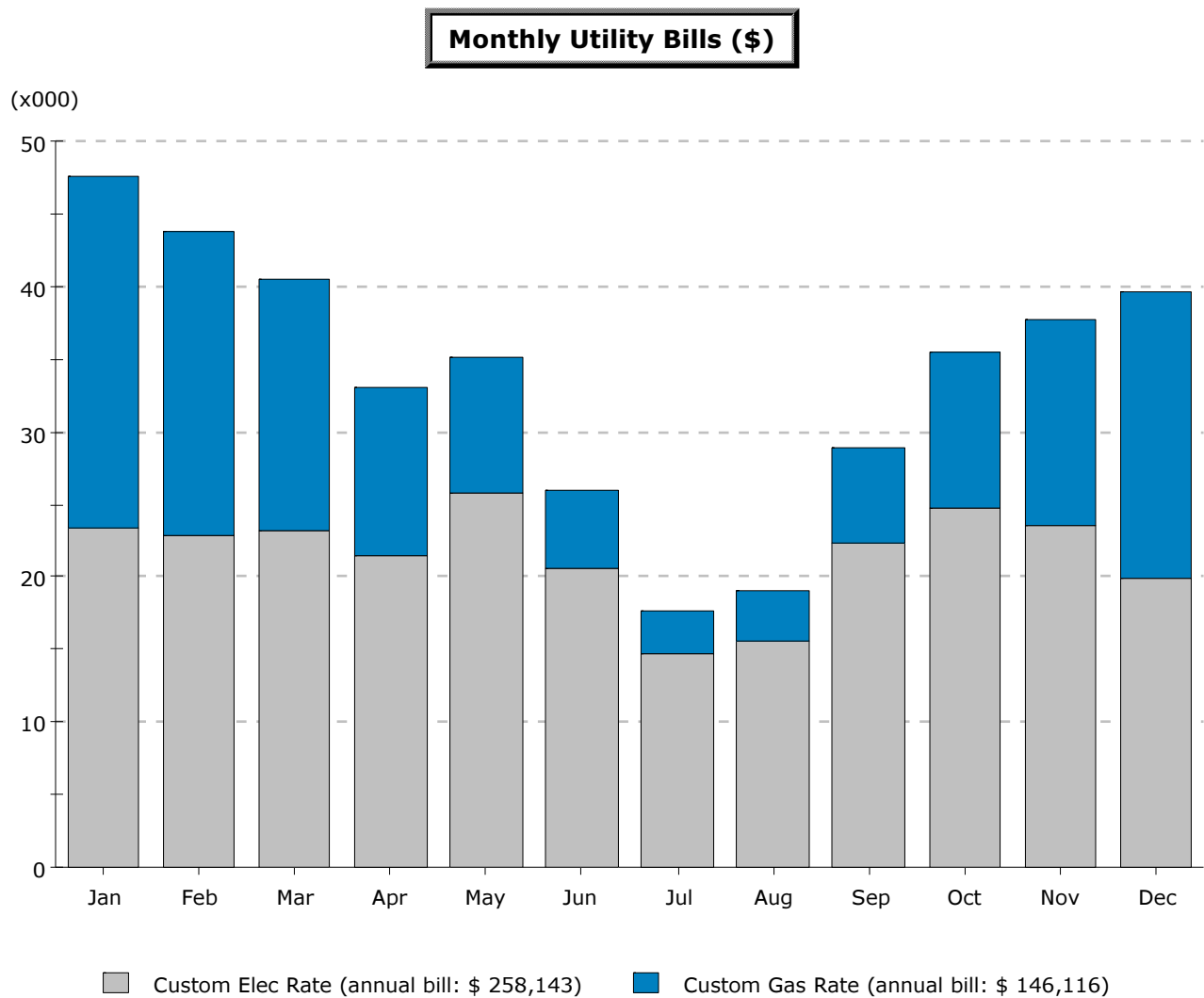
**Gas Consumption (Btu x000,000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total        |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Space Heat    | 1.56        | 1.28        | 0.97        | 0.57        | 0.35        | 0.16        | 0.07        | 0.10        | 0.24        | 0.51        | 0.78        | 1.26        | 7.86         |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Hot Water     | 0.25        | 0.25        | 0.29        | 0.25        | 0.27        | 0.20        | 0.14        | 0.15        | 0.19        | 0.22        | 0.23        | 0.22        | 2.66         |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Misc. Equip.  | 0.08        | 0.09        | 0.08        | 0.08        | 0.11        | 0.06        | 0.02        | 0.02        | 0.08        | 0.10        | 0.10        | 0.05        | 0.87         |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| <b>Total</b>  | <b>1.89</b> | <b>1.63</b> | <b>1.34</b> | <b>0.90</b> | <b>0.73</b> | <b>0.42</b> | <b>0.23</b> | <b>0.27</b> | <b>0.51</b> | <b>0.84</b> | <b>1.11</b> | <b>1.53</b> | <b>11.39</b> |

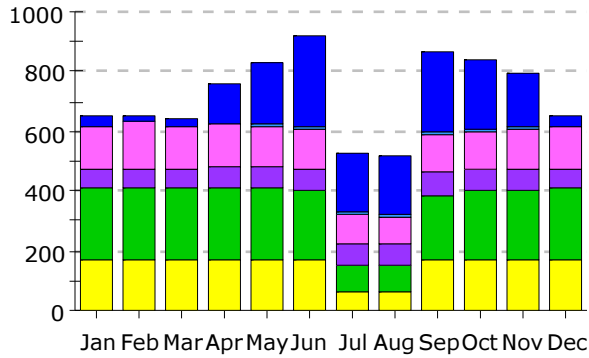
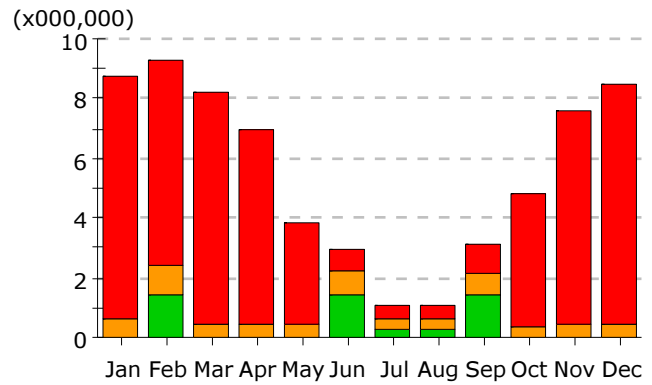
**Annual Energy Consumption by Enduse**

|               | <b>Electricity<br/>kWh (x000)</b> | <b>Natural Gas<br/>MBtu</b> | <b>Steam<br/>Btu</b> | <b>Chilled Water<br/>Btu</b> |
|---------------|-----------------------------------|-----------------------------|----------------------|------------------------------|
| Space Cool    | 250.9                             | -                           | -                    | -                            |
| Heat Reject.  | 5.1                               | -                           | -                    | -                            |
| Refrigeration | -                                 | -                           | -                    | -                            |
| Space Heat    | 0.0                               | 7,855                       | -                    | -                            |
| HP Supp.      | -                                 | -                           | -                    | -                            |
| Hot Water     | -                                 | 2,659                       | -                    | -                            |
| Vent. Fans    | 479.3                             | -                           | -                    | -                            |
| Pumps & Aux.  | 418.4                             | -                           | -                    | -                            |
| Ext. Usage    | 29.5                              | -                           | -                    | -                            |
| Misc. Equip.  | 525.3                             | 874                         | -                    | -                            |
| Task Lights   | -                                 | -                           | -                    | -                            |
| Area Lights   | 494.1                             | -                           | -                    | -                            |
| <b>Total</b>  | <b>2,202.6</b>                    | <b>11,389</b>               | <b>-</b>             | <b>-</b>                     |

**Electricity****Natural Gas**



**Total Annual Bill Across All Rates: \$ 404,259**

**Electric Demand (kW)****Gas Demand (Btu/h)****Electric Demand (kW)**

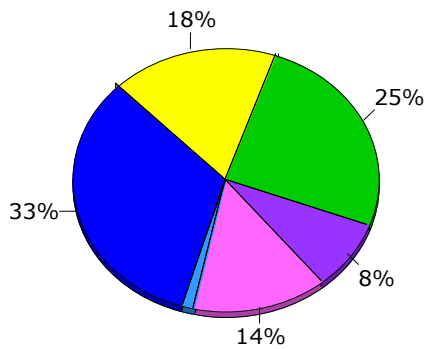
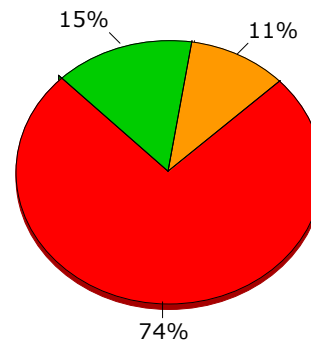
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 39.1         | 15.2         | 33.8         | 128.9        | 209.6        | 303.6        | 196.2        | 191.1        | 268.5        | 231.7        | 184.0        | 42.0         | 1,843.7        |
| Heat Reject.  | -            | -            | -            | 3.0          | 7.4          | 12.5         | 9.2          | 9.3          | 9.6          | 8.0          | 6.1          | -            | 65.1           |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 0.0          | 0.0          | -            | -            | -            | -            | -            | -            | -            | -            | -            | 0.0          | 0.0            |
| HP Supp.      | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 136.4        | 159.9        | 138.4        | 146.7        | 134.8        | 128.8        | 94.9         | 92.2         | 130.8        | 124.1        | 134.8        | 138.3        | 1,560.0        |
| Pumps & Aux.  | 68.6         | 66.1         | 67.5         | 72.0         | 73.9         | 76.1         | 70.2         | 68.8         | 74.6         | 73.0         | 75.9         | 68.1         | 854.8          |
| Ext. Usage    | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Misc. Equip.  | 240.7        | 240.7        | 240.7        | 240.7        | 240.7        | 231.4        | 90.0         | 90.0         | 218.7        | 231.4        | 231.4        | 240.7        | 2,536.8        |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 64.4         | 64.4         | 166.7        | 166.7        | 166.7        | 166.7        | 1,795.9        |
| <b>Total</b>  | <b>651.5</b> | <b>648.5</b> | <b>647.1</b> | <b>758.1</b> | <b>833.1</b> | <b>919.1</b> | <b>524.8</b> | <b>515.8</b> | <b>868.9</b> | <b>834.8</b> | <b>799.0</b> | <b>655.8</b> | <b>8,656.4</b> |

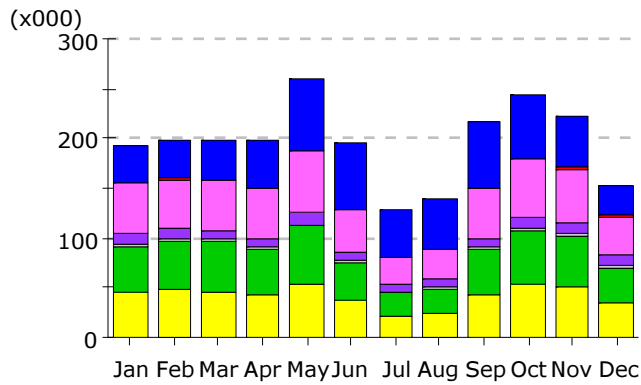
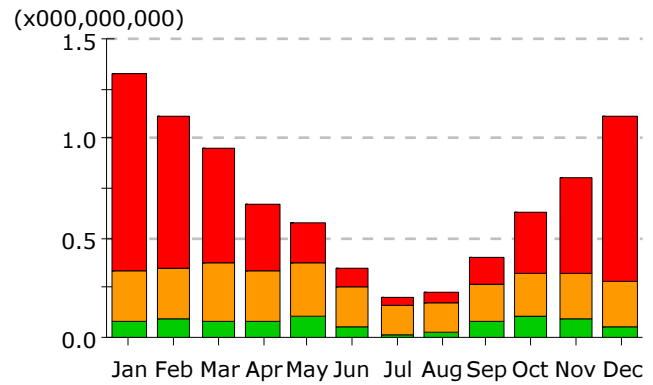
**Gas Demand (Btu/h x1000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total        |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Space Heat    | 8.18        | 6.92        | 7.77        | 6.52        | 3.37        | 0.66        | 0.45        | 0.48        | 0.98        | 4.42        | 7.22        | 8.05        | 55.02        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Hot Water     | 0.58        | 0.98        | 0.47        | 0.46        | 0.43        | 0.84        | 0.37        | 0.35        | 0.74        | 0.37        | 0.39        | 0.42        | 6.41         |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Misc. Equip.  | 0.01        | 1.42        | 0.01        | 0.01        | 0.01        | 1.42        | 0.27        | 0.27        | 1.42        | 0.01        | 0.01        | 0.01        | 4.89         |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| <b>Total</b>  | <b>8.78</b> | <b>9.31</b> | <b>8.25</b> | <b>6.99</b> | <b>3.81</b> | <b>2.91</b> | <b>1.09</b> | <b>1.10</b> | <b>3.14</b> | <b>4.80</b> | <b>7.63</b> | <b>8.49</b> | <b>66.31</b> |

