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FOR INSTITUTIONAL CONSERVATION



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T A B L E O F C O N T E N T S

ENERGY AUDIT AND PREVENTIVE MAINTENANCE REPORTS

ANIMAS

CAPITAN

CARRIZOZO

CHAMA VALLEY

CIMARRON

CLAYTON

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**ENERGY AUDITS
AND
PREVENTATIVE MAINTENANCE**

MARCH 1988

**Prepared for
ANIMAS SCHOOL DISTRICT
AND
STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
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SECTION I

EXECUTIVE SUMMARY

The State of New Mexico has contracted with Frank Bolek & Associates to perform an Energy Audit (EA) for Animas Elementary and Animas High Schools, and to organize data at the schools to assist the School District in developing a Heating, Ventilating and Air Conditioning (HVAC) Preventative Maintenance (PM) program.

The goal of both the EA and PM is to reduce energy consumption and operating costs of the schools.

A team of an engineer and an HVAC technician worked with Richard Clifton, Superintendent of the Animas School District. Mr. Clifton was extremely helpful in organizing his staff to assist us in collecting data to determine the energy savings options available to the school district. This report summarizes our team's findings and the data collected.

Animas School District is comprised of two schools - Animas Elementary and Animas High School, grouped together on one campus and consisting of a total of twelve buildings. The buildings range in age from seven to thirty-nine years old. The elementary school occupies five buildings totaling 23,836 square feet, and the high school uses five buildings totaling 71,710 square feet. One-half of the 9,310 square feet Administration Building, and all of the 19,049 square feet gymnasium are no longer in use and are unheated. A summary of all buildings' age, area, and type of heating, cooling, and lighting is presented at the end of this section in Table 1, Building Summary. Seven other buildings or mobile homes are used as teacher and employee residences. The comments pertaining to closet furnaces and evaporative coolers also apply to the residential systems.

This report is split into two divisions: the first division discusses the Animas Elementary School; the second division discusses the Animas High School. There are some residences near the campus which are occupied by the school staff. They use gas furnaces and evaporative coolers which should be maintained as described in Table 3, Maintenance Summary.

Each division begins with a campus map (Section A-1 or B-1). The engineering team labeled 103 pieces of HVAC equipment in the field with numbered aluminum tags. The location of these pieces of equipment and their associated labels is shown on page 6. Each piece of equipment requires periodic preventative maintenance. Data for each piece of equipment is in the appendix.

Dorian Nelson is responsible for maintenance and reports directly to the superintendent. Mr. Nelson assisted the engineering team in locating the equipment identified on the Equipment Identification maps and is extremely interested in the proper maintenance of this facility. He is in charge of all equipment maintenance and repair and has been doing a good job of attending to both while staying within his maintenance budget.

The map is followed by a discussion of the energy usage data (Section A-11 or B-11) which was assembled for the engineering team by Fern Johnson of the Superintendent's Office. The energy usage data indicates usage has been experiencing crossing trends. The elementary school usage is up slightly and the high school usage has risen steadily over the last three years.

The elementary classrooms which were built in 1957 have since been converted from a hot water heating system to gas-fired unit heaters. The old system was abandoned in place. It appeared that the old water piping may still be covered with exposed asbestos insulation. This situation should be investigated further by an insulation specialist, and

all asbestos insulation should be properly removed and disposed of.

Energy saving maintenance practices and ideas for retrofit are discussed in Section A-III or B-III.

From the maintenance data and facilities data collected and from experience with similar facilities, the engineering team estimates that at least 21% of the annual energy costs can be eliminated with continuous preventative maintenance. And by spending approximately \$22,758 on energy savings retrofits, approximately \$8,179 can be saved in annual energy costs.

After the discussion of each school in Divisions A and B, suggestions for implementing the program and obtaining these savings are in Section II.

Finally, the appendix contains data for each piece of equipment identified on the map. This data may be used by the district to develop a preventative maintenance program.

Table 1

Bldg. Name	Constr. Yr.	Sq.Ft.	Cooling	Heating	Lighting
Administration ²	1972	9,310	Evap.	RTF	Fluor.
Elementary - Horseshoe	1958	9,616	Evap.	UH+CF	Incand.
New Elementary	1981	11,340	Evap.	HW+Solar	Fluor.
Elem.Chardon Bldg. - So.	1977	1,440	DX	CF	Fluor.
Elem.Chardon Bldg. - No.	1977	1,440	DX	CF	Fluor.
Elem.Office & Maint. Bldg. ²	1958	3,580	Evap.	CF	Fluor.
Old Gymnasium ¹	1949	10,357	—	—	Incand.
High School Bldg.	1977	24,933	Evap.	RTF	Fluor.
New H.S. Gymnasium	1977	19,049	Evap.	RTF	HPS
H.S. Vo-Ag Bldg.	1977	4,846	Evap.	UH	Fluor.
H.S. Cultural Bldg./Cafeteria	1977	19,192	Evap.	RTF/Rad.	Fluor.
H.S. Field House	1967	3,690	Evap.	CF	Fluor.

Notes

1 = not in use

2 = partially unused

Legend

Evap.	=	Evaporative (swamp) cooler	Fluor.	=	Fluorescent
DX	=	Direct expansion refrigerated cooling	Incand.	=	Incandescent
RTF	=	Rooftop gas furnace	HPS	=	High pressure sodium
CF	=	Closet type gas furnace	Rad	=	Radiant
UH	=	Gas unit heater			
HW	=	Hot water fan coil heater			

BUILDING SUMMARY

DIVISION A - ANIMAS ELEMENTARY SCHOOL

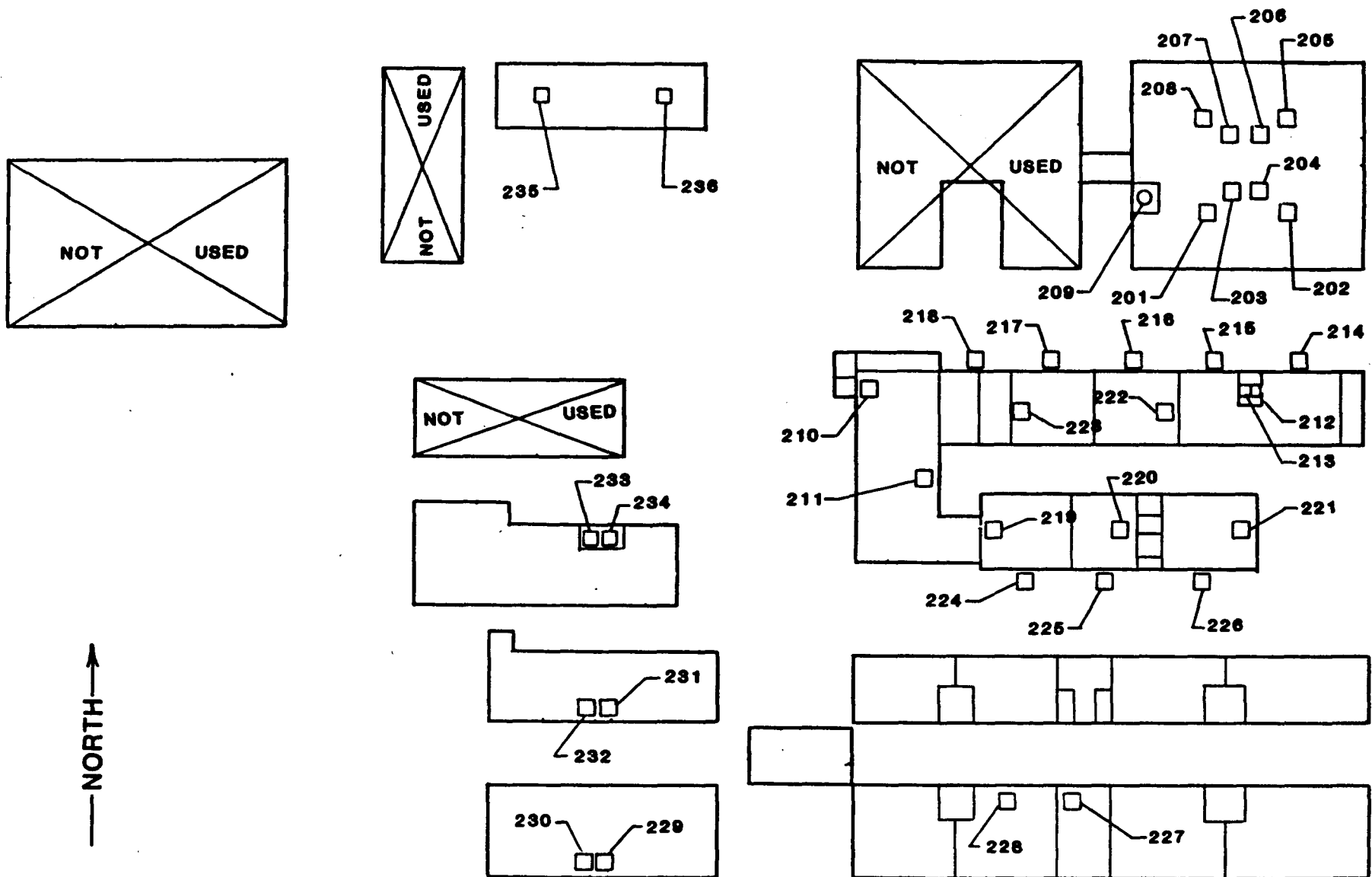
SECTION A-I. LOCATION OF EQUIPMENT

The following Figure 1 shows the locations of the HVAC equipment on the building used exclusively by the elementary school. The equipment includes ducted forced air furnaces, ceiling mounted fan coil units, room unit heaters, evaporative coolers, mechanical refrigeration units, and exhaust fans.

There is some additional equipment which has not been identified, such as exhaust fans on the roofs of the buildings, pumps in the elementary building mechanical room, and controls in the elementary building mechanical room. This equipment may be identified and labeled by school personnel to complete the building inventory.

Each number on the maps locates a piece of equipment that is labeled in the field and needs periodic maintenance.

Figure 1



ANIMAS ELEMENTARY SCHOOL

201-236

EQUIPMENT IDENTIFICATION MAP

SECTION A-II. ENERGY DATA

Table 2 on page 8 shows the history of energy usage for Animas Elementary School. This usage includes the Administration building and the elementary buildings. Converting all energy units to thousands of BTUs (British Thermal Units) shows that the following site energy is used:

	<u>MBTUs</u>		
	<u>1987/86</u>	<u>1986/85</u>	<u>1985/84</u>
Heating (natural gas)	1,697,500	1,298,300	1,622,900
Electricity	<u>441,649</u>	<u>442,332</u>	<u>390,196</u>
Total	2,139,149	1,740,632	2,013,096

Total energy usage for 1987/86 amounts to 58.2 BTUs per square foot per year.

ENERGY HISTORY DATA

RECEIVED

A	SCHOOL NAME Elementary buildings, Elem. Office, Elem. Gym & Administration Building	SQUARE FOOTAGE 47,083				
B	Name(s) of Electric/Fuel Utility(s): Columbus Electric Cooperative, Inc.					
	Rate Schedule Electric: _____ Fuel: _____ _____					
C	Gas Co. of New Mexico Heating Fuel					
	Natural Gas Electricity Oil Propane Other: _____	Type of Use <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:50%;">Space Heat</th> <th style="width:50%;">Water Heat</th> </tr> <tr> <td style="text-align: center;"> ☒ ☐ ☐ ☐ </td> <td style="text-align: center;"> ☐ ☐ ☐ ☐ </td> </tr> </table>	Space Heat	Water Heat	☒ ☐ ☐ ☐	☐ ☐ ☐ ☐
Space Heat	Water Heat					
☒ ☐ ☐ ☐	☐ ☐ ☐ ☐					

D ENERGY AND POWER												
	1987/1986				1986/1985				1985/1984			
	Electricity		Fuel		Electricity		Fuel		Electricity		Fuel	
	Consumption KWH	Demand KW	Consumption Natural Gas Therms	Other Units: CCF	Consumption KWH	Demand KW	Consumption Natural Gas Therms	Other Units: CCF	Consumption KWH	Demand KW	Consumption Natural Gas Therms	Other Units: CCF
JUL	6,120	33.20	233	267	7,240	40.40	222	259	5,160	112.00	219	254
AUG	4,400	31.20	192	222	4,200	34.00	206	240	3,960	32.40	100	116
SEP	5,240	27.60	179	208	5,200	38.80	190	221	7,680	41.60	64	74
OCT	13,600	42.00	112	129	13,920	40.40	96	112	14,720	40.00	49	57
NOV	12,320	37.20	261	304	11,640	39.20	368	427	12,000	40.00	172	200
DEC	13,440	41.60	1,354	1,574	15,480	39.20	1,107	1,286	5,320	36.80	738	859
JAN	10,560	44.40	3,065	3,564	11,960	44.80	2,977	3,462	9,680	41.60	3,744	4,353
FEB	11,000	42.40	4,032	4,688	10,800	45.60	2,681	3,081	12,560	46.80	4,416	5,135
MAR	14,480	43.20	2,781	3,232	13,120	44.80	2,620	3,012	12,040	42.80	3,219	3,743
APR	14,080	43.60	2,705	3,145	14,320	53.20	1,474	1,695	12,920	42.00	1,982	2,304
MAY	13,360	43.60	1,663	1,934	9,600	36.80	817	939	8,920	47.20	1,233	1,434
JUN	10,840	33.20	398	467	12,160	36.40	225	259	9,400	50.00	293	341

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SECTION A-III

RESULTS

Introduction

After review of this facility, a number of maintenance procedures and retrofits have been identified. These two items are discussed in this section.

MAINTENANCE PROCEDURES

The following maintenance procedures are general in nature but apply to the specific equipment and systems in this facility. Other maintenance comments which are specific to a particular piece of equipment (such as worn-out fan belt, missing filters, etc.) can be found in Appendix A, Equipment Data Forms.

1. Change Filters on Scheduled Basis. Filters on furnaces, room heaters, and fan coils should be replaced every 4-6 months, especially in areas exposed to wind-blown dust. Filter media on evaporative coolers should be replaced prior to every cooling season. Dirty filters increase the resistance to air flowing past the filters, which decreases the air flowing to the space.

This decreased air flow requires the burners in furnaces and boilers feeding the fan coils to operate for longer periods and can result in the equipment overheating, wasting fuel. Additional effects of dirty filters will be reduced comfort and increased maintenance of the equipment. A maintenance log should be kept current, which can form the basis for generating work orders for filter changes, lubrication, replacement of belts, etc. on specific equipment.

2. Maintain Fans. The following items should be checked and maintained every 3 months on each piece of HVAC equipment which contains a fan. It will be most critical

to provide this service to equipment with the largest fans:

- **Lubricate Bearings.** If shaft bearings are in need of lubrication, the motor will work harder for the same fan output. Increased horsepower and electrical current will result.

- **Keep Fan Belts Tight.** All belt-driven fans will have some energy lost through belt slippage and flexing. This loss can be reduced by ensuring belts are kept tight and are in good repair. Be cautious not to overtighten belts as this will increase wear on the motor. Optimum tension is a ½ inch deflection midway between the pulleys.

3. Maintain Water Heaters. The following items should be checked every six months on each water heater.

- **Remove Sediment.** Turn off the burners, then run water from bottom drain of water heater until sediment clears and water is clean so more efficient heat transfer occurs from the burner.

- **Adjust Temperature.** The water temperature should be as low as possible to maintain acceptable temperatures. This avoids potential burn problems and standby losses when the hot water is not needed.

4. Maintain Boiler on a Regular Basis. Boilers have many subsystems that must be maintained on a regular basis to ensure efficient operation. Performing the following maintenance items on the schedules shown will increase the efficiency of boiler operation.

- **Check Flame Efficiency.** Cleaning burners and employing a professional to check combustion efficiency every other year will assure that boilers are producing as much heat as possible from the fuel used.

- **Blowdown Boilers.** Once quarterly run water from the bottom drain of the boiler until sediment is cleared. This will ensure that the heat transfer surfaces of the

boiler are at maximum efficiency.

5. Maintain Control Systems. There are many parts of a control system that affect energy usage and each of these should be checked annually.

- **Check and Adjust Thermostat Calibration on Scheduled Basis.** Thermostats can lose their calibration over time and create confusion over proper temperature setpoints. This can often result in occupants adjusting the thermostat temperature settings to over-compensate for the thermostat's miscalibration - wasting energy. A qualified HVAC repairman should be able to adjust the thermostat's internal components to provide for accurate thermostat settings and proper control of equipment, resulting in increased comfort and energy savings.

Thermostat calibration should be checked annually. This item should be included in the maintenance log for the equipment it is controlling.

- **Check Calibration of Outside Air Reset.** The outside air reset system lowers hot boiler water temperature when the outside air temperature warms up so internal building temperatures do not overshoot their setpoints and boiler idle losses are lowered, therefore energy is saved. This calibration should be checked annually.

6. Turn Lights Off in Unoccupied Rooms. A student, teacher, and staff energy awareness program should be undertaken to ensure that lighting is turned off by the last person to exit a room. Although turning lighting off and on does decrease the life of the lamps, studies have shown that if lights are not needed for ten minutes or more, the dollar savings from energy reduction will more than offset the increased lamp replacement costs.

Mr. Nelson is replacing fluorescent tubes with the lower wattage type as they burn out, which is good, but it is unknown if the ballasts used are the low wattage type. Since the older type uses approximately 20% of the fixture's electricity, energy saving ballasts

can save 6% of fluorescent lighting cost.

7. Repair Ductwork Leaks in Heating and Cooling Systems. All rooftop furnaces and evaporative coolers are installed with a three-inch flexible section between the unit discharge and the ductwork. In many cases this flex connection has been deteriorated by ultraviolet sunlight and is leaking conditioned air day and night. All flex connections should be inspected and replaced as required. Ask your supplier to provide you with materials, meeting the following specification:

- **Flexible Duct Connections.** 1] Provide manufactured access doors in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated. 2] UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 36 ounce per square yard approximately 3 inches wide, crimped into metal edging strip.

Once you have the proper materials, replace all the bad flex connections.

8. Evaporative "Swamp" Cooler Maintenance. All buildings are served by evaporative coolers which are served by dedicated supply air ducts. These units are interlocked with roof-mounted relief air openings or in some cases the relief air is discharged through operable windows. General maintenance recommendations regarding these coolers are:

- a) install evaporative media securely to prevent sagging and holes in the media which reduce the cooling effectiveness of the unit,
- b) perform regular maintenance tasks such as checking belts, bearings, media placement, and water distribution.

9. Install Seasonal Slide Damper in Evaporative Cooler Main Supply Duct. Standard practice usually includes a seasonal damper to keep the warm air from leaving the building during the heating season. The damper should be located in the main supply duct on the roof near the penetration. The duct access door to the damper should seal air tight. The

damper is removed and stored during the cooling season.

MAINTENANCE PROCEDURE SAVINGS

The total energy savings based on 23% total energy savings if all above items are undertaken is:

ANNUAL SAVINGS

Energy: 6733 THERMS

\$2,714

Simple Payback: Immediate

Table 3 on the next pages summarizes these maintenance procedures.

MAINTENANCE SUMMARY

SCHOOL: Animas Elementary

SURVEY DATE: March 3, 1988

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
I. Pumping				✓		
A. Pipe Flow Strainers				✓		
II. Water Heaters - Domestic				✓		Look for and repair piping leaks
A. Remove Sediment		✓				Turn off in summer
B. Controls						
III. Heating						
A. Boilers - Space Heating				✓		
1. Pipe Joint Seals		✓			✓	
2. Burner Efficiency				✓		
3. Blowdown Boilers						
B. Furnaces, Room Heaters, Fan Coils						
1. Filter	✓		✓			
2. Hi/Lo Limit					✓	
3. Burner Efficiency						
4. Heat Exchanger(s)			✓			
5. Oil Bearings				✓		
6. Fan Belts				✓		
7. Clean Fan Blades				✓		

Table 3

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
C. Fin Tubes/Radiators			✓	✓		
1. Clean Surfaces _____				✓		
2. Remove Obstructions _____				✓		
IV. Control System						
A. Sensors						
1. Temperature Domestic Hot Water _____		✓				
2. Water Temperature in Pipe/Pump _____		✓				
3. On/Off Setpoints _____	✓					
4. Air Temperature for Controllers _____					✓	
B. Time Clocks _____	✓				✓	
C. Thermostats _____		✓			✓	
V. Air Conditioning/Ventilating						
A. Compressors						
1. Cleaning _____			✓	✓		
2. Freon Check _____				✓		
3. Belt Tighten _____				✓	✓	
4. Lubricate Bearings _____				✓		
B. Evaporators						
1. Cleaning _____			✓	✓		
2. Heat Exchanger(s) _____			✓	✓		

Table 3 continued

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
C. Swamp Coolers						
1. Pad Cleaning				✓	✓	
2. Water Flow Check				✓	✓	
3. Winterize				✓		
4. Slide Damper					✓	Seasonally
D. Fans						
1. Filter			✓	✓		
2. Bearings				✓		
3. Belts				✓	✓	
4. Clean Fan Blades				✓		
VI. Lighting						
A. Lamp Efficiency			✓			
B. Diffusers and Reflectors			✓			
C. Lighting Level		✓				
D. Manual Control		✓				
VII. Building Envelope						
A. Infiltration						
1. Door and Window Caulking				✓	✓	

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Table 3 continued

RETROFIT RECOMMENDATIONS

1. Replace Present Thermostats with Night Setback Thermostats. The present single setting thermostats in the elementary building must be manually set back at night to prevent full nighttime heater operation. It would be difficult for personnel assigned to this task to accomplish it each evening for each furnace. The function of turning down thermostats to approximately 55° F at night therefore lends itself well to automatic operation.

The most effective type of setback thermostat are the ones that allow seven (7) day programming. 7-day programmable thermostats allow setback to 55° F on week nights and all weekend, further reducing unnecessary heater operation.

ANNUAL SAVINGS

Energy: 5090 THERMS

Cost: \$3,767

Annual Savings: \$1,278

Simple Payback: 2.9 years

2. Install Building Setback System. The central boiler can be controlled with a 7-day timeclock and single freeze sensing unit to set back the entire building. Warm-up in the morning is accomplished automatically and the building is protected from extremely low temperatures. Night temperatures will be 55° F with an override for night functions.

The boiler system will experience additional thermal stressing so additional budget has been included to monitor the system and to install expansion lines where needed.

ANNUAL SAVINGS

Energy: 1142 THERMS

Cost: \$1,600

Annual Savings: \$287

Simple Payback: 3.9 years

3. Install Dampers and Automatic Operator to Control Outside Air Quantity. All of the existing rooftop furnace (RTF) units have an existing opening in the cabinet to allow outside air to mix with the return air for personal ventilation. At present none of these openings is capable of being shut, and ventilation air is being heated even when the building is unoccupied. The addition of an automatic damper would save energy by closing this opening at night and on weekends.

ANNUAL SAVINGS

Energy: 7588 THERMS

Cost: \$4,708

Annual Savings: \$1,904

Simple Payback: 2.5 years

Table 4 on the next page summarizes retrofit costs, savings and payback.

ENERGY RETROFIT SUMMARY

SCHOOL: Animas Elementary School

Survey Date: March 3, 1988

	Therms Saved	Dollar Capital Cost	Annual Dollar Savings	Years Payback
I. Furnaces and Room Heating				
A. Install 7-day setback thermostats throughout	5,090	\$ 3,767	\$ 1,278	2.9
B. Install central 7-day setback system in main building	1,142	1,600	287	3.9
C. Install motorized outside air dampers on air handlers	<u>8,072</u>	<u>4,708</u>	<u>2,026</u>	<u>2.3</u>
TOTAL	14,304	\$10,075	\$ 3,591	2.8

Table 4

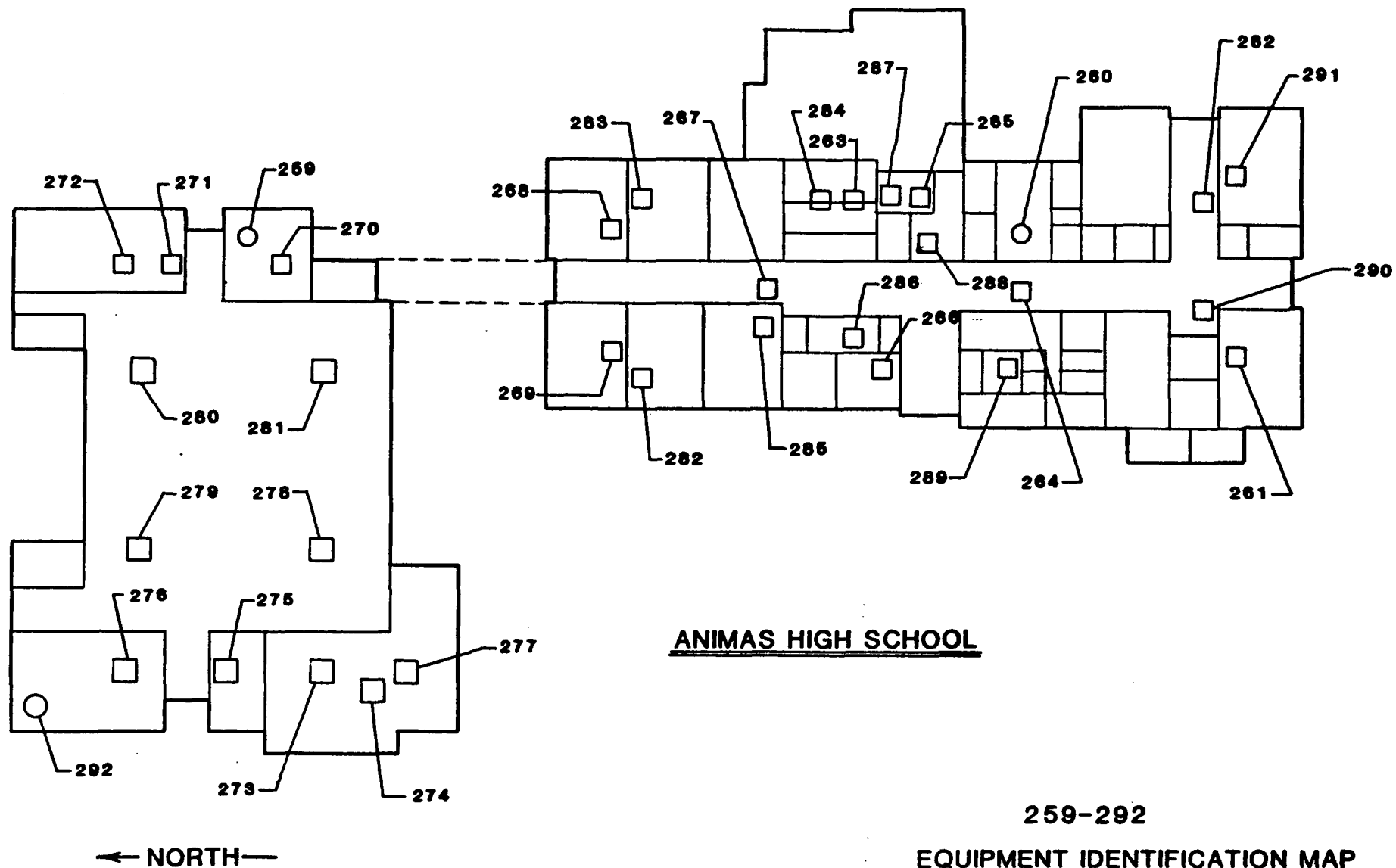
DIVISION B - ANIMAS HIGH SCHOOL

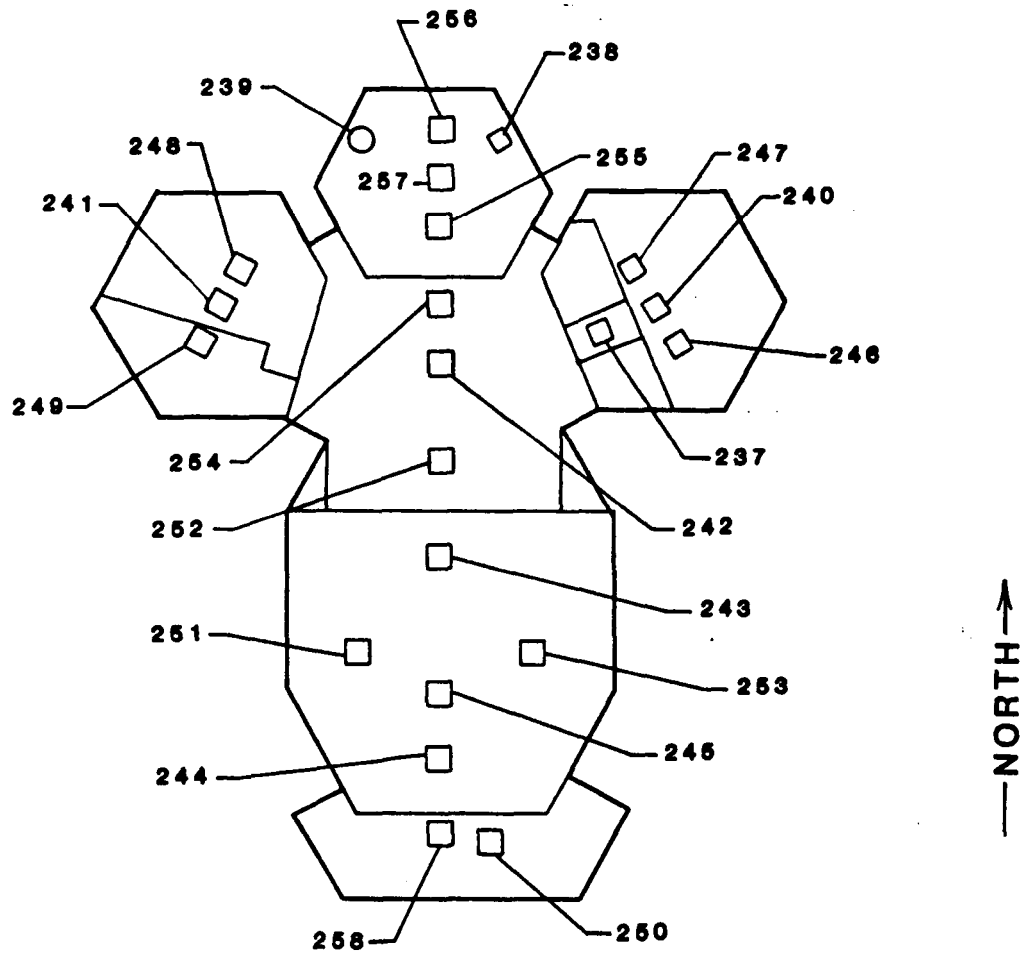
SECTION B-I. LOCATION OF EQUIPMENT

The following Figures 2, 3, 4, and 5 show the locations of the HVAC equipment on the buildings of Animas High School, and include the Cafeteria/Cultural building, the Vocational/Agriculture building, the Field House, Teacherage and the main High School building. The equipment includes ducted forced air furnaces, gas-fired fan units, evaporative coolers, and exhaust fans.

Each number on the maps locates a piece of equipment that is labeled in the field and needs periodic maintenance.

Figure 2

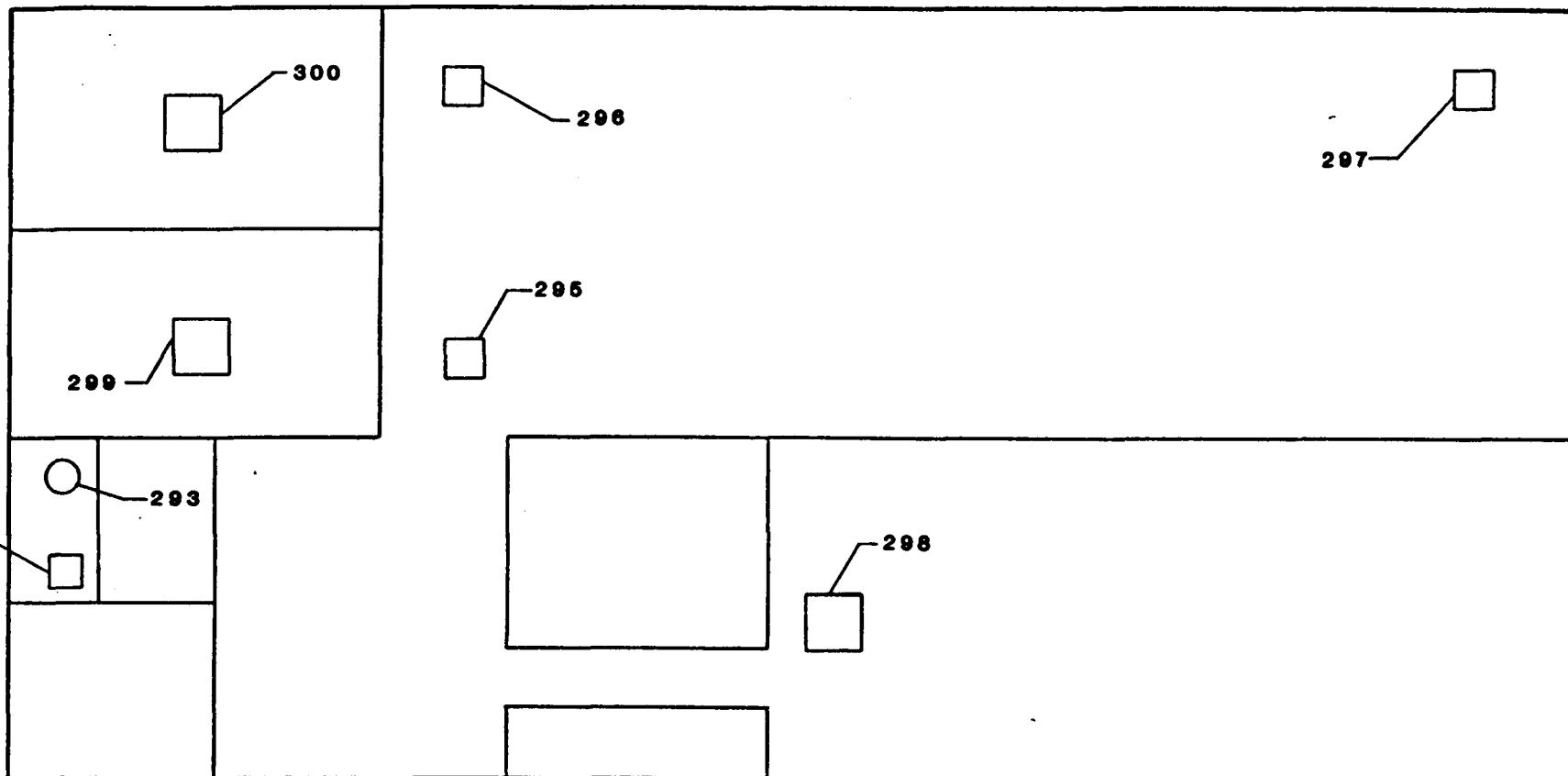




ANIMAS HIGH/ELEMENTARY SCHOOLS
COMMONS BLDG.

237-258
EQUIPMENT IDENTIFICATION MAP

Figure 3

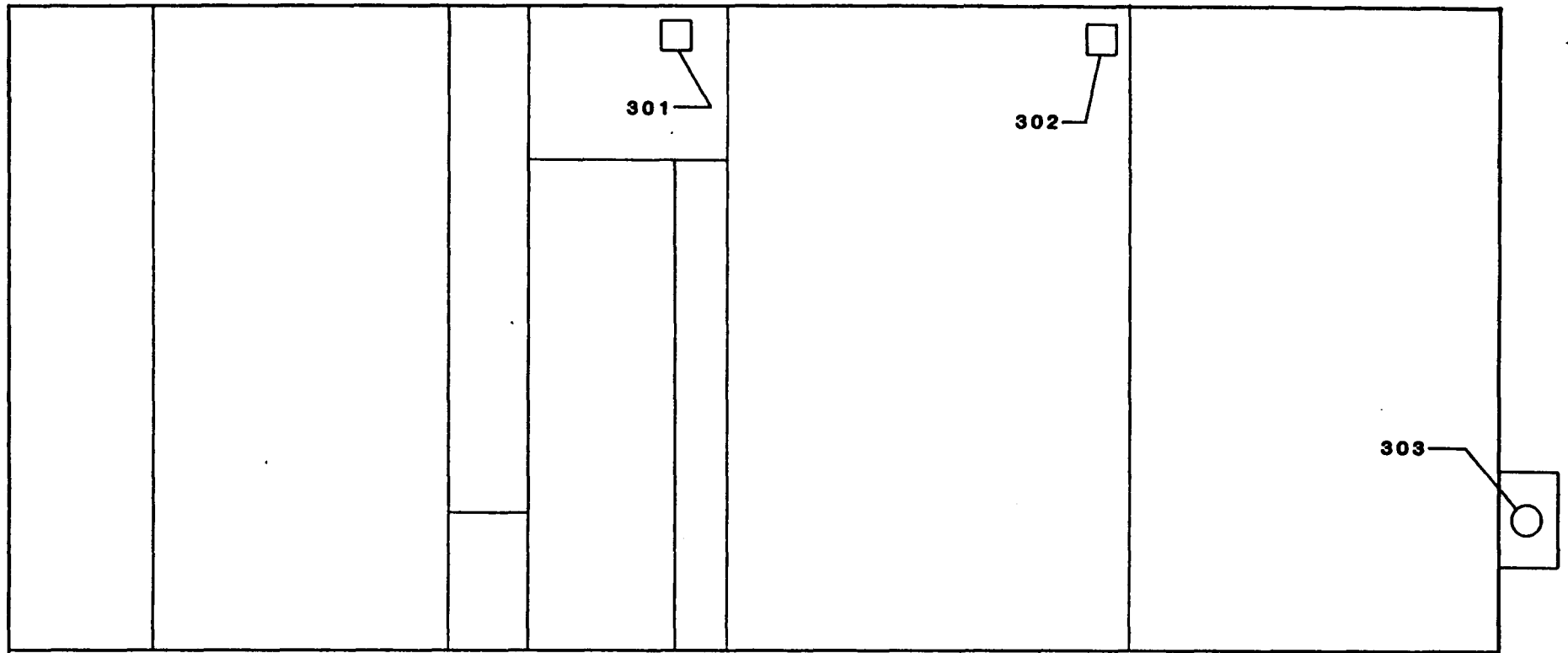


ANIMAS HIGH SCHOOL
VOCATIONAL - AGRICULTURE BLDG.

293-300
EQUIPMENT IDENTIFICATION MAP

NORTH ↑

Figure 5



ANIMAS HIGH SCHOOL FIELDHOUSE

— NORTH —>

301-303
EQUIPMENT IDENTIFICATION MAP

SECTION B-II. ENERGY DATA

Table 5 on the next pages shows the history of energy usage for Animas High School. Converting all energy units to thousands of BTUs (British Thermal Units) shows that the following energy is used.

	<u>MBTUs</u>		
	<u>1987/86</u>	<u>1986/85</u>	<u>1985/84</u>
Heating (natural gas)	3,636,600	3,391,400	4,043,400
Electricity	<u>1,090,885</u>	<u>1,062,613</u>	<u>1,004,220</u>
Total	4,727,485	4,454,013	5,047,620

Total energy usage for 1987/86 amounts to 65.9 MBTUs per square foot per year.

ENERGY HISTORY DATA

A	SCHOOL NAME <u>High School, gym & Vo.Ag. Building</u> SQUARE FOOTAGE <u>48,828</u>																
B	Name(s) of Electric/Fuel Utility(s): <u>Columbus Electric Cooperative, Inc.</u>						C										
Rate Schedule Electric: <u>#.105/KWH</u> Fuel: <u>#.2510/THM</u>						Gas Co. of New Mexico											
						Heating Fuel						Type of Use					
						Natural Gas ☒			Electricity ☐			Oil ☐			Propane ☐		
						Other: _____			Space Heat ☐			Water Heat ☐					
D	ENERGY AND POWER																
		1987/1986				1986/1985				1985/1984							
		Electricity		Fuel		Electricity		Fuel		Electricity		Fuel					
	Consumption	Demand	Consumption		Consumption	Demand	Consumption		Consumption	Demand	Consumption						
	KWH	KW	Natural Gas	Other Units:	KWH	KW	Natural Gas	Other Units:	KWH	KW	Natural Gas	Other Units:					
			Therms	CCF			Therms	CCF			Therms	CCF					
JUL	10,080		301	346	9,880		289	336	6,600		320	372					
AUG	7,160		219	255	5,880		127	148	3,880		200	232					
SEP	6,760		61	71	8,600		164	191	7,040		219	255					
OCT	17,440		109	127	17,520		272	316	19,360		368	428					
NOV	16,840		341	397	14,720		1,932	2,247	16,320		469	545					
DEC	17,800		2,274	2,644	19,560		1,729	2,011	8,640		1,626	1,891					
JAN	14,880		4,187	4,869	16,720		4,163	4,841	13,000		5,920	5,920					
FEB	18,280		6,317	7,345	15,680		4,668	5,365	18,320		5,362	6,235					
MAR	19,160		4,071	4,734	17,840		3,895	4,477	19,840		3,988	4,637					
APR	18,680		4,671	5,431	22,640		2,356	2,708	19,440		2,764	3,214					
MAY	18,200		3,167	3,683	16,800		1,005	1,155	15,240		1,565	1,820					
JUN	14,320		597	702	18,800		350	402	18,440		681	792					

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Table 5

ENERGY HISTORY DATA

RECEIVED

A	SCHOOL NAME <u>Cultural Building</u>	SQUARE FOOTAGE <u>19,192</u>																		
B	Name(s) of Electric/Fuel Utility(s): <u>Columbus Electric Cooperative, Inc.</u>																			
	Rate Schedule Electric: <u>1 & 5 & 6</u> Fuel: <u>natural gas 20</u>																			
C	Gas Co. of New Mexico <table style="width:100%;"> <tr> <th style="text-align: left;">Heating Fuel</th> <th style="text-align: center;">Space Heat</th> <th style="text-align: center;">Water Heat</th> </tr> <tr> <td>Natural Gas</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Electricity</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Oil</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Propane</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Other:</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </table>		Heating Fuel	Space Heat	Water Heat	Natural Gas	☒	☐	Electricity	☐	☐	Oil	☐	☐	Propane	☐	☐	Other:	_____	_____
Heating Fuel	Space Heat	Water Heat																		
Natural Gas	☒	☐																		
Electricity	☐	☐																		
Oil	☐	☐																		
Propane	☐	☐																		
Other:	_____	_____																		

D ENERGY AND POWER												
	1987/1986				1986/1985				1985/1984			
	Electricity		Fuel		Electricity		Fuel		Electricity		Fuel	
	Consumption KWH	Demand KW	Consumption Natural Gas Therms	Other Units: CCF	Consumption KWH	Demand KW	Consumption Natural Gas Therms	Other Units: CCF	Consumption KWH	Demand KW	Consumption Natural Gas Therms	Other Units: CCF
JUL	7,680		224	257	7,840		157	183	9,680		455	529
AUG	5,360		157	183	5,200		88	102	6,320		92	107
SEP	5,360		132	153	5,440		108	125	12,640		57	66
OCT	12,640		272	316	10,400		265	308	13,440		252	293
NOV	12,480		363	422	9,120		289	336	10,320		368	428
DEC	12,000		980	1,140	10,960		906	1,054	4,080		863	1,003
JAN	13,760		1,742	2,026	8,640		1,806	2,100	7,440		2,312	2,688
FEB	10,320		2,099	2,441	8,560		1,856	2,133	10,240		1,931	2,245
MAR	12,240		1,749	2,034	8,720		1,687	1,939	10,800		1,884	2,191
APR	14,000		1,379	1,603	11,120		1,005	1,155	8,400		1,048	1,219
MAY	13,120		1,079	1,255	8,880		556	639	8,880		738	858
JUN	12,240		389	458	11,440		361	415	10,320		309	359

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Table 5 continued

ENERGY HISTORY DATA

RECEIVED

A	SCHOOL NAME <u>*Field House & Football Field</u> SQUARE FOOTAGE <u>3,690</u> * *This includes a teacherage residence square footage of 1,248 Sq. Ft.																			
B	Name(s) of Electric/Fuel Utility(s): <u>Columbus Electric Cooperative, Inc.</u> Rate Schedule Electric: _____ Fuel: _____ _____	C Gas Co. of New Mexico Heating Fuel Type of Use <table style="width:100%; border: none;"> <tr> <td></td> <td style="text-align: center;">Space Heat</td> <td style="text-align: center;">Water Heat</td> </tr> <tr> <td>Natural Gas</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Electricity</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Oil</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Propane</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Other:</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </table>		Space Heat	Water Heat	Natural Gas	☒	☐	Electricity	☐	☐	Oil	☐	☐	Propane	☐	☐	Other:	_____	_____
	Space Heat	Water Heat																		
Natural Gas	☒	☐																		
Electricity	☐	☐																		
Oil	☐	☐																		
Propane	☐	☐																		
Other:	_____	_____																		

D ENERGY AND POWER												
	1987/1986				1986/1985				1985/1984			
	Electricity		Fuel		Electricity		Fuel		Electricity		Fuel	
	Consumption KWH	Demand KW	Consumption Natural Gas Therms	Other Units: CCF	Consumption KWH	Demand KW	Consumption Natural Gas Therms	Other Units: CCF	Consumption KWH	Demand KW	Consumption Natural Gas Therms	Other Units: CCF
JUL	640		85	98	1,080		77	90	360		66	77
AUG	480		60	70	520		65	76	360		64	74
SEP	960		52	60	1,440		82	95	1,040		66	77
OCT	2,040		60	70	1,960		91	106	2,360		80	93
NOV	2,080		118	137	1,600		201	234	2,320		100	116
DEC	1,920		399	464	2,160		399	464	640		329	383
JAN	1,280		586	681	1,080		690	802	1,760		696	809
FEB	1,800		819	952	1,040		768	883	1,440		767	892
MAR	1,240		568	660	1,400		639	735	1,680		636	740
APR	1,120		632	735	1,680		453	521	1,200		498	579
MAY	800		501	582	1,160		262	301	1,320		317	369
JUN	560		154	181	1,320		153	176	1,160		174	202

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Table 5 continued

SECTION B - III

RESULTS

Introduction

After review of this facility, a number of maintenance procedures and retrofits have been identified. These two items are discussed in this section.

MAINTENANCE PROCEDURES

The following maintenance procedures are general in nature but apply to the specific equipment and systems in this facility. Other maintenance comments which are specific to a particular piece of equipment (such as worn-out fanbelt, missing filters, etc.) can be found in Appendix A, Equipment Data Forms.

1. Change Filters on Scheduled Basis. Filters on furnaces should be replaced every 4-6 months, especially in areas exposed to wind-blown dust. Filter media on evaporative coolers should be replaced prior to every cooling season. Dirty filters increase the resistance to air flowing past the filters, which decreases the air flowing to the space.

This decreased air flow requires the burners in furnaces to operate for longer periods and can result in the furnace cabinet heating up more than necessary, wasting fuel. Additional effects of dirty filters will be reduced comfort and increased maintenance of the furnace. A maintenance log should be kept current, which can form the basis for generating work orders for filter changes, lubrication, replacement of belts, etc. on specific equipment.

2. Maintain Water Heaters. The following items should be checked every six months on each water heater.

- Remove Sediment. Turn off the burners, then run water from bottom drain of

water heater until sediment clears and water is clean so more efficient heat transfer occurs from the burner.

