SCHOOLS AND HOSPITALS
ENERGY MANAGEMENT PROGRAM REPORT

For

UVALDE CONSOLIDATED INDEPENDENT SCHOOL DISTRICT

1000 N. Getty Street / PO Box 1909
Uvalde, Texas 78802
(830) 278-6655

Administered By:

SECO
State Energy Conservation Office

COMPTROLLER OF PUBLIC ACCOUNTS
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ENERGY STAR PARTNER

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Schools & Hospitals Energy Management Program
Uvalde Consolidated Independent School District
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1.0 EXECUTIVE SUMMARY

Uvalde Consolidated Independent School District, now referred to as the District, requested that Texas Energy Engineering Services, Inc. (TEESI) perform a Preliminary Energy Assessment (PEA) of their facilities. This report documents that analysis.

This service is provided at no cost to the District through the Schools and Hospitals Energy Management and Technical Assistance Program as administered by the Texas Comptroller of Public Accounts, State Energy Conservation Office (SECO). This program promotes and encourages an active partnership between SECO and Texas schools for the purpose of planning, funding and implementing energy saving measures, which will ultimately reduce facility energy bills.

The annual cost savings, implementation cost estimate and simple payback for all building energy retrofit projects identified in this preliminary analysis are summarized below. Individual building projects are summarized in Section 7.0 of this report.

Implementation Cost Estimate:	$538,000
Annual Energy Cost Savings:	$52,300
Simple Payback:	10.3

Recommendations and information of interest to the District is provided in this report regarding Energy Consumption and Performance (Section 3.0), Energy Accounting (Section 4.0), Senate Bill 12 and House Bill 3693 Overview (Section 5.0), Recommended Maintenance & Operation Procedures (Section 6.0), Retrofit Opportunities (Section 7.0), Capital Improvement Projects (Section 8.0), Funding Options (Section 9.0), and Energy Management Policy (Section 10.0). A follow-up visit to the District will be scheduled to address any questions pertaining to this report, or any other aspect of this program.

SECO is committed to providing whatever assistance the District may require in planning, funding and implementing the recommendations of this report. The District is encouraged to direct any questions or concerns to either of the following contact persons:

SECO / Ms. Glenda Baldwin
(512) 463-1731

TEESI / Saleem Khan
(512) 328-2533

2.0 FACILITY DESCRIPTIONS

This section provides a brief description of the facilities surveyed. The purpose of the onsite survey was to evaluate the major energy consuming equipment in each facility (i.e. Lighting, HVAC, and Controls Equipment). A description of each facility is provided below.

Uvalde High School

Stories:	Single story building
Area:	234,286 SF
Bldg. Components:	Brick building with flat built-up roof as well as pitched metal roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC:	Packaged roof top units, Air-cooled chiller, Electric boiler
Controls:	Energy Management Systems, Manufacturers TAC and Robertshaw Controls

Uvalde Jr. High

Stories:	Single story building
Area:	111,593 SF
Bldg. Components:	Brick building, flat built-up roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC:	Wall mounted “Bard” units, Split-DX systems, Window units, Packaged rooftop units.
Controls:	Energy Management Systems, Manufacturer TAC

Benson Elementary

Stories:	Single story building
Area:	60,544 SF
Bldg. Components:	Brick building, pitched metal roof and flat built-up roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC:	Wall mounted “Bard” units, Split-DX systems
Controls:	Energy Management Systems, Manufacturer Carrier

Dalton Elementary

Stories:	Single story building
Area:	63,087 SF
Bldg. Components:	Brick building, pitched metal roof and flat built-up roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC:	Wall mounted “Bard” units, Split-DX systems
Controls:	Energy Management Systems, Manufacturer TAC

Robb Elementary

Stories:	Single story building
Area:	59,783 SF
Bldg. Components:	Brick building, pitched metal and flat built-up roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC:	Wall mounted “Bard” units, Split-DX systems
Controls:	Energy Management Systems, Manufacturer Carrier

Flores Middle School

Stories:	Two story building
Area:	100,594 SF
Bldg. Components:	Brick building, flat built-up, pitched metal, and flat modified bitumen roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC:	Air-cooled chiller, Gas boiler
Controls:	Energy Management Systems, Manufacturer Carrier

Anthon Elementary

Stories:	Single story building
Area:	54,037 SF
Bldg. Components:	Brick and metal exterior walls, pitched metal roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC:	Wall mounted “Bard” units, Split-DX systems
Controls:	Energy Management Systems, Manufacturer TAC

3.0 ENERGY CONSUMPTION AND PERFORMANCE

A site survey was conducted at several of the District's facilities. The facilities surveyed comprised a total gross area of approximately 720 thousand square feet.

Annual electric and natural gas invoices for the buildings surveyed were $1,049,443 for the 12-month period ending December 2008. A summary of annual utility costs is provided in Appendix C, Base Year Consumption History.

To help the District evaluate the overall energy performance of its facilities TEESI has calculated their Energy Utilization Index (EUI) and Energy Cost Index (ECI). The EUI represents a facility's annual energy usage per square foot, it is measured as thousand BTU's per square foot per year (kBTU/SF/Year). Similarly, ECI is measured as cost per square foot per year ($/SF/Year). The EUI and ECI performance for selected facilities are listed below:

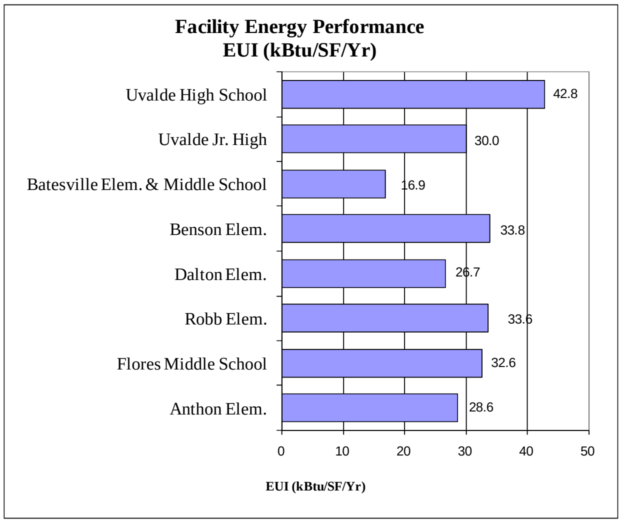
Energy Cost and Cosumption Benchmarks

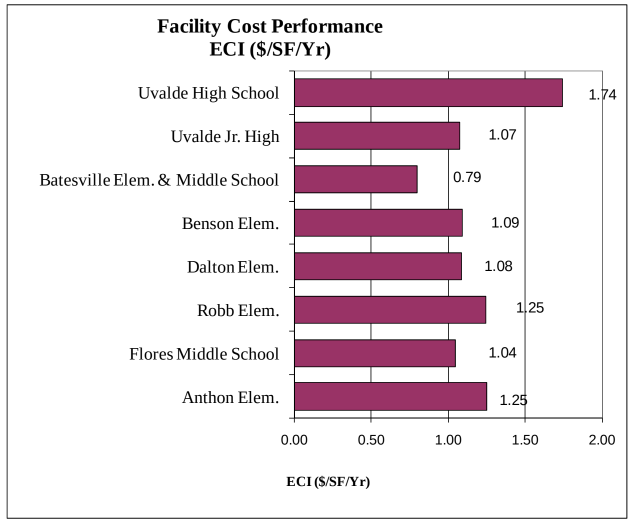
		Electric*		Natural Gas		Total	Total	EUI	ECI	
	Building	KWH/Yr	$Cost/Yr	MCF/Yr	$Cost/Yr	$Cost/Yr	MMBTU/Yr	kBTU/SF/Yr	$/SF/Yr	SF
1	Uvalde High School	2,818,865	401,954	404	6,047	408,002	10,037	42.8	1.74	234,286
2	Uvalde Jr. High	822,880	111,687	529	7,889	119,576	3,353	30.0	1.07	111,593
3	Batesville Elem. & Middle School	182,960	29,414	0	0	29,414	624	16.9	0.79	37,038
4	Benson Elem.	425,688	57,420	577	8,427	65,847	2,047	33.8	1.09	60,544
5	Dalton Elem.	492,312	68,258	4	176	68,434	1,684	26.7	1.08	63,087
6	Robb Elem.	522,356	71,097	217	3,376	74,474	2,006	33.6	1.25	59,783
7	Flores Middle School	698,460	92,062	872	12,917	104,978	3,282	32.6	1.04	100,594
8	Anthon Elem.	452,388	67,297	1	141	67,438	1,545	28.6	1.25	54,037
9	Central Office Complex	467,136	61,355	28	632	61,987	1,623	N/A	N/A	N/A
10	Excel Academy	93,148	15,784	615	1,407	17,191	951	N/A	N/A	N/A
11	Alternative Education Center	33,376	5,794	0	0	5,794	114	N/A	N/A	N/A
12	Bus Barn	60,131	8,737	0	0	8,737	205	N/A	N/A	N/A
13	Barn & Fuel Pump - Batesville	1,301	398	0	0	398	4	N/A	N/A	N/A
14	Tennis Center	27,888	4,775	0	0	4,775	95	N/A	N/A	N/A
15	UCISD Honeybowl Football Stadium	50,117	11,845	29	552	12,397	201	N/A	N/A	N/A
		KWH/Yr	$Cost/Yr	MCF/Yr	$Cost/Yr	$Cost/Yr	MMBTU/Yr	kBTU/SF/Yr	$/SF/Yr	SF
		7,149,006	1,007,879	3,275	41,564	1,049,443	27,772	34.1	1.30	720,962

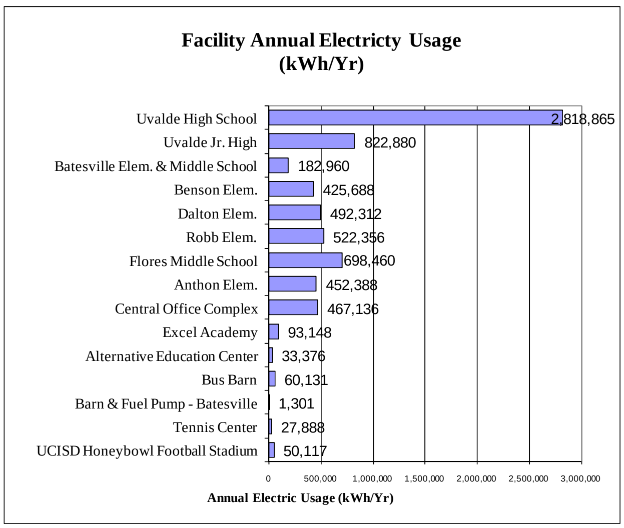
(*) EUI & ECI is for facilities with square footage data provided by the District.

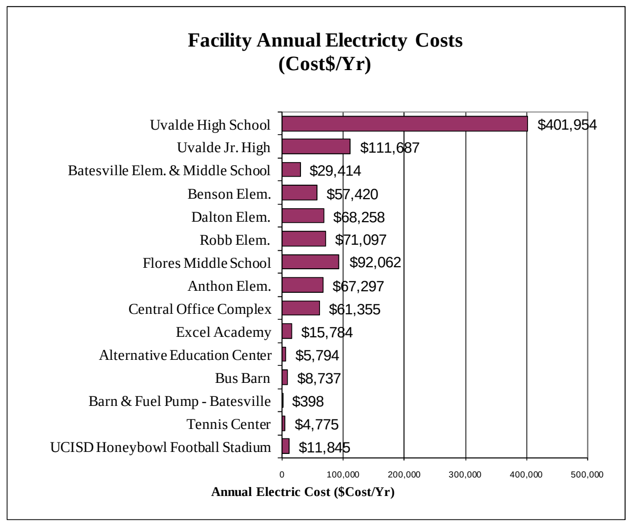
Knowing the EUI and ECI of each facility is useful to help determine the District's overall energy performance. In addition, the District's EUI was compared to TEESI's database of Texas schools. See Appendix D to determine how each facility ranked.

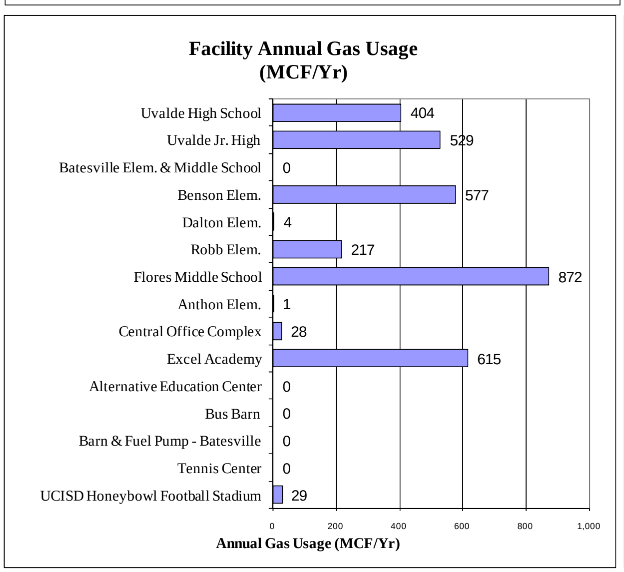
The following charts summarize the data presented in the previous table. See appendix C for further detail.

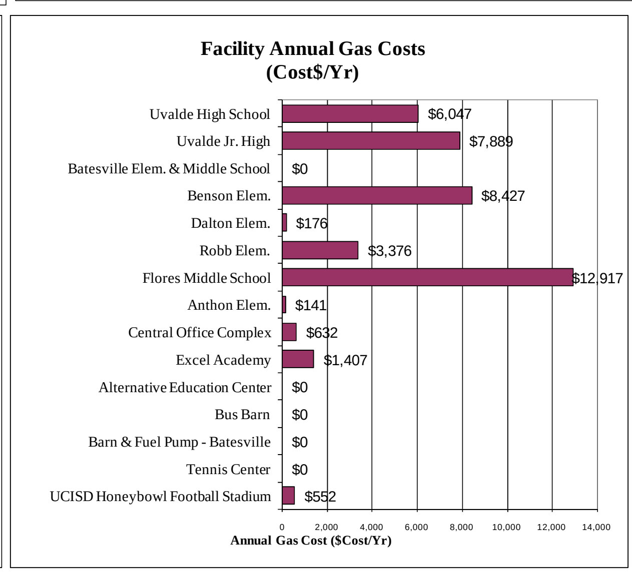






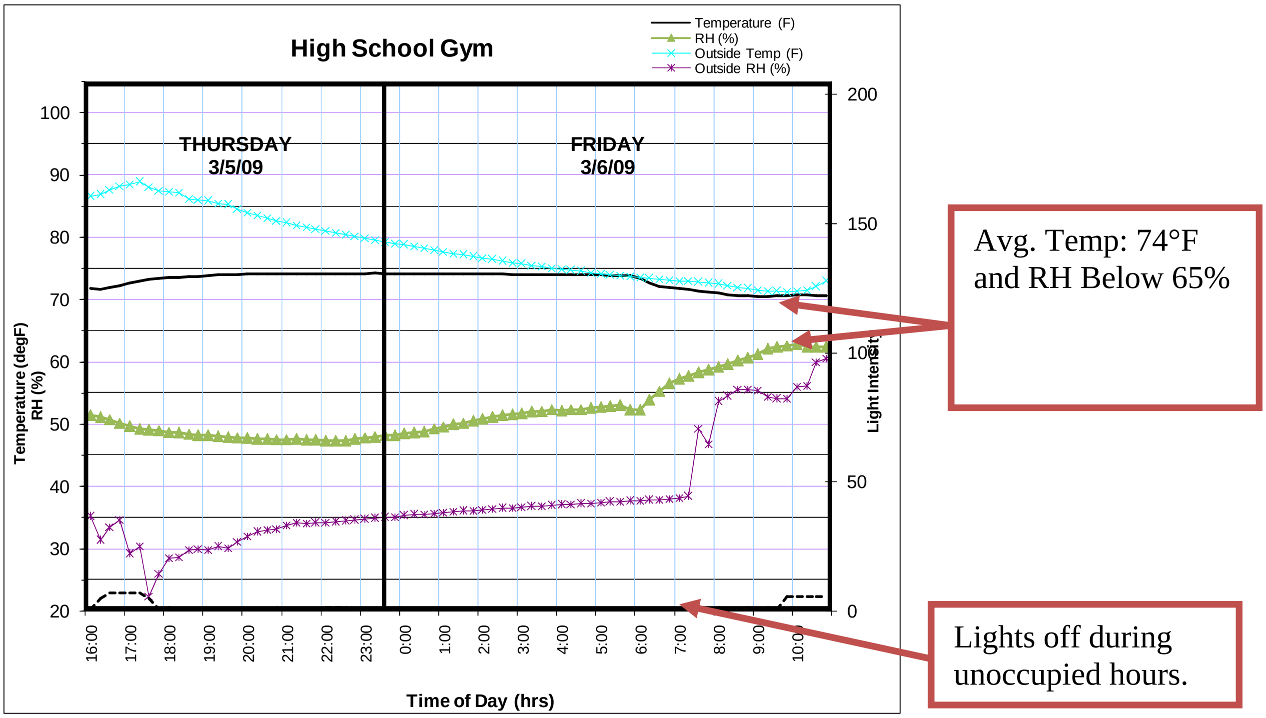






INDOOR TEMPERATURES AND LIGHT STATUS

During the onsite survey, data-logging equipment was deployed at several locations throughout the District, to provide a snapshot of the indoor conditions of selected facilities. The data-logging equipment recorded the room's light intensity, temperature and % relative humidity (RH). The data was analyzed to determine the average room temperatures during a typical weekday. In addition, the light intensity was recorded to determine if the lights remained on during unoccupied periods. Below is a sample chart describing the environment conditions at the High School Gym, additional charts are attached in Appendix E.



4.0 ENERGY ACCOUNTING

UTILITY PROVIDERS

District’s electric utility Retail Energy Provider (REP) is Energy for Schools and their Transmission & Distribution Service Provider (TDSP) is American Electric & Power (AEP). City of Uvalde provides natural gas service to all of the District’s facilities.

MONITORING AND TRACKING

An effective energy tracking system is an essential tool by which an energy management program's activities are monitored. Electronic spreadsheets are an effective tool to help establish an energy tracking system. These spreadsheet can be used to track all utilities consumption and cost (i.e., Electric kWh & Cost$, Gas MCF & Cost$) on a monthly basis. The District can use this data to track utility consumption patterns and budget utility expenses. Having this historical data improves the District’s awareness of their energy performance and will help in tracking their energy reduction goals.

The steps below are essential for an effective energy management tracking system:

1. Perform regular updates. An effective system requires current and comprehensive data. Monthly updates should be strongly encouraged.

2. Conduct periodic reviews. Such reviews should focus on progress made, problems encountered, and potential rewards.

3. Identify necessary corrective actions. This step is essential for identifying if a specific activity is not meeting its expected performance and is in need of review.

In addition, having this historical utility data would facilitate **House Bill 3693** and **Senate Bill 12** reporting requirements. Please see Section 5.0 for additional information regarding these requirements.

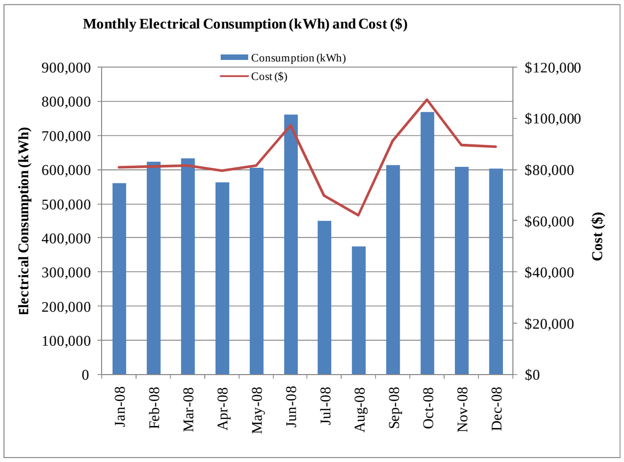
Furthermore, below in the following page is a sample format the District can customize to help summarize their overall utility usage and costs.

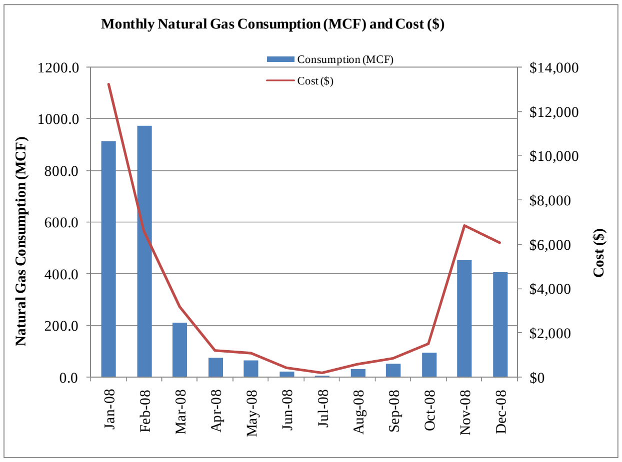
The data presented below is a summation of the data provided by the District. This data below includes only selected utility accounts and is for reference purposes only and does not represent the District's total utility data. See **Appendix C** for further detail regarding each utility account represented in the table below.

Uvalde ISD - Sample Utility Data Input Form

MONTH	ELECTRICITY			NATURAL GAS			WATER		
	KWH	COST $	$/KWH	MCF	COST $	$/MCF	GAL	COST $	$/GAL
Jan-08	558,991	$80,581	$0.1442	911.1	$13,207	$14.5			
Feb-08	622,492	$80,856	$0.1299	970.9	$6,609	$6.8			
Mar-08	632,005	$81,244	$0.1286	207.3	$3,168	$15.3			
Apr-08	561,487	$79,273	$0.1412	72.1	$1,177	$16.3			
May-08	604,952	$81,354	$0.1345	63.6	$1,053	$16.5			
Jun-08	758,508	$96,992	$0.1279	19.4	$404	$20.9			
Jul-08	448,880	$69,543	$0.1549	3.8	$176	$46.4			
Aug-08	373,643	$61,947	$0.1658	28.8	$544	$18.9			
Sep-08	611,380	$90,926	$0.1487	48.7	$836	$17.2			
Oct-08	767,586	$107,062	$0.1395	93.6	$1,496	$16.0			
Nov-08	607,514	$89,475	$0.1473	452.2	$6,844	$15.1			
Dec-08	601,568	$88,625	$0.1473	403.2	$6,051	$15.0			
Total	7,149,006	$1,007,879	$0.1410	3,275	$41,564	$12.7			

Gross Building Area:	720,962	SF





5.0 SENATE BILL 12 AND HOUSE BILL 3693 OVERVIEW

In 2001, the 77th Texas Legislature passed Senate Bill 5 (SB5), also known as the Texas Emissions Reduction Plan, to amend the Texas Health and Safety Code. The legislation required ambitious, fundamental changes in energy use to help the state comply with federal Clean Air Act standards. It applied to all political subdivisions within 38 designated counties, later expanded to 41 counties.

