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# Executive Summary

Eanes ISD encourages the conservation of energy in the operation of all its facilities in order to maintain a safe environment that is conducive to effective teaching and learning. The administration of the school district shall set and implement standards and procedures. In order to achieve the goal of maximizing the efficient use of utilities, the district will collaborate with TASB’s OnSite Energy Services.

Eanes Energy Management (E**2**M) is committed to energy efficiency improvement programs. Our department uses tried and true energy savings best practices along with today’s current technologies to assist schools in lowering their utility and operating costs while maintaining and often increasing occupant comfort. We encourage teachers, students and staff to get involved with making their school more energy aware and sustainable.

Today’s school districts face many challenges in achieving their organizational goals. Rising energy and operating costs, often get in the way of reaching these goals. Market trends, confusing and often difficult procurement methods, as well as an ever-changing internal budget and personnel constraints make for choosing appropriate action plans difficult. Recognizing that a “one size fits all” approach is not appropriate in most circumstances, education and attitude changes are important to the success and sustainability of the program. District personnel have the capabilities, understanding, and personal best interest of the district’s short and long-term strategic goals in mind.

Eanes Energy Management has been working with other local school districts and TASB’s OnSite Energy Services to examine Eanes sites, compare Eanes to regional standards, and make recommendations to improve all aspects of energy efficiency improvement programs within our district. OnSite Energy Services has completed objective and detailed energy audits on each campus.

The Eanes Energy Management program is a comprehensive behavior modification and facility improvement plan. Our four-pronged approach is as follows:

* Behavior Modification Plan
* Low/no cost energy conservation measures
* Retro commissioning action plans
* Recommendations for energy efficiency and conservation facility improvements

### Establish Design Intent & Operational Parameters

Eanes Energy Management will come to a consensus of what the building’s design intent and operational parameters should be with the current equipment and occupancy levels. The design intent and operational parameters are the basis for energy policies. A comparison of how the building functions in day-to-day use compared to design standards creates goals for improvements in energy policies and equipment

### Survey Facility Existing Conditions

Eanes Energy Management has conducted a building-by-building survey and an audit of each facility by utilizing TASB’s OnSite Energy Services. Eanes Energy Management will continue to survey and test the building and equipment to see how it does or does not meet the agreed upon design intent and operational parameters that have been set forth by the District. Eanes Energy Management has tracked and monitored utility usage and cost for the past several years using UtilityDirect software. The building survey addresses the following major issues:

* Overall building energy use, demand and areas of highest energy use
* Current design and operational intent and actual control sequences
* Equipment nameplate information and equipment condition issues
* Current schedules (set point, time-of-day, holiday, etc.)
* The most severe control and operational problems
* Location of the most frequent HVAC trouble spots in the buildings

### Suggested Corrective Measures

Eanes Energy Management will prepare a report that outlines all findings from the OnSite building audits and surveys. Included in this report will be a master list of deficiencies by building. At a minimum, the list should include the name of the system or piece of equipment, a description of the deficiency or problem, and a suggested solution.

**1. Program Overview**

Outlined below is the cooperative approach to a district wide energy efficiency and conservation program. This four-pronged approach is customized for each campus depending on its needs and goals.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Option** | **Behavior Modification** | **Low Cost /  No Cost** | **Retro Commissioning** | **EEC\* Projects** |
| **What?** | Increase awareness on how energy is used and the everyday steps students, faculty and administration can take to reduce consumption. | Small, simple energy efficiency measures that can be easily implemented by District staff. | The commissioning process of an existing building in order to bring a facility’s existing systems back to their intended design and intended operation. | Comprehensive retrofit  or renovation projects that include installation  of energy efficient equipment and control systems. |
| **Why?** | To encourage personal responsibility and energy conservation habits that positively impact the environment and the District’s finances. | To address items that are not typically a part of EEC projects, such as personal appliances, computers, and other plug loads. | Many schools have efficient equipment and adequate controls, but are out of sync with design intent and operational intent. | The district has old, inefficient equipment  and a lack of (or deficient) energy management controls |
| **Who?** |  |  |  |  |

*\*Energy Efficiency and Conservation*

Our Energy Management plan will include the following components:

* Behavior Modification
* Mechanical
* Communication
* Investment



**Behavior Modification**

Behavior Modification is the area where the simplest and least costly savings occur. However, it is also the most difficult to achieve as it involves many different kinds of people.

We will develop a plan to educate our students, teachers and staff, providing incentives to help the district achieve its goals.

* + Campus Consumption Committees - **C³**
  + Incentives
  + Progress Reports
  + Energy Audits
  + Inventory

**Campus Conservation Committees** or **C³** will be formed at the campus level and are integral in changing the culture at each campus. Members of the committees could include Principals, Assistant Principals, teachers, students, and custodians.

Eanes Energy Management Team is working to develop training and implement the program with our **C³** teams. The most successful programs provide incentives returned to the campus as a percentage of their savings to be used to aid the campus in instructional purchases.

Students and teachers have ownership in the savings and see tangible results from their actions. This will reinforce their energy plan and create sustained results. Progress reportswill be provided and made readily available online so each campus can easily compare to other campuses. These reports will be used to measure the successes of the plan and help identify areas where improvement is needed.

Eanes Energy Management and OnSite Energy Services will perform both routine and random energy auditslooking for instant impact items and develop a project list for future opportunities to increase the savings for the district. The audits will be customized for each campus to bring focus to the “low hanging fruit” for low cost or no cost solutions. Areas will be identified that can be upgraded using Capital Funds or Reinvested Energy Funds to achieve higher savings for the district.

Best Practices Approach for the Maintenance Department

Below is an example on how to utilizing funds from the savings. Savings dollars are calculated from the base year of the 2009/2010 fiscal year

Savings are allocated as follows.