- **Adjust Temperature.** The water temperature should be as low as possible to maintain acceptable temperatures. This avoids potential burn problems and standby losses when the hot water is not needed. Information on the dual temperature water heater controllers is included in Appendix B.

3. Maintain Control Systems. There are many parts of a control system that affect energy usage and each of these should be checked annually.

- **Check and Adjust Thermostat Calibration on Scheduled Basis.** Thermostats can lose their calibration over time and create confusion over proper temperature setpoints. This can often result in occupants adjusting the thermostat temperature settings to over-compensate for the thermostat's miscalibration - wasting energy. A qualified HVAC repairman should be able to adjust the thermostat's internal components to provide for accurate thermostat settings resulting in increased comfort and energy savings.

Thermostat calibration should be checked annually. This item should be included in the maintenance log for the equipment it is controlling. The rooftop air handlers serving the high school classrooms have individual thermostats and should all be checked as part of a scheduled program associated with the rooftop unit being controlled.

4. Maintain Fans. The following items should be checked and maintained every 3 months on each piece of HVAC equipment which contains a fan.

- **Lubricate Bearings.** If shaft bearings are in need of lubrication, the motor will work harder for the same fan output. Increased horsepower and electrical current will result.

- **Keep Fan Belts Tight.** All belt-driven fans will have some energy lost through

belt slippage and flexing. This loss can be reduced by ensuring belts are kept tight and are in good repair. Be cautious not to overtighten belts as this will increase wear on the motor. Optimum tension is a ½ inch deflection midway between the pulleys.

5. Turn Lights Off in Unoccupied Rooms. A student, teacher and staff energy awareness program should be undertaken to ensure that lighting is turned off by the last person to exit a room. Although turning lighting off and on does decrease the life of the lamps, studies have shown that if lights are not needed for ten minutes or more, the dollar savings from energy reduction will more than offset the increased lamp replacement costs.

Mr. Nelson is replacing fluorescent tubes with the lower wattage type as they burn out, which is good, but it is unknown if the ballasts used are the low wattage type. Since the older type uses approximately 20% of the fixture's electricity, energy saving ballasts can save 6% of fluorescent lighting cost.

6. Repair Ductwork Leaks in Heating and Cooling Systems. All rooftop furnaces and evaporative coolers are installed with a three-inch flexible section between the unit discharge and the ductwork. In many cases this flex connection has been deteriorated by ultraviolet sunlight and is leaking conditioned air day and night. All flex connections should be inspected and replaced as required. Ask your supplier to provide you with materials, meeting the following specification:

- Flexible Duct Connections. 1] Provide manufactured access doors in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated. 2] UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 36 ounce per square yard approximately 3 inches wide, crimped into metal edging strip.

Once you have the proper materials, replace all the bad flex connections.

7. Evaporative "Swamp" Cooler Maintenance. All buildings are served by evaporative

coolers which are served by dedicated supply air ducts. These units are interlocked with roof-mounted relief air openings or in some cases the relief air is discharged through operable windows. General maintenance recommendations regarding these coolers are:

- a) install evaporative media securely to prevent sagging and holes in the media which reduce the cooling effectiveness of the unit,
- b) perform regular maintenance tasks such as checking belts, bearings, media placement, and water distribution.

8. Install Seasonal Slide Damper in Evaporative Cooler Main Supply Duct. Standard practice usually includes a seasonal damper to keep the warm air from leaving the building during the heating season. The damper should be located in the main supply duct on the roof near the penetration. The duct access door to the damper should seal air tight. The damper is removed and stored during the cooling season.

9. Weatherization. Seal cracks around windows and doors with caulk or weatherstripping to keep air infiltration to a minimum.

Reseal the coating on the exterior urethane roof insulation. There are several places on the high school complex roof where cracks, bubbles, and weather have deteriorated the protective coating and exposed the orange colored insulation. The UV sunlight will degrade the insulating value of the urethane foam if left exposed.

10. Zoning. Relocate the thermostat controlling the rooftop furnace serving the corridor in the high school building. It is located in an unoccupied and unconditioned janitor's closet. It should be relocated to the opposite side of the same wall to sense the heating load in the area served. A locking cover should be added.

MAINTENANCE PROCEDURE SAVINGS

The total energy savings based on 19% total heating savings if all above items are undertaken is:

ANNUAL SAVINGS

Energy: 12620 THERMS

\$5,943

Simple Payback: Immediate

Table 8 on the next pages summarizes these recommendations.

MAINTENANCE SUMMARY

SCHOOL: Animas High School

SURVEY DATE: March 3, 1988

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
I. Pumping				✓		
A. Pipe Flow Strainers						
II. Water Heaters - Domestic				✓		Look for and repair piping leaks
A. Remove Sediment						
B. Controls		✓				Turn off in summer
III. Heating						
A. Furnaces, Room Heaters, Fan Coils						
1. Filter			✓			
2. Hi/Lo Limit	✓					
3. Burner Efficiency					✓	
4. Heat Exchanger(s)			✓			
5. Oil Bearings				✓		
6. Fan Belts				✓		
7. Clean Fan Blades				✓		
B. Fin Tubes/Radiators						
1. Clean Surfaces			✓	✓		
2. Remove Obstructions				✓		

Table 6

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
IV. Control System						
A. Pneumatics						
1. Valve/Damper Operation _____			✓		✓	
2. Linkage Operation _____					✓	
B. Mixed Air Temperature _____		✓			✓	
C. Sensors						
1. Temperature Domestic Hot Water _____		✓				
2. Water Temperature in Pipe/Pump _____		✓				
3. On/Off Setpoints _____	✓					
4. Air Temperature for Controllers _____					✓	
D. Time Clocks _____	✓				✓	
E. Thermostats _____		✓			✓	
V. Air Conditioning/Ventilating						
A. Compressors						
1. Cleaning _____			✓	✓		
2. Freon Check _____				✓		
3. Belt Tighten _____				✓	✓	
4. Lubricate Bearings _____				✓		
B. Evaporators						
1. Cleaning _____			✓	✓		
2. Heat Exchanger(s) _____			✓	✓		

Table 6 continued

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
C. Swamp Coolers						
1. Pad Cleaning				✓	✓	
2. Water Flow Check				✓		
3. Winterize				✓		
4. Slide Damper					✓	Seasonally
D. Fans						
1. Filter			✓	✓		
2. Bearings				✓		
3. Belts				✓	✓	
4. Clean Fan Blades				✓		
VI. Lighting						
A. Lamp Efficiency			✓			
B. Diffusers and Reflectors			✓			
C. Lighting Level		✓				
D. Manual Control		✓				
VII. Building Envelope						
A. Infiltration						
1. Door and Window Caulking				✓	✓	

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Table 6 continued

RETROFIT RECOMMENDATIONS

1. Replace Present Thermostats with Night Setback Thermostats. The present single setting thermostats in the High School buildings must be manually set back at night to prevent full nighttime heater operation. It would be difficult for personnel assigned to this task to accomplish it each evening for each furnace. The function of turning down thermostats to approximately 55° F at night therefore lends itself well to automatic operation.

The most effective type of setback thermostat are the ones that allow seven (7) day programming. 7-day programming thermostats will allow setback to 55° F on week nights and all weekend, further reducing unnecessary furnace operation.

ANNUAL SAVINGS

Energy: 6925 THERMS

Cost: \$5,637

Annual Savings: \$1,738

Simple Payback: 3.2 years

2. Install Dampers and Automatic Operator to Control Outside Air Quantity. All of the existing rooftop furnace (RTF) units have an existing opening in the cabinet to allow outside air to mix with the return air for personal ventilation. At present none of these openings is capable of being shut, and ventilation air is being heated even when the building is unoccupied. The addition of an automatic damper would save energy by closing this opening at night and on weekends.

ANNUAL SAVINGS

Energy: 11356 THERMS

Cost: \$7,046

Annual Savings: \$2,850

Simple Payback: 2.5 years

ENERGY RETROFIT SUMMARY**SCHOOL: Animas High School****Survey Date: March 3, 1988**

	Therms Saved	Dollar Capital Cost	Annual Dollar Savings	Years Payback
I. Furnaces, and Room Heating Unit(s)				
A. Install night setback thermostats	6925	\$ 5,637	\$ 1,738	3.2
B. Install motorized outside air dampers on air handlers	<u>11356</u>	<u>7,046</u>	<u>2,850</u>	<u>2.5</u>
TOTAL	18281	\$12,683	\$ 4,588	2.8

Table 7

SECTION II

RECOMMENDATIONS

We recommend that the school consider instituting a preventative maintenance and energy savings program involving administration, staff and students.

Administration would be able to support the preventative maintenance program by maintaining records of equipment, such as those in the following appendix, which gives staff information for repairs. The map in Section II of each division may be used to organize repairs by staff on a scheduled and non-emergency basis. Additional items may be added to the appendix and map as needed. The benefit to everyone is, work is performed on an organized, complete, and non-stressful basis and operating budget is saved.

Administration would be able to support the energy savings program by encouraging staff and students to monitor energy usage and keep facilities and equipment clean and by obtaining funding for retrofits.

The benefit to everyone is that the environment is cleaner, more healthful, more enjoyable and operating costs are saved.

Thank you for allowing us to be part of your school program.

APPENDIX A
EQUIPMENT DATA FORMS

EQUIPMENT DATA

SCHOOL: Animas BLDG: Admin Survey Date: 3/3

EQUIPMENT TYPE: Furnace I.D. Number(s): 201/202

Approx. Age of Equipment: 15 years Number of Identical Units: 2

Manufacturer: Reznor Model Number: RXE-125

Location: Roof Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Roof top gas fired

Capacity: 125,000 Btuh CFM HP GPM KW (circle units)

Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type T-STAT

115 Volts 6 1/3 Amps/HP 1 Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Dirty filters

2. No control motor for OSA damper.

3. #202 is not used because of the area served is not in use.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Admin Survey Date: 3/3

EQUIPMENT TYPE: Evap. Cooler I.D. Number(s): 203 & 204

Approx. Age of Equipment: 15 years Number of Identical Units: 2

Manufacturer: ? Model Number: ?

Location: Roof Function: Cooling

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Sump Pump

Capacity: unknown Btuh CFM HP GPM KW (circle units)

Switch control Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

230 Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Evap media has holes.

2. Water distribution - not even through.

RETROFIT INFORMATION

1. Install slide dampers.

EQUIPMENT DATA

SCHOOL: Animas BLDG: Admin. Survey Date: 3/3/88

EQUIPMENT TYPE: Roof top Furnace I.D. Number(s): 205

Approx. Age of Equipment: 15 years Number of Identical Units: 1

Manufacturer: Reznor Model Number: RPVE 125-2

Location: Roof Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired - Forced Air

Capacity: 125,000 Btu ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

115 Volts _____ Amps/HP 1 Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Inoperable for about 4 to 5 year, missing
components

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Admin Survey Date: 3/3/88

EQUIPMENT TYPE: Evap Cooler I.D. Number(s): 206

Approx. Age of Equipment: 5-6 years Number of Identical Units: 1

Manufacturer: unknown Model Number: unknown

Location: Roof Function: cooling

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Unit is used.

2. Parts missing.

RETROFIT INFORMATION

1. Needs cooler media pad.

2. Maintain missing parts.

EQUIPMENT DATA

SCHOOL: Animas BLDG: Admin Survey Date: 3/3

EQUIPMENT TYPE: Evap Cooler I.D. Number(s): 207

Approx. Age of Equipment: 5-6 years Number of Identical Units: 1

Manufacturer: Mcgraw Edison Model Number: B2133

Location: Roof Function: Cooling

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Swamp Cooler

Capacity: unknown Btuh CFM HP GPM KW (circle units)
Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Cooler media need annual maintenance
2. Slide damper needed.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Admin. Survey Date: 3/3/88

EQUIPMENT TYPE: Roof top Furnace I.D. Number(s): 208

Approx. Age of Equipment: 15 years Number of Identical Units: 1

Manufacturer: Reznor Model Number: RPVE 150-2

Location: Roof Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired - Forced Air

Capacity: 150,000 in Btuh CFM HP GPM KW (circle units)
_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Filters missing - recommend throw away type
2. Regular maintenance - recommended.
3. Unit is short cycling.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Admin Survey Date: 3/3/88

EQUIPMENT TYPE: Domestic W/H I.D. Number(s): 209

Approx. Age of Equipment: 5 years Number of Identical Units: 1

Manufacturer: Day & Night Model Number: 050J-1

Location: South west side of bldg Function: Heating Domestic Water

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired Natural Draft

Capacity: 45,000 in Btuh CFM HP GPM KW (circle units)
_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Circulating pump not used

2. 37.8 recovery rate @ 100°F rise

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Elementary Survey Date: 3/3

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 210 & 211

Approx. Age of Equipment: 3 years Number of Identical Units: 2

Manufacturer: Dayton Model Number: 3E236

Location: Auditorium Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Burner - Gas Fired

Capacity: 150,000 Btu ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
115,000 out Other _____

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
Other _____

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

115 Volts 1.3/1/10 Amps/HP 1 Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Good Condition

2. 24 volt t-stat controlled

RETROFIT INFORMATION

1. Seal flue at roof

EQUIPMENT DATA

SCHOOL: Animas BLDG: Elementary Survey Date: 3/3

EQUIPMENT TYPE: Furnace I.D. Number(s): 212 & 213

Approx. Age of Equipment: 12 years Number of Identical Units: 2

Manufacturer: Bryant Model Number: 150 393U

Location: Class rooms Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Updraft / Under floor return #212

Capacity: 150,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
120,000 out ☐ Other

2) Type: Updraft / Under floor return #213

Capacity: 2 125,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
95,000 out ☐ Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. No filters on both units

RETROFIT INFORMATION

2. Recommend throw away type filters

EQUIPMENT DATA

SCHOOL: Airmas BLDG: elementary Survey Date: 3/3

EQUIPMENT TYPE: Evap Cooler I.D. Number(s): 214-218

Approx. Age of Equipment: 5/6 years Number of Identical Units: 5

Manufacturer: unknown Model Number: unknown

Location: North side of Bldg Function: cooling

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. No control damper (slide)

2. Media sagging

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Elementary Survey Date: 3/3

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 219-221

Approx. Age of Equipment: 3/5 years Number of Identical Units: 3

Manufacturer: Dayton Model Number: 3E404

Location: Classrooms Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired.

Capacity: 60,000 in Btuh CFM HP GPM KW (circle units)
45,600 out. Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Existing water piping to unused base heater
pipes appear to have asbestos insulation, should
be checked out.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Elementary Survey Date: 3/3

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 222 - 223

Approx. Age of Equipment: 3/5 years Number of Identical Units: 2

Manufacturer: Dayton Model Number: 3E369

Location: Classrooms Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired - space heater

Capacity: 100,000 in Btuh CFM HP GPM KW (circle units)
77,000 out Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

115 Volts 2 Amps/HP 1 Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Good shape
2. #223 has daylight at flue thru roof.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Elementary Survey Date: 3/3

EQUIPMENT TYPE: Evap Cooler I.D. Number(s): 224-226

Approx. Age of Equipment: 5/10 years Number of Identical Units: 3

Manufacturer: unknown Model Number: unknown

Location: South side of Bldg Function: cooling

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Med-a sagging

2. Regular maintenance needed

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Elementary Survey Date: 3/3
EQUIPMENT TYPE: Boiler I.D. Number(s): 227
Approx. Age of Equipment: 8 years Number of Identical Units: 1
Manufacturer: Raypak Model Number: E516T
Location: Mech. room Function: Heating - Back up to passive solar system
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired Packaged Unit
Capacity: 516,000 in Btuh CFM HP GPM KW (circle units)
112,800 out Other _____
2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____
3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type Recirc. Pump
115 Volts 1/4 Amps/HP 1 Phase _____ KW
2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Modulating gas valve
2. North & South Bldgs have solar heating w/ boiler back up.
3. Good condition.

RETROFIT INFORMATION

1. Pump runs manually
2. Recommend to interact w/ Boiler & T' STAT
3. T' stat reset recommended.

EQUIPMENT DATA

SCHOOL: Animas BLDG: Elementary Survey Date: 3/3
EQUIPMENT TYPE: Fancoils I.D. Number(s): 228
Approx. Age of Equipment: 8 years Number of Identical Units: Typical of 8
Manufacturer: McQuay Model Number: TSC 041EA 12
Location: North & South Classroom Function: Heating
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other
- 2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other
- 3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
115 Volts 1.1 Amps/HP 1 Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Clean filters
2. Dampers controlled manually
3. 3-speed fan/variable T-stat controlled
4. Regular preventive maintenance recommended
5. Each unit has outside air supply

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Chardon Survey Date: 3/3
EQUIPMENT TYPE: Furnace I.D. Number(s): 229-232
Approx. Age of Equipment: 3/10 years Number of Identical Units: 4
Manufacturer: Fraser-Johnston Model Number: 00CD36ANA
Location: Southside of (2) Bldgs Function: Heating & Cooling
Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Heating Furnace
Capacity: 20,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
64,000 out Other _____
2) Type: _____
Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____
3) Type: _____
Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

No condenser. Fraser-Johnston # 363LA1A
1 circuit / 1 compressor 230V. 1 ph
1/4 hp. fan @ 2.2 amp 1 ph
w/ refrigeration coils

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Maintenance Survey Date: 3/3

EQUIPMENT TYPE: Furnace I.D. Number(s): 233

Approx. Age of Equipment: 12 years Number of Identical Units: 1

Manufacturer: General Electric Model Number: 21LG-125LS52

Location: Mech. Room Function: Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired - Forced Air

Capacity: 125,000 in ☒ Btuh CFM HP GPM KW (circle units)
100,000 out. Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. No filters

2. No duct insulation

3. No filter banks

4. Maintenance Bldg is also part of the Elementary
Principal's office

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Maintenance Survey Date: 3/3
EQUIPMENT TYPE: Dom. Water Heater I.D. Number(s): 234
Approx. Age of Equipment: 10 years Number of Identical Units: 1
Manufacturer: Norge Model Number: G1-30H
Location: Mech. room Function: Heating Dom. Water
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired - Natural Draft
Capacity: 30,000 Btu Btu/h CFM HP GPM KW (circle units)
30 gal capacity Other _____
2) Type: _____
Capacity: _____ Btu/h CFM HP GPM KW (circle units)
_____ Other _____
3) Type: _____
Capacity: _____ Btu/h CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Pipe insulation needed on hot water piping.
2. Check for flue leaks.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Teacherage Survey Date: 3/3

EQUIPMENT TYPE: Space Heater I.D. Number(s): 235

Approx. Age of Equipment: ? years Number of Identical Units: 1

Manufacturer: Signature Model Number: SFB-50219

Location: Livingroom Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Burner.. Radiant

Capacity: 50,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Fan-forced draft
2. T-stat controlled

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Teacherage Survey Date: 3/3

EQUIPMENT TYPE: Furnace I.D. Number(s): 236

Approx. Age of Equipment: ? years Number of Identical Units: 1

Manufacturer: Marsh Industries Model Number: 06-6123

Location: Bedroom Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Convector Type

Capacity: unknown ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3
EQUIPMENT TYPE: Dom. Water Heater I.D. Number(s): 237
Approx. Age of Equipment: 10 years Number of Identical Units: 1
Manufacturer: National Model Number: N-100-210C
Location: Adjacent to Kitchen Function: Heating Domestic Water
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas - Domestic Water Heater
Capacity: 250,000 in 100 gal capacity Bluh CFM HP GPM KW (circle units)
Other _____
2) Type: _____
Capacity: _____ Bluh CFM HP GPM KW (circle units)
Other _____
3) Type: _____
Capacity: _____ Bluh CFM HP GPM KW (circle units)
Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type in-line Pump E/g 100 AB
115 Volts _____ Amps/HP _____ Phase _____ KW
2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. T & P relief valve drainage on floor
2. Dial set - thermostat control temp.
3. Circulating Pump Bell/Gossett series 100AB

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3

EQUIPMENT TYPE: Booster Heater I.D. Number(s): 238

Approx. Age of Equipment: unknown years Number of Identical Units: 1

Manufacturer: National Steel Co. Model Number: NBH-12

Location: Kitchen Function: Heating domestic water

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

208 Volts _____ Amps/HP 3 Phase 12 KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Good shape

2. Temp & Pressure included

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3

EQUIPMENT TYPE: Dom. Water Heater I.D. Number(s): 239

Approx. Age of Equipment: 10 years Number of Identical Units: 1

Manufacturer: National Model Number: N 90 202 B

Location: Mech. Room Function: Dom water Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural Gas-fired

Capacity: 360,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
90 gal capacity Other _____

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. 2-temp control set (T-stat)

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3

EQUIPMENT TYPE: R/T Furnace I.D. Number(s): 240-241

Approx. Age of Equipment: 10 years Number of Identical Units: 2

Manufacturer: Reznor Model Number: RXE 250-4-24

Location: Roof Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired - Forced Air

Capacity: 150,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
112,500 out Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

115 Volts 1 Amps/HP 1 Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Replace Filter

2. OSA opening no damper

3. Plenum return

4. Belt tension needed

5. Filter missing on #241

6. 3175 CFM @ .41" ESP.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3
EQUIPMENT TYPE: R/T Furnace I.D. Number(s): 242
Approx. Age of Equipment: 10 years Number of Identical Units: 1
Manufacturer: Reznor Model Number: RXE 250-4-28
Location: Roof Function: Heating
Heating Fuel Type: (Gas) Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired - Forced Air
Capacity: 250,000 Btu 1.7 (Btu) CFM HP GPM KW (circle units)
3655 CFM @ .65 EER Other _____
2) Type: _____
Capacity: _____ Btu/h CFM HP GPM KW (circle units)
_____ Other _____
3) Type: _____
Capacity: _____ Btu/h CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
708 Volts 5.5/1 1/2 Amps/HP 3 Phase _____ KW
2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Belt tension needed
2. Filters needed
3. Atmospheric - no damper

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3

EQUIPMENT TYPE: R/T Furnace I.D. Number(s): 243

Approx. Age of Equipment: 10 years Number of Identical Units: 1

Manufacturer: Reznor Model Number: RXE 400-4-2Y

Location: Roof Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired - Forced Air

Capacity: 400,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
300,000 out Other _____

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

208 Volts 10/3 Amps/HP 3 Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Cabinet insulation loose
2. No OSA damper
3. 5200 CFM @ 81" ESP.
4. Belts ok fine

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3

EQUIPMENT TYPE: R/T Furnace I.D. Number(s): 244

Approx. Age of Equipment: 10 years Number of Identical Units: 1

Manufacturer: Reznor Model Number: RXE-125-4-2Y

Location: Roof Function: Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired - Forced Air

Capacity: 125,000 Btu Btuh CFM HP GPM KW (circle units)
1750 CFM @ 54" ESP Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____
115 Volts 13.8/1.75 Amps/HP 1 Phase _____ KW

2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Unit inoperable needs new parts

1. Fan is missing

3. Unit is repairable

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3

EQUIPMENT TYPE: Evap Cooler I.D. Number(s): 245-250

Approx. Age of Equipment: 10 years Number of Identical Units: 6

Manufacturer: ESSICK Model Number: EA-10776

Location: Roof Function: Cooling

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts 1/2 HP Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Sagging media on all evap coolers

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3
EQUIPMENT TYPE: Evap. Cooler I.D. Number(s): 251-254
Approx. Age of Equipment: 10 years Number of Identical Units: 4
Manufacturer: ESSICK Model Number: BA-813-0D-2
Location: Roof Function: Cooling
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other
- 2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other
- 3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Sagging media on all evap cooler
2. #253 is missing motor

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3

EQUIPMENT TYPE: R/T. Make-up Air I.D. Number(s): 255 & 256

Approx. Age of Equipment: 10 years Number of Identical Units: 2

Manufacturer: ESSICK Model Number: 150T-1

Location: Roof Function: Heating & Cooling (Equip)

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Make-up Air Unit.

Capacity: 2780 max Btuh CFM HP GPM KW (circle units)
1240 min. Other @ .5" ESP

2) Type: Gas Fired - Forced Air.

Capacity: 150,000 in Btuh CFM HP GPM KW (circle units)
112,500 out. Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

115 Volts 1/2 Amps/HP 1 Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Heating hardly used.

2. Cooling motor needs replacement.

3. Needs cleaning / summerized.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3

EQUIPMENT TYPE: Exhaust Fan I.D. Number(s): 257

Approx. Age of Equipment: 10 years Number of Identical Units: 1

Manufacturer: unknown Model Number: unknown

Location: Roof Function: Exhausting

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Utility Exhaust Fan DX

Capacity: 2000 approx Btuh CFM HP GPM KW (circle units)
_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Good condition

2. Damper are in good condition

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Commons Survey Date: 3/3
EQUIPMENT TYPE: R/T Furnace I.D. Number(s): 258
Approx. Age of Equipment: 10 years Number of Identical Units: 1
Manufacturer: Reznor Model Number: RXE-125-4-2Y
Location: Roof Function: Heating
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired - Forced Air
Capacity: 1750 @ 54" ESP Btuh CFM HP GPM KW (circle units)
_____ Other _____
- 2) Type: _____
Capacity: 125,000 in Bluh CFM HP GPM KW (circle units)
93,750 out. Other _____
- 3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
115 Volts 138 3/4 Amps/HP 1 Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Spark ignition on standing pilot
2. Filters are fine

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: High School Survey Date: 3/3
EQUIPMENT TYPE: Dom. Water Heater I.D. Number(s): 259
Approx. Age of Equipment: 11 years Number of Identical Units: 1
Manufacturer: National Model Number: N-70-920-B
Location: Mech. Room Function: Heating Domestic Water.
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired water heater
Capacity: 500,000 in Btuh CFM HP GPM KW (circle units)
70 gal capacity Other 420 gph recovery.
- 2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____
- 3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Water regulator leaking
2. Water damage on pipes & storage tank & circ. pump.
3. Corrosion on drain valve.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: High School Survey Date: 3/3

EQUIPMENT TYPE: Dom. Water Heater I.D. Number(s): 260

Approx. Age of Equipment: 11 years Number of Identical Units: 1

Manufacturer: National Model Number: N-90-302B

Location: Mech Room Function: Heating Dom. Water

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired Water Heater

Capacity: 360,000 BTU ☒ BTU ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

90 gal capacity Other _____

2) Type: _____

Capacity: _____ ☐ BTU ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other _____

3) Type: _____

Capacity: _____ ☐ BTU ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Water damage from previous leak to outer skirt of tank

2. Corrosion on outlet side of tank

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: High School Survey Date: 3/3
EQUIPMENT TYPE: R/T Furnace I.D. Number(s): 261-263/270, 273
Approx. Age of Equipment: 11 years Number of Identical Units: 5
Manufacturer: Reznor Model Number: RXE-250-4-2Y
Location: Roof Function: Heating
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired - Forced Air
Capacity: 250,000 in 187,000 out Btuh CFM HP GPM KW (circle units)
Other _____
- 2) Type: _____
Capacity: 2785 @ .46" ESP Btuh CFM HP GPM KW (circle units)
Other _____
- 3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
208 Volts 88/1 Amps/HP 1 Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Lacks Filters
2. Needs New Belts
3. No OSP dampers
4. #270 does not operate, get hot & shuts down, ignition system burned out, filter casing disassembled
5. #273 not operating, belts, filter need replacing ignition problems

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: High School Survey Date: 3/3
EQUIPMENT TYPE: R/T FURNACE I.D. Number(s): 264, 265, 266, 267, 268
Approx. Age of Equipment: 11 years Number of Identical Units: 8
Manufacturer: Reznor Model Number: RXE-125-4-2Y
Location: Roof Function: Heating
Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired - Forced Air
Capacity: 125,000 in Btuh CFM HP GPM KW (circle units)
93,750 out Other _____
2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____
3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
115 Volts 13.8/34 Amps/HP 1 Phase _____ KW
2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Filters dirty - need replacing
2. Standing pilot w/ spark ignition
3. Weather strip @ fan compartment door need replacing
4. Loose belts
5. No OSP dampers on all units
6. #276 No filters & flex connector is ripped
7. #272 Recommend removing supply air duct damper @ unit

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: High School Survey Date: 3/3
EQUIPMENT TYPE: R/H Furnace I.D. Number(s): 271 & 275
Approx. Age of Equipment: 11 years Number of Identical Units: 2
Manufacturer: Reznor Model Number: RXJ-350-4-SMB
Location: Roof Function: Heating
Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired - Forced Air
Capacity: 350,000 in ☒ Btuh CFM HP GPM KW (circle units)
262,000 out Other _____
2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____
3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Lacks filters on Both units
2. Damper lacking
3. Loose belts
4. 100% O.P. units
5. #275 missing bearings on squirrel cage

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: High School Survey Date: 3/3
EQUIPMENT TYPE: R/T Unit I.D. Number(s): 274
Approx. Age of Equipment: 11 years Number of Identical Units: 1
Manufacturer: Reznor Model Number: RXE-150-4-2Y
Location: Roof Function: Heating
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired - Forced Air
Capacity: 150,000 in Btuh CFM HP GPM KW (circle units)
112,500 out Other _____
- 2) Type: _____
Capacity: 3175 @ .41" ESP Btuh CFM HP GPM KW (circle units)
Other _____
- 3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
115 Volts 16/1 Amps/HP 1 Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Needs replacing filters
2. Belts loose
3. No OSA damper

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: High School Survey Date: 3/3
EQUIPMENT TYPE: Evap Coolers I.D. Number(s): 277-291
Approx. Age of Equipment: 11 years Number of Identical Units: 15
Manufacturer: unknown Model Number: unknown
Location: Roof Function: Cooling
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Evap cooler (swamp)
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other
- 2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other
- 3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Sagging media
2. Some holes @ flex connection between ducts
& evap coolers.
3. Belts need replacing.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: High School Survey Date: 3/3
EQUIPMENT TYPE: Dom. Water Htr I.D. Number(s): 292
Approx. Age of Equipment: 11 years Number of Identical Units: 1
Manufacturer: National Model Number: N-70-420-B
Location: Mech. room Function: Heating Domestic Water
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired
Capacity: 500,000 Btu 70 gal capacity Btuh CFM HP GPM KW (circle units)
Other
- 2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other
- 3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Incorrect air/fuel mixture
2. 42.0 gph recovery

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Vc-Ag Survey Date: 3/3
EQUIPMENT TYPE: Dom. Gas Wtr. Htr I.D. Number(s): 293
Approx. Age of Equipment: 11 years Number of Identical Units: 1
Manufacturer: Mor Flo Model Number: ESG 3133
Location: Mech. Room Function: Heating Dom. Water
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired
Capacity: 33,000 Btu Btu/h CFM HP GPM KW (circle units)
30 gal cap. Other _____
- 2) Type: _____
Capacity: _____ Btu/h CFM HP GPM KW (circle units)
_____ Other _____
- 3) Type: _____
Capacity: _____ Btu/h CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. 37.7 gph recovery
2. Seal flue thru roof penetration

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Vo-Ag Survey Date: 3/3
EQUIPMENT TYPE: Furnace I.D. Number(s): 294
Approx. Age of Equipment: _____ years Number of Identical Units: 1
Manufacturer: Westinghouse Model Number: FGCJ C80 AB
Location: Mech. Room Function: Heating
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired - Updraft
Capacity: 80,000 in Btuh CFM HP GPM KW (circle units)
64,000 out Other _____
2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____
3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Change filters

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: No. A9 Survey Date: 3/3
EQUIPMENT TYPE: Unit Heaters I.D. Number(s): 295 & 296
Approx. Age of Equipment: 11 years Number of Identical Units: 2
Manufacturer: Westinghouse Model Number: UH 175 LE
Location: Shop Function: Heating
Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Gas Fired - Space Heater
Capacity: 175,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
140,000 out ☐ Other _____
- 2) Type: _____
Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ ☐ Other _____
- 3) Type: _____
Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ ☐ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Both units are in good shape

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Vo-Aq Survey Date: 3/3
EQUIPMENT TYPE: Exhaust Fan I.D. Number(s): 297
Approx. Age of Equipment: 11 years Number of Identical Units: 1
Manufacturer: Peerless Model Number: 300K
Location: Roof Function: Exhaust
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Utility Set - Class I
Capacity: 14,420 @ 1/4" ESP Btuh CFM HP GPM KW (circle units)
1,074 EPM Other _____
2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____
3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Belts are fine

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Vo-Ag Survey Date: 3/3

EQUIPMENT TYPE: Evap Cooler I.D. Number(s): 298-299-300

Approx. Age of Equipment: 11 years Number of Identical Units: 3

Manufacturer: Essick Model Number: #298 BA 7130-D-2

Location: Roof Function: Cooling

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Media sagging

2. Holes in flex connector

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Fieldhouse Survey Date: 3/3

EQUIPMENT TYPE: Furnace I.D. Number(s): 301

Approx. Age of Equipment: 11 years Number of Identical Units: 1

Manufacturer: Fedder Model Number: unknown

Location: Equip Room Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. filters need replacing

2. Louver door is needed.

3. OSA mixing with return air

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Field House Survey Date: 3/3

EQUIPMENT TYPE: Furnace I.D. Number(s): 302

Approx. Age of Equipment: 11 years Number of Identical Units: 1

Manufacturer: Fraser Johnston Model Number: unknown

Location: West side of Bldg Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: N/A

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. filters needed

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Animas BLDG: Field House Survey Date: 3/3

EQUIPMENT TYPE: Dom Uti Htr I.D. Number(s): 303

Approx. Age of Equipment: 11 years Number of Identical Units: 1

Manufacturer: Rheem Model Number: RF 180-98

Location: North side of Bldg Function: Heating Dom Water

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired

Capacity: 180,000 in Btuh CFM HP GPM KW (circle units)
98 gal capacity Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

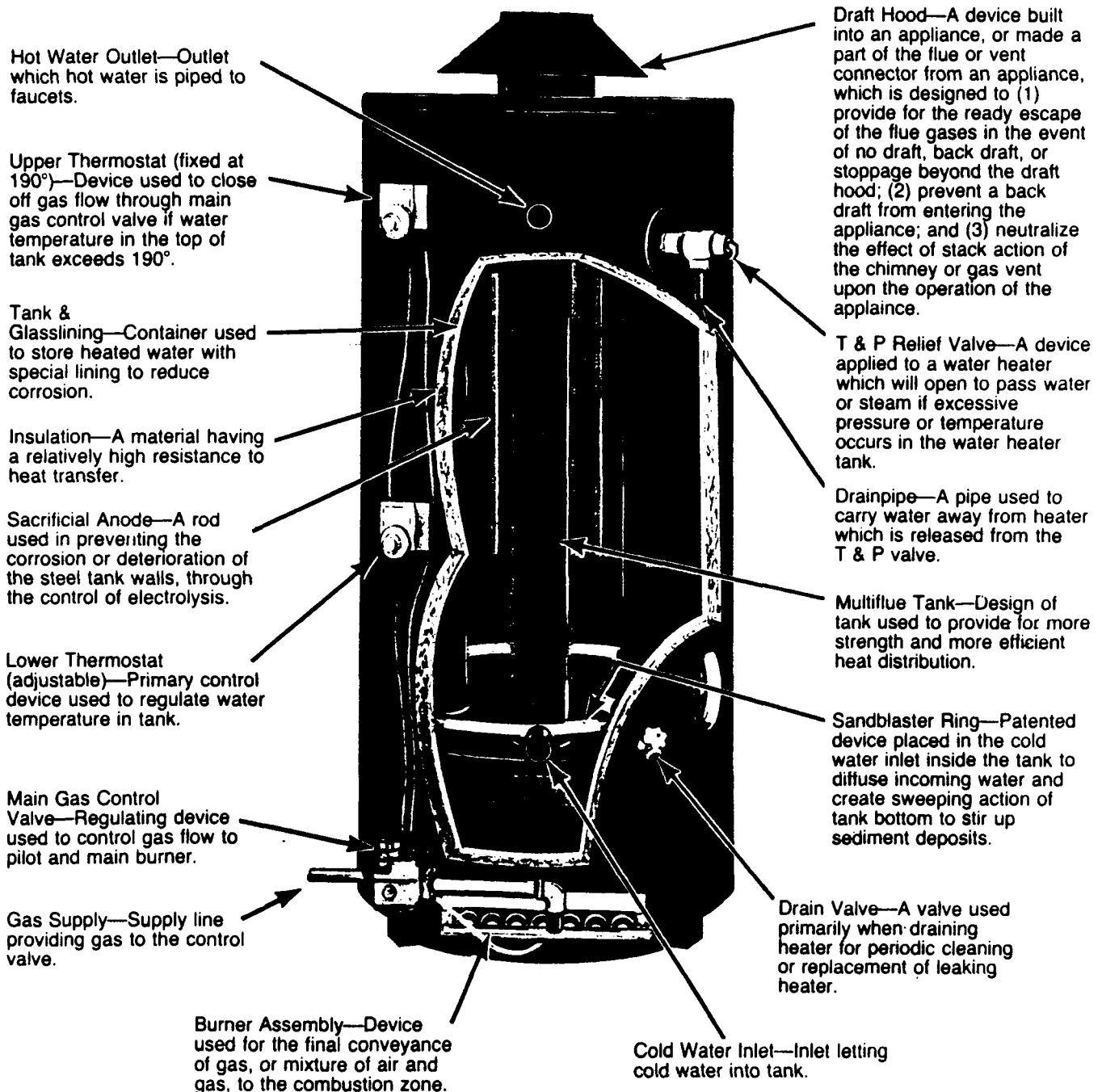
ADDITIONAL MAINTENANCE INFORMATION

1. Door to room to water heater is off.

RETROFIT INFORMATION

APPENDIX B
MANUFACTURERS CUT SHEETS

Bleed Type Systems

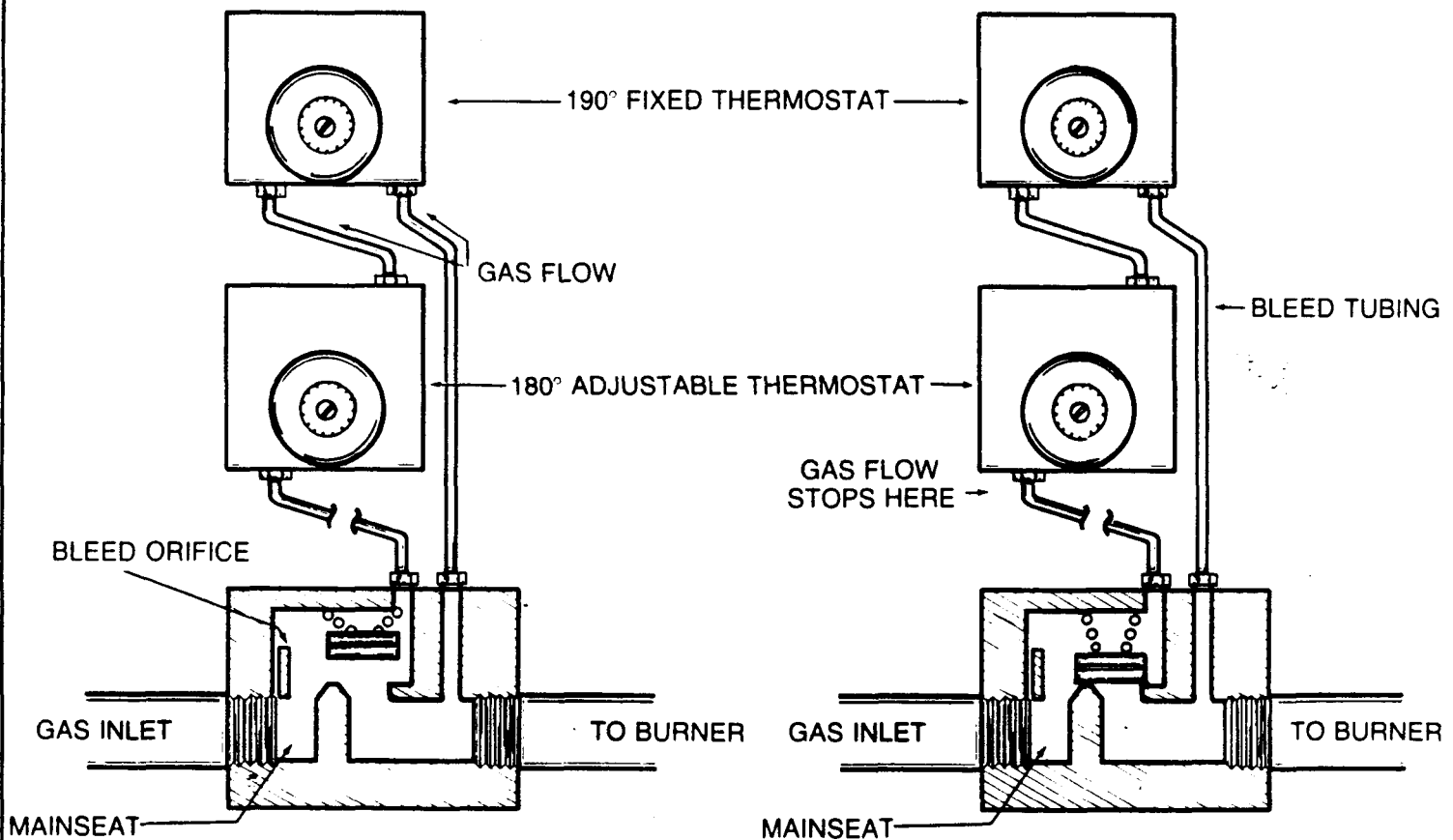


EXPLANATION OF CONTROL SYSTEM

The system shown in the drawing incorporates the use of two snap acting bleed gas thermostatic valves in conjunction with a diaphragm type main gas control valve. A small amount of bleed gas flowing through each of the thermostats relieves the pressure on top of the diaphragm in the control valve allowing gas to flow freely through the valve. When either thermostat closes, gas flow through the bleed system is stopped and the pressure build up on top of the diaphragm will cause the main gas valve to close.

In normal operation the burner cycle will be

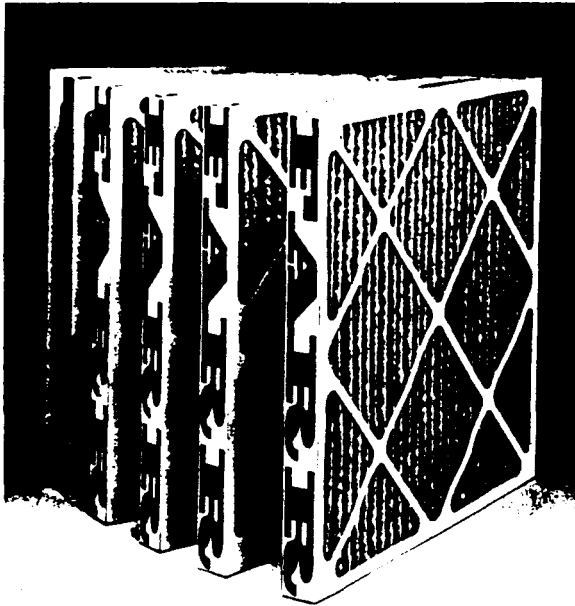
controlled by the lower thermostat which has a differential of less than 10°F . Thus the water in the tank will be maintained within 10° of the lower thermostat setting. In case of temperature build up within the tank to 190°F . the upper thermostat will act as an energy cut off and block the flow of bleed gas which in turn closes the main diaphragm valve. Upon a drop in the temperature at the top of the tank of less than 10° the upper thermostat will open and return control to the lower thermostat. Thus, the heater is controlled within water temperature limits of the lower thermostat setting and the 190° upper thermostat setting automatically.



COMMERCIAL PRODUCTS SELECTION GUIDE

30/30 FILTERS

FARR 30/30 EXTENDED AREA FILTERS have established a new air filtration standard in a wide variety of commercial, industrial and residential applications. High efficiency ratings, extended service life and ease of handling have made them the accepted choice where both performance and economy are required.



FILTER MEDIA shall be of the non-woven cotton fabric type. The filter media shall have an average efficiency of 25-30% on ASHRAE Test Standard 52-76. It shall have an average arrestance of 90-92% in accordance with that test standard.

The Farr 30/30 is categorized as a 30% efficiency filter. Average efficiencies may vary 5 points. These variances are typical of filters in the medium efficiency category when tested in accordance with the ASHRAE 52-76 standard.

MEDIA SUPPORT GRID shall be a welded wire grid with an effective open area of not less than 96%.

The welded wire grid shall be bonded to the filter media to eliminate the possibility of media oscillation and media pull away.

The media support grid shall be formed in such a manner that it affects a radial pleat design, allowing total use of filter media.

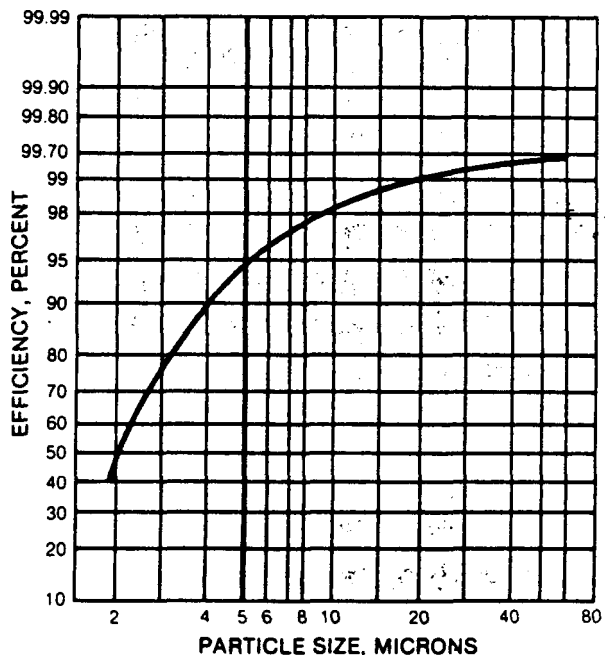
NEW OR EXISTING SYSTEMS can be upgraded by incorporating the Farr 30/30. Its greater dust holding capacity not only extends replacement intervals, but considerably lengthens the service life of any other secondary filters in the system.

Farr 30/30 filters may be installed in built-up banks, Farr Glide/Pack side access housings and OEM air handling units. A wide range of conversion fasteners and clips are available to adapt the Farr 30/30 to almost any existing built-up filter bank.

ENCLOSING FRAME shall be constructed of a rigid, heavy duty, high wet strength beverage board, with diagonal support members bonded to the air entering and air exit side of each pleat, to ensure pleat stability. The inside periphery of the enclosing frame shall be bonded to the filter pack, thus, eliminating the possibility of air bypass.

HOLDING FRAMES shall be Farr Type 8, factory fabricated of 16 gauge galvanized steel and shall be equipped with gaskets and four spring-type positive sealing fasteners. Fasteners shall be capable of being attached or removed without the use of tools.

EFFECTIVE PARTICLE SIZE EFFICIENCY



A COMPLETE LIST OF AVAILABLE SIZES IS SHOWN ON REVERSE SIDE.