In 2007, the 80th Texas Legislature passed Senate Bill 12 (SB 12) which among other things extended the timeline set in SB 5 for emission reductions. In the same period, the 80th Texas Legislature passed House Bill 3693 (HB 3693) which amended provisions of several codes relating primarily to energy efficiency.

The Bill requirements that are most relevant to this program are as follows:

Establish a goal of reducing electric consumption by five percent (5%) each state fiscal year for six (6) years, beginning on September 1, 2007.

Record electric, water, and natural gas utility services (consumption and cost) in an electronic repository. The recorded information shall be on a publicly accessible Internet Web site with an interface designed for ease of navigation if available, or at another publicly accessible location.

Energy-efficient light bulbs for buildings, requires an institution to purchase commercially available light bulbs using the lowest wattages for the required illumination levels.

Installation of energy saving devices in Vending Machines with non-perishable food products. **Not required by School Districts but highly recommended.**

A summary description of SB 12 and HB 3693 is available in Appendix A. Further detail regarding each bill can be found in the Texas Legislature website (http://www.capitol.state.tx.us/Home.aspx).

To help with the utility reporting process a sample input form can be found in Appendix B of this report.

6.0 RECOMMENDED MAINTENANCE & OPERATION PROCEDURES

Sound Maintenance and Operation procedures significantly improve annual utility costs, equipment life, and occupant comfort. Generally, maintenance and operation procedural improvements can be made with existing staff and budgetary levels. With this in mind, the following maintenance and operation procedures are recommended.

PUBLICIZE ENERGY CONSERVATION.

Promote energy awareness at regular staff meetings, on bulletin boards, and through organizational publications. Publicize energy cost reports showing uptrends and downtrends. Also, considering implementing WattWatchers, a SECO sponsored program, which encourages teacher and student involvement in energy awareness, see Appendix G for further information.

IMPROVE CONTROL OF INTERIOR & EXTERIOR LIGHTING.

Establish procedures to monitor use of lighting at times and places of possible/probable unnecessary use: Offices and classes at lunchtime, maintenance shops, closets, parking lots during daylight hours, etc. One or two friendly reminders for minor infractions will usually result in lower electric bills. The pictures below are examples of lights being left on during unoccupied periods.

OPTIMIZE ENERGY MANAGEMENT SYSTEM SETTINGS.

A Building Commissioning Program (see Section 7.0) should be considered to optimize the performance of the HVAC systems at the Uvalde High School, especially in areas with large fluctuations in occupancy patterns such as gymnasiums and assembly areas. These areas typically can have significant energy savings with improved HVAC control settings. In addition, these high occupancy areas have significant ventilation air requirements. During humid outdoor conditions, the HVAC system's dehumidification mode is activated causing the heating and cooling system to work simultaneously. For example to help lower dehumidification loads, the following adjustments should be considered at the High School at the Air Handling Units serving the Gym and Auditorium areas.

The setpoint for activating the dehumidification mode should be raised to 60% (Present setting is 55% RH based on original drawings), and the setpoint for exiting the dehumidification mode should be set near 55% RH. This higher humidity range should provide sufficient control while eliminating the need for excessive simultaneous heating and cooling. As a precaution, the impact of slightly higher humidity levels on the gym floor should be reviewed prior to adjustment. A more detailed discussion is described in Section 7.0 under "Building Commissioning".

CONTROL OUTSIDE AIR INFILTRATION.

Conduct periodic inspections of door and window weather-stripping, and schedule repairs when needed. Additionally, make sure doors and windows are closed during operation of HVAC systems (heating or cooling). Unintended outside air contributes to higher energy consumption, shorter equipment life, and occupant discomfort.

ESTABLISH HVAC UNIT SERVICE SCHEDULES.

Document schedules and review requirements for replacing filters, cleaning condensers, and cleaning evaporators. Include particulars such as filter sizes, crew scheduling, contract availability if needed, etc. Replace filters with standard efficiency pleated units. Generally, appropriate service frequencies are as follows -- filters: monthly; condensers: annually; evaporators: 5 years.

REPLACE INCANDESCENT LAMPS WITH COMPACT FLUORESCENTS.

Replace existing incandescent lamps with compact fluorescent lamps as they burn out. Compact fluorescents use 50 to 75 percent less wattage for the same light output, with ten times the operating life of incandescents.

ENERGY STAR POWER MANAGEMENT

ENERGY STAR Power Management Program promotes placing monitors and computers (CPU, hard drive, etc.) into a low-power “sleep mode” after a period of inactivity. The estimated annual savings can range from $25 to $75 per computer. ENERGY STAR recommends setting computers to enter system standby or hibernate after 30 to 60 minutes of inactivity. Simply touching the mouse or keyboard “wakes” the computer and monitor in seconds. Activating sleep features saves energy, money, and helps protect the environment.

INSTALL ENERGY SAVING DEVICES ON VENDING MACHINE

Install energy saving devices on vending machines with non-perishable food items to reduce the equipment power usage. These devices shut the vending machines down during unoccupied periods. There are several commercially available devices that can be easily installed on existing vending machines. These devices typical have a motion sensor, which powers down the equipment after periods of inactivity. For example if the motion sensor does not sense activity within 15 minutes the device will shutdown the vending machine and turn on once motion is sensed. These devices range in price from $100 to $250 and have a typical annual savings of $20 to $150 per vending machine.

HAIL GUARDS ON CONDENSING UNITS AND PACKAGED ROOFTOP UNITS

When an HVAC unit is replaced the District should ensure the new unit be specified with hail guards. The hail guards protect the condensing unit’s heat exchanger coils from hail damage. Damage to the condensing unit heat exchangers reduces the efficiency of the units. During the preliminary walk-through, it was noted that several of the units did not have hail guards installed and showed signs of significant hail damage. It is recommended that the unit(s) condensing fins be straightened using a fin comb.

WATT WATCHER PROGRAM

Watt Watchers of Texas is a FREE energy conservation program for Texas schools sponsored by the Texas State Energy Conservation Office/ Comptroller of Public Accounts and the Department of Energy. The program is designed for K-12 classrooms the help energy conservation awareness. The program encourages student and staff participation to help schools reduce energy waste. Information regarding this program in is found in Appendix G.

TYPICAL EQUIPMENT MAINTENANCE CHECKLISTS

Effective operation and maintenance of equipment is one of the most cost effective ways to achieve reliability, safety, and efficiency. Failing to maintain equipment can cause significant energy waste and severely decrease the life of equipment. Substantial savings can result from good operation and maintenance procedures. In addition, such procedures require little time and cost to implement. Examples of typical maintenance checklists for common equipment including, boilers, chillers, building controls, pumps, fans, and electric motors, are provided in **Appendix F**. These checklists from the Federal Energy Management Program (FEMP), a branch of the Department of Energy (DOE), are based on industry standards and should supplement, not replace those provided by the manufacturer.

7.0 RETROFIT OPPORTUNITIES

Energy retrofit projects identified during the preliminary analysis are detailed below. Project cost estimates include complete design and construction management services.

REPLACE HVAC SYSTEMS

During the preliminary walkthrough, several Packaged Roof Top Units (RTUs) identified at the Uvalde High School's classroom and administration wings were near or have reached their effective operating life. The existing units are inefficient and require extensive maintenance. It is recommended the existing inefficient RTUs be replaced with new high efficiency units. The units to be replaced at Uvalde High School consist of 30 RTUs totaling approximately 163 tons. The units recommended for replacement are located near the 200s, 700s, and 800s Classroom Wings. The table below summarizes the estimated cost and savings for replacing the units.

HVAC Replacement			
Building	**Estimated Implementation Cost**	**Estimated Annual Savings**	**Payback (years)**
Uvalde High School	$326,000	$18,100	18.0
TOTAL	**$326,000**	**$18,100**	**18.0**

UPGRADE ENERGY MANAGEMENT SYSTEM (EMS)

Upgrade existing Energy Management System serving the High School's Gymnasium and Auditorium to provide remote monitoring and control capabilities. This upgrade will allow the EMS to be used as a proactive maintenance tool that can be used to remotely diagnose and document HVAC maintenance problems. Additionally, the upgrade will help to maintain up to date scheduling and provide greater access to maintenance staff. This EMS upgrade consists of software upgrades and network setup. The table below summarizes the estimated cost and savings for this EMS upgrade.

Upgrade EMS			
Building	**Estimated Implementation Cost**	**Estimated Annual Savings**	**Payback (years)**
Uvalde High School	$12,500	$1,200	10.4
TOTAL	**$12,500**	**$1,200**	**10.4**

BUILDING COMMISSIONING (Cx)

Detailed HVAC commissioning in an existing building involves analysis of existing systems to ensure compliance with original set-up/design conditions and where feasible to adjust operating parameters to enhance comfort and reduce energy consumption.

Based on the preliminary examination (utility data review, discussion with staff, and walkthrough) of the District's facilities indicated potential for energy cost savings primarily in the HVAC operations. The facilities that would benefit most from a Building Commissioning (Cx) program are the Uvalde High School Auditorium and Gym, and the Flores Middle School. The HVAC performance at these facilities can be improved by optimizing and calibrating existing controls. For example, based on a preliminary review of the original design control sequence at the High School, the dehumidification mode (at various Air Handling Units) are engaged if the relative humidity exceeds 55%, and remains there until the RH falls below 45%. If the chilled water temperature set-point is not lower than in the original design, it will not be possible to achieve an RH below 45%. This may cause the gym and auditorium to be in dehumidification mode for an extended period of time (possibly days), resulting in high energy usage. During dehumidification mode the chiller and boiler operate simultaneously to dehumidify and re-heat the supply air.

The remedy is to revise three critical control features:

1. Utilize variable air volume (VAV) control to reduce fan power usage at low loads. At lower airflow, the cooling air temperature will also be lower, assisting in control of the indoor relative humidity.
2. Reset the supply air temperature according to the fan speed and the space relative humidity so that the supply air temperature only goes as low as necessary to maintain the indoor humidity at an acceptable level (typically 65% RH) and the fan power at an economical level. (Supply air temperature should be set lower, gradually going down from around 70°F to around 55°F, as the fan speed approaches full speed and/or as the space relative humidity approaches the design setpoint.) This results in smooth control with a steady relative humidity.
3. Control ventilation (the supply of fresh, outdoor air) to more closely match the occupancy levels in these spaces. Control can be by schedule, by override timer, by CO_2 sensor, or by maintaining a fresh air fraction that matches the maximum possible fresh air to heat ratio, as best fits the application and the local ventilation code.

With the implementation of a Building Commission (Cx) program, the above items along with additional optimization opportunities can be further investigated and addressed. Commissioning measures usually have a fast payback, usually 12-60 months. Examples include chiller, boiler, air handler and terminal box service and/or adjustment, calibration of control systems and temperature settings, etc.

The goal of commissioning is to deliver a facility that operates as it was originally intended (or better), meets the needs of the building owner and occupants, and provides training of facility operators. To reach this goal it is necessary for the commissioning process to provide documentation and verification of the performance of all building equipment and systems. For the process to work successfully it is equally important to have good communications between all participants (Owners, operators and the commissioning agent) and to keep all parties involved and informed of all pertinent decisions.

At the building level, typical commissioning measures will look into opportunities to optimize the operations of HVAC equipment. Detailed commissioning measures at the building level may include the following:

1. Optimize the AHU operation
    - Develop optimal schedule for the AHUs.
    - Develop accurate occupancy schedules or sensor for variable ventilation control.
    - Develop optimal reset schedules for VAV unit discharge air temperature setpoints.
    - Develop optimal cold deck and hot deck temperature reset schedules.
    - Develop optimal duct static pressure reset strategies for VAV units.
    - Improve economizer cycle operation (if applicable).
    - Determine damper positions or suction pressures for minimum outside air intake, or provide demand-controlled ventilation.
    - Optimize air distribution where necessary.

2. Verify and calibrate the temperature and pressure sensors
    - Verify the accuracy of space temperature sensors, discharge air, cold deck and hot deck temperature sensors, as well as duct static pressure sensor and water differential pressure sensors. Calibrate the sensors if necessary.

3. Set up trends for major control parameters
    - Trending for major control parameters such as cold and hot deck temperatures, discharge air temperatures and static pressures.

4. Identify malfunctioning devices
    - Identify malfunctioning devices such as leaky valves. Reconnect damper linkages that are disconnected.

5. Reprogram control sequences where required

6. Optimize Central Plant Performance
    - Develop optimal start/stop schedules for chillers and boilers, or enact demand-controlled operation.
    - Develop optimal reset schedule for water supply temperature for chillers and boilers, or enact demand-controlled reset.
    - Develop demand-controlled reset of chilled and heating water header pressures.

The following Commissioning estimates are based on a preliminary walkthrough and available utility data analysis. Please note, included in the estimate below are the anticipated costs for items such as hardware upgrades and deferred maintenance items.

Building Commissioning (Cx)			
Building	**Estimated Implementation Cost**	**Estimated Annual Savings**	**Payback (years)**
Uvalde High School	$47,400	$10,500	4.5
Flores Middle School	$27,100	$4,900	5.5
Owner/Contractor-Deferred Maint.	$10,000	-	-
TOTAL	**$84,500**	**$15,400**	**5.5**

ELECTRIC TO NATURAL GAS BOILER REPLACEMENT

One 960 kW (3,276 MBH output) Electric Boiler supplies heating to Uvalde High School's Auditorium and Gym. Replacing the existing electric boiler to a natural gas boiler will help lower annual electric utility costs. The conversion to a natural gas heating system will help reduce the peak demand and the demand cost component of the respective electric utility account. Furthermore, if the heating system is optimized by implementing the Building Commissioning (Cx) program previously described; the capacity requirement of the new gas boiler may be reduced. Based on preliminary estimates the capacity requirement of the new gas boiler can be reduced by 40%. Therefore, the estimated cost noted in the table below is for a 2,000 MBH gas boiler. The figures noted in the table below includes complete gas boiler system replacement costs and estimated annual electrical cost savings. The estimates below are based on preliminary observations exact cost and savings can be determined during a detailed energy assessment.

Electric to Gas Boiler Replacement			
Building	**Estimated Implementation Cost**	**Estimated Annual Savings**	**Payback (years)**
Uvalde High School	$115,000	$17,600	6.5
TOTAL	**$115,000**	**$17,600**	**6.5**

The following table summarizes the implementation costs, annual savings and payback for the above projects:

SUMMARY OF ENERGY COST REDUCTION MEASURES			
Project Description	**Estimated Implementation Cost**	**Estimated Annual Savings**	**Payback (years)**
HVAC Replacement	$326,000	$18,100	18.0
Upgrade EMS	$12,500	$1,200	10.4
Building Commissioning (Cx)	$84,500	$15,400	5.5
Electric to Gas Boiler Replacement	$115,000	$17,600	6.5
TOTAL:	**$538,000**	**$52,300**	**10.3**

The above projects implementation costs and annual savings are estimated based on a preliminary examination of the facilities. Final costs will be determined from detailed building assessments, engineering calculations, and contractor estimates.

Project design (drawings and specifications), if authorized, would normally be accomplished by professional engineers. Project acquisition (competitive bidding) would be in accordance with District requirements, and construction management would be provided by the engineering group who prepared the drawings and specifications.

8.0 CAPITAL IMPROVEMENT PROJECTS

This section is intended to describe capital improvement projects that may have energy saving opportunities but cannot be solely justified based on the potential energy savings. However, these projects may be considered essential to ensure optimum system performance, enhance occupant comfort and to improve overall building efficiency. Capital improvement projects identified during the preliminary analysis are detailed below. Project cost estimates include complete design and construction management services.

REPLACE HVAC SYSTEMS

Replace one of the existing Air-Cooled Chillers serving the High School and Auditorium Gymnasium with a new high efficiency unit. The existing two (2) Air-Cooled Chillers total approximately 300 tons in cooling capacity. The existing chillers have power requirements in the 1.3 kW/ton range. Replacing the larger, 200 ton chiller with a new high efficiency centrifugal chiller (with power a requirement near 0.6 kW/ton) would improve the system's efficiency and reliability. The smaller, 100 ton air-cooled chiller could be retained as a low-load machine. This is a high capital cost item, and is more attractive if combined with a need to expand the central plant capacity. However, it is possible that the higher available efficiency over the remaining life expectancy of the existing 200 ton chiller would make the cost of early replacement to be a viable and cost effective option.

Chiller Replacement	
Building	**Estimated Implementation Cost**
Uvalde High School	425,000
TOTAL	**$425,000**

9.0 FUNDING OPTIONS FOR CAPITAL ENERGY PROJECTS

Institutional organizations have traditionally tapped bond money, maintenance dollars, or federal grants to fund energy-efficient equipment change outs or additions such as energy-efficient lighting systems, high efficiency air conditioning units, and computerized energy management control systems. Today, a broader range of funding options are available. A number of these are listed below.

Texas LoanSTAR Program

The LoanSTAR (Saving Taxes and Resources) Program, which is administered by the State Energy Conservation Office, finances energy-efficient building retrofits at a current interest rate of 3 percent. The program's revolving loan mechanism allows borrowers to repay loans through the stream of cost savings realized from the projects. Projects financed by LoanSTAR must have an average simple payback of ten years or less and must be analyzed in an Energy Assessment Report by a Professional Engineer. Upon final loan execution, the School District proceeds to implement funded projects through the traditional bid/specification process. Contact: Theresa Sifuentes (512/463-1896).

Internal Financing

Improvements can be paid for by direct allocations of revenues from an organization's currently available operating or capital funds (bond programs). The use of internal financing normally requires the inclusion and approval of energy-efficiency projects within an organization's annual operating and capital budget-setting process. Often, small projects with high rate of return can be scheduled for implementation during the budget year for which they are approved. Large projects can be scheduled for implementation over the full time period during which the capital budgets is in place. Budget constraints, competition among alternative investments, and the need for higher rates of return can significantly limit the number of internally financed energy-efficiency improvements.

Private Lending Institutions or Leasing Corporations

Banks, leasing corporations, and other private lenders have become increasingly interested in the energy efficiency market. The financing vehicle frequently used by these entities is a municipal lease. Structured like a simple loan, a municipal leasing agreement is usually a lease-purchase arrangement. Ownership of the financed equipment passes to the School District at the beginning of the lease, and the lessor retains a security interest in the purchase until the loan is paid off. A typical lease covers the total cost of the equipment and may include installation costs. At the end of the contract period the lessee pays a nominal amount, usually a dollar, for title to the equipment.

Performance Contracting with an Energy Service Company

Through this arrangement, an energy service company (ESCO) uses third party financing to implement a comprehensive package of energy management retrofits for a facility. This turnkey service includes an initial assessment by the contractor to determine the energy-saving potential for a facility, design work for identified projects, purchase and installation of equipment, and overall project management. The ESCO guarantees that the cost savings generated by the projects will, at a minimum, cover the annual payment due to the ESCO over the term of the contract.

Utility Sponsored Energy Efficiency Incentive Programs

Many of the State's utilities offer energy efficiency incentive programs to offset a portion of the upfront cost associated with energy efficiency measures. The program requirements and incentives range from utility to utility. For example, certain utility providers provide incentives for efficiency measures such as installation of high efficiency equipment, lighting upgrades, and building commissioning. These energy efficiency programs' incentives typically cover $0.06/kWh and $175/kW of verifiable energy and demand reductions, respectively. For further information, contact your utility provider to determine what programs are available in your area.

10.0 ENERGY MANAGEMENT POLICY

By requesting this study, the District has demonstrated interest in taking a more aggressive approach to energy management. In order to establish an effective Energy Management Program it should have support from top management. An Energy Management Policy adopted by the school board sends a strong signal that energy management is an institutional priority. A formal Energy Management Policy can be as simple as a two-page document that clearly states the District's energy management objectives. The policy should cover items such as:

- who is accountable for energy management
- what your energy savings targets are
- how you will monitor, review and report on progress
- staffing and training to support the policy
- criteria for energy management investment
- working energy efficiency into new capital investments

Along with a clear energy **policy** an energy management **plan** should be developed to ensure sustained energy savings. The energy management plan is a document that details roles, responsibilities, and objectives. Following are key items that should be included in an energy management plan:

1. ESTABLISH ROUTINE ENERGY TRACKING AND REPORTING PROCEDURES Establishing a procedures to monitor energy usage and cost will help identify energy use patterns. The data will also help determine the effectiveness of the Energy Management Program.

2. ESTABLISH AN ENERGY MANAGEMENT STEERING COMMITTEE The Energy Management Steering Committee will include representatives from a cross section of the District. The steering committee will serve as a review board to evaluate all energy management recommendations before adoption and implementation. The steering committee will meet **quarterly or semiannually** to review the District's energy cost and consumption. Regular meetings will ensure the Districts goals are being met prior to the end of the year.

3. PROMOTE ENERGY AWARENESS The energy management steering committee members shall establish a program to publicize the District's energy goals and progress on a **quarterly or semiannually** basis. For example, student drawn posters of the District's energy savings can be placed in hallways. This will encourage student involvement and act as an educational tool. Continuous promotion of the District's goals will ensure the sustainability of the energy management program and help achieve further energy savings. **In addition, considering participating in the SECO sponsored WattWatchers program will help accomplish this task, see Appendix G for further information regarding this program.**

4. <u>ESTABLISH ACCEPTABLE EQUIPMENT PARAMETERS</u> Establish a District-wide uniform temperature set point for all HVAC units. Having a standard setpoint will help keep HVAC runtimes to a minimum. The following are some suggested temperature settings, however, the district will need to monitor and ensure that other building parameters (humidity levels etc.) are within acceptable limits. Also, areas with special equipment (MDF/IDF, server rooms, etc.) or materials (wood flooring, paper storage, etc.) shall be maintained at the equipment supplier's recommended settings and settings appropriate to the material.