**Annual Peak Demand by Enduse**

|               | <b>Electricity<br/>kW</b> | <b>Natural Gas<br/>Btu/h (x000)</b> | <b>Steam<br/>Btu/h</b> | <b>Chilled Water<br/>Btu/h</b> |
|---------------|---------------------------|-------------------------------------|------------------------|--------------------------------|
| Space Cool    | 303.61                    | -                                   | -                      | -                              |
| Heat Reject.  | 12.50                     | -                                   | -                      | -                              |
| Refrigeration | -                         | -                                   | -                      | -                              |
| Space Heat    | -                         | 6,917.5                             | -                      | -                              |
| HP Supp.      | -                         | -                                   | -                      | -                              |
| Hot Water     | -                         | 979.6                               | -                      | -                              |
| Vent. Fans    | 128.77                    | -                                   | -                      | -                              |
| Pumps & Aux.  | 76.09                     | -                                   | -                      | -                              |
| Ext. Usage    | -                         | -                                   | -                      | -                              |
| Misc. Equip.  | 231.37                    | 1,416.1                             | -                      | -                              |
| Task Lights   | -                         | -                                   | -                      | -                              |
| Area Lights   | 166.72                    | -                                   | -                      | -                              |
| <b>Total</b>  | <b>919.05</b>             | <b>9,313.1</b>                      | <b>-</b>               | <b>-</b>                       |

**Electricity****Natural Gas**

**Electric Consumption (kWh)****Gas Consumption (Btu)****Electric Consumption (kWh x000)**

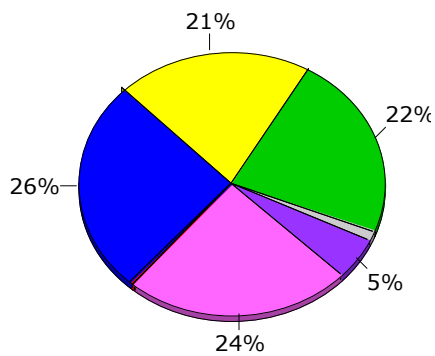
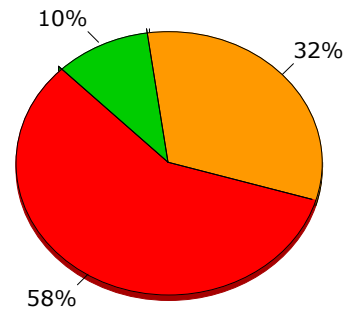
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 38.5         | 37.7         | 41.4         | 49.6         | 73.4         | 65.1         | 48.9         | 50.2         | 66.6         | 63.3         | 52.8         | 29.7         | 617.2          |
| Heat Reject.  | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 1.1          | 0.9          | 0.8          | 0.6          | 0.5          | 0.3          | 0.1          | 0.2          | 0.3          | 0.5          | 0.7          | 1.0          | 7.1            |
| HP Supp.      | 0.1          | 0.1          | 0.0          | 0.0          | -            | -            | -            | -            | -            | 0.0          | 0.0          | 0.1          | 0.4            |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 48.8         | 49.9         | 48.6         | 48.6         | 62.1         | 42.6         | 26.8         | 28.6         | 49.0         | 58.8         | 53.9         | 37.7         | 555.5          |
| Pumps & Aux.  | 11.5         | 10.0         | 10.0         | 10.1         | 11.4         | 8.7          | 7.6          | 7.5          | 9.3          | 10.9         | 10.4         | 10.5         | 118.0          |
| Ext. Usage    | 3.0          | 2.3          | 2.5          | 2.4          | 1.7          | 1.7          | 1.7          | 2.8          | 2.7          | 2.8          | 2.9          | 3.0          | 29.5           |
| Misc. Equip.  | 46.7         | 49.6         | 49.2         | 45.1         | 57.1         | 39.4         | 23.4         | 25.9         | 45.1         | 54.9         | 52.3         | 36.5         | 525.3          |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 44.3         | 47.3         | 46.3         | 42.6         | 54.5         | 36.6         | 20.8         | 22.8         | 42.6         | 52.3         | 50.0         | 34.0         | 494.1          |
| <b>Total</b>  | <b>194.1</b> | <b>197.9</b> | <b>198.9</b> | <b>199.0</b> | <b>260.9</b> | <b>194.4</b> | <b>129.4</b> | <b>138.1</b> | <b>215.6</b> | <b>243.6</b> | <b>222.9</b> | <b>152.4</b> | <b>2,347.3</b> |

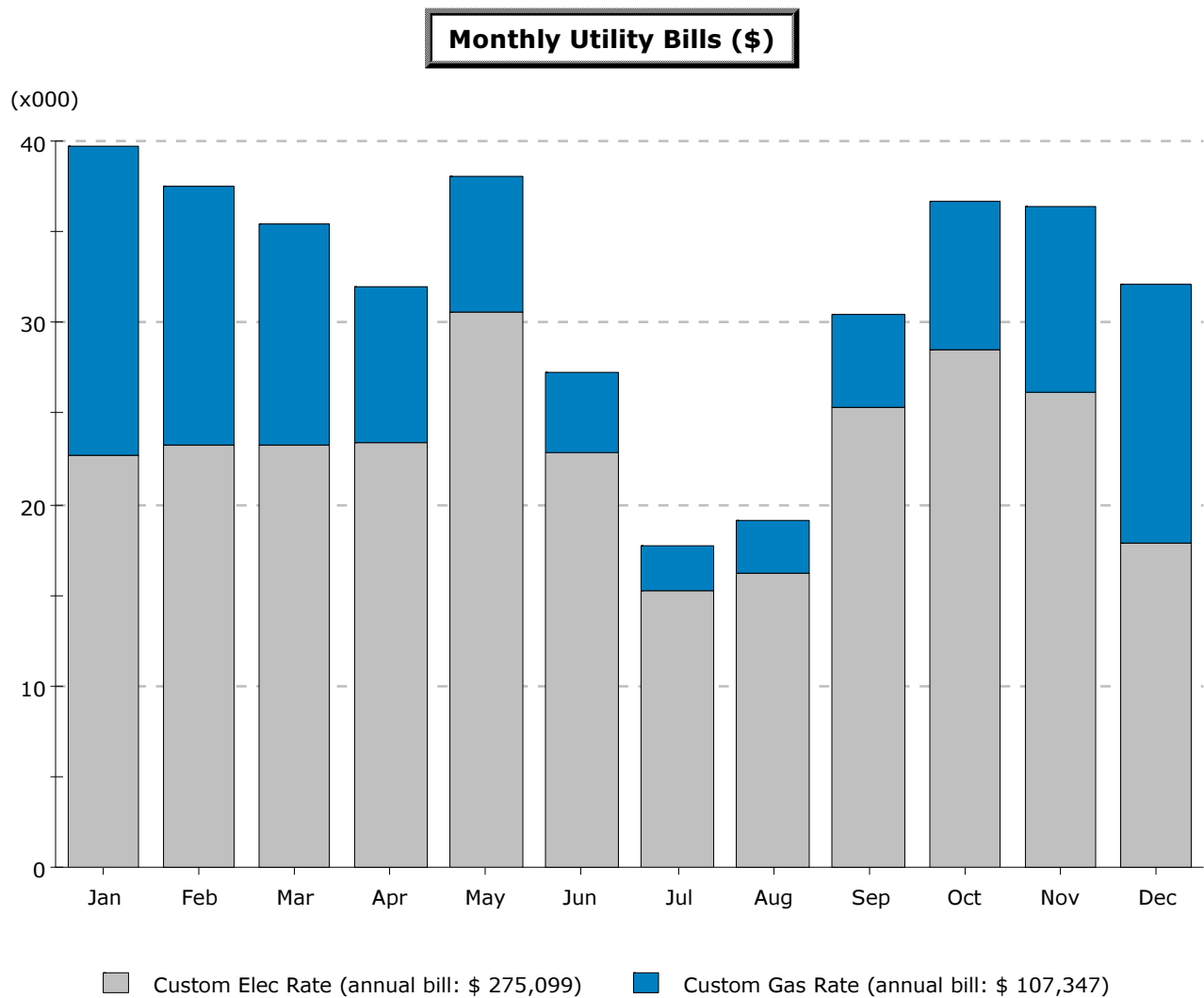
**Gas Consumption (Btu x000,000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total       |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Space Heat    | 0.99        | 0.77        | 0.57        | 0.34        | 0.21        | 0.09        | 0.04        | 0.06        | 0.14        | 0.31        | 0.48        | 0.83        | 4.83        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Hot Water     | 0.25        | 0.25        | 0.29        | 0.25        | 0.27        | 0.20        | 0.14        | 0.15        | 0.19        | 0.22        | 0.23        | 0.22        | 2.66        |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Misc. Equip.  | 0.08        | 0.09        | 0.08        | 0.08        | 0.11        | 0.06        | 0.02        | 0.02        | 0.08        | 0.10        | 0.10        | 0.05        | 0.87        |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| <b>Total</b>  | <b>1.32</b> | <b>1.11</b> | <b>0.95</b> | <b>0.67</b> | <b>0.58</b> | <b>0.35</b> | <b>0.20</b> | <b>0.23</b> | <b>0.41</b> | <b>0.63</b> | <b>0.80</b> | <b>1.11</b> | <b>8.37</b> |

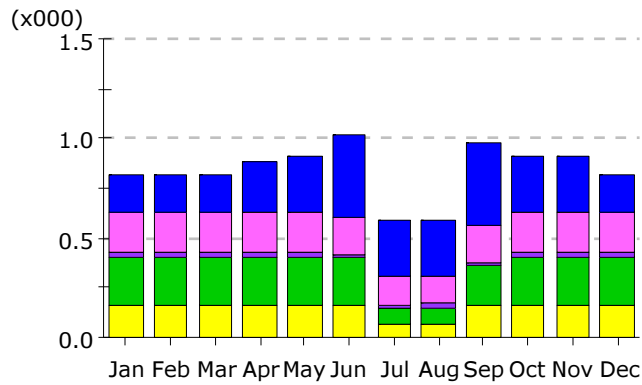
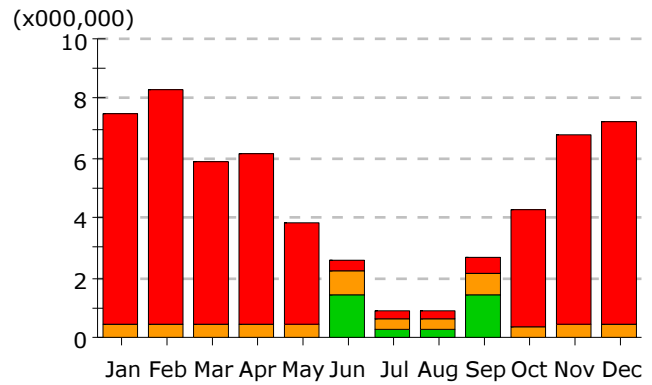
**Annual Energy Consumption by Enduse**

|               | <b>Electricity<br/>kWh (x000)</b> | <b>Natural Gas<br/>MBtu</b> | <b>Steam<br/>Btu</b> | <b>Chilled Water<br/>Btu</b> |
|---------------|-----------------------------------|-----------------------------|----------------------|------------------------------|
| Space Cool    | 617.2                             | -                           | -                    | -                            |
| Heat Reject.  | -                                 | -                           | -                    | -                            |
| Refrigeration | -                                 | -                           | -                    | -                            |
| Space Heat    | 7.1                               | 4,834.8                     | -                    | -                            |
| HP Supp.      | 0.4                               | -                           | -                    | -                            |
| Hot Water     | -                                 | 2,658.2                     | -                    | -                            |
| Vent. Fans    | 555.5                             | -                           | -                    | -                            |
| Pumps & Aux.  | 118.0                             | -                           | -                    | -                            |
| Ext. Usage    | 29.5                              | -                           | -                    | -                            |
| Misc. Equip.  | 525.3                             | 873.8                       | -                    | -                            |
| Task Lights   | -                                 | -                           | -                    | -                            |
| Area Lights   | 494.1                             | -                           | -                    | -                            |
| <b>Total</b>  | <b>2,347.3</b>                    | <b>8,366.9</b>              | <b>-</b>             | <b>-</b>                     |