FARR

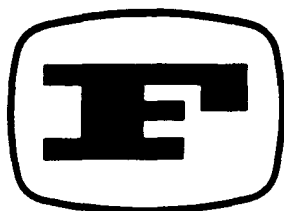
NOMINAL FILTER DEPTH	NOMINAL SIZE (Inches) (mm)	ACTUAL SIZE (Inches) (mm)			CAPACITIES (CFM) (m ³ /h)		RESISTANCE AT CAPACITY (Inches WG) (kPa)			MEDIA AREA (ft ²) (m ²)	
		WIDTH	HEIGHT	DEPTH	MEDIUM	HIGH	MEDIUM	HIGH	FINAL**	TOTAL	MEDIA AREA PER SQUARE FOOT FACE AREA
4"	12 x 24 ~~305 x 610~~	11.38 ~~289~~	23.38 ~~594~~	3.88 ~~98.4~~	600 ~~1020~~	1200 ~~2040~~	.12 ~~.03~~	.35 ~~.09~~	.90 ~~.22~~	13.8 ~~1.28~~	7.0 ft ² 11 pleats per linear foot 65 m ² 36 pleats per linear meter
	16 x 20 ~~406 x 508~~	15.38 ~~391~~	19.38 ~~492~~	3.88 ~~98.4~~	665 ~~1130~~	1325 ~~2250~~	.12 ~~.03~~	.35 ~~.09~~	.90 ~~.22~~	15.6 ~~1.45~~	
	16 x 25 ~~406 x 635~~	15.38 ~~391~~	24.38 ~~619~~	3.88 ~~98.4~~	835 ~~1420~~	1670 ~~2840~~	.12 ~~.03~~	.35 ~~.09~~	.90 ~~.22~~	19.6 ~~1.82~~	
	18 x 24 ~~457 x 610~~	17.38 ~~441~~	23.38 ~~594~~	3.88 ~~98.4~~	900 ~~1530~~	1800 ~~3060~~	.12 ~~.03~~	.35 ~~.09~~	.90 ~~.22~~	20.6 ~~1.91~~	
	20 x 20 ~~508 x 508~~	19.38 ~~492~~	19.38 ~~492~~	3.88 ~~98.4~~	835 ~~1420~~	1670 ~~2840~~	.12 ~~.03~~	.35 ~~.09~~	.90 ~~.22~~	18.6 ~~1.73~~	
	20 x 24 ~~508 x 610~~	19.38 ~~492~~	23.38 ~~594~~	3.88 ~~98.4~~	1000 ~~1700~~	2000 ~~3400~~	.12 ~~.03~~	.35 ~~.09~~	.90 ~~.22~~	22.5 ~~2.09~~	
	20 x 25 ~~508 x 635~~	19.38 ~~492~~	24.38 ~~619~~	3.88 ~~98.4~~	1050 ~~1785~~	2100 ~~3570~~	.12 ~~.03~~	.35 ~~.09~~	.90 ~~.22~~	23.5 ~~2.18~~	
	24 x 24 ~~610 x 610~~	23.38 ~~594~~	23.38 ~~594~~	3.88 ~~98.4~~	1200 ~~2040~~	2400 ~~4080~~	.12 ~~.03~~	.35 ~~.09~~	.90 ~~.22~~	27.5 ~~2.55~~	
	29 x 25 ~~737 x 635~~	28.38 ~~721~~	24.38 ~~619~~	3.88 ~~98.4~~	1540 ~~2615~~	3075 ~~5225~~	.12 ~~.03~~	.35 ~~.09~~	.90 ~~.22~~	35.2 ~~3.27~~	
2"	10 x 20* ~~254 x 508~~	9.50 ~~241~~	19.50 ~~495~~	1.88 ~~47.6~~	350 ~~595~~	695 ~~1180~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	5.9 ~~.55~~	4.6 ft ² 15 pleats per linear foot 43 m ² 49 pleats per linear meter
	12 x 20 ~~305 x 508~~	11.88 ~~302~~	19.50 ~~495~~	1.88 ~~47.6~~	420 ~~715~~	835 ~~1420~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	7.5 ~~.70~~	
	12 x 24 ~~305 x 610~~	11.38 ~~289~~	23.38 ~~594~~	1.88 ~~47.6~~	500 ~~850~~	1000 ~~1700~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	8.5 ~~.79~~	
	14 x 20* ~~356 x 508~~	13.50 ~~343~~	19.50 ~~495~~	1.88 ~~47.6~~	485 ~~825~~	970 ~~1650~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	8.4 ~~.78~~	
	14 x 25* ~~356 x 635~~	13.50 ~~343~~	24.50 ~~622~~	1.88 ~~47.6~~	610 ~~1035~~	1215 ~~2065~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	10.6 ~~.98~~	
	15 x 20* ~~381 x 508~~	14.50 ~~368~~	19.50 ~~495~~	1.88 ~~47.6~~	520 ~~885~~	1040 ~~1765~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	9.0 ~~.84~~	
	16 x 20 ~~406 x 508~~	15.50 ~~394~~	19.50 ~~495~~	1.88 ~~47.6~~	550 ~~935~~	1100 ~~1870~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	10.1 ~~.94~~	
	16 x 25 ~~406 x 635~~	15.50 ~~394~~	24.50 ~~622~~	1.88 ~~47.6~~	695 ~~1180~~	1390 ~~2360~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	12.7 ~~1.18~~	
	18 x 20 ~~457 x 508~~	17.50 ~~445~~	19.50 ~~495~~	1.88 ~~47.6~~	625 ~~1060~~	1250 ~~2125~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	10.9 ~~1.01~~	
	18 x 25 ~~457 x 635~~	17.50 ~~445~~	24.50 ~~622~~	1.88 ~~47.6~~	780 ~~1325~~	1560 ~~2650~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	13.7 ~~1.27~~	
	20 x 20 ~~508 x 508~~	19.50 ~~495~~	19.50 ~~495~~	1.88 ~~47.6~~	695 ~~1180~~	1390 ~~2360~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	12.1 ~~1.12~~	
	20 x 24* ~~508 x 610~~	19.50 ~~495~~	23.50 ~~597~~	1.88 ~~47.6~~	835 ~~1420~~	1670 ~~2840~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	14.6 ~~1.36~~	
	20 x 25 ~~508 x 635~~	19.50 ~~495~~	24.50 ~~622~~	1.88 ~~47.6~~	870 ~~1480~~	1740 ~~2955~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	15.3 ~~1.42~~	
	24 x 24 ~~610 x 610~~	23.38 ~~594~~	23.38 ~~594~~	1.88 ~~47.6~~	1000 ~~1700~~	2000 ~~3400~~	.08 ~~.02~~	.28 ~~.07~~	.90 ~~.22~~	17.6 ~~1.64~~	
1"	14 x 20 ~~356 x 508~~	13.50 ~~343~~	19.50 ~~495~~	.88 ~~22.4~~	485 ~~825~~	970 ~~1650~~	.14 ~~.03~~	.45 ~~.11~~	.90 ~~.22~~	4.2 ~~.39~~	2.3 ft ² 16 pleats per linear foot 21 m ² 52 pleats per linear meter
	14 x 25 ~~356 x 635~~	13.50 ~~343~~	24.50 ~~622~~	.88 ~~22.4~~	605 ~~1030~~	1210 ~~2055~~	.14 ~~.03~~	.45 ~~.11~~	.90 ~~.22~~	5.2 ~~.48~~	
	16 x 20 ~~406 x 508~~	15.50 ~~394~~	19.50 ~~495~~	.88 ~~22.4~~	555 ~~945~~	1110 ~~1885~~	.14 ~~.03~~	.45 ~~.11~~	.90 ~~.22~~	4.8 ~~.45~~	
	16 x 25 ~~406 x 635~~	15.50 ~~394~~	24.50 ~~622~~	.88 ~~22.4~~	695 ~~1180~~	1390 ~~2360~~	.14 ~~.03~~	.45 ~~.11~~	.90 ~~.22~~	6.1 ~~.57~~	
	20 x 20 ~~508 x 508~~	19.50 ~~495~~	19.50 ~~495~~	.88 ~~22.4~~	695 ~~1180~~	1390 ~~2360~~	.14 ~~.03~~	.45 ~~.11~~	.90 ~~.22~~	6.0 ~~.56~~	
	20 x 25 ~~508 x 635~~	19.50 ~~495~~	24.50 ~~622~~	.88 ~~22.4~~	870 ~~1480~~	1740 ~~2955~~	.14 ~~.03~~	.45 ~~.11~~	.90 ~~.22~~	7.6 ~~.71~~	
	24 x 24 ~~610 x 610~~	23.50 ~~597~~	23.50 ~~597~~	.88 ~~22.4~~	1000 ~~1700~~	2000 ~~3400~~	.14 ~~.03~~	.45 ~~.11~~	.90 ~~.22~~	8.9 ~~.83~~	

* These are custom sizes, fabricated to order. Framework is not constructed of die-cut stock. Performance is similar to other standard sizes.

** Recommended final resistance. System design may dictate a lower change-out point.

NOTE: Metric equivalents have been rounded for convenience and are within factory tolerance.

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268-6776



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**ENERGY AUDITS
AND
PREVENTATIVE MAINTENANCE**

MARCH 1988

**Prepared for
CAPITAN SCHOOL DISTRICT
AND
STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
Santa Fe, New Mexico**

Contract #76-521.03-042

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SECTION I

EXECUTIVE SUMMARY

The State of New Mexico has contracted with Frank Bolek & Associates to perform an Energy Audit (EA) for Capitan Elementary and Capitan High Schools, and to organize data at the schools to assist the School District in developing a Heating, Ventilating and Air Conditioning (HVAC) Preventative Maintenance (PM) program.

The goal of both the EA and PM is to reduce energy consumption and operating costs of the schools.

A team of an engineer and an HVAC technician worked with Dr. Scott Childress, Superintendent of the Capitan School District. Dr. Childress was extremely helpful in organizing his staff to assist us in collecting data to determine the energy savings options available to the school district. This report summarizes our team's findings and the data collected.

Capitan School District is comprised of two schools - Capitan Elementary and Capitan High School, grouped together on one campus and consisting of a total of eight (8) buildings. The buildings range in age from six (6) to fifty-two (52) years old. The elementary schools occupy two buildings totaling approximately 30,113 square feet. West of the elementary school is the 5,400 square foot Administration building and the 15,000 square foot Multi-Purpose building. At the far north end of campus are the 36,000 square foot main High School building, the 10,935 square foot Old Gym, 1,270 square foot commons enclosure, and the 2,200 square foot Library building. There are two other buildings used for storage or maintenance which were not included in this survey. Seven separate phases of construction occurred to form the school as it is today.

This report is split into two divisions: the first division discusses the Capitan Elementary School; the second division discusses the Capitan High School.

Each division begins with a campus map (Section A-I or B-I). While at the schools, the engineering team labeled 22 pieces of HVAC equipment with numbered aluminum tags. The location of these pieces of equipment and their associated labels is shown on pages 5 and 6. Each piece of equipment requires periodic preventative maintenance. Data for each piece of equipment is in the appendix.

Jay Ware is responsible for maintenance and reports directly to the superintendent. Mr. Ware assisted the engineering team in locating the equipment identified on the Campus Map, and is extremely interested in the maintenance of this facility. From time to time Mr. Ware is assisted by the custodial staff. The custodial staff report to the elementary principal, Jerry Newsome, and to the high school principal, Larry DeWees. Both Mr. Newsome and Mr. DeWees and their staffs were very helpful in arranging access to equipment. At times some portion of the maintenance work may be assigned to the custodial staff by Mr. Ware through this organizational structure.

The map is followed by a discussion of the energy usage data (Section A-II or B-II) which was assembled for the engineering team by Frances Traylor and Joan Pumphrey of the Superintendent's Office. The energy usage data indicates usage has been experiencing crossing trends. Usage dropped in 85/86 but has risen significantly in 86/87.

Energy saving maintenance practices and ideas for retrofit are discussed in Section A-III or B-III.

From the maintenance data and facilities data collected and from experience with similar facilities, the engineering team estimates that at least 10% of the annual energy costs can be eliminated with continuous preventative maintenance. And by spending

approximately \$16,397 on energy savings retrofits, approximately \$8,041 can be saved in annual energy costs.

After the discussion of each school in Divisions A and B, suggestions for implementing the program and obtaining these savings are in Section II.

Finally, the appendix contains data for each piece of equipment identified on the map. This data may be used by the district to develop a preventative maintenance program.

DIVISION A - CAPITAN ELEMENTARY SCHOOL

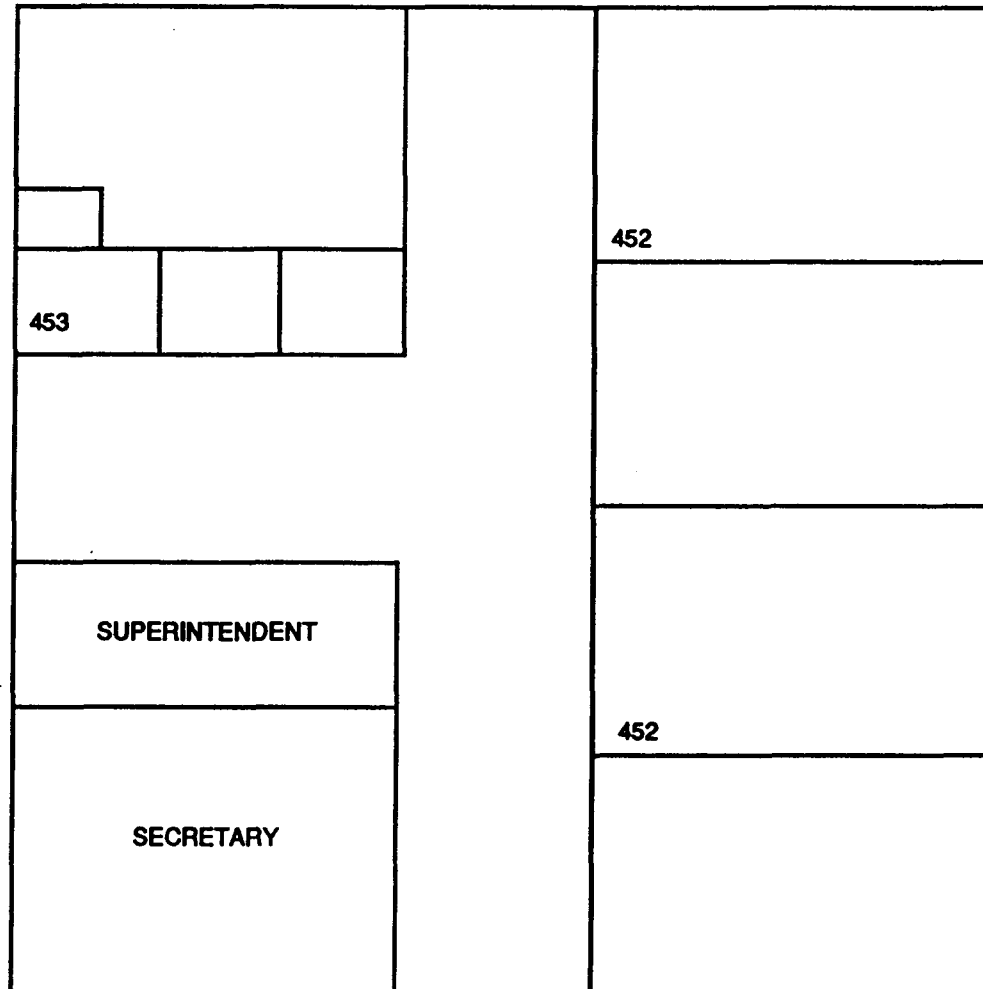
SECTION A-I. LOCATION OF EQUIPMENT

The following Figures 1 and 2 show the locations of the HVAC equipment on the building used exclusively by the elementary school. The equipment includes ducted forced air furnaces, room unit heaters, and exhaust fans.

There is some additional equipment which has not been identified, such as exhaust fans on the roofs of the buildings and domestic hot water circulation pumps in the mechanical rooms. This equipment may be identified and labeled by school personnel to complete the building inventory.

ADMINISTRATION BUILDING/CAPITAN SCHOOL DISTRICT
CAPITAN, NEW MEXICO

EQUIPMENT IDENTIFICATION MAP



—N →

Figure 1

ELEMENTARY BLDG./CAPITAN MUNICIPAL SCHOOLS
CAPITAN, NEW MEXICO

EQUIPMENT IDENTIFICATION MAP

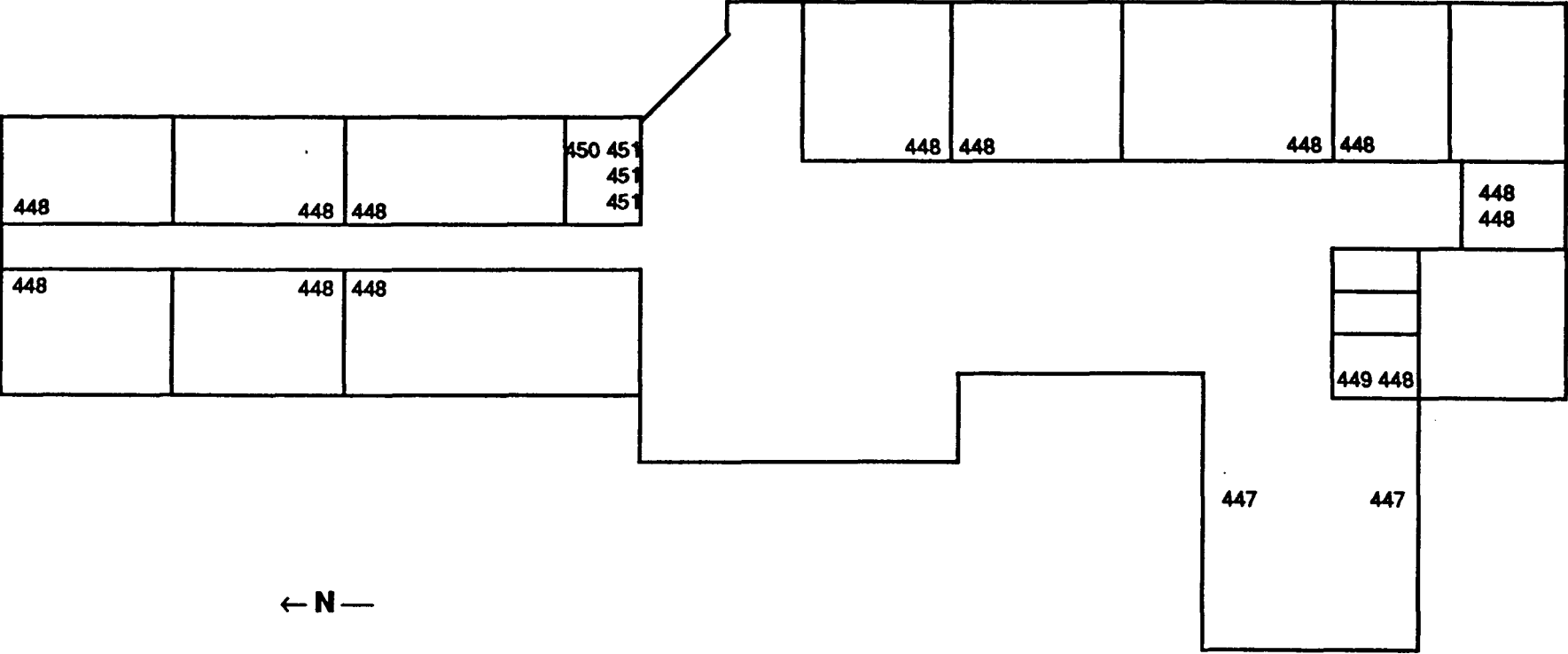


Figure 2
6

SECTION A-II. ENERGY DATA

Table 1 on page 8 shows the history of energy usage for Capitan Elementary Schools.

This usage includes the Special Ed building, the Administration building and energy used at the Middle School and Elementary buildings. Converting all energy units to thousands of BTUs (British Thermal Units) shows that the following site energy is used:

	<u>MBTUs</u>		
	<u>1987/86</u>	<u>1986/85</u>	<u>1985/84</u>
Heating (natural gas)	1,698,775	1,299,415	1,531,272
Electricity	<u>331,391</u>	<u>297,585</u>	<u>323,633</u>
Total	2,030,166	1,597,000	1,854,905

Total energy usage for 1987/86 amounts to 57.2 MBTUs per square foot per year.

It is interesting that the 1986/85 consumption was 16% less than the previous year, but then increased 21% in 1987/86. While this could indicate a mild winter in 1986/85, it could also be a result of usage patterns, maintenance procedures and energy conserving retrofits. Of these factors, the weather is the only one which we have no control over. The staff should be complimented for 85/86's performance.

ENERGY HISTORY DATA

A	SCHOOL NAME <u>Capitan Elementary</u>		SQUARE FOOTAGE <u>35,513</u>									
B	Name(s) of Electric/Fuel Utility(s): <u>Otero County Electric</u> <u>Capitan-Carrizozo Natural Gas</u> Rate Schedule Electric: <u>.08507/KWH</u> Fuel: <u>'84 - 6.81/MCF</u> <u>'85 - 6.70/MCF</u> <u>'86 - 5.77/MCF</u> <u>'87 - 5.76/MCF</u>		C	Heating Fuel Type of Use Natural Gas Electricity Oil Propane Other: Space Heat ☒ ☐ ☐ ☐ ☐ Water Heat ☒ ☐ ☐ ☐ ☐								
D	ENERGY AND POWER											
	1987/1986				1986/1985				1985/1984			
	Electricity		Fuel		Electricity		Fuel		Electricity		Fuel	
	Consumption	Demand	Consumption		Consumption	Demand	Consumption		Consumption	Demand	Consumption	
	KWH	KW	Natural Gas Therms	Other Units: <u>CF</u>	KWH	KW	Natural Gas Therms	Other Units: <u>CF</u>	KWH	KW	Natural Gas Therms	Other Units: <u>CF</u>
JUL	3,756	16.47		14,784	2,903	16.16		7,744	3,256	27.03		4,048
AUG	3,734	15.91		17,248	3,035	19.75		8,096	466	19.85		5,104
SEP	8,120	53.19		24,288	4,407	50.58		14,432	8,449	46.25		12,144
OCT	6,092	56.32		135,872	6,038	59.31		52,096	8,546	59.07		53,856
NOV	10,242	43.65		220,704	11,245	51.50		111,232	9,973	47.94		154,528
DEC	10,066	34.00		246,048	8,161	26.19		262,240	10,166	48.86		282,304
JAN	10,737	30.27		361,152	8,332	27.03		218,312	7,488	31.05		242,176
FEB	10,335	31.47		353,056	10,392	28.72		241,120	12,441	30.20		353,760
MAR	9,934	31.43		92,224	11,019	26.82		149,600	8,976	29.78		173,888
APR	8,596	29.39		145,024	7,245	30.84		126,720	10,052	44.56		139,040
MAY	9,229	24.82		32,384	8,186	24.36		51,040	5,848	30.87		55,616
JUN	6,222	24.82		6,512	6,258	25.20		33,440	9,188	37.70		10,208

• • FRANK BOLEK & ASSOCIATES • •

Table 1

SECTION A-III

RESULTS

Introduction

After review of this facility, a number of maintenance procedures and retrofits have been identified. These two items are discussed in this section.

MAINTENANCE PROCEDURES

1. Change Filters on Scheduled Basis. Filters on furnaces, room heaters, and fan coils should be replaced every 4-6 months, especially in areas exposed to wind-blown dust. Dirty filters increase the resistance to air flowing past the filters, which decreases the air flowing to the space.

This decreased air flow requires the burners in furnaces and boilers feeding the fan coils to operate for longer periods and can result in the equipment overheating, wasting fuel. Additional effects of dirty filters will be reduced comfort and increased maintenance of the equipment. A maintenance log should be kept current, which can form the basis for generating work orders for filter changes, lubrication, replacement of belts, etc. on specific equipment.

2. Maintain Fans. The following items should be checked and maintained every 3 months on each piece of HVAC equipment which contains a fan. It will be most critical to provide this service to equipment with the largest fans:

- **Lubricate Bearings.** If shaft bearings are in need of lubrication, the motor will work harder for the same fan output. Increased horsepower and electrical current will result.

- **Keep Fan Belts Tight.** All belt-driven fans will have some energy lost through

belt slippage and flexing. This loss can be reduced by ensuring belts are kept tight and are in good repair. Be cautious not to overtighten belts as this will increase wear on the motor. There should be ½ inch deflection of the belt midway between the pulleys.

3. Maintain Water Heaters. The following items should be checked every six months on each water heater.

- **Remove Sediment.** Turn off the burners, then run water from bottom drain of water heater until sediment clears and water is clean so more efficient heat transfer occurs from the burner.
- **Adjust Temperature.** The water temperature should be as low as possible to maintain acceptable temperatures. This avoids potential burn problems and standby losses when the hot water is not needed.
- **Check Flame Efficiency.** Cleaning burners and employing a professional to check combustion efficiency every other year will assure that water heaters are producing as much heat as possible from the fuel used.

4. Maintain Control Systems. There are many parts of a control system that affect energy usage and each of these should be checked annually.

- **Check and Adjust Thermostat Calibration on Scheduled Basis.** Thermostats can lose their calibration over time and create confusion over proper temperature setpoints. This can often result in occupants adjusting the thermostat temperature settings to over-compensate for the thermostat's miscalibration - wasting energy. A qualified HVAC repairman should be able to adjust the thermostat's internal components to provide for accurate thermostat settings and proper control of equipment, resulting in increased comfort and energy savings.

Thermostat calibration should be checked annually. This item should be

included in the maintenance log for the equipment it is controlling.

- **Check Linkage Operation.** For economy's sake at times many units are connected to one pneumatic or electric actuator via linkages. These linkages tend to become stuck with dirt, screws become loose on the linkages jamming them or even letting the linkages fall off. Proper operation of linkages should be checked annually.

5. Turn Lights Off in Unoccupied Rooms. A student, teacher, and staff energy awareness program should be undertaken to ensure that lighting is turned off by the last person to exit a room. Although turning lighting off and on does decrease the life of the lamps, studies have shown that if high intensity discharge (HID) lamps are not needed for ten minutes or more, and two minutes for fluorescent lamps, the dollar savings from energy reduction will more than offset the increased lamp replacement costs.

Mr. Ware is replacing fluorescent tubes with the lower wattage type as they burn out. which is good, but it is unknown if the ballasts used are the low wattage type. Since the older type uses approximately 20% of the fixture's electricity, energy saving ballasts can save 6% of fluorescent lighting cost.

6. Proper Operation of Closet Furnace Dampers Necessary. The closet furnaces serving the individual classrooms are equipped with motorized or thermally activated flue dampers to save energy on furnace standby losses. The proper operation of these dampers is very important from a life safety standpoint and should be checked whenever the filters are serviced.

MAINTENANCE PROCEDURE SAVINGS

The energy savings based on 10% total heating savings if all above items are undertaken is:

ANNUAL SAVINGS

Energy: 2030 THERMS

\$1,776

Simple Payback: Immediate

Table 2 on the following pages summarizes these maintenance procedures.

MAINTENANCE SUMMARY

SCHOOL: Capitan Elementary School

SURVEY DATE: March 22, 1988

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
I. Water Heaters - Domestic			✓	✓		
A. Remove Sediment				✓		
B. Insulation				✓		Inspect
II. Heating						
A. Furnaces, Room Heaters, Fan Coils			✓	✓	✓	
1. Filter	✓					
2. Hi/Lo Limit			✓	✓		
3. Heat Exchanger(s)				✓	✓	
4. Oil Bearings				✓	✓	
5. Fan Belts				✓	✓	
6. Clean Fan Blades			✓			Inspect-Tighten
B. Fin Tubes/Radiators			✓	✓		
1. Clean Surfaces			✓	✓		
2. Remove Obstructions						
III. Control System						
A. Sensors						
1. Temperature Domestic Hot Water	✓					
2. Water Temperature in Pipe/Pump	✓					
3. On/Off Setpoints	✓					
4. Air Temperature for Controllers	✓				✓	

Table 2

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
F. Time Clocks _____					✓	
G. Thermostats _____					✓	
IV. Air Conditioning/Ventilating						
A. Fans						
1. Filter _____			✓	✓	✓	
2. Bearings _____				✓	✓	
3. Belts _____				✓	✓	
4. Clean Fan Blades _____			✓			Clean Completely
V. Lighting						
A. Lamp Efficiency _____	✓	✓				
B. Diffusers and Reflectors _____			✓			
C. Lighting Level _____		✓				
D. Manual Control _____	✓					
VII. Building Envelope						
A. Infiltration						
1. Door and Window Caulking _____				✓	✓	

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Table 2
continued

RETROFIT RECOMMENDATIONS

1. Replace Present Thermostats with Night Setback Thermostats. The present single setting thermostats in the Elementary buildings must be manually set back at night to prevent full nighttime heater operation. It would be difficult for personnel assigned to this task to accomplish it each evening for each furnace. The function of turning down thermostats to approximately 55° F at night therefore lends itself well to automatic operation.

Some of the newer classrooms already have an existing setback system, which should be maintained and calibrated when daylight savings time changes occur.

The most effective type of setback thermostat are the ones that allow seven (7) day programming. 7-day programmable thermostats allow setback to 55° F on weeknights and all weekend, further reducing unnecessary heater operation.

ANNUAL SAVINGS

Energy: 3490 THERMS

Cost: \$2841

Annual Savings: \$1951

Simple Payback: 1.5 years

2. Replace Standing Pilot with Electronic Ignition. Most of the furnaces and water heaters use a standing pilot flame to ignite the main burner. Since this energy use is continuous and does not heat the classrooms, it makes good sense to replace the standing pilot with electronic ignition. This type pilot is only lit when there is a demand for heating. Safety features which lock out the main burner valve until the pilot lights should be included.

ANNUAL SAVINGS

Energy: 2592 THERMS

Cost: \$6,750

Annual Savings: \$1,449

Simple Payback: 4.7 years

3. Add Timeclock to System. The domestic water heaters and their associated circulation pumps presently operate all the time. Night and weekend operation is normally not required and the burners cycle on to maintain setpoint temperature and offset tank and piping losses. A timeclock can be added to the system to lock out the burner and circulation pump at night and on weekends, with a manual override to keep the system operable for night or weekend events.

ANNUAL SAVINGS

Energy: 386 THERMS

Cost: \$750

Annual Savings: \$232

Simple Payback: 3.2 years

Table 3 on the next page summarizes retrofit costs, savings and payback.

ENERGY RETROFIT SUMMARY**SCHOOL: Capitan Elementary School****Survey Date: March 22, 1988**

	Therms Saved	Dollar Capital Cost	Annual Dollar Savings	Years Payback
I. Furnaces and Room Heating				
A. Install 7-day setback thermostats	3490	\$ 2,841	\$ 1,951	1.5
B. Retrofit standing pilots	2592	6,750	1,449	4.7
II. Domestic Water Heater Setback	<u>386</u>	<u>750</u>	<u>232</u>	<u>3.2</u>
TOTAL	6468	\$10,341	\$ 3,632	2.8

Table 3

DIVISION B - CAPITAN HIGH SCHOOL

SECTION B-I. LOCATION OF EQUIPMENT

The following Figures 3, 4, 5, and 6 show the locations of the HVAC equipment on the buildings of Capitan High School, and include the Multi-Purpose building, the Library building, the main High School building, Commons Area and the Old Gymnasium. The equipment includes ducted forced air closet furnaces, attic type forced air furnaces, and suspended unit heaters.

Each number on the maps locates a piece of equipment that is labeled in the field and needs periodic maintenance.

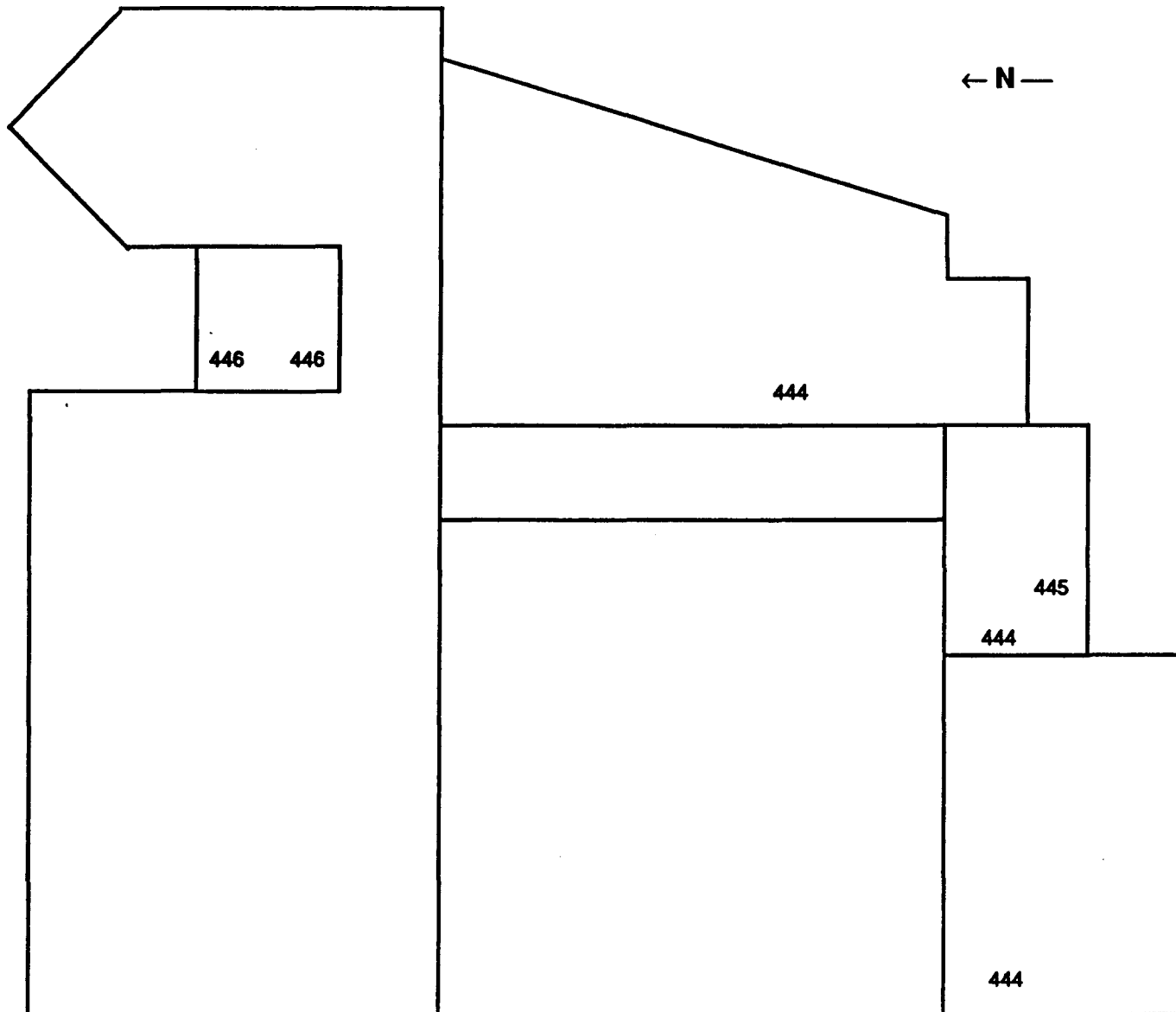
**CAPITAN HIGH SCHOOL/CAPITAN MUNICIPAL SCHOOLS
CAPITAN, NEW MEXICO**

EQUIPMENT IDENTIFICATION MAP



441	441 441		440	440		440	438			438	438		438	438		438
440	440				442 441 441			438	438		439	439				

Figure 3



**MULTI/PURPOSE BUILDING
CAPITAN, NEW MEXICO
EQUIPMENT IDENTIFICATION MAP**

Figure 4

**CAPITAN MUNICIPAL SCHOOLS
CAPITAN, NEW MEXICO
EQUIPMENT IDENTIFICATION MAP**

— N →

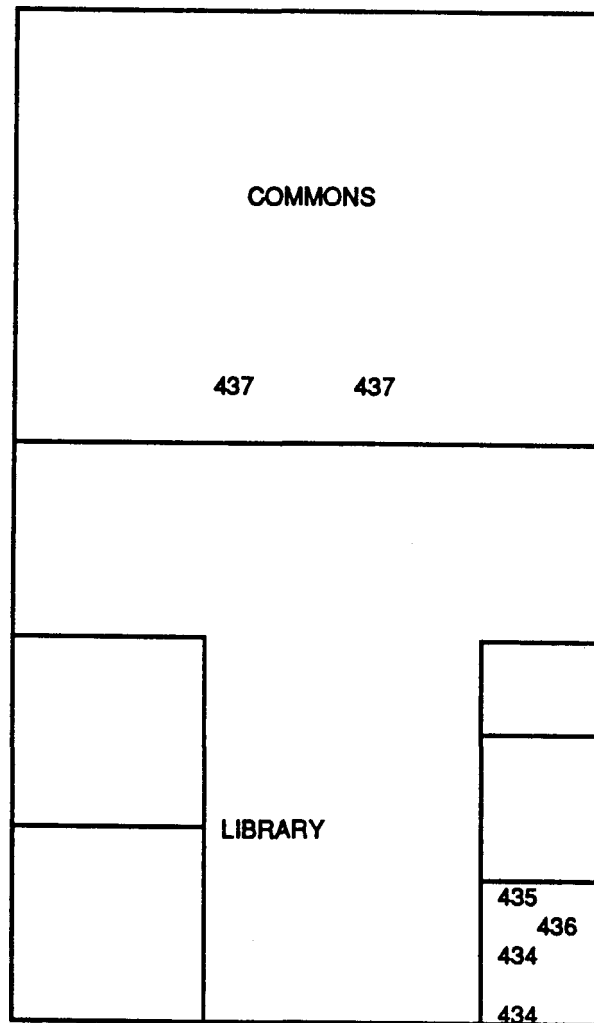


Figure 5

**CAPITAN MUNICIPAL SCHOOLS
CAPITAN, NEW MEXICO
EQUIPMENT IDENTIFICATION MAP**

— N →

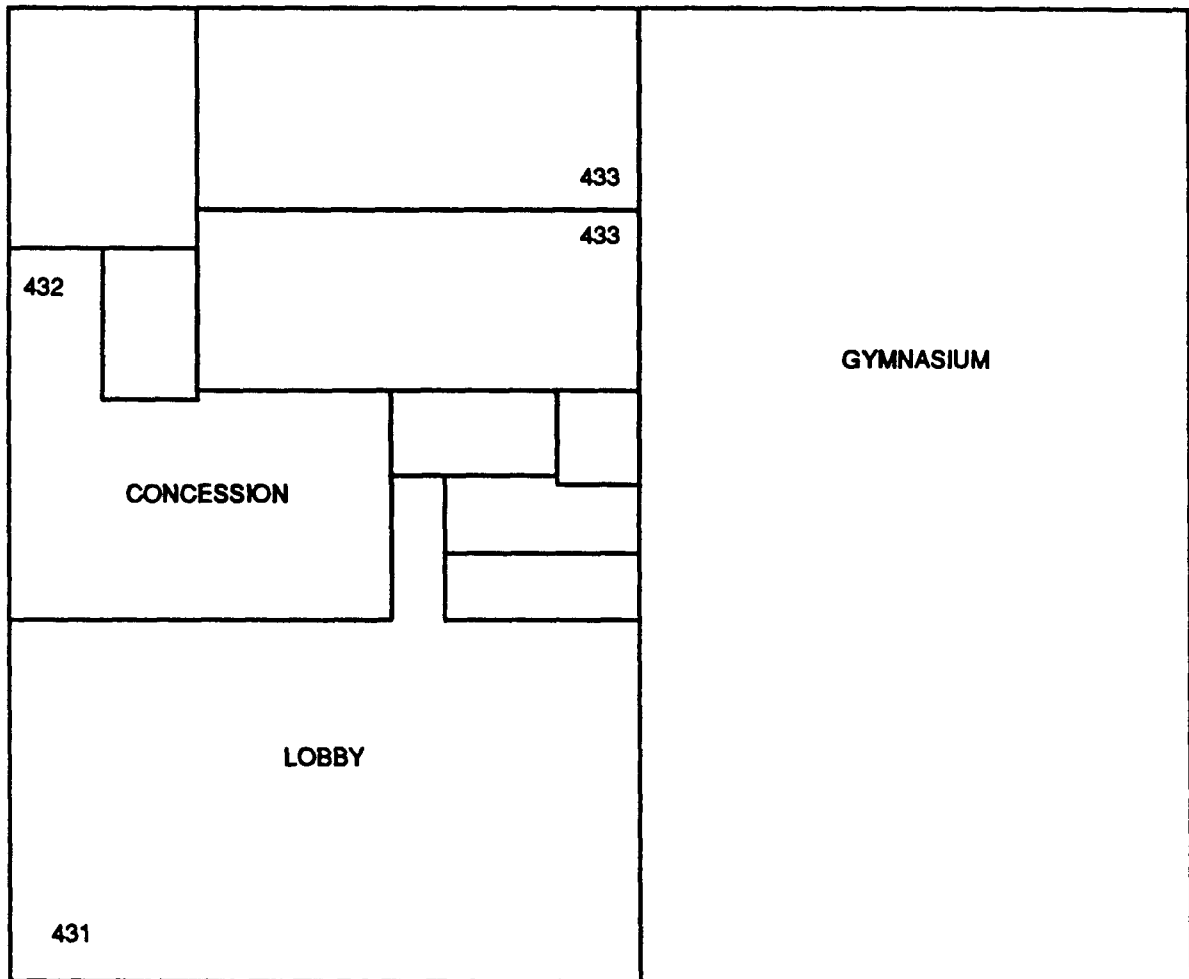


Figure 6

SECTION B-II. ENERGY DATA

Table 4 on the next page shows the history of energy usage for Capitan High School.

Converting all energy units to thousands of BTUs (British Thermal Units) shows that the following energy is used:

	<u>MBTUs</u>		
	<u>1987/86</u>	<u>1986/85</u>	<u>1985/84</u>
Heating (natural gas)	3,127,290	2,392,105	2,818,933
Electricity	<u>610,062</u>	<u>547,827</u>	<u>595,778</u>
Total	3,737,352	2,939,932	3,414,711

Total energy usage has risen dramatically indicating a change in function or change in operation at the high school.

It is interesting that the 1986/85 consumption was 16% less than the previous year, but then increased 21% in 1987/86. While this could indicate a mild winter in 1986/85, it could also be a result of usage patterns, maintenance procedures and energy conserving retrofits. Of these factors, the weather is the only one which we have no control over. The staff should be complimented for 85/86's performance.

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Table 4

SECTION B - III

RESULTS

Introduction

After review of the high school facility, a number of maintenance procedures and retrofits have been identified. These two items are discussed in this section.

MAINTENANCE PROCEDURES

1. **Change Filters on Scheduled Basis.** Filters on furnaces should be replaced every 4-6 months, especially in areas exposed to much wind-blown dust. Dirty filters increase the resistance to air flowing past the filters, which decreases the air flowing to the space.

This decreased air flow requires the burners in furnaces to operate for longer periods and can result in the furnace cabinet heating up more than necessary, wasting fuel. Additional effects of dirty filters will be reduced comfort and increased maintenance of the furnace. A maintenance log should be kept current, which can form the basis for generating work orders for filter changes on specific equipment.

2. **Maintain Water Heaters.** The following items should be checked every six months on each water heater.

- **Remove Sediment.** Turn off the burners, then run water from bottom drain of water heater until sediment clears and water is clean so more efficient heat transfer occurs from the burner.

- **Adjust Temperature.** The water temperature should be as low as possible to maintain acceptable temperatures. This avoids potential burn problems and standby losses when the hot water is not needed.

- **Check Flame Efficiency.** Cleaning burners and employing a professional to check flame efficiency every other year will assure that boilers are producing as much heat as possible from the fuel used.

- **Blowdown Boilers.** Once quarterly run water from the bottom drain of the boiler until sediment is cleared. This will ensure that the heat transfer surfaces of the boiler are at maximum efficiency.

3. Maintain Control Systems. There are many parts of a control system that affect energy usage and each of these should be checked annually.

- **Check and Adjust Thermostat Calibration on Scheduled Basis.** Thermostats can lose their calibration over time and create confusion over proper temperature setpoints. This can often result in occupants adjusting the thermostat temperature settings to over-compensate for the thermostat's miscalibration - wasting energy. A qualified HVAC repairman should be able to adjust the thermostat's internal components to provide for accurate thermostat settings resulting in increased comfort and energy savings.

Thermostat calibration should be checked annually. This item should be included in the maintenance log for the equipment it is controlling. The closet furnaces serving the high school classrooms have individual thermostats and should all be checked as part of a scheduled program associated with the unit being controlled.

4. Maintain Fans. The following items should be checked and maintained every 3 months on each piece of HVAC equipment which contains a fan.

- **Lubricate Bearings.** If shaft bearings are in need of lubrication, the motor will work harder for the same fan output. Increased horsepower and electrical current will result.

- **Keep Fan Belts Tight.** All belt-driven fans will have some energy lost through

belt slippage and flexing. This loss can be reduced by ensuring belts are kept tight and are in good repair. Be cautious not to overtighten belts as this will increase wear on the motor. There should be ½ inch deflection of the belt midway between the pulleys.

5. Turn Lights Off in Unoccupied Rooms. A student, teacher and staff energy awareness program should be undertaken to ensure that lighting is turned off by the last person to exit a room. Although turning lighting off and on does decrease the life of the lamps, studies have shown that if high intensity discharge (HID) lamps are not needed for ten minutes or more, and two minutes for fluorescent lamps, the dollar savings from energy reduction will more than offset the increased lamp replacement costs.

Mr. Ware is replacing fluorescent tubes with the lower wattage type as they burn out, which is good, but it is unknown if the ballasts used are the low wattage type. Since the older type uses approximately 20% of the fixture's electricity, energy saving ballasts can save 6% of fluorescent lighting cost.

6. Clear Combustion Air Openings. Grills allowing air to enter a mechanical room should be kept free of filter material or any other obstructions so the burners can receive oxygen and burn efficiently and cleanly. If winds are entering the mechanical rooms through these openings and blowing out pilot lights, consider putting internal ducting with elbows to block the wind. (Check local building codes for correct size and installation.)

The weight room in the Gymnasium has a suspended unit heater which is causing complaints of combustion fumes in the room. This could be caused by a lack of combustion air or possibly by the narrow flue pipe extension which has been added. A larger diameter extension with a Bridert type flue cap, and leaving a door to the room slightly open should remedy the situation.

7. Proper Operation of Closet Furnace Dampers Necessary. The closet furnaces serving the individual classrooms are equipped with motorized or thermally activated flue dampers to save energy on furnace standby losses. The proper operation of these dampers is very important from a life safety standpoint and should be checked whenever the filters are serviced.

MAINTENANCE PROCEDURE SAVINGS

The total energy savings based on 10% total heating savings if all above items are undertaken is:

ANNUAL SAVINGS

Energy: 5768 THERMS

\$3,269

Simple Payback: Immediate

Table 5 on the following pages summarizes these recommendations.