Occupied Cooling Temperature Setpoints:
Instructional Areas 74 F – 76 F
Admin Areas 72 F – 74 F

Unoccupied Cooling Temperature Setpoints:
Instructional Areas 85 F
Admin Areas 85 F

Occupied Heating Temperature Setpoints:
Instructional Areas 68 F – 70 F
Admin Areas 68 F – 70 F

Unoccupied Heating Temperature Setpoints:
Instructional Areas 55 F
Admin Areas 55 F

5. <u>STAFF INCENTIVES AND RECOGNITION PROGRAM</u> Establishing a student, staff and campus incentive and recognition program would help promote and encourage support from staff and custodial members. The District may consider implementing a staff incentive and recognition program. Following are some program examples.

- The energy accounting system can be used to monitor cost savings and compare it to the base year consumption. An energy incentive plan consisting of a 50-50 sharing with the school campus and the Energy Management Program could be employed. The school would get 50% of the savings resulting from energy cost reduction. The school would be free to use the money for educational programs such as materials, supplies, etc. The other 50% would be used for continuing energy management efforts. The following is an example of the Building savings summary report.

  EXAMPLE:

  High School - Annual Total Electric Cost

Baseline (2006 - 07)	Current (2007 - 08)	Savings	50% Savings
$248,483	$240,483	$8,000	$4,000

In this example, the High School saved $8,000 where 50% ($4,000) will be assigned to the school. This money will be paid on October of the following fiscal year.

- ❖ An energy flag program will be implemented. There will be three energy flags, one flag per each grade level. This energy flags will be awarded to the schools exhibiting the greatest percentage reduction in energy costs. Energy flags will be awarded on a rotating basis each summer. In order to provide motivation, maintain enthusiasm, and recognize individuals doing their part to save the District taxpayers money through the Energy Management Program, the local media (including district newsletters) will be informed of the Energy flag results. The energy flag will be awarded on January and August of each year based on the energy consumption of the previous four months.

- ❖ The successes of the program should also be communicated to the public through the media to show what the District is doing to reduce costs to taxpayers.

6. <u>NEW BUILDING AND CONSTRUCTION</u> Ensure proper maintenance and operation of energy using equipment in new buildings by required adequate documentation of all systems and control strategies, specifying minimum content of M&O manuals; specifying contractor requirements for cleaning and adjusting equipment prior to occupancy; specifying on-site vendor training for M&O staff; and requiring as-built drawings.

7. <u>ESTABLISH A WATER MANAGEMENT PROGRAM</u> Along with saving energy the District shall a establish a program to reduce water consumption. The following conservation measures shall be employed.

   a. Investigate the use of water conserving faucets, showerheads, and toilets in all new and existing facilities.
   b. Utilize water-previous materials such as gravel, crushed stone, open paving blocks or previous paving blocks for walkways and patios to minimize runoff and increase infiltration.
   c. Employ Xeriscaping, using native plants that are well suited to the local climate, that are drought-tolerant and do not require supplemental irrigation.
   d. Utilize drip irrigation systems for watering plants in beds and gardens.
   e. Install controls to prevent irrigation when the soil is wet from rainfall.
   f. Establish a routine check of water consuming equipment for leaks and repair equipment immediately.

11.0 ANALYST IDENTIFICATION

Texas Energy Engineering Services, Inc.
Capital View Center, Suite B-325
1301 Capital of Texas Highway
Austin, Texas 78746
(512) 328-2533

M. Saleem Khan, P.E., CxA
Thomas Glass, P.E.
David Rocha, LEED-AP

APPENDICES

APPENDIX A

SENATE BILL 12 AND HOUSE BILL 3693 SUMMARY

How to comply with SB12 & HB 3693

What you need to know about Texas Senate Bill 12

The passage of Senate Bill 12 (SB12) by the 80th Texas Legislature signified the continuance of Senate Bill 5 (SB5), the 77th Texas Legislature's sweeping approach in 2001 to clean air and encourage energy efficiency in Texas. SB12 was enacted on September 1, 2007 and was crafted to continue to assist the state and its political jurisdictions to conform to the standards set forth in the Federal Clean Air Act. The bill contains energy-efficiency strategies intended to decrease energy consumption while improving air quality.

All political subdivisions in the 41 non-attainment or near non-attainment counties in Texas are required to:

*1) Adopt a goal to reduce electric consumption by 5 percent each year for six years, beginning September 1, 2007**

2) Implement all cost-effective energy-efficiency measures to reduce electric consumption by existing facilities. (Cost effectiveness is interpreted by this legislation to provide a 20 year return on investment.)

3) Report annually to the State Energy Conservation Office (SECO) on the entity's progress, efforts and consumption data.

*Note: The recommended baseline data for those reporting entities will consist of the jurisdiction's 2006 energy consumption for its facilities and based on the State Fiscal Year (September 1, 2006 to August 31, 2007).

What you need to know about Texas House Bill 3693

The passage of House Bill 3693 (HB3693) by the 80th Texas Legislature is intended to provide additional provisions for energy-efficiency in Texas. Adopted with an effective date of September 1, 2007, HB 3693 is an additional mechanism by which the state can encourage energy-efficiency through various means for School Districts, State Facilities and Political Jurisdictions in Texas.

HB 3693 includes the following state-wide mandates that apply differently according to the nature and origin of the entity:

Record, Report and Display Consumption Data

All Political Subdivisions, School Districts and State-Funded Institutes of Higher Education, are mandated to record and report the entity's metered resource consumption usage data for electricity, natural gas and water on a publically accessible internet page. *Note: The format, content and display of this information are determined by the entity or subdivision providing this information.*

Energy Efficient Light Bulbs

All School Districts and State-Funded Institutes of Higher Education shall purchase and use energy-efficient light bulbs in education and housing facilities.

Who must comply?

The provisions in this bill will apply to entities including: Cities and Counties; School Districts; Institutes of Higher Education; State Facilities and Buildings.

How do you define energy-efficiency measures?

Energy-efficiency measures are defined as any facility modifications or changes in operations that reduce energy consumption. Energy-efficiency is a strategy that has the potential to conserve resources, save money** and better the quality of our air. They provide immediate savings and add minimal costs to your project budget.

Examples of energy-efficiency measures include:

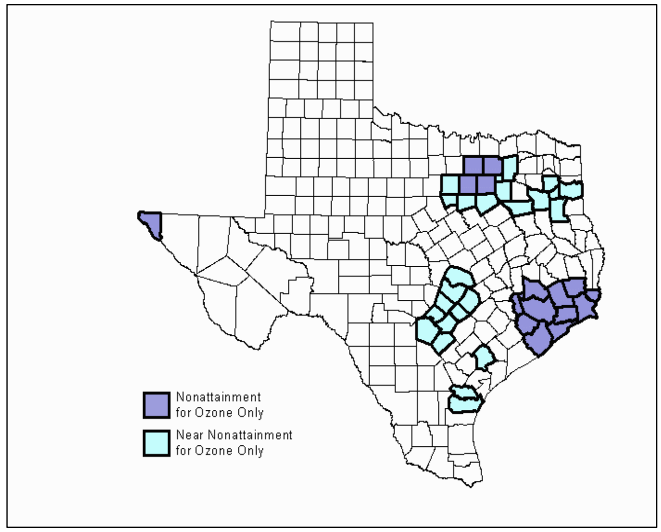
• installation of insulation and high-efficiency windows and doors • modifications or replacement of HVAC systems, lighting fixtures and electrical systems • installation of automatic energy control systems • installation of energy recovery systems or renewable energy generation equipment • building commissioning • development of energy efficient procurement specifications • employee awareness campaigns

***SECO's Preliminary Energy Assessment (PEA) program is an excellent resource for uncovering those energy-efficiency measures that can benefit your organization.*

What counties are affected?

All political jurisdictions located in the following Non-attainment and affected counties:

Bastrop Bexar Brazoria Caldwell Chambers Collin
Comal Dallas Denton El Paso Ellis Fort Bend
Galveston Gregg Guadalupe Hardin Harris Harrison
Hays Henderson Hood Hunt Jefferson Johnson
Kaufman Liberty Montgomery Nueces Orange Parker
Rockwall Rusk San Patricio Smith Tarrant Travis
Upshur Victoria Waller Williamson Wilson



What assistance is available for affected areas?

The Texas Energy Partnership is a partner with Energy Star©, who partners across the nation with the goal of improving building performance, reducing air emissions through reduced energy demand, and enhancing the quality of life through energy-efficiency and renewable energy technologies.

To assist jurisdictions, the Texas Energy Partnership will:

- Present workshops and training seminars in partnership with private industry on a range of topics that include energy services, financing, building technologies and energy performance rating and benchmarking
- Prepare information packages – containing flyers, documents and national lab reports about energy services, management tools and national, state and industry resources that will help communities throughout the region
- Launch an electronic newsletter to provide continuous updates and develop additional information packages as needed

Please contact Stephen Ross at 512-463-1770 for more information.

SECO Program Contact Information

LoanSTAR;
Preliminary Energy Assessments:
Theresa Sifuentes - 512-463-1896
Theresa.Sifuentes@cpa.state.tx.us

Schools Partnership Program:
Glenda Baldwin - 512-463-1731
Glenda.Baldwin@cpa.state.tx.us

Engineering (Codes / Standards):
Felix Lopez - 512-463-1080
Felix.Lopez@cpa.state.tx.us

Innovative / Renewable Energy:
Pamela Groce - 512-463-1889
pam.groce@cpa.state.tx.us

Energy / Housing Partnership Programs:
Stephen Ross - 512-463-1770
Stephen.Ross@cpa.state.tx.us

Alternate Fuels / Transportation:
Mary-Jo Rowan - 512-463-2637
Mary-Jo.Rowan@cpa.state.tx.us

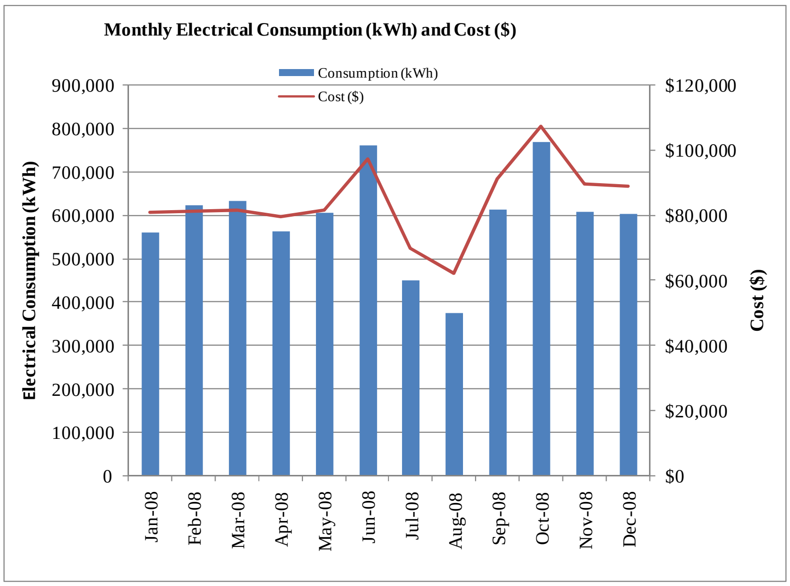
APPENDIX B

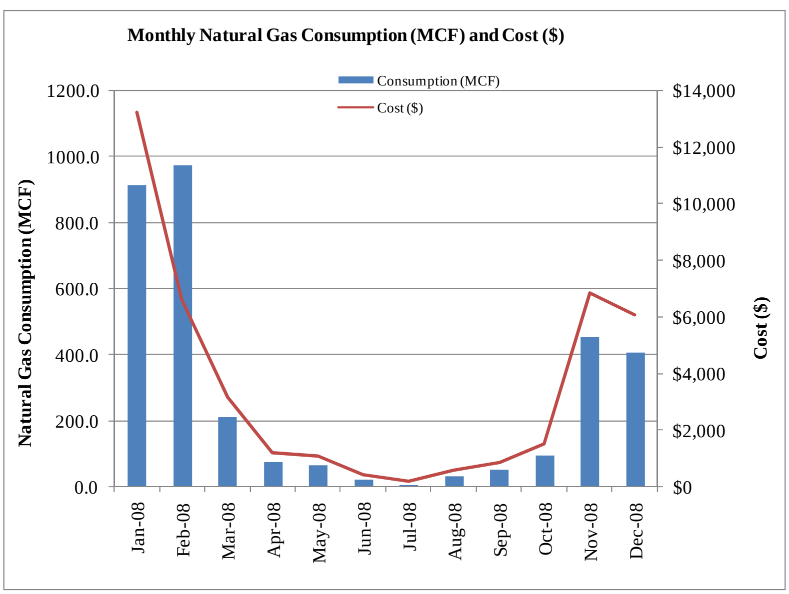
SAMPLE UTILITY DATA REPORTING FORM

Uvalde ISD - Sample Utility Data Input Form

MONTH	ELECTRICITY			NATURAL GAS			WATER		
	KWH	COST $	$/KWH	MCF	COST $	$/MCF	GAL	COST $	$/GAL
Jan-08	558,991	$80,581	$0.1442	911.1	$13,207	$14.5			
Feb-08	622,492	$80,856	$0.1299	970.9	$6,609	$6.8			
Mar-08	632,005	$81,244	$0.1286	207.3	$3,168	$15.3			
Apr-08	561,487	$79,273	$0.1412	72.1	$1,177	$16.3			
May-08	604,952	$81,354	$0.1345	63.6	$1,053	$16.5			
Jun-08	758,508	$96,992	$0.1279	19.4	$404	$20.9			
Jul-08	448,880	$69,543	$0.1549	3.8	$176	$46.4			
Aug-08	373,643	$61,947	$0.1658	28.8	$544	$18.9			
Sep-08	611,380	$90,926	$0.1487	48.7	$836	$17.2			
Oct-08	767,586	$107,062	$0.1395	93.6	$1,496	$16.0			
Nov-08	607,514	$89,475	$0.1473	452.2	$6,844	$15.1			
Dec-08	601,568	$88,625	$0.1473	403.2	$6,051	$15.0			
Total	7,149,006	$1,007,879	$0.1410	3,275	$41,564	$12.7			

Gross Building Area:	720,962	SF





APPENDIX C

BASE YEAR
CONSUMPTION HISTORY

Energy Cost and Cosumption Benchmarks

		Electric*		Natural Gas		Total	Total	EUI	ECI	
	Building	KWH/Yr	$Cost/Yr	MCF/Yr	$Cost/Yr	$Cost/Yr	MMBTU/Yr	kBTU/SF/Yr	$/SF/Yr	SF
1	Uvalde High School	2,818,865	401,954	404	6,047	408,002	10,037	42.8	1.74	234,286
2	Uvalde Jr. High	822,880	111,687	529	7,889	119,576	3,353	30.0	1.07	111,593
3	Batesville Elem. & Middle School	182,960	29,414	0	0	29,414	624	16.9	0.79	37,038
4	Benson Elem.	425,688	57,420	577	8,427	65,847	2,047	33.8	1.09	60,544
5	Dalton Elem.	492,312	68,258	4	176	68,434	1,684	26.7	1.08	63,087
6	Robb Elem.	522,356	71,097	217	3,376	74,474	2,006	33.6	1.25	59,783
7	Flores Middle School	698,460	92,062	872	12,917	104,978	3,282	32.6	1.04	100,594
8	Anthon Elem.	452,388	67,297	1	141	67,438	1,545	28.6	1.25	54,037
9	Central Office Complex	467,136	61,355	28	632	61,987	1,623	N/A	N/A	N/A
10	Excel Academy	93,148	15,784	615	1,407	17,191	951	N/A	N/A	N/A
11	Alternative Education Center	33,376	5,794	0	0	5,794	114	N/A	N/A	N/A
12	Bus Barn	60,131	8,737	0	0	8,737	205	N/A	N/A	N/A
13	Barn & Fuel Pump - Batesville	1,301	398	0	0	398	4	N/A	N/A	N/A
14	Tennis Center	27,888	4,775	0	0	4,775	95	N/A	N/A	N/A
15	UCISD Honeybowl Football Stadium	50,117	11,845	29	552	12,397	201	N/A	N/A	N/A
		KWH/Yr	$Cost/Yr	MCF/Yr	$Cost/Yr	$Cost/Yr	MMBTU/Yr	kBTU/SF/Yr	$/SF/Yr	SF
		7,149,006	1,007,879	3,275	41,564	1,049,443	27,772	34.1	1.30	720,962

	10032789495717880 10032789478792240
	10032789438406420 10032789450022220
ACCOUNT#	10032789416118230 Electric
	Gas
BUILDING:	Uvalde High School

District: Uvalde CISD

FLOOR AREA: 234,286

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	235,394				33,394	150	2,202
February	2008	282,903				35,683	59	865
March	2008	289,704				36,364	25	382
April	2008	223,891				32,453	10	153
May	2008	215,546				32,255	6	96
June	2008	294,938				39,521	1	22
July	2008	169,731				26,852	1	18
August	2008	139,096				24,079	1	18
September	2008	213,495				32,655	0	10
October	2008	276,446				38,408	23	354
November	2008	222,865				33,622	53	791
December	2008	254,856				36,668	77	1,135
TOTAL		2,818,865				401,954	404.4	6,047

Annual Total Energy Cost = 408,002 $/year

Total KWH/yr x 0.003413 = 9,620.79 MMBTU/year
Total MCF/yr x 1.03 = 416.54 MMBTU/year
Total Other x ________ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 10,037 MMBTU/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = 43 kBTU/SF/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = 1.74 $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: City of Uvalde

ACCOUNT#	10032789400613137 10032789400228290 10032789433784712 10032789400228291 Electric
	Gas
BUILDING:	Uvalde Jr. High

District: Uvalde CISD

FLOOR AREA: 111,593

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	63,220				8,909	125	1,855
February	2008	69,340				8,762	89	1,311
March	2008	67,180				8,409	75	1,112
April	2008	64,740				8,615	29	439
May	2008	70,380				9,226	30	454
June	2008	103,900				12,768	5	85
July	2008	35,100				5,945	3	48
August	2008	30,420				5,413	11	166
September	2008	64,300				9,651	21	324
October	2008	106,860				13,883	29	435
November	2008	76,500				10,383	45	670
December	2008	70,940				9,722	67	989
TOTAL		822,880				111,687	528.5	7,889

Annual Total Energy Cost = 119,576 $/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = 30 kBTU/SF/year

Total KWH/yr x 0.003413 = 2,808.49 MMBTU/year
Total MCF/yr x 1.03 = 544.36 MMBTU/year
Total Other x ________ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 3,353 MMBTU/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = 1.07 $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: City of Uvalde

410038010-003 410038010-004 410038010-012

ACCOUNT# 410038010-013 Electric

Gas

District: Uvalde CISD

BUILDING: Batesville Elem. & Middle School

FLOOR AREA: 37,038

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	16,280				2,461		
February	2008	11,240				1,971		
March	2008	19,200				2,712		
April	2008	19,640				2,802		
May	2008	14,120				2,284		
June	2008	10,040				1,901		
July	2008	15,360				2,439		
August	2008	19,920				2,929		
September	2008	19,320				2,967		
October	2008	11,040				2,108		
November	2008	13,320				2,411		
December	2008	13,480				2,428		
TOTAL		182,960				29,414		

Annual Total Energy Cost = 29,414 $/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 17 kBTU/SF/year

Total KWH/yr x 0.003413 = 624.44 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x ________ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 624 MMBTU/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 0.79 $/SF/year

Electric Utility: Medina Electric Co-Op

Gas Utility: N/A

District: Uvalde CISD

ACCOUNT# 10032789476123429 10032789485300434 Electric

Gas

BUILDING: Benson Elem. FLOOR AREA: 60,544

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	27,474				3,901	192.2	2,550
February	2008	31,698				4,005	128.7	1,911
March	2008	33,234				4,160	7.6	132
April	2008	33,234				4,386	2.3	54
May	2008	40,530				5,171	1.7	46
June	2008	50,322				6,445	0.6	29
July	2008	19,218				3,201	0.0	20
August	2008	21,138				3,350	0.1	21
September	2008	44,754				6,114	0.3	25
October	2008	50,322				6,619	16.8	268
November	2008	40,146				5,365	134.9	2,003
December	2008	33,618				4,703	91.7	1,369
TOTAL		425,688				57,420	576.7	8,427

Annual Total Energy Cost = 65,847 $/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = 34 kBTU/SF/year

Total KWH/yr x 0.003413 = 1,452.87 MMBTU/year
Total MCF/yr x 1.03 = 594.02 MMBTU/year
Total Other x ________ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 2,047 MMBTU/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = 1.09 $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: City of Uvalde

10032789426356000 10032789418379681

ACCOUNT# 10032789418379680 Electric

Gas

District: Uvalde CISD

BUILDING: Dalton Elem.

FLOOR AREA: 63,087

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	34,002				5,071	0.67	20
February	2008	42,642				5,780	0.49	18
March	2008	40,722				5,289	0.36	15
April	2008	30,354				4,480	0.36	15
May	2008	44,562				5,234	0.32	15
June	2008	61,458				6,926	0.00	10
July	2008	23,634				4,010	0.01	10
August	2008	19,986				3,590	0.15	12
September	2008	35,154				5,458	0.18	13
October	2008	65,106				9,003	0.27	15
November	2008	51,858				7,257	0.50	18
December	2008	42,834				6,159	0.36	15
TOTAL		492,312				68,258	3.7	176

Annual Total Energy Cost = 68,434 $/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 27 kBTU/SF/year

Total KWH/yr x 0.003413 = 1,680.26 MMBTU/year

Total MCF/yr x 1.03 = 3.78 MMBTU/year

Total Other x ________ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 1,684 MMBTU/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 1.08 $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: City of Uvalde

	10032789456112770 10032789450598576
ACCOUNT#	10032789419250341 10032789419250342 Electric
	Gas
BUILDING:	Robb Elem.