**Electricity****Natural Gas**



**Total Annual Bill Across All Rates: \$ 382,446**

**Electric Demand (kW)****Gas Demand (Btu/h)****Electric Demand (kW x000)**

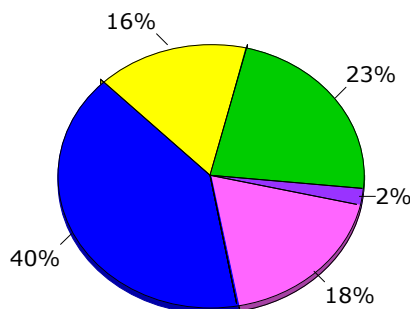
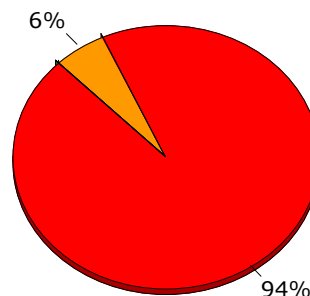
|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total        |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Space Cool    | 0.19        | 0.19        | 0.20        | 0.26        | 0.29        | 0.41        | 0.29        | 0.27        | 0.42        | 0.28        | 0.28        | 0.20        | 3.26         |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Space Heat    | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 0.01         |
| HP Supp.      | -           | -           | 0.00        | -           | -           | -           | -           | -           | -           | -           | -           | -           | 0.00         |
| Hot Water     | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Vent. Fans    | 0.19        | 0.20        | 0.19        | 0.20        | 0.20        | 0.18        | 0.14        | 0.14        | 0.18        | 0.20        | 0.20        | 0.19        | 2.22         |
| Pumps & Aux.  | 0.02        | 0.02        | 0.02        | 0.02        | 0.02        | 0.02        | 0.02        | 0.02        | 0.02        | 0.02        | 0.02        | 0.02        | 0.27         |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Misc. Equip.  | 0.24        | 0.24        | 0.24        | 0.24        | 0.24        | 0.23        | 0.08        | 0.09        | 0.19        | 0.24        | 0.24        | 0.24        | 2.51         |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Area Lights   | 0.17        | 0.17        | 0.17        | 0.17        | 0.17        | 0.17        | 0.06        | 0.06        | 0.17        | 0.17        | 0.17        | 0.17        | 1.80         |
| <b>Total</b>  | <b>0.82</b> | <b>0.82</b> | <b>0.82</b> | <b>0.89</b> | <b>0.91</b> | <b>1.02</b> | <b>0.59</b> | <b>0.58</b> | <b>0.98</b> | <b>0.91</b> | <b>0.91</b> | <b>0.82</b> | <b>10.08</b> |

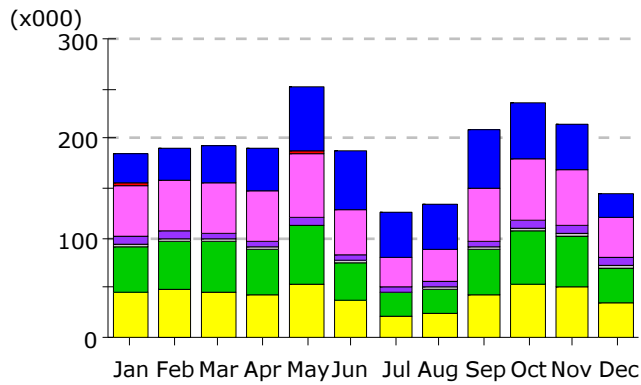
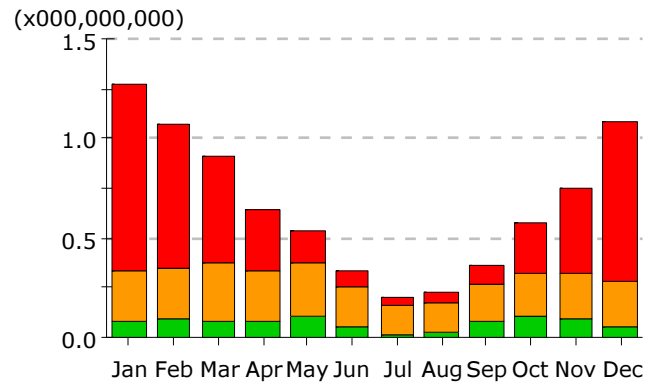
**Gas Demand (Btu/h x000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total        |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Space Heat    | 7.05        | 7.85        | 5.38        | 5.69        | 3.38        | 0.30        | 0.25        | 0.28        | 0.52        | 3.92        | 6.34        | 6.83        | 47.78        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Hot Water     | 0.45        | 0.46        | 0.47        | 0.46        | 0.43        | 0.84        | 0.37        | 0.35        | 0.74        | 0.37        | 0.39        | 0.42        | 5.75         |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Misc. Equip.  | 0.01        | 0.01        | 0.01        | 0.01        | 0.01        | 1.42        | 0.27        | 0.27        | 1.42        | 0.01        | 0.01        | 0.01        | 3.48         |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| <b>Total</b>  | <b>7.51</b> | <b>8.33</b> | <b>5.86</b> | <b>6.16</b> | <b>3.82</b> | <b>2.55</b> | <b>0.88</b> | <b>0.91</b> | <b>2.68</b> | <b>4.31</b> | <b>6.75</b> | <b>7.26</b> | <b>57.02</b> |

**Annual Peak Demand by Enduse**

|               | <b>Electricity<br/>kW</b> | <b>Natural Gas<br/>Btu/h (x000)</b> | <b>Steam<br/>Btu/h</b> | <b>Chilled Water<br/>Btu/h</b> |
|---------------|---------------------------|-------------------------------------|------------------------|--------------------------------|
| Space Cool    | 411.2                     | -                                   | -                      | -                              |
| Heat Reject.  | -                         | -                                   | -                      | -                              |
| Refrigeration | -                         | -                                   | -                      | -                              |
| Space Heat    | 0.6                       | 7,846.3                             | -                      | -                              |
| HP Supp.      | -                         | -                                   | -                      | -                              |
| Hot Water     | -                         | 464.8                               | -                      | -                              |
| Vent. Fans    | 184.2                     | -                                   | -                      | -                              |
| Pumps & Aux.  | 21.2                      | -                                   | -                      | -                              |
| Ext. Usage    | -                         | -                                   | -                      | -                              |
| Misc. Equip.  | 231.4                     | 14.2                                | -                      | -                              |
| Task Lights   | -                         | -                                   | -                      | -                              |
| Area Lights   | 166.7                     | -                                   | -                      | -                              |
| <b>Total</b>  | <b>1,015.3</b>            | <b>8,325.3</b>                      | <b>-</b>               | <b>-</b>                       |

**Electricity****Natural Gas**

**Electric Consumption (kWh)****Gas Consumption (Btu)****Electric Consumption (kWh x000)**

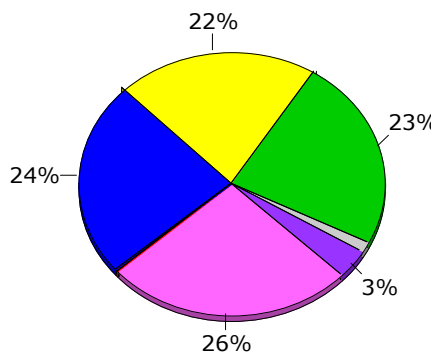
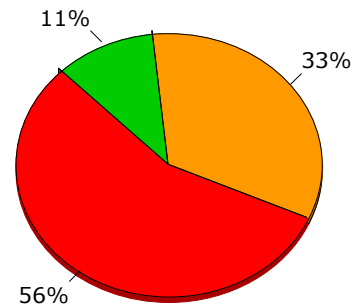
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 31.6         | 32.4         | 35.9         | 43.5         | 66.3         | 58.9         | 44.5         | 45.8         | 60.3         | 56.7         | 45.6         | 24.6         | 546.1          |
| Heat Reject.  | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 1.1          | 0.9          | 0.8          | 0.6          | 0.4          | 0.2          | 0.1          | 0.2          | 0.3          | 0.5          | 0.7          | 1.0          | 7.0            |
| HP Supp.      | 0.1          | 0.1          | 0.0          | 0.0          | -            | -            | -            | -            | -            | 0.0          | 0.0          | 0.1          | 0.4            |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 51.4         | 51.7         | 50.2         | 50.2         | 65.3         | 46.2         | 30.0         | 31.8         | 52.9         | 61.3         | 55.9         | 39.9         | 586.9          |
| Pumps & Aux.  | 7.6          | 7.0          | 7.2          | 6.7          | 7.4          | 5.4          | 4.3          | 4.4          | 6.0          | 7.3          | 7.3          | 6.8          | 77.6           |
| Ext. Usage    | 3.0          | 2.3          | 2.5          | 2.4          | 1.7          | 1.7          | 1.7          | 2.8          | 2.7          | 2.8          | 2.9          | 3.0          | 29.5           |
| Misc. Equip.  | 46.7         | 49.6         | 49.2         | 45.1         | 57.1         | 39.4         | 23.4         | 25.9         | 45.1         | 54.9         | 52.3         | 36.5         | 525.3          |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 44.3         | 47.3         | 46.3         | 42.6         | 54.5         | 36.6         | 20.8         | 22.8         | 42.6         | 52.3         | 50.0         | 34.0         | 494.1          |
| <b>Total</b>  | <b>185.9</b> | <b>191.4</b> | <b>192.3</b> | <b>191.2</b> | <b>252.8</b> | <b>188.5</b> | <b>124.9</b> | <b>133.8</b> | <b>209.9</b> | <b>235.8</b> | <b>214.6</b> | <b>145.9</b> | <b>2,266.9</b> |

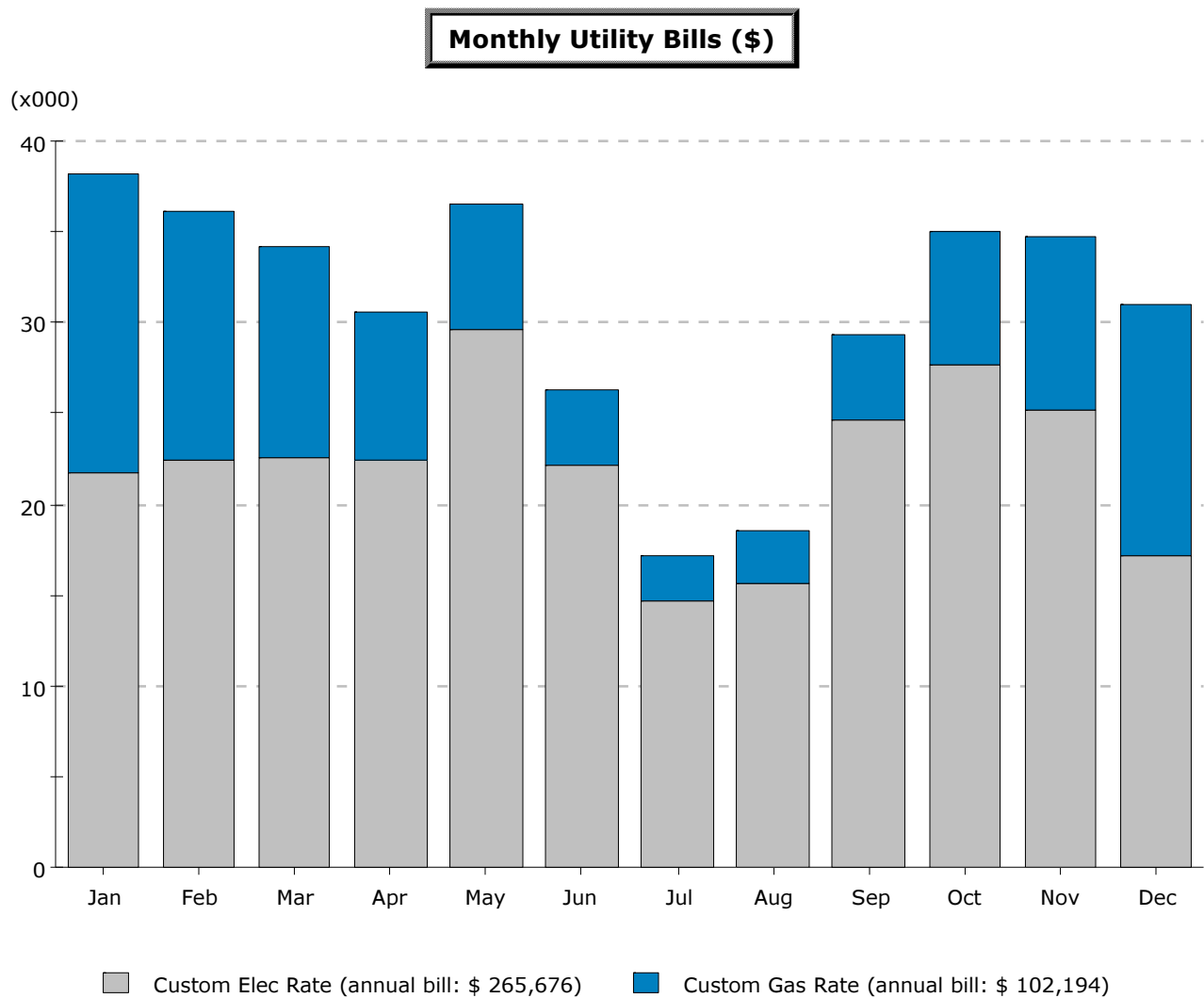
**Gas Consumption (Btu x000,000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total       |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Space Heat    | 0.95        | 0.73        | 0.54        | 0.31        | 0.17        | 0.07        | 0.04        | 0.05        | 0.10        | 0.25        | 0.42        | 0.80        | 4.43        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Hot Water     | 0.25        | 0.25        | 0.29        | 0.25        | 0.27        | 0.20        | 0.14        | 0.15        | 0.19        | 0.22        | 0.23        | 0.22        | 2.66        |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Misc. Equip.  | 0.08        | 0.09        | 0.08        | 0.08        | 0.11        | 0.06        | 0.02        | 0.02        | 0.08        | 0.10        | 0.10        | 0.05        | 0.87        |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| <b>Total</b>  | <b>1.28</b> | <b>1.07</b> | <b>0.91</b> | <b>0.64</b> | <b>0.54</b> | <b>0.33</b> | <b>0.20</b> | <b>0.23</b> | <b>0.37</b> | <b>0.58</b> | <b>0.75</b> | <b>1.08</b> | <b>7.97</b> |