10% Cost Savings is returned to the campus achieving the savings

25% Cost Savings toward new energy management initiative

25% Cost Savings toward new energy management personnel

25% Cost Savings for new maintenance vehicles

15% Cost Savings to an account offsetting any future electrical rate increases.

When savings are put back into rewards, education, and equipment, sustainability of the Energy Management program will continue to see returns on the investment. By keeping up with technology related to energy management, and rewarding energy savings behavior from students and teachers, a successful program can be achieved.

**Mechanical**

Savings in the mechanical arena are more costly but have a much higher return. These projects have to be measured against Return on Investment (ROI), to determine their feasibility as well as how they should be funded.

During the last two years, the M&O Department has created sustainable savings by re-commissioning several pieces of HVAC equipment as well as implementing our Building Automation System (BAS) controls. Ongoing commissioning and preventive maintenance are critical to sustaining the life cycle and efficiency of our HVAC equipment. Below is an example of continued real time BAS monitoring.

The 2011 Bond has already identified areas in the district that have potential to help the district maintain current efficiency and achieve greater efficiency by replacing or upgrading existing equipment.

* Replacing HVAC Equipment that has reached the end of its effective life
* Adding BAS controls to Barton Creek Elementary (last campus to get controls)
* Upgrade lighting from costly HIDs to high efficiency T-5 fluorescents and LEDs
* Add occupancy sensors and lighting controls district wide
* Provide meters and software for real time controls and measurement of electricity consumption in the district.

Eanes Energy Management will continue to utilize the software that the district has in place to measure and report energy consumption and cost.

The software the district currently uses are SchoolDude UtilityDirect and ConserveDirect this program easily ties into our MaintenanceDirect for easy creation of corrective work orders and preventive maintenance on HVAC equipment.

UtilityDirect is utility bill data storage and reporting software.

ConserveDirect is new reporting software that the Energy Management Program will utilize to communicate progress and goals. It also generates Energy Star ratings for each school site and tracks improvements.

The cost for the products is approximately $4,400/yr for both.

Currently the M&O budget spends approximately $18,000/yr with our BAS vendor for re-commissioning and continued modifications to optimize run times for BAS controls.

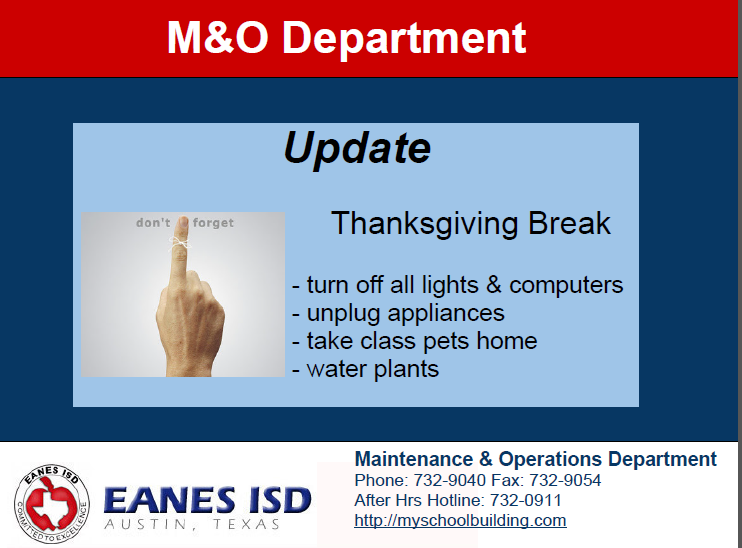
**These measurement, reporting and controls tools are currently being funded by the M&O budget.**

Recently established procedures in the M&O department to help insure that the programming of our BAS controls, once commissioned, are not tampered with or changed unless authorized by the Director of Maintenance and Operations.

**Communication**

Communication is the most critical component for the success of any plan. All components of the plan will have different levels of communication used to educate, inform, and develop future programs to increase the effectiveness of the program. In order to maximize results, our energy management program needs to appeal to teachers and students as well as staff. Goals and day-to-day tasks of energy savings need to be tailored to each group.

Monthly flyers are designed to remind staff to do their part in reducing utility consumption.



# 2. Behavior Modification Program

The Behavior Modification Program provides guidelines, implementation assistance, and educational seminars to increase awareness of how energy is used and what everyday steps students, faculty, and administration can take to reduce a facility’s energy consumption. The concept is to employ multiple strategies to significantly reduce utility costs. Behavior Modification have the greatest potential for savings by getting staff and students involved in daily habits to reduce energy waste. The key elements of the Behavior Modification Program include the following:

1. Energy Plug Load Surveys
2. Campus Conservation Committee - **C³**
3. District-Wide Energy Guidelines and Procedures

The goal of this program is to provide energy saving opportunities that increase energy awareness, while at the same time reducing the environmental impact and cost to the District.

### 2.1 Energy Plug Load Analysis

The plug load analysis establishes a baseline of current personnel behaviors with respect to plug load energy usage. Leaving items turned on or plugged in consumes electricity and by turning off and unplugging items not in use can save thousands of dollars without costing anything but your time. Initial plug load data is collected by OnSite and is an accurate representation of personal energy use in a facility regarding educational and non-educational electronic items. Particular areas of interest are classroom spaces and computer labs.

Personal energy consumption within each facility and an educational program specific to each site is developed that demonstrates practical and conservative ways to lower energy costs. The plug load analysis provides energy spend and cost awareness, behavior modification opportunities, and conservation strategies that both students and staff can take part in.

The survey results are provided to the district in a detailed document containing audits conducted by OnSite.



### 2.2 Campus Conservation Committee

The Campus Conservation Committee, **C³** is a group of faculty, staff, and students that are charged with assisting in the development and implementing the District Energy Guidelines and Procedures.