District: Uvalde CISD

FLOOR AREA: 59,783

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	34,479				4,878	51	764
February	2008	37,199				4,774	27	401
March	2008	40,527				5,116	13	204
April	2008	38,543				5,254	15	232
May	2008	51,167				6,512	13	195
June	2008	60,223				7,488	5	81
July	2008	43,791				6,148	0	13
August	2008	24,559				4,022	12	192
September	2008	59,215				8,074	14	213
October	2008	51,471				7,138	16	246
November	2008	45,599				6,418	23	415
December	2008	35,583				5,275	28	422
TOTAL		522,356				71,097	216.5	3,376

Annual Total Energy Cost = 74,474 $/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = 34 kBTU/SF/year

Total KWH/yr x 0.003413 = 1,782.80 MMBTU/year
Total MCF/yr x 1.03 = 223.00 MMBTU/year
Total Other x ________ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 2,006 MMBTU/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = 1.25 $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: City of Uvalde

District: Uvalde CISD

ACCOUNT# 1032789484832790 10032789497786750 Electric
Gas

BUILDING: Flores Middle School FLOOR AREA: 100,594

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	50,505				6,746	367	5,401
February	2008	45,705				5,808	126	1,857
March	2008	54,105				6,702	78	1,161
April	2008	50,205				6,653	12	192
May	2008	60,705				6,825	12	186
June	2008	79,605				8,994	7	118
July	2008	61,305				8,397	0	17
August	2008	33,705				5,240	5	79
September	2008	53,805				7,761	9	145
October	2008	88,605				12,046	0	0
November	2008	63,405				8,938	145	2,138
December	2008	56,805				7,951	110	1,624
TOTAL		698,460				92,062	871.6	12,917

Annual Total Energy Cost = 104,978 $/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = 33 kBTU/SF/year

Total KWH/yr x 0.003413 = 2,383.84 MMBTU/year
Total MCF/yr x 1.03 = 897.80 MMBTU/year
Total Other x ________ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 3,282 MMBTU/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = 1.04 $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: City of Uvalde

ACCOUNT# 10032789416368500 10032789436869443 10032789482641730 Electric

Gas

District: Uvalde CISD

BUILDING: Anthon Elem.

FLOOR AREA: 54,037

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	37,749				6,180	0	12
February	2008	40,749				5,563	0	12
March	2008	32,049				4,563	0	12
April	2008	45,549				6,247	0	12
May	2008	45,549				5,635	0	11
June	2008	31,449				4,401	0	10
July	2008	13,749				2,847	0	10
August	2008	28,749				4,774	0	12
September	2008	53,349				7,726	0	13
October	2008	47,649				7,050	0	13
November	2008	38,949				5,988	0	12
December	2008	36,849				6,323	0	12
TOTAL		452,388				67,297	1.3	141

Annual Total Energy Cost = 67,438 $/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = 29 kBTU/SF/year

Total KWH/yr x 0.003413 = 1,544.00 MMBTU/year
Total MCF/yr x 1.03 = 1.31 MMBTU/year
Total Other x ________ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 1,545 MMBTU/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = 1.25 $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: City of Uvalde

ACCOUNT# 10032789421951740 10032789440291740 10032789406084181 10032789497528520 10032789419133228 Electric

Gas

BUILDING: Central Office Complex

District: Uvalde CISD

FLOOR AREA: N/A

		Electrical					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
February	2008	36,770				5,028	10.0	164
March	2008	36,037				4,651	4.4	83
April	2008	32,987				4,343	2.4	53
May	2008	33,143				4,534	0.3	23
June	2008	34,958				4,162	0.0	18
July	2008	41,483				4,768	0.0	18
August	2008	47,736				6,167	0.0	18
September	2008	42,877				5,644	0.0	18
October	2008	45,337				5,993	0.0	18
November	2008	45,897				6,072	0.5	26
December	2008	33,976				4,756	5.7	107
January	2009	35,935				5,237	4.6	86
TOTAL		467,136				61,355	27.9	632

Annual Total Energy Cost = 61,987 $/year

Total KWH/yr x 0.003413 = 1,594.34 MMBTU/year
Total MCF/yr x 1.03 = 28.69 MMBTU/year
Total Other x ________ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 1,623 MMBTU/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: City of Uvalde

ACCOUNT# 10032789444259490 10032789465348340 10032789457235192 10032789444259491 Electric

Gas

District: Uvalde CISD

BUILDING: Excel Academy

FLOOR AREA: N/A

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	10,604				1,680	15	228
February	2008	10,820				1,604	534	98
March	2008	8,903				1,414	1	22
April	2008	10,669				1,607	1	19
May	2008	13,099				1,729	1	22
June	2008	8,003				1,247	1	22
July	2008	7,113				1,271	0	11
August	2008	1,886				710	0	11
September	2008	5,435				1,101	0	11
October	2008	4,822				1,036	3	55
November	2008	4,830				1,050	39	586
December	2008	6,964				1,332	21	322
TOTAL		93,148				15,784	615.0	1,407

Annual Total Energy Cost = 17,191 $/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Total KWH/yr x 0.003413 = 317.91 MMBTU/year
Total MCF/yr x 1.03 = 633.45 MMBTU/year
Total Other x ________ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 951 MMBTU/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: City of Uvalde

District: Uvalde CISD

ACCOUNT# 100327894222173310 Electric

Gas

BUILDING: Alternative Education Center

FLOOR AREA: N/A

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	2,407				501		
February	2008	3,192				512		
March	2008	3,193				497		
April	2008	2,789				524		
May	2008	3,343				488		
June	2008	4,497				581		
July	2008	1,657				360		
August	2008	1,365				332		
September	2008	2,323				448		
October	2008	3,237				554		
November	2008	2,453				469		
December	2008	2,920				530		
TOTAL		33,376				5,794		

Annual Total Energy Cost = 5,794 $/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Total KWH/yr x 0.003413 = 113.91 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x ________ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 114 MMBTU/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: N/A

ACCOUNT# 10032789493528241 10032789403749200
10032789400568670 10032789403749201
10032789403749203 10032789403749202
10032789403749204 Electric

Gas

BUILDING: Bus Barn

District: Uvalde CISD

FLOOR AREA: N/A

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	4,613				723		
February	2008	4,495				609		
March	2008	4,166				577		
April	2008	4,085				636		
May	2008	4,734				633		
June	2008	5,869				709		
July	2008	5,511				804		
August	2008	5,354				789		
September	2008	5,974				875		
October	2008	6,000				883		
November	2008	4,942				784		
December	2008	4,388				716		
TOTAL		60,131				8,737		

Annual Total Energy Cost = 8,737 $/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Total KWH/yr x 0.003413 = 205.23 MMBTU/year
Total MCF/yr x 1.03 = 0.00 MMBTU/year
Total Other x ________ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 205 MMBTU/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: N/A

District: Uvalde CISD

ACCOUNT# 410038010-001 Electric

Gas

BUILDING: Barn & Fuel Pump - Batesville FLOOR AREA: N/A

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	127				34		
February	2008	102				32		
March	2008	109				32		
April	2008	92				31		
May	2008	84				30		
June	2008	106				32		
July	2008	92				31		
August	2008	95				32		
September	2008	128				36		
October	2008	100				33		
November	2008	138				38		
December	2008	128				36		
TOTAL		1,301				398		

Energy Use Index:

Annual Total Energy Cost = 398 $/year

Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Total KWH/yr x 0.003413 = 4.44 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x ________ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 4 MMBTU/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: Medina Electric Co-Op

Gas Utility: N/A

ACCOUNT# 10032789437281321 10032789410313600 10032789485598620 Electric

Gas

District: Uvalde CISD

BUILDING: Tennis Center

FLOOR AREA: N/A

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	1,086		6		147	0	0
February	2008	1,057		5		121	0	0
March	2008	1,646		7		186	0	0
April	2008	1,868		6		239	0	0
May	2008	2,225		6		248	0	0
June	2008	2,855		6		316	0	0
July	2008	2,629		5		353	0	0
August	2008	2,259		5		326	0	0
September	2008	3,887		58		813	0	0
October	2008	3,682		59		798	0	0
November	2008	1,938		59		568	0	0
December	2008	2,756		59		660	0	0
TOTAL		27,888				4,775	0.0	0

Annual Total Energy Cost = 4,775 $/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Total KWH/yr x 0.003413 = 95.18 MMBTU/year
Total MCF/yr x 1.03 = 0.00 MMBTU/year
Total Other x ________ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 95 MMBTU/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: Reliant/AEP

Gas Utility: N/A

ACCOUNT# 10032789439654951 10032789438751690 10032789428105001 10032789438751691 10032789438751692 Electric

Gas

District: Uvalde CISD

BUILDING: UCISD Honeybowl Football Stadium

FLOOR AREA: N/A

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
January	2008	4,281		14		928	0.00	12
February	2008	5,313		39		981	2.90	53
March	2008	4,280		48		881	4.50	76
April	2008	2,685		36		812	1.85	37
May	2008	3,950		43		920	0.00	10
June	2008	3,760		47		895	0.00	10
July	2008	2,254		8		716	0.00	10
August	2008	2,234		9		718	0.26	14
September	2008	4,904		62		1,253	3.70	65
October	2008	6,349		67		1,430	5.03	85
November	2008	6,595		62		1,427	6.36	104
December	2008	3,512		10		884	4.50	77
TOTAL		50,117				11,845	29.1	552

Annual Total Energy Cost = 12,397 $/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Total KWH/yr x 0.003413 = 171.05 MMBTU/year

Total MCF/yr x 1.03 = 29.97 MMBTU/year

Total Other x ________ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 201 MMBTU/year

Energy Cost Index:

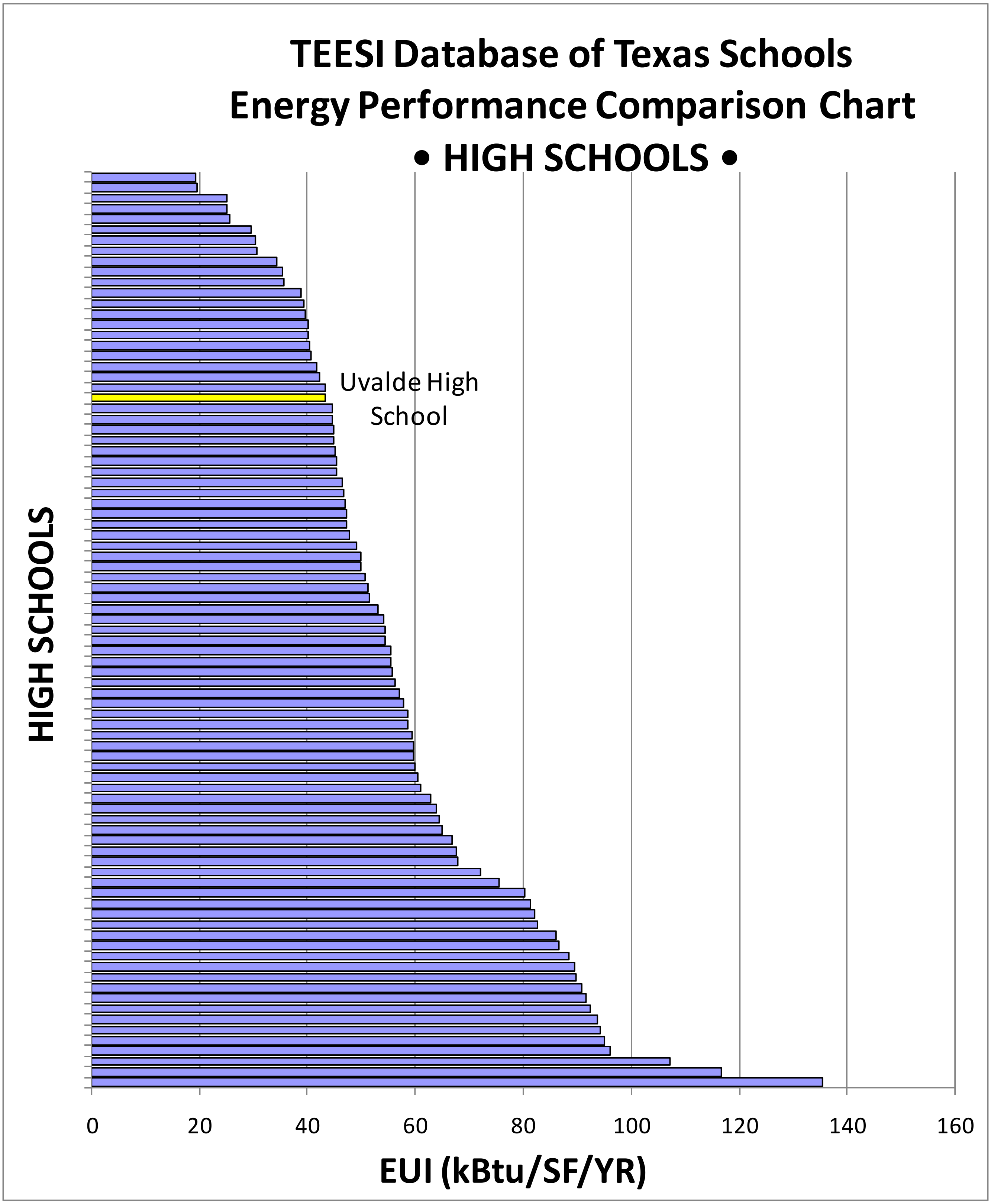
Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: Reliant/AEP

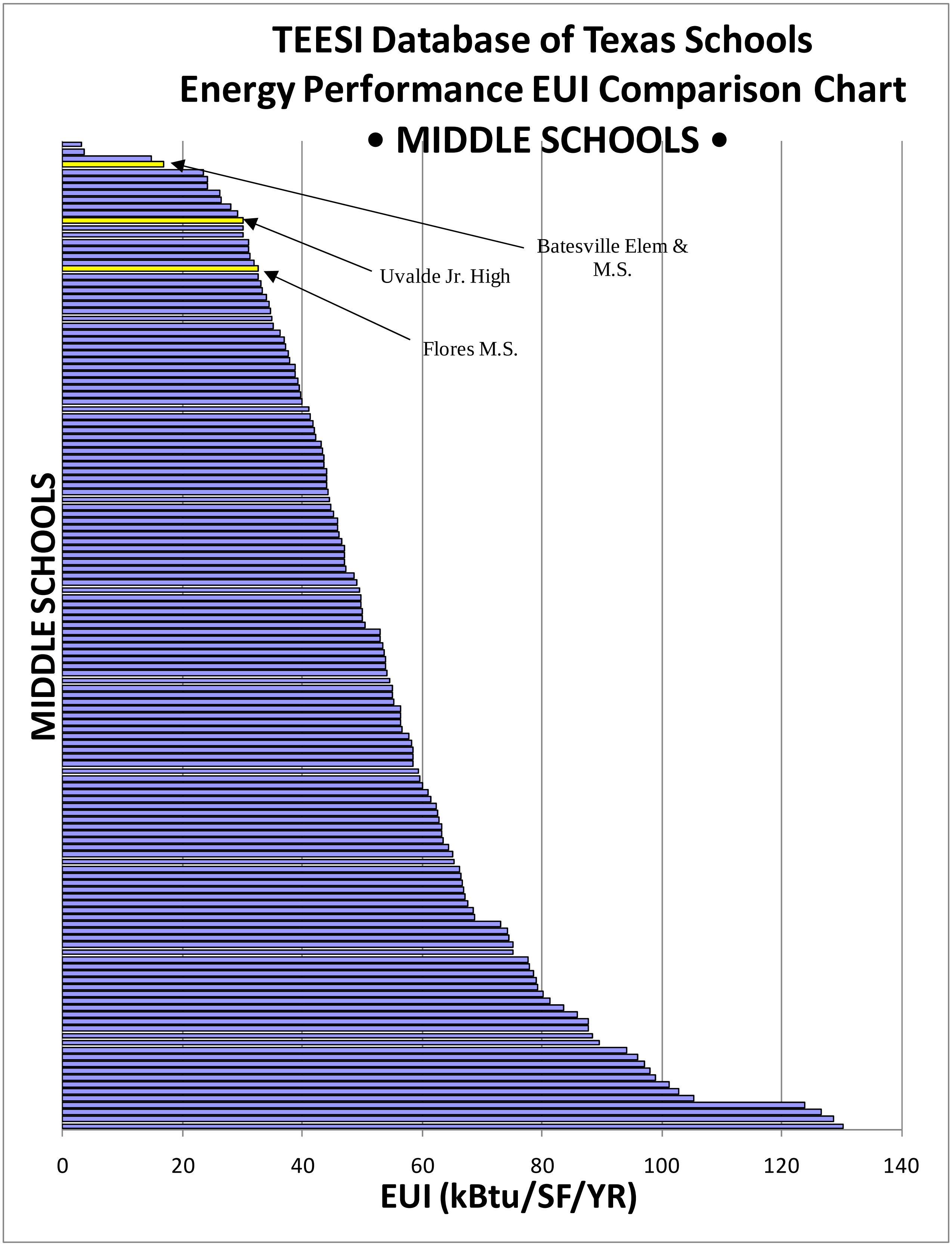
Gas Utility: City of Uvalde

APPENDIX D

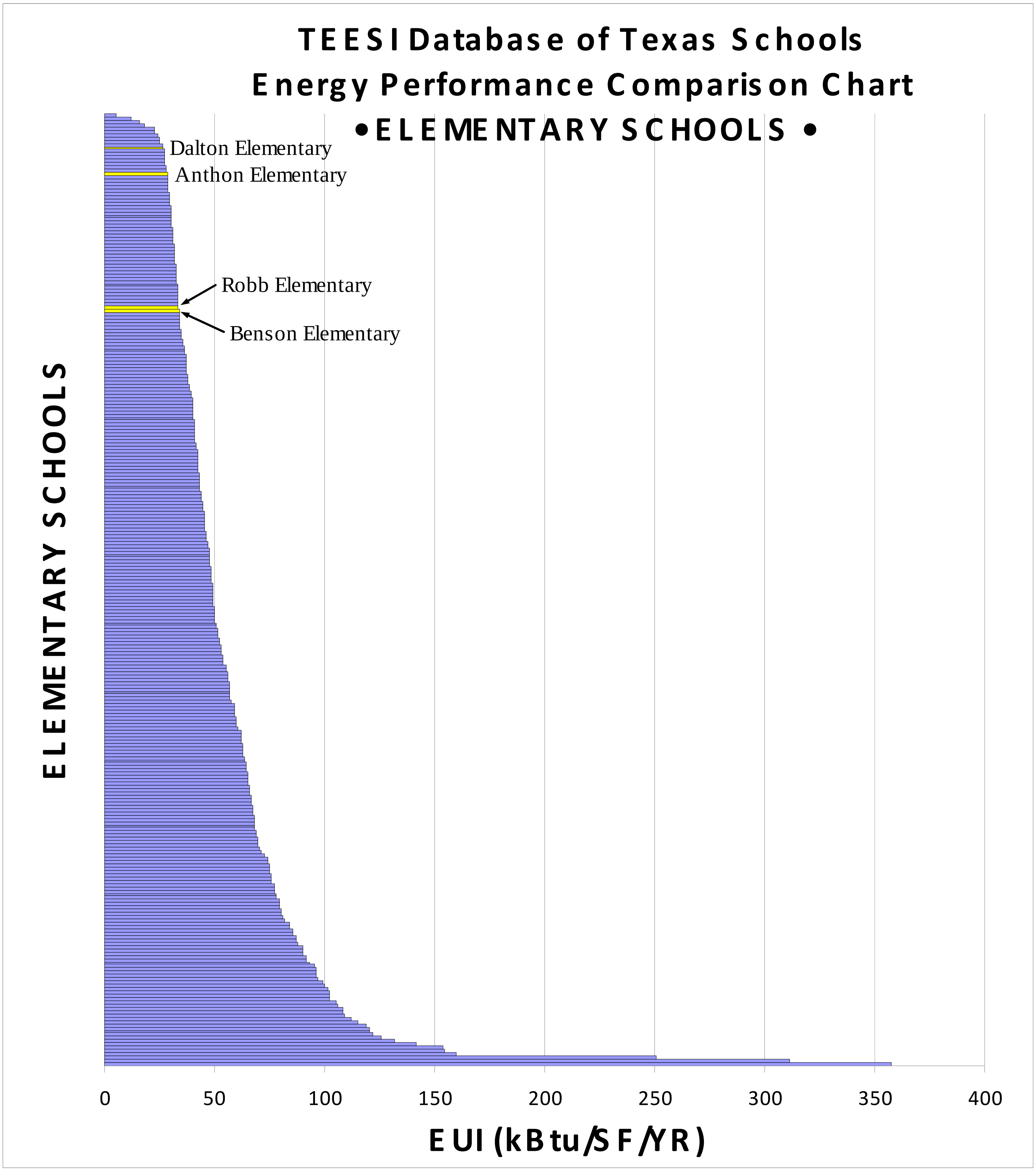
ENERGY PERFORMANCE COMPARISON CHARTS



(The chart above is a comparison of EUIs based on sample data from TEESI's database of Texas Schools)



(The chart above is a comparison of EUIs based on sample data from TEESI's database of Texas Schools)