MAINTENANCE SUMMARY

SCHOOL: Capitan High School

SURVEY DATE: March 22, 1988

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
I. Water Heaters - Domestic			✓	✓		
A. Remove Sediment				✓		
B. Insulation						Inspect
II. Heating						
A. Furnaces, Room Heaters, Fan Coils			✓	✓	✓	
1. Filter	✓					
2. Hi/Lo Limit			✓	✓		
3. Heat Exchanger(s)				✓	✓	
4. Oil Bearings				✓	✓	
5. Fan Belts			✓			
6. Clean Fan Blades						Inspect-Tighten
B. Fin Tubes/Radiators			✓	✓		
1. Clean Surfaces			✓	✓		
2. Remove Obstructions						
III. Control System						
A. Sensors	✓					
1. Temperature Domestic Hot Water	✓					
2. Water Temperature in Pipe/Pump	✓					
3. On/Off Setpoints	✓					
4. Air Temperature for Controllers	✓				✓	

Table 5

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
F. Time Clocks _____					✓	
G. Thermostats _____					✓	
IV. Air Conditioning/Ventilating						
A. Fans						
1. Filter _____			✓	✓	✓	
2. Bearings _____				✓	✓	
3. Belts _____				✓	✓	
4. Clean Fan Blades _____			✓			Clean Completely
V. Lighting						
A. Lamp Efficiency _____	✓	✓				
B. Diffusers and Reflectors _____			✓			
C. Lighting Level _____		✓				
D. Manual Control _____	✓					
VII. Building Envelope						
A. Infiltration						
1. Door and Window Caulking _____				✓	✓	

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Table 5
continued

RETROFIT RECOMMENDATIONS

1. Replace Present Thermostats with Night Setback Thermostats. The present single setting thermostats in the Multi-Purpose building, Gymnasium, Commons, and High School buildings must be manually set back at night to prevent full nighttime heater operation. It would be difficult for personnel assigned to this task to accomplish it each evening for each furnace. The function of turning down thermostats to approximately 55° F at night therefore lends itself well to automatic operation. The Library has a setback thermostat which should be maintained and calibrated when daylight savings time changes occur.

The most effective type of setback thermostats are the ones that allow seven (7) day programming. 7-day programming thermostats will allow setback to 55° F on week-nights and all weekend, further reducing unnecessary furnace operation.

ANNUAL SAVINGS

Energy: 6212 THERMS

Cost: \$5,056

Annual Savings: \$3,472

Simple Payback: 1.5 years

2. Add Timeclock to System. The domestic water heaters and their associated circulation pumps presently operate all the time. Night and weekend operation is normally not required and the burners cycle on to maintain setpoint temperature and offset tank and piping losses. A timeclock can be added to the system to lock out the burner and circulation pump at night and on weekends, with a manual override to keep the system operable for night or weekend events.

ANNUAL SAVINGS

Energy: 1647 THERMS

Cost: \$1,000

Annual Savings: \$937

Simple Payback: 1.1 years

Table 6 on the next page summarizes retrofit costs, savings and payback.

ENERGY RETROFIT SUMMARY**SCHOOL: Capitan High School****Survey Date: March 22, 1988**

	Therms Saved	Dollar Capital Cost	Annual Dollar Savings	Years Payback
I. Furnaces, Room Heating Unit(s)				
A. Install night setback thermostats	6,212	\$ 5,056	\$ 3,472	1.5
II. Domestic Water Heater Setback	<u>1,647</u>	<u>1,000</u>	<u>937</u>	<u>1.1</u>
TOTAL	7,859	\$ 6,056	\$ 4,409	1.4

Table 6

SECTION II

RECOMMENDATIONS

We recommend that the school consider instituting a preventative maintenance and energy savings program involving administration, staff and students.

Administration would be able to support the preventative maintenance program by maintaining records of equipment, such as those in the following appendix, which gives staff information for repairs. The map in Section II of each division may be used to organize repairs by staff on a scheduled and non-emergency basis. Additional items may be added to the appendix and map as needed. The benefit to everyone is, work is performed on an organized, complete, and non-stressful basis and operating budget is saved.

Administration would be able to support the energy savings program by encouraging staff and students to monitor energy usage and keep facilities and equipment clean and by obtaining funding for retrofits.

The benefit to everyone is that the environment is cleaner, more healthful, more enjoyable and operating costs are saved.

Thank you for allowing us to be part of your school program.

APPENDIX A
EQUIPMENT DATA FORMS

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Old Gym Survey Date: 3/23

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 431

Approx. Age of Equipment: 16 years Number of Identical Units: 1

Manufacturer: Lennox Model Number: LF 75X

Location: Lobby Function: Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other (Nat) (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired Forced Air

Capacity: 75,000 in Btuh CFM HP GPM KW (circle units)
60,000 out Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Retrofitted with power exhaust.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Gym Survey Date: 3/22

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 432

Approx. Age of Equipment: 16 years Number of Identical Units: 1

Manufacturer: Gaffers & Sattler Model Number: 254FS

Location: Weight room Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other (Nat.) (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired, Forced Air.

Capacity: 25,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
20,000 out. Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Maintenance personnel says back draft causes
carbon monoxide fumes back into weight room.

RETROFIT INFORMATION

Increase flue size and install anti-gravity
back draft flue cap.

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Gym Survey Date: 3/22

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 433

Approx. Age of Equipment: 16 years Number of Identical Units: 2

Manufacturer: Reznor Model Number: UA 35

Location: Locker Rooms Function: Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other (Wat) (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired Forced Air

Capacity: Approx. 35,000 in ☒ Btuh CFM HP GPM KW (circle units)
30,000 out Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION _____

RETROFIT INFORMATION _____

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Library Survey Date: 3/22

EQUIPMENT TYPE: Furnace I.D. Number(s): 434

Approx. Age of Equipment: 21 years Number of Identical Units: 1

Manufacturer: RUUD Model Number: UGDA-125A-GP

Location: Library Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other Nat (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired Forced Air

Capacity: 125,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts 1/2 _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Washable filters

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Library Survey Date: 3/22

EQUIPMENT TYPE: Furnace I.D. Number(s): 435

Approx. Age of Equipment: approx 21 years Number of Identical Units: 2

Manufacturer: RUID Model Number: UGDA-075A-AR

Location: Library Function: Heating

Heating Fuel Type: (Gas) Electricity Propane Oil N/A Other (Nat.) (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired, Forced Air

Capacity: 75,000 in Btuh CFM HP GPM KW (circle units)
Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Washable filters

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Library Survey Date: 3/22

EQUIPMENT TYPE: Domestic Water Heater I.D. Number(s): 436

Approx. Age of Equipment: approx 21 years Number of Identical Units: 1

Manufacturer: A.O. Smith Model Number: BT-80-926B

Location: Library Function: Heating Domestic Water

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other (Nat) (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired

Capacity: 75,000 in Btuh CFM HP GPM KW (circle units)

Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

80 gal capacity

63.7 gph heat recovery

Standing pilot

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Commons Survey Date: 3/22

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 437

Approx. Age of Equipment: 21 years Number of Identical Units: 2

Manufacturer: Lennox Model Number: LF 100A M

Location: Commons Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other Nat (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired Forced Air

Capacity: 100,000 in Btuh CFM HP GPM KW (circle units)

80,000 out Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Unit is in uninsulated area.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitol BLDG: High School Survey Date: 3/02

EQUIPMENT TYPE: Gas Furnace I.D. Number(s): 438

Approx. Age of Equipment: 8 years Number of Identical Units: 5

Manufacturer: Lennox Model Number: G12RD-2E-55-6

Location: High School Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other Nat (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired, Forced Air, Down Draft

Capacity: 55,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
43,000 out Other

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

120 Volts 12 Amps/HP 1/5 ~~10~~ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Unit is Down Draft type

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: High School Survey Date: 3/22

EQUIPMENT TYPE: Furnace I.D. Number(s): 439

Approx. Age of Equipment: 8 years Number of Identical Units: 2

Manufacturer: Lennox Model Number: G12Q3E-40-6

Location: High School Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other Nat (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired, Up-draft, Forced Air.

Capacity: 40,000 in Btuh CFM HP GPM KW (circle units)
32,000 out Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

120 Volts 1/3 Amps/HP 1Ø Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Throw away type filter

Electronic spark Ignition

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: High School Survey Date: 3/22

EQUIPMENT TYPE: Furnace I.D. Number(s): 440

Approx. Age of Equipment: 8 years Number of Identical Units: 3

Manufacturer: Carrier Model Number: 50B DRO-50-BA ^{Series} 121

Location: High School Function: Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other (Nat.) (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Updraft Gas Fired, Forced Air

Capacity: 50,000 12 ☒ Btuh CFM HP GPM KW (circle units)
Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts 1/3 Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Spark ignition

Thermally actuated vent damper

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: High School Survey Date: 3/22

EQUIPMENT TYPE: Furnace I.D. Number(s): 441

Approx. Age of Equipment: 8 years Number of Identical Units: 2

Manufacturer: Carrier Model Number: 58GS-050-2/SBDR-075-BA

Location: Home Economic Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other Nat (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

Series 201

1) Type: Gas Fired Updraft Forced Air.

Capacity: 50,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

Other

2) Type: Carrier Furnace Gas Fired Updraft, Forced Air.

Capacity: 75,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

One unit is not working - Carrier SBDR-075-BA.
Spark ignition.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: High School Survey Date: 3/22

EQUIPMENT TYPE: Domestic Water Heater I.D. Number(s): 442

Approx. Age of Equipment: 8 years Number of Identical Units: 1

Manufacturer: State Model Number: SRX-50-NRT2-DFH

Location: Home Economics Function: Heating Domestic Water

Heating Fuel Type: Gas Electricity Propane Oil N/A Other Nat. (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired

Capacity: 52,500 Btu/h (circle units) CFM HP GPM KW

50 gal capacity Other

2) Type: _____

Capacity: _____ Btu/h CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btu/h CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Multi-purpose Survey Date: 3/22

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 443

Approx. Age of Equipment: 6 years Number of Identical Units: 2

Manufacturer: Gallers & Sattler Model Number: 50-4F-5

Location: Kitchen Function: Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other Nat. (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fire, Forced Air

Capacity: 50,000 in ☒ Btuh CFM HP GPM KW (circle units)
40,000 out. Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Standing Pilot

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Multi-purpose Survey Date: 3/22

EQUIPMENT TYPE: Furnace-AHU I.D. Number(s): 444

Approx. Age of Equipment: 6 years Number of Identical Units: 3

Manufacturer: Jackson & Church Model Number: 02560545RH

Location: Gym Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other Nat (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired, Forced Air.

Capacity: 750,000 - 350,000 ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type Blower/Motor.

230 Volts 12 Amps/HP 1 Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Unit has be retrofitted from oil burning unit to
gas fired

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Multi-purpose Survey Date: 3/22

EQUIPMENT TYPE: Furnace I.D. Number(s): 445

Approx. Age of Equipment: 6 years Number of Identical Units: 1

Manufacturer: Carrier Model Number: 349 EAW-060-140-B

Location: Mezz. in Gym. Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other Nat (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired, Furnace

Capacity: 140,000 in Btuh CFM HP GPM KW (circle units)

 Other

2) Type:

Capacity: Btuh CFM HP GPM KW (circle units)

 Other

3) Type:

Capacity: Btuh CFM HP GPM KW (circle units)

 Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type

 Volts 10.2 Amps/HP Phase KW

2) Equipment Component Type

 Volts Amps/HP Phase KW

3) Equipment Component Type

 Volts Amps/HP Phase KW

ADDITIONAL MAINTENANCE INFORMATION

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Multi-purpose Survey Date: 3/22

EQUIPMENT TYPE: Domestic W/H I.D. Number(s): 446

Approx. Age of Equipment: 6 years Number of Identical Units: 2

Manufacturer: PVI Model Number: 27-N-250-A-PG

Location: Multi-purpose Function: Heating Domestic Water

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other Nat. (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired

Capacity: 270,000 in. ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
250 gal capacity Other

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

120 Volts 10 Amps/HP 1 Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Elementary Survey Date: 3/22

EQUIPMENT TYPE: Furnace I.D. Number(s): 447

Approx. Age of Equipment: 26 years Number of Identical Units: 2

Manufacturer: National Champion Model Number: GTU-250

Location: Elementary Function: Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other Nat. (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired, Forced Burner

Capacity: 312,500 BTU Btuh CFM HP GPM KW (circle units)

250,000 BTU Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

115 Volts _____ Amps/HP 1 Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Elementary Survey Date: 3/22

EQUIPMENT TYPE: Furnace I.D. Number(s): 448

Approx. Age of Equipment: 8 years Number of Identical Units: 13

Manufacturer: Lennox Model Number: G12RD-2E-55-4

Location: Elementary Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other (Nat) (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired, Forced Air, Down Draft

Capacity: 55,000 in Btuh CFM HP GPM KW (circle units)
44,000 out Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts 115 @ 5" esp Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Automatic exhaust vent damper

No O.A manual damper.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Elementary Survey Date: 3/22

EQUIPMENT TYPE: Domestic w/H I.D. Number(s): 449

Approx. Age of Equipment: 8 years Number of Identical Units: 1

Manufacturer: Mor/Elo Model Number: ESG-31

Location: Elementary Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other Nat. (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired

Capacity: 33,000 in Btuh CFM HP GPM KW (circle units)
30 gal capacity Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Standing pilot

27.7 gph @ 100° rise

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Elementary Survey Date: 3/22

EQUIPMENT TYPE: Domestic W/H I.D. Number(s): 450

Approx. Age of Equipment: 8 years Number of Identical Units: 1

Manufacturer: Mor/Flo Model Number: G40-H-12

Location: Elementary Function: Heating Domestic Water

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other (Nat.) (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired

Capacity: 46,000 in Btuh CFM HP GPM KW (circle units)
40 gal capacity Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Standing Pilot

38.7 gph @ 100° rise

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Elementary Survey Date: 3/22

EQUIPMENT TYPE: Furnace I.D. Number(s): 451

Approx. Age of Equipment: 8 years Number of Identical Units: 3

Manufacturer: Lennox Model Number: G12D2E-4D-4

Location: Elementary Function: Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other Nat (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas fired, Forced Air, Up draft.

Capacity: 40,000 in Btuh CFM HP GPM KW (circle units)
32,000 out. Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Automatic exhaust vent damper.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Administration Survey Date: 3/22

EQUIPMENT TYPE: Furnace I.D. Number(s): 452

Approx. Age of Equipment: 8 years Number of Identical Units: 2

Manufacturer: Ruud Model Number: UGDA-125A-ER

Location: Administration Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other Nat (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Forced Air, Gas Fired

Capacity: 125,000 in Btuh CFM HP GPM KW (circle units)
Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Capitan BLDG: Admin Survey Date: 3/22

EQUIPMENT TYPE: Domestic w/H I.D. Number(s): 453

Approx. Age of Equipment: 8 years Number of Identical Units: 1

Manufacturer: A.O. Smith Model Number: FSG-75-899

Location: Administration Function: Heating Domestic H₂O

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other Nat (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Gas Fired

Capacity: 75,100 ☒ Btuh CFM HP GPM KW (circle units)
75 gal capacity Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

Standing pilot

63.7 gph @ 100° rise

RETROFIT INFORMATION

**ENERGY AUDITS
AND
PREVENTATIVE MAINTENANCE
MARCH 1988**

**Prepared for
CARRIZOZO SCHOOL DISTRICT
AND
STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
Santa Fe, New Mexico**

Contract #76-521.03-042

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SECTION I

EXECUTIVE SUMMARY

The State of New Mexico has contracted with Frank Bolek & Associates to perform an Energy Audit (EA) for Carrizozo Elementary School and Carrizozo High School and to organize data at the schools to assist the School District in developing a Heating, Ventilating and Air Conditioning (HVAC) Preventative Maintenance (PM) program.

The goal of both the EA and PM is to reduce energy consumption and operating costs of the schools.

A team of an engineer and an HVAC technician worked with Danny Burnett, Superintendent of Carrizozo School District. Mr. Burnett was extremely helpful in organizing his staff to assist us in collecting data to determine the energy savings options available to the school district. This report summarizes our team's findings and the data collected.

Carrizozo School District is comprised of two schools, Carrizozo Mid/Elementary School and Carrizozo High School. All of the buildings are heated using natural gas. Carrizozo Mid/Elementary consists of the Elementary School (9,600 square feet), Mid-High School (9,300 square feet), and the Administration building (4,000 square feet). The classrooms are heated by hydronic baseboard convectors and rooftop furnaces. The Carrizozo High School also consists of three building: High School (29,814 square feet), Klegg Hall multi-purpose building (18,750 square feet), and the Gymnasium/Vo-Ag building (17,400 square feet). The buildings range in age from 48 years to the new Track building. Total square footage of the campus buildings is 88,864 square feet. Classrooms are heated with a boiler and baseboard hot water fin-tube convectors, rooftop furnaces, and

unitary hot air solar systems. The Administration building and the computer room are cooled. The track facility had just been completed but not accepted by the District.

This report is split into two divisions. The first division discusses the Carrizozo Mid/Elementary School, and the second division discusses the Carrizozo High School. Each division begins with a campus map (Sections A-I and B-I). While at the schools, the engineering team labeled 22 pieces of HVAC equipment with numbered tags. The location of these pieces of equipment and their associated labels are shown on the campus maps on pages 5 and 21. Each piece of equipment requires periodic preventative maintenance. Data for each piece of equipment is in the appendix.

Nat Chavez is responsible for equipment maintenance and reports directly to the superintendent. Mr. Chavez assisted the engineering team in locating the equipment identified on the campus map. He has been with the District for 18 years and is extremely interested in the maintenance of the entire facility.

The map is followed by a discussion of the energy usage data (Section A-II or B-II) which was assembled for the engineering team by Maria Vega of the superintendent's office. The energy usage data indicates usage at the Carrizozo School District had a sharp drop in consumption in 1985/86 due mainly to the energy conservation efforts made just prior to that period. The following year's consumption, however, surpassed the two previous years' totals. This is discussed further in the Energy Data Sections.

Energy saving maintenance practices and ideas for retrofit are discussed in Sections A-III and B-III.

From the maintenance data and facilities data collected, and from experience with similar facilities, the engineering team estimates that at least 10% of the annual energy

costs can be eliminated with continuous preventative maintenance. And by spending approximately \$6,070 on energy saving retrofits, approximately \$4,593 can be saved in annual energy costs.

After the discussion of each school in Divisions A and B, suggestions for implementing the program and obtaining these savings are in Section II.

Finally, the appendix contains data for each piece of equipment identified on the map. This data may be used by the District to develop a preventative maintenance program.

DIVISION A - CARRIZOZO MID/ELEMENTARY SCHOOL

SECTION A-I. LOCATION OF EQUIPMENT

The following Figure 1 shows the locations of the HVAC equipment at Carrizozo Mid/Elementary School. The equipment includes a boiler, baseboard hot water convectors, rooftop furnaces, and domestic water heaters. The Administration building is conditioned with air source heat pump, and the mid-school computer room is cooled with an evaporative cooler.

There is some additional equipment which has not been identified, such as exhaust fans, circulating pumps, and controls in the mechanical room. This equipment may be identified and labeled by school personnel to expand the building equipment inventory.

Each number on the maps locates a piece of equipment that is labeled in the field and needs periodic maintenance.

SECTION A-II
ENERGY DATA

The table on the next page shows the history of energy usage for Carrizozo Mid/Elementary School.

Converting all energy units to thousands of BTUs (British Thermal Units) shows that the following energy is used:

	MBTUs		
	1987/86	1986/85	1985/84
Heating	632,526	415,599	601,991
Electricity	205,302	178,510	185,310
TOTAL	837,828	594,109	787,301

Total energy usage for 1987/86 had risen from the preceding year and amounts to 36.6 MBTUs per square foot per year. This is a reasonable figure and indicates that attention has been paid to energy conservation.

The energy consumption decreased 32.5% in 1986/85, then rose 29.1% in 1987/86. This is a large variation and indicates that the Administration and Maintenance Staff did a great job at energy conservation in 1986/85. The increase in 1987/86 could indicate a more severe winter or a change in usage patterns, maintenance routines, or the use of energy conserving retrofits. The weather is the only variable which we have no control over.

ENERGY HISTORY DATA

A	SCHOOL NAME <u>Carrizozo Elementary</u>		SQUARE FOOTAGE <u>22,900</u>									
B	Name(s) of Electric/Fuel Utility(s): <u>Otero County Electric Cooperative</u> <u>Capitan-Carrizozo Natural Gas Assn.</u> Rate Schedule # <u>552/THM</u> Electric: # <u>0.55/KWH</u> Fuel: <u>1987-86 #5.69/AFX</u> <u>1986-85 # 6.72</u> <u>1985-84 # 6.72</u>		C	Heating Fuel Type of Use Natural Gas Electricity Oil Propane Other: Space Heat ☒ ☒ ☐ ☐ _____ Water Heat ☐ ☐ ☐ ☐ _____								
D	ENERGY AND POWER											
	1987/1986				1986/1985				1985/1984			
	Electricity		Fuel		Electricity		Fuel		Electricity		Fuel	
	Consumption	Demand	Consumption		Consumption	Demand	Consumption		Consumption	Demand	Consumption	
	KWH	KW	Natural Gas	Other Units:	KWH	KW	Natural Gas	Other Units:	KWH	KW	Natural Gas	Other Units:
			Therms	<u>CF</u>			Therms	<u>CF</u>			Therms	<u>CF</u>
JUL	2,197	18		2580	1,735	13		516	1,298	14		1548
AUG	1,892	16		5418	1931	15		1,032	1,477	16		2,064
SEP	3,857	34		6,192	3986	47		4644	4130	20		7740
OCT	5,203	55		19,608	4,669	51		7,224	5,019	52		12,384
NOV	5,986	58		82,818	5,543	55		10,320	4,870	53		52,374
DEC	5,709	37		111,456	5,599	33		83,334	7,611	54		130,032
JAN	6,684	38		150,154	5,483	36		89,526	4,059	34		101,136
FEB	7,457	39		111,456	4,807	36		113,520	7,125	37		151,962
MAR	6,396	35		66,306	5,309	35		48,762	5,908	36		78,432
APR	5,623	36		37,410	5,059	33		35,862	4,882	35		40,506
MAY	5,368	33		7,740	4,322	33		4,644	4,104	28		4,128
JUN	3,670	28		5,160	3,962	30		3,612	3,891	30		2,838

• • FRANK BOLEK & ASSOCIATES • •

Table 1

SECTION A-III

RESULTS

Introduction

After review of this facility, a number of maintenance procedures and retrofits have been identified. These items are discussed in this section.

MAINTENANCE PROCEDURES

The following maintenance procedures are general in nature but apply to the specific equipment and systems in this facility. Other maintenance comments which are specific to a particular piece of equipment (such as worn out fanbelt, missing filters, etc.), can be found in Appendix A, Equipment Data Forms. Mr. Chavez is already performing some of these maintenance items, and can use this information as a basis for a routine maintenance schedule and logbook.

1. **Change Filters on Scheduled Basis.** Filters on furnaces, fan coils, and air handlers should be replaced every 4 to 6 months, or more often in areas exposed to much windblown dust. When changing filters check the fresh air intake screen and clean if necessary. Dirty filters increase the resistance to air flowing past the filters, which decreases the air flowing to the space.

This decreased air flow requires the burners in furnaces to operate for longer periods and can result in overheating and wasting fuel. Additional effects of dirty filters will be to reduce comfort and increase maintenance of the unit. A maintenance log should be kept current, which can form the basis for generating work orders for filter changes, lubrication, replacement of belts, etc., on specific equipment.

Filters and filter racks were missing from rooftop furnaces equipment numbers 458A, B, and C. The Albuquerque Reznor Heater representative, Bill Terpening, can recommend the proper replacement filter racks and filters.

2. Maintain Fans. The following items should be checked and maintained every 3 months on each piece of HVAC equipment which contains a fan. It will be most critical to provide this service to equipment with the largest fans:

- **Lubricate Bearings.** If shaft bearings are in need of lubrication, the motor will work harder for the same fan output. Increased horsepower and electrical current will result.

- **Clean Fan Blades.** Grease, dust and dirt on the fan blades will increase the rotational inertia of the fan, requiring greater work from the motor for the same fan output.

- **Check Fan Belts for Wear.** Check fan belts for frays, cracks, and nicks. Replace as necessary.

- **Keep Fan Belts Tight.** All belt-driven fans will have some energy lost through belt slippage and flexing. This loss can be reduced by ensuring belts are kept tight and are in good repair. Be cautious not to overtighten belts as this will increase wear on the motor. Belts should have ½-inch deflection midway between the pulleys.

3. Perform Annual HVAC Maintenance. The following items should be performed a minimum of once a year:

- **Check and repair all weatherstripping, insulation and caulking in the HVAC casing.**

- **Remove all rust and repaint where necessary.**

- **Clean heating coils or burners.**

- Check and tighten all bolts and screws, cabinets, brackets, and other HVAC components.

- Check blower cabinet for dirt, and vacuum as required.
- Check duct thermostats for accuracy and adjust/repair as necessary.
- Check flexible duct connections near the unit for leaks and repair as necessary.
- Check the ceiling plenum for obvious problems. Many times an inspection with a flashlight will reveal the cause of comfort complaints such as: duct access doors blown open; loose duct insulation blocking airflow; disconnected control wires; or, outside air dampers stuck open.

4. Maintain Control Systems. There are many parts of a control system that affect energy usage and each of these should be checked annually.

- Check and Adjust Thermostat Calibration on Scheduled Basis. Thermostats can lose their calibration over time and create confusion over proper temperature setpoints. This can often result in occupants adjusting the thermostat temperature settings to over-compensate for the thermostat's miscalibration, wasting energy. A qualified HVAC repairman should be able to adjust the thermostat's internal components to provide for accurate thermostat settings, resulting in increased comfort and energy savings.

The heat pump control system in the Administration building is malfunctioning. The electric resistance coil should be the second stage of heating after the heat pump heating mode. But, according to the unit indicator lights, the heat pump is not functioning in the heating mode, and the resistance coil is the only heating. This uses more energy than required and decreases the heating capacity of the unit. The system should be thoroughly investigated by a controls technician who is familiar with heat pumps.

Thermostat calibration should be checked annually. This item should be included in the maintenance log for the equipment it is controlling.

- **Check Damper and Valve Linkage Operation.** For economy's sake, at times many units are designed to be connected to one actuator via linkages. These linkages tend to become stuck with dirt, screws become loose on the linkages, jamming them or even letting the linkages fall off. Proper linkages should be checked annually.

The rooftop furnaces (equipment nos. 458A, B, and C) have disconnected linkages for outside air control. These should be repaired so that the colder ventilation air (usually 20%), is heated only when the building is occupied.

5. Maintain Water Heaters. The following items should be checked every 6 months on each water heater:

- **Remove Sediment.** Turn off the burners, then run water from bottom drain of water heater until sediment clears and water is clean so more efficient heat transfer occurs from the burner.

- **Adjust Temperature.** The water temperature should be as low as possible to maintain acceptable temperatures. Water temperatures above 150° F are generally unnecessary and can cause scalding. Water temperature for lavatory use should be set at 110° F to maximize safety and minimize standby energy losses.

- **Inspect Piping for Leaks.** Piping leaks, especially around the water tank, can eventually cause corrosion and rupture of the storage tank. These leaks should be repaired as soon as they are recognized.

- **Install Insulation on Domestic Hot Water Piping.** Presently some hot water piping in the mechanical room is uninsulated. Apply a one-inch insulative wrap to reduce standby losses.

- Domestic water heater (equipment No. 457) is equipped with an air-to-water heat exchanger to preheat the water with solar energy from rooftop solar collectors. The sun was shining, but the system was not energized. This control problem could be caused by a faulty sensor and should be investigated by a controls technician familiar with that type of system. Often the manufacturer of the collector can recommend qualified contractors. Because solar energy only uses minimal energy for a small fan and pump, this repair should be a high priority.

6. Clear Combustion Air Opening. Grills allowing air to enter a mechanical room should be kept free of filter material or any other obstructions to the total area of the grill. If wind is entering the mechanical room through these openings and blowing out pilot lights, consider putting internal ducting with elbows to block the wind. (Check local building codes for correct size and installation.)

7. Maintain Boiler on a Regular Basis. Boilers have many subsystems that must be maintained on a regular basis to ensure efficient operation. Performing the following maintenance items on the schedules shown will increase the efficiency of boiler operation:

- **Check Flame Efficiency.** Cleaning burners and employing a professional to check flame efficiency every other year will assure that boilers are producing as much heat as possible from the fuel used.

- **Blow Down Boilers.** Once quarterly run water from the bottom drain of the boiler until sediment is cleared. This will ensure that the heat transfer surfaces of the boiler are at maximum efficiency. Pipe sediment strainers and valve strainers will also collect debris. They should be cleaned at the same time. Strainers should be replaced at two-year intervals.

- **Inspect Piping for Leaks.** Piping leaks, especially around the water tank can eventually cause corrosion to the tank. These leaks should be repaired as soon as they are recognized.

- **Inspect Hot Water Piping for Loose or Missing Insulation.** Many times repairs to a pump or a piping device will require removing the pipe insulation. It is important that this insulation be replaced. The mechanical room has some bare hot water pipes which should be reinsulated.

- **Check Calibration of Boiler Outside Air Reset.** This control is a recommended retrofit in the next section. When it is installed, it will require maintenance. The outside air system lowers hot boiler water temperature when the outside air temperature warms up so internal building temperatures do not overshoot their setpoints and boiler idle losses are lowered; therefore, energy is saved. This calibration should be checked annually. The timeclock should be reset seasonally for daylight savings time. Manual setback of boiler water temperature is good, but automatic setback is more dependable and frees maintenance personnel for other tasks.

8. Turn Lights Off in Unoccupied Rooms. A student, teacher, and staff energy awareness program should be undertaken to ensure that lighting is turned off by the last person to exit a room. Although turning lighting off and on does decrease the life of the lamps, studies have shown that if high intensity discharge (HID) lights are not needed for ten minutes or more, and two minutes for fluorescent lights, the dollar savings from energy reduction will more than offset the increased lamp replacement costs.

It is recommended that fluorescent tubes and ballasts be replaced with the lower wattage type as they burn out. Since the older type ballasts use approximately 20% of the

fixture's electricity, energy saving ballasts can save 6% of the fluorescent lighting cost.

MAINTENANCE PROCEDURE SAVINGS

The total energy savings based on 10% total heating savings if all above items are undertaken is:

ANNUAL SAVINGS

Energy: 837 TH

\$680

Simple Payback: Immediate

The table on the following pages summarizes the maintenance recommendations.

MAINTENANCE SUMMARY

SCHOOL: Carrizozo Mid/Elementary

Survey Date: March 23, 1988

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
I. Pumping						
A. Pipe Flow Strainers			✓	✓		
B. Heating and Cooling Coil Valves				✓	✓	
C. Bearings/Sleeves/Seals				✓		
II. Water Heaters - Domestic						
A. Remove Sediment			✓	✓		
B. Insulation				✓		INSPECT
III. Heating						
A. Boilers - Space Heating						
1. Insulation/Refractory				✓		"
2. Piping Insulation				✓		"
3. Pipe Joint Seals				✓		"
4. Burner Efficiency				✓	✓	
5. Blowdown Boilers						
B. Furnaces, Room Heaters, Fan Coils						
1. Filter			✓	✓		
2. Hi/Lo Limit		✓		✓	✓	
3. Burner Efficiency				✓		
4. Heat Exchanger(s)			✓	✓		
5. Lubricate Bearings				✓	✓	
6. Fan Belts				✓	✓	
7. Clean Fan Blades			✓	✓		

Table 2

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
C. Fin Tubes/Radiators						
1. Clean Surfaces _____			✓	✓		
2. Remove Obstructions _____				✓		INSPECT
IV. Control System						
A. Compressor _____			✓	✓		
B. Dryers Filters _____			✓	✓		"
C. Pneumatics						
1. Outside Air Reset _____						
2. Valve/Damper Operation _____						
3. Linkage Operation _____						
D. Mixed Air Temperature _____				✓	✓	"
E. Sensors						
1. Temperature Domestic Hot Water _____		✓		✓		
2. Water Temperature in Pipe/Pump _____				✓		
3. On/Off Setpoints _____	✓			✓		
4. Air Temperature for Controllers _____				✓	✓	
F. Time Clocks _____				✓	✓	RESET AT TIME CHANGE
G. Thermostats _____				✓	✓	
V. Air Conditioning/Ventilating						
A. Compressors						
1. Cleaning _____			✓	✓		
2. Freon Check _____				✓		
3. Belt Tighten _____				✓	✓	
4. Lubricate Bearings _____				✓		

Table 2 continued

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
B. Evaporators						
1. Cleaning _____			✓	✓		
2. Heat Exchanger(s) _____			✓	✓		
C. Swamp Coolers _____				✓		
1. Pad Cleaning _____			✓	✓		
2. Water Flow Check _____			✓	✓	✓	
3. Winterize _____				✓		
4. Slide Damper _____				✓	✓	
D. Fans						
1. Filter _____			✓	✓	✓	
2. Bearings _____				✓		
3. Belts _____				✓	✓	
4. Clean Fan Blades _____			✓	✓		
VI. Lighting						
A. Lamp Efficiency _____				✓		
B. Diffusers and Reflectors _____			✓			
C. Lighting Level _____		✓				
D. Manual Control _____	✓					
VII. Building Envelope						
A. Infiltration						
1. Door and Window Caulking _____				✓		INSPECT

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Table 2 continued

RETROFIT RECOMMENDATIONS

1. **Replace Present Thermostats with Night Setback Thermostats.** The present single setting thermostats used throughout the school must be manually set back at night to prevent full nighttime heater operation. It would be difficult for assigned personnel to accomplish this task each evening for each heating unit. The function of turning down thermostats to approximately 55° F at night therefore lends itself well to automatic operation.

The most effective type of setback thermostat are the ones that allow seven (7) day programming. 7-day programmable thermostats allow setback to 55° F on week nights and all weekend, further reducing unnecessary heater operation.

ANNUAL SAVINGS

Energy: 1407 TH
Capital Cost: \$1,832
Annual Savings: \$776
Simple Payback: 2.4 years

2. **Weatherize.** Infiltration is the penetration of cold air into a heated room due to wind pressure on the exterior building envelope, or a negative room pressure due to an exhaust fan or flue. Exfiltration is the escape of warm air from a building due to positive pressurization of a room. The classroom interiors at these schools are normally under a neutral or slightly negative pressure, causing a heat loss due to infiltration.

During the winter, therefore, heat loss due to infiltration can be very significant, especially if the doors and windows are not well sealed. Weatherstripping should be installed around all doors and windows that do not already have weatherstripping that is in good condition.

Cracks can also be an avenue for cold winter air to enter a room, or for heated classroom air to escape. All cracks should therefore be caulked and sealed tight. Look for cracks around windows and door framing and in corners of walls. This is an extremely economical retrofit measure to carry out and can have a significant and immediate effect on energy consumption and comfort.

ANNUAL SAVINGS

Energy: 253 TH
Capital Cost: \$458
Annual Savings: \$140
Simple Payback: 3.3 years

3. Repair Building Setback System on Classroom Boiler. The central boiler (equipment no. 456) has been equipped with a now inoperative 7-day timeclock to reduce the usage at all fin-tube convectors. To complete the system, freezestats should be located in areas which are prone to freezing. These are used to turn the boiler on during setback if nighttime temperatures get too low. The system should be equipped with an override switch in the conditioned space to accommodate night usage. Night temperatures would be set to 50° F, and will be set to normal daytime temperatures early in the morning so the building will be up to temperature at the beginning of the school day.

ANNUAL SAVINGS

Energy: 3096 TH
Capital Cost: \$2,000
Annual Savings: \$1,709
Simple Payback: 1.2 years

4. Repair Outside Air Reset on the Classroom Boiler. Sensors are installed in the boiler room, which indicates that a reset system was installed but is now inoperative. An outside air reset system for a boiler keeps the water temperature only as hot as it needs to

be to satisfy the heating load in the building. The water temperature will be 180° F when it is extremely cold out, say 0° F; but the water gets colder as the outside temperature gets hotter, until the outside air temperature reaches 65° F, and the burners are shut off. Energy is saved since the building does not overheat in mild weather, or overshoot setpoint with fluctuations in daily temperature, causing windows to be opened for comfort. Comfort is also increased by using this control.

ANNUAL SAVINGS

Energy: 605 TH

Capital Cost: \$550

Annual Savings: \$334

Simple Payback: 1.6 years

The table on the next page summarizes the retrofit recommendations.

ENERGY RETROFIT SUMMARY**SCHOOL: Carrizozo Elementary School****Survey Date: March 23, 1988**

	Therms Saved	Dollar Capital Cost	Annual Dollar Savings	Years Payback
1. Replace Thermostats with Setback Type	1407	\$ 1,832	\$ 776	2.4
2. Weatherize	253	458	140	3.3
3. Install Boiler Setback Controls	3096	2,000	1,709	1.2
4. Repair Boiler Outside Air Reset	605	550	334	1.6
Total:	5361	\$ 4,840	\$ 2,959	1.6

Table 3

DIVISION B - CARRIZOZO HIGH SCHOOL

SECTION B-I. LOCATION OF EQUIPMENT

The following Figure 2 shows the locations of the HVAC equipment at the Carrizozo High School. The equipment includes roof-mounted furnaces, unit heaters, exhaust fans, hot air type solar collectors, and domestic water heaters. There is some additional equipment which has not been identified, such as exhaust fans and controls in the mechanical rooms. This equipment may be identified and labeled by school personnel to expand the building equipment inventory. The Track and Field building is scheduled to be accepted soon and the new equipment and maintenance items should be added to maintenance schedule and log.

Each number on the maps locates a piece of equipment that is labeled in the field and needs periodic maintenance.

SECTION B-II
ENERGY DATA

Table 4 on the next page shows the history of energy usage for Carrizozo High School.

Converting all energy units to thousands of BTUs (British Thermal Units) shows that the following energy is used:

	MBTUs		
	1987/86	1986/85	1985/84
Heating	1,822,007	1,194,261	1,734,049
Electricity	571,379	514,204	533,789
TOTAL	2,393,386	1,708,465	2,267,838

Total energy usage for 1987/86 had risen from the preceding year and amounts to 36.6 MBTUs per square foot per year. This is a reasonable figure and indicates that attention has been paid to energy conservation.

The energy consumption decreased 32.5% in 1986/85, then rose 29.1% in 1987/86. This is a large variation and indicates that the Administration and Maintenance Staff did a great job at energy conservation in 1986/85. The increase in 1987/86 could indicate a more severe winter or a change in usage patterns, maintenance routines, or the use of energy conserving retrofits. The weather is the only variable which we have no control over.

ENERGY HISTORY DATA

A	SCHOOL NAME <u>Carri2020 High School</u> SQUARE FOOTAGE <u>65,694</u>															
B	Name(s) of Electric/Fuel Utility(s): <u>Otero County Electric Cooperative</u> <u>Capitan-Carri2020 Natural Gas Assn.</u> Rate Schedule <u>\$1.52/THM</u> Electric: <u>\$0.55/KWH</u> Fuel: <u>1987-86 \$5.69/MCF</u> <u>1986-85 \$6.22</u> <u>1985-84 \$6.12</u>						C	<table style="width:100%; border: none;"> <tr> <td style="width:50%; vertical-align: top;"> Heating Fuel Natural Gas Electricity Oil Propane Other: </td> <td style="width:5%; text-align: center; vertical-align: top;"> Space Heat ☒ ☒ ☐ ☐ ☐ </td> <td style="width:45%; text-align: center; vertical-align: top;"> Type of Use Water Heat ☐ ☐ ☐ ☐ </td> </tr> </table>						Heating Fuel Natural Gas Electricity Oil Propane Other:	Space Heat ☒ ☒ ☐ ☐ ☐	Type of Use Water Heat ☐ ☐ ☐ ☐
Heating Fuel Natural Gas Electricity Oil Propane Other:	Space Heat ☒ ☒ ☐ ☐ ☐	Type of Use Water Heat ☐ ☐ ☐ ☐														
D	ENERGY AND POWER															
	1987/1986				1986/1985				1985/1984							
	Electricity		Fuel		Electricity		Fuel		Electricity		Fuel					
	Consumption	Demand	Consumption		Consumption	Demand	Consumption		Consumption	Demand	Consumption					
	KWH	KW	Natural Gas Therms	Other Units: <u>CF</u>	KWH	KW	Natural Gas Therms	Other Units: <u>CF</u>	KWH	KW	Natural Gas Therms	Other Units: <u>CF</u>				
JUL	6320	52		7,420	4988	36		1,484	3,734	42		4,452				
AUG	5441	45		15,582	5570	42		2,968	4,249	46		5,936				
SEP	11,094	98		17,808	11,464	137		13,856	11,878	57		22,260				
OCT	14,963	157		56,392	13,427	146		20,776	14,434	149		35,616				
NOV	17,217	168		238,182	15,941	157		29,680	14,007	154		150,626				
DEC	16,417	105		320,544	16,103	94		239,666	21,889	154		373,968				
JAN	19,222	108		454,846	15,632	103		257,474	11,674	98		290,864				
FEB	22,020	111		320,544	13,825	102		326,480	20,492	107		437,038				
MAR	18,394	101		190,694	15,270	101		140,238	16,991	103		225,568				
APR	16,171	102		107,590	14,549	96		103,138	14,040	102		116,494				
MAY	15,437	96		22,260	12,429	96		13,356	11,803	80		11,872				
JUN	10,556	81		14,840	11,394	87		10,388	11,191	85		8,162				

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Table 4

SECTION B-III

RESULTS

Introduction

After review of this facility, a number of maintenance procedures and retrofits have been identified. These items are discussed in this section.

MAINTENANCE PROCEDURES

The following maintenance procedures are general in nature but apply to the specific equipment and systems in this facility. Other maintenance comments which are specific to a particular piece of equipment (such as worn out fan belt, missing filters, etc.), can be found in Appendix A, Equipment Data Forms. Mr. Chavez is already performing some of these maintenance items, and can use this information as a basis for a routine maintenance schedule and logbook.

1. **Change Filters on Scheduled Basis.** Filters on furnaces and air handlers should be replaced every 4 to 6 months, or more often in areas exposed to much windblown dust. When changing filters check the fresh air intake screen and clean if necessary. Dirty filters increase the resistance to air flowing past the filters, which decreases the air flowing to the space. This decreased air flow requires the burners in furnaces to operate for longer periods and can result in overheating and wasting fuel.

Additional effects of dirty filters will be to reduce comfort and increase maintenance of the unit. A maintenance log should be kept current, which can form the basis for generating work orders for filter changes, lubrication, replacement of belts, etc., on specific equipment.

2. Maintain Fans. The following items should be checked and maintained every 3 months on each piece of HVAC equipment which contains a fan. It will be most critical to provide this service to equipment with the largest fans:

- **Lubricate Bearings.** If shaft bearings are in need of lubrication, the motor will work harder for the same fan output. Increased horsepower and electrical current will result.

- **Clean Fan Blades.** Grease, dust and dirt on the fan blades will increase the rotational inertia of the fan, requiring greater work from the motor for the same fan output.

- **Check Fan Belts for Wear.** Check fan belts for frays, cracks, and nicks. Replace as necessary.

- **Keep Fan Belts Tight.** All belt-driven fans will have some energy lost through belt slippage and flexing. This loss can be reduced by ensuring belts are kept tight and are in good repair. Be cautious not to overtighten belts as this will increase wear on the motor. Belts should have ½-inch deflection midway between the pulleys.

3. Perform Annual HVAC Maintenance. The following items should be performed a minimum of once a year:

- Check and repair all weatherstripping, insulation and caulking in the HVAC casing.

- Remove all rust and repaint where necessary.

- Clean heating coils or burners.

- Check and tighten all bolts and screws, cabinets, brackets, and other HVAC components.

- Check blower cabinet for dirt, and vacuum as required.

- Check duct thermostats for accuracy and adjust/repair as necessary.
- Check flexible duct connections for leaks and repair as necessary. If there are leaks at the flex connection, conditioned air is being needlessly wasted. The flex connections near the rooftop furnaces on the Gymnasium should be repaired.
- Check the ceiling plenum for obvious problems. Many times an inspection with a flashlight will reveal the cause of comfort complaints, such as: duct access doors blown open; loose duct insulation blocking airflow; disconnected control wires; or, outside air dampers stuck open.

4. Maintain Control Systems. There are many parts of a control system that affect energy usage and each of these should be checked annually.

- Check and Adjust Thermostat Calibration on Scheduled Basis. Thermostats can lose their calibration over time and create confusion over proper temperature setpoints. This can often result in occupants adjusting the thermostat temperature settings to over-compensate for the thermostat's miscalibration, wasting energy. A qualified HVAC repairman should be able to adjust the thermostat's internal components to provide for accurate thermostat settings, resulting in increased comfort and energy savings.

Thermostat calibration should be checked annually. This item should be included in the maintenance log for the equipment it is controlling.

- Check Damper Linkage Operation. For economy's sake, many units are designed to be connected to one actuator via linkages. These linkages tend to become stuck with dirt, screws become loose on the linkages, jamming them or even letting the linkages fall off. Proper linkages should be checked annually.

5. Maintain Water Heaters. The following items should be checked every six months

on each water heater:

- **Remove Sediment.** Turn off the burners, then run water from bottom drain of water heater until sediment clears and water is clean so more efficient heat transfer occurs from the burner.
- **Adjust Temperature.** The water temperature should be as low as possible to maintain acceptable temperatures. Automatic dishwashers with a booster heater should be supplied with a minimum of 140° F water. Water temperatures above 150° F are generally unnecessary and can cause scalding. Water temperature for lavatory use should be set at 110° F to maximize safety and minimize standby energy losses.
- **Inspect Piping for Leaks.** Piping leaks, especially around the water tank, can eventually cause corrosion and rupture of the storage tank. These leaks should be repaired as soon as they are recognized.
- **Install Insulation on Domestic Hot Water Piping.** Presently some hot water piping in the mechanical room is uninsulated. Apply a one-inch insulative wrap to reduce standby losses.

6. Turn Lights Off in Unoccupied Rooms. A student, teacher, and staff energy awareness program should be undertaken to ensure that lighting is turned off by the last person to exit a room. Although turning lighting off and on does decrease the life of the lamps, studies have shown that if high intensity discharge (HID) lights are not needed for ten minutes or more, and two minutes for fluorescent lights, the dollar savings from energy reduction will more than offset the increased lamp replacement costs.

It is recommended that fluorescent tubes and ballasts be replaced with the lower wattage type as they burn out. Since the older type ballasts use approximately 20% of the

fixture's electricity, energy saving ballasts can save 6% of the fluorescent lighting cost.

MAINTENANCE PROCEDURE SAVINGS

The total energy savings based on 10% total heating savings if all above items are undertaken is:

ANNUAL SAVINGS

Energy: 2412 TH

\$1,958

Simple Payback: Immediate

The table on the following pages summarizes the maintenance recommendations.