**C³** is tasked with describing and providing goals for the energy plan for each campus, an implementation plan to meet those goals and identify a “special projects” list.

This list may include items such as forming a student “Green Team” to compete in “Green Games” to learn about conservation and reduce energy waste at each campus, promoting recycling programs, or renewable energy programs. **C³** members will also be responsible for recruiting students and staff at each facility to ensure the program’s success at their buildings.

**Campus Conservation Committee - C³ - Goals**

* Provide educational resources, activities and projects for staff and students on how to improve the energy efficiency of their school
* Review monthly utility usage from ConserveDirect software
* Review Energy Star rating yearly
* Compete in Green Games to compare their campus usage to other campuses
* Perform student run energy audits to look for energy waste

**Campus Conservation Committee - C³ - Personnel**

Each campus will have their own group of staff and students dedicated to promoting energy efficiency. It is comprised of the principal, assistant principal, teachers, custodians, kitchen staff, and students.

* **Principals** will ultimately be responsible for the overall performance of their Campus Conservation Committee.
* **Assistant principals** will assist with enforcing the program and procedures to ensure the turning off of lights in unoccupied rooms and making sure cafeterias, auditoriums, and gym lighting are off when unoccupied.
* **Teachers** will assist in helping to unplug all appliances and follow the energy program’s guidelines and procedures. Staff member will assist in the checkout of classrooms before seasonal shutdown.
* **Custodial staff** will assist by ensuring proper after hours temperature guidelines are followed and lights are in the off mode when unoccupied.
* **Kitchen staff** will assist by operating vent hoods, ovens, and grills properly and insure that they are off when cooking is not taking place. Kitchen staff will also assist in inspecting refrigerators and walk-in coolers to be sure they are properly stocked and insulated.
* **Green Team**, of students and teacher advisors who participate in a wide variety of educational activities about energy conservation and sustainability. Perform tasks like turning off lighting in unoccupied areas, monitoring that other staff and students are following energy policies and competing in Green Games to compare their campus to energy usage of other Eanes campuses.

# 2.3 District Energy Guidelines and Procedures

An important aspect of an effective energy conservation program is to establish straight forward, easy to understand, and easily implemented behavioral modifications for staff, students, and district personnel. The following list contains examples of what might be contained within a district-wide Energy Conservation Program:

District-wide guidelines and procedures for temperature set points

Temperature settings should be between 69 and 74 degrees.

District-wide personal appliance guidelines

Assess current plug load from personal appliances.

Classroom exiting procedure

A simple classroom exit procedure will create accumulated annual savings.

Shutdown checklist guidelines

District-wide procedures and guidelines are set ensure all plug loads, lighting, air conditioning equipment, kitchen equipment, computer labs, and all other electronic devices are unplugged/turned off/turned down to ensure optimal energy conservation. There are checklists specific towards the function of the kitchen staff, custodial staff, maintenance staff, teachers, and administration. All will have their own specific shutdown checklists for weekends, holiday breaks, and summer break.

Lighting condition standards

In all areas not provided occupancy sensors, daylight harvesting or light use guidelines will be in effect. Turning lighting on when more than adequate daylight is available is unnecessary. Several rooms throughout the district offer double and triple banked switches. Utilizing double and triple banked switches, combined with daylight harvesting, will generate significant savings.

Developing a district-wide Energy Guidelines and Procedures plan begins with assessing behavioral tendencies of all facility occupants. Audits of each area of the facility will provide a detailed analysis of occupied spaces including classrooms, auditoriums, gymnasiums, cafeterias, kitchen, administration offices, and common areas. Guidelines and procedures are set to conserve energy without incurring costs or extra workload for district staff. EISD believe having direct involvement of teachers, students, and facility staff, in the procedural process will give a sense of pride and ownership in saving the district valuable dollars. OnSite will facilitate the conservation program development and provide regional guidelines, seasonal shut down programs, and include energy analysis applications for each facility.



# 3. Low-Cost/No-Cost Program

Low-Cost/No-Cost Program goes a step beyond daily behavior modification to include simple energy efficiency conservation measures that can be easily implemented by district staff. In most cases these measures are one time or seasonal in nature and thus do not require daily habit change. Some examples of these types of measures are:

* Installing occupancy sensors in closets, hallways, offices, storage rooms
* Installing time clocks on electric water coolers
* Installing vending machine controls (vending misers)
* Installing draft barriers on freezers and refrigerators
* Converting from older, less efficient CRT computer monitors to more efficient, modern LCD or LED monitors
* Using smart power strips
* Repairing duct and pipe insulation
* Combing damaged fins on HVAC equipment
* Printer consolidation program

A detailed room-by-room survey of every facility and compile a list of specific measures that can be implemented. Generally, we do not recommend performing detailed savings analysis for these smaller measures as the cost, time and resources to do so would have a negative effect on the overall savings of the program.

The primary focus of Low Cost/No Cost Program is to reduce the energy consumed by appliances and office equipment by installing timers and using/unplugging smart strips. Savings are generated primarily by reducing the runtime of equipment.

Examples of typical Low-Cost/No-Cost program are detailed below.

### Drinking Water Fountain Energy Controls

Most drinking fountains include a condensing unit that cycles on and off throughout the day to provide cool drinking water. Recommendations to unplugging or installing timers on these units to reduce the cycling time of these condensing units. The average cost of operation for drinking fountains can be approximately $30 to $55 a year.

A second option would be to unplug water fountains during the cooler seasons and allow for room temperature water.



### Occupancy Sensors

Occupancy sensors provide a simple and cost effective way to reduce lighting burn hours in areas we find high unoccupied lighting burn hours. Opportunities present themselves in common areas like gyms, cafeterias, auditoriums, and locker rooms where students and staff often leave lights on while unoccupied. The district may have the staff and expertise to install these sensors in house at a much lower cost to the district than contracting the work out. Some examples of areas that we found in need of these sensors are outlined in the report.