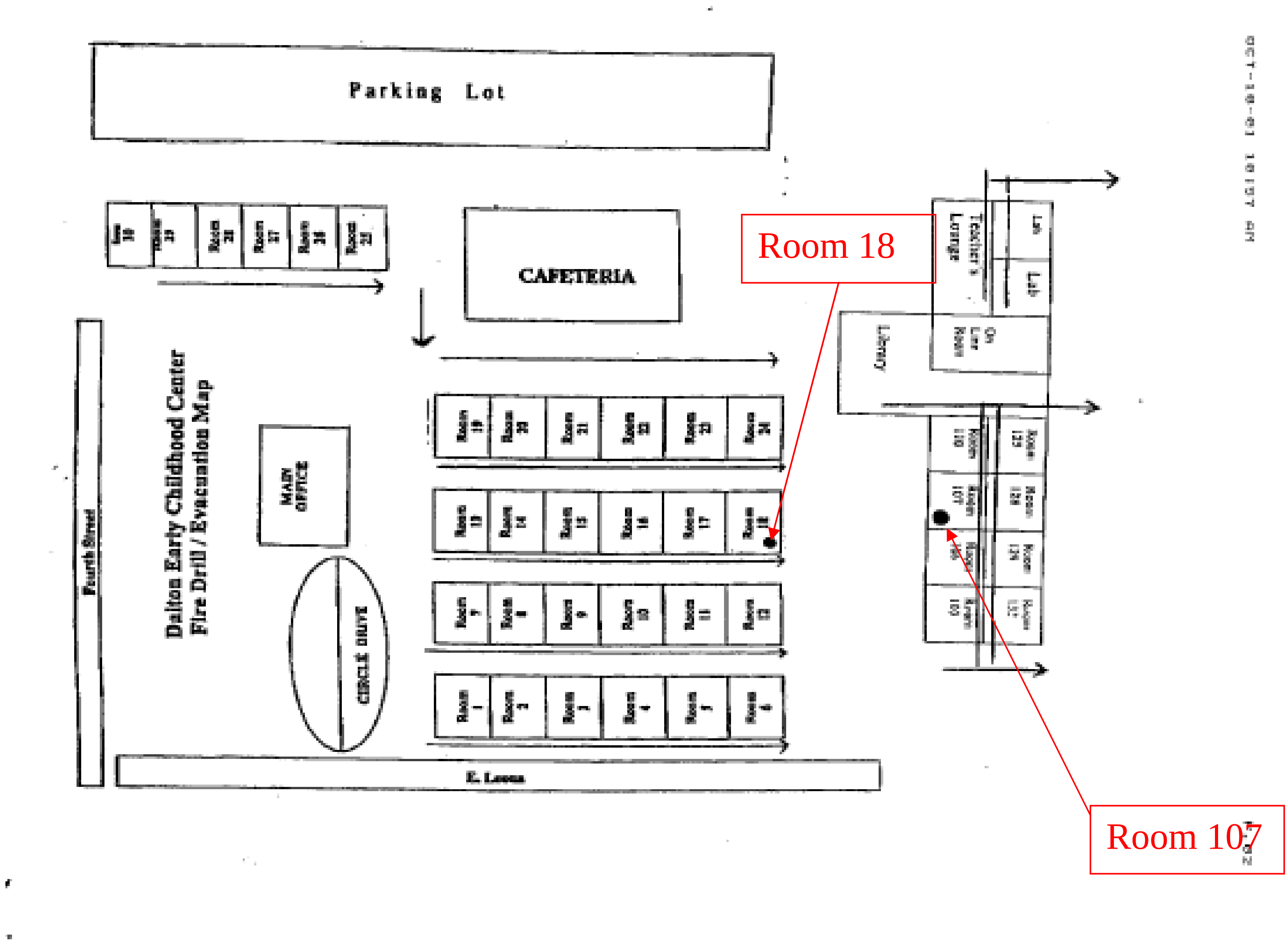


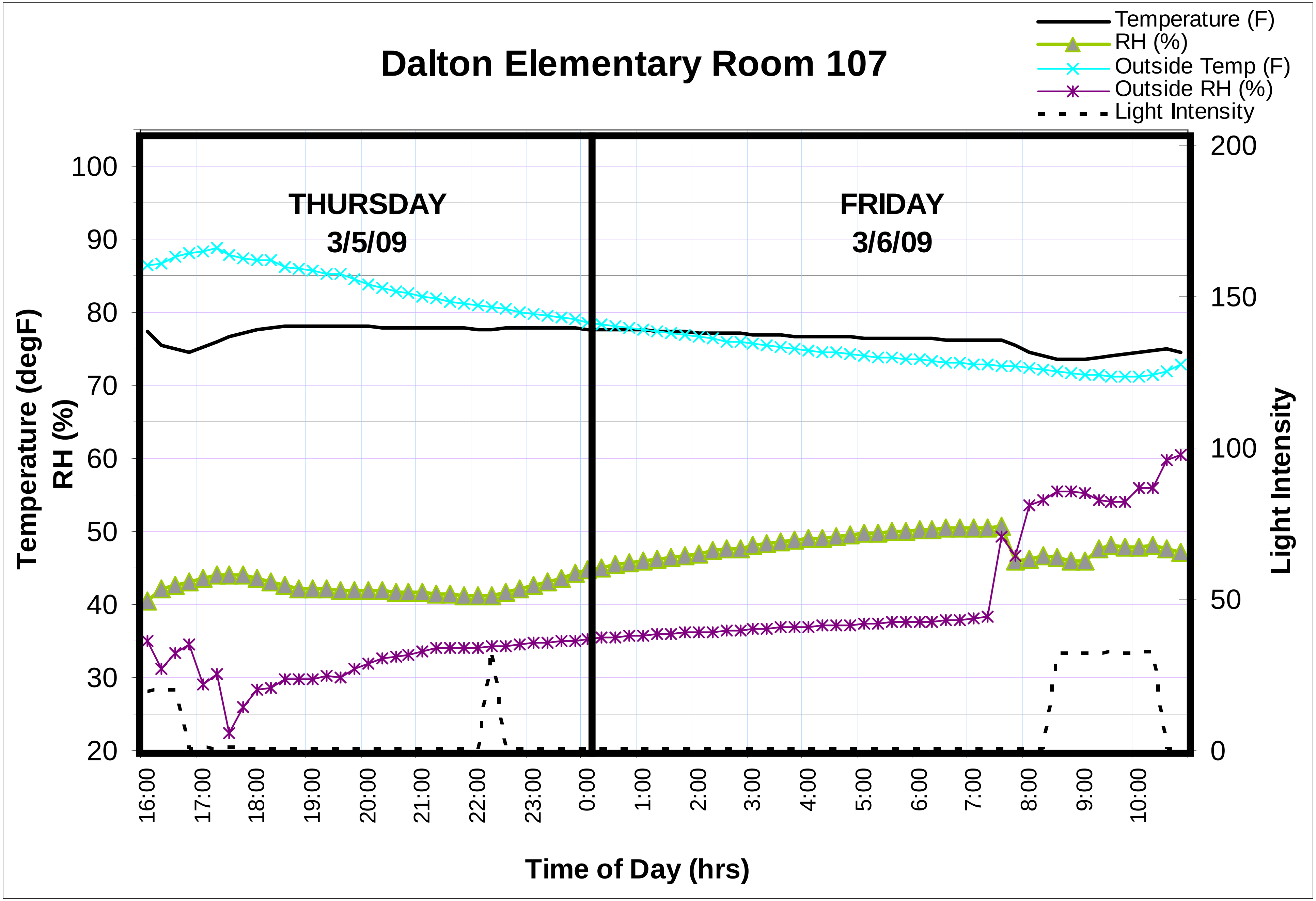
(The chart above is a comparison of EUIs based on sample data from TEESI's database of Texas Schools)

APPENDIX E

DATALOGGER CHARTS

DALTON ELEMENTARY





Dalton Elementary Room 107
Temperature (F)
RH (%)
Outside Temp (F)
Outside RH (%)
Light Intensity
THURSDAY
3/5/09
FRIDAY
3/6/09
Temperature (degF)
RH (%)
Light Intensity
Time of Day (hrs)
100
90
80
70
60
50
40
30
20
200
150
100
50
0
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
1:00
2:00
3:00
4:00
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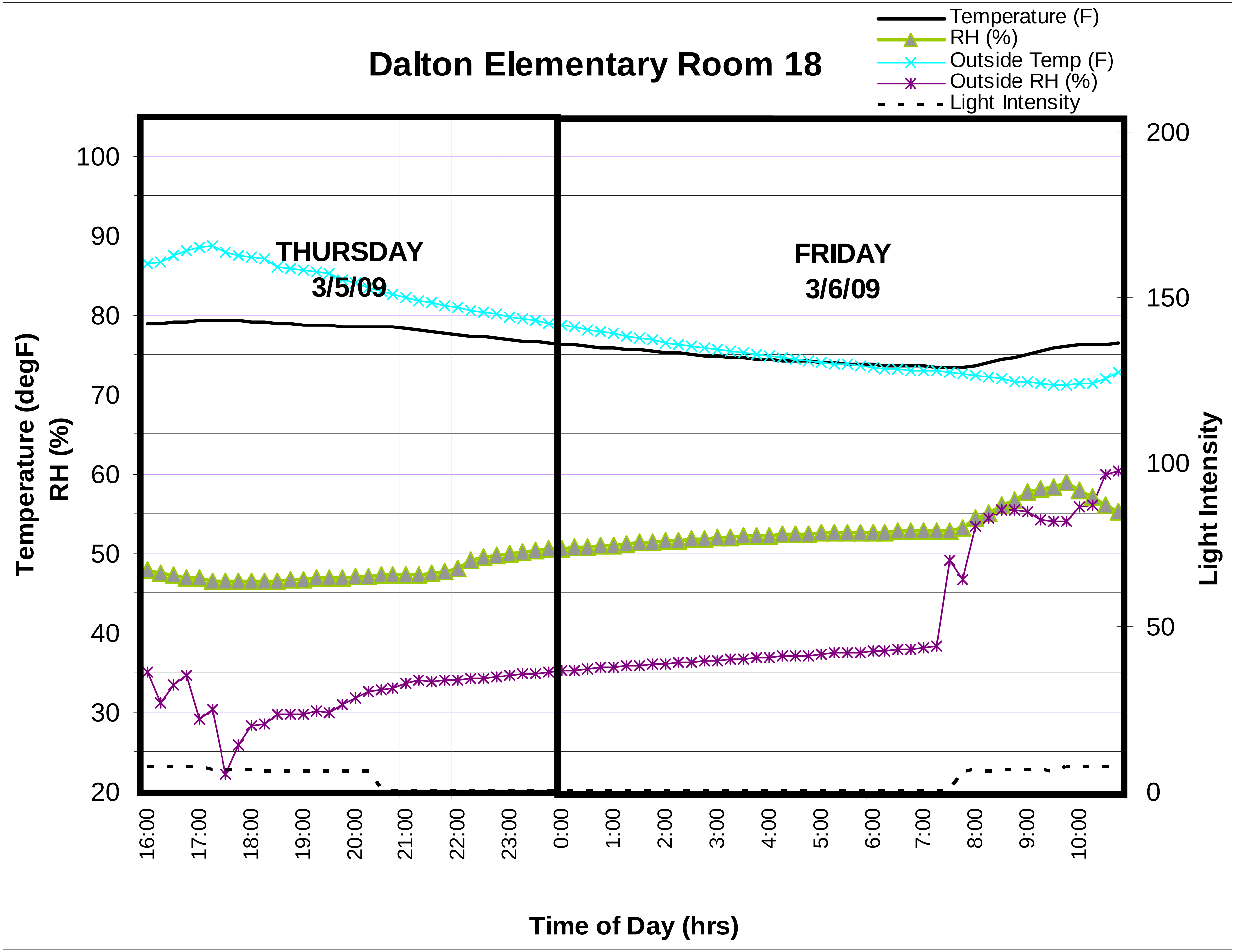
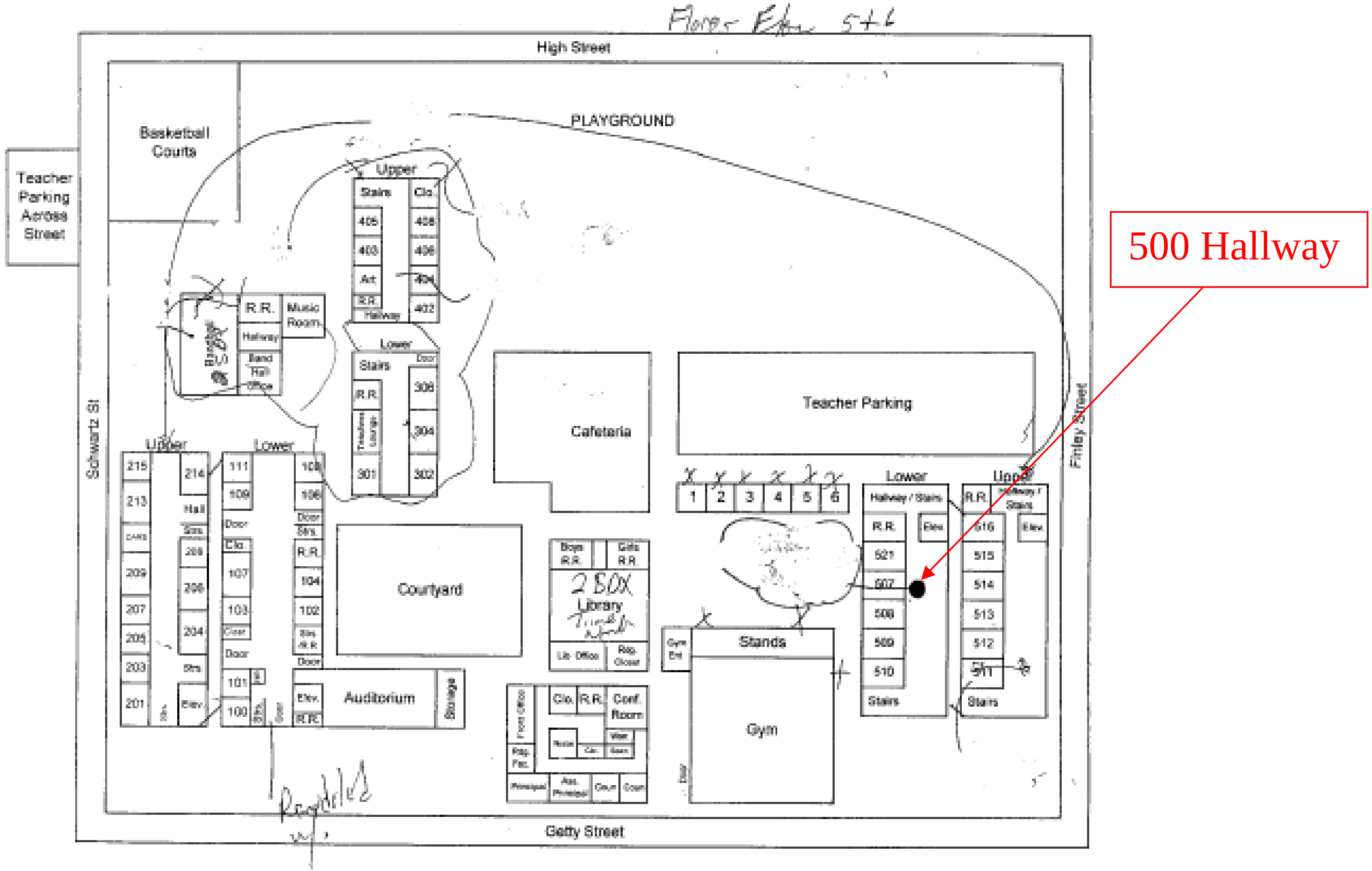
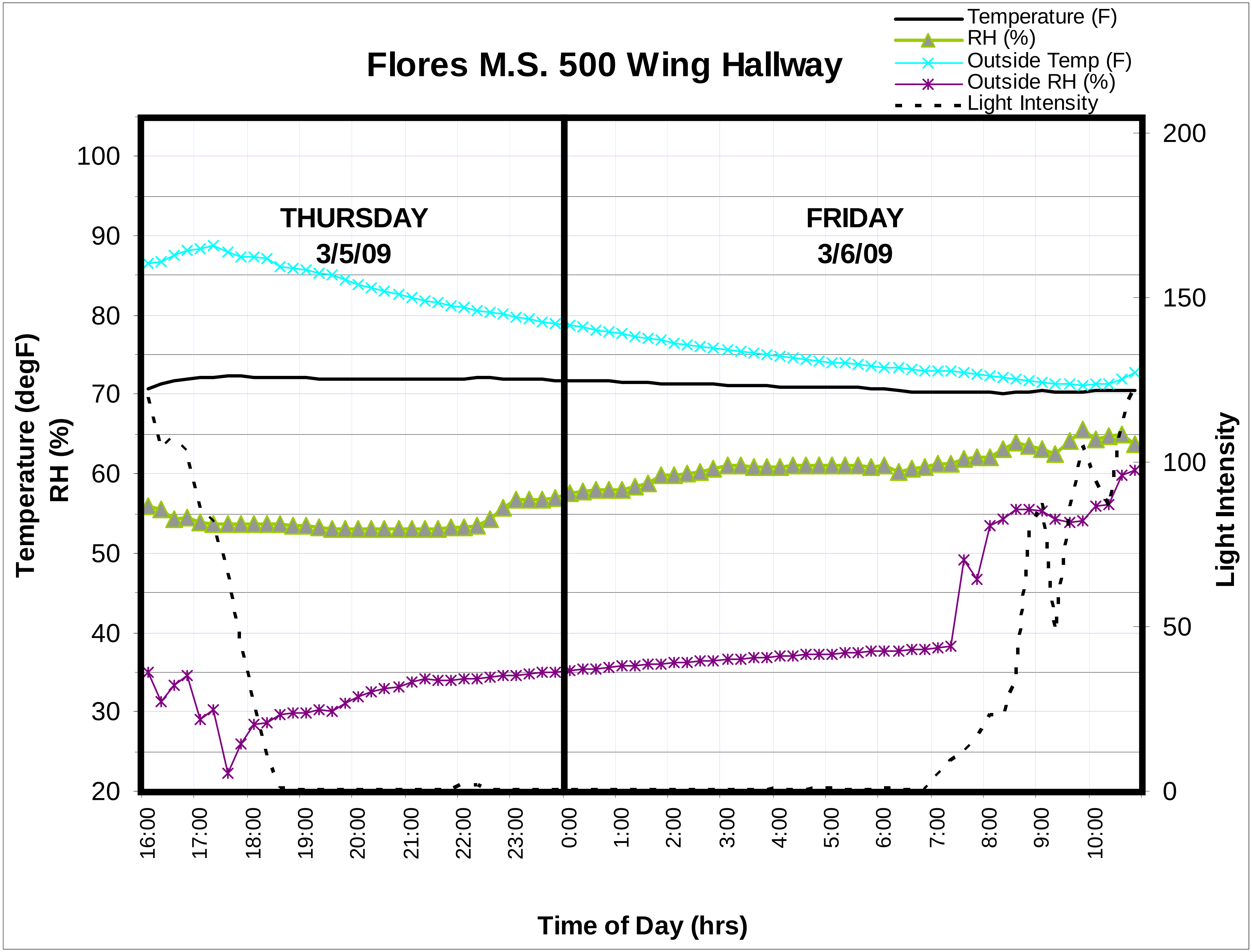
8:00
9:00
10:00


Dalton Elementary Room 18
Temperature (F)
RH (%)
Outside Temp (F)
Outside RH (%)
Light Intensity
THURSDAY
3/5/09
FRIDAY
3/6/09
Temperature (degF)
RH (%)
Light Intensity
100
90
80
70
60
50
40
30
20
200
150
100
50
0
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
Time of Day (hrs)

FLORES ELEMENTARY




Flores M.S. 500 Wing Hallway
Temperature (F)
RH (%)
Outside Temp (F)
Outside RH (%)
Light Intensity
THURSDAY
3/5/09
FRIDAY
3/6/09
Temperature (degF)
RH (%)
Light Intensity
100
90
80
70
60
50
40
30
20
200
150
100
50
0
16:00
17:00
18:00
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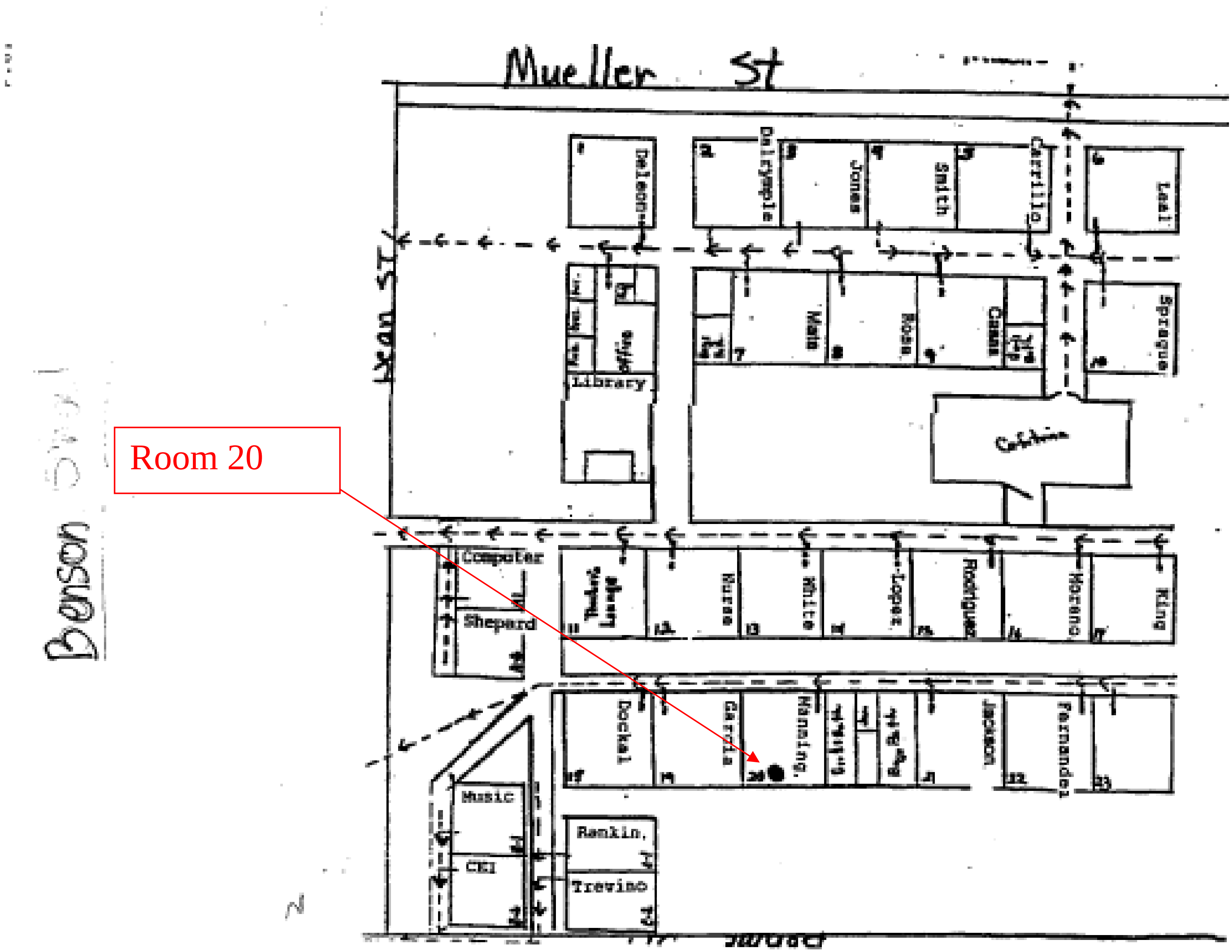
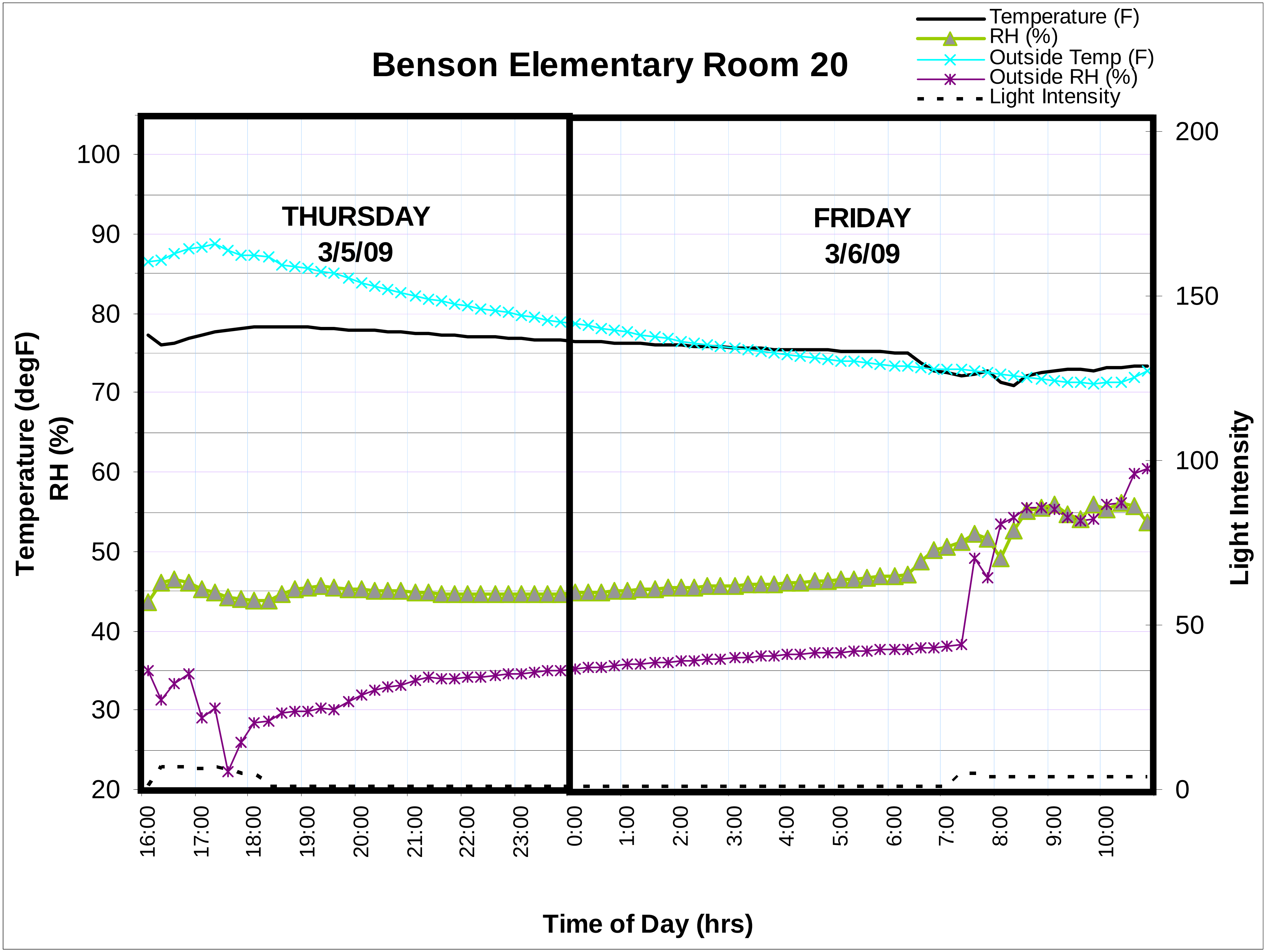
5:00
6:00
7:00
8:00
9:00
10:00
Time of Day (hrs)