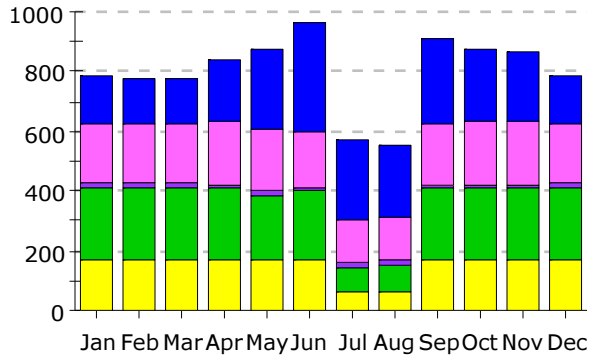
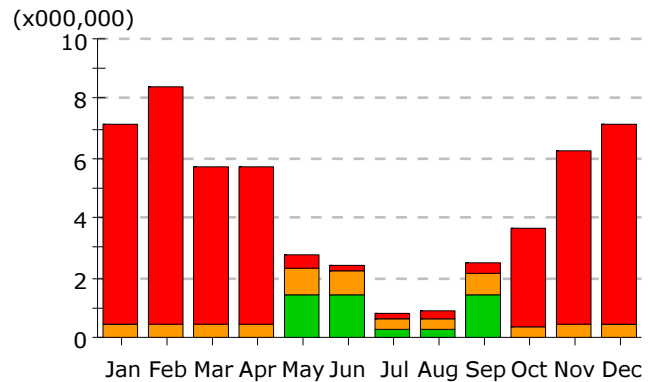
**Annual Energy Consumption by Enduse**

|               | <b>Electricity<br/>kWh (x000)</b> | <b>Natural Gas<br/>MBtu</b> | <b>Steam<br/>Btu</b> | <b>Chilled Water<br/>Btu</b> |
|---------------|-----------------------------------|-----------------------------|----------------------|------------------------------|
| Space Cool    | 546.1                             | -                           | -                    | -                            |
| Heat Reject.  | -                                 | -                           | -                    | -                            |
| Refrigeration | -                                 | -                           | -                    | -                            |
| Space Heat    | 7.0                               | 4,433.2                     | -                    | -                            |
| HP Supp.      | 0.4                               | -                           | -                    | -                            |
| Hot Water     | -                                 | 2,658.2                     | -                    | -                            |
| Vent. Fans    | 586.9                             | -                           | -                    | -                            |
| Pumps & Aux.  | 77.6                              | -                           | -                    | -                            |
| Ext. Usage    | 29.5                              | -                           | -                    | -                            |
| Misc. Equip.  | 525.3                             | 873.8                       | -                    | -                            |
| Task Lights   | -                                 | -                           | -                    | -                            |
| Area Lights   | 494.1                             | -                           | -                    | -                            |
| <b>Total</b>  | <b>2,266.9</b>                    | <b>7,965.2</b>              | <b>-</b>             | <b>-</b>                     |

**Electricity****Natural Gas**



**Total Annual Bill Across All Rates: \$ 367,870**

**Electric Demand (kW)****Gas Demand (Btu/h)****Electric Demand (kW)**

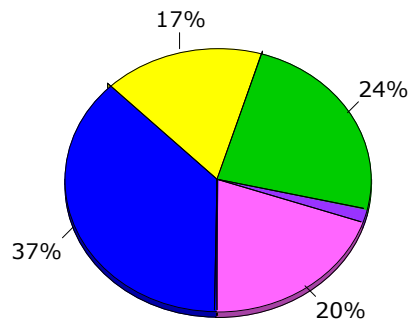
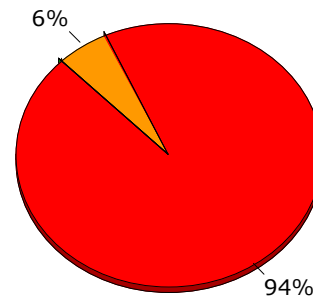
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 156.1        | 151.3        | 149.4        | 204.8        | 262.2        | 360.4        | 264.5        | 244.5        | 291.3        | 244.7        | 239.0        | 153.4        | 2,721.5        |
| Heat Reject.  | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 1.3          | 1.3          | 1.4          | 0.7          | 0.5          | 0.2          | 0.4          | 0.4          | 0.4          | 0.6          | 0.8          | 1.4          | 9.5            |
| HP Supp.      | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 201.2        | 203.0        | 201.0        | 207.3        | 207.9        | 189.2        | 144.6        | 143.9        | 201.3        | 208.8        | 207.1        | 203.2        | 2,318.5        |
| Pumps & Aux.  | 17.1         | 16.8         | 16.9         | 15.6         | 15.8         | 13.8         | 13.8         | 13.5         | 12.1         | 15.8         | 16.0         | 16.8         | 184.2          |
| Ext. Usage    | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Misc. Equip.  | 240.7        | 240.7        | 240.7        | 240.7        | 218.7        | 231.4        | 80.5         | 88.5         | 240.7        | 240.7        | 240.7        | 240.7        | 2,544.5        |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 64.4         | 64.4         | 166.7        | 166.7        | 166.7        | 166.7        | 1,795.9        |
| <b>Total</b>  | <b>783.2</b> | <b>779.8</b> | <b>776.0</b> | <b>835.8</b> | <b>871.9</b> | <b>961.7</b> | <b>568.1</b> | <b>555.2</b> | <b>912.6</b> | <b>877.2</b> | <b>870.2</b> | <b>782.2</b> | <b>9,574.1</b> |

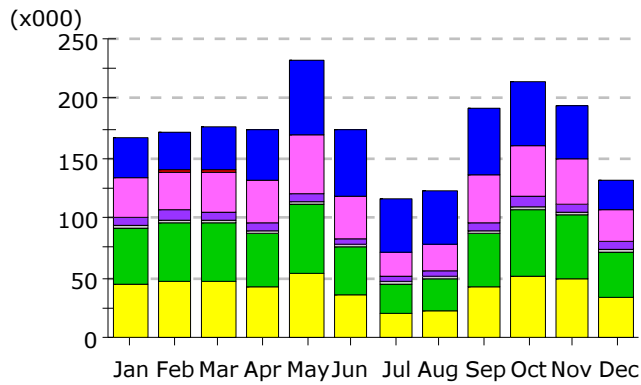
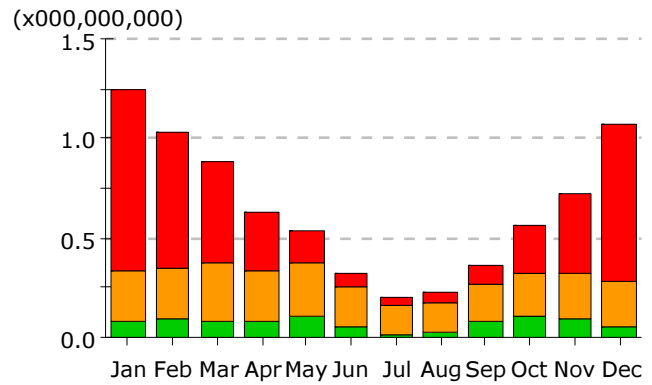
**Gas Demand (Btu/h x000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total        |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Space Heat    | 6.72        | 7.91        | 5.20        | 5.28        | 0.46        | 0.18        | 0.21        | 0.25        | 0.32        | 3.25        | 5.81        | 6.71        | 42.30        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Hot Water     | 0.45        | 0.46        | 0.47        | 0.46        | 0.90        | 0.84        | 0.37        | 0.35        | 0.74        | 0.37        | 0.39        | 0.42        | 6.23         |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Misc. Equip.  | 0.01        | 0.01        | 0.01        | 0.01        | 1.42        | 1.42        | 0.27        | 0.27        | 1.42        | 0.01        | 0.01        | 0.01        | 4.89         |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| <b>Total</b>  | <b>7.19</b> | <b>8.39</b> | <b>5.68</b> | <b>5.75</b> | <b>2.77</b> | <b>2.43</b> | <b>0.85</b> | <b>0.87</b> | <b>2.48</b> | <b>3.63</b> | <b>6.22</b> | <b>7.15</b> | <b>53.41</b> |

**Annual Peak Demand by Enduse**

|               | <b>Electricity<br/>kW</b> | <b>Natural Gas<br/>Btu/h (x000)</b> | <b>Steam<br/>Btu/h</b> | <b>Chilled Water<br/>Btu/h</b> |
|---------------|---------------------------|-------------------------------------|------------------------|--------------------------------|
| Space Cool    | 360.38                    | -                                   | -                      | -                              |
| Heat Reject.  | -                         | -                                   | -                      | -                              |
| Refrigeration | -                         | -                                   | -                      | -                              |
| Space Heat    | 0.25                      | 7,911.3                             | -                      | -                              |
| HP Supp.      | -                         | -                                   | -                      | -                              |
| Hot Water     | -                         | 464.8                               | -                      | -                              |
| Vent. Fans    | 189.17                    | -                                   | -                      | -                              |
| Pumps & Aux.  | 13.77                     | -                                   | -                      | -                              |
| Ext. Usage    | -                         | -                                   | -                      | -                              |
| Misc. Equip.  | 231.37                    | 14.2                                | -                      | -                              |
| Task Lights   | -                         | -                                   | -                      | -                              |
| Area Lights   | 166.72                    | -                                   | -                      | -                              |
| <b>Total</b>  | <b>961.65</b>             | <b>8,390.3</b>                      | <b>-</b>               | <b>-</b>                       |