Installing wall mounted occupancy sensors in the spaces mentioned above are at minimal expense to the district and can yield up to a 30% reduction in burn hours in some applications.

Occupancy sensors are ideally suited for applications that require better control that can be achieved by behavior modification. Sensors are also considered most suitable when a space is intermittently occupied and where lights are typically left on when the space is unoccupied.

### Vending Misers

Vending Misers are plug and play devices for use with vending machines and are typically very easy to install. They can be installed on any machine, reducing maintenance costs and energy costs annually. In some cases, energy costs associated with the refrigerated vending machines can be reduced by upwards to 46 percent.

### Plug Load Measures

Personal electric, appliance, and computer plug loads account for a significant percentage of total energy consumed in a building. A load is any device that is powered by an electrical system and requires electricity to do work. Plug loads consist of electrical equipment and appliances plugged into the electrical grid of a building. Examples of plug loads found in the classroom are: computers, televisions, DVD players, radios, printers, refrigerators, toasters, hot plates, microwaves, window air conditioners, wireless routers and projectors.

***Note:*** *Personal space heaters must be plugged in directly to the outlet, not an extension cord, to be compliant with Texas Fire Hazard and Safety Codes.*

***Note:*** *Overloading circuits increases energy loss on that circuit and increases the possibility of fire. Power strips, whether smart or not, will not prevent overload.*

Electronic educational tools are important in the classroom, but it is also important to understand the tool’s effect on energy consumption.

Smart strips surge protectors can be a useful tool in eliminating plug load and phantom plug load costs. Having items plugged into one strip can allow the staff to unplug all electrical devices simply and quickly.



**Refrigeration**

Refrigeration systems can be one of the larger personal appliance energy consumers. Most refrigerators observed during our audit including faculty refrigerators, were either empty or practically empty. Keeping the refrigerator full of food has a lot to do with energy efficiency. When a refrigerator is nearly empty, it has to circulate more cold air to keep the space inside at the right temperature. When your refrigerator is full of food, the food will retain that cold temperature, cooling the inside itself rather than making the refrigerator do all the work. There were several refrigerators larger than 1.1 cubic feet in classrooms and offices that could be replaced with a smaller, more efficient refrigerator.

It was also noted that most of the personal and teacher lounge refrigerators had dust and ice buildup on the coils, this can reduce the efficiency of the refrigerator by 30 percent.

### Building Schedule Optimization

A highly effective way to reduce energy usage is to have equipment off when not needed. Building Automation Systems (BAS) or Energy Management Systems (EMS) provides computerized access to a building’s electrical and mechanical systems without having to step foot on the campus. District facility personnel have direct control over temperature set points, run time, and sequence of operations to reduce peak demand.

There are four criteria to consider when optimizing a building schedule:

Temperature set points

Temperature set points are based on several determining factors; the space being occupied, time of year, time of use, and regional aspects on humidity are some examples. During the spring and fall, equipment lead times may vary if outside temperatures are mild versus summer and winter months when lead times may be longer with extreme outside temperature.

Building Zones

Different areas of a building typically have different hours of operation. Teachers typically leave prior to administration and gyms and auditoriums may be in use after schools hours. Accurate and conservative temperature set points based on a building’s zones and run times are effective measures in energy conservation.

Outside Air

Outside air requirements differ in occupied spaces versus unoccupied spaces. Having air handlers and exhaust fans operating only during occupied times provides an excellent opportunity in lower equipment run time thus lowering their overall impact on energy costs



Temperature Set Back

The set-back temperature is also important to the overall energy conservation efforts. Typical set-backs are 55 degrees and 85 degrees in winter and summer months. It is also important to pay attention during extreme cold and hot weather to make sure your facilities have enough time to “catch up” to your set points. It can be counterproductive to have set-back temperatures too low/high and equipment has to use more energy to ramp up to meet the set points. Realistic set back temperatures create a balance between conservation and comfortable conditions when staff arrives in the morning. Optimal Start is a feature on automated controls that can vary building start times for changes in weather. If the weather is extreme, then equipment is started early enough to properly condition the building before it is occupied. During mild weather, equipment start times can be delayed to obtain more energy savings.

### Food Service Equipment

Refrigeration systems are the single largest consumer of energy for food services. These pieces of equipment should be given the biggest consideration in a conservation plan. To keep refrigerator equipment from working too hard, let hot foods cool, cover foods, and keep walk in coolers full for optimal efficiency. Turn milk and juice coolers off when empty and consolidate when applicable.

Clear wall curtains are an excellent, low cost measure that can dramatically reduce heat transfer as these coolers are opened and closed several times a day as the very design is to act as a barrier for heat transfer. For each degree lower the temperature is set to safely maintain perishables, the energy cost is increased by 6 percent. Strip curtains and clear doors are designed to prevent excess temperature loss for the period of use.

Vent hoods are designed to operate during cooking only. Operation of these hoods when cooking is not taking place is extremely wasteful.

Optimizing schedules of selected ovens turned on during cooking times can also provide savings during prep times.

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**4. Observations and Recommendations**

**4.1 District Wide Observations & Recommendations:**

Throughout the district, there was a steady range of light levels from slightly under to standard recommended levels. It is recommended a district wide, comprehensive lighting re-balance according to IES (Illuminating Engineering Society) levels.