BENSON ELEMENTARY



Appendix E-6


Benson Elementary Room 20
Temperature (F)
RH (%)
Outside Temp (F)
Outside RH (%)
Light Intensity
THURSDAY
3/5/09
FRIDAY
3/6/09
Temperature (degF)
RH (%)
Light Intensity
Time of Day (hrs)
100
90
80
70
60
50
40
30
20
200
150
100
50
0
16:00
17:00
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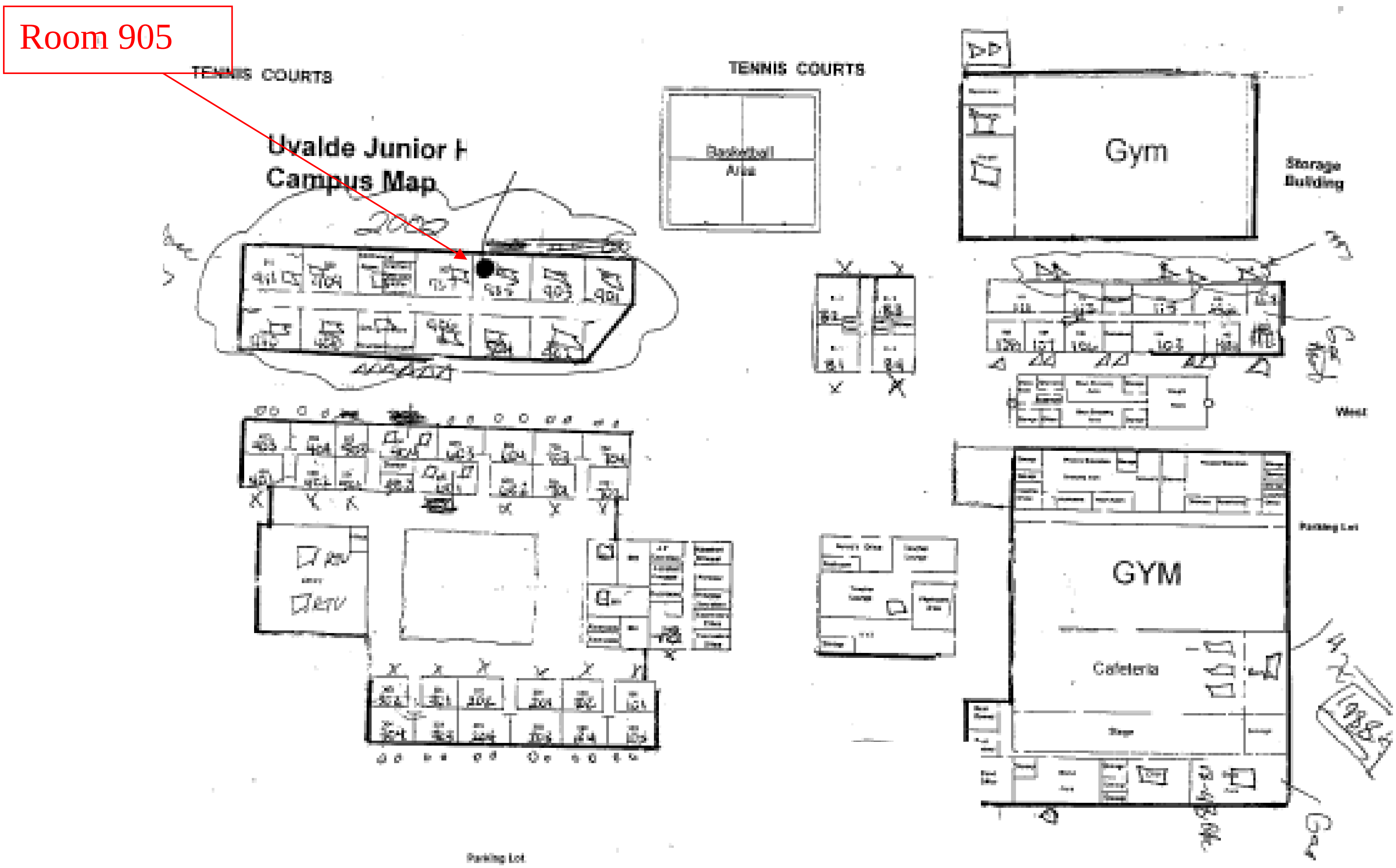
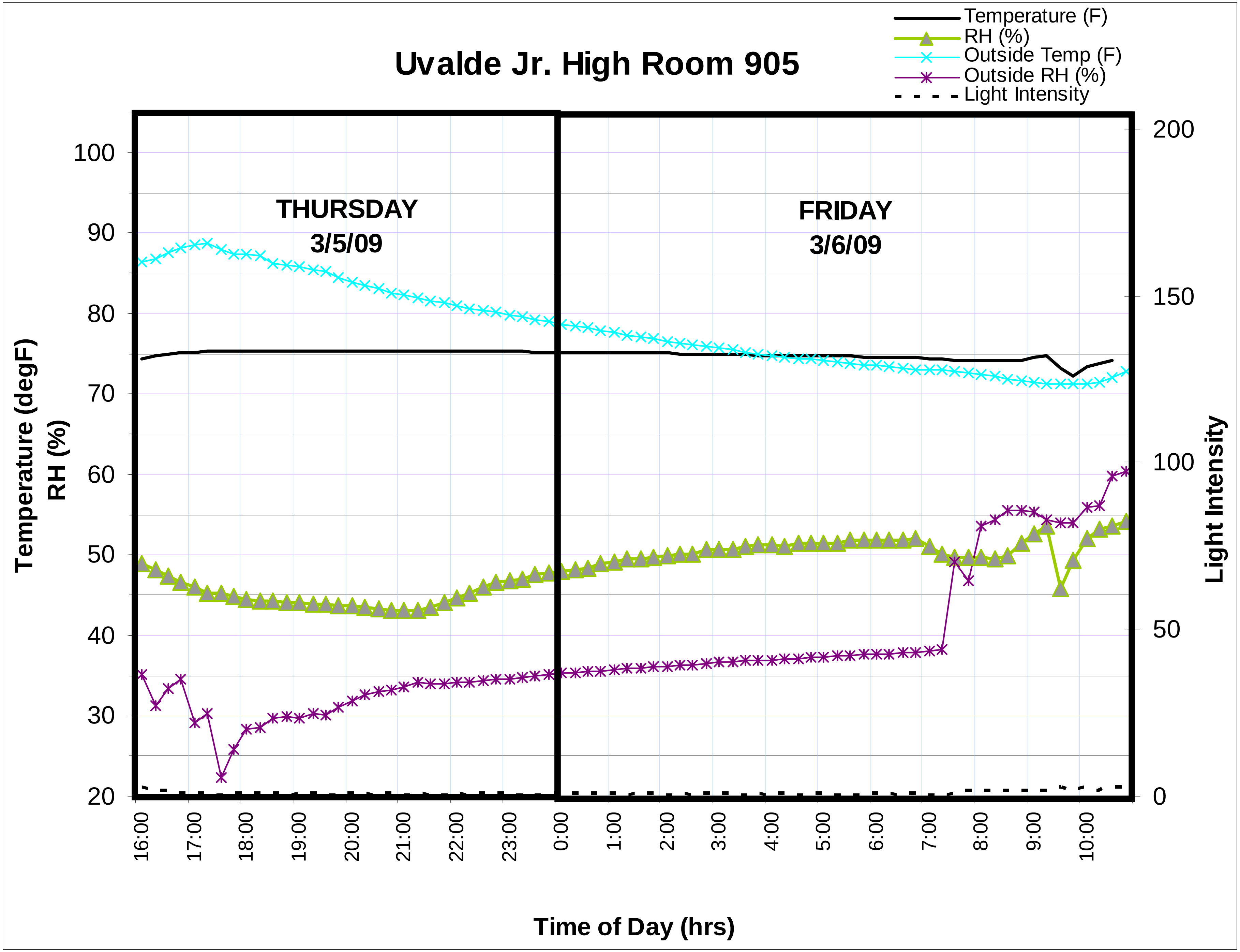
UVALDE JUNIOR HIGH





Uvalde Jr. High Room 905
Temperature (F)
RH (%)
Outside Temp (F)
Outside RH (%)
Light Intensity
THURSDAY
3/5/09
FRIDAY
3/6/09
Temperature (degF)
RH (%)
Light Intensity
Time of Day (hrs)
100
90
80
70
60
50
40
30
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200
150
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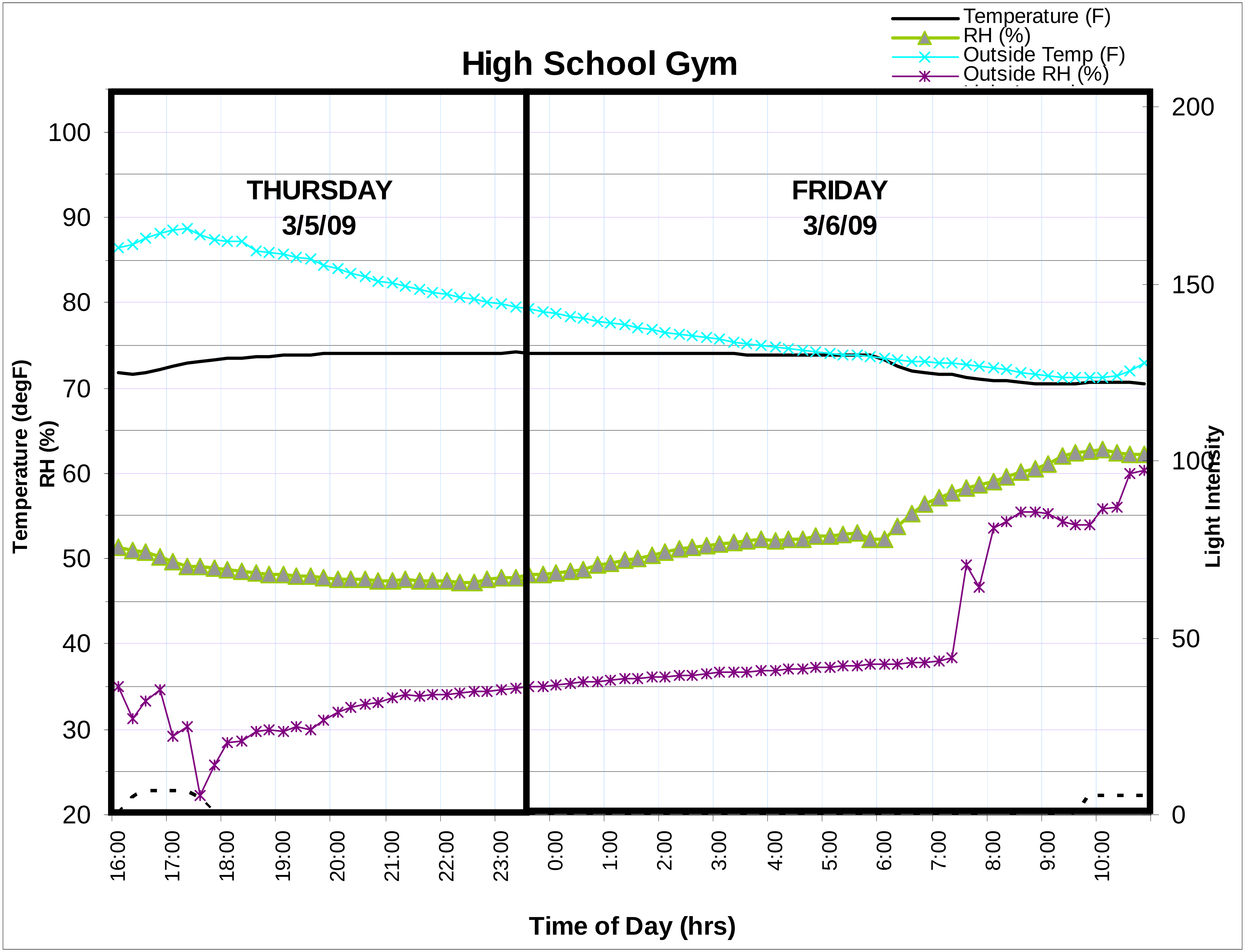


High School Gym
Temperature (F)
RH (%)
Outside Temp (F)
Outside RH (%)
THURSDAY
3/5/09
FRIDAY
3/6/09
Temperature (degF)
RH (%)
Light Intensity
Time of Day (hrs)

APPENDIX F

TYPICAL EQUIPMENT MAINTENANCE CHECKLISTS

Boilers Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Boiler use/sequencing	Turn off/sequence unnecessary boilers	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Follow manufacturer's recommended procedures in lubricating all components	Compare temperatures with tests performed after annual cleaning	X			
Check steam pressure	Is variation in steam pressure as expected under different loads? Wet steam may be produced if the pressure drops too fast	X			
Check unstable water level	Unstable levels can be a sign of contaminates in feedwater, overloading of boiler, equipment malfunction	X			
Check burner	Check for proper control and cleanliness	X			
Check motor condition temperatures	Check for proper function	X			
Check air temperatures in boiler room	Temperatures should not exceed or drop below design limits	X			
Boiler blowdown	Verify the bottom, surface and water column blow downs are occurring and are effective	X			
Boiler logs	Keep daily logs on: • Type and amount of fuel used • Flue gas temperature • Makeup water volume • Steam pressure, temperature, and amount generated Look for variations as a method of fault detection	X			
Check oil filter assemblies	Check and clean/replace oil filters and strainers	X			
Inspect oil heaters	Check to ensure that oil is at proper temperature prior to burning	X			
Check boiler water treatment	Confirm water treatment system is functioning properly	X			
Check flue gas temperatures and composition	Measure flue gas composition and temperatures at selected firing positions - recommended O2% and CO2% Fuel / O2 % / CO2% Natural gas / 1.5 / 10 No. 2 fuel oil / 2.0 / 11.5 No. 6 fuel oil / 2.5 / 12.5 Note: percentages may vary due to fuel composition variations		X		

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Boilers Checklist (contd)

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Check all relief valves	Check for leaks		X		
Check water level control	Stop feedwater pump and allow control to stop fuel flow to burner. Do not allow water level to drop below recommended level.		X		
Check pilot and burner assemblies	Clean pilot and burner following manufacturer's guidelines. Examine for mineral or corrosion buildup.		X		
Check boiler operating characteristics	Stop fuel flow and observe flame failure. Start boiler and observe characteristics of flame.		X		
Inspect system for water/ steam leaks and leakage opportunities	Look for: leaks, defective valves and traps, corroded piping, condition of insulation		X		
Inspect all linkages on combustion air dampers and fuel valves	Check for proper setting and tightness		X		
Inspect boiler for air leaks	Check damper seals		X		
Check blowdown and water treatment procedures	Determine if blowdown is adequate to prevent solids buildup			X	
Flue gases	Measure and compare last month's readings flue gas composition over entire firing range			X	
Combustion air supply	Check combustion air inlet to boiler room and boiler to make sure openings are adequate and clean			X	
Check fuel system	Check pressure gauge, pumps, filters and transfer lines. Clean filters as required.			X	
Check belts and packing glands	Check belts for proper tension. Check packing glands for compression leakage.			X	
Check for air leaks	Check for air leaks around access openings and flame scanner assembly.			X	
Check all blower belts	Check for tightness and minimum slippage.			X	
Check all gaskets	Check gaskets for tight sealing, replace if do not provide tight seal			X	
Inspect boiler insulation	Inspect all boiler insulation and casings for hot spots			X	
Steam control valves	Calibrate steam control valves as specified by manufacturer			X	
Pressure reducing/regulating valves	Check for proper operation			X	

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Boilers Checklist (contd)

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Perform water quality test	Check water quality for proper chemical balance			X	
Clean waterside surfaces	Follow manufacturer's recommendation on cleaning and preparing waterside surfaces				X
Clean fireside	Follow manufacturer's recommendation on cleaning and preparing fireside surfaces				X
Inspect and repair refrac-tories on fireside	Use recommended material and procedures				X
Relief valve	Remove and recondition or replace				X
Feedwater system	Clean and recondition feedwater pumps. Clean condensate receivers and deaeration system				X
Fuel system	Clean and recondition system pumps, filters, pilot, oil preheaters, oil storage tanks, etc.				X
Electrical systems	Clean all electrical terminals. Check electronic controls and replace any defective parts.				X
Hydraulic and pneumatic valves	Check operation and repair as necessary				X
Flue gases	Make adjustments to give optimal flue gas composition. Record composition, firing position, and temperature.				X
Eddy current test	As required, conduct eddy current test to assess tube wall thickness				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Chillers Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Semi-Annually	Annually
Chiller use/sequencing	Turn off/sequence unnecessary chillers	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Check setpoints	Check all setpoints for proper setting and function	X			
Evaporator and condenser coil fouling	Assess evaporator and condenser coil fouling as required		X		
Compressor motor temperature	Check temperature per manufacturer's specifications		X		
Perform water quality test	Check water quality for proper chemical balance		X		
Leak testing	Conduct leak testing on all compressor fittings, oil pump joints and fittings, and relief valves		X		
Check all insulation	Check insulation for condition and appropriateness		X		
Control operation	Verify proper control function including: • Hot gas bypass • Liquid injection		X		
Check vane control settings	Check settings per manufacturer's specification			X	
Verify motor load limit control	Check settings per manufacturer's specification			X	
Verify load balance operation	Check settings per manufacturer's specification			X	
Check chilled water reset settings and function	Check settings per manufacturer's specification			X	
Check chiller lockout setpoint	Check settings per manufacturer's specification				X
Clean condenser tubes	Clean tubes at least annually as part of shutdown procedure				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Building Controls Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Semi-Annually	Annually
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Verify control schedules	Verify in control software that schedules are accurate for season, occupancy, etc.	X			
Verify setpoints	Verify in control software that setpoints are accurate for season, occupancy, etc.	X			
Time clocks	Reset after every power outage	X			
Check all gauges	Check all gauges to make sure readings are as expected		X		
Control tubing (pneumatic system)	Check all control tubing for leaks		X		
Check outside air volumes	Calculated the amount of outside air introduced and compare to requirements		X		
Check setpoints	Check setpoints and review rational for setting		X		
Check schedules	Check schedules and review rational for setting		X		
Check deadbands	Assure that all deadbands are accurate and the only simultaneous heating and cooling is by design		X		
Check sensors	Conduct thorough check of all sensors - temperature, pressure, humidity, flow, etc. - for expected values			X	
Time clocks	Check for accuracy and clean			X	
Calibrate sensors	Calibrate all sensors: temperature, pressure, humidity, flow, etc.				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Pumps Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Pump use/sequencing	Turn off/sequence unnecessary pumps	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Check lubrication	Assure that all bearings are lubricated per the manufacture's recommendation			X	
Check packing	Check packing for wear and repack as necessary. Consider replacing packing with mechanical seals.			X	
Motor/pump alignment	Aligning the pump/motor coupling allows for efficient torque transfer to the pump			X	
Check mountings	Check and secure all pump mountings			X	
Check bearings	Inspect bearings and drive belts for wear. Adjust, repair, or replace as necessary.				X
Motor condition	Checking the condition of the motor through temperature or vibration analysis assures long life				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Fans Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
System use/sequencing	Turn off/sequence unnecessary equipment	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Observe belts	Verify proper belt tension and alignment			X	
Inspect pulley wheels	Clean and lubricate where required			X	
Inspect dampers	Confirm proper and complete closure control; outside air dampers should be airtight when closed			X	
Observe actuator/linkage control	Verify operation, clean, lubricate, adjust as needed			X	
Check fan blades	Validate proper rotation and clean when necessary			X	
Filters	Check for gaps, replace when dirty - monthly			X	
Check for air quality anomalies	Inspect for moisture/growth on walls, ceilings, carpets, and in/outside of duct-work. Check for musty smells and listen to complaints.			X	
Check wiring	Verify all electrical connections are tight				X
Inspect ductwork	Check and refasten loose connections, repair all leaks				X
Coils	Confirm that filters have kept clean, clean as necessary				X
Insulation	Inspect, repair, replace all compromised duct insulation				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Electric Motors Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Motor use/sequencing	Turn off/sequence unnecessary motors	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Motor condition	Check the condition of the motor through temperature or vibration analysis and compare to baseline values		X		
Check lubrication	Assure that all bearings are lubricated per the manufacture's recommendation			X	
Check packing	Check packing for wear and repack as necessary. Consider replacing packing with mechanical seals.			X	
Motor alignment	Aligning the motor coupling allows for efficient torque transfer to the pump			X	
Check mountings	Check and secure all motor mountings			X	
Check terminal tightness	Tighten connection terminals as necessary			X	
Cleaning	Remove dust and dirt from motor to facilitate cooling			X	
Check bearings	Inspect bearings and drive belts for wear. Adjust, repair, or replace as necessary.				X
Motor condition	Checking the condition of the motor through temperature or vibration analysis assures long life				X
Check for balanced three-phase power	Unbalanced power can shorten the motor life through excessive heat build up				X
Check for over-voltage or under-voltage conditions	Over- or under-voltage situations can shorten the motor life through excessive heat build up				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

APPENDIX G

WATT WATCHERS PROGRAM

Watt Watchers of Texas

Saving Energy in Texas Schools

1-888-US WATTS

or

1-888-WATTEAM

Watt Watchers of Texas is a free, state sponsored program to help schools save energy and money by getting students involved. Students patrol their school looking for empty classrooms with the lights on. They turn out the lights and leave a ticket for the teacher. It may sound trivial but...when the teacher forgets to turn out the lights an extra 2 hours per day, at lunch and after school, for example - it costs the district $50 every year.