**Electricity****Natural Gas**

**Electric Consumption (kWh)****Gas Consumption (Btu)****Electric Consumption (kWh x000)**

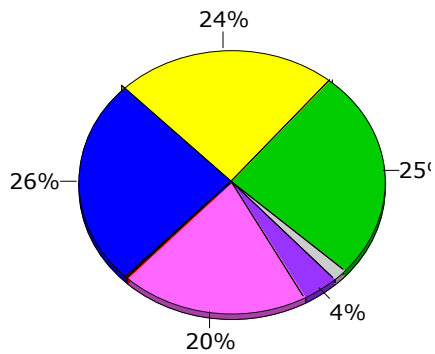
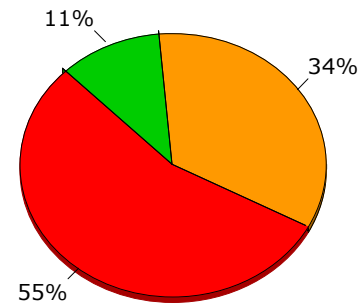
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 31.6         | 32.5         | 35.7         | 42.1         | 61.7         | 55.8         | 44.6         | 45.2         | 56.1         | 53.7         | 44.3         | 24.6         | 527.8          |
| Heat Reject.  | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 1.1          | 0.9          | 0.8          | 0.6          | 0.4          | 0.2          | 0.1          | 0.2          | 0.3          | 0.5          | 0.6          | 0.9          | 6.4            |
| HP Supp.      | 0.1          | 0.1          | 0.0          | 0.0          | -            | -            | -            | -            | -            | 0.0          | 0.0          | 0.1          | 0.4            |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 32.3         | 32.8         | 33.7         | 35.5         | 48.2         | 34.8         | 20.5         | 22.2         | 39.8         | 43.3         | 37.3         | 26.0         | 406.5          |
| Pumps & Aux.  | 7.5          | 6.9          | 7.1          | 6.6          | 7.4          | 5.5          | 4.4          | 4.5          | 6.1          | 7.2          | 7.1          | 6.7          | 76.9           |
| Ext. Usage    | 3.0          | 2.3          | 2.5          | 2.4          | 1.7          | 1.7          | 1.7          | 2.8          | 2.7          | 2.8          | 2.9          | 3.0          | 29.5           |
| Misc. Equip.  | 46.7         | 49.6         | 49.2         | 45.1         | 57.1         | 39.4         | 23.4         | 25.9         | 45.1         | 54.9         | 52.3         | 36.5         | 525.3          |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 44.3         | 47.3         | 46.3         | 42.6         | 54.5         | 36.6         | 20.8         | 22.8         | 42.6         | 52.3         | 50.0         | 34.0         | 494.1          |
| <b>Total</b>  | <b>166.5</b> | <b>172.4</b> | <b>175.3</b> | <b>174.9</b> | <b>231.1</b> | <b>174.0</b> | <b>115.5</b> | <b>123.7</b> | <b>192.6</b> | <b>214.7</b> | <b>194.6</b> | <b>131.7</b> | <b>2,067.0</b> |

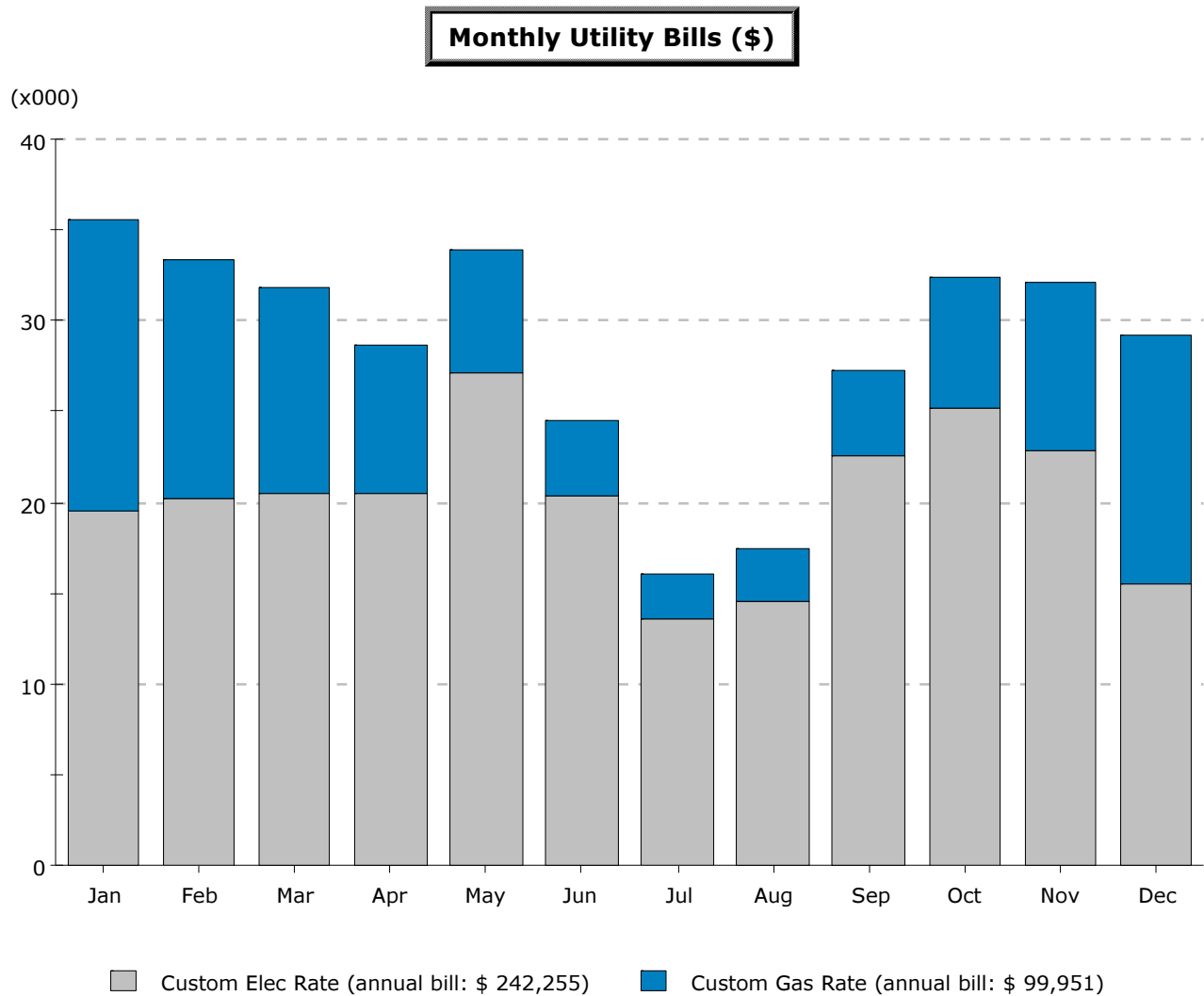
**Gas Consumption (Btu x000,000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total       |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Space Heat    | 0.92        | 0.68        | 0.51        | 0.30        | 0.16        | 0.06        | 0.04        | 0.05        | 0.10        | 0.24        | 0.40        | 0.80        | 4.26        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Hot Water     | 0.25        | 0.25        | 0.29        | 0.25        | 0.27        | 0.20        | 0.14        | 0.15        | 0.19        | 0.22        | 0.23        | 0.22        | 2.66        |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Misc. Equip.  | 0.08        | 0.09        | 0.08        | 0.08        | 0.11        | 0.06        | 0.02        | 0.02        | 0.08        | 0.10        | 0.10        | 0.05        | 0.87        |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| <b>Total</b>  | <b>1.25</b> | <b>1.03</b> | <b>0.88</b> | <b>0.63</b> | <b>0.53</b> | <b>0.32</b> | <b>0.20</b> | <b>0.22</b> | <b>0.36</b> | <b>0.56</b> | <b>0.72</b> | <b>1.08</b> | <b>7.79</b> |

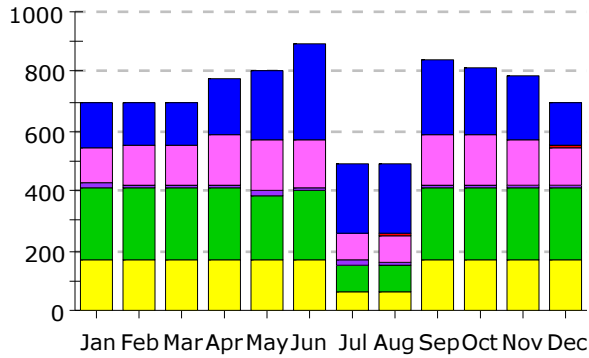
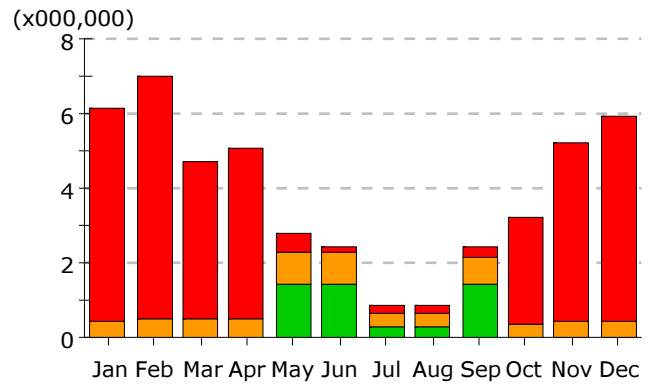
**Annual Energy Consumption by Enduse**

|               | <b>Electricity<br/>kWh (x000)</b> | <b>Natural Gas<br/>MBtu</b> | <b>Steam<br/>Btu</b> | <b>Chilled Water<br/>Btu</b> |
|---------------|-----------------------------------|-----------------------------|----------------------|------------------------------|
| Space Cool    | 527.8                             | -                           | -                    | -                            |
| Heat Reject.  | -                                 | -                           | -                    | -                            |
| Refrigeration | -                                 | -                           | -                    | -                            |
| Space Heat    | 6.4                               | 4,258.3                     | -                    | -                            |
| HP Supp.      | 0.4                               | -                           | -                    | -                            |
| Hot Water     | -                                 | 2,658.2                     | -                    | -                            |
| Vent. Fans    | 406.5                             | -                           | -                    | -                            |
| Pumps & Aux.  | 76.9                              | -                           | -                    | -                            |
| Ext. Usage    | 29.5                              | -                           | -                    | -                            |
| Misc. Equip.  | 525.3                             | 873.8                       | -                    | -                            |
| Task Lights   | -                                 | -                           | -                    | -                            |
| Area Lights   | 494.1                             | -                           | -                    | -                            |
| <b>Total</b>  | <b>2,067.0</b>                    | <b>7,790.4</b>              | <b>-</b>             | <b>-</b>                     |

**Electricity****Natural Gas**



**Total Annual Bill Across All Rates: \$ 342,206**

**Electric Demand (kW)****Gas Demand (Btu/h)****Electric Demand (kW)**

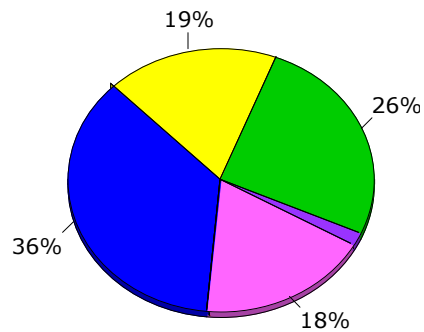
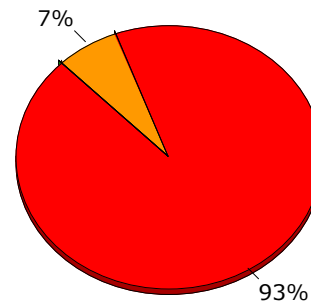
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 151.0        | 144.6        | 140.6        | 189.5        | 231.1        | 325.5        | 234.1        | 232.5        | 256.5        | 215.7        | 213.7        | 147.0        | 2,481.7        |
| Heat Reject.  | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 1.2          | 1.2          | 1.0          | 0.6          | 0.5          | 0.2          | 0.4          | 0.5          | 0.4          | 0.5          | 0.8          | 1.2          | 8.4            |
| HP Supp.      | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 121.8        | 125.9        | 132.2        | 165.8        | 172.3        | 160.0        | 91.1         | 90.7         | 166.6        | 169.5        | 149.6        | 124.7        | 1,670.1        |
| Pumps & Aux.  | 16.9         | 16.6         | 16.5         | 15.3         | 15.5         | 13.5         | 13.5         | 13.3         | 11.8         | 15.5         | 15.7         | 16.6         | 180.6          |
| Ext. Usage    | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Misc. Equip.  | 240.7        | 240.7        | 240.7        | 240.7        | 218.7        | 231.4        | 88.5         | 85.6         | 240.7        | 240.7        | 240.7        | 240.7        | 2,549.7        |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 64.4         | 64.4         | 166.7        | 166.7        | 166.7        | 166.7        | 1,795.9        |
| <b>Total</b>  | <b>698.3</b> | <b>695.7</b> | <b>697.7</b> | <b>778.6</b> | <b>804.8</b> | <b>897.2</b> | <b>491.9</b> | <b>486.9</b> | <b>842.6</b> | <b>808.6</b> | <b>787.1</b> | <b>696.9</b> | <b>8,686.4</b> |