**Observations**:

* Every campus had unoccupied spaces with lights on, even on weekends.
* During the school day, there was a mix of teachers and staff utilizing the double banked switching.
* Several campuses have common areas where daylight harvesting can completely replace overhead lighting.
* Decorative lighting throughout was on while all overhead fixtures were on
* Window blinds were not shut after hours and on weekends.
* When cafeteria was not in use, there was a mixture of campuses utilizing banked switched lighting and others had all fixtures on while unoccupied.
* Several personal lamps were still using incandescence bulbs.
* All campuses had classrooms, labs, and libraries with computers and monitors on while unoccupied.
* All kitchens and storage areas had lights on while unoccupied.
* Several kitchens throughout had 4 foot 32W four lamp fixtures and areas were far over lit.
* Walk-in coolers and freezers, with a few exceptions, had clear draft barriers in working condition.
* Walk-in coolers and freezers, with a few exceptions, had magnetic insulation strips in good condition.
* There was a large variance in temperatures between campuses for their walk-ins. We noted temperature ranges on -6 to -22 degrees for freezers and 34-40 degrees for coolers.
* Exterior doors and windows were open during air conditioning cycles at several campuses.
* Several gyms are still utilizing metal halide lamp fixtures.
* During one weekend audit, three gyms had all metal halide lamps on while unoccupied.
* Several hallways throughout utilize 4 foot 32W four lamp fixtures that could be de-lamped for immediate savings.
* Several can lights throughout had 100 plus watt fluorescent bulbs that could be reduced to 60 watts.



**Recommendations**:

* Interior lights should be turned off when area is unoccupied including lunch, conference periods, and before & after school.
* Lighting fixtures with bank switching or dual switch capabilities should be utilized appropriately to capitalize on efficiency and savings.
* Decorative lighting should be turned off after the school day.
* When personal lamps are on, utilize dual bank switching capabilities.
* Trophy lighting should be turned off during and after the school day.
* Utilize natural lighting in rooms wherever possible while balancing the amount of solar heat/temperature entering windows.
* Installed timer controls, photo-sensors, and motion sensors should be positioned appropriately; adjust for timer and sensor settings for special or school related activities; after 15 minutes of inactivity, sensors should be adjusted to turn OFF.
* Window blinds should be pulled down at the end of each school day.
* Install window blinds wherever needed to decrease the amount of solar heat and reduce the temperature in the room.
* Turn off outdoor lights when possible with consideration for safety.
* When cafeteria is not in use, banked switched lighting should be with one switch in the ON position and the remainder off for conservation purposes.
* Metal Halides consume far more energy than T-8 light fixtures. TASB recommends retrofitting metal halide lamps to T8 or T5 high bays as budget and time permit.
* When turning on athletic field lighting, a multiple panel switch is recommended to offset the high peak KW demand.
* Several personal lamps were still using incandescent bulbs.



**Plug Load**

Request that all personal appliances and non-essential plug loads be unplugged on weekends and holidays.

* When possible, the district requests replacing mini-refrigerators with high efficiency 1.1 cubic foot models.
* Hot plates and personal space heaters are not considered a fire hazard if used properly. We recommend space heaters be plugged directly into an outlet.
* Space heaters should have a tip over safety device to prevent possible fires.
* Microwaves and coffee pots use a large amount of energy when in use. Microwaves can use between 900 and 1300 watts and coffee makers can use 900 kWh.
* Coffee makers consisting of insulated thermal coffee units are recommended.

*District staff is responsible for cleaning their microwaves, refrigerators, and coffee makers to comply with district IAQ and IPM policy.*

* Microwaves should be consolidated and placed in teacher’s lounges.

***\*Average annual energy costs can vary depending on the size and age of mini-refrigerators. The range of energy costs associated with a typical 1.1 cubic foot refrigerator can be $36-$56 annually. The range of energy costs associated with a typical 4.1 cubic foot refrigerator can be $45-$75 annually. This cost can be mitigated by district staff adhering to the energy management program guidelines and procedures***.

**Vending Machines**

Most school campuses have vending machines of various sizes. These machines are typically located in hallways, cafeterias, teacher lounges and other common areas. Walkthrough of the campuses found several vending machines. Although it was difficult to discern if these vending machines were equipped with vending misers (*a plug-and-play device to power down the machine when not in use*), some were de-lamped, thus taking advantage of energy saving techniques.

* Make contact with your local vendor to have all vending machines equipped with vending misers.
* If the vendor does not provide such a service free of charge then you may want to reconsider contracting with another vendor who will be able to provide you with that service.
* All lighting should be removed from vending machines if hallway or space lighting provides adequate illumination.



**Kitchens**

Kitchens and cafeterias can be one of the most challenging places to conserve energy. Usually food service staffs are under a tight deadline to complete and serve breakfast and lunch to students every day, 5 days a week. Room temperatures can be hot considering most kitchen staff work in close quarters most of the time.

* Inspect ventilator fans for optimum efficiency.
* Maintain proper use of refrigeration equipment, let hot foods cool to a safe temperature on a countertop, properly cover foods with appropriate containers, and keep freezers to a full capacity.
* Vending misers should be installed in all vending machines
* Milk coolers were properly stocked, some de-lamped. This is a positive energy saving technique.
* OnSite recommends placing wall strips in all refrigerators and freezers to reduce cooling loss due to frequent door opening and check all insulations strips monthly for deterioration.