MAINTENANCE SUMMARY

SCHOOL: Carrizozo High School

Survey Date: March 23, 1988

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
I. Pumping						
A. Pipe Flow Strainers						
B. Heating and Cooling Coil Valves						
C. Bearings/Sleeves/Seals						
II. Water Heaters - Domestic						
A. Remove Sediment			✓	✓		
B. Insulation				✓		INSPECT
III. Heating						
A. Boilers - Space Heating						
1. Insulation/Refractory				✓		"
2. Piping Insulation				✓		"
3. Pipe Joint Seals				✓		"
4. Burner Efficiency				✓	✓	
5. Blowdown Boilers			✓	✓		
B. Furnaces, Room Heaters, Fan Coils						
1. Filter			✓	✓		
2. Hi/Lo Limit		✓		✓	✓	
3. Burner Efficiency				✓		
4. Heat Exchanger(s)			✓	✓		
5. Lubricate Bearings				✓	✓	
6. Fan Belts				✓	✓	
7. Clean Fan Blades				✓		

Table 5

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
C. Fin Tubes/Radiators						
1. Clean Surfaces _____			✓	✓		
2. Remove Obstructions _____				✓		INSPECT
IV. Control System						
A. Compressor _____						
B. Dryers Filters _____						
C. Pneumatics						
1. Outside Air Reset _____						
2. Valve/Damper Operation _____						
3. Linkage Operation _____						
D. Mixed Air Temperature _____				✓	✓	"
E. Sensors						
1. Temperature Domestic Hot Water _____		✓		✓		
2. Water Temperature in Pipe/Pump _____				✓		
3. On/Off Setpoints _____	✓			✓		
4. Air Temperature for Controllers _____				✓	✓	
F. Time Clocks _____				✓	✓	RESET AT TIME CHANGE
G. Thermostats _____				✓	✓	
V. Air Conditioning/Ventilating						
A. Compressors						
1. Cleaning _____			✓			
2. Freon Check _____						
3. Belt Tighten _____						
4. Lubricate Bearings _____						

Table 5 continued

	Adjust to Decrease Run Time	Adjust to Decrease Capacity	Clean Compts. (e.g. filter)	Perform Periodic Maint.	Repair/ Replace/ Calibrate	Comments
B. Evaporators						
1. Cleaning _____						
2. Heat Exchanger(s) _____						
C. Swamp Coolers _____						
1. Pad Cleaning _____						
2. Water Flow Check _____						
3. Winterize _____						
4. Slide Damper _____						
D. Fans						
1. Filter _____			✓	✓	✓	
2. Bearings _____				✓		
3. Belts _____				✓	✓	
4. Clean Fan Blades _____			✓	✓		
VI. Lighting						
A. Lamp Efficiency _____				✓		
B. Diffusers and Reflectors _____			✓			
C. Lighting Level _____		✓				
D. Manual Control _____	✓					
VII. Building Envelope						
A. Infiltration						
1. Door and Window Caulking _____				✓		INSPECT

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Table 5 continued

RETROFIT RECOMMENDATIONS

1. **Replace Present Thermostats with Night Setback Thermostats.** The present single setting thermostats used in the new addition must be manually set back at night to prevent full nighttime heater operation. It would be difficult for assigned personnel to accomplish this task each evening for each furnace. The function of turning down thermostats to approximately 55° F at night therefore lends itself well to automatic operation.

The most effective type of setback thermostat are the ones that allow seven (7) day programming. 7-day programmable thermostats allow setback to 55° F on week nights and all weekend, further reducing unnecessary heater operation.

ANNUAL SAVINGS

Energy: 4197 TH
Capital Cost: \$5,256
Annual Savings: \$2,317
Simple Payback: 2.3 years

2. **Weatherize.** Infiltration is the penetration of cold air into a heated room due to wind pressure on the exterior building envelope, or a negative room pressure due to an exhaust fan or flue. Exfiltration is the escape of warm air from a building due to positive pressurization of a room. The classroom interiors at these schools are normally under a neutral or slightly negative pressure, causing a heat loss due to infiltration.

During the winter, therefore, heat loss due to infiltration can be very significant, especially if the doors and windows are not well sealed. Weatherstripping should be installed around all doors and windows that do not already have weatherstripping that is in good condition.

Cracks can also be an avenue for cold winter air to enter a room, or for heated

classroom air to escape. All cracks should therefore be caulked and sealed tight. Look for cracks around windows and door framing and in corners of walls. This is an extremely economical retrofit measure to carry out and can have a significant and immediate effect on energy consumption and comfort.

ANNUAL SAVINGS

Energy: 728 TH
Capital Cost: \$1,314
Annual Savings: \$402
Simple Payback: 3.3 years

The table on the next page summarizes the retrofit recommendations.

ENERGY RETROFIT SUMMARY**SCHOOL: Carrizozo High School****Survey Date: March 23, 1988**

	Therms Saved	Dollar Capital Cost	Annual Dollar Savings	Years Payback
1. Replace Thermostats with Setback Type	4197	\$ 5,256	\$ 2,317	2.4
2. Weatherize	728	1,314	402	3.3
Total:	4925	\$ 6,570	\$ 2,719	2.4

Table 6

SECTION II

RECOMMENDATIONS

We recommend that the school consider instituting a preventative maintenance and energy savings program involving administration, staff and students.

Administration would be able to support the preventative maintenance program by maintaining records of equipment, such as those in the following appendix, which gives staff information for repairs. The map in Section II of each division may be used to organize repairs by staff on a scheduled and non-emergency basis. Additional items may be added to the appendix and map as needed. The benefit to everyone is, work is performed on an organized, complete, and non-stressful basis and operating budget is saved.

Administration would be able to support the energy savings program by encouraging staff and student to monitor energy usage and keep facilities and equipment clean and by obtaining funding for retrofits.

The benefit to everyone is that the environment is cleaner, more healthful, more enjoyable and operating costs are saved.

Thank you for allowing us to be part of your school program.

APPENDIX A
EQUIPMENT DATA FORMS

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: Administration Survey Date: 3/23

EQUIPMENT TYPE: Heat pump I.D. Number(s): 454

Approx. Age of Equipment: 12 years Number of Identical Units: 1

Manufacturer: Lennox Model Number: HPB-511V-1P

Location: Outside/East of Bldg Function: Space Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Heat pump - heating and cooling

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

208 Volts 30.8/1.5 Amps/HP 1 Phase _____ KW

2) Equipment Component Type Compressor

_____ Volts 1/3 Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Split system

2. Evaporator ECB-10-51/65-471-1P.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: Elementary Survey Date: 3/23

EQUIPMENT TYPE: Dom. Water Heater I.D. Number(s): 455

Approx. Age of Equipment: 20 years Number of Identical Units: 1

Manufacturer: National Model Number: N-40-D

Location: Janitor's Closet Function: Heating Domestic Water

Heating Fuel Type: Gas Electricity Propane Oil N/A Other Nat. (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural - Gas Fired.

Capacity: 4500 in 40 gal capacity Stub CFM HP GPM KW (circle units)
Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. 37.8 gph recovery

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: Elementary Survey Date: 3/23

EQUIPMENT TYPE: Boiler I.D. Number(s): 456

Approx. Age of Equipment: 8 years Number of Identical Units: 1

Manufacturer: Peerless Model Number: 211-7-1

Location: Boiler Room Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural - Gas Fired

Capacity: 1,260,000 in ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
1,008,000 out ☐ Other

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. O.A sensor

2. High and low temp. setting

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: Elementary Survey Date: 3/23

EQUIPMENT TYPE: Dom. Water Heater I.D. Number(s): 457

Approx. Age of Equipment: 8 years Number of Identical Units: 1

Manufacturer: A.O. Smith Model Number: FSG 40-930F

Location: Boiler Room Function: Heating Domestic Water

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural - Gas Fired

Capacity: 32,500 ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
40 gal capacity Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. 32.8 gph recovery

2. Preheated water from heat exchanger of solar panels

3. Possibly bad sensor - Solar dampers are not operating to heat water in the coils.

4. No water treatment.

5. Some insulation needed on Boiler piping.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: Elementary Survey Date: 3/23

EQUIPMENT TYPE: Roof Top Furnace I.D. Number(s): 458 A,B,C

Approx. Age of Equipment: 8 years Number of Identical Units: 3

Manufacturer: Reznor Model Number: RXE-300-8MV

Location: Roof Function: Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural Gas Fired - Forced Air

Capacity: 300,000 in ☒ CFM ☐ HP ☐ GPM ☐ KW (circle units)
225,000 out Other _____

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. 458A - standing pilot occasionally goes out, no filters, O.S.A damper linkage disconnected
2. 458B - control problem, O.S.A damper linkage disconnected, drawing from return air plenum, No filters
3. 458C - No filters, Belt loose

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: New Gym Survey Date: 3/23

EQUIPMENT TYPE: Dom. Water Heater I.D. Number(s): 459

Approx. Age of Equipment: 3-4 years Number of Identical Units: 1

Manufacturer: Rheem Model Number: RF-200-94

Location: North side of Bldg. Function: Heating Domestic Water

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural-Gas Fired

Capacity: 1,999,000 ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
94 gal capacity Other _____

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. 169.6 gph recovery

2. Set @ 140°F, reset @ 120°F (water temp)

3. Looks in good condition.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carriazo BLDG: New Gym Survey Date: 3/23

EQUIPMENT TYPE: Roof Top Furnace I.D. Number(s): 460 A and B

Approx. Age of Equipment: 8 years Number of Identical Units: 2

Manufacturer: Payne Model Number: 150 HO-2 Series 551

Location: Roof Function: Space Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Nat-Gas Fired-Forced Air.

Capacity: 150,000 in ☒ Bluh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
112,000 out Other _____

2) Type: _____

Capacity: _____ ☐ Bluh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ ☐ Bluh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: New Gym Survey Date: 3/23

EQUIPMENT TYPE: Roof Top Furnace I.D. Number(s): 461

Approx. Age of Equipment: 8 years Number of Identical Units: 5

Manufacturer: Payne Model Number: 200 HO-2-AC

Location: Roof Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Nat. Gas Fired-Forced Air.

Capacity: 200,000 in Btuh CFM HP GPM KW (circle units)
150,000 out. Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Pilot ignition problems

2. Filters inaccessible

3. Units have economizers

4. Holes in flex connection @ ductwork.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: VO-AG. Survey Date: 3/23

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 462

Approx. Age of Equipment: 8 years Number of Identical Units: 3

Manufacturer: Payne Model Number: 100 UHE-2

Location: Shop. Function: Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Nat-Gas Fired

Capacity: 100,000 in ☒ Btuh CFM HP GPM KW (circle units)
80,000 out Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. T-stat controlled

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Corr 12020 BLDG: Testing / Council Survey Date: 3/23

EQUIPMENT TYPE: Furnace I.D. Number(s): 463

Approx. Age of Equipment: 25 years Number of Identical Units: 1

Manufacturer: Fraser-Johnson Model Number: 250-C-33

Location: West side of Bldg Function: Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Nat-Gas Fired-Forced Air

Capacity: 250,000 in ☒ Btuh CFM HP GPM KW (circle units)

200,000 out Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Loose belt on fan motor.

2. Standing pilot

3. Filters are custom fitted

4. T-stat controlled

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: High School Survey Date: 3/23
EQUIPMENT TYPE: Unit Heater I.D. Number(s): 464
Approx. Age of Equipment: 12 years Number of Identical Units: 2
Manufacturer: Day & Night Model Number: N/A.
Location: Old Gym. Function: Space Heating
Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

- 1) Type: Nat-Gas Fired w/ Fan.
Capacity: N/A. Btuh CFM HP GPM KW (circle units)
_____ Other _____
- 2) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____
- 3) Type: _____
Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

- 1) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 2) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW
- 3) Equipment Component Type _____
_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. T-stat controlled, mounted on units

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: High School Survey Date: 3/23

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 465 / 466

Approx. Age of Equipment: 12 years Number of Identical Units: 2 / 2

Manufacturer: Day & Night Model Number: 50-4AG-1

Location: Gym/Girls Locker Room Function: Space Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural - Gas Fired

Capacity: 50,000 in 40,000 out Btuh CFM HP GPM KW (circle units)
Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. T-stat controlled, mounted on units

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: High School Survey Date: 3/23

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 467

Approx. Age of Equipment: 12 years Number of Identical Units: 12

Manufacturer: Day & Night Model Number: 50-DUAE-1

Location: Classrooms Function: Heating (space)

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural - Gas Fired w/ Fan.

Capacity: 50,000 in Bluh CFM HP GPM KW (circle units)
40,000 out Other

2) Type: _____

Capacity: _____ Bluh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Bluh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Unit heater are substitute to solar heating

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Corrigo BLDG: Cafeteria Survey Date: 3/23

EQUIPMENT TYPE: Furnace I.D. Number(s): 468

Approx. Age of Equipment: 20 years Number of Identical Units: 4

Manufacturer: Lennox Model Number: GS 70-75-DM

Location: Cafeteria Function: Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Nat. Gas Fired - Forced Air

Capacity: 75,000 in approx Btuh CFM HP GPM KW (circle units)

60,000 out approx Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type Blower Fan

_____ Volts 1/3 _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Filter are dirty

2. Pilot burning ineffeciently

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carriazo BLDG: Cafeteria Survey Date: 3/23

EQUIPMENT TYPE: Dom. Water Heater I.D. Number(s): 469

Approx. Age of Equipment: 12 years Number of Identical Units: 1

Manufacturer: Ruud Model Number: N/A

Location: Cafeteria Function: Heating Domestic Water

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural - Gas Fired

Capacity: N/A Btuh CFM HP GPM KW (circle units)
75 gal capacity Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Water Heater is wrapped with an insulating blanket.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carri2020 BLDG: Arto/Klegg Hall Survey Date: 3/23

EQUIPMENT TYPE: Furnace I.D. Number(s): 470

Approx. Age of Equipment: 20 years Number of Identical Units: 1

Manufacturer: Lennox Model Number: GH 6140 M

Location: Cafeteria Function: Space Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Nat. Gas Fired - Forced Air.

Capacity: 140,000 in ☒ Bluh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
112,000 out ☐ Other

2) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Filters need cleaning

2. Retrofitted for Nat. Gas - Labeled for LPG

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: Arts/Kleg Hall Survey Date: 3/23

EQUIPMENT TYPE: Furnace I.D. Number(s): 471

Approx. Age of Equipment: 20 years Number of Identical Units: 1

Manufacturer: Lennox Model Number: N/A

Location: Kitchen Function: Space Heating

Heating Fuel Type: ☒ Gas ☐ Electricity ☐ Propane ☐ Oil ☐ N/A ☐ Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural-Gas Fired-Forced Air

Capacity: 50,000 in. ☒ Btuh ☐ CFM ☐ HP ☐ GPM ☐ KW (circle units)

approx 35,000 out Other _____

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other _____

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other _____

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION _____

1. T-stat controlled.

RETROFIT INFORMATION _____

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: Arts/Klegg Hall Survey Date: 3/23

EQUIPMENT TYPE: Unit Heater I.D. Number(s): 472

Approx. Age of Equipment: 24 years Number of Identical Units: 10

Manufacturer: Lennox Model Number: N/A

Location: Vestibule/Classrooms Function: Space Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Each classroom/ vestibule has unit and T-stat control.

2. Library is also heated with solar heating.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Curri2020 BLDG: Arts/Kleghall Survey Date: 3/23

EQUIPMENT TYPE: Furnace I.D. Number(s): 473

Approx. Age of Equipment: 8 years Number of Identical Units: 1

Manufacturer: Carrier Model Number: 396-GAW-000-100

Location: Special Ed. Function: Space Heating

Heating Fuel Type: ☒ Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Nat. Gas Fired - Forced Air

Capacity: 100,000 in ☒ Btuh CFM HP GPM KW (circle units)

_____ Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)

_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Filter are dirty

2. Access limited.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: Arts / Klang Hall Survey Date: 3/23

EQUIPMENT TYPE: Furnace I.D. Number(s): 474

Approx. Age of Equipment: 20 years Number of Identical Units: 1

Manufacturer: Lennox Model Number: GH6140m

Location: East side of Bldg Function: Space Heating

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Nat-Gas Fired - Forced Air

Capacity: 140,000 in Btuh CFM HP GPM KW (circle units)
112,000 out Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Filters need cleaning.

RETROFIT INFORMATION

EQUIPMENT DATA

SCHOOL: Carrizozo BLDG: Arts / Mess Hall Survey Date: 3/23

EQUIPMENT TYPE: Dom. Water Heater I.D. Number(s): 475

Approx. Age of Equipment: 8 years Number of Identical Units: 1

Manufacturer: Ruud Model Number: P30-6

Location: East side of Bldg Function: Heating Dom.

Heating Fuel Type: Gas Electricity Propane Oil N/A Other _____ (circle fuel)

SUB-EQUIPMENT COMPONENT(S)

1) Type: Natural - Gas Fired

Capacity: 32,000 in Btuh CFM HP GPM KW (circle units)
30 gal capacity Other

2) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

3) Type: _____

Capacity: _____ Btuh CFM HP GPM KW (circle units)
_____ Other

ELECTRICAL REQUIREMENTS

1) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

2) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

3) Equipment Component Type _____

_____ Volts _____ Amps/HP _____ Phase _____ KW

ADDITIONAL MAINTENANCE INFORMATION

1. Water Heater is wrapped with insulating blanket

2. Flue is disconnected

RETROFIT INFORMATION

1988 ENERGY STUDY
FOR
CHAMA VALLEY INDEPENDENT SCHOOLS

Prepared by
M & E ENGINEERING, INC.
1210 Luisa St. Suite #12
Santa Fe, New Mexico

505-983-2389

Sponsored by
The New Mexico Energy, Minerals and Natural Resources Department
The New Mexico Department of Education
The New Mexico School Administrators Association
The New Mexico School Boards Association
The U.S. Department of Energy

February 1988

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INTRODUCTION

Since 1978 the New Mexico Energy, Minerals and Natural Resources Department has been active in assisting schools throughout the state in developing energy conservation programs for their facilities. In continuation of its assignment to promote the conservation of energy and to reduce the rate of growth of energy demand, the Department has initiated a pilot program to specifically assist the smaller school districts. This program is being carried out with funding assistance from the U.S. Department of Energy under the Institutional Conservation Program, and there is no cost to your Districts.

The purpose of this pilot program is to develop and implement an innovative program to increase energy efficiency in the small school districts. Two steps of this program are to be performed by M & E Engineering. The first step is an energy audit to evaluate the facility and identify potential savings from both Operations and Maintenance Procedures and Energy Conservation Measure Projects. The second step is to provide training sessions at each school district to instruct both the administration and the maintenance personnel in effective methods of project implementation. The training will include instruction of hands-on skills for maintenance personnel.

Follow-up steps will be provided by the New Mexico Energy, Minerals and Natural Resources Department. They include financial advice and recommendations to implement the ECM projects, a newsletter and a networking of activities involving the conservation of energy.

This project is co-sponsored by the New Mexico Department of Education, the New Mexico School Administrators Association and the New Mexico School Boards Association.

This report is intended to help you lower your utility bills by presenting specific actions to reduce energy use. The actions that were identified include Operations and Maintenance Procedures (O&Ms) and Energy Conservation Measures (ECMs).

O&Ms are changes in the operation and maintenance of the building systems that will lead to lower utility bills. ECMs are projects that, when installed, will also lower utility bills. The complete nature and details of these projects will be presented at the training session phase of this project.

Please read this report and begin to put into practice any O&Ms and ECMs that you can. Be prepared to ask questions about those projects which are not clear and to ask any other questions about energy conservation. The trainer will answer these and any other questions at the session.

POTENTIAL SAVINGS

The savings potential for each school at Chama Valley is presented in the individual school section. Due to the nature and scope of the projects at some of the schools, Chama may want to consider participation in the Institutional Conservation Program.

Putting the O&Ms into regular and on-going practice and installing the ECMs could reduce the utility bills by approximately 19 to 25%.

Potential Savings from O&Ms

	Dollars per year	
Administration and TA Elementary	\$1,668	to \$3,446
Escalante High and TA Middle	\$2,439	to \$5,811
Chama Elementary and Middle	\$2,475	to \$5,383
Canjilon Elementary	\$ 260	to \$ 545

Totals	\$6,842	to \$15,185

Potential Savings from ECMs

	Dollars Saved	Project Costs	Simple Payback (years)
Administration and TA Elementary	\$3,011	\$10,940	3.6
Escalante High and TA Middle	\$8,760	\$44,397	5.1
Chama Elementary and Middle	\$5,306	\$63,343	11.9
Canjilon Elementary	\$1,642	\$13,901	8.5

Totals	\$18,719	\$132,581	7.1

HOW DOES CHAMA COMPARE?

Indicators are a way of comparing energy consumption of a school to a large group of schools. The effects of weather, which have a big impact on the use of fuel, are accounted for in the fuel indicator.

The indicator data base is compiled from New Mexico schools over the past 8 years. M & E Engineering, Inc. has collected this information during energy evaluations at the facilities.

Data was available for each Chama school for 86-87

For the Administration Building the utility indicator rates are:

Electric use (KWH/sf): High
Fuel Use (BTU/sf/HDD): Low

For Tierra Amarilla Elementary School the utility indicator rates are:

Electric use (KWH/sf): Medium
Fuel Use (BTU/sf/HDD): Medium

For Escalante High and Tierra Amarilla Middle School the utility indicator rates are:

Electric use (KWH/sf): Medium
Fuel Use (BTU/sf/HDD): Medium

For Chama Elementary School the utility indicator rates are:

Electric use (KWH/sf): Medium-High
Fuel Use (BTU/sf/HDD): Medium

For Chama Middle School the utility indicator rates are:

Electric use (KWH/sf): Low
Fuel Use (BTU/sf/HDD): Medium

For Canjilon Elementary School the utility indicator rates are:

Electric use (KWH/sf): Low
Fuel Use (BTU/sf/HDD): Low

Data and Indicators for each school are located in the individual school section.

A "High" use indicator suggests that there is much room for improvement. It may also mean that you have some source of high energy use. A "Medium" use indicator implies that you are using an average amount of energy and that you may have already started a plan to conserve energy. A "Low" use indicator says that you are actively working to conserve energy. Other areas of this report explain procedures which will help you to further reduce energy use.

UTILITY INFORMATION

At Chama Valley Independent Schools each campus has 3 electric meters and either 1 or more natural gas meters or an LP gas tank station. At most campuses, current electric rates have averaged \$0.12 to \$0.15 per KWH. Natural gas is about \$0.38 per therm and LP is currently \$0.442 per gallon down from an average of \$0.51 during 86-87. While gas rates are typical for Northern New Mexico schools, the electric rates are higher.

Electricity is provided by Rio Arriba Electric Coop, and natural gas is provided by Northern New Mexico Gas Co. Propane is bid annually. All rate structures appear to be appropriate.

Usage by school for previous years was unavailable.

At the teacherages, the utilities are billed to the occupants.

CHAMA VALLEY INDEPENDENT SCHOOLS

**ADMINISTRATION BUILDING
and
TIERRA AMARILLA ELEMENTARY**

**TIERRA AMARILLA ELEMENTARY SCHOOL
and
CHAMA DISTRICT OFFICE**

Tierra Amarilla Elementary and the Chama Valley Independent Schools District Complex are on the same site and share a parking lot.

The Chama District Office is a two and one half story adobe building which was constructed in 1929 as the original Tierra Amarilla school. The only other District building is an insulated metal storage building. An interesting feature is that the blanket insulation is also installed across the skylight sections of the roof. This works out pretty well; the sunlight comes right through the insulation.

The Tierra Amarilla Elementary School has two "pod" type Classroom Buildings, a Multipurpose Building, a Library-Media Center with attached storage and four Portables which are used for an office, and three classrooms. The portables are standard insulated metal building classrooms. Constructed in 1978, the other buildings are all constructed of concrete block and have insulated roofs.

We at M&E Engineering, Inc. wish to thank Ms. Odelia and Ray Coriz for their kind cooperation and assistance during this Energy Audit project.

SUMMARY

At the District Office the gas energy use is low while the electric energy use is high. Energy use for both gas and electricity is medium at Tierra Amarilla Elementary School. Data and indicators are on the following page.

There is good energy savings potential through both O&Ms and ECMs.

Potential Savings from O&Ms - \$1,668 to \$3,446 per year

Potential Savings from ECMs - \$3,011 per year

DATA AND INDICATORS FOR CHAMA VALLEY ADMINISTRATION

	84-85	85-86	86-87
DATA			
Heating Degree Days	8,522	8,253	8,881
Area (Sq. Ft.)	6,774	6,774	6,774
Students			
Fuel - Propane			3,826
Fuel Costs			\$1,999
Electric			52,076
Electric Costs			\$4,894
Fuel Cost per gallon			\$.522
Elec Cost per KWH			\$.094 ✓
INDICATORS			
Btu per sqft/HDD			6.07
KWH per sqft			7.69
Cost per sqft			\$1.018
Cost per Student			

DATA AND INDICATORS FOR TIERRA AMARILLA ELEMENTARY SCHOOL

	84-85	85-86	86-87
DATA			
Heating Degree Days	8,742	7,555	7,690
Area (Sq. Ft.)	20,325	20,325	20,325
Students			155
Propane			20,522
Fuel Costs			\$10,826
Electric			84,163
Electric Costs			\$11,324
Fuel Cost per gallon			\$.528
Elec Cost per KWH			\$.135
INDICATORS			
Btu per sqft/HDD			12.54
KWH per sqft			4.14
Cost per sqft			\$1.090
Cost per Student			\$143

DESCRIPTIONS OF O&Ms
TIERRA AMARILLA ELEMENTARY SCHOOL
and
DISTRICT OFFICE

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of furnace filters, and annual flushing of water heaters.

O&M Night and Weekend Setback

The thermostats in the Buildings should be manually set back by the Teachers, Staff, or Custodians at the end of each day. The day setting should be 70 deg. F. and the night setting should be 60 deg. F.

O&M Set Back Thermostats in Unused Spaces

If a space is not being occupied, and that space has a thermostat which controls the heat only to that space, set the temperature back. Close the doors to the adjacent space. If this condition occurs frequently, weather-strip the door(s) between the heated space and the space where setback occurs.

O&M Furnace Filter Management

When a furnace filter is very dirty, the furnace cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced at least twice during the heating season for a furnace system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the following furnaces:

Building	Room	No. of Furnaces
Portable	Mech. Rm. 1	2
Portable	Mech. Rm. 2	2
Portable	Mech. Rm. 3	1
Portable	Mech. Rm. 4	2
Multipurpose Bldg.	MP Room	2

O&M Use Vestibules to Conserve Energy

Vestibule doors have been installed. These double sets of doors can be very helpful in reducing the amount of heated air that escapes during the day. If one pair of doors is propped open, it effectively negates the effect of the vestibule.

Our recommendation is to make sure that all doors at a vestibule remain closed during the entire heating season.

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

O&M Turn Off Unneed Lights

Learn not to turn lights "on" just because they are there! When there is enough natural daylighting or when the light level can be very low, keep the lights turned "off".

O&M Lower Temperature of Hot Water

The domestic hot water is currently supplied at a temperature too high for hand washing and other non-kitchen school use. Lower the temperature settings on the tanks to no higher than 110 deg. f. This can be accomplished by setting the dial to "WARM" and after some time has elapsed, measuring the hot water temperature at a tap with a thermometer. Keep adjusting the water tank dial until the tap water comes out at about 105-110 deg.F.

RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES

DISTRICT Chama Valley Independent Schools

SCHOOL Tierra Amarilla Elementary School and District Office

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report.

The savings from more than one procedure may have been combined in the results presented below.

O & M PROCEDURE		SAVINGS	RANGE
SYSTEM		LOW	HIGH
HEATING			
	SET BACK STATS WHEN UNOCCUPIED	\$1,099	\$2,199
	SET BACK STATS IN UNUSED SPACES	\$55	\$110
	PREVENTIVE MAINTENANCE PROGRAM	\$440	\$880
COOLING			
AUXILIARY			
	PREVENTIVE MAINTENANCE PROGRAM	\$3	\$15
LIGHTING			
	TURN OFF WHEN SPACE UNOCCUPIED	\$54	\$215
HOT WATER LOWER SUPPLY TO 110 DEG. F.			
		\$18	\$28
KITCHEN			
TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$1,668	\$3,446
TOTAL SAVINGS RANGE, PERCENTAGE		5.7%	11.9%

DESCRIPTIONS OF ECMs
TIERRA AMARILLA ELEMENTARY SCHOOL
and
DISTRICT OFFICE

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Install twenty two electric clock operated night/weekend setback thermostats with locking covers.

ECM Replace Incandescent Lights

The original incandescent lighting is not nearly as energy-efficient as other kinds of lighting that are now available. There are several areas in which this incandescent lighting can be easily replaced with more efficient lighting, such as fluorescent (F), metal halide (MH) or sodium vapor (SV).

Space	No. Fixtures	Bulbs per Fixture	Watts per Bulb	Replace Type/Qty
Admin/Offices	36	1	150	F1/36

ECM Install Air to Fuel Mixture Adjustment Plates on Furnaces

The forced air furnaces in the portable classrooms do not have combustion air setting plates on the burners. The screws to hold the plates and adjust the plates exist. We recommend a contractor be hired to install and adjust the plates for maximum efficiency for the units. Seven units require plates, each unit requires six plates, and each plate is approximately 1" in diameter.

SUMMARY OF RECOMMENDED ENERGY CONSERVATION MEASURES

School District: Chama Valley Independent Schools

School: Tierra Amarilla Elementary School & District Office

Description of Measure	Utility Dollars Saved	Estimated Project Costs	Simple Payback in years
Night and Weekend Setback	\$1,792	\$6,017	3.4
Replace Incandescent Lights	\$1,008	\$3,974	3.9
Install Fuel/Air Ratio Plate	\$212	\$949	4.5
TOTALS	\$3,011	\$10,940	3.6

* These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.

NOTE: These project costs are for budget purposes.

MECHANICAL EQUIPMENT INVENTORY

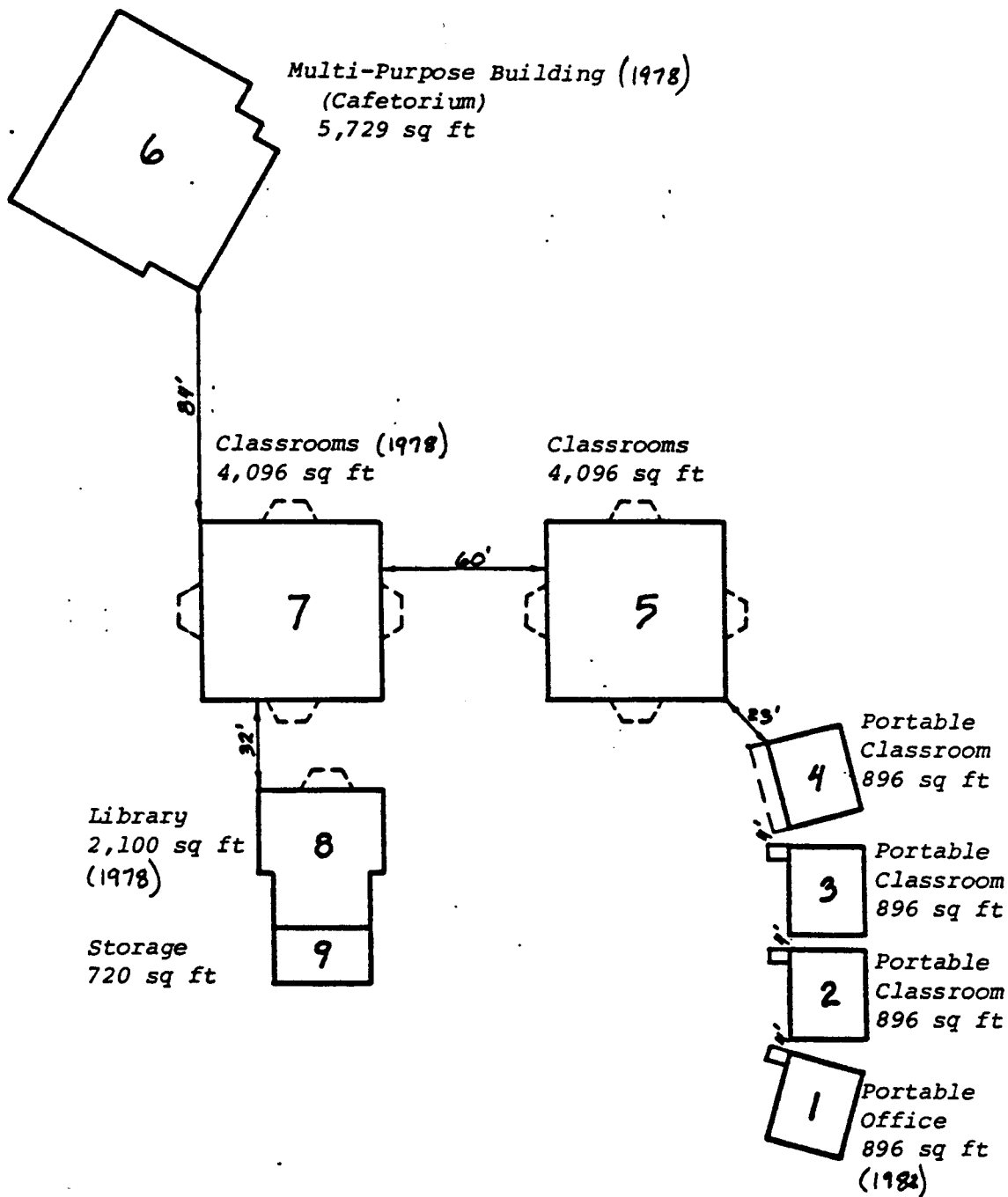
TIERRA AMARILLA ELEMENTARY SCHOOL AND DISTRICT OFFICE

G ITEM	LOCATION	DESCRIPTION	COMMENT
Furnace	Admin./Mtnng. Rm.	Propane	Comment No. 1
Unit Heater	Admin./Office	Propane	
Furnace	Admin./Board Rm.	Propane	Comment No. 1
DX Clng Unit	Admin./Board Rm.	Electric	
Furnace	Admin./Board Rm.	Propane	Comment No. 1
Unit Heater	Admin./Smoking Rm.	Propane	
Wall Heater	Admin./Men's Rm.	Propane	
Wall Heater	Admin./Women's Rm.	Propane	
Furnace	Admin./Purchasing Off.	Propane	Comment No. 1
DX Clng Unit	Admin./Purchasing Off.	Electric	
Unit Heater	Admin./Assist.Super.Off.	Propane	
Unit Heater	Admin./Sect. Off.	Propane	
Unit Heater	Admin./Work Room	Propane	
Wall Heater	Admin./Trans. Off.	Propane	
Unit Heater	Admin./Bus.Mngr.Off.	Propane	
Unit Heater	Admin./Super. Off.	Propane	
Space Heater	Storage Bldg.	Propane	
DHW System	Admin./Kitchen	Electric	
DHW System	Admin./Restrooms	Electric	
Furnace	Port. Mech. Rm. # 1	Propane	Comment No. 2
Furnace	Port. Mech. Rm. # 1	Propane	Comment No. 2
Furnace	Port. Mech. Rm. # 2	Propane	Comment No. 2
Furnace	Port. Mech. Rm. # 2	Propane	Comment No. 2
Furnace	Port. Mech. Rm. # 3	Propane	Comment No. 2
Furnace	Port. Mech. Rm. # 4	Propane	Comment No. 2
Furnace	Port. Mech. Rm. # 4	Propane	Comment No. 2
Wall Heater	Quad. Pod	Propane	Comment No. 3
DHW System	Restrooms/Quad. Pod	Electric	
Wall Heater	Quad. Pod	Propane	Comment No. 3
DHW System	Restrooms/Quad. Pod	Electric	
Wall Heaters	Library	Propane	Comment No. 4
Space Heater	Library Storage	Propane	
DHW System	Library/Storage	Propane	
Space Heater	Library/Storage	Propane	
DHW System	Multi-Purpose Mch. Rm. 5	Propane	
HW Boiler	MP/Mech. Rm. 5	Propane	Comment No. 5
Fence Post	Outside	Wood	Comment No. 6
Number not used.			
Space Heater	MP/Mech. Rm. 5	Electric	
AHU Furnace	Multi-Purpose Area	Propane	Comment No. 6
AHU Furnace	Multi-Purpose Area	Propane	Comment No. 6
Radiant Htrs	Multi-Purpose Area	Propane	

Comments:

1. Vertical wall mounted furnace without filters. Each with a thermostat. The staff use manual night/weekend setback methods.
2. Filters washed out once per year.

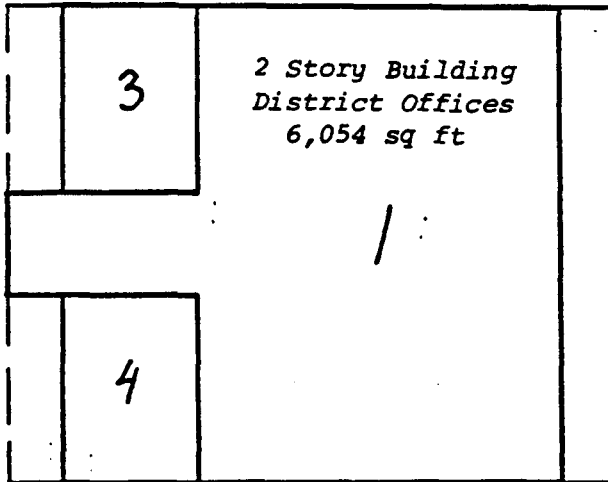
3. Eight wall heaters total in the Pod. Each has a thermostat. No filters exist on the units.
4. Three wall heaters total in Library. Each has a thermostat. No filters in the units.
5. The hot water boiler feeds fintube convectors in the kitchen and restrooms. The pump is activated by a single thermostat. The water temperature is set at 170 deg. F.
6. The unit uses 100% outside air, with exposed uninsulated barbed wire, 3 wire connection.
6. The unit provides 100% outside air. The units are rarely used. Filters not changed often as a result of little use.



CHAMA VALLEY INDEPENDENT SCHOOLS
CAMPUS NO. 5.
TIERRA NUEVA ELEMENTARY
 NOT TO SCALE
 AMARILLA

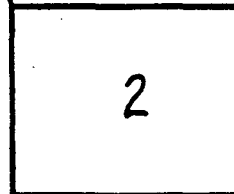
Restrooms
408 sq ft

Storage
408 sq ft



(1929)

16'



Storage Building
720 sq ft
(new)



CHAMA VALLEY INDEPENDENT SCHOOLS
CAMPUS NO. 1
DISTRICT OFFICE
NOT TO SCALE

CHAMA VALLEY INDEPENDENT SCHOOLS

**ESCALANTE HIGH SCHOOL
and
TIERRA AMARILLA MIDDLE SCHOOL**

**ESCALANTE HIGH SCHOOL
and
TIERRA AMARILLA MIDDLE SCHOOL**

The campus for Escalante High and Tierra Amarilla Middle School consists of four buildings - the Middle School Building, the High School Building, the Athletic Complex which includes the Middle School Gym, the business classrooms, the High School Gym and a Lobby, and a Portable classroom used for music. The more recent construction is well insulated, and the older construction is predominantly concrete block walls with some insulated roofs.

With the exception of some of the furnaces in the Athletic Complex, the general condition of the buildings and their equipment is satisfactory. Presently there are very few energy conservation measures or programs in effect.

We at M&E Engineering, Inc. wish to thank Manuel Valdez, Melvin Jarmillo, and Bernie Rivera for their kind cooperation and assistance during this Energy Audit project.

SUMMARY

Throughout the campus, both electric and gas energy use are at a medium level. Data and indicators are on the following page.

In order to substantially reduce energy use and consequently costs, and to insure continued reduction, the installation of energy saving projects is recommended. The savings potential is excellent.

Potential Savings from O&Ms - \$2,439 to \$5,811 per year

Potential Savings from ECMs - \$8,760 per year

•

DATA AND INDICATORS FOR ESCALANTE HIGH SCHOOL AND
TIERRA AMARILLA MIDDLE SCHOOL

	84-85	85-86	86-87
DATA			
Heating Degree Days	8,742	7,555	7,690
Area (Sq. Ft.)	67,533	67,533	66,686
Students			235
Propane			58,666
Fuel Costs			\$30,241
Electric			234,165
Electric Costs			\$32,065
Fuel Cost per gallon			\$.515
Elec Cost per KWH			\$.137
INDICATORS			
Btu per sqft/HDD			10.92
KWH per sqft			3.51
Cost per sqft			<u>\$.934</u>
Cost per Student			\$265

DESCRIPTIONS OF O&Ms

ESCALANTE HIGH SCHOOL and TIERRA AMARILLA MIDDLE SCHOOL

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of furnace filters, and annual flushing of water heaters.

O&M Night and Weekend Setback

The thermostats in the Buildings should be manually set back by the Teachers, Staff, or the Custodians at the end of each day. The day setting should be 70 deg. F. and the night setting should be 60 deg. F.

O&M Set Back Thermostats in Unused Spaces

If a space is not being occupied, and that space has a thermostat which controls the heat only to that space, set the temperature back. Close the doors to the adjacent space.

O&M Furnace Filter Management

When a furnace filter is very dirty, the furnace cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced at least twice during the heating season for a furnace system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the following furnaces:

Building	Room	No. of Furnaces
Mid. School	Library	2
Mid. School	Gym	3
Mid. School	Gym/Lockers	1
High School	Gym	1
High School	Gym/Lockers	1
High School	Business	1
High School	Gym Lobby	1

O&M Repair/Adjust Door Hardware and Weather-stripping

Several doors do not close properly. This allows the loss of heated air. Adjust and/or repair the door hardware so that they draw the door to a closed position against the weather-stripping. Doors noted with an asterisk (*) also need weather-stripping and those with ** need door sweeps.

Building	Doors
Main Classroom Bldg.	Four doors to inner court require new door sweeps.
Main Classroom bldg.	Five exterior double doors require weather-stripping and new door sweeps.

O&M Use Vestibules to Conserve Energy

Vestibule doors have been installed at the Mid School. These double sets of doors can be very helpful in reducing the amount of heated air that escapes during the day. If one pair of doors is propped open, it effectively negates the effect of the vestibule.

Our recommendation is to make sure that all doors at a vestibule remain closed during the entire heating season.

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

O&M Turn Off Unneed Lights

Learn not to turn lights "on" just because they are there! When there is enough natural daylighting or when the light level can be very low, keep the lights turned "off". Especially in the hallway of the main high school building.

O&M Lower Temperature of Hot Water

The domestic hot water is currently supplied at a temperature too high for hand washing and other non-kitchen school use. Lower the temperature settings on the tanks to no higher than 110 deg. f. This can be accomplished by setting the dial to "WARM" and after some time has elapsed, measuring the hot water temperature at a tap with a thermometer. Keep adjusting the water tank dial until the tap water comes out at about 105-110 deg.F.

O&M Turn DHW Pump Around

The domestic hot water pump circulating the hot water between the storage tank and the heater in the gym mechanical room was installed backwards. This pump should be turn around.

RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES

DISTRICT Chama Valley Independent Schools
SCHOOL Escalante High School and Tierra Amarilla Middle School

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report.
The savings from more than one procedure may have been combined in the results presented below.

SYSTEM	O & M PROCEDURE	SAVINGS	RANGE
		LOW	HIGH
HEATING	REPAIR CAULKING/WEATHERSTRIPPING	\$74	\$149
	REDUCE OUTSIDE AIR TO MIN.	\$149	\$372
	EXHAUST FANS OFF WHEN NOT NEEDED	\$149	\$223
	SET BACK STATS WHEN UNOCCUPIED	\$1,488	\$2,976
	SET BACK STATS IN UNUSED SPACES	\$74	\$149
COOLING			
AUXILIARY	PREVENTIVE MAINTENANCE PROGRAM	\$8	\$40
LIGHTING	TURN OFF UNNEEDED LIGHTS	\$70	\$210
	TURN OFF WHEN SPACE UNOCCUPIED	\$420	\$1,682
HOT WATER LOWER SUPPLY TO 110 DEG. F.			
		\$6	\$10
KITCHEN			
TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$2,439	\$5,811
TOTAL SAVINGS RANGE, PERCENTAGE		3.9%	9.3%

DESCRIPTIONS OF ECMs

ESCALANTE HIGH SCHOOL and TIERRA AMARILLA MIDDLE SCHOOL

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Install forty electric clock operated night/weekend setback thermostats with locking covers for 24 volt applications. Install one seven day timeclock, several pneumatic transducers, three low pressure pneumatic night thermostats, and equipment necessary for night setback for a pneumatic system in the Middle School Building.

ECM Re-Pipe Domestic Hot Water Heating System to Kitchen

The existing domestic hot water system to the kitchen currently has a 100 gallon hot water heater and a 300 gallon hot water storage tank with a circulating pump in the middle. The 300 gallon storage tank is not required and should be abandoned, and the pump disconnected and removed. The hot water piping from the water heater should be connected directly to the pipe supply to the kitchen. Approximately 10' of new 2" pipe and insulation are required.

ECM Add Spray on Insulation to Interior Walls and Roof

Heat is lost through the high, low R-value walls of gymnasium. Energy can be saved by adding 2" of spray on cellulose fiber insulation to the interior surface of the walls and roof from the ceiling line to 10' above the floor or 7' above the bleachers.

Gymnasium: Total area to be insulated - 10,800 square feet.

ECM Add Second Lens to Skylight

Because warm air rises, much heat is lost through single dome skylights. Add another layer of glazing to the skylight in the following areas:

Location	#	Size	Type of Second Glazing
Admin. Offices	11	3'x3'	Plexi-glass

ECM Replace Incandescent Lights

The original incandescent lighting is not nearly as energy-efficient as other kinds of lighting that are now available. There are several areas in which this incandescent lighting can be easily replaced with more efficient lighting, such as fluorescent (F), metal halide (MH) or sodium vapor (SV).

Space	No. Fixtures	Bulbs per Fixture	Watts per Bulb	Replace Type/Qty
Gym	30	Inc.	500	Sodium

SUMMARY OF RECOMMENDED ENERGY CONSERVATION MEASURES

School District: Chama Valley Independent Schools

School: Escalante High School and Tierra Amarilla Mid School

Description of Measure	Utility Dollars Saved	Estimated Project Costs	Simple Payback in years
Night and Weekend Setback	\$4,645	\$13,893	3.0
Replace Incandescent Lights	\$2,357	\$15,523	6.6
Spray Insulation on Walls and Roof	\$1,492	\$13,572	9.1
Repipe DHW to Kitchen	\$237	\$1,138	4.8
Add Plexiglass Layer to Skylights	\$28	\$271	9.7
TOTALS	\$8,760	\$44,397	5.1

* These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.

NOTE: These project costs are for budget purposes.