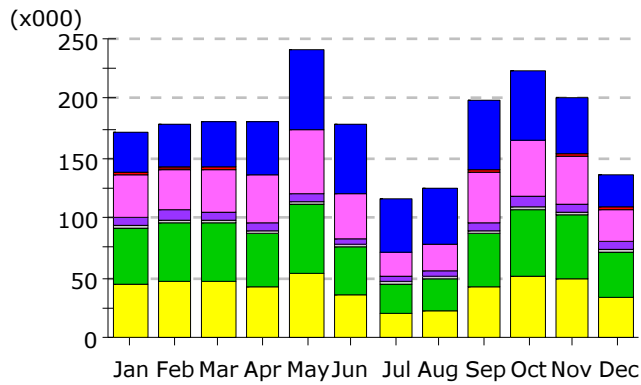
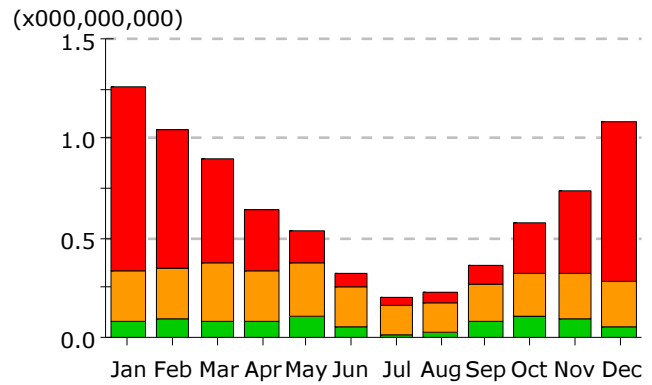
**Gas Demand (Btu/h x1000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total        |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Space Heat    | 5.68        | 6.51        | 4.25        | 4.57        | 0.45        | 0.16        | 0.20        | 0.24        | 0.30        | 2.83        | 4.84        | 5.52        | 35.54        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Hot Water     | 0.45        | 0.46        | 0.47        | 0.46        | 0.90        | 0.84        | 0.37        | 0.35        | 0.74        | 0.37        | 0.39        | 0.42        | 6.23         |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Misc. Equip.  | 0.01        | 0.01        | 0.01        | 0.01        | 1.42        | 1.42        | 0.27        | 0.27        | 1.42        | 0.01        | 0.01        | 0.01        | 4.89         |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| <b>Total</b>  | <b>6.14</b> | <b>6.98</b> | <b>4.73</b> | <b>5.04</b> | <b>2.76</b> | <b>2.42</b> | <b>0.84</b> | <b>0.86</b> | <b>2.46</b> | <b>3.22</b> | <b>5.25</b> | <b>5.96</b> | <b>46.66</b> |

**Annual Peak Demand by Enduse**

|               | <b>Electricity<br/>kW</b> | <b>Natural Gas<br/>Btu/h (x000)</b> | <b>Steam<br/>Btu/h</b> | <b>Chilled Water<br/>Btu/h</b> |
|---------------|---------------------------|-------------------------------------|------------------------|--------------------------------|
| Space Cool    | 325.46                    | -                                   | -                      | -                              |
| Heat Reject.  | -                         | -                                   | -                      | -                              |
| Refrigeration | -                         | -                                   | -                      | -                              |
| Space Heat    | 0.17                      | 6,505.6                             | -                      | -                              |
| HP Supp.      | -                         | -                                   | -                      | -                              |
| Hot Water     | -                         | 464.8                               | -                      | -                              |
| Vent. Fans    | 160.03                    | -                                   | -                      | -                              |
| Pumps & Aux.  | 13.45                     | -                                   | -                      | -                              |
| Ext. Usage    | -                         | -                                   | -                      | -                              |
| Misc. Equip.  | 231.37                    | 14.2                                | -                      | -                              |
| Task Lights   | -                         | -                                   | -                      | -                              |
| Area Lights   | 166.72                    | -                                   | -                      | -                              |
| <b>Total</b>  | <b>897.21</b>             | <b>6,984.6</b>                      | -                      | -                              |

**Electricity****Natural Gas**

**Electric Consumption (kWh)****Gas Consumption (Btu)****Electric Consumption (kWh x000)**

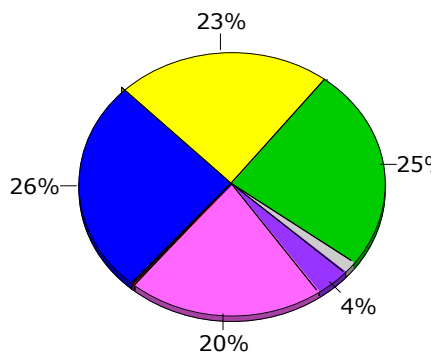
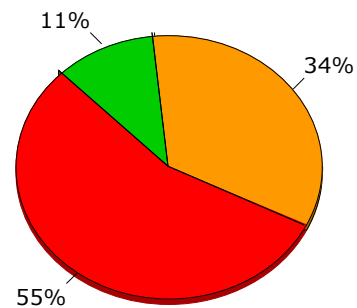
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 34.3         | 35.1         | 38.6         | 45.8         | 66.7         | 58.7         | 45.0         | 46.4         | 59.4         | 58.1         | 48.4         | 26.2         | 562.9          |
| Heat Reject.  | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 1.1          | 0.9          | 0.8          | 0.6          | 0.4          | 0.2          | 0.1          | 0.2          | 0.3          | 0.5          | 0.7          | 1.0          | 6.8            |
| HP Supp.      | 0.1          | 0.1          | 0.0          | 0.0          | -            | -            | -            | -            | -            | 0.0          | 0.0          | 0.1          | 0.4            |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 34.6         | 35.5         | 36.3         | 38.6         | 53.3         | 37.0         | 20.1         | 22.0         | 43.0         | 47.2         | 40.2         | 27.6         | 435.3          |
| Pumps & Aux.  | 7.5          | 7.0          | 7.2          | 6.7          | 7.3          | 5.4          | 4.4          | 4.5          | 5.9          | 7.2          | 7.2          | 6.7          | 76.8           |
| Ext. Usage    | 3.0          | 2.3          | 2.5          | 2.4          | 1.7          | 1.7          | 1.7          | 2.8          | 2.7          | 2.8          | 2.9          | 3.0          | 29.5           |
| Misc. Equip.  | 46.7         | 49.6         | 49.2         | 45.1         | 57.1         | 39.4         | 23.4         | 25.9         | 45.1         | 54.9         | 52.3         | 36.5         | 525.3          |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 44.3         | 47.3         | 46.3         | 42.6         | 54.5         | 36.6         | 20.8         | 22.8         | 42.6         | 52.3         | 50.0         | 34.0         | 494.1          |
| <b>Total</b>  | <b>171.6</b> | <b>177.8</b> | <b>181.0</b> | <b>181.8</b> | <b>241.0</b> | <b>179.0</b> | <b>115.5</b> | <b>124.6</b> | <b>199.0</b> | <b>223.1</b> | <b>201.7</b> | <b>135.1</b> | <b>2,131.1</b> |

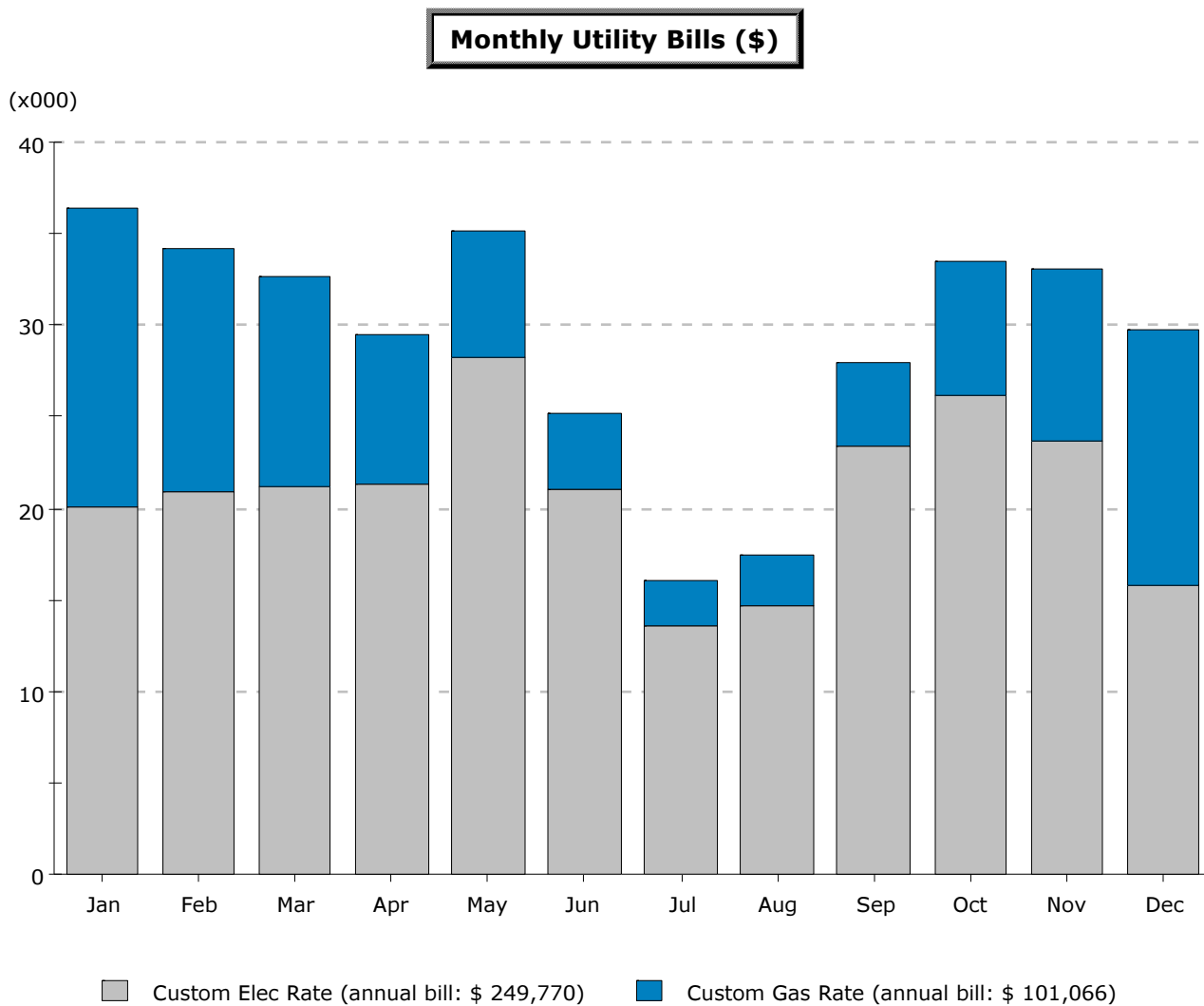
**Gas Consumption (Btu x000,000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total       |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Space Heat    | 0.93        | 0.70        | 0.52        | 0.31        | 0.16        | 0.07        | 0.04        | 0.05        | 0.10        | 0.25        | 0.41        | 0.81        | 4.35        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Hot Water     | 0.25        | 0.25        | 0.29        | 0.25        | 0.27        | 0.20        | 0.14        | 0.15        | 0.19        | 0.22        | 0.23        | 0.22        | 2.66        |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Misc. Equip.  | 0.08        | 0.09        | 0.08        | 0.08        | 0.11        | 0.06        | 0.02        | 0.02        | 0.08        | 0.10        | 0.10        | 0.05        | 0.87        |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| <b>Total</b>  | <b>1.26</b> | <b>1.04</b> | <b>0.89</b> | <b>0.64</b> | <b>0.53</b> | <b>0.33</b> | <b>0.20</b> | <b>0.23</b> | <b>0.36</b> | <b>0.57</b> | <b>0.74</b> | <b>1.08</b> | <b>7.88</b> |