**Computers**

Computer plug load usage can account for 5-10% of a Districts electrical plug load. Newer technologies and software management can cut computer related energy usage by 25-40% with little to no impact on the user.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Campus | CRT monitor | LCD Monitor | Desktop | Laptop | Desktop Printer |
| High School/9th | **31** | **687** | **718** | **33** | **95** |
| Hill Country | **20** | **288** | **308** | **4** | **47** |
| West Ridge | **46** | **253** | **299** | **1** | **46** |
| Barton Creek | **0** | **128** | **128** | **54** | **29** |
| Cedar Creek | **8** | **104** | **132** | **65** | **15** |
| Forest Trail | **0** | **144** | **144** | **133** | **49** |
| Valley View | **56** | **142** | **198** | **22** | **32** |
| Eanes | **39** | **80** | **119** | **87** | **22** |
| Bridge Point | **0** | **131** | **131** | **131** | **48** |
|  |  |  |  |  |  |
| Totals | **200** | **1957** | **2157** | **412** | **383** |
| Annual unit cost | **$13.16** | **$4.11** | **$18.91** | **$4.93** | **$15.62** |
| Total annual cost | **$2,632.00** | **$8,043.00** | **$40,788.77** | **$2,033.22** | **$5,982.00** |



Eanes ISD IS department has been proactive in replacing outdated equipment and updating with more efficient systems and will completely phase out CRT monitors. The following is expected for the 2012-2013 school year:

* 6,500 iPads
* 250 Laptops
* 1,900 LCD monitors
* 1,900 Desktop computers
* 30 iMacs
* 770 Projectors
* 300 SmartBoards

The IS department has district wide remote access to initiate startup and shut down procedures for campus computers so all district computers can enter hibernation mode after 15 minutes of nonuse. Hibernation mode is a power management mode that conserves energy by powering down the system. Hibernation mode saves the most recent operations to the hard drive, therefore students and staff has access to the previous data for use.

**Printers and Copiers**

All printers should remain off and unplugged unless being used. Copiers should be in power saver mode and be turned off at the end of the day. There were several desktop printers throughout the district in almost every classroom. A recommendation of consolidating printers can be both an energy savings technique and assist in managing cost for paper and toner.

**TV’s, VCR’s, DVD’s**

The District employs many TV/VCR and TV/DVD combo sets. When not in use, all combination units should remain unplugged.



**4.2 Campus Specific Personal Appliance Plug Load Costs**

Each campus has been audited by OnSite Energy Services to determine yearly cost for plug load use on small appliances like mini fridges, radios, space heaters, etc. These will be included in the customized package given to the Campus Conservation Committee or **C³** as potential ways to reduce energy usage. (See example below)

**Forest Trail Elementary**

|  |  |  |  |
| --- | --- | --- | --- |
| **Plug Load item** | **Estimated**  **per unit cost** | **Total** | **Estimated annual  cost in dollars ($)** |
| Small Mini Fridge 1-3 cu ft | 45 | 20 | 900.00 |
| Large Mini fridge | 75 | 3 | 225.00 |
| Large fridge | 70 | 1 | 70.00 |
| Microwave (5 min a day) | 9 | 8 | 72.00 |
| Toaster Oven | 14.56 | 2 | 29.12 |
| Thermal Coffee Pot | 2.17 | 0 | 0.00 |
| Hot Plate Coffee Pot | 8.66 | 5 | 43.30 |
| Desk/Small Lamp | 6.75 | 15 | 101.25 |
| Floor Lamp | 8.65 | 6 | 51.90 |
| Space Heater | 16.80 | 0 | 0.00 |
| Desk Fan | 6.21 | 1 | 6.21 |
| Floor/large Fan | 9.92 | 3 | 29.76 |
| Stereo | 5.25 | 3 | 15.75 |
| Clock radio/ radio | 3.60 | 6 | 21.60 |
| TV/VCR Combo | 4.32 | 0 | 0.00 |
| VCR/DVD player | 0.72 | 5 | 3.60 |
| VCR/DVD combo | 0.72 | 3 | 2.16 |
| Water fountains | 40 | 2 | 15.90 |
| **TOTAL** |  | 10 | 400.00  **$1,988** |
|  |  |  |  |

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|  |  |
| --- | --- |
| Campus | Plug Load by Year |
| Barton Creek | $731 |
| Bridge Point | $428 |
| Cedar Creek | $1,259 |
| Eanes Elem | $428 |
| Forest Trail | $1,988 |
| Hill Country | $1,550 |
| Valley View | $1,308 |
| West Ridge | $2,822 |
| WHS / 9th | $5,228 |
|  |  |
| *Totals* | ***$15,742*** |

**Additional Recommendations**

* Consider limiting the use of personal mini-fridges and microwaves.
* Balance lighting throughout the facility according to the Illumination Engineering Society.
* Perform feasibility study determining replacement of locale appropriate units for specific classrooms being occupied.
* All unoccupied rooms should have doors closed and blinds/shades closed to reduce ambient heat loads.
* Set temperature ranges throughout the building.
* It is recommended to de-lamp if natural lighting permits.
* Consider limiting the use of personal mini-fridges in the classroom along with other personal items.
* Consider replacing metal halide lamps with T-8 or T-5 lamps when budgeting permits.
* Turn off the lights when the cafeteria, libraries, auditoriums, and other common spaces are unoccupied.



**5. District Energy Guidelines and Procedures**

**5.1 Temperature Set-points Guidelines**

Recommended temperature set points for maximum efficiency:

Temperature settings should be between 69 and 74 degrees.

**5.2 Lighting Guidelines**

The following energy conservation guidelines are to be exercised when operating lighting in the District’s facilities.

* Staff will be responsible for turning off all lights in classrooms, work areas, and offices when exiting the space.
* Lights will be turned off before and after school and when rooms are not in use. Librarians and cafeteria staff will be responsible for utilizing multiple switch capabilities for optimal savings.
* Lighting with “banked” or “dual switching” capabilities shall be utilized for realized energy savings.
* When students are not present, teachers are encouraged to use natural lighting, personal lamps, or dual switching.
* All personal lamps must utilize fluorescent bulbs and be turned off when not in use.
* All trophy cases and other lighting displays will be turned off at night and during summer/winter shutdown.
* Custodial staff will only use lighting in areas being cleaned.
* Outside lighting will remain off during daylight hours.
* Vending Machines should be de-lamped.