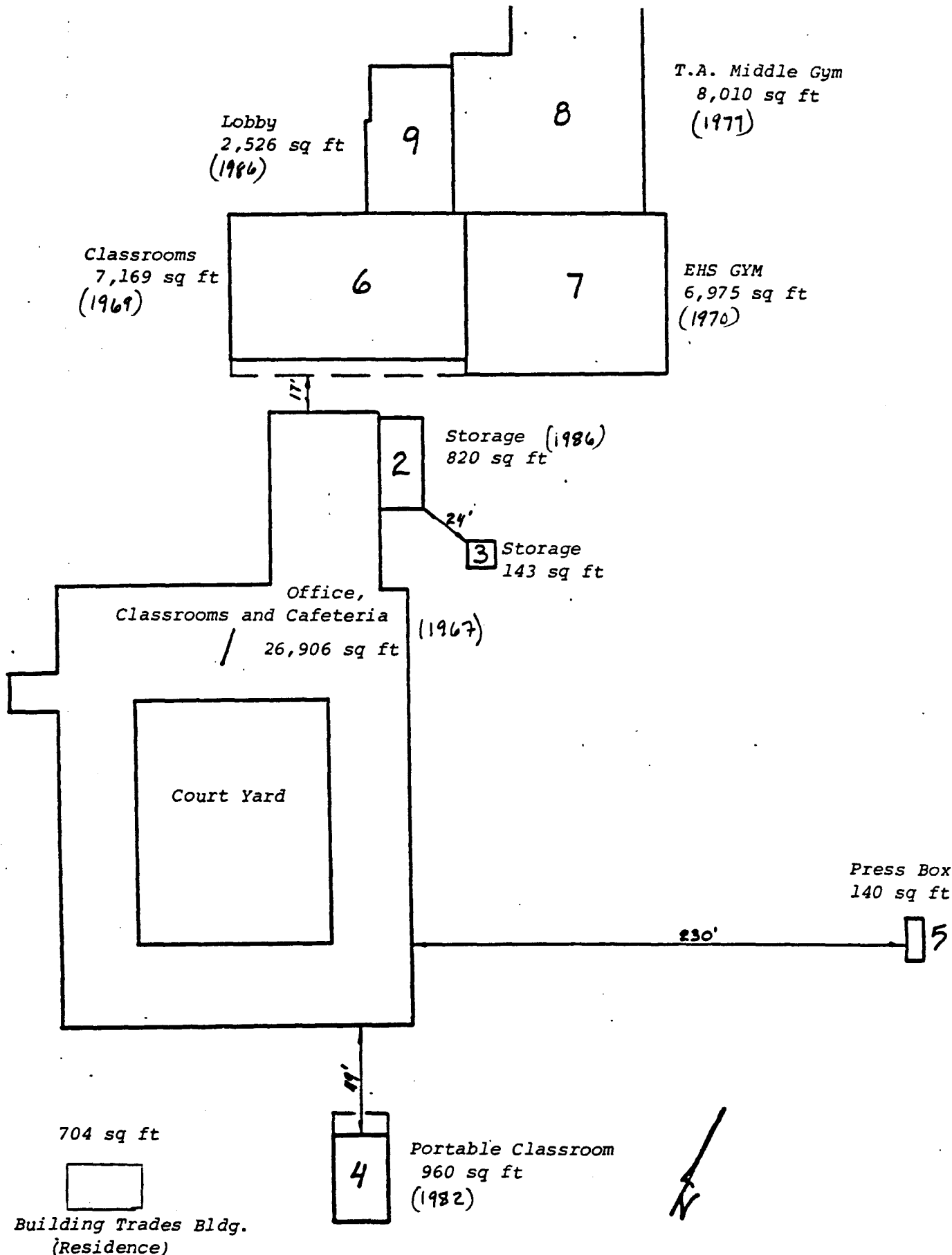
MECHANICAL EQUIPMENT INVENTORY
ESCALANTE HIGH SCHOOL AND TIERRA AMARILLA MID SCHOOL

ITEM	LOCATION	DESCRIPTION	COMMENT
HW Boiler	Mid. Schl./Mech. Rm.	Propane	Comment No. 1
HW Boiler	Mid. Schl./Mech. Rm.	Propane	Comment No. 1
DHW System	Mid. Schl./Mech. Rm.	Propane	Comment No. 2
Unit Heater	Mid. Schl./Hallways	Hot water	
Unit Heater	Mid. Schl./Hallways	Hot water	
Unit Ventilator	Mid. Schl./Library	Hot Water	Comment No. 3
Unit Ventilator	Mid. Schl./Library	Hot Water	Comment No. 3
17 Radiators	Mid. Schl./Most Areas	Hot Water	Comment No. 4
AHU's	Mid. Schl./Gym	Propane	Comment No. 5
Furnace	Mid. Schl./Gym Lockers	Propane	Comment No. 6
DHW System	Mid. Schl./Gym Lockers	Propane	
Furnace	High Schl./Gym	Propane	Comment No. 7
Furnace	High Schl./Gym Lockers	Propane	Comment No. 8
DHW System	High Schl./Gym	Propane	Comment No. 9
Furnace	High Schl./Business	Propane	Comment No. 8
Rooftop Unit	High Schl./Gym Lobby	Propane	Comment No. 10
DHW System	High Schl./Cafeteria	Propane	Comment No. 11
Space Heater	High Schl./Lobby	Propane	
Wall Heater	High Schl./Sect. Off.	Propane	
Wall Heater	High Schl./Counc. Off.	Propane	
Furnace	High Schl./Xerox Rm.	Propane	
Furnace	High Schl./Storage Rm.	Propane	
-37 Wall Heater	High School	Propane	Comment No. 12
Floor Furnace	High School	Propane	Comment No. 13
-45 Wall Heater	High School	Propane	Comment No. 12
Floor Furnace	High School	Propane	Comment No. 13
Floor Furnace	High School	Propane	Comment No. 13
Space Heater	High Schl./Hallway	Propane	
-53 Wall Heater	High School	Propane	Comment No. 12
Floor Furnace	High School	Propane	Comment No. 13
Wall Heater	High School	Propane	Comment No. 12
Floor Furnace	Music Portable	Propane	
Space Heater	Storage Shed	Propane	

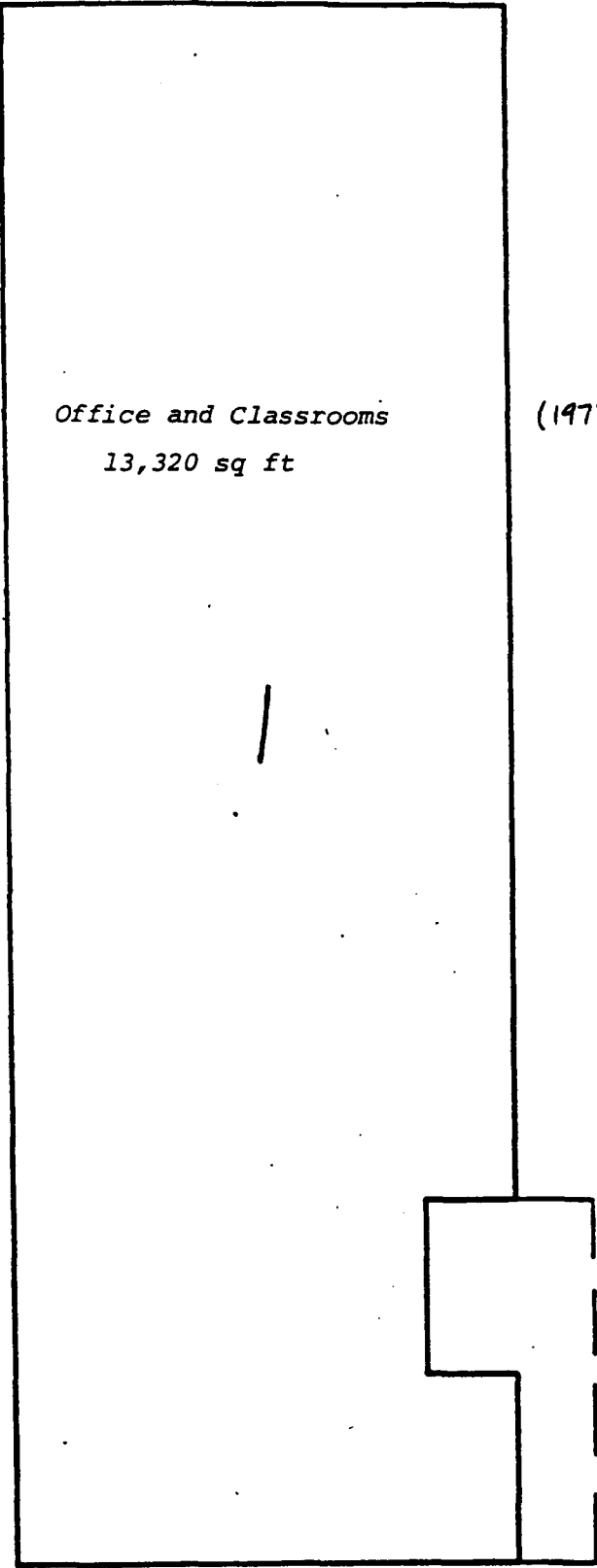
Comments:

- Item no. 1 above and item no. 2 are connected together to form a lead-lag control system. The controls are in poor condition and need work. Hot water is pumped throughout the building to convectors, unit heaters, and ventilators.
- The domestic hot water heater is trying to maintain a water temperature of 180 deg. F.
- The ceiling hung unit ventilators in the Library possibly do require filters and have not been added or changed.
- The radiators in each room are controlled by individual thermostat.

- 
5. The three air handling units serving the gym should have filters. The units do have outside air intake, however, they do not have outside air dampers. The controls on the units are in poor condition. One of the units does not operate at all.
 6. The unit should have filters.
 7. The forced air furnace serving the gym provides warm air to floor grilles on the main gym floor. The unit should have filters.
 8. Filters are required, however, no provisions for holding or locating filters are available.
 9. The domestic hot water is circulated from the water heater to the storage tank. However, the pump was installed backwards and should be re-installed. Also, the thermometer to measure the supply water temperature is broken and should be replaced.
 10. The rooftop unit has a two stage thermostat. The unit has filters.
 11. Domestic hot water for cafeteria is provided by a 100 gallon hot water heater and is circulated to a 300 gallon storage tank. The water temperature in the tank is 170 deg. F. and is piped to the cafeteria.
 12. Wall furnaces located in offices, storage rooms, workrooms, and classrooms.
 13. Floor furnaces located in Science Rm., Library Workroom, Chem. Lab., and Auxiliary. Rm.



CHAMA VALLEY INDEPENDENT SCHOOLS
CAMPUS NO. 3
ESCALANTE HIGH
 NOT TO SCALE



Office and Classrooms
13,320 sq ft

(1977)

CHAMA VALLEY INDEPENDENT SCHOOLS
CAMPUS NO. 4
TIERRA AMARILLA MIDDLE
NOT TO SCALE

CHANA VALLEY INDEPENDENT SCHOOLS

**CHANA ELEMENTARY SCHOOL
and
CHANA MIDDLE SCHOOL**

**CHAMA ELEMENTARY SCHOOL
and
CHAMA MIDDLE SCHOOL**

Chama Elementary School consists of three classroom "pod" buildings, a Cafeteria building with attached storage, a Multipurpose building and two portable classroom buildings which are used for Special Education and the Head Start programs. The Middle School is a one building complex with classrooms, a library, and administration areas.

For the most part all buildings are constructed of concrete block and they have insulated roofs. The Multipurpose building was built with energy conservation in mind. The main heating for the gym floor area is supplied by radiant heaters located at the ceiling, and the DHW tank for the showers is extremely well insulated.

The roof of Middle School Building has leaked, damaging the acoustical tiles and the insulation. In some places the insulation is falling loose from the roof deck. The windows are single pane, but well sealed and in good repair. Both entrances to this building have vestibules.

Except as noted above, the general condition of buildings is good. With the exception of energy conservation features incorporated in the design of the gym, no other energy conservation measures are presently in effect.

We at M&E Engineering, Inc. wish to thank the Principal, Mr. Ramon Estrada, and Custodial/Maintenance personnel, Tito Sandoval and Chone Pacheco for their cooperation and assistance during this Energy Audit project.

SUMMARY

At this campus, the energy use is medium for gas consumption. For electricity, the use is low at the Middle School and medium at the Elementary School. Energy data and indicators are on the following page.

Except for further training of the personnel, and the addition of some clock controls for a setback program, there are few recommendations for the Middle School Building to supplement the outside temperature reset which has already been installed. There is good potential savings at this campus.

Potential Savings from O&Ms - \$2,475 to \$5,383 per year

Potential Savings from ECMs - \$5,306 per year

DATA AND INDICATORS FOR CHAMA ELEMENTARY SCHOOL

	84-85	85-86	86-87
DATA			
Heating Degree Days	8,522	8,253	8,881
Area (Sq. Ft.)	23,718	23,718	23,718
Students			121
Natural Gas			21,956
Fuel Costs			\$8,254
Electric			103,645
Electric Costs			\$14,829
Fuel Cost per therm			\$.376
Elec Cost per KWH			\$.143
INDICATORS			
Btu per sqft/HDD			10.42
KWH per sqft			4.37
Cost per sqft			\$.973
Cost per Student			\$191

DATA AND INDICATORS FOR CHAMA MIDDLE SCHOOL

	84-85	85-86	86-87
DATA			
Heating Degree Days	8,522	8,253	8,881
Area (Sq. Ft.)	13,320	13,320	13,320
Students			63
Natural Gas			12,303
Fuel Costs			\$4,614
Electric			27,220
Electric Costs			\$4,484
Fuel Cost per therm			\$.375
Elec Cost per KWH			\$.165
INDICATORS			
Btu per sqft/HDD			10.40
KWH per sqft			2.04
Cost per sqft			\$.683
Cost per Student			\$144

DESCRIPTIONS OF O&Ms

CHAMA ELEMENTARY SCHOOL and CHAMA MIDDLE SCHOOL

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of furnace filters, and annual flushing of water heaters.

O&M Night and Weekend Setback

The thermostats in the all the buildings should be manually set back by the teachers, staff, or the custodians at the end of each day. The day setting should be 70 deg. F. and the night setting should be 60 deg. F.

O&M Set Back Thermostats in Unused Spaces

If a space is not being occupied, such as storage areas or unused teaching pods, and that space has a thermostat which controls the heat only to that space, set the temperature back. Close the doors to the adjacent space. If this condition occurs frequently, weather-strip the door(s) between the heated space and the space where setback occurs.

O&M Turn Off Heating When Not Needed

Whenever heat is not needed, turn it "off". For example, in the spring and fall in New Mexico heat is often needed in the morning, but if left on all day, the space overheats. Building occupants then open the windows to cool the space. This practice wastes energy.

O&M Furnace Filter Management

When a furnace filter is very dirty, the furnace cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced at least twice during the heating season for a furnace system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the following furnaces:

Building	Room	No. of Furnaces
Mid. School	Library	2
Mid. School	Science Room	2
Multi-purpose	Gym. Area	4
Portables	Mech. Rms.	4

O&M Replace or Repair Door Hardware

Eight exterior doors at the Mid School should have the door sweeps on the bottom of the doors replaced to reduce the infiltration of cold and hot air into the building. This condition allows the loss of heated air. Adjust and/or repair the door hardware so that they draw the door to a closed position against the weather-stripping.

O&M Use Vestibules to Conserve Energy

Vestibule doors have been installed at the Mid School and the Elementary School teaching pods. These double sets of doors can be very helpful in reducing the amount of heated air that escapes during the day. If one pair of doors is propped open, it effectively negates the effect of the vestibule.

Our recommendation is to make sure that all doors at a vestibule remain closed during the entire heating season.

O&M Close Doors and Windows When Heating

Sometimes when a space is too warm, the occupants open doors and/or windows to cool the space. During the heating season this practice wastes energy. Find other ways to make the room comfortable, such as turn down the thermostat.

O&M Seal Building Cracks

The cracks under the window sill in the Mid School building exterior allow heated air to escape. These cracks should be filled with the appropriate sealant to minimize the leakage of heated air.

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

O&M Lower Temperature of Hot Water

The domestic hot water is currently supplied at a temperature too high for hand washing and other non-kitchen school use. Lower the temperature settings on the tanks to no higher than 110 deg. f. This can be accomplished by setting the dial to "WARM" and after some time has elapsed, measuring the hot water temperature at a tap with a thermometer. Keep adjusting the water tank dial until the tap water comes out at about 105-110 deg.F.

O&M Adjust Air/Fuel Ratio on Furnace and Boiler Burners

The flame on the natural gas fired furnaces and boilers is yellow. When the gas company returns in the fall to light the pilots, request that they adjust air/fuel mixture to produce a blue flame for better efficiency.

O&M Relocate Outdoor Reset Temperature Sensor

The outdoor temperature sensor for the reset controller at the Mid School hot water heating boiler is currently located on the south side of the building without a weather and solar shield. The temperature sensor should be relocated to the west side of the building and a weather and solar shield should be installed for better operation.

O&M Turn on Air Compressor During Heating Season

The air compressor for the heating system at the Mid School should operate continuously during the heating season. The thermostats, valves, and control devices in the building are pneumatic. The valves are normally open and will over heat areas if pneumatic air control is not provided.

O&M Check Outside Air Dampers on Ventilators

The dampers in the space ventilators at the Mid School should be checked. When the thermostat is satisfied, the dampers should be closed to the outside air. When the thermostat is calling for heat, the outside air dampers should be open at a maximum of 25% to the outside air.

RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES

DISTRICT Chama Valley Independent Schools
SCHOOL Chama Elementary School & Chama Middle School

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report.
The savings from more than one procedure may have been combined in the results presented below.

SYSTEM	O & M PROCEDURE	SAVINGS	RANGE
		LOW	HIGH
HEATING	TURN OFF WHEN NOT NEEDED	\$60	\$240
	CLOSE DOORS & WINDOWS WHEN HEATING	\$60	\$120
	REDUCE OUTSIDE AIR TO MIN.	\$120	\$300
	SET BACK STATS WHEN UNOCCUPIED	\$1,199	\$2,397
	SET BACK STATS IN UNUSED SPACES	\$180	\$360
	PREVENTIVE MAINTENANCE PROGRAM	\$719	\$1,438
COOLING			
AUXILIARY	PREVENTIVE MAINTENANCE PROGRAM	\$14	\$72
LIGHTING	TURN OFF WHEN SPACE UNOCCUPIED	\$108	\$430
HOT WATER	LOWER SUPPLY TO 110 DEG. F.	\$16	\$25
KITCHEN			
TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$2,475	\$5,383
TOTAL SAVINGS RANGE, PERCENTAGE		7.7%	16.7%

DESCRIPTIONS OF ECMs

CHAMA ELEMENTARY SCHOOL and CHAMA MIDDLE SCHOOL

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Install twenty five electric clock operated night/weekend setback thermostats with locking covers for 24 volt applications throughout the campus. Install one seven day timeclock, several pneumatic transducers, three low pressure pneumatic night thermostats, and equipment necessary for night setback for a pneumatic system in the Middle School Building.

ECM Spray Insulate Exterior Roof

The roof at the Mid School is in poor condition. There are many leaks in roof. Water has leaked into the existing roof insulation and consequently has significantly reduced the R Value. The estimated current roof U-Value is .26. Three inches of exterior spray foam and a hard sealer should be added to increase the U-Value to .037. The total area of the roof is 13,330 square feet.

School District: Chama Valley Independent Schools
School: Chama Mid School and Chama Elementary School

* These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.

41

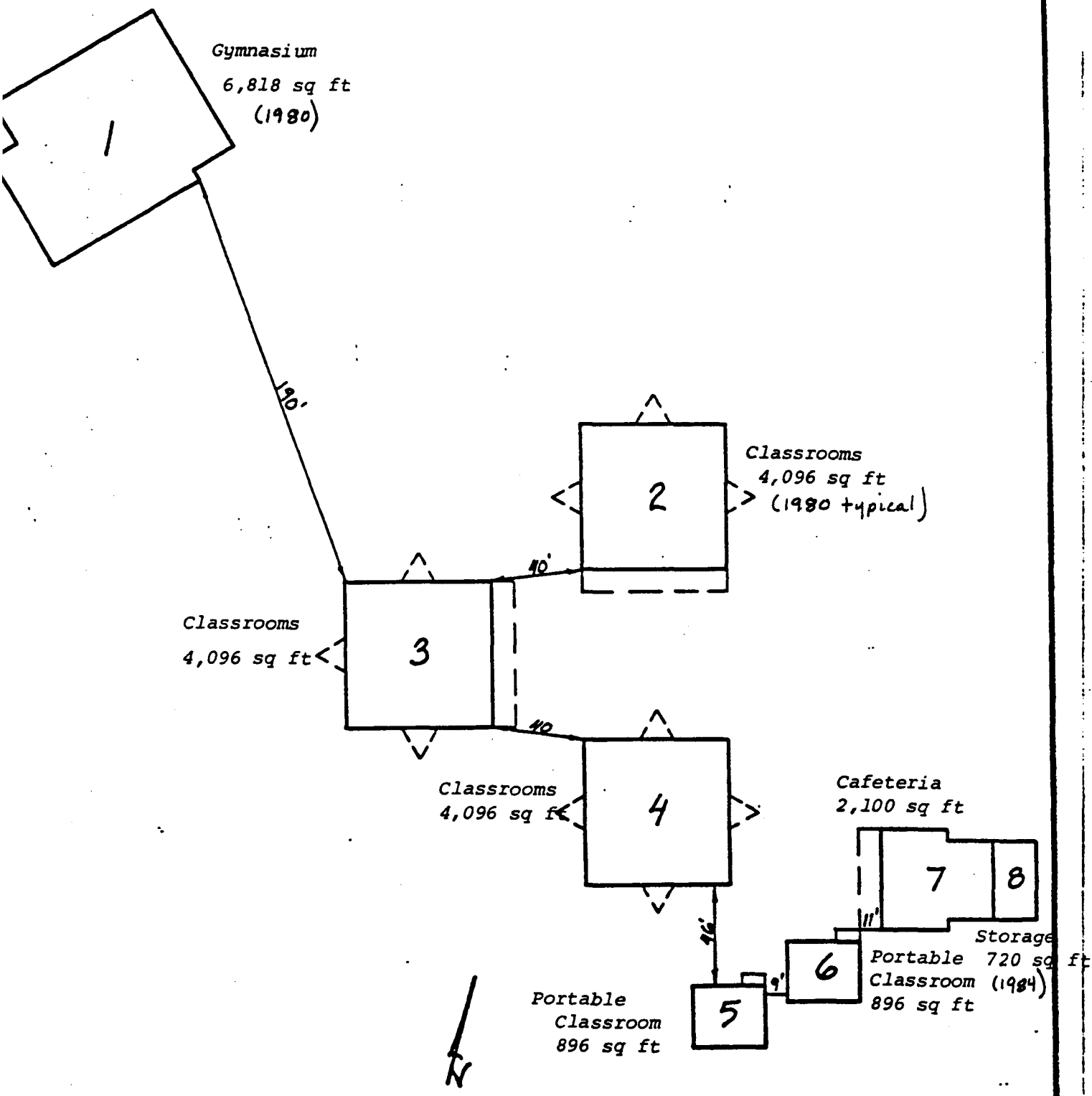
MECHANICAL EQUIPMENT INVENTORY

CHAMA MIDDLE SCHOOL AND CHAMA ELEMENTARY SCHOOL

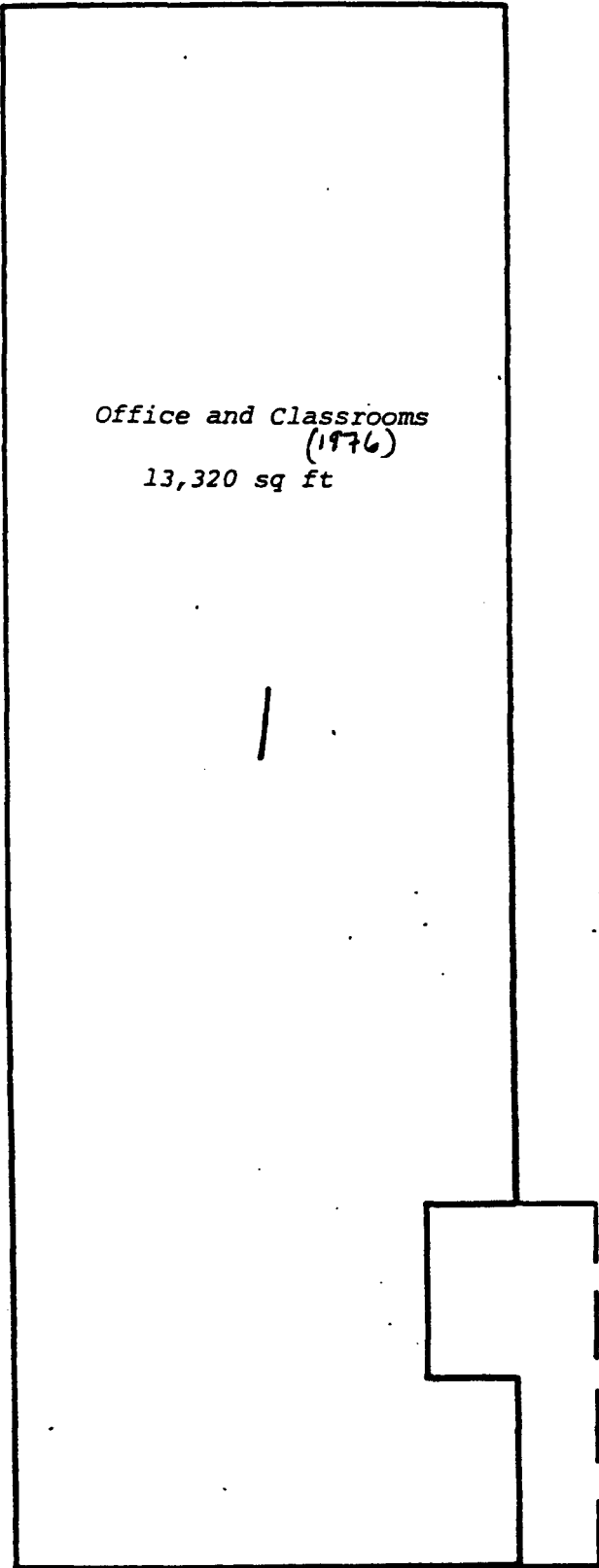
ITEM	LOCATION	DESCRIPTION	COMMENT
HW Boiler	Mid. Schl./Mech. Rm.	Natural Gas	Comment No. 1
HW Boiler	Mid. Schl./Mech. Rm.	Natural Gas	Comment No. 1
DHW System	Mid. Schl./Mech. Rm.	Natural Gas	Comment No. 2
Unit Heater	Mid. Schl./Hallways	Hot water	
Unit Heater	Mid. Schl./Hallways	Hot water	
Unit Ventilator	Mid. Schl./Library	Hot Water	Comment No. 3
Unit Ventilator	Mid. Schl./Library	Hot Water	Comment No. 3
Unit Ventilator	Mid. Schl./Science Rm.	Hot Water	Comment No. 3
Unit Ventilator	Mid. Schl./Science Rm.	Hot Water	Comment No. 3
-18 Radiators	Mid. Schl./Most Areas	Hot Water	Comment No. 4
-20 Numbers are not used.			
HW Boiler	Gym Boiler Room	Natural Gas	Comment No. 5
DHW System	Gym Boiler Room	Natural Gas	
DHW System	Gym Boiler Room	Storage Tank	
Space Heater	Gym Boiler Room	Electric	
AHU Furnace	Multi-Purpose Area	Natural Gas	Comment No. 6
AHU Furnace	Multi-Purpose Area	Natural Gas	Comment No. 6
AHU Furnace	Multi-Purpose Area	Natural Gas	Comment No. 6
AHU Furnace	Multi-Purpose Area	Natural Gas	Comment No. 6
Radiant Htrs	Multi-Purpose Area	Natural Gas	
-37 Wall Furnace	Pod Classrooms	Natural Gas	
DHW System	Pod Restrooms	Electric	
-46 Wall Furnace	Pod Classrooms	Natural Gas	
DHW System	Pod Restrooms	Electric	
-55 Wall Furnace	Pod Classrooms	Natural Gas	
DHW System	Pod Restrooms	Electric	
-59 Wall Furnace	Cafeteria	Natural Gas	
Space Heater	Kitchen	Natural Gas	
-62 Furnace	Portable Mech. Room	Natural Gas	Comment No. 7
-64 Furnace	Portable Mech. Room	Natural Gas	Comment No. 7

Comments:

1. Item no. 1 above and item no. 2 are connected together to form a lead-lag control system. The controls are in poor condition and need work. Hot water is pumped throughout the building to convectors, unit heaters, and ventilators.
2. The domestic hot water heater is trying to maintain a water temperature of 180 deg. F.
3. The ceiling hung unit ventilators in the Library and Science Rm. possibly do require filters and have not been added or changed.
4. The radiators in each room are controlled by individual thermostats.
5. Hot water is circulated to heating convectors in the locker/shower areas, stage area, and the restrooms.
6. The unit can provide 100% outside air. The units are rarely used. Filters not changed often as a result of little use.
7. The units have filters.



CHAMA VALLEY INDEPENDENT SCHOOLS
CAMPUS NO. 8
CHAMA ELEMENTARY
NOT TO SCALE
43



Office and Classrooms
(1976)
13,320 sq ft

CHAMA VALLEY INDEPENDENT SCHOOLS
CAMPUS NO. 9
CHAMA MIDDLE
NOT TO SCALE

CHAMA VALLEY INDEPENDENT SCHOOLS

CANJILON ELEMENTARY SCHOOL

CANJILON ELEMENTARY SCHOOL

Located in Canjilon, New Mexico, Canjilon Elementary School has three buildings. The Administration/Classroom Building was constructed in 1951 with concrete block walls and a pitched metal roof which is insulated and has a lowered acoustical tile ceiling inside. The exterior roof is new.

Two insulated metal buildings complete the campus, the Cafeteria which was constructed in 1965 and the Gymnasium which was constructed in 1985.

There is a 520 square foot typical mobile home that is not used. The trailer was purchased in 1968.

We at M&E Engineering, Inc. wish to thank Mr. Nonato Leyba and Ms. Virginia Lopez for their cooperation and assistance during this Energy Audit project.

SUMMARY

While the energy use is low, several O&Ms and ECMs will help reduce the energy use at Canjilon. Even though the energy use is low, energy costs at Canjilon are higher than at other District schools, so it is important to take advantage of all energy conservation opportunities. The Energy data and indicators are on the following page.

Potential Savings from O&Ms - \$260 to \$545 per year

Potential Savings from ECMs - \$1,642 per year

DATA AND INDICATORS FOR CANJILON ELEMENTARY

	84-85	85-86	86-87
DATA			
Heating Degree Days	8,742	7,555	7,690
Area (Sq. Ft.)	11,351	11,351	11,351
Students			23
Propane			8,443
Fuel Costs			\$4,410
Electric			17,600
Electric Costs			\$3,264
Fuel Cost per gallon			\$.522
Elec Cost per KWH			\$.185
INDICATORS			
Btu per sqft/HDD			9.23
KWH per sqft			1.55
Cost per sqft			\$.676
Cost per Student			\$334

DESCRIPTIONS OF O&Ms

CANJILON ELEMENTARY SCHOOL

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners and annual flushing of water heaters.

O&M Night and Weekend Setback

The thermostats in the buildings should be manually set back by the teachers, staff, or the custodians at the end of each day. The day setting should be 70 deg. F. and the night setting should be 60 deg. F. 55°?

O&M Set Back Thermostats in Unused Spaces

If a space is not being occupied, such as the mobile home trailer, and that space has a thermostat which controls the heat only to that space, set the temperature back. Close the doors to the adjacent space.

O&M Door Weather-stripping and Sweeps

Doors noted with an asterisk (*) need weather-stripping and those with ** need door sweeps.

<u>Building</u>	<u>Doors</u>
Classroom Bldg.	Two sets of double doors. * **
Cafeteria	One set of double doors. * **

O&M Caulk Window Frames

Several window frames have developed cracks between the frame and the building structure. This crack allows the loss of heated air. Install silicone caulking on the inside of the window frame to seal the cracks.

<u>Building</u>	<u>Windows</u>
Classroom Building	All cracks.

O&M Window Maintenance

Some windows on the Classroom Building are broken and need repair.

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room. All unoccupied room should have the lights "off".

O&M Lower Temperature of Hot Water

The domestic hot water in the Classroom Building is currently supplied at a temperature too high for hand washing and other non-kitchen school use. Lower the temperature settings on the tanks to no higher than 110 deg. f. This can be accomplished by setting the dial to "WARM" and after some time has elapsed, measuring the hot water temperature at a tap with a thermometer. Keep adjusting the water tank dial until the tap water comes out at about 105-110 deg.F.

RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES

DISTRICT Chama Valley Independent Schools
SCHOOL Canjilon Elementary

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report.
The savings from more than one procedure may have been combined in the results presented below.

O & M PROCEDURE		SAVINGS	RANGE
SYSTEM		LOW	HIGH
HEATING			
	REPAIR CAULKING/WEATHERSTRIPPING	\$22	\$43
	SET BACK STATS WHEN UNOCCUPIED	\$216	\$431
	SET BACK STATS IN UNUSED SPACES	\$11	\$22
COOLING			
AUXILIARY			
LIGHTING			
	TURN OFF WHEN SPACE UNOCCUPIED	\$12	\$49
HOT WATER			
KITCHEN			
TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$260	\$545
TOTAL SAVINGS RANGE, PERCENTAGE		4.5%	9.4%

DESCRIPTIONS OF ECMs

CANJILON ELEMENTARY SCHOOL

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Install nine electric clock operated night/weekend setback thermostats with locking covers and battery carry-over.

ECM Reduce and Replace Windows

The upper area of the large window sections in the Classroom Building have been painted over and offer no natural lighting. These window sections are single glazed and should be covered over with a furred out frame section to reduce heat loss. Leaving the windows in place, install rigid insulation against the glass and cover with drywall, taped and painted.

Classroom Bldg.: 18 east windows - each 7' x 4'
10 west windows - each 7' x 4'

ECM Replace Electric Domestic Hot Water System

Replace the 52 gallon, electric hot water heating unit in the Classroom building with a LP gas fired water heater.

SUMMARY OF RECOMMENDED ENERGY CONSERVATION MEASURES

School District: Chama Valley Independent Schools

School: Canjilon Elementary

Description of Measure	Utility Dollars Saved	Estimated Project Costs	Simple Payback in years
Night and Weekend Setback	\$519	\$2,462	4.7
Replace Electric Hot Water	\$110	\$1,587	14.5
Reduce Window Areas	\$1,013	\$9,852	9.7
TOTALS	\$1,642	\$13,901	8.5

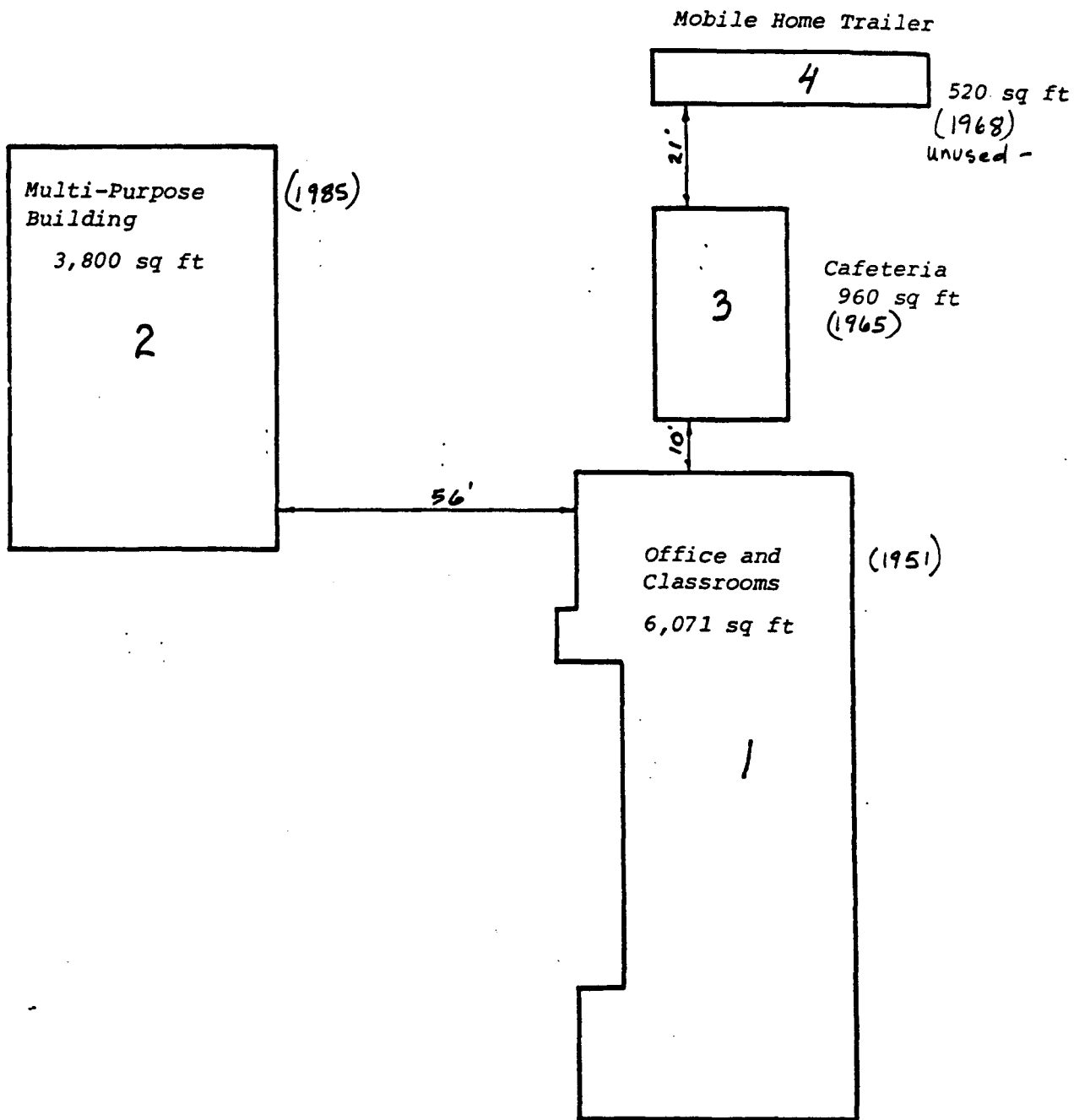
* These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.

NOTE: These project costs are for budget purposes.

MECHANICAL EQUIPMENT INVENTORY

CANJILON ELEMENTARY SCHOOL

ITEM	LOCATION	DESCRIPTION	COMMENT
DHW System	Classroom Bldg/Mech Rm	Electric, 52 gal.	Water to hot.
Wall Furnace	Classroom Bldg/Classrm	Propane	
Floor Furnace	Classroom Bldg/Office	Propane	No Tstat.
Wall Furnace	Classroom Bldg/Classrm	Propane	
Floor Furnace	Classroom Bldg/Office	Propane	No Tstat.
Space Heater	Cafeteria	Propane	
DHW System	Cafeteria/Kitchen	Propane	
Space Heater	MP Bldg./SE Corner	Propane	
Space Heater	MP Bldg./NW Corner	Propane	Unit not operational.



CHAMA VALLEY INDEPENDENT SCHOOLS
CAMPUS NO. 2
CANYON ELEMENTARY
NOT TO SCALE

1988 ENERGY STUDY
FOR
CIMARRON MUNICIPAL SCHOOLS

Prepared by

M & E ENGINEERING, INC.
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Santa Fe, New Mexico

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Sponsored by

The New Mexico Energy, Minerals and Natural Resources Department
The New Mexico Department of Education
The New Mexico School Administrators Association
The New Mexico School Boards Association
The U.S. Department of Energy

January 1988

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INTRODUCTION

Since 1978 the New Mexico Energy, Minerals and Natural Resources Department has been active in assisting schools throughout the state in developing energy conservation programs for their facilities. In continuation of its assignment to promote the conservation of energy and to reduce the rate of growth of energy demand, the Department has initiated a pilot program to specifically assist the smaller school districts. This program is being carried out with funding assistance from the U.S. Department of Energy under the Institutional Conservation Program, and there is no cost to your Districts.

The purpose of this pilot program is to develop and implement an innovative program to increase energy efficiency in the small school districts. Two steps of this program are to be performed by M & E Engineering. The first step is an energy audit to evaluate the facility and identify potential savings from both Operations and Maintenance Procedures and Energy Conservation Measure Projects. The second step is to provide training sessions at each school district to instruct both the administration and the maintenance personnel in effective methods of project implementation. The training will include instruction of hands-on skills for maintenance personnel.

Follow-up steps will be provided by the New Mexico Energy, Minerals and Natural Resources Department. They include financial advice and recommendations to implement the ECM projects, a newsletter and a networking of activities involving the conservation of energy.

This project is co-sponsored by the New Mexico Department of Education, the New Mexico School Administrators Association and the New Mexico School Boards Association.

This report is intended to help you lower your utility bills by presenting specific actions to reduce energy use. The actions that were identified include Operations and Maintenance Procedures (O&Ms) and Energy Conservation Measures (ECMs).

O&Ms are changes in the operation and maintenance of the building systems that will lead to lower utility bills. ECMs are projects that, when installed, will also lower utility bills. The complete nature and details of these projects will be presented at the training session phase of this project.

Please read this report and begin to put into practice any O&Ms and ECMs that you can. Be prepared to ask questions about those projects which are not clear and to ask any other questions about energy conservation. The trainer will answer these and any other questions at the session.

POTENTIAL SAVINGS

Recommendations for saving energy at each school are presented in the individual school sections.

Putting all of the O&Ms into regular and on-going practice and installing all the ECMs could reduce the utility bills at Cimarron Municipal Schools by approximately 11-14%.

Potential Savings from O&Ms

	Dollars per year		
Cimarron Elementary	\$ 176	to	\$ 506
Cimarron High	\$ 652	to	\$1,594
Eagle Nest Elementary	\$ 926	to	\$2,117

Totals	\$1,754	to	\$4,217

Potential Savings from ECMs

	Dollars Saved	Project Costs	Simple Payback (years)
Cimarron Elementary	\$ 394	\$2,085	5.3
Cimarron High	\$4,157	\$22,505	5.4
Eagle Nest Elementary	\$1,938	\$ 7,030	3.6

Totals	\$6,489	\$31,620	4.9

HOW DOES CIMARRON COMPARE?

Indicators are a way of comparing energy consumption of a school to a large group of schools. The effects of weather, which have a big impact on the use of fuel, are accounted for in the fuel indicator.

The indicator data base is compiled from New Mexico schools over the past 8 years. M & E Engineering, Inc. has collected this information during energy evaluations at the facilities.

For Cimarron Elementary School the utility indicator rates are:

Electric use (KWH/sf):	Medium-Low
Fuel Use (BTU/sf/HDD):	Medium-Low

For Cimarron High School the utility indicator rates are:

Electric use (KWH/sf):	Low
Fuel Use (BTU/sf/HDD):	Low for the Main High for the Shop

For Eagle Nest Elementary School the utility indicator rates are:

Electric use (KWH/sf):	Medium
Fuel Use (BTU/sf/HDD):	Medium

A "High" use indicator suggests that there is much room for improvement. It may also mean that you have some source of high energy use. A "Medium" use indicator implies that you are using an average amount of energy and that you may have already started a plan to conserve energy. A "Low" use indicator says that you are actively working to conserve energy. Other areas of this report explain procedures which will help you to further reduce energy use.

Data and Indicator Sheets for each school are located in the individual school section.

UTILITY INFORMATION

Each of the three facilities at Cimarron Municipal Schools has separate utility information.

Cimarron High has two electric meters, both are large service power with demand metering. The most recent billing from Springer Electric Cooperative shows costs at \$14.00 for demand charges and about \$0.05 per KWH. Propane delivery is from Northern New Mexico Gas Co. at \$.45 per gallon. Propane deliveries are bid annually for the district.

Cimarron Elementary has two small service electric meters with service from Springer Electric Cooperative. While costs vary between the two meters, the average cost is \$0.093 per KWH. In addition to propane, this school uses coal which is provided to the school by B.T.U Block and Concrete at \$87.50 per ton. This price is negotiated annually.

Eagle Nest Elementary has one large power service from Kit Carson Electric Cooperative who charges \$15.50 for demand and \$0.069 per KWH. Propane is \$0.46 per gallon and coal is \$90.50 per ton.

Generally, electric costs have increased over the last three years and propane costs have decreased. Coal costs have increased. Utility usage at all three school has been fairly consistent, however, Eagle Nest shows a significant reduction in fuel energy use.

During the summer months the main buildings at each school used about 10% of the total electrical usage. Considering the administrative usages during the summer, this use falls into an acceptable range. The Industrial Arts used only 4.7%.

Cimarron Municipal Schools

Cimarron Elementary School

CIMARRON ELEMENTARY SCHOOL

The Cimarron Elementary School has two buildings, the classroom building, and the cafeteria/kitchen building. The classroom building is used for primary education and is composed of classrooms and a library. The cafeteria/kitchen is used for lunch and some physical education programs.

The original Cimarron Elementary school was built in 1964 and addition was added in 1984. It is masonry construction with hot water convectors around the perimeter of the building for heat. The hot water for heating is generated by a coal fired boiler. The lighting is mainly fluorescent. The windows are single glazed. The teachers, staff, and maintenance personnel provide good energy conservation operation.

The Cafeteria/Kitchen was built in 1984. It is masonry construction. Hot water unit heaters in the cafeteria provide heat for the area and a propane fired outdoor furnace provides heat for the kitchen. The hot water for heating is generated by a coal fired boiler. Preheated domestic hot water for the kitchen is provided from solar collectors and the final heated water passes through a heat exchanger with hot water from the coal fired boiler. The lighting is fluorescent. The windows are single glazed. The kitchen staff and maintenance personnel provide good energy conservation operation.

We at M&E Engineering, Inc. wish to thank Superintendent Coker, Principal Jerry Potter, and Gilbert for their kind cooperation and assistance during this Energy Audit project.

SUMMARY

The energy use for the Elementary Building at Cimarron Elementary is low for both fuel and electricity, and medium for both at the Cafeteria Building. Data and Indicators are on the following page.

While there has been a conscious effort to conserve energy at Cimarron Elementary School, the Energy Audit team has a few suggestions for further reducing energy.

Potential Savings from D&Ms - \$173 to \$506 per year

Potential Savings from ECMs - \$394 per year

DATA AND INDICATORS FOR CIMARRON ELEMENTARY

	84-85	85-86	86-87
DATA			
Heating Degree Days	6,311	5,564	6,274
Area (Sq. Ft.)	14,358	14,358	14,358
Students			107
Fuel 1 - Propane	6,564	7,425	2,180
Fuel 2 - Coal			23.28
Fuel Costs	\$4,136	\$4,617	\$1,114
Fuel 2 Costs			\$1,979
Electric	44,040	40,796	34,160
Electric Costs	\$3,395	\$4,172	\$4,499
Fuel Cost per gallon	\$.630	\$.622	\$.511
Fuel 2 Cost per ton			\$85.01
Elec Cost per KWH	\$.077	\$.102	\$.132
INDICATORS			
Btu per sqft/HDD	6.92	8.87	8.64
KWH per sqft	3.07	2.84	2.38
Cost per sqft	\$.525	\$.612	\$.391
Cost per Student			\$52

DATA AND INDICATORS FOR CIMARRON ELEM GYM, CAFE & SHOP

	84-85	85-86	86-87
DATA			
Heating Degree Days	6,311	5,564	6,274
Area (Sq. Ft.)	12,967	12,967	12,967
Students			
Fuel 1 - Propane	9,576	4,048	3,838
Fuel 2 - Coal		19.64	24.9
Fuel Costs	\$6,033	\$2,550	\$1,957
Fuel 2 Costs		1276	\$2,116
Electric	57,420	47,380	57,420
Electric Costs	\$4,216	\$4,618	\$4,216
Fuel Cost per gallon	\$.630	\$.630	\$.510
Fuel 2 Cost per ton		\$64.97	\$84.98
Elec Cost per KWH	\$.073	\$.097	\$.073
INDICATORS			
Btu per sqft/HDD	11.17	12.03	12.00
KWH per sqft	4.43	3.65	4.43
Cost per sqft	\$.790	\$.553	\$.476
Cost per Student			

DESCRIPTIONS OF O&Ms

CIMARRON ELEMENTARY SCHOOL

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of furnace filters, and annual flushing of water heaters.

O&M Night and Weekend Setback

The thermostats in the Elementary Building and the Cafeteria/Kitchen should be manually set back by the teachers or the custodians at the end of each day. The day setting should be 70 deg. F. and the night setting should be 60 deg. F.

O&M Furnace Filter Management

When a furnace filter is very dirty, the furnace cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced at least twice during the heating season for a furnace system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the following furnaces:

<u>Building</u>	<u>Room</u>	<u>No. of Units</u>
Cafeteria/Kitchen	Kitchen	1 Furnace
Cafeteria/Kitchen	Kitchen	1 Make-up air unit.