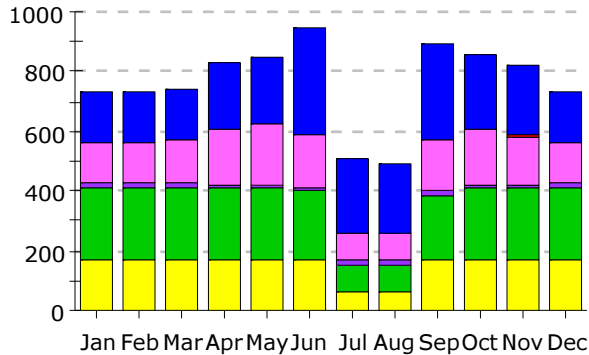
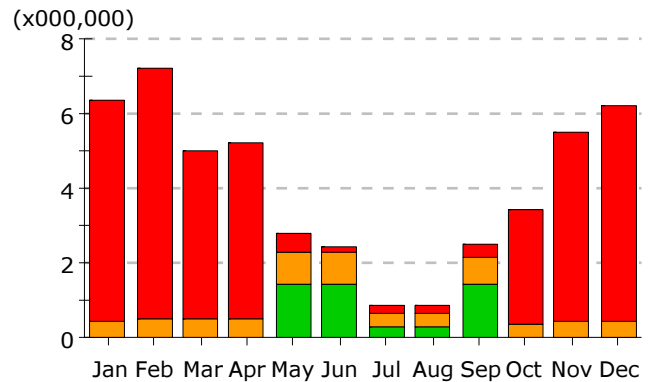
**Annual Energy Consumption by Enduse**

|               | <b>Electricity<br/>kWh (x000)</b> | <b>Natural Gas<br/>MBtu</b> | <b>Steam<br/>Btu</b> | <b>Chilled Water<br/>Btu</b> |
|---------------|-----------------------------------|-----------------------------|----------------------|------------------------------|
| Space Cool    | 562.9                             | -                           | -                    | -                            |
| Heat Reject.  | -                                 | -                           | -                    | -                            |
| Refrigeration | -                                 | -                           | -                    | -                            |
| Space Heat    | 6.8                               | 4,345.3                     | -                    | -                            |
| HP Supp.      | 0.4                               | -                           | -                    | -                            |
| Hot Water     | -                                 | 2,658.2                     | -                    | -                            |
| Vent. Fans    | 435.3                             | -                           | -                    | -                            |
| Pumps & Aux.  | 76.8                              | -                           | -                    | -                            |
| Ext. Usage    | 29.5                              | -                           | -                    | -                            |
| Misc. Equip.  | 525.3                             | 873.8                       | -                    | -                            |
| Task Lights   | -                                 | -                           | -                    | -                            |
| Area Lights   | 494.1                             | -                           | -                    | -                            |
| <b>Total</b>  | <b>2,131.1</b>                    | <b>7,877.3</b>              | <b>-</b>             | <b>-</b>                     |

**Electricity****Natural Gas**



**Total Annual Bill Across All Rates: \$ 350,836**

**Electric Demand (kW)****Gas Demand (Btu/h)****Electric Demand (kW)**

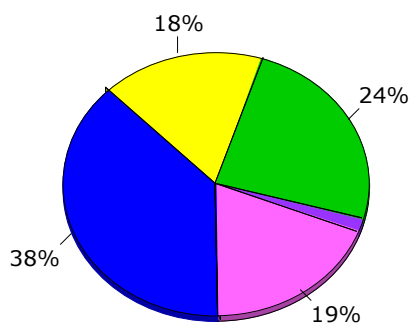
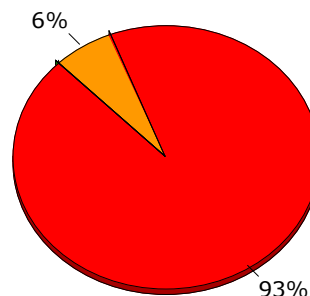
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 171.4        | 170.2        | 168.0        | 223.1        | 225.6        | 359.6        | 251.8        | 236.2        | 315.3        | 243.6        | 233.1        | 170.3        | 2,768.3        |
| Heat Reject.  | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 1.3          | 1.3          | 1.1          | 0.7          | 0.5          | 0.2          | 0.4          | 0.5          | 0.2          | 0.5          | 0.8          | 1.3          | 8.8            |
| HP Supp.      | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 139.5        | 139.5        | 148.4        | 181.1        | 198.5        | 175.8        | 94.3         | 91.7         | 177.6        | 187.7        | 161.2        | 137.2        | 1,832.4        |
| Pumps & Aux.  | 16.8         | 16.8         | 16.7         | 15.6         | 15.4         | 13.9         | 13.8         | 13.6         | 12.7         | 15.8         | 16.0         | 16.8         | 183.9          |
| Ext. Usage    | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Misc. Equip.  | 240.7        | 240.7        | 240.7        | 240.7        | 240.7        | 231.4        | 88.5         | 88.5         | 218.7        | 240.7        | 240.7        | 240.7        | 2,552.6        |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 64.4         | 64.4         | 166.7        | 166.7        | 166.7        | 166.7        | 1,795.9        |
| <b>Total</b>  | <b>736.3</b> | <b>735.2</b> | <b>741.7</b> | <b>827.9</b> | <b>847.4</b> | <b>947.6</b> | <b>513.1</b> | <b>494.8</b> | <b>891.2</b> | <b>855.0</b> | <b>818.6</b> | <b>733.1</b> | <b>9,142.0</b> |

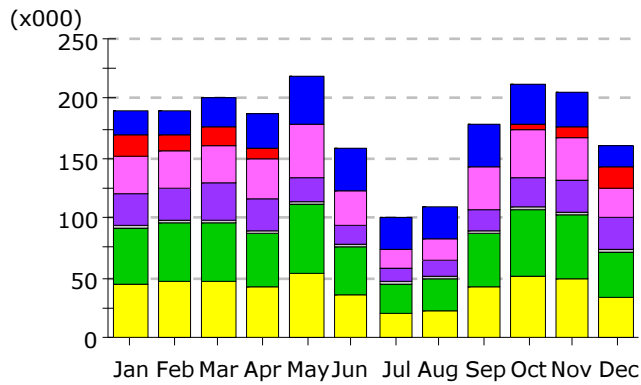
**Gas Demand (Btu/h x1000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total        |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Space Heat    | 5.89        | 6.77        | 4.50        | 4.75        | 0.46        | 0.17        | 0.20        | 0.24        | 0.32        | 3.06        | 5.07        | 5.77        | 37.22        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Hot Water     | 0.45        | 0.46        | 0.47        | 0.46        | 0.90        | 0.84        | 0.37        | 0.35        | 0.74        | 0.37        | 0.39        | 0.42        | 6.23         |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Misc. Equip.  | 0.01        | 0.01        | 0.01        | 0.01        | 1.42        | 1.42        | 0.27        | 0.27        | 1.42        | 0.01        | 0.01        | 0.01        | 4.89         |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| <b>Total</b>  | <b>6.36</b> | <b>7.25</b> | <b>4.98</b> | <b>5.22</b> | <b>2.77</b> | <b>2.42</b> | <b>0.84</b> | <b>0.87</b> | <b>2.47</b> | <b>3.45</b> | <b>5.48</b> | <b>6.21</b> | <b>48.33</b> |

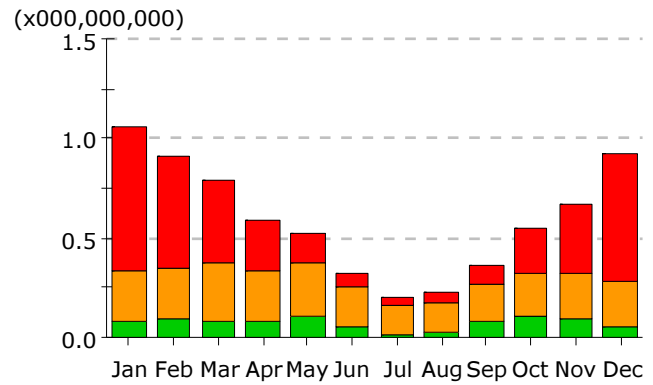
**Annual Peak Demand by Enduse**

|               | <b>Electricity<br/>kW</b> | <b>Natural Gas<br/>Btu/h (x000)</b> | <b>Steam<br/>Btu/h</b> | <b>Chilled Water<br/>Btu/h</b> |
|---------------|---------------------------|-------------------------------------|------------------------|--------------------------------|
| Space Cool    | 359.60                    | -                                   | -                      | -                              |
| Heat Reject.  | -                         | -                                   | -                      | -                              |
| Refrigeration | -                         | -                                   | -                      | -                              |
| Space Heat    | 0.21                      | 6,770.5                             | -                      | -                              |
| HP Supp.      | -                         | -                                   | -                      | -                              |
| Hot Water     | -                         | 464.8                               | -                      | -                              |
| Vent. Fans    | 175.81                    | -                                   | -                      | -                              |
| Pumps & Aux.  | 13.88                     | -                                   | -                      | -                              |
| Ext. Usage    | -                         | -                                   | -                      | -                              |
| Misc. Equip.  | 231.37                    | 14.2                                | -                      | -                              |
| Task Lights   | -                         | -                                   | -                      | -                              |
| Area Lights   | 166.72                    | -                                   | -                      | -                              |
| <b>Total</b>  | <b>947.59</b>             | <b>7,249.5</b>                      | <b>-</b>               | <b>-</b>                       |

**Electricity****Natural Gas**

**Electric Consumption (kWh)**

■ Area Lighting  
■ Task Lighting  
■ Misc. Equipment  
■ Ventilation Fans  
■ Pumps & Aux.  
■ Exterior Usage

**Gas Consumption (Btu)**

■ Space Heating  
■ Ht Pump Supp.  
■ Water Heating  
■ Space Cooling  
■ Refrigeration  
■ Heat Rejection

**Electric Consumption (kWh x000)**

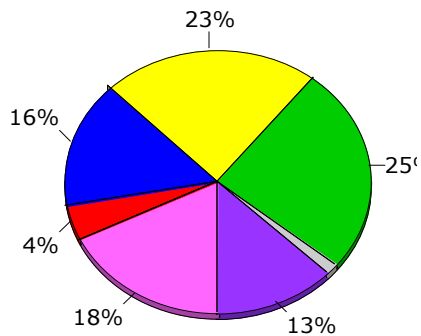
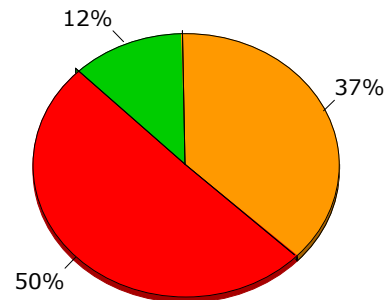
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 18.8         | 19.5         | 24.0         | 27.4         | 40.0         | 34.2         | 26.0         | 26.2         | 35.2         | 34.9         | 28.3         | 17.1         | 331.7          |
| Heat Reject.  | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 18.4         | 14.0         | 15.3         | 9.9          | 1.0          | 0.2          | 0.1          | 0.1          | 0.4          | 4.0          | 9.8          | 18.3         | 91.5           |
| HP Supp.      | 0.1          | 0.1          | 0.0          | 0.0          | -            | -            | -            | -            | -            | 0.0          | 0.0          | 0.1          | 0.4            |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 31.0         | 31.3         | 32.2         | 33.1         | 43.5         | 30.3         | 16.8         | 18.4         | 34.9         | 39.7         | 34.7         | 25.5         | 371.3          |
| Pumps & Aux.  | 26.6         | 26.1         | 30.7         | 26.1         | 21.3         | 15.4         | 11.4         | 12.5         | 17.1         | 24.2         | 27.6         | 26.5         | 265.5          |
| Ext. Usage    | 3.0          | 2.3          | 2.5          | 2.4          | 1.7          | 1.7          | 1.7          | 2.8          | 2.7          | 2.8          | 2.9          | 3.0          | 29.5           |
| Misc. Equip.  | 46.7         | 49.6         | 49.2         | 45.1         | 57.1         | 39.4         | 23.4         | 25.9         | 45.1         | 54.9         | 52.3         | 36.5         | 525.3          |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 44.3         | 47.3         | 46.3         | 42.6         | 54.5         | 36.6         | 20.8         | 22.8         | 42.6         | 52.3         | 50.0         | 34.0         | 494.1          |
| <b>Total</b>  | <b>189.0</b> | <b>190.2</b> | <b>200.3</b> | <b>186.7</b> | <b>219.2</b> | <b>157.9</b> | <b>100.3</b> | <b>108.8</b> | <b>178.0</b> | <b>212.8</b> | <b>205.5</b> | <b>160.9</b> | <b>2,109.4</b> |