Get your students involved.
Save energy, save money,
and prevent pollution.

Sign Up for a free kit today.

Watt Watchers of Texas
University of Texas at El Paso – Energy Center
PO Box 68660
El Paso, Texas 79968
http://wattwatchers.org

Watt Watchers of Texas is sponsored by the Texas State Energy Conservation Office/Comptroller of Public Accounts and the U.S. Department of Energy

APPENDIX H

LOANSTAR INFORMATION

Texas LoanSTAR Program

FACTS ABOUT LoanSTAR

The State of Texas LoanSTAR (Saving Taxes and Resources) Program finances energy efficient facility up-grades for state agencies, public schools, institutions of higher education, local governments, municipalities, and hospitals. The program's revolving loan mechanism allows participants to borrow money and repay all project costs through the stream of **cost savings** produced.

ELIGIBLE PROJECTS

Up-grades financed through the program include, but are not limited to, (1) energy efficient lighting systems; (2) high efficiency heating, ventilation and air conditioning systems; (3) energy management systems; (4) boiler efficiency improvements; (5) energy recovery systems; (6) building shell improvements; and (7) load management projects. The prospective borrower hires a Professional Engineer to analyze the potential energy efficient projects that will be submitted for funding through the Loan STAR Program. All engineering costs are covered under the program.

PROGRAM REQUIREMENTS

Once the projects are analyzed and the prospective borrower agrees with the recommended projects, the engineer prepares an Energy Assessment Report (EAR) with the project descriptions and calculations. The EAR must be prepared according to the LoanSTAR Technical Guidelines. The EAR is reviewed and approved by the State Energy Conservation Office (SECO) technical staff before project financing is authorized. Projects financed by LoanSTAR must have an average simple payback of ten years or less. Borrowers do, however, have the option of buying down paybacks to meet the composite ten-year limit.

To ensure up-grade projects are designed and constructed according to the EAR, SECO performs a review of the design documents at the 50% and 100% completion phases. On-site construction monitoring is also performed at the 50% and 100% completion phases.

SAVINGS VERIFICATION

To ensure that the Borrower is achieving the estimated energy savings, monitoring and verification is required for all LoanSTAR funded projects. The level of monitoring and verifications may range from utility bill analysis to individual system or whole building metering depending on the size and type of retrofit projects. If whole building metering is required, metering and monitoring cost can be rolled into the loan.

For additional information regarding the
LoanSTAR program, please contact:

Theresa Sifuentes
SECO, LoanSTAR Program Manager
(512) 463-1896

APPENDIX I

DESCRIPTION OF SECO PROGRAMS

Texas State Energy Conservation Office (SECO)

The Texas State Energy Conservation Office (SECO) helps Texas make the most of domestic energy, reduce state and local government energy costs and promote cost-effective, clean-energy technologies. SECO's mission is to maximize energy efficiency while protecting the environment.

LoanSTAR Revolving Loan Program: has saved taxpayers more than $224.6 million through energy-efficiency projects for state agencies, institutions of higher education, school districts, county hospitals and local governments. Borrowers repay loans through cost savings generated by the projects. LoanSTAR-funded projects have also prevented the release of 7,781 tons of nitrogen oxides (NOx), 2.3 million tons of carbon dioxide (CO_2) and 5,339 tons of sulfur dioxide (SO_2).

Schools/Local Government Energy Program: has helped more than 3,500 schools and other units of local government set up and maintain effective energy-efficiency programs. SECO provides facility preliminary energy assessments, energy management training workshops, technical support in designing new facilities and on-site training for student energy awareness projects. Clean energy technologies are demonstrated at public facilities and school districts to increase awareness and address air quality at the community level. Texas schools also employ the computer power management software that puts monitors to "sleep" when not in use. Over 136,000 school computers now use this software, saving 42 million kWh and reducing energy costs by $3 million annually.

Energy Education Program: promotes energy conservation and efficiency through education. The program strives to lay the foundation for environmental stewardship in teachers and students through critical-thinking and problem-solving investigations in Texas Education Agency approved workshops. Over 2,500 teachers have attended these workshops and utilized the materials in their classrooms reaching over 375,000 students. The program also supports fuel cell technical training curriculum development at the college level.

State Agencies/Higher Education Program: ensures that new facilities are designed and built with energy efficiency and water conservation in mind. Projects include administration and maintenance of the Energy and Water Conservation Design Standard for new state buildings and major renovation projects. Other initiatives include development of statewide employee energy awareness through workshops on how energy efficiency and employee behavior can reduce energy use. The program provides educational materials on how to use energy more efficiently through product procurement, innovative technologies and sustainable design practices. This program also provides education and outreach on residential and commercial energy codes statewide. The goal is to demonstrate the clear benefits of energy codes and standards in improving the quality of life, the environment and the safety and health of communities.

Alternative Fuels Program: demonstrates the positive environmental impact, technical feasibility and energy efficiency of domestically-produced alternative fuels. The Alternative Fuels Program is designed to assist state agencies, school districts, local government and private fleets to operate more of their fleets on alternative fuels. Initiatives include support for the Clean Cities Program, Clean School Bus USA Program, Mechanics Education Outreach and Air Quality Demonstration Projects.

Energy Management Services: a comprehensive energy management program designed to significantly reduce energy and utility expenditures in state-owned facilities. The State of Texas spent over $216 million in energy and utility expenditures in 2006. Program components include construction of a state-of-the-art energy and utility information management system, a comprehensive analysis of historic and future utility bills, energy procurement at the lowest possible rates and best available terms, and owner's representative services on ongoing and future energy-conservation projects. Institutions of higher education, state university systems and local governments are eligible to participate in the program.

Innovative Energy Program: promotes the use of renewable energy and sustainable building practices through technology demonstration, hands-on instruction and renewable energy education. Renewable energy has significant economic, security and reliability benefits and opportunities for Texas communities and individuals as they develop and use these resources. SECO increases public awareness of Texas' vast renewable energy resources and provides the public better access to vendors, financing options, and renewable energy incentives through its educational web site, The Infinite Power of Texas, at www.infinitepower.org.

Housing Partnership Program: promotes the efficient use of energy in low-to-moderate-income housing through partnerships among nonprofit organizations, community action agencies, local governments, utility companies, public housing authorities and social service organizations. The program encourages community and residential involvement in energy-efficiency projects such as housing retrofits, model demonstration projects, technical training assistance and energy education workshops and seminars.

Pollution Mitigation Program: assists political subdivisions in the 41 non-attainment counties to reduce electric consumption in their facilities by implementing cost-effective energy efficiency projects. SECO provides technical support and guidance through the Texas Energy Partnership, a joint initiative involving SECO, the U. S. Department of Energy and ENERGY STAR®. Information, planning tools and electronic reporting are offered at www.texasenergypartnership.org.

Pantex Program: The Pantex Nuclear Weapons plant, located in Carson County, is responsible for assembling and disassembling nuclear weapons. The U.S. Department of Energy funds the Texas Agreement in Principle, which SECO has administered since 1990. SECO contracts with a variety of state and local governments to ensure that human health and safety, and the environment, are protected around the plant. The Pantex Program also administers a DOE grant to train local emergency responders along routes that have shipments of radioactive waste going to the Waste Isolation Pilot Plant near Carlsbad, New Mexico, and eventually shipments of spent fuel tentatively scheduled to go to Yucca Mountain in Nevada.

State Energy Conservation Office
111 East 17th Street
Austin, TX 78774-1440
Phone: (512) 463-1931
Fax: (512) 475-2569
www.seco.cpa.state.tx.us

APPENDIX J

BUILDING COMMISSIONING (Cx) INFORMATION

RECOMMISSIONING

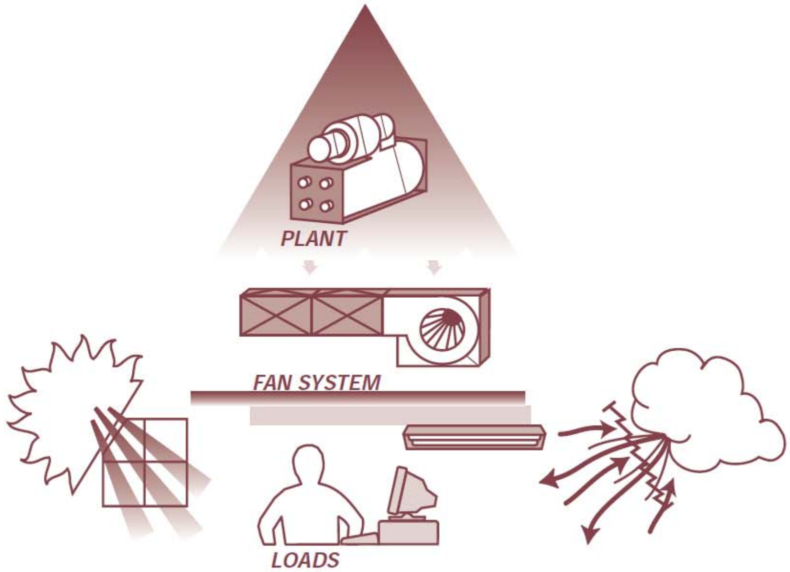
Overview

Recommissioning is essentially the same process as commissioning, but applied to existing building's HVAC, controls, and electrical systems. When standardized maintenance and energy management procedures fail to fix chronic building problems, recommissioning provides a systematic approach for discovering and solving them. Recommsioning entails the examination of actual building equipment systems operation and maintenance procedures for comparison to intended or design operation and maintenance procedures.

The heat flow diagram (Figure 1) illustrates the interaction of all buildings systems and activities. Recommissioning capitalize on heating, cooling, and electrical load reductions by continually monitoring energy consumption to optimize energy performance and savings. Recommisioning can be a cost-effective retrofit in itself, sometimes generating more savings than the cost of the retrofit measure. This can result in additional savings other than direct energy cost reductions. For example, a recommissioning may help avoid the need to install new or additional equipment, resulting in capital savings. In the recommissioning phase, you will continue to implement numerous cost-effective strategies to reduce your heating, cooling, and electrical loads, and your overall energy consumption, while improving occupant comfort.

Previously referred to as Building Tune-Up, the recommissioning chapter will help you understand if the building is operating as intended and if current operational needs are being met. It will help you identify improper equipment performance, opportunities for saving energy and money, and strategies for improving performance of the various building systems. "Best Ways to Save" and "Take Action" are checklists of typical opportunities to tune-up equipment and how to approach funding recommissioning.

Figure 1: Heat Flow In Buildings



Heat Flow In Buildings: Building Systems Interactions

Figure 2 shows the interaction of heating, cooling, and electrical loads with the HVAC equipment. Arrows indicate heat flow pathways. Reducing heating, cooling, and electrical loads reduces the demand on HVAC equipment, thus saving energy.

The Best Ways To Save

- Calibrate building controls such as thermostats and occupancy sensors.
- Adjust operating schedules to ensure equipment is on only when necessary.
- Check for leaking or improperly functioning steam traps.
- Clean heat exchanger tubes in the condenser, evaporator, and boiler to maintain optimal efficiency.

Take Action!

- Recognize building tune-up as an opportunity to reduce energy costs and regain or improve comfort.
- Allocate time and funding to a building tune-up separately from your ongoing maintenance budget.
- Explore available financing options if in-house funds are not available.

Understanding Recommisioning Process

Making low-cost or no-cost adjustments to your building systems will not only minimize your current operating costs but will also lower future maintenance costs. Furthermore, performing a recommissioning will help you understand your building's current operational needs, how it is intended to operate, and how you can improve the current level of performance in the other stages.

Commissioning

Commissioning is a quality assurance process that ensures design intent and operational needs are met for new buildings or major rehabilitation. Ideally, commissioning takes place during the construction process and continues through occupancy.

Maintenance

Maintenance is an ongoing process to ensure that equipment operates at peak performance. It should take place following the initial system tune-up and should be routinely scheduled for the life of the equipment.

Unlike the other four stages of an integrated upgrade approach recommissioning does not necessarily require purchasing and installing new equipment or technology. However, both time and budget should be set aside expressly for a building recommissiong. Savings, though often surprising, can be harder to estimate in advance; yet, because recommissioning plays an integral role in the process of identifying potential upgrade opportunities to be implemented in the other stages, it should be viewed, planned, and funded as a process separate from standard maintenance.

Financing can be a limiting factor, especially if a recommissioning is mistakenly lumped into the maintenance budget. Financing options are often available. See Financing Your Energy-Efficient Upgrade chapter.

Performing a Successful Recommisioning Project

The key to a successful recommissioning process is the commitment of the commissioning team. The commitment may be express through a written contract defining the responsibilities and contractual relationship of team members, and the specific tasks to be performed by each team member according to area of expertise. One major task in the process is for the owner's design professionals and contractors to set realistic contract agreements and assign appropriate responsibilities. Communication among the recommissioning team and facility staff is paramount for uncovering building systems problems and opportunities.

A successful recommissioning effort also depends not only on a deep understanding of building systems but also a firm grasp on how people interact to operate the building systems from day to day. This helps the recommissioning team to collect accurate data and propose cost-effective and energy savings solutions.

Recommissioning may be performed by in-house staff or by outside contractors. A decision to obtain outside expertise should not be viewed as "pointing the finger" at maintenance staff for previous oversights but instead as an opportunity to get a non-bias assessment of building systems operation and maintenance procedures.

Facility staff that are trying to fix these problems work under a variety of constraints, including limited labor force, limited budgets, and limited access to monitoring equipment. Sometimes, facility maangement lack technical expertise or staff to perform diagnostic tests and repair problems.

However, recommissioning will affect the building's future maintenance and operations program, facility staff should be updated on revised maintenance and operations procedures. In addition, facility staff should undergo regular training to learn how to effectively operate and maintain building's systems.

Recommissioning Strategy and Savings Potential

The strategy for recommissioning is a series of building recommissioning that build upon one another in a staged approach. By following the order suggested below, you can capitalize on the benefits of a comprehensive systems upgrade approach.

When recommissioning your building, you should keep in mind the primary goal, does the building operate as intended and are operational needs being met. For example, occupant comfort is paramount in the operational needs assessment. Occupants *will* modify their personal space to achieve comfort. This often results in tampering with thermostats and sensor calibrations, using inefficient portable lighting or space heaters, or even blocking vents, all of which will further increase energy use.

Potential Savings

Building Recommissioning Offer Surprising Paybacks

A detailed assessment of the costs and benefits of tuning up buildings was conducted based on a survey of results from more than 40 tune-up projects. Results from the study confirmed that recommissioning can typically translate into energy savings of 5 to 15 percent. Although it is difficult to pinpoint exactly which tune-up procedures generate the greatest savings, a study performed by the Energy Systems Laboratory of Texas A&M University showed that about 80 percent of all savings from recommissioning come from optimizing building control systems. Improving operations and maintenance accounts for nearly all remaining savings.

Financing the tune-up of a building may require spending funds up front, although parts are generally inexpensive and expenses are minimal. However, you should plan on incurring additional labor costs. If your building's maintenance staff does not have the skills to perform tune-up procedures, or, if your staff is simply too busy, look into outside consultants such as energy service companies or utility companies. Energy service companies have offered tune-up services for years as part of shared-savings contracts. Some utilities continue to conduct re-commissioning on a fee-for-service basis.

Source: "Commissioning Existing Buildings," E SOURCE Tech Update (TU-97-3; March 1997).

Recommissioning will assist you with systematically assessing building performance and effects of occupants and equipment loads on performance. The recommissioning process consist of a series of strategically ordered building recommissioning should be implemented in the following order:

Building Tune-Up Strategy

- Lighting + Supplemental Loads
- Building Envelope
- Controls
- Testing, Adjusting, and Balancing
- Heat Exchange Equipment
- Heating and Cooling System

Lighting

The lighting systems within a building are an integral part of a comfortable working environment. Over the course of its life, all lighting systems become gradually less efficient. Certain efficiency losses are unavoidable, such as reduction in light output are due to the aging of lighting equipment. However, other efficiency losses, such as improperly functioning controls, or dirt accumulation on fixture lenses and housings and lamp lumen depreciation can be avoided by regularly scheduled lighting maintenance.

Insufficient lighting can have a negative impact on energy performance of the building. Without adequate lighting, occupants will bring in less efficient fixtures, thus increasing the lighting and cooling loads in the building.

Lighting Tune-Up

A lighting system tune-up should be performed in the following order:

1. Follow a strategic lighting maintenance plan of scheduled group relamping and fixture cleaning.
2. Measure and ensure proper light levels.
3. Calibrate lighting controls.

(see Lighting chapter for lighting system specifications and details)

Periodically cleaning the existing fixtures and replacing burned-out lamps and ballasts can considerably increase fixture light output. This simple and cost-effective tune-up item can restore light levels in a building close to their initial design specifications.

After the fixtures have been cleaned and group relamping has taken place, the next step is to measure existing light levels to ensure that proper illuminance levels are provided for the tasks being performed in the space. As space use and furnishings may change over time, it is important to match the lighting level to the current occupant requirements. The Illuminating Engineering Society of North America issues recommended illuminance levels depending on the job or activity performed. Overlighted or underlighted areas should be corrected. Lighting uniformity should also be assessed, as relocation of furniture and even walls may have altered lighting distribution.

Once the proper light levels and uniformity have been achieved in the space, examine the automatic lighting controls. Many buildings use a variety of automatic controls for time-based, occupancy-based, and lighting level-based strategies. These controls may have never been properly calibrated during installation or may have been subsequently tampered with by occupants. Adjusting these controls and associated sensors now will reduce occupant complaints, maintain safety, and ensure maximum energy savings.

Many buildings utilize energy management systems, time clocks, and electronic wallbox timers to control lighting automatically based on a predictable time schedule. These systems need to be programmed correctly to ensure that lights are only operating when the building is occupied, and that overrides are operational where required. Exterior lighting schedules must also be changed throughout the year according to the season.

The performance of occupancy or motion sensors depends on customizing the sensitivity and time-delay settings to the requirements of each individual space. The sensor's installed position should also be checked to ensure adequate coverage of the occupied area. Also, keep all furnishings from obstructing the sensor's line of sight. A sample commissioning protocol is available to guide your staff or contractor to commission occupancy sensors properly (call the ENERGY STAR hotline at 1-888-STAR YES for more information).

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Any indoor and outdoor photocells should also be checked at this time to ensure the desired daylight dimming or daylight switching response. Set-points should be adjusted so that the desired light levels are maintained. Photocells and dimming ballasts are also used to save energy in non-daylight areas through lumen maintenance control, a strategy to adjust system output to compensate for aging lamps and dirt accumulation on luminaries. To maintain continued energy savings in lumen maintenance control strategies, you will need to tune the set-point manually to reduce the light level by 25 to 30 percent (the expected light level depreciation over the maintenance cycle) each time fixtures are periodically cleaned and re-lamped. This will allow the ballast to increase the system output over time to maintain the illuminance set-point.

Savings

Although the savings associated with performing a lighting tune-up will vary depending on the quality and performance of the current lighting system, they can be significant. For example, cleaning alone may boost fixture light output from 10 percent in enclosed fixtures in clean environments to more than 60 percent in open fixtures located in dirty areas. Simple calibration of occupancy sensors and photocells can restore correct operation, reducing the energy used by the lighting system in those areas by 50 percent or more.

Considerations

- Is a scheduled lighting maintenance policy in place?
- Are spaces provided with the proper light levels?
- Have all automatic controls been calibrated?

Supplemental Loads

The area of supplemental loads is also an opportunity for recommissioning. In the business world, office equipment constitutes the fastest growing portion of electrical loads. However, much of this energy is wasted because equipment is left on when not in use throughout the workday, at night, and on weekends. Electrical loads from office equipment can be reduced by the use of ENERGY STAR labeled office equipment and/or enabling power management features.

Supplemental Loads Tune-up

For existing office equipment models, check to see if they have power management or other energy-saving features and that these features are enabled. Whether or not they may not meet the ENERGY STAR specifications, these features will provide some energy savings if activated.