O&M Use Vestibules to Conserve Energy

Vestibule doors have been installed at the Elementary Classroom building. These double sets of doors can be very helpful in reducing the amount of heated air that escapes during the day. We noticed that one pair of doors was propped open at each vestibule. This practice effectively negates the effect of the vestibule.

Our recommendation is to allow all doors at a vestibule to remain closed during the entire heating season.

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

O&M Insulation Blankets on Hot Water Heater Tanks

To reduce heat loss from the domestic hot water tanks, purchase and place insulation blankets around the tank at the Elementary Building.

**RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES**

DISTRICT Cimarron Municipal Schools
SCHOOL Cimarron Elementary

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report.
The savings from more than one procedure may have been combined in the results presented below.

O & M PROCEDURE		SAVINGS	RANGE
SYSTEM		LOW	HIGH
HEATING			
	CLOSE DOORS & WINDOWS WHEN HEATING	\$17	\$33
	SET BACK STATS WHEN UNOCCUPIED	\$41	\$83
	PREVENTIVE MAINTENANCE PROGRAM	\$33	\$66
COOLING			
AUXILIARY			
LIGHTING			
	TURN OFF WHEN SPACE UNOCCUPIED	\$80	\$320
HOT WATER			
	INSULATION BLANKETS ON TANKS	\$1	\$2
	PREVENTIVE MAINTENANCE PROGRAM	\$1	\$2
KITCHEN			

TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$173	\$506
TOTAL SAVINGS RANGE, PERCENTAGE		1.1%	3.2%

DESCRIPTIONS OF ECMs

CIMARRON ELEMENTARY SCHOOL

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Install electric clock operated night/weekend setback thermostats with locking covers to control the furnace for the Maintenance Shop Building and the furnace for the kitchen in the Cafetorium Building.

ECM Replace Incandescent Lights

The incandescent lighting is not nearly as energy-efficient as other kinds of lighting that are now available. There are several areas in which this incandescent lighting can be easily replaced with more efficient lighting, such as fluorescent (F), metal halide (MH) or sodium vapor (SV).

Space	No. Fixtures	Bulbs per Fixture	Watts per Bulb	Replace Type/Qty
Elem Bldg Halls	14	1	100	FL/9-40w
Elem Bldg Restrooms	7	1	100	FL/5-40

SUMMARY OF RECOMMENDED ENERGY CONSERVATION MEASURES

School District: Cimarron Municipal Schools
School: Cimarron Elementary School

Description of Measure	Utility Dollars Saved	Estimated Project Costs	Simple Payback in years
Night Setback Controls	\$148	\$547	3.7
Replace Incandescent Lights	\$246	\$1,538	6.3
TOTALS	\$394	\$2,085	5.3

*** These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.**

NOTE: These project costs are for budget purposes.

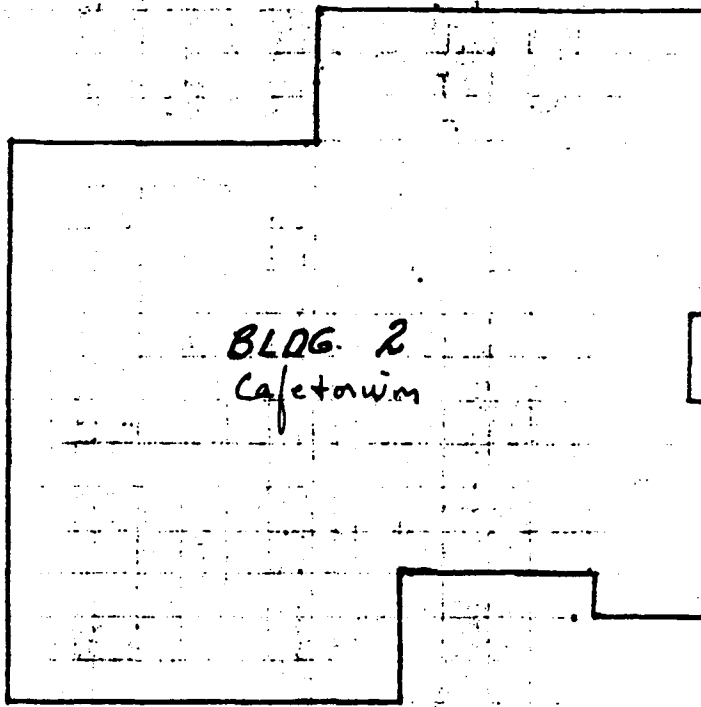
MECHANICAL EQUIPMENT INVENTORY

CIMARRON ELEMENTARY SCHOOL

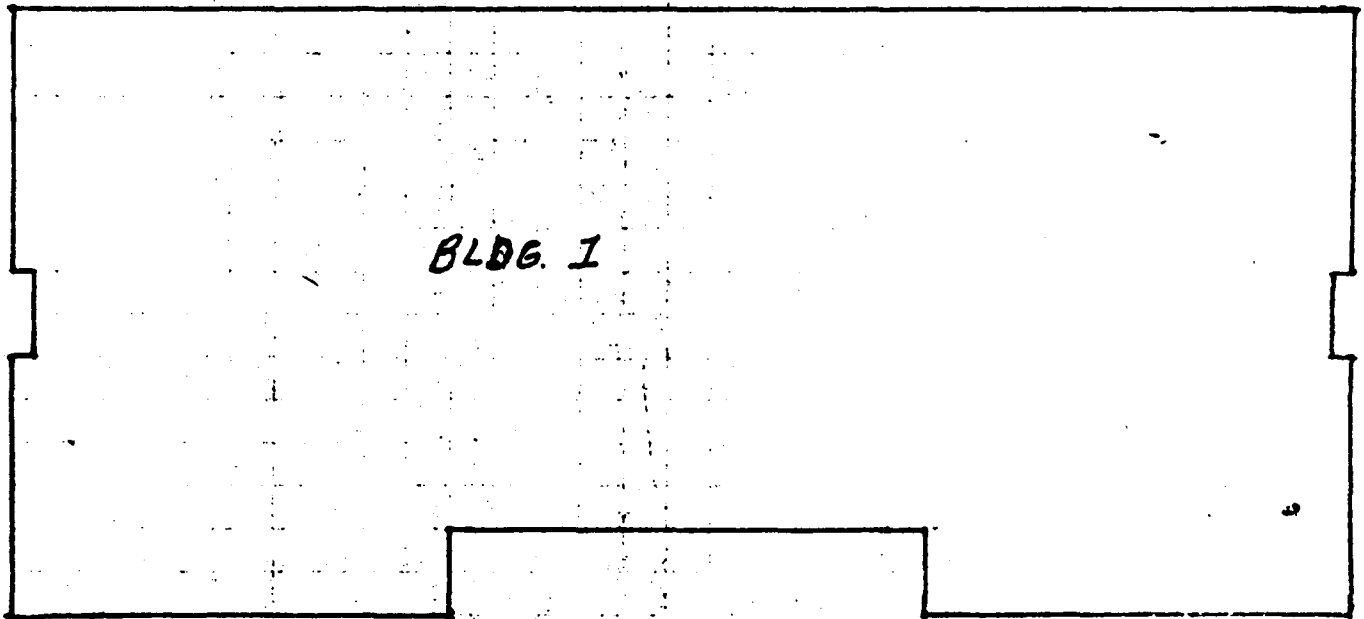
ITEM	LOCATION	DESCRIPTION	COMMENT
DHW System	Mech. Room # 1	LP Fired	Comment No. 1
Hot Water Generator	Mech. Room # 2	Coal Fired	Comment No. 2
Unit Heater	Cafeteria	Hot water	Comment No. 3
Unit Heater	Cafeteria	Hot water	Comment No. 3
Unit Heater	Cafeteria	Hot water	Comment No. 3
Unit Heater	Cafeteria	Hot water	Comment No. 3
DHW System	Kitchen	Solar/Coal HW Gen.	Comment No. 4
Kitchen Hood & Make-up Air	Kitchen		Comment No. 5
Furnace	Kitchen	LP Fired Furnace	Comment No. 6
			Comment No. 7
Hot Water Generator	Mech. Room # 3	Coal Fired	Comment No. 8
Unit Heater	Maintenance Storage	LP Fired	

Comments:

1. The domestic hot water supply temperature is 120 deg. F. This unit will be replaced soon.
2. The coal fired boiler provides hot water for heating at 180 deg. F. The unit has a coal hopper, a stoker, and a 3" auger. Two pumps provide hot water to convectors throughout the building. Each convector zone has a three-way valve that is operated with a pneumatic thermostat. A propane fired backup hot water generator exists.
3. Each unit is controlled by an individual thermostat that cycles the fan "on" and "off". The outside air intake has been blocked off.
4. Solar glycol water is circulated by a pump from the collectors to a solar hot water storage tank with a heat exchanger. This preheats or heats the water. The cold domestic water enters the solar storage tank and is then circulated to a heat exchanger to make up the required temperature difference to the kitchen. The solar storage tank and all the piping is insulated.
5. The kitchen hood is a compensating hood with a make-up air unit that provides untempered air to the hood. The exhaust fan for the hood and the make-up air fan are interconnected to a switch on the hood.
6. The filters are change once a year at best by the gas company. They should be changed more frequently.
7. The unit has outside air and return air dampers.
8. The coal fired boiler provides hot water for heating at 180 deg. F. The unit has a 3" auger. Two pumps provide hot water to convectors and unit heaters throughout the building. Each zone has a three-way valve that is operated by a pneumatic thermostat. A propane fired backup hot water generator exists.



North First Street



CIMARRON ELEMENTARY

Cimarron Municipal Schools

Cimarron High School

CIMARRON HIGH SCHOOL

Cimarron High School has two buildings, the High School Building and the Industrial Arts Building. The High School Building contains administrative offices, classrooms, library, band room and the gymnasium. The Industrial Arts Building is used for shop classes. Both buildings are in excellent condition.

A Technical Analysis Study was done for the High School Building last year and Cimarron Municipal Schools has applied for project funds from the ICP Program.

The High School Building was built in 1969 with the gymnasium added two years later. It is masonry construction with furnaces providing heat. The gymnasium roof is uninsulated. Lighting is fluorescent with banked switching in the classrooms and is mercury vapor in the gymnasium. The windows are single glazed but are a relatively small area of the wall. In general, good energy conservation operations are practiced by the occupants.

The Industrial Arts Building is an insulated metal building with furnaces for heating and a make up air system. The system uses a lot of energy. Lighting is fluorescent. It is two years old.

We at M&E Engineering, Inc. wish to thank Superintendent Coker, Principal Jack Weldon, Jerry Potter and Gilbert for their kind cooperation and assistance during this Energy Audit project.

SUMMARY

At the High School Building the energy use is low for both electricity and gas, however at the Industrial Arts Building the energy use is high for gas and low for electricity. The Data and Indicators are on the following page.

While there has been a conscious effort to conserve energy at Cimarron High School, the Energy Audit team has some suggestions for further reducing energy. A few O & Ms are recommended, but more savings will come from projects. Replacing the heating system in the Industrial Arts Building with radiant heat constitutes a large share of the savings.

Potential Savings from O&Ms - \$652 to \$1,594 per year

Potential Savings from ECMs - \$4,157 per year

DATA AND INDICATORS FOR CIMARRON HIGH SCHOOL COMPLEX

	84-85	85-86	86-87
DATA			
Heating Degree Days	6,311	5,564	6,274
Area (Sq. Ft.)	32,776	32,776	32,776
Students			152
Fuel-Propane	18,097	15,927	19,621
Fuel Costs	\$12,343	\$9,991	\$9,554
Electric	122,040	78,447	81,764
Electric Costs	\$11,149	\$15,836	\$16,380
Fuel Cost per gallon	\$.682	\$.627	\$.487
Elec Cost per KWH	\$.091	\$.202	\$.200
INDICATORS			
Btu per sqft/HDD	8.35	8.34	9.11
KWH per sqft	3.72	2.39	2.49
Cost per sqft	\$.717	\$.788	\$.791
Cost per Student			\$171

DATA AND INDICATORS FOR CIMARRON INDUSTRIAL ARTS BUILDING

	84-85	85-86	86-87
DATA			
Heating Degree Days	6,311	5,564	6,274
Area (Sq. Ft.)			6,660
Students			152
Fuel-Propane			7,658
Fuel Costs			\$3,723
Electric			8,832
Electric Costs			\$4,320
Fuel Cost per gallon			\$.486
Elec Cost per KWH			\$.489
INDICATORS			
Btu per sqft/HDD			17.50
KWH per sqft			1.33
Cost per sqft			\$1.208
Cost per Student			\$53

DESCRIPTIONS OF O&Ms CIMARRON HIGH SCHOOL

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of furnace filters, and annual flushing of water heaters.

O&M Furnace Filter Management

When a furnace filter is very dirty, the furnace cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced at least twice during the heating season for a furnace system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the following furnaces:

<u>Building</u>	<u>Room</u>	<u>No. of Furnaces</u>
High School Building	Mech. Room	9 furnaces
Industrial Arts	Mech Room	1 furnace
Industrial Arts	Mech. Room	in 2 outside air units clean the filters

District procedure has been to have the gas company perform routine maintenance on the furnaces. It was obvious that the

filters had not been changed. Either the gas company must perform this task more often or the district should begin this task.

O&M Preventive Maintenance

The district relies on the gas company for flame adjustment. This year it was either not done, or it needs to be done again.

O&M Repair/Install Weather-stripping and Adjust Door

Several doors need new weather-stripping to prevent heat loss. One door does not close properly. This allows the loss of heated air. Adjust and/or repair the door hardware so that it draws the door to a closed position against the weather-stripping. Doors noted with an asterisk (*) need adjusting.

Building	Doors
High School Building	4 single entrance doors 1 double entrance
Gymnasium	2 double entrances
Industrial Arts Building	1 entrance *

O&M Caulk Window Frames

Several window frames have developed cracks between the frame and the building structure. This crack allows the loss of heated air. Install silicone caulking on the inside of the window frame to seal the cracks.

Building	Windows
High School Building	15 windows 4.5' x 6'

O&M Use Vestibules to Conserve Energy

A vestibule door has been installed on the Industrial Arts Building. These double sets of doors can be very helpful in reducing the amount of heated air that escapes during the day. We noticed that one pair of doors was propped open. This practice effectively negates the effect of the vestibule.

Our recommendation is to insure that all doors at a vestibule remain closed during the entire heating season.

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

During the audit several rooms were unoccupied with the lights on.

O&M Turn Off the Lights When Unneeded

When there is sufficient daylighting, or when the light level need is very low, turn off the lights.

During the Audit the lights were turned off in the Lobby and the light level was such that occupants did not turn them back on.

O&M Insulation Blankets on Hot Water Heater Tanks

To reduce heat loss from the domestic hot water tanks, purchase and place insulation blankets around the 3 tanks at the High School Building and the 1 tank at the Industrial Arts Building.

**RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES**

DISTRICT Cimarron Municipal Schools
SCHOOL Cimarron High School

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report.
The savings from more than one procedure may have been combined in the results presented below.

O & M PROCEDURE		SAVINGS LOW	RANGE HIGH
SYSTEM			
HEATING	REPAIR CAULKING/WEATHERSTRIPPING	\$32	\$65
	CLOSE DOORS & WINDOWS WHEN HEATING	\$32	\$65
	PREVENTIVE MAINTENANCE PROGRAM	\$390	\$779
COOLING			
AUXILIARY			
LIGHTING	TURN OFF UNNEEDED LIGHTS	\$96	\$287
	TURN OFF WHEN SPACE UNOCCUPIED	\$96	\$383
HOT WATER	INSULATION BLANKETS ON TANKS	\$3	\$6
	PREVENTIVE MAINTENANCE PROGRAM	\$3	\$9
KITCHEN			
TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$652	\$1,594
TOTAL SAVINGS RANGE, PERCENTAGE		1.9%	4.7%

DESCRIPTIONS OF ECMs

CIMARRON HIGH SCHOOL

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Install 17 electric clock operated night/weekend setback thermostats with locking covers.

ECM Install Radiant Heat

Unit heaters located near the ceiling in shop type spaces provide ineffective heating for the space. The installation of propane fired radiant heaters will greatly improve the comfort and lower expenditure of fuel to heat the space.

The project will involve the installation of four 50,000 BTUH un-vented radiant heaters with propane supply line and setback thermostats in the Industrial Arts Shop area.

ECM Rework Controls to Make-up Air Unit

The make-up air unit serving the industrial shop area was originally designed to operate when any of the exhaust fans in the building were operating and to be "off" when the exhaust fans were "off". Somehow, the controls were damaged or alternate control work changed the operation of the unit so that the unit now operates continuously.

This project will require an electrical contractor verifying that the relays and electrical work is operating correctly. If his findings show that all electrical components are operating correctly, then, a controls contractor will be require to rework the controls to make the unit operate accordingly.

ECM Add Insulation to the Gymnasium Roof

The gymnasium is a large space with an uninsulated roof. Even though the space is kept cool, roof insulation will reduce the energy use by this space.

Add batt insulation - R-19 to the underside of the metal deck. Hold in place with wire. The roof area is 10920 and has an R-value of 6.2 ($U=0.161$).

ECM Modify Gym Heating Fans

Because the gymnasium has a high ceiling, stratification occurs. To bring the warm air down to the floor level from the roof level, the heating system should be modified to circulate this air down.

Modify the 6 heating blowers to allow continuous operation of the fans without the burners being engaged.

SUMMARY OF RECOMMENDED ENERGY CONSERVATION MEASURES

School District: Cimarron Municipal Schools
School: Cimarron High School

Description of Measure	Utility Dollars Saved	Estimated Project Costs	Simple Payback in years
Night Setback	\$902	\$4,650	5.2
Install Radiant Heat	\$955	\$5,825	6.1
Rework Controls to Make-up Air Unit	\$397	\$3,960	10.0
Add Batt Ins. to Gym Roof	\$1,011	\$6,296	6.2
Modify Gym Heating Fans	\$892	\$1,774	2.0
TOTALS	\$4,157	\$22,505	5.4

* These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.

NOTE: These project costs are for budget purposes.

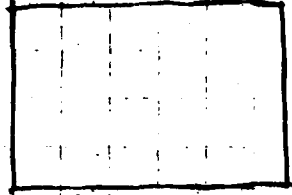
MECHANICAL EQUIPMENT INVENTORY

CIMARRON HIGH SCHOOL

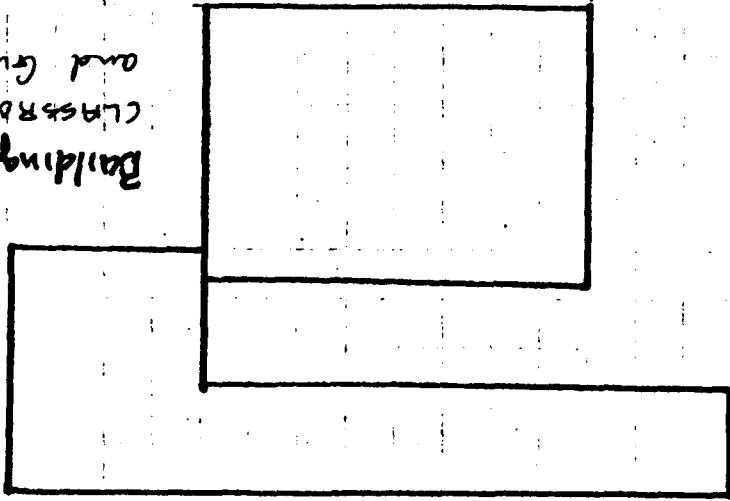
S ITEM	LOCATION	DESCRIPTION	COMMENT
Furnace	Mech. Room # 1	LP Fired Furnace	Comment No. 1
Up-flow			Comment No. 2
DHW System	Mech. Room # 1	LP Fired	Comment No. 3
Furnace	Mech. Room # 2	LP Fired Furnace	Comment No. 1
Up-flow			Comment No. 2
Furnace	Mech. Room # 3	LP Fired Furnace	Comment No. 2
Up-flow			Comment No. 5
DHW System	Mech. Room # 3	LP Fired	Comment No. 4
Furnace	Mech. Room # 4	LP Fired Furnace	Comment No. 2
Up-flow			
Furnace	Mech. Room # 5	LP Fired Furnace	Comment No. 1
Up-flow			Comment No. 2
Furnace	Mech. Room # 5	LP Fired Furnace	Comment No. 1
Up-flow			Comment No. 2
Furnace	Mech. Room # 5	LP Fired Furnace	Comment No. 1
Up-flow			Comment No. 2
DHW System	Mech. Room # 5	LP Fired	Comment No. 3
Furnace	Mech. Room # 6	LP Fired Furnace	Comment No. 1
Up-flow			
Furnace	Gym Area/ Cing. Mntd.	LP Fired Furnace	Horizontal Flow
Furnace	Gym Area/ Cing. Mntd.	LP Fired Furnace	Horizontal Flow
Furnace	Gym Area/ Cing. Mntd.	LP Fired Furnace	Horizontal Flow
Furnace	Gym Area/ Cing. Mntd.	LP Fired Furnace	Horizontal Flow
Furnace	Gym Area/ Cing. Mntd.	LP Fired Furnace	Horizontal Flow
Furnace	Gym Area/ Cing. Mntd.	LP Fired Furnace	Horizontal Flow
Furnace	Mech. Room # 7	LP Fired Furnace	Comment No. 5
DHW System	Mech. Room # 7	LP Fired	Comment No. 6
Outside Furnace	Outdoors	LP Fired Furnace	Comment No. 7
Outside Furnace	Outdoors	LP Fired Furnace	Comment No. 8
Furnace	Mech. Room # 8	LP Fired Furnace	Comment No. 1
DHW System	Mech. Room # 8	LP Fired	Comment No. 3

Comments:

1. Filters are changed only once a year at best by gas company.
2. The outside air ductwork contains motorized dampers.
3. The temperature of the water is set at 120 deg. F.
4. The domestic hot water system is currently non-operational.
5. No required filter on the unit exists.
6. This domestic hot water system serves the gym area locker rooms and showers. The system is composed of a hot water heater, an insulated storage tank, and a circulating pump. The hot water heater is set at 160 deg. F. to heat the water in the storage tank to approximately 120 deg. F.
7. This unit contains metal filters and modulating OA/RA dampers.
8. This unit contains metal filters. It utilizes 100% outside air and strictly used as a make-up air unit. However, the controls do not operate correctly and the unit operates continuously.



INDUSTRIAL ARTS



Building 1
CLASSROOMS
and GYMNASIUM

Collision

Cimarron High School
Cimarron, New Mexico
↓
N

Cimarron Municipal Schools

Eagle Nest Elementary

EAGLE NEST ELEMENTARY

Eagle Nest Elementary is located adjacent to the lake in Eagle Nest. Constructed in 1984, the building contains administrative offices, classrooms, gymnasium and kitchen. There is a small unheated storage building on the site.

The building is in excellent condition. It was designed and built to include energy conservation concepts. The walls are masonry and insulated frame with small areas of double glazing. The roof is well insulated. Passive and active solar features have been incorporated - high and low south facing glazing and a hot water preheat system. The primary heat source is a coal fired hot water boiler with a propane backup system.

We at M&E Engineering, Inc. wish to thank Principal Marla Gadry and Elias Grine for their kind cooperation and assistance during this Energy Audit project.

SUMMARY

Eagle Nest was designed to be a low energy user. While the building envelope is in excellent condition, the mechanical system controls are not operating correctly. Currently the energy use is medium for fuel and electricity. After correcting the heating system and putting the O&Ms into practice, energy use should be lower.

The Data and Indicators are on the following page.

Potential Savings from O&Ms - \$ 926 to \$2,117 per year

Potential Savings from ECMs - \$ 1,938 per year

DATA AND INDICATORS FOR EAGLE NEST ELEMENTARY

	84-85	85-86	86-87
DATA			
Heating Degree Days	8,980	7,954	9,643
Area (Sq. Ft.)	26,254	26,254	26,254
Students			143
Fuel 1 - Propane	13,782	8,459	5,785
Fuel 2 - Coal	80	84	75.4
Fuel Costs	\$9,519	\$5,186	\$2,813
Fuel 2 Costs	5760	5932	\$6,559
Electric	109,920	130,180	117,680
Electric Costs	\$10,327	\$16,899	\$15,605
Fuel Cost per gallon	\$.691	\$.613	\$.486
Fuel 2 Cost per ton	\$72.00	\$70.62	\$86.99
Elec Cost per KWH	\$.094	\$.130	\$.133
INDICATORS			
Btu per sqft/HDD	13.89	13.72	9.48
KWH per sqft	4.19	4.96	4.48
Cost per sqft	\$.756	\$.841	\$.702
Cost per Student			\$129

DESCRIPTIONS OF O&Ms

EAGLE NEST ELEMENTARY SCHOOL

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of unit ventilator filters, and annual flushing of water heaters.

Eagle Nest Elementary School will benefit both in the area of comfort and energy conservation by accomplishing the following:

1. Remove and reinstall the damper in the baseboard cabinets located throughout the school. These dampers are incorrectly installed and block the flow of heated air from circulating to the room.
2. Calibrate each and every thermostat and verify that each stat properly controls the hot water valve. Currently, more than one thermostat is not controlling the valve at all.
3. The School has seven unit ventilators. Four serve the gymnasium. These four should be serviced and the outside air dampers fixed in the minimum position. Two serve the

Library and one the special ed room. These three should be serviced to bring their operation back to specification. Currently, they are not operating correctly or efficiently.

4. The fresh air requirements for the school are met by a single make up air unit located above the corridor ceiling. As it now stands, the operation of this unit is unknown. The make up air unit should be serviced and brought back up to specification. Also, a fan only switch should be installed to allow the units operation in the spring and fall for ventilation.

O&M Night and Weekend Setback

Once the Preventive Maintenance Program has fixed the items above, a night setback program should be started. This should involve lowering the thermostats at night and over the weekend. Setback settings should be established by a trial and error procedure until they are just low enough so that the room can be brought back to comfort in the morning. The thermostats in the Library should be manually set back by the Librarian or the custodians at the end of each day. The day setting should be 70 deg. F. and the night setting should be 60 deg. F.

O&M Unit Ventilator Filter Management

When a Unit Ventilator filter is very dirty, the Unit Ventilator cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced or cleaned at least twice during the heating season for a Unit Ventilator system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the following Unit Ventilators:

Building	Room	No. of Unit Ventilators
Main	Library	2
	Gymnasium	4
	Special Ed	1

O&M Reduce Outside Air

The unit ventilators in the Building serve the corridors and other areas in the building. The unit mixes outside air and return air in a plenum before heating the air and delivering it to the spaces. There are dampers located in the outside air intake duct. Adjust these dampers to minimize the amount of outside air and open the return air dampers to wide open. This will allow the unit ventilator to heat the space more quickly and to use less energy to do it.

O&M Repair/Adjust Door Hardware and Weather-stripping

Several doors need new or additional weather-stripping. If the weather-stripping does not fill the space to the door, heated air escapes. After repairing the weather-stripping, adjust the door hardware so that they draw the door to a closed position against the weather-stripping. Doors noted with an asterisk (*) also need door sweeps.

Space	Doors
Storeroom off the gym	1 single *
Gym exit doors	1 single, 1 double
Entrance doors	3 single

In harsh climates, weather-stripping is very important. Checking the condition of the weather-stripping prior to the heating season should be part of a preventive maintenance program.

O&M Use Vestibules to Conserve Energy

Vestibule doors have been installed. These double sets of doors can be very helpful in reducing the amount of heated air that escapes during the day. If one pair of doors is propped open, it effectively negates the effect of the vestibule.

At Eagle Nest the vestibule doors were used effectively. Keep up the good practice - Remember to make sure that all doors at a vestibule remain closed during the entire heating season.

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

In the gymnasium the Mercury Vapor lights should be turned "off" when ever the space is un-occupied for more than 15 minutes.

O&M Turn Off Unneeded Lights

Learn not to turn lights "on" just because they are there! When there is enough natural daylighting or when the light level can be very low, keep the lights turned "off".

In many areas of this building, the lights are switched such that one, two or all three bulbs in the fixtures can be "on". There is a tendency to operate the lights with all three bulbs "on". Try using one or two as there is good natural daylighting.

**RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES**

DISTRICT Cimarron Municipal Schools
SCHOOL Eagle Nest Elementary

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report.
The savings from more than one procedure may have been combined in the results presented below.

SYSTEM	O & M PROCEDURE	SAVINGS LOW	RANGE HIGH
HEATING	REPAIR CAULKING/WEATHERSTRIPPING	\$45	\$90
	CLOSE DOORS & WINDOWS WHEN HEATING	\$23	\$45
	REDUCE OUTSIDE AIR TO MIN.	\$135	\$338
	SET BACK STATS WHEN UNOCCUPIED	\$338	\$677
	PREVENTIVE MAINTENANCE PROGRAM	\$271	\$541
COOLING			
AUXILIARY	SHUT OFF WHEN NOT NEEDED	\$4	\$20
	PREVENTIVE MAINTENANCE PROGRAM	\$4	\$20
LIGHTING	TURN OFF WHEN SPACE UNOCCUPIED	\$68	\$273
	PREVENTIVE MAINTENANCE PROGRAM	\$34	\$103
HOT WATER			
	PREVENTIVE MAINTENANCE PROGRAM	\$1	\$4
KITCHEN			
	PREVENTIVE MAINTENANCE PROGRAM	\$2	\$6

TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$926	\$2,117
TOTAL SAVINGS RANGE, PERCENTAGE		3.7%	8.5%

DESCRIPTIONS OF ECMs

EAGLE NEST ELEMENTARY

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Once the hot water heating system is brought back to its correct operation by the Preventive Maintenance O&M presented above, the system will be ready for night and weekend setback.

Install twenty-three electric clock operated night/weekend setback thermostats with locking covers at each convector or unit ventilator control station. The thermostats will set the space temperature back to about 60 degrees when the building is unoccupied. The coal boiler will still operate, the hot water will still circulate, but less hot water will run through the various convectors.

SUMMARY OF RECOMMENDED ENERGY CONSERVATION MEASURES

School District: Cimarron Municipal Schools

School: Eagle Nest Elementary

Description of Measure	Utility Dollars Saved	Estimated Project Costs	Simple Payback in years
Night Setback Controls	\$1,938	\$7,030	3.6

TOTALS	\$1,938	\$7,030	3.6

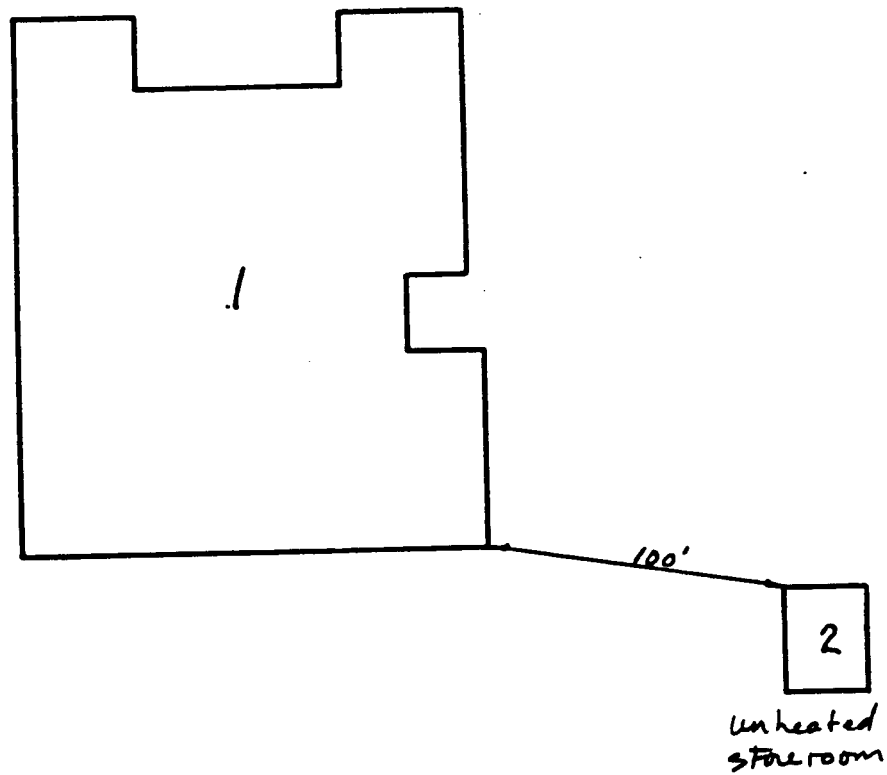
*** These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.**

NOTE: These project costs are for budget purposes.

MECHANICAL EQUIPMENT INVENTORY

EAGLE NEST ELEMENTARY

ITEM	LOCATION	DESCRIPTION	COMMENT
Boiler	Mech Room	Coal Fired	Setback training required
Boiler	Mech Room	Propane Fired	Backup system
Pump	Mech Room	circulating	Alternated weekly
Pump	Mech Room	circulating	
Solar DHW	Room near boys RR	tank, collectors, pump controller, valve	
Unit Ventilator - Gymnasium			one broken
Unit Ventilator - Gymnasium			
Unit Ventilator - Gymnasium			
Unit Ventilator - Gymnasium			
Elec DHW	Kitchen	15 KW	for dishmachine
Kitchen Hood	Kitchen	compensating hood	complies with code
Unit Ventilator - ceiling		serves Special Ed	needs setback stat
			service damper controls
Unit Ventilator - ceiling		serves library	needs setback stat
			service damper controls
Unit Ventilator - ceiling		serves Library	needs setback stat
			service damper controls
Make up Air Unit	ceiling	fresh air for entire bldg	service and check out for proper operation



CIMARRON PUBLIC SCHOOLS
CAMPUS NO. 2
EAGLE NEST
NOT TO SCALE

1988 ENERGY STUDY

FOR

CLAYTON PUBLIC SCHOOLS

Prepared by

M & E ENGINEERING, INC.
1210 Luisa St. Suite #12
Santa Fe, New Mexico

505-983-2389

Sponsored by

The New Mexico Energy, Minerals and Natural Resources Department
The New Mexico Department of Education
The New Mexico School Administrators Association
The New Mexico School Boards Association
The U.S. Department of Energy

February 1988

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INTRODUCTION

Since 1978 the New Mexico Energy, Minerals and Natural Resources Department has been active in assisting schools throughout the state in developing energy conservation programs for their facilities. In continuation of its assignment to promote the conservation of energy and to reduce the rate of growth of energy demand, the Department has initiated a pilot program to specifically assist the smaller school districts. This program is being carried out with funding assistance from the U.S. Department of Energy under the Institutional Conservation Program, and there is no cost to your Districts.

The purpose of this pilot program is to develop and implement an innovative program to increase energy efficiency in the small school districts. Two steps of this program are to be performed by M & E Engineering. The first step is an energy audit to evaluate the facility and identify potential savings from both Operations and Maintenance Procedures and Energy Conservation Measure Projects. The second step is to provide training sessions at each school district to instruct both the administration and the maintenance personnel in effective methods of project implementation. The training will include instruction of hands-on skills for maintenance personnel.

Follow-up steps will be provided by the New Mexico Energy, Minerals and Natural Resources Department. They include financial advice and recommendations to implement the ECM projects, a newsletter and a networking of activities involving the conservation of energy.

This project is co-sponsored by the New Mexico Department of Education, the New Mexico School Administrators Association and the New Mexico School Boards Association.

This report is intended to help you lower your utility bills by presenting specific actions to reduce energy use. The actions that were identified include Operations and Maintenance Procedures (O&Ms) and Energy Conservation Measures (ECMs).

O&Ms are changes in the operation and maintenance of the building systems that will lead to lower utility bills. ECMs are projects that, when installed, will also lower utility bills. The complete nature and details of these projects will be presented at the training session phase of this project.

Please read this report and begin to put into practice any O&Ms and ECMs that you can. Be prepared to ask questions about those projects which are not clear and to ask any other questions about energy conservation. The trainer will answer these and any other questions at the session.

POTENTIAL SAVINGS

Recommendations for saving energy at each school are presented in the individual school section.

Putting all the O&Ms into regular and on-going practice and installing all the ECMs could reduce the utility bills at Clayton Public Schools by approximately 21-24%.

Potential Savings from O&Ms

	Dollars per year		
Amistad Elementary	\$ 202	to	\$ 455
Alvis Elementary	\$ 212	to	\$ 499
Kiser Elementary	\$ 123	to	\$ 270
Clayton Junior High	\$ 245	to	\$ 612
Clayton High School	\$1,625	to	\$3,468

Totals	\$2,407	to	\$5,304

Potential Savings from ECMs

	Dollars Saved	Project Costs	Simple Payback (years)
Amistad Elementary **			
Alvis Elementary	\$2,962	\$16,038	5.4
Kiser Elementary	\$2,859	\$25,654	9.0
Clayton Junior High	\$2,177	\$34,371	15.8
Clayton High School	\$8,969	\$82,596	9.2

Totals	\$16,967	\$158,659	9.4

**See the ECM Description section of Amistad Elementary

HOW DO CLAYTON SCHOOLS COMPARE?

Indicators are a way of comparing energy consumption of a school to a large group of schools. The effects of weather, which have a big impact on the use of fuel, are accounted for in the fuel indicator.

The indicator data base is compiled from New Mexico schools over the past 8 years. M & E Engineering, Inc. has collected this information during energy evaluations at the facilities.

Utility information was available for each school at Clayton. The utility indicator rates for each school are listed below.

Amistad Elementary

Electric use (KWH/sf): Low
Fuel Use (BTU/sf/HDD): Low

Alvis Elementary

Electric use (KWH/sf): Medium-Low
Fuel Use (BTU/sf/HDD): Medium

Kiser Elementary

Electric use (KWH/sf): Low
Fuel Use (BTU/sf/HDD): High

Clayton Junior High

Electric use (KWH/sf): Medium-Low
Fuel Use (BTU/sf/HDD): Low

Clayton High School

Electric use (KWH/sf): Low
Fuel Use (BTU/sf/HDD): Medium

A "High" use indicator suggests that there is much room for improvement. It may also mean that you have some source of high energy use. A "Medium" use indicator implies that you are using an average amount of energy and that you may have already started a plan to conserve energy. A "Low" use indicator says that you are actively working to conserve energy. Other areas of this report explain procedures which will help you to further reduce energy use.

The Data and Indicator Sheets for each school are in the individual school sections.

UTILITY INFORMATION

Clayton Public Schools has electric and gas meters at each of their 5 campuses. Even though 2 meters are set up for demand metering, all electric billings are for small power service. Public Service Company of New Mexico (PNM) provides service for all Clayton schools at an average rate of \$0.095. Natural gas rates are \$0.29 per CCF. Petrolane provides LP to Amistad Elementary at \$0.528 with escalation depending on LP costs. The most recent billing was \$0.578 per gallon. This contract is bid annually.

All utility rate billings are appropriate. The unit energy costs for electricity and natural gas are on the low side of what is typical at other school districts in the area. LP is on the high side.

Clayton Public Schools
Amistad Elementary School

AMISTAD ELEMENTARY SCHOOL

While part of the Clayton Public Schools, Amistad Elementary is located 45 miles south in the town of Amistad. Previously it was a small campus which included a school building, residences and a shop building, but now the residences are rented and maintained by a business and the shop has been purchased for the fire station. Currently the district maintains the school building which contains classrooms, a kitchen and cafeteria room, and a gymnasium. The gymnasium is used frequently by the community. Portions of the building are no longer used.

When there is unused space in a building, there is a tendency for occupants to "take it over". This practice should be discouraged as there are very few students at Amistad. Instead, only the spaces necessary should be heated. Generally the practices are good at Amistad, except for the room which is being used for Music. Use of this room should be discontinued and the activity should be held in another space.

We at M&E Engineering, Inc. wish to thank Principal Florence Hall for her kind cooperation and assistance during this Energy Audit project.

SUMMARY

The energy use at Amistad is low for both propane and electric partially because the area actually used by the school is less than the area of the building. However, in general good energy conservation is practiced.

Data and Indicators for Amistad are on the following page.

Depending on the long range plans for Amistad, there are potential energy savings.

Potential Savings from O&Ms - \$202 to \$455 per year

For potential savings from ECMs, see the ECM Description Section.

DATA AND INDICATORS FOR AMISTAD ELEMENTARY

	84-85	85-86	86-87

DATA			
Heating Degree Days	4,739	4,284	4,832
Area (Sq. Ft.)	21,414	21,414	21,414
Students			36
Fuel-Propane	4,230	5,010	7,496
Fuel Costs	\$2,866	\$3,340	\$4,504
Fuel-Diesel	1,800		
Fuel 2 Costs	\$1,672		
Electric	40,801	37,993	35,512
Electric Costs	\$4,277	\$4,761	\$4,639
Propane Cost per gallon	\$.678	\$.667	\$.601
Diesel Cost per gallon	\$.929		
Elec Cost per KWH	\$.105	\$.125	\$.131
INDICATORS			
Btu per sqft/HDD	6.44	5.21	6.92
KWH per sqft	1.91	1.77	1.66
Cost per sqft	\$.334	\$.378	\$.427
Cost per Student			\$254

DESCRIPTIONS OF O&Ms

AMISTAD ELEMENTARY SCHOOL

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of furnace filters, and annual flushing of water heaters.

O&M Furnace Filter Management

When a furnace filter is very dirty, the furnace cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced at least twice during the heating season for a furnace system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the two furnaces.

O&M Repair/Adjust Door Hardware and Weather-stripping

Several doors do not close properly. This allows the loss of heated air. Adjust and/or repair the door hardware so that they draw the door to a closed position against the weather-stripping. Doors noted with an asterisk (*) also need weather-stripping and those with ** need door sweeps.

Building

Doors

entrance doors
east end doors *
gymnasium doors *, **

O&M Caulk Window Frames

Several window frames have developed cracks between the frame and the building structure. This crack allows the loss of heated air. Install silicone caulking on the inside of the window frame to seal the cracks.

O&M Use Vestibules to Conserve Energy

Vestibule doors have been installed. These double sets of doors can be very helpful in reducing the amount of heated air that escapes during the day. If one pair of doors is propped open, it effectively negates the effect of the vestibule.

Our recommendation is to make sure that all doors at a vestibule remain closed during the entire heating season.

O&M Seal Building Cracks

Cracks in the building exterior allow heated air to escape. These cracks should be filled with the appropriate sealant to minimize the leakage of heated air.

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

**RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES**

DISTRICT Clayton Public Schools
SCHOOL Amistad Elementary

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report.
The savings from more than one procedure may have been combined in the results presented below.

O & M PROCEDURE		SAVINGS	RANGE
SYSTEM		LOW	HIGH
HEATING	REPAIR CAULKING/WEATHERSTRIPPING	\$22	\$43
	CLOSE DOORS & WINDOWS WHEN HEATING	\$11	\$22
	PREVENTIVE MAINTENANCE PROGRAM	\$130	\$259
COOLING			
AUXILIARY			
LIGHTING	TURN OFF WHEN SPACE UNOCCUPIED	\$21	\$82
	PREVENTIVE MAINTENANCE PROGRAM	\$10	\$31
HOT WATER	LOWER SUPPLY TO 110 DEG. F.	\$6	\$10
	PREVENTIVE MAINTENANCE PROGRAM	\$3	\$8
KITCHEN			
TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$202	\$455
TOTAL SAVINGS RANGE, PERCENTAGE		2.2%	5.0%

DESCRIPTIONS OF ECMs

AMISTAD ELEMENTARY SCHOOL

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

Because the building at Amistad Elementary is partially unused and the portions that are used are turned off when ever possible, project paybacks are very long. This is not to imply that energy savings are not possible, or necessary, but that projects for this building should be part of long range planning for this school community. The building is in need of repairs that go beyond the reason of energy conservation and in many cases, the repairs would need to be done be before the energy conservation projects.

If the district intends to maintain and repair the building for the use of the school and the community and increase its use, they should have a technical assistance study done with the intent of applying for project funds through the Institutional Conservation Program. These projects should be coordinated with other work on the building.

A list of potential projects follows:

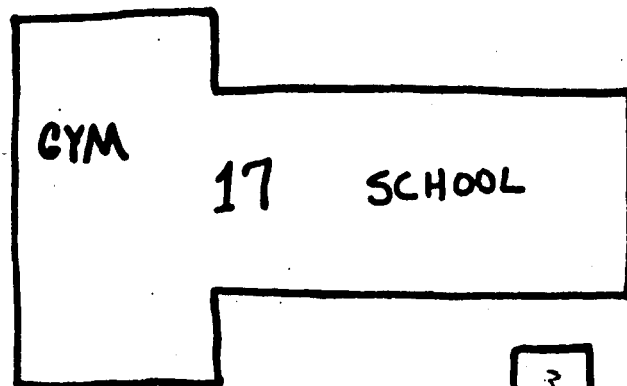
- ECM Install Night and Weekend Setback Thermostats
 - ECM Replace Electric Domestic Hot Water in the Gym
 - ECM Insulate Domestic Hot Water Piping in the Gym
 - ECM Lower and Insulate Ceiling
 - ECM Add Cellulose Fiber Spray on Insulation to the high interior walls of the Gym
 - ECM Reduce and Replace Windows in the gym
 - ECM Add Storm Windows to other windows throughout the building
 - ECM Replace Incandescent Lights in the gym and volunteer room
-

MECHANICAL EQUIPMENT INVENTORY

AMISTAD ELEMENTARY SCHOOL

G ITEM	LOCATION	DESCRIPTION	COMMENT
Unit Heater	ceiling	serves classroom	Needs setback stat
Unit Heater	ceiling	serves cafeteria	Needs setback stat
Furnace	closet	serves 2 classrooms	change filter
			Needs setback stat
Wall Furnace		serves office	Needs setback stat
Wall Furnace		serves office	
Room Furnace		serves volunteer room	
Unit Heater	ceiling	serves gym	Needs setback stat
Unit Heater	ceiling	serves gym	Needs setback stat
Furnace		serves locker	Needs setback stat
			Change filter
Hot Water Sys	closet	30 gallon electric	Insulate pipe
Hot Water Sys	closet	30 gallon electric	45' of 1 1/4" & 20" of 3/4"

TE: Unless otherwise noted, all units are LP fired.



3
dwelling - rented

Dwelling
2

7

- rented

2A

Vocational Agriculture
18

- sold

Dwelling
5

- rented

Dwelling
6

Clayton Public Schools

Alvis Elementary

ALVIS ELEMENTARY SCHOOL

Alvis Elementary was constructed in 1965. It is a single building containing classrooms and offices around the perimeter with a multipurpose space in the center and a library at one end. Three portables complete the campus. There are 309 students in grades K-4.

The building is masonry construction with a small amount of single glazed windows. There are a few corridor skylights which are double domed and tunneled. The roof above the multipurpose room is uninsulated, but the ceiling above the corridors and classrooms has insulation. Furnaces heat the classrooms in groups of 2 and 3, and two furnaces provide heat to the multipurpose space. The corridors are not heated. The hot water heaters are gas fired. While the classroom lighting is fluorescent, the multipurpose room, the corridors and restrooms have incandescent.

M & E Engineering thanks Principal Toni Dabovich, her staff and Andrew Garcia for their patience and cooperation during the Energy Audit study. Special thanks to the Special Education staff who shared their space with us for two days.

SUMMARY

At Alvis the energy use for gas is medium and for electric is low in the main building and medium in the portables. Very good energy conservation practices were observed.

The Data and Indicators are on the following page.