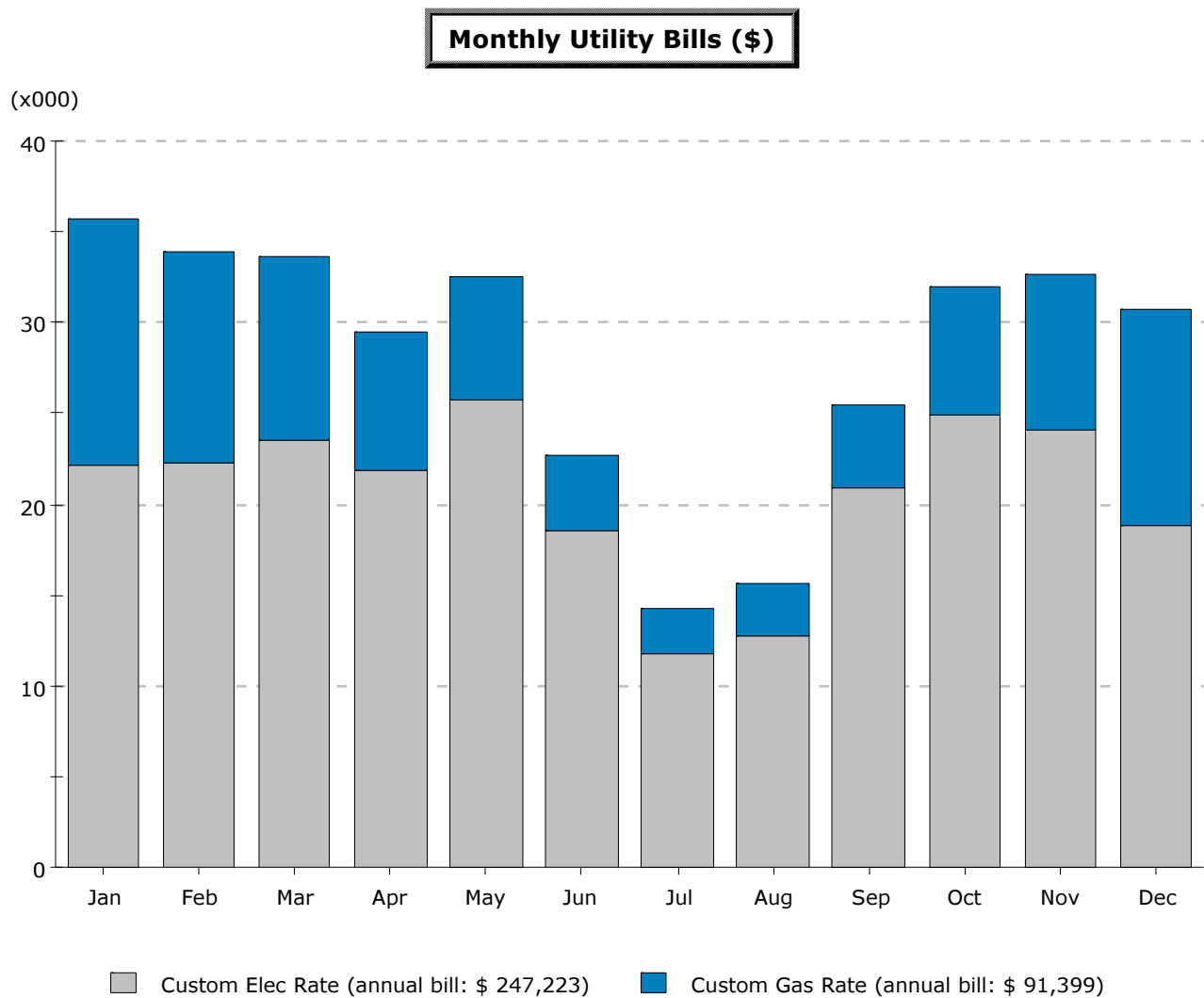
**Gas Consumption (Btu x000,000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total       |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Space Heat    | 0.73        | 0.57        | 0.42        | 0.26        | 0.16        | 0.06        | 0.03        | 0.05        | 0.10        | 0.23        | 0.35        | 0.64        | 3.59        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Hot Water     | 0.25        | 0.25        | 0.29        | 0.25        | 0.27        | 0.20        | 0.14        | 0.15        | 0.19        | 0.22        | 0.23        | 0.22        | 2.66        |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Misc. Equip.  | 0.08        | 0.09        | 0.08        | 0.08        | 0.11        | 0.06        | 0.02        | 0.02        | 0.08        | 0.10        | 0.10        | 0.05        | 0.87        |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           |
| <b>Total</b>  | <b>1.06</b> | <b>0.91</b> | <b>0.80</b> | <b>0.59</b> | <b>0.53</b> | <b>0.32</b> | <b>0.20</b> | <b>0.22</b> | <b>0.36</b> | <b>0.55</b> | <b>0.67</b> | <b>0.92</b> | <b>7.12</b> |

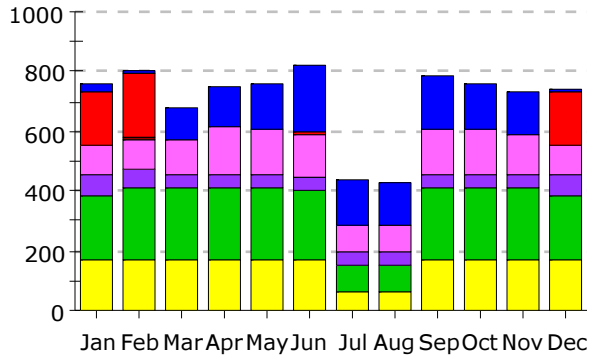
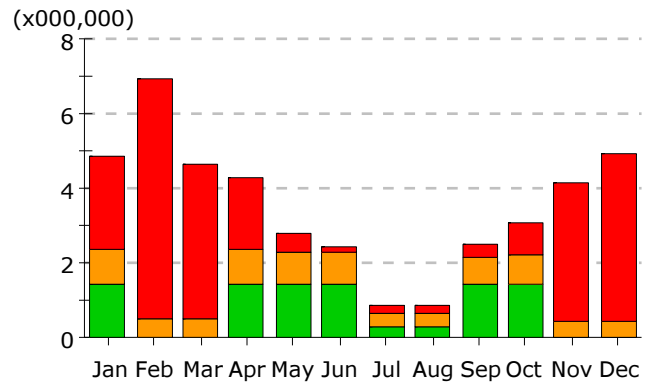
**Annual Energy Consumption by Enduse**

|               | Electricity<br>kWh (x000) | Natural Gas<br>MBtu | Steam<br>Btu | Chilled Water<br>Btu |
|---------------|---------------------------|---------------------|--------------|----------------------|
| Space Cool    | 331.7                     | -                   | -            | -                    |
| Heat Reject.  | -                         | -                   | -            | -                    |
| Refrigeration | -                         | -                   | -            | -                    |
| Space Heat    | 91.5                      | 3,591.7             | -            | -                    |
| HP Supp.      | 0.4                       | -                   | -            | -                    |
| Hot Water     | -                         | 2,658.3             | -            | -                    |
| Vent. Fans    | 371.3                     | -                   | -            | -                    |
| Pumps & Aux.  | 265.5                     | -                   | -            | -                    |
| Ext. Usage    | 29.5                      | -                   | -            | -                    |
| Misc. Equip.  | 525.3                     | 873.8               | -            | -                    |
| Task Lights   | -                         | -                   | -            | -                    |
| Area Lights   | 494.1                     | -                   | -            | -                    |
| <b>Total</b>  | <b>2,109.4</b>            | <b>7,123.8</b>      | -            | -                    |

**Electricity****Natural Gas**



**Total Annual Bill Across All Rates: \$ 338,622**

**Electric Demand (kW)****Gas Demand (Btu/h)****Electric Demand (kW)**

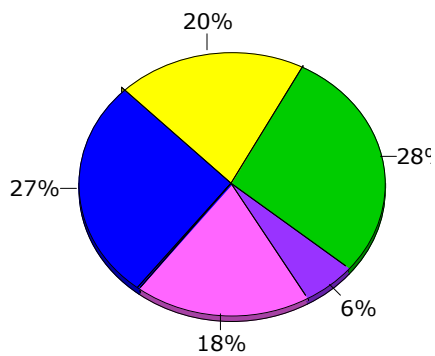
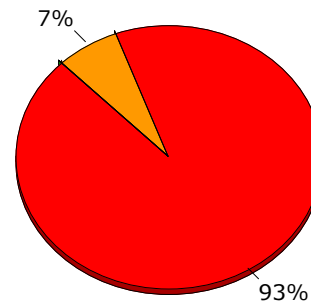
|               | Jan          | Feb          | Mar          | Apr          | May          | Jun          | Jul          | Aug          | Sep          | Oct          | Nov          | Dec          | Total          |
|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Space Cool    | 22.5         | 9.2          | 99.4         | 129.2        | 155.3        | 224.4        | 155.8        | 144.6        | 177.1        | 147.0        | 142.5        | 8.6          | 1,415.5        |
| Heat Reject.  | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Refrigeration | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Space Heat    | 183.1        | 221.5        | 1.0          | 0.7          | 0.4          | 0.2          | 0.4          | 0.4          | 0.4          | 0.5          | 0.8          | 177.9        | 587.3          |
| HP Supp.      | 0.2          | 3.4          | -            | -            | -            | -            | -            | -            | -            | -            | -            | 0.2          | 3.7            |
| Hot Water     | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Vent. Fans    | 98.9         | 97.7         | 118.8        | 162.9        | 152.4        | 150.1        | 84.5         | 82.6         | 153.1        | 152.3        | 132.6        | 98.6         | 1,484.5        |
| Pumps & Aux.  | 67.9         | 67.7         | 48.3         | 47.4         | 45.0         | 45.5         | 45.0         | 44.7         | 44.2         | 47.5         | 47.7         | 67.9         | 618.9          |
| Ext. Usage    | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Misc. Equip.  | 218.7        | 240.7        | 240.7        | 240.7        | 240.7        | 231.4        | 88.5         | 90.0         | 240.7        | 240.7        | 240.7        | 218.7        | 2,532.0        |
| Task Lights   | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -            | -              |
| Area Lights   | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 64.4         | 64.4         | 166.7        | 166.7        | 166.7        | 166.7        | 1,795.9        |
| <b>Total</b>  | <b>757.9</b> | <b>806.8</b> | <b>674.9</b> | <b>747.6</b> | <b>760.6</b> | <b>818.4</b> | <b>438.6</b> | <b>426.6</b> | <b>782.2</b> | <b>754.7</b> | <b>731.0</b> | <b>738.6</b> | <b>8,438.0</b> |

**Gas Demand (Btu/h x1000,000)**

|               | Jan         | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec         | Total        |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| Space Cool    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Heat Reject.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Refrigeration | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Space Heat    | 2.51        | 6.42        | 4.14        | 1.91        | 0.47        | 0.17        | 0.19        | 0.24        | 0.31        | 0.90        | 3.76        | 4.50        | 25.50        |
| HP Supp.      | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Hot Water     | 0.94        | 0.46        | 0.47        | 0.96        | 0.90        | 0.84        | 0.37        | 0.35        | 0.74        | 0.77        | 0.39        | 0.40        | 7.61         |
| Vent. Fans    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Pumps & Aux.  | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Ext. Usage    | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Misc. Equip.  | 1.42        | 0.01        | 0.01        | 1.42        | 1.42        | 1.42        | 0.27        | 0.27        | 1.42        | 1.42        | 0.01        | 0.01        | 9.08         |
| Task Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| Area Lights   | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -           | -            |
| <b>Total</b>  | <b>4.87</b> | <b>6.90</b> | <b>4.62</b> | <b>4.29</b> | <b>2.78</b> | <b>2.42</b> | <b>0.83</b> | <b>0.86</b> | <b>2.47</b> | <b>3.08</b> | <b>4.17</b> | <b>4.91</b> | <b>42.20</b> |

**Annual Peak Demand by Enduse**

|               | Electricity<br>kW | Natural Gas<br>Btu/h (x000) | Steam<br>Btu/h | Chilled Water<br>Btu/h |
|---------------|-------------------|-----------------------------|----------------|------------------------|
| Space Cool    | 224.43            | -                           | -              | -                      |
| Heat Reject.  | -                 | -                           | -              | -                      |
| Refrigeration | -                 | -                           | -              | -                      |
| Space Heat    | 0.22              | 6,416.6                     | -              | -                      |
| HP Supp.      | -                 | -                           | -              | -                      |
| Hot Water     | -                 | 464.8                       | -              | -                      |
| Vent. Fans    | 150.12            | -                           | -              | -                      |
| Pumps & Aux.  | 45.49             | -                           | -              | -                      |
| Ext. Usage    | -                 | -                           | -              | -                      |
| Misc. Equip.  | 231.37            | 14.2                        | -              | -                      |
| Task Lights   | -                 | -                           | -              | -                      |
| Area Lights   | 166.72            | -                           | -              | -                      |
| <b>Total</b>  | <b>818.36</b>     | <b>6,895.6</b>              | -              | -                      |

**Electricity****Natural Gas**