**5.3 Teacher Classroom Exiting Procedure**

The last person leaving a particular space for the day should do the following:

**Daily**

* Turn off computer(s)
* Turn off all computer printers, scanners, and copiers
* Unplug all appliances and remove perishable food items
* Close blinds or curtains
* Close classroom door
* Turn off lights

**Winter & Spring Breaks**

* Empty refrigerator, unplug and leave door open

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**Summer Break**

* Take home ALL personal appliances, lamps, radios, etc.

**5.4 Staff Guidelines**

**Summer & Winter Shutdown Procedures**

* HVAC schedules will be set to unoccupied set points as noted.
* Interior lights will be OFF except for exit and safety lighting.
* Water heaters will be turned OFF.
* All non-essential kitchen appliances should be unplugged.
* All refrigerators and freezers will have gaskets inspected and cleaned.
* All business related machines including, but not limited to copiers, faxes, and printers will be unplugged.

**5.5 Additional Guidelines**

* Vent hoods and fans are to remain off when not cooking and stoves are off
* Storage closets and walk-ins lighting will remain off when no one is present
* Weekly inspection of door insulation gaskets and barriers for deterioration
* Cafeteria lighting will be in energy saver mode when students are not present
* All milk coolers will remain at least 75% stocked or consolidated
* All lighting for coolers, freezers, and refrigerators will be de-lamped to provide lighting at a minimum, but safe level
* All space heaters must be electric and plugged directly into wall
* All hot plates will be unplugged when not in use
* We recommend replacing inefficient mini-fridges with 1 cubic foot, Energy Star rated appliances
* Microwaves & refrigerators will be unplugged on weekends and long breaks
* Microwaves & refrigerators will be cleaned on a regular basis by owner to prevent IAQ (Indoor Air Quality) and IPM (Integrated Pest Management) issues
* Radios, lamps, & any other small appliances will be turned off when not in use
* When exiting the classroom for the day, items will be unplugged to reduce phantom load
* Furniture should not be placed in close proximity to return air or supply air ventilation systems
* File cabinets & other furniture should not be placed in front of thermostats
* All computers, printers, copiers, fax machines will be in hibernation mode when not in use
* Heaters and Boilers temperatures are as follows according to Texas Department of State Health Services:

170 degrees for sanitation equipment

130 degrees for domestic hot water



**6. Retro-Commissioning**

Retro-commissioning is simply taking the commissioning process and applying it to an existing building. It seeks to improve how the building systems function and work together. Depending on a building’s age, complexity of existing systems, and districts facility usage, this process can correct issues in design or construction, and address any problems that have occurred due to improper operation or age of the systems.

The overall goal of this process is to commission a building that not only operates as efficiently as possible, but also meets the needs of the owner and occupants. This process avoids “quick fix” solutions and works to address root causes and systematically ensure systems run efficiently and reliably and can be maintained over time.

Retro-commissioning typically focuses on major energy intensive equipment, such as mechanical equipment, lighting and related controls, and focuses on optimizing the performance of existing systems, rather than relying on major equipment replacement. Typically, a retro-commissioning project will result in any or all of the following:

* Improved indoor air quality
* Improved occupant comfort
* Better control of the systems and equipment
* Superior energy and resource efficiency

According to a study performed by Penn State University, a building that was commissioned when it was built will be significantly out of calibration after five years. In many cases new buildings are not being commissioned properly, thus making the operating efficiency of its equipment suspect from the beginning.

On-Site’s approach to retro-commissioning focuses on working with the owner and the building operators to ensure the building is meeting their functional needs as efficiently as possible. In order to do so, we have developed a two-phase retro-commissioning process. The first phase is focused on consensus and investigation, while the second phase involves corrections and verification. For this proposal, we are looking at phase one retro-commissioning only.

Outlined below are various steps in the consensus and investigation phase of retro-commissioning:

* Review of design documents
* Establish design intent/operational parameters
* Survey facility existing conditions
* Compare findings to design intent
* Compile list of suggested corrective measures



**Appendix A**

**Example Audit - Cedar Creek Elementary**

Each campus was audited by OnSite in April-May 2012. Below is one of the audits and recommendations.

**Lighting:**

* Library has approximately (34) 4 foot lamps with (3) 32 watt bulbs in each with a 4 bank switch for lighting
* Library also has 13 can lamps with (2) 60 watt bulbs in each
* Majority of classrooms have (9) 4 foot lamps with 32 watt bulbs in each, some with dual switch banking
* Cafetorium has (60) 4 foot lamps with (3) 32 watt bulbs in each with a 4 bank switch

***\*Proper utilization of multiple bank switching is a great way to save valuable energy dollars at zero cost.***

Classroom lighting costs an estimated $162 per room for a year multiplied by 31 rooms for a total of $5,022 a year for lighting. Combining efforts to turn lights off when not needed and reducing the burn hours may result in savings of $1200 per year, just by turning off lights.

Cafetorium lighting costs an estimated $1,200 a year. Reducing the number of burn hours to only occupied times can save an estimated $400 per year.

Library lighting costs an estimated $1,030 a year. Reducing burn hours for all switches can save up to $450 per year.

By utilizing the daylight harvesting techniques during sunny days, an estimated 45 light fixtures can reduce burns hours for a savings of approximately $700 a year.

**Potential total savings: $2,750 a year just by turning off lights.**

**Observations:**

* Some areas are de-lamped and utilize daylight harvesting techniques
* Kitchen freezer was at proper temperature of -4 degrees; however ice buildup on wall strip. Typically occurs when hot foods are placed in without time to cool safely.
* The library had ~~4~~ windows open at 12:45pm while the temperature outside was 88 degrees and humidity was at 68%. This forces the air conditioning equipment to work harder, thus spending more energy.
* All 20 Metal Halide lights were on while gym was unoccupied at 12:45pm, as well as the weekend of April 14 and after school hours on April 26.