Educate employees so that they understand what power management is and why it is important. Here are some examples of issues that you should focus on:

- Sleeping equipment still draws some electricity; so turn it off when not in use for long periods of time.
- Heat is a leading cause of equipment failure. When the power-management feature is used, the computer generates less heat, so it may last longer and have improved reliability.
- If screen savers are used in the office, be sure to choose those that will display images for a predetermined period of time and then enter the sleep mode. Graphical screen savers are primarily for entertainment and are not energy-efficient features.

Savings

Energy-efficient equipment with the ENERGY STAR label cost the same as comparable non- labeled equipment. However, the savings are greater for labeled equipment. Products that meet ENERGY STAR specifications use about half as much electricity as conventional equipment. ENERGY STAR labeled and non-labeled equipment produce less heat when powered down or not in use, which results in reduced cooling loads, and energy costs.

Considerations

- Is your organization purchasing office equipment with the ENERGY STAR label?
- Are energy saving features enabled on office equipment?

Building Envelope

The next step of a building tune-up is to reduce air infiltration through the building envelope to enhance occupant comfort. Outside air can penetrate a building through a variety of places, most commonly through the windows, doors, walls, and roof. Drafts created by improperly sealed windows and doors can cause cold hands and feet in the winter and discomfort in the summer.

In general, a building envelope should meet recommended infiltration standards. For commercial buildings, the National Association of Architectural Metal Manufacturers recommends infiltration rates per unit of exterior wall not to exceed 0.06 cubic feet per minute per square foot (cfm/sf) at a pressure difference of 0.3 in. of water (ASHRAE *Fundamentals Handbook*, 2001, 26.24).

A frequent result of infiltration problems, other than general occupant complaints, is an increase in building heating, cooling, and/or electrical loads (when, for example, occupants bring in space heaters or fans). In addition, the escape of conditioned air forces the air handling system to work longer and harder to provide the required space temperature. Thus, tuning up the envelope of a building can reduce HVAC costs while greatly improving occupant comfort.

Tune-Up

The first step in reducing air infiltration is to tighten the existing building by locating all air leaks in the windows, doors, walls, and roofs. Once you have detected the air leaks, seal them with appropriate materials and techniques such as weather-stripping on doors, sealing and caulking on windows, and proper insulation distribution in walls, ceilings, and roofing.

If your building is equipped with revolving doors, you should encourage their use. Revolving doors significantly reduce drafts and conditioned air loss. Automatic doors should be calibrated to minimize air loss from the building envelope.

Savings

Reducing infiltration will result in a reduction in heating and cooling loads. Savings will depend on many factors, including the existing condition of the building; the building surface area-to-volume ratio; construction type; geographical location; and the internal heating, cooling, and electrical loads. Typical savings for a large office building range up to 5 percent of heating and cooling costs.

Considerations

- Are any areas particularly drafty?
- Are any areas routinely serviced?
- Do the windows and doors close and seal properly?
- Are the windows and door frames adequately caulked?
- Is weather stripping installed on windows and doorways?
- Is there any wet or deteriorating insulation that needs to be replaced?

Controls

The energy management system and controls within a building play a crucial role in providing a comfortable building environment. Over time, temperature sensors or thermostats often become out of tune. Wall thermostats are frequently adjusted by occupants, throwing off controls and causing unintended energy consumption within a building.

Poorly calibrated sensors cause increased heating and cooling loads and occupant discomfort. As with envelope infiltration problems, occupants are likely to take matters into their own hands if they are consistently experiencing heating or cooling problems. By integrating mechanical and control recommissioning within each system, you are more likely to improve occupant comfort.

Tune-Up

The first step in tuning up controls is to calibrate the indoor and outdoor building sensors. Calibration of room thermostats, duct thermostats, humidistats, and pressure and temperature sensors should be in accordance with the original design specifications. Calibrating these controls may require specialized skills or equipment, such as computer software. Thus, you should seriously consider the use of outside expertise for this tune-up item.

In addition to calibrating the sensors, damper and valve controls should be inspected to make sure they are functioning properly. Check pneumatically controlled dampers for leaks in the compressed air hose lines. Also examine dampers to ensure they open and close properly. Stiff dampers can cause improper modulation of the amount of outside air being used in the supply air stream. In some cases, dampers may have actually be wired in a single position or disconnected entirely, violating minimum outside air requirements (for a more detailed explanation, see Supplemental Load Reductions).

As part of tuning up controls, be sure to review building operating schedules. Often, while control schedules remain constant, occupancy schedules change frequently over the life of a building. This results in discomfort at the beginning and end of each day. HVAC controls must be adjusted to heat and cool the building properly during occupied hours. For example, operating schedules should be adjusted to reflect Daylight Savings Time.

When the building is unoccupied, set the temperature back to save some heating or cooling energy. Keep in mind that some minimum heating and cooling may be required when the building is unoccupied. In cold climates, for example, heating may be needed to keep water pipes from freezing.

In addition to the building's operation schedule, review the utility rate schedule. Utilities typically charge on-peak and off-peak times within a rate, which can dramatically affect the amount of your electric bills. If possible, equipment should run during the less expensive off-peak hours. For certain buildings, precooling and/or preheating strategies may be called for. (See also Supplemental Load Reductions, Night Precooling, p. 14.)

Savings

The main savings associated with tuning controls result from reductions in charges for heating and cooling energy (and possibly demand). Because savings are heavily dependent on the existing condition of the controls, it is difficult to estimate the actual savings that will result from a tune-up. Savings will depend on many factors related to the building including heating and cooling system types; construction; geographical location; and internal heating, cooling, and electrical loads. Typical savings can range up to 30 percent of annual heating and cooling costs.

Considerations

- Are building sensors, such as thermostats and humidistats, calibrated and operating properly?
- Are damper and valve controls functioning properly?
- Are there any leaks present in the pneumatic control systems?
- Do equipment schedules reflect occupancy schedules and seasonal changes?
- Can certain equipment be scheduled to operate during utility off-peak hours?
- Can temperatures be set-back during unoccupied times?

Testing, Adjusting, And Balancing

Proper air and water distribution in an HVAC system is critical to create comfortable conditions within a given space. Excessive room air temperature fluctuations, excessive draft, and improper air distributions will lead to occupants' discomfort and can increase energy consumption.

Testing, adjusting, and balancing (TAB) involves investigating the current state of a system and making adjustments to bring the HVAC system back into balance and close to its original design specifications. As we mentioned before, over time, occupancy levels and space utilization may change dramatically. The TAB process will help identify and make necessary adjustments to fit these changes, thereby improving occupant comfort and saving energy costs.

A qualified TAB contractor should:

- Verify the current state of the system.
- Identify and correct any problems with the system.
- Ensure the system provides proper indoor air quality.

Testing, Adjusting, And Balancing

Testing, Adjusting, and Balancing (TAB) is the process of adjusting HVAC system components to supply air and water flows to match load requirements.

TAB generally includes:

Testing: The process of evaluating the performance of the equipment in its current state and making recommendations for improvements.

Adjusting: The process of regulating flow rates of air or water for the purpose of balancing the system.

Balancing: The process of proportioning the air or water flows throughout a building to match the loads.

Perform TAB analysis on a building whenever you think that the air or water distribution system is not functioning as designed. Indicators that TAB is needed include frequent complaints from occupants about hot or cold spots in a building, the renovation of spaces for different uses and occupancy, and the frequent adjustment of HVAC components to maintain comfort.

Tune-Up

A TAB analysis usually includes a complete review of a building's design documentation. Typical HVAC system components and parameters to investigate may include:

- Air system flow rates, including supply, return, exhaust, and outside airflow. Flows include main ducts, branches, and supply diffusers that lead to specific spaces in a building.
- Water system flow rates for chillers, condensers, boilers, and primary and/or secondary heating and cooling coils.
- Temperatures of heating and cooling delivery systems (air side and water side).
- Positions and functioning of flow control devices for air and water delivery systems.
- Control settings and operation.
- Fan and pump speeds and pressures.

The TAB contractor will provide a test and balance report with a complete record of the design specifications, preliminary measurements, and final test data. All discrepancies between the design and test data should be outlined along with an analysis. The report should also include recommended and completed adjustments.

Savings

The savings associated with TAB come from the reductions in the energy used by the heating and cooling system. Because savings are heavily dependent on the building's condition, it is difficult to estimate the actual savings that will result from TAB. Savings will differ depending on many factors related to the building including heating and cooling system types, construction, geographical location, and internal heating, cooling, and electrical loads. Savings can range up to 10 percent of heating and cooling costs.

Considerations

- Are occupants frequently complaining about the temperature, humidity, etc., in the building?
- Have HVAC system components been replaced or modified?
- Has any building space been renovated?
- Can the HVAC system satisfy comfort requirements during very hot or very cold days?

Heat Exchange Equipment

The next steps in building tune-up focus on the heat exchange equipment that cools and heats the air that ultimately reaches building spaces. This equipment usually consists of heating and cooling coils installed in air handlers, fan coil terminal units, or baseboard radiators. These units are typically supplied with chilled water and hot water from a central plant. The heating and cooling coils can also be part of a packaged unit such as a rooftop air conditioning unit or central station air handling unit.

As with other tune-up items, tuning up your heat exchange equipment has the potential not only to save energy costs but also to increase your building occupants' comfort.

Although many of the tune-up recommendations presented below should be performed as normally scheduled maintenance, they are included in Supplemental Load Reductions because of the potential for resultant energy cost savings.

The controls and flow issues for heat exchange equipment were addressed in the previous controls and TAB sections. The remaining action is to ensure that all surfaces and filters are clean. Dirty surfaces reduce heat transfer, increase pressure loss, and increase energy use.

Tune-Up

Clean the air side of heating and cooling coils, whether in an air handler or in a rooftop unit, to reduce deposit buildup. Methods for cleaning may include compressed air, dust rags/brushes, and power washes. Check baseboard heating systems for dust build up and clean if necessary.

The water side of heating and cooling systems is generally inaccessible for mechanical cleaning. Chemical treatments are often the best solution to clean these surfaces. Ongoing water treatment and filtering of the water side is recommended to reduce dirt, biological, and mineral scale buildup. Filters for both air side and water side systems should be cleaned and replaced as necessary.

Avoid covering or blocking terminal fan coil units and baseboards with books, boxes, or file cabinets. Besides creating a fire hazard (in the case of radiators), blocking the units prevents proper air circulation and renders heating and cooling inefficient.

Savings

The savings you will see from a tune-up of your heat exchange equipment are highly dependent upon the existing conditions of the equipment. In general, the more you can improve the heat transfer of surfaces, the more you will save. Additionally, cleaning coils and filters may reduce the pressure drop across the coil and reduce fan or pump energy consumption.

Savings will differ depending on many factors related to the building, including heating and cooling system types; construction; geographical location; and internal heating, cooling, and electrical loads. Typical heating and cooling system cost savings can range up to 10 percent.

Considerations

- Are the heating and cooling surfaces clean?
- Are air and water filters changed regularly?
- Are heating or cooling terminal units and baseboards blocked by furniture or debris?

Heating and Cooling System

Following the framework of the integrated approach, the final step is to tune up the heating and cooling system. The heating and cooling system, generally a central plant, supplies all of the heating and cooling to make building spaces comfortable. Some buildings may have distributed heating and cooling units or a combination of both instead of a designated central plant.

The information gathered during the previous sections may become useful in determining any potential operational changes to the central plant. Additionally, recommissioning conducted on the HVAC and lighting systems should reduce the amount of energy the central plant consumes.

Some of the following tune-up items should be performed as part of normal scheduled maintenance. They are included here because of their potential for resultant energy cost savings. Specially trained and qualified personnel should perform all of these tune-up procedures.

Chiller Tune-Up

Chillers are similar to air conditioners found in any home, except that chillers supply cool water and home air conditioners supply cool air. The cool water from a chiller is eventually pumped through a heat exchanger (i.e., cooling coil), which cools the building's air. (For more information on specific types of chiller equipment, see Heating And Cooling System Upgrades.)

Chilled Water And Condenser Water Temperature Reset – A chiller's operating efficiency can be increased by raising the chilled water temperature and/or by decreasing the temperature of the condenser water. Chilled water reset is the practice of modifying the chilled water temperature and/or condenser water temperature in order to reduce chiller energy consumption.

If you decide to undertake chilled water reset, be careful that all of the considerations are taken into account. Although raising the chilled water will reduce chiller energy consumption, it may increase supply fan energy consumption. Reducing the condenser water temperature may increase the cooling tower fan energy consumption as well. Be sure to consult experts who can analyze all the effects of chilled water reset. If in doubt, using the intended design temperatures is your safest bet (E Source, *Space Cooling Atlas*,).

Chiller Tube Cleaning And Water Treatment – Optimum heat transfer relies on clean surfaces on both the refrigerant and water side of the chiller tubes. Typically, the water side of the condenser needs the most attention because evaporative cooling towers have an open loop and new water is introduced continuously. Thus, water treatment is needed to keep surfaces clean and reduce biological films and mineral scale. Similar treatments may be needed for the chilled water loop.

As part of the tune-up, clean the condenser and evaporator tubes to remove any scale or buildup of biological film. To do this, the surfaces usually have to be physically scrubbed and sometimes treated with chemicals.

Reciprocating Compressor Unloading – Reciprocating compressors are typically used for smaller chillers. Many of these compressors utilize multiple stages (that is, more than one piston for the compressor) of cooling to allow for more efficient part-load performance and reduced cycling of the compressor motor.

At part-load performance, one or more of the stages are unloaded. If the controls of the system fail to unload the cooling stage, then the system may cycle unnecessarily during low cooling loads. Because starting and stopping is inherently inefficient, cycling decreases the efficiency of the cooling system. Additionally, increased cycling can lead to compressor and/or electrical failures (E Source, *Space Cooling Atlas*).

Consult manufacturer's maintenance information to check for proper cooling stage unloading. Unloading may be controlled by a pressure sensor that is set for a specific evaporator pressure. This sensor, and the controls dependent upon it, can fall out of calibration or fail.

Boiler Tune-Up

In many buildings, the boiler is the heart of the heating system. Steam or hot-water boilers are present in approximately 42 percent of heated commercial floor space (CBECS, 1995).

When considering a tune-up for a boiler, always make sure that you and the maintenance staff or contractor know and fully understand all safety precautions. Also, always follow manufacturer's information on maintenance and local safety or environmental codes. Energy Star recommends you consider obtaining specialized expertise for boiler tune-up items.

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Boiler System Steam Traps – Steam heating systems use mechanical devices called steam traps to remove condensate and air from the system. Steam traps frequently become stuck in the open or closed position. When a trap is stuck open, steam can escape through the condensate return lines to the atmosphere, and the resulting energy loss can be significant. Check steam traps for leaks frequently and make repairs as needed. Because special tools and experience are required, you should consider the use of outside expertise.

Combustion Air – More air is typically supplied for combustion than is needed. Excess air helps prevent incomplete combustion, which contributes to associated hazards such as smoke and carbon monoxide buildup. If too much air is introduced, some of the fuel is wasted heating this excess air. A tune-up of combustion air consists of adjusting combustion air intake until measured oxygen levels in the flue gas reach a safe minimum. (This tune-up measure does not apply to electric boilers.)

Boiler Tube Cleaning And Water Treatment – Optimum heat transfer relies on clean surfaces on both the boiler's combustion and water or steam side. Surfaces that are dirtied with fouling (see sidebar) will ultimately increase the energy consumption of the heating system. A tune-up consists of removing fouling buildup from both the fire side and water side of the boiler tubes by physically scrubbing the surfaces and sometimes by applying a chemical treatment.

Additionally, treating the heating water may be a good option to reduce the further deterioration of your boiler tubes.

Fouling

Fouling is the buildup of a film that reduces heat transfer. Soot, ash, or other particles can build up on the fire side surfaces of a boiler. Mineral deposits or other materials can build up on the water or steam side surfaces.

Heating and Cooling Equipment Savings

The savings associated with central plant recommissioning are derived from reducing the energy consumption of the heating and cooling system. Savings are highly dependent on the existing condition of the equipment. Other related factors include the heating and cooling system types; construction type; geographical location; and internal heating, cooling, and electrical loads.

Savings for most of the central plant recommissioning are listed below. When all recommissioning are taken together, heating and cooling cost savings can reach upwards of 15 percent.

Chilled Water and Condenser Water Temperature Reset – The savings associated with a water temperature reset will vary, depending on equipment type and system interactions. Because temperature reset does not require the purchase of new equipment, it can often be inexpensive. The complexity of reset, however, could result in incorrect implementation, instead increasing your energy use. Therefore, a professional consultant should be contacted who will be able to estimate the savings potential.

Chiller Tube Cleaning and Water Treatment – The savings achieved by cleaning tube surfaces are highly dependent on the current state of the tubes. Savings can be estimated by looking at what the temperature change through the evaporator or condenser should be and comparing it to the actual temperature change. Contact an HVAC consultant or a chiller specialist for a savings estimate.

Boiler System Steam Traps – The savings achieved by fixing steam trap leaks is highly dependent on the size of the leak and the pressure of the system. Table 1 compares orifice size with the estimated steam leaked per month and the resulting costs.

Table 1: Steam Trap Leaks

Size of Orifice (in.)	*Steam Leak per month (lb.)*	*Total Cost per month ($)*
1/2	835,000	2,480
7/16	637,000	1,892
3/8	470,000	1,396

Based on: 100 psi, boiler efficiency of 80 percent, energy cost of $2 per million Btu.

Source: Wayne C. Turner. *Energy Management Handbook*, 2nd ed., 1993, Fairmont Press, Table 14.17, page 341.

Boiler Combustion Air – The savings for the reduction of combustion air depend on the type of fuel used and the exiting flue gas temperature. Stage Five—Heating and Cooling System Upgrades includes a detailed plot of boiler fuel savings as excess air is adjusted. For example, for every 10 percent reduction in excess air, the boiler efficiency will increase 0.7 percent (based on burning No. 2 fuel oil with a flue gas temperature of 500° F).

Boiler Tube Cleaning and Water Treatment – The savings achieved by cleaning the tube surfaces is highly dependent on the current state of the tubes. Tables 2 and 3 illustrate the increased fuel consumption that results from surface fouling on the combustion and water side of a boiler.

Table 2: Boiler Combustion Fouling

Soot layer on heating surface (in.)	Increase in fuel consumption (%)
1/32	2.5
1/16	4.4
1/8	8.5

Source: W.H. Axtman, *Boiler Fuel Management and Energy Conservation*, American Boiler Manufacturers Association.

Table 3: Boiler Water Side Fouling

Thickness of scale (soft carbonate scale) (in.)	Increase in fuel consumption (%)
1/32	7.0
1/16	12.5
1/11	15.0

Source: W.H. Axtman, *Boiler Fuel Management and Energy Conservation*, American Boiler Manufacturers Association.

Considerations

Chillers

- Have you consulted an expert to determine the implications of chilled water temperature reset on supply fan energy consumption?
- How dirty are your evaporator and condenser tubes?
- Are reciprocating compressor cylinders unloading at part load?

Boilers

- Have the steam traps been inspected for leaks?
- Has combustion air been checked in the last year?
- Have the combustion and water or steam side heat transfer surfaces been cleaned recently?

Summary

To recap, your strategy for recommissioning should follow the framework an integrated staged approach. Keep in mind that the overriding concern in performing recommissioning is to ensure that the building operates as intended and meets current operational needs.

Building tune-up strategies should be implemented in the following order:

- Lighting + Supplemental Loads
- Building Envelope
- Controls
- Testing, Adjusting, And Balancing
- Heat Exchange Equipment
- Heating And Cooling System

Next Steps

- Make certain that facility staff receive training so that they are familiar with tuning and maintaining building systems.
- Use the information learned in recommissioning to identify and implement other energy performance strategies and savings opportunities in throughout the entire building and its systems.

APPENDIX K

REQUEST FOR
ENERGY ASSISTANCE

REQUEST FOR ENERGY ASSISTANCE

Energy efficiency is increasingly important for our local communities and the state of Texas. It reduces costs, increases available capital, spurs economic growth, improves working, learning and living environments and preserves precious resources. The State Energy Conservation Office (SECO) offers a number of **free and cost shared** programs and services to help public agencies establish and achieve their energy efficiency goals.

SECO through its engineering consultants offers public agencies the following free or cost shared energy management services:

• On-Site Energy Assessments Of Facilities	Free
• Senate Bill 12 and House Bill 3693 Assistance	Free
• On-Site Training For Maintenance And Operations Personnel	Free
• Workshops For Energy Managers, Maintenance Personnel And Administrators	Free
• Energy Efficiency Programs For Students and Teachers	Free
• Energy Master Planning	50% Cost Shared
• Energy Management Policy Development And Implementation	Free
• Assistance In Identifying Energy Retrofit Funding Sources	Free

Specific responsibilities of the partner and SECO in this agreement:

- Partner will select a contact person to work with SECO and its engineering consultant to establish an energy policy and set realistic energy efficiency goals.
- SECO's contractor will contact partners to assess their energy management needs.
- SECO will provide a report, which identifies no cost/low cost recommendations, capital retrofit projects, potential sources of funding and other needs and opportunities.
- Partner will schedule a time for SECO's contractor to present its findings and recommendations to key decision makers.
- Partner pledges that it is ready and willing to consider implementing the energy saving recommendations.

Acceptance Of Agreement And Request For Energy Management Assistance

Signature: [signature] Date: 1/26/09

Name (Mr./Ms./Dr.) Mr. James Ward Title: Energy Manager

Organization: Uvalde C.I.S.D. Phone: 830-591-4926 Mobile 830-591-6734

Address: P.O. Box 1909 Fax: 830-591-4911

Uvalde, Texas 78802 E-mail: wardj@ucisd.net

Assigned Program Person:

Name: ______ Title: ______

Phone: ______ County: ______

Fax: ______ E-Mail: ______

Please complete and mail or fax to the following SECO Consultant : Texas Energy Engineering Services, Inc. (TEESI), ATTENTION: Saleem Khan / Ernie Moore, 1301 Capital Of Texas Highway #B-325, Austin, TX. 78746, Phone 512-328-2533, **Fax 512-328-2544.** If you need to contact the State Energy Conservation Office, please call **Glenda Baldwin At 512-463-1731** or you may write to her at: Comptroller Of Public Accounts, State Energy Conservation Office, 111 E. 17th Street, Austin, Texas 78774.