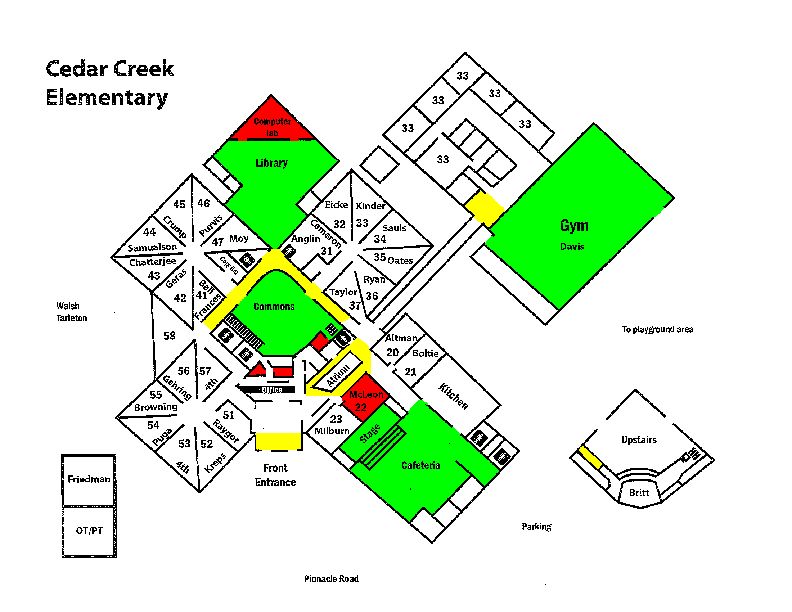
C³ Checklists

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Yes | No | Notes | |
|  |  |  | |  |
| Window coverings closed? |  |  | |  |
| Overhead Projectors off? |  |  | |  |
| Smart Boards off? |  |  | |  |
| Computers & Monitors unplugged? |  |  | |  |
| Printers & scanners unplugged? |  |  | |  |
| Personal Appliances unplugged? |  |  | |  |
| Lamps and stereos unplugged? |  |  | |  |
| Lights off? |  |  | |  |
| Is my classroom door closed? |  |  | |  |

Each school will be given energy saving checklists designed for personnel like teachers, students, kitchen staff, coaches and custodians.

**Teacher/Administration Daily Checklist**





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**Appendix B**

**Student Activities**

Below are some example materials of suggestions for student involvement. Each campus and age group will have materials tailored to their individual needs.

**Are you green minded?**

**Want to help protect the environment?**

**help your school reduce its energy waste!**

**join the Green Team!**

**What is it?** – The Green Team is comprised of a group of students dedicated to the monitoring and reduction of energy usage on their school campus.

**What does the Green Team do?** – Wherever possible, Green Team members will ensure energy reduction protocols are being used and observed. They will also make periodic audits of areas of the campus designated by the district energy manager and Campus Conversation Committee as “problem areas” – areas where excessive energy waste has been recorded historically.

**Why should I join?** – You can gain valuable experience in the green energy field and use your status as a Green Team member on your college application!

**How do I join?** – Contact your district Energy Manager – David Hoedebeck.   
They can be reached at this number – 512-732-9040.

**Duties and Responsibilities:**

* Identify areas in the school where conservation of heating and cooling are possible. Ask: How can the school help to lower the need for heating and cooling? How can students personally help to lower the need for heating and cooling?
* Assist in/execute energy audits for the school
* Compete in Green Games to compare your campus to other Eanes campuses.
* <http://www.greeneducationfoundation.org/courses/lesson-clearinghouse/369-Computer-Lab-Energy-Audit> Ask: When can computers be on sleep mode, or off completely?
* Be a recycling champion!
* Ask: What kinds of equipment can be installed in sinks and showerheads to conserve water in a home or building with a high flow-rate?
* Look at the types and quantity of lamps used in the parking lot and outside areas of the school
* How can more natural light be maximized? Which artificial lights are unnecessary?



Ask a Teacher - Hopefully you have come up with several ways to save energy and/or water. In fact, if you have implemented suggested changes, take a closer look at how they can add up to really big savings! Now is the time to see how much money you saved in the process.

**Healthy Habits for the Environment:**

* **Turn off lights when leaving an empty classroom**  
  Simple habits can lead to big savings - for the environment and for your school budget. Turning off the lights when leaving any room is a great place to start!
* **Unplug electronic devices at the end of the day**  
  Plugged in electronics are energy vampires - even when powered down! In the average home, up to 75% of the electricity used to power home electronics is consumed while the products are turned off.
* **Recycle (aluminium, glass, plastic, paper, cardboard)**  
  Implement a straightforward recycling system in your classroom or school, and conserve energy while also reducing the amount of waste in landfills. Energy saved from a single recycled aluminium can operate a TV set for 3 hours, and is the equivalent to half a can of gasoline. Glass is one of the very few products that can be completely recycled again and again. However, if it ends up in a landfill it will never decompose. Another alarming statistic: plastic bags and other plastic thrown into the ocean kills as many as 1,000,000 sea creatures every year
* **Use environmentally-safe cleaning supplies**  
  Avoid Sick Building Syndrome! In the United States, 1 in 3 people suffer from allergies, asthma, sinusitis or bronchitis (US National Center for Health Statistics). Non-toxic cleaning supplies ensure healthier buildings and healthier occupants.
* **Turn off water faucets tightly**Only 1% of the earth's water resources are useable for drinking - the rest is permanently frozen or salt water. Given the implications of rapid global population growth, it is critical that water conservation is practiced daily. A dripping faucet can add up to hundreds of gallons.