While there are some potential savings from O & Ms, most of the potential savings are from installed projects.

Potential Savings from O&Ms - \$212 to \$499 per year

Potential Savings from ECMs - \$2,962 per year

DATA AND INDICATORS FOR ALVIS ELEMENTARY SCHOOL

	84-85	85-86	86-87
DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	26,220	26,220	26,220
Students			311
Fuel-Natural Gas	18,383	15,759	16,588
Fuel Costs	\$7,864	\$5,948	\$5,251
Electric	50,928	59,652	52,708
Electric Costs	\$4,287	\$4,991	\$5,274
Fuel Cost per CCF	\$.428	\$.377	\$.317
Elec Cost per KWH	\$.084	\$.084	\$.100
INDICATORS			
Btu per sqft/HDD	12.30	11.49	11.18
KWH per sqft	1.94	2.28	2.01
Cost per sqft	\$.463	\$.417	\$.401
Cost per Student			\$34

DATA AND INDICATORS FOR ALVIS ELEMENTARY - MODULARS

	84-85	85-86	86-87
DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	5,040	5,040	5,040
Students			311
Fuel-Natural Gas	3,811	3,668	4,229
Fuel Costs	\$1,725	\$1,478	\$1,378
Electric	12,521	13,840	15,179
Electric Costs	\$1,027	\$1,166	\$1,339
Fuel Cost per CCF	\$.453	\$.403	\$.326
Elec Cost per KWH	\$.082	\$.084	\$.088
INDICATORS			
Btu per sqft/HDD	13.27	13.92	14.83
KWH per sqft	2.48	2.75	3.01
Cost per sqft	\$.546	\$.525	\$.539
Cost per Student			\$9

DESCRIPTIONS OF O&Ms

ALVIS ELEMENTARY SCHOOL

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of furnace filters, and annual flushing of water heaters.

O&M Furnace Filter Management

When a furnace filter is very dirty, the furnace cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced at least twice during the heating season for a furnace system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the following furnaces:

Building	Room	No. of Furnaces
Main	Mech. Loft 1	4
	Mech. Loft 2	4
	Portables	6

O&M Repair/Adjust Door Hardware and Weather-stripping

Several doors do not seal properly against outside air. This allows the loss of heated air. Adjust and/or repair the door hardware so that they draw the door to a closed position against the weather-stripping. Repair or be prepared to replace weather-stripping. Doors noted with an asterisk (*) also need weather-stripping and those with ** need door sweeps.

Building	Doors
Main	Front entry*
Portables	Entry doors*

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

O&M Insulation Blankets on Water Heater Tank

To reduce the heat loss from the domestic hot water heater tank, purchase and wrap insulation blankets on the tank.

Insulation blankets should be purchased for the two large domestic hot water system located in the lofts. These blankets should be installed to minimize the use of gas to heat water.

O&M Lower Temperature of Hot Water

The domestic hot water is currently supplied at a temperature too high for hand washing and other non-kitchen school use. Lower the temperature settings on the tanks to no higher than 110 deg. f. This can be accomplished by setting the dial to "WARM" and after some time has elapsed, measuring the hot water temperature at a tap with a thermometer. Keep adjusting the water tank dial until the tap water comes out at about 105-110 deg. F.

**RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES**

DISTRICT Clayton Public Schools
SCHOOL Alvis Elementary

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report.
The savings from more than one procedure may have been combined in the results presented below.

SYSTEM	O & M PROCEDURE	SAVINGS	RANGE
		LOW	HIGH
HEATING	REPAIR CAULKING/WEATHERSTRIPPING	\$16	\$32
	PREVENTIVE MAINTENANCE PROGRAM	\$130	\$260
COOLING			
AUXILIARY	PREVENTIVE MAINTENANCE PROGRAM	\$1	\$6
LIGHTING	TURN OFF WHEN SPACE UNOCCUPIED	\$30	\$119
	PREVENTIVE MAINTENANCE PROGRAM	\$15	\$45
HOT WATER	LOWER SUPPLY TO 110 DEG. F.	\$12	\$19
	INSULATION BLANKETS ON TANKS	\$5	\$9
	PREVENTIVE MAINTENANCE PROGRAM	\$3	\$9
KITCHEN			
TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$212	\$499
TOTAL SAVINGS RANGE, PERCENTAGE		1.6%	3.8%

DESCRIPTIONS OF ECMs

ALVIS ELEMENTARY

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Install electric clock operated night/weekend setback thermostats with locking covers. Please note that the staff of Alvis Elementary are doing a good job of doing this manually, but setback thermostats will help insure that this step is not overlooked.

There are a total of fourteen furnaces with thermostats that would benefit from installation of setback thermostats.

ECM Reduce Window Areas

Large windows or windows in very poor condition are large energy wasters. The drafts and infiltration associated with these windows make building occupants feel uncomfortable. This project is to reduce the size of the windows by blocking out a portion of the windows. Leaving the windows in place, install rigid insulation against the glass and cover with drywall, taped and painted.

This project should be considered for the high windows, or at least some of the windows located in the high walls of the Multipurpose Room.

ECM Seal Gravity Vents

Large amounts of heated air escape through gravity ventilators. These ventilators can be useful when a space needs additional ventilation, but if there is no problem with ventilation, gravity ventilators can be sealed shut.

The Multipurpose Room has 16 wall-mounted gravity ventilators which cause tremendous losses of heated air. This project calls for the installation of interior covers to close these openings, at least two per wall should be removable to allow cross-ventilation in the warmer periods.

ECM Replace Incandescent Lights

The original incandescent lighting is not nearly as energy-efficient as other kinds of lighting that are now available. There are several areas in which this incandescent lighting can be easily replaced with more efficient lighting, such as fluorescent (F), metal halide (MH) or sodium vapor (SV).

Space	No. Fixtures	Bulbs per Fixture	Watts per Bulb	Replace Type/Qty
Restrooms	12	2	100	FL/4
Corridors	52	2	100	FL/16
Multipurpose	12	1	500	HID/6

NOT RECOMMENDED

ECM Spray Insulate High Walls in Multipurpose Room

Heat is lost through the top portion of the high walls in the Multipurpose Room because the wall has a low R-value. Even though only an average of 4' rises above the adjacent roof, an additional 4' of the wall is against the unheated space above the insulated ceiling.

The ceiling is not insulated in this space and it would also benefit from insulation.

This project is to add 2" of spray on cellulose fiber insulation to the underside of the ceiling and to the top portion of the walls beginning 10' above the floor. This project should be coordinated with the project to reduce windows.

This project is not recommended as the payback exceeds 20 years.

SUMMARY OF RECOMMENDED ENERGY CONSERVATION MEASURES

School District: CLAYTON MUNICIPAL SCHOOLS
 School: ALVIS ELEMENTARY

Description of Measure	Utility Dollars Saved	Estimated Project Costs	Simple Payback in years
Night and Weekend Setback	\$1,039	\$3,829	3.7
Dampers in Gravity Vents	\$55	\$419	7.6
Replace Incandescent Lights	\$1,539	\$8,361	5.4
Reduce Window Areas	\$329	\$3,430	10.4
TOTALS	\$2,962	\$16,038	5.4

* These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.

NOTE: These project costs are for budget purposes.

MECHANICAL EQUIPMENT INVENTORY

ALVIS ELEMENTARY SCHOOL

S ITEM	LOCATION	DESCRIPTION	COMMENT
<u>in Building</u>			
Horiz Furnace	Mech Loft 1		Change furnace filter
Horiz Furnace	Mech Loft 1		Change furnace filter
Horiz Furnace	Mech Loft 1		Change furnace filter
Horiz Furnace	Mech Loft 1		Change furnace filter
Hot Water Sys	Mech Loft 1		Lower temperature
Air Washer		Alton	Beign relocated to CHS
Air Washer		Alton	Being relocated to CHS
Horiz Furnace	Mech Loft 2	serves 3 classrooms	Change furnace filter
Horiz Furnace	Mech Loft 2	serves 2 classrooms	Change furnace filter
Horiz Furnace	Mech Loft 2	serves multipurpose room	Change furnace filter
Horiz Furnace	Mech Loft 2	serves 2 classrooms	Change furnace filter
Hot Water Sys	Mech Loft 2		
<u>portables</u>			
Furnace	closet	serves 1/2 portable	Change furnace filter
Furnace	closet	serves 1/2 portable	Change furnace filter
Hot Water Sys	bathroom	electric	Lower temperature
Evap Cooler	window	serves 1/2 portable	Winterized
Evap Cooler	window	serves 1/2 portable	Winterized
Furnace	closet	serves 1/2 portable	Change furnace filter
Furnace	closet	serves 1/2 portable	Change furnace filter
Hot Water Sys	bathroom	electric	Lower temperature
Evap Cooler	window	serves 1/2 portable	Winterized
Evap Cooler	window	serves 1/2 portable	Needs to be covered
Furnace	closet	serves 1/2 portable	Change furnace filter
Furnace	closet	serves 1/2 portable	Change furnace filter
Hot Water Sys	bathroom	electric	Lower temperature
Evap Cooler	window	serves 1/2 portable	Needs to be covered
Evap Cooler	window	serves 1/2 portable	Needs to be covered

TE: All furnace thermostats need to be changed to night and weekend setback thermostats.

Clayton Public Schools
Kiser Elementary School

KISER ELEMENTARY SCHOOL

Kiser Elementary School is a school building serving 5th and 6th graders. Constructed in the 1920's, the original portion of the school contains 4 classrooms and the offices. During the WPA era, two areas were added - a multipurpose room and another block of 4 rooms. The entire building is masonry and stone construction with the original wood, single glazed windows. While the ceilings have been lowered about 8", the ceilings are still high. Lighting has been modernized to fluorescent throughout the building. Except for the multipurpose room which has unit heaters, the building is heated by a steam boiler/radiator system. Two portable complete the campus.

We at M&E Engineering, Inc. wish to thank Principal James Curry and Andrew Garcia for their kind cooperation and assistance during this Energy Audit project.

SUMMARY

The energy use at this school is high in gas and low in electricity. The building is in good condition, so the high gas use is due to the building construction and the heating system.

The Data and Indicators are on the following page.

There has been discussion in the district concerning the continued use of this school. If the long term decision is to continue using the building, there is a excellent potential for reducing energy use through the installation of energy conservation projects. An appropriate source of matching funding for these projects would be a grant through the Institutional Conservation Program.

Savings Potential from D&Ms - \$123 to \$270 per year

Savings Potential from ECMs - \$2,859 per year

DATA AND INDICATORS FOR KISER ELEMENTARY SCHOOL

	84-85	85-86	86-87

DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	13,998	13,998	13,998
Students			103
Fuel-Natural Gas	12,493	10,454	12,099
Fuel Costs	\$5,401	\$3,995	\$3,871
Electric	26,739	26,417	25,578
Electric Costs	\$2,436	\$2,445	\$2,510
Fuel Cost per CCF	\$.432	\$.382	\$.320
Elec Cost per KWH	\$.091	\$.093	\$.098
INDICATORS			
Btu per sqft/HDD	15.66	14.28	15.27
KWH per sqft	1.91	1.89	1.83
Cost per sqft	\$.560	\$.460	\$.456
Cost per Student			\$62

DESCRIPTIONS OF O&Ms

KISER ELEMENTARY SCHOOL

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of furnace filters, and annual flushing of water heaters.

O&M Furnace Filter Management

When a furnace filter is very dirty, the furnace cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced at least twice during the heating season for a furnace system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the following furnaces:

<u>Building</u>	<u>Room</u>	<u>No. of Furnaces</u>
Portables	closet	4 furnaces total

O&M Weather-strip Doors and Repair/Adjust Door Hardware

All doors need weather-stripping to prevent the loss of heated air. Then adjust and/or repair the door hardware so that it draws the door to a closed position against the weather-stripping. Doors noted with an asterisk (*) also need door sweeps.

<u>Building</u>	<u>Doors</u>
Main Building	2 pairs of entrance doors * 3 single doors *
Portables	4 single doors

O&M Caulk Window Frames

Several window frames have developed cracks between the frame and the building structure. This crack allows the loss of heated air. Install silicone caulking on the inside of the window frame to seal the cracks.

<u>Building</u>	<u>Windows</u>
Main Building	most windows
Multipurpose room	all windows

O&M Use Vestibules to Conserve Energy

Vestibule doors have been installed. These double sets of doors can be very helpful in reducing the amount of heated air that escapes during the day. If one pair of doors is propped open, it effectively negates the effect of the vestibule.

The two sets of vestibule doors at Kiser were propped open. Our recommendation is to make sure that all doors at a vestibule remain closed during the entire heating season.

O&M Seal Building Cracks

Cracks in the building exterior allow heated air to escape. These cracks should be filled with the appropriate sealant to minimize the leakage of heated air. There are several cracks in the Multipurpose room.

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

Generally, the practices seen at Kiser were excellent. Keep up the good job. Reminders always help.

O&M Insulation Blankets on Water Heater Tank

To reduce the heat loss from the domestic hot water heater tank, purchase and wrap an insulation blanket on the tank in the basement.

O&M Lower Temperature of Hot Water

The domestic hot water is currently supplied at a temperature too high for hand washing and other non-kitchen school use. Lower the temperature settings on the tanks to no higher than 110 deg. f. This can be accomplished by setting the dial to "WARM" and after some time has elapsed, measuring the hot water temperature at a tap with a thermometer. Keep adjusting the water tank dial until the tap water comes out at about 105-110 deg.F.

**RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES**

DISTRICT Clayton Public Schools
SCHOOL Kiser Elementary

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report. The savings from more than one procedure may have been combined in the results presented below.

O & M PROCEDURE		SAVINGS	RANGE
SYSTEM		LOW	HIGH
HEATING	REPAIR CAULKING/WEATHERSTRIPPING	\$29	\$57
	PREVENTIVE MAINTENANCE PROGRAM	\$76	\$153
COOLING			
AUXILIARY	PREVENTIVE MAINTENANCE PROGRAM	\$0	\$1
LIGHTING	TURN OFF WHEN SPACE UNOCCUPIED	\$12	\$48
HOT WATER	LOWER SUPPLY TO 110 DEG. F.	\$3	\$5
	INSULATION BLANKETS ON TANKS	\$1	\$2
	PREVENTIVE MAINTENANCE PROGRAM	\$1	\$4
KITCHEN			
TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$123	\$270
TOTAL SAVINGS RANGE, PERCENTAGE		1.9%	4.2%

DESCRIPTIONS OF ECMs

KISER ELEMENTARY

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Currently this building must be heated twenty-four hours per day because there is no way to reduce the flow of steam to the building. Nigh/weekend setback could be accomplished by the installation of a motor operated steam valve located in the main steam supply adjacent to the boiler. This valve would receive a signal to open or close in accordance with a new time clock. The flow of steam would be allowed during the day but reduced to a minimum during the unoccupied periods. AS single freeze protection thermostat would be installed in the building to override the timeclock and provide heat to the building in the event the temperature dropped below a pre-set minimum.

Four clock-operated night setback thermostats should be installed in the portables.

ECM Insulate Steam and Condensate Piping

Steam and condensate piping loose a lot of heat to the surroundings if the pipe is not insulated. The loss of heat causes the more steam to be condensates before it reaches the radiators and the boiler to run more. This can be resolved by the installation of insulation to the sections of un-insulated pipe. This can be done by the maintenance staff, if simple, or by an insulation contractor, if complex or large.

Most of the steam piping in the crawl space needs to be insulated while all of the condensate piping needs insulation. This project calls for the installation of pipe insulation on all accessible sections of the pipe.

Pipe size, in.	Length, ft.
1	225
1-1/2	225
2	200
3	150
4	160
6	80

ECM Insulate Domestic Hot Water Piping

When hot water piping is not insulated, the hot pipes loose heat to the surrounding space. The hot water heater must work harder to keep up with this loss.

Insulate the following lengths and diameters of domestic hot water piping:

Pipe diameter, in.	Length, ft.
3/4	80

ECM Lower and Insulate Ceiling

A high and un-insulated ceiling causes energy to be wasted by the loss of heat though the roof and by loss of heat though large expanses of high wall area. This waste can be eliminated by lowering the ceiling and insulating the new ceiling. Often this project requires that the existing lights be lowered.

In Kiser Elementary, the ceilings have already been lowered, but insulation still needs to be installed. This will require

the purchase of insulation batts, removal of the ceiling panel, installation of the insulation, and replacement of the panels. This can be accomplished for 8755 square feet.

ECM Add Spray on Insulation to Interior Walls

Heat is lost through the high, low R-value walls of gymnasiums and multipurpose rooms. Energy can be saved by adding 2" of spray on cellulose fiber insulation to the interior surface of the walls from the ceiling line to 10' above the floor or 7' above the bleachers.

Gymnasium: Total area to be insulated - 2880 square feet.

ECM Reduce Window Areas

Large windows or windows in very poor condition are large energy wasters. The drafts and infiltration associated with these windows make building occupants feel uncomfortable. This project is to reduce the size of the windows by blocking out a portion of the windows. Leaving the windows in place, install rigid insulation against the glass and cover with drywall, taped and painted.

There are 58 windows approx. 30 in. wide x 96 in. high. This number will be reduced to 20 and the area of windows removed will be insulated per the description above.

SUMMARY OF RECOMMENDED ENERGY CONSERVATION MEASURES

School District: Clayton Public Schools

School: Kiser Elementary School

Description of Measure	Utility Dollars Saved	Estimated Project Costs	Simple Payback in years
Night and Weekend Setback	\$520	\$4,346	8.4
Spray Insulation on Walls	\$200	\$3,996	20.0
Insulate Piping, DHW	\$83	\$297	3.6
Insulate Piping, Steam/Cond.	\$571	\$5,320	9.3
Reduce Window Areas	\$934	\$6,517	7.0
Add Insulation to Ceiling *	\$550	\$5,177	9.4
TOTALS	\$2,859	\$25,654	9.0

* These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.

NOTE: These project costs are for budget purposes.

MECHANICAL EQUIPMENT INVENTORY

KISER ELEMENTARY SCHOOL

G ITEM	LOCATION	DESCRIPTION	COMMENT
<u>in Building</u>			
Steam Boiler	basement	operates at 5 psig	Good condition
Hot Water Sys	basement		Lower temperature
Unit Heater	ceiling hung	serves Multipurpose	Needs setback stat
Unit Heater	ceiling hung	serves Multipurpose	Needs setback stat
<u>portables</u>			
Furnace	closet	serves 1/2 portable	Needs setback stat
Furnace	closet	serves 1/2 portable	Change furnace filter
Furnace	closet	serves 1/2 portable	Needs setback stat
Hot Water Sys	restroom	electric	Change furnace filter
Evap Cooler	window	serves 1/2 portable	Lower temperature
Evap Cooler	window	serves 1/2 portable	Needs cover
Furnace	closet	serves 1/2 portable	Needs cover
Furnace	closet	serves 1/2 portable	Needs setback stat
Furnace	closet	serves 1/2 portable	Change furnace filter
Hot Water Sys	restroom	electric	Needs setback stat
Evap Cooler	window	serves 1/2 portable	Change furnace filter
Evap Cooler	window	serves 1/2 portable	Lower temperature
Evap Cooler	window	serves 1/2 portable	Needs cover
Evap Cooler	window	serves 1/2 portable	Needs cover

Adams Street

modular

modular

KISER ELEMENTARY School

Court Street

South 4th Avenue

South 2nd Avenue

E 37

N

Clayton Public Schools

Clayton Junior High

CLAYTON JUNIOR HIGH SCHOOL

Constructed in 1977, Clayton Junior High is the newest of the Clayton Schools. It contains classrooms, offices, a library, a cafeteria and the gymnasium which is used by the District. It is constructed of face brick on concrete block. While the gymnasium roof is not insulated, the rest of the building is insulated. The windows are single glazing in aluminum frame.

We at M&E Engineering, Inc. wish to thank Principal Huff and Andrew Garcia for their kind cooperation and assistance during this Energy Audit project.

SUMMARY

The Junior High has a very low gas usage. This fact is remarkable considering both the high hours of use for the gymnasium and that the building walls are not insulated and the windows are single glazed.

The Data and Indicators for Clayton Junior High are on the following page.

There is some potential for reducing energy bills at this school. The best potential is from O&Ms and the lower payback ECMs. While some larger scope projects were identified, their paybacks are high.

Savings Potential from O&Ms - \$245 to \$612 per year
Savings Potential from ECMs - \$2,177 per year

DATA AND INDICATORS FOR CLAYTON JUNIOR HIGH SCHOOL

	84-85	85-86	86-87
DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	40,025	40,025	40,025
Students			132
Fuel-Natural Gas	20,018	15,048	16,040
Fuel Costs	\$8,549	\$5,688	\$5,091
Electric	24,584	122,064	132,428
Electric Costs	\$8,689	\$11,109	\$12,411
Fuel Cost per CCF	\$.427	\$.378	\$.317
Elec Cost per KWH	\$.353	\$.091	\$.094
INDICATORS			
Btu per sqft/HDD	8.77	7.19	7.08
KWH per sqft	.61	3.05	3.31
Cost per sqft	\$.431	\$.420	\$.437
Cost per Student	ERR	ERR	\$133

DATA AND INDICATORS FOR CLAYTON JUNIOR HIGH - MODULARS

	84-85	85-86	86-87
DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	1,680	1,680	1,680
Students			132
Fuel-Natural Gas	1,665	185	1,018
Fuel Costs	\$828	\$188	\$268
Electric	1,952	1,520	1,036
Electric Costs	\$158	\$136	\$85
Fuel Cost per CCF	\$.497	\$1.016	\$.263
Elec Cost per KWH	\$.081	\$.089	\$.082
INDICATORS			
Btu per sqft/HDD	17.39	2.11	10.71
KWH per sqft	1.16	.90	.62
Cost per sqft	\$.587	\$.193	\$.210
Cost per Student			\$3

DESCRIPTIONS OF O&Ms

CLAYTON JUNIOR HIGH

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of furnace filters, and annual flushing of water heaters.

O&M Furnace Filter Management

When a furnace filter is very dirty, the furnace cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced at least twice during the heating season for a furnace system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the following furnaces:

Building	Room	No. of Furnaces
Main Building	through out	15
Portable	closets	2

O&M Repair/Adjust Door Hardware and Weather-stripping

Weather-strip all doors to prevent the loss of heated air. Then adjust and/or repair the door hardware so that it draws the door to a closed position against the weather-stripping. Doors noted with an asterisk (*) also need door sweeps.

Building	Doors
Main Building	all 14 doors
Portable	2 doors

O&M Caulk Window Frames

All of the window frames have developed cracks between the frame and the building structure. This crack allows the loss of heated air. Install silicone caulking on the inside of the window frame to seal the cracks.

This has been done at the Junior High, but it needs to be renewed. Actually, this is only a small area of leakage. The larger leakage is within the aluminum frames, and this condition can not be easily solved. Storm windows or insulating curtains, both projects involving capital expenditure, are being analyzed.

O&M Use Vestibules to Conserve Energy

Vestibule doors have been installed at one entrance. They were originally installed at another entrance, but one pair of doors has been removed. These double sets of doors can be very helpful in reducing the amount of heated air that escapes during the day. If one pair of doors is propped open, it effectively negates the effect of the vestibule.

Our recommendation is to make sure that all doors at a vestibule remain closed during the entire heating season.

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

This is a friendly reminder. In general, good practices were observed at the Junior High.

O&M Lower Temperature of Hot Water

The domestic hot water is currently supplied at a temperature too high for hand washing and other non-kitchen school use. Lower the temperature settings on the tanks to no higher than 110 deg. f. This can be accomplished by setting the dial to "WARM" and after some time has elapsed, measuring the hot water temperature at a tap with a thermometer. Keep adjusting the water tank dial until the tap water comes out at about 105-110 deg.F.

This applies to the hot water in the portable only.

**RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES**

DISTRICT Clayton Public Schools
SCHOOL Clayton Junior High

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report. The savings from more than one procedure may have been combined in the results presented below.

O & M PROCEDURE		SAVINGS	RANGE
SYSTEM		LOW	HIGH
HEATING	REPAIR CAULKING/WEATHERSTRIPPING	\$60	\$121
	PREVENTIVE MAINTENANCE PROGRAM	\$121	\$242
COOLING			
AUXILIARY	PREVENTIVE MAINTENANCE PROGRAM	\$5	\$23
LIGHTING	TURN OFF WHEN SPACE UNOCCUPIED	\$53	\$212
HOT WATER	LOWER SUPPLY TO 110 DEG. F.	\$4	\$6
	PREVENTIVE MAINTENANCE PROGRAM	\$3	\$9
KITCHEN			
TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$245	\$612
TOTAL SAVINGS RANGE, PERCENTAGE		1.4%	3.4%

DESCRIPTIONS OF ECM'S

CLAYTON JUNIOR HIGH

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Install electric clock operated night/weekend setback thermostats with locking covers to control the operation of the furnaces. There are a total of seventeen setback thermostats required including the portable.

ECM Add Spray on Insulation to Interior Walls

Heat is lost through the high, low R-value walls of gymnasiums and multipurpose rooms. Energy can be saved by adding 2" of spray on cellulose fiber insulation to the interior surface of the walls from the ceiling line to 10' above the floor or 7' above the bleachers.

This project calls for the addition of Spray-On insulation on the high south and high north walls as well as the underside of the roof deck.

South Wall	1680 sq. ft.
North Wall	1120 sq. ft.
Roof	14,000 sq. ft.

ECM Add Storm Windows

Large windows or windows in very poor condition are large energy wasters. The drafts and infiltration associated with these windows make building occupants feel uncomfortable. This project is to purchase and install interior storm windows that will effectively reduce the transmission and greatly reduce the infiltration.

Elevation	Window Area
North	342
South	171
East	171
West	171

ECM Replace Incandescent Lights

The original incandescent lighting is not nearly as energy-efficient as other kinds of lighting that are now available. There are several areas in which this incandescent lighting can be easily replaced with more efficient lighting, such as fluorescent (F), metal halide (MH) or sodium vapor (SV).

Space	No. Fixtures	Bulbs per Fixture	Watts per Bulb	Replace Type/Qty
Storage Rooms	8	1	150	FL/2

ECM Timeclock on Re-circulation pumps

There are times when it is necessary to continue to operate a re-circulation pump on a domestic hot water system. When this is the case, it is practical to put the pump operation under the control of a timeclock to operate the pump only when the building is occupied.

Clayton Junior High has two such pumps. Install timeclocks to operate these pumps only when needed.

SUMMARY OF RECOMMENDED ENERGY CONSERVATION MEASURES

School District: Clayton Public Schools

School: Clayton Junior High

Description of Measure	Utility Dollars Saved	Estimated Project Costs	Simple Payback in years
Night and Weekend Setback	\$541	\$4,650	8.6
Replace Incandescent Lights	\$104	\$993	9.5
Spray Insulation on Walls	\$1,140	\$21,112	18.5
Timeclocks on Re-Circ. Pumps	\$96	\$665	7.0
Add Storm Windows *	\$295	\$6,952	23.5
TOTALS	\$2,177	\$34,371	15.8

* These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.

NOTE: These project costs are for budget purposes.

MECHANICAL EQUIPMENT INVENTORY

CLAYTON JUNIOR HIGH

ITEM	LOCATION	DESCRIPTION	COMMENT
in Building			
Unit Heater	ceiling	serves Cafeteria	
Unit Heater	ceiling	serves Cafeteria	
Unit Heater	ceiling	serves Kitchen	
Unit Heater	ceiling	serves gymnasium	
Unit Heater	ceiling	serves gymnasium	
Unit Heater	ceiling	serves gymnasium	
Unit Heater	ceiling	serves gymnasium	
Hot Water Sys	closet	with circulating pump	install timeclock
Unit Heater	ceiling	serves Chorus room	
Furnace	closet	serves offices	
Furnace	closet	serves 2 classrooms	
Furnace	closet	serves 2 classrooms	
Furnace	closet	serves 2 classrooms	
Furnace	closet	serves 2 classrooms	
Hot Water Sys	closet	with circulating pump	install timeclock
Furnace	closet	serves 2 classrooms	
Furnace	closet	serves 2 classrooms	
Unit Heater	ceiling	serves shower locker-boys	electric
Unit Heater	ceiling	serves shower locker-boys	electric
Unit Heater	ceiling	serves shower locker-boys	electric
Unit Heater	ceiling	serves shower locker-girls	electric
Unit Heater	ceiling	serves shower locker-girls	electric
Unit Heater	ceiling	serves shower locker-girls	electric
Portable			
Furnace	closet	serves 1/2 Portable	
Furnace	closet	serves 1/2 Portable	
Hot Water Sys	closet	electric	lower temperature
Evap Cooler	window	serves 1/2 portable	cover
Evap Cooler	window	serves 1/2 portable	cover

Note: All furnaces need filters changed and need to have their thermostats replaced with setback thermostats.

South 4th

Yellowjacket Gym

CLAYTON Junior High School

module

W

South 4th

Spruce

Street

South
4th

Clayton Public Schools

Clayton High School

CLAYTON HIGH SCHOOL

Clayton High School is a 9-12 campus with 8 buildings. The oldest construction dates back to the 1920's and the most recent was in 1966. The High School Building contains classrooms, library, the kitchen and cafeteria, and the Superintendent's office. Other buildings are the Agriculture Building, the Machine Shop/Art Building, the Band Building, the Chorus Building, the Industrial Arts Building, Wood Auditorium and Huff Gymnasium which includes a gym floor, a swimming pool and the home economics department.

All the buildings are masonry construction with most having large wood framed, single glazed windows. A steam boiler in the basement of the Junior High Building (the building is no longer used), provides heat to most of the High School Building and the Agriculture Building. The Cafeteria, the Machine Shop and Industrial Arts Building have ceiling hung Unit Heaters. The Auditorium, Art Room and Chorus have furnaces. A hot water boiler provides heat to the Band Building. Another steam boiler provides heat for the gym and home economics while the pool room is unheated.

Throughout the last few years a variety of energy conservation projects have been installed at the school by the maintenance staff. Operable storm windows are being installed on the inside of the windows. Most incandescent lights have been converted to fluorescent fixtures. Some ceilings have been lowered. An insulated roofing system has been added to a few roof areas.

The Stadium complex is adjacent to the Campus. It has seasonal use, predominantly during the spring and fall.

We at M&E Engineering, Inc. wish to thank Principal John Burgess and Andrew Garcia for their kind cooperation and assistance during this Energy Audit project.

SUMMARY

Campus wide the energy use is low for electricity and medium for gas. However, some building groups have high gas use. The Cafeteria appears high, but that figure is due to the gas used for cooking. The Industrial Art, Chorus & Auditorium and the Gym, Home Ec & Band groups have high gas use due to both the type of building and the type and use of the heating system.

The Data and Indicators for the campus are listed on the following page. Those information sheets for the various building groups follow the High School Mechanical Equipment Inventory list.

Due to declining enrollment, there are some spaces at the High School that appear to have low usage. In the O&M Descriptions Section there are some suggestions for consolidation of space use, however no savings are calculated for those actions.

While many energy conservation projects have been installed and more are in the process of being installed, other ways of conserving energy have been identified. For assistance with project funds for the Gymnasium Building, it would be appropriate to apply to the Institutional Conservation Program.

Potential Savings from O&Ms - \$1,625 to \$3,468 per year

Potential Savings from ECMs - \$8,969 per year

DATA AND INDICATORS FOR CLAYTON HIGH SCHOOL CAMPUS

	84-85	85-86	86-87
DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	110,098	110,098	110,098
Students			261
Fuel-Natural Gas	95,517	82,292	85,994
Fuel Costs	\$41,542	\$31,283	\$27,919
Electric	146,061	186,044	190,459
Electric Costs	\$11,501	\$17,112	\$19,434
Fuel Cost per CCF	\$.435	\$.380	\$.325
Elec Cost per KWH	\$.079	\$.092	\$.102
INDICATORS			
Btu per sqft/HDD	15.22	14.29	13.80
KWH per sqft	1.33	1.69	1.73
Cost per sqft	\$.482	\$.440	\$.430
Cost per Student			\$181

DESCRIPTIONS OF O&Ms

CLAYTON HIGH SCHOOL

O&Ms are Operations and Maintenance procedures that can be accomplished by the custodians, maintenance staff, and all other building occupants. These procedures have either a very low cost or no cost at all. The O&Ms described below are those procedures that we recommend be done to keep the energy bills at this school as low as possible. Please note that we recommend that procedures now being done still be done, and that all occupants keep their eyes open for other ways to keep the cost of operation from going up.

Start doing the O&Ms described below. The trainer will demonstrate to the District staff how to do any or all of the O&Ms presented below.

O&M Preventive Maintenance

Besides the important function of avoiding equipment breakdowns, Preventive Maintenance has an important function in energy conservation. In each energy using system, preventive maintenance means specific scheduled tasks to insure the proper and efficient working of that system. If preventive maintenance tasks are not performed, energy use of that system rises unnecessarily and the savings from energy conservation projects diminish. A couple of specific tasks are annual adjustment of fuel burners, scheduled replacement of furnace filters, and annual flushing of water heaters.

O&M Turn Off Heating When Not Needed

Whenever heat is not needed, turn it "off". For example, in the spring and fall in New Mexico heat is often needed in the morning, but if left on all day, the space overheats. Building occupants then open the windows to cool the space. This practice wastes energy.

While open window were not observed at Clayton High, this practice is typical in buildings heated by a central steam boiler. On warm days, set the temperature back before the spaces overheat.

O&M Furnace Filter Management

When a furnace filter is very dirty, the furnace cannot deliver the full amount of air required to heat a space. Dirty filters must be replaced at least twice during the heating season for a furnace system to work correctly. Replacing filters is part of a preventive maintenance program. Replace the filters in the following furnaces:

Building	Room	No. of Furnaces
Auditorium	Mechanical Rms	6 furnaces
Art Room	closet	1 furnace
Chorus	closet	1 furnace
Field House	closet	1 furnace

O&M Repair/Adjust Door Hardware and Weather-stripping

Almost all of the doors at Clayton High need to be weather-stripped to prevent the loss of heated air. Then adjust and/or repair the door hardware so that it draws the door to a closed position against the weather-stripping. Most of these doors also need new door sweeps.

Building	Doors
High School	7 pairs of doors and 4 single
Agriculture Bldg.	3 single
Machine Shop/Art	1 pair and 3 single
Huff Gymnasium	2 pairs and 3 single
Band Bldg	2 pairs
Chorus Bldg	2 single
Industrial Arts	2 single
Auditorium	1 pair and 4 single

O&M Caulk Window Frames

Many window frames have developed cracks between the frame and the building structure. This crack allows the loss of heated air. Install silicone caulking on the inside of the window frame to seal the cracks. This work should be done to the windows as the storm windows are installed.

In buildings where storm windows are not being installed, the window frames should be inspected and caulked as needed.

O&M Caulk Garage Door Frames and Patch Doors

Several garage door frames have developed cracks between the frame and the door and between the sections of the doors panels. These cracks allow the loss of heated air. Install silicone caulking on the inside of the door frames and to seal each panel.

To reduce heat loss through the doors, the cracks and holes in the garage doors should also be sealed and an appropriate door seal (sweep) should be installed on the lower edge.

Building	Doors
Industrial Arts	1 wood garage door
Agriculture Building	1 garage door

O&M Light Management

Install stickers to the lighting wall switches, reminding students, teachers, and staff to turn lights "OFF" when leaving the room.

Clayton High staff and students do an excellent job with light management. This is a friendly reminder to keep up the good work.

O&M Lower Temperature of Hot Water

The domestic hot water is currently supplied at a temperature too high for hand washing and other non-kitchen school use. Lower the temperature settings on the tanks to no higher than 110 deg. F. This can be accomplished by setting the dial to "WARM" and after some time has elapsed, measuring the hot water temperature at a tap with a thermometer. Keep adjusting the water tank dial until the tap water comes out at about 105-110 deg.F. Do this at all hot water tanks.

O&M Space Management

Because of declining enrollment, some spaces at the High School are under used. For example, the administration might consider consolidating the space requirements of band and chorus. The goal of consolidation would be to stop using either an entire building or spaces in a building where the heat can be turned off.

The administration should also investigate completely shutting off the field house in the stadium for several months when usage is negligible. Because Wood Auditorium is not used very often, it should be shut down to 40 degrees or with appropriate actions shut completely off between periods of use.

Since this is a complex decision involving many issues other than energy conservation, no savings were estimated for this measure. The savings would be in addition to other savings calculated.

RECOMMENDED OPERATION AND MAINTENANCE PROCEDURES
WITH ESTIMATED SAVINGS RANGES

DISTRICT Clayton Public Schools
SCHOOL Clayton High School

The Operation and Maintenance procedures presented below are recommended for this school. Complete descriptions of the Procedures can be found in the descriptions section of this report.
The savings from more than one procedure may have been combined in the results presented below.

-----		-----	
SYSTEM	O & M PROCEDURE	SAVINGS LOW	RANGE HIGH
HEATING	REPAIR CAULKING/WEATHERSTRIPPING	\$265	\$529
	CLOSE DOORS & WINDOWS WHEN HEATING	\$132	\$265
	PREVENTIVE MAINTENANCE PROGRAM	\$1,059	\$2,117
COOLING			
AUXILIARY	PREVENTIVE MAINTENANCE PROGRAM	\$2	\$12
LIGHTING	TURN OFF WHEN SPACE UNOCCUPIED	\$87	\$347
	PREVENTIVE MAINTENANCE PROGRAM	\$43	\$130
HOT WATER	LOWER SUPPLY TO 110 DEG. F.	\$10	\$16
	PREVENTIVE MAINTENANCE PROGRAM	\$4	\$12
KITCHEN			
	PREVENTIVE MAINTENANCE PROGRAM	\$23	\$58
-----		-----	
TOTAL ENERGY DOLLARS			
TOTAL SAVINGS RANGE, DOLLARS		\$1,625	\$3,486
TOTAL SAVINGS RANGE, PERCENTAGE		3.4%	7.4%

DESCRIPTIONS OF ECMs

CLAYTON HIGH SCHOOL

ECMs are Energy Conservation Measures. Energy Conservation Measures are projects that can be done by District employees or by contractors. Often, an ECM requires the services of a design professional, an Architect or Engineer, to insure that codes and public safety issues are addressed. ECMs require a commitment of money for purchase of labor and materials. The initial cost of the project returns to the District by reductions in utility bills over the lifetime of the project. This is called payback and it is expressed in years. The shorter the payback, the better the project.

ECM Night Setback Controls

Energy can be saved by lowering the thermostat when a space is unoccupied. This saves both fuel and electricity.

The teachers and custodians do a good job of turning the thermostats down when they leave, but installation of clock operated night setback thermostats will still provide savings by eliminating those times when the staff may forget.

This project calls for the following:

Building	Space	Number of thermostats
Main Building:	Cafeteria	1
Machine Shop		3
Industrial Arts		1
Wood Auditorium		6
Field House		1
Chorus		2
Band Building		*

*The Band Building requires the installation of a timeclock, pump relay, outside temperature shutoff controller.

ECM Eliminate Steam Heat in the Gymnasium

The steam boiler serving the Gymnasium also serves the Home Economics area, the shower lockerroom, the weightroom, and the Museum. Currently, this steam heat system must operate continuously to serve the Home Economics space during the day while heat is needed primarily at night in the Gymnasium.

This project calls for the elimination of the steam heating boiler under the west end of the building. Replacement heating for the following spaces will be provided by:

Gymnasium	Gas fired radiant heating panels. Four 75 MBTU units.
Home Economics	Gas fired ducted furnace.
Museum	Gas fired wall furnace
Lockerroom/Weightroom	Gas fired ducted furnace.

ECM Insulate Steam and Condensate Piping

Steam and condensate piping loose a great deal of heat to the surroundings if the pipe is not insulated. The loss of heat causes the More steam to be condensed and the boiler to run more. This can be resolved by the installation of insulation to the sections of un-insulated pipe. This can be done by the maintenance staff, if simple, or by an insulation contractor, if complex or large.

Much of the steam and condensate piping in the steam heated sections of the High School Building is un-insulated. This project calls for the installation of pipe insulation on all accessible sections of the pipe.

Pipe size, in.	Length, ft.
3/4	650
1	500
1-1/2	500
2	200

ECM Insulate Heating Water Piping

Heating water piping loses a great deal of heat to the surroundings if the pipe is not insulated. The loss of heat causes the the water delivery temperature to be lower and the boiler to run more. This can be resolved by the installation of insulation to the sections of un-insulated pipe. This can be done by the maintenance staff, if simple, or by an insulation contractor, if complex or large.

All of the heating water piping located in the Band Building is uninsulated. This project calls for the installation of pipe insulation on all accessible sections of the pipe.

<u>Pipe size, in.</u>	<u>Length, ft.</u>
1-1/2	400
3/4	168

ECM Insulate Domestic Hot Water Piping

When hot water piping is not insulated, the hot pipes lose heat to the surrounding space. The hot water heater must work harder by burning extra fuel to make up for this loss.

Insulate the following lengths and diameters of domestic hot water piping:

<u>Pipe size, in.</u>	<u>Length, ft.</u>
1/2	30
3/4	140
1	100
1-1/4	60
1-1/2	60

ECM Lower and Insulate Ceiling

A high and un-insulated ceiling causes energy to be wasted by the loss of heat through the roof and by loss of heat through large expanses of high wall area. This waste can be eliminated by lowering the ceiling and insulating the new ceiling. Often this project requires that the existing lights be lowered.

A lowered ceiling has been installed, but due to lack of funds, the insulation has not been installed. This generally .pa

involves removing the ceiling tiles, installing the insulation, and replacing the tiles.

The areas requiring this treatment are estimated as following.

Main Building 34,000 sq. ft.

ECM Add Spray-On Insulation to Interior Walls

Heat is lost through the high, low R-value walls of gymnasiums and multipurpose rooms. Energy can be saved by adding 2" of spray on cellulose fiber insulation to the interior surface of the walls from the ceiling line to 10' above the floor or 7' above the bleachers.

Gymnasium:	roof area	9900 sq. ft.
	east wall	900
	west wall	900
	north wall	1900
	south wall	1900

The windows should be painted over and finished off with a coat of spray insulation.

ECM Replace Incandescent Lights

The original incandescent lighting is not nearly as energy-efficient as other kinds of lighting that are now available. There are several areas in which this incandescent lighting can be easily replaced with more efficient lighting, such as fluorescent (F), metal halide (MH) or sodium vapor (SV).

Space	No. Fixtures	Bulbs per Fixture	Watts per Bulb	Replace Type/Qty
Gymnasium Floor	28	1	500	8/MH
Hall weightroom & Museum	11	1	150	7/FL
Swimming	3	1	300	4/FL
Agriculture	3	1	150	3/FL

NOT RECOMMENDED

ECM Reduce and Replace Windows

Large windows or windows in very poor condition are large energy wasters. The drafts and infiltration associated with these windows make building occupants feel uncomfortable.

Large windows or windows in very poor condition are large energy wasters. The drafts and infiltration associated with these windows make building occupants feel uncomfortable. This project is for the elimination of certain areas by leaving the windows in place, installing rigid insulation against the glass and covering the interior with drywall, taping and painting.

Band Building

4 @ 5ft. X 15 Ft jalousie
windows-Fill two and
leave two.

This project is not recommended as it was analyzed because the payback exceeded 50 years. However, the school has been doing window reductions with minimal materials and staff labor. Often these reductions are in conjunction with a project to lower the ceilings. We do not doubt that these installations are helping to reduce utility expenditure.

SUMMARY OF RECOMMENDED ENERGY CONSERVATION MEASURES

School District: Clayton Public Schools

School: Clayton High School

Description of Measure	Utility Dollars Saved	Estimated Project Costs	Simple Payback in years
Night and Weekend Setback	\$926	\$4,679	5.1
Elim. Steam Ht in Gym	\$2,200	\$21,500	9.8
Replace Incandescent Lights	\$1,225	\$5,523	4.5
Spray Insulation on Walls	\$1,700	\$19,478	11.5
Insulate Steam/Cond. Piping	\$850	\$7,431	8.7
Insulate Htg. Water Piping	\$330	\$2,350	7.1
Insulate DHW Piping	\$172	\$1,528	8.9
Add Roof Insulation	\$1,567	\$20,106	12.8
TOTALS	\$8,969	\$82,596	9.2

* These projects do not require special skills and are not large scope. They can be done by the maintenance staff with materials purchased from a hardware store.

NOTE: These project costs are for budget purposes.

MECHANICAL EQUIPMENT INVENTORY

CLAYTON HIGH SCHOOL

TE: All furnaces need filters changed regularly. Night and weekend setback thermostats should be installed on all furnaces and unit heaters.

ITEM	LOCATION	DESCRIPTION	COMMENT
<u>High School Building</u>			
Steam Boiler	basement Old Bldg	5 psig	
Unit Heater	ceiling	Journalism room	
Hot Water Sys	kitchen	holds 180 deg	
Hot Water Sys	kitchen	holds 140 deg	
Evap Cooler	kitchen		
Unit Heater	ceiling	Cafeteria	
Evap Cooler		Cafeteria	
Evap Cooler		Cafeteria	
Hot Water Sys	Teacher's lounge	electric	lower temperature
<u>Agriculture Building</u>			
Hot Water Sys	Ag shop		lower temperature
<u>Machine Shop/Art Building</u>			
Unit Heater	ceiling	Spec Ed room	
Unit Heater	ceiling	Welding Shop	
Furnace	closet	Art Area	
Hot Water Sys	closet	Art Area	lower temperature
<u>Industrial Arts</u>			
Unit Heater	ceiling		
Unit Heater	ceiling		
Exhaust Sys		sandpaper machine	
Air Compressor			
<u>Food Auditorium</u>			
Furnace	Mech Room		
Furnace	Mech Room		
Furnace	Mech Room		
Furnace	Mech Room		
Furnace	Mech Room		
Furnace	Mech Room		
Evap Cooler			
Evap Cooler			
Evap Cooler			

G ITEM	LOCATION	DESCRIPTION	COMMENT
eld House			
Furnace			shut off
Hot Water Sys			
orus Building			
Unit Heater		serves shop	
Furnace		serves chorus	
ff Gymnasium			
Fan Units	gym	steam	clean coils
Fan Units	gym	steam	clean coils
Fan Units	gym	steam	clean coils
Steam Boiler	basement	5 psig	insulate pipe
Hot Water Sys	basement		lower temperature
Pool Heater Sys	mech room	boiler, tanks	
nd Building			
Boiler	mech room	hot water	add setback controls
Pump	mech room		insulate pipes

DATA AND INDICATORS FOR CLAYTON HIGH SCHOOL STADIUM

	84-85	85-86	86-87
DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	2,535	2,535	2,535
Students			
Fuel-Natural Gas	1,977	1,545	1,811
Fuel Costs	\$1,095	\$812	\$786
Electric	6,509	7,070	7,930
Electric Costs	\$536	\$593	\$634
Fuel Cost per CCF	\$.554	\$.526	\$.434
Elec Cost per KWH	\$.082	\$.084	\$.080
INDICATORS			
Btu per sqft/HDD	13.68	11.65	12.62
KWH per sqft	2.57	2.79	3.13
Cost per sqft	\$.643	\$.554	\$.560
Cost per Student	ERR	ERR	ERR

DATA AND INDICATORS FOR CLAYTON HIGH SCHOOL-CAFETERIA

	84-85	85-86	86-87
DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	6,302	6,302	6,302
Students			
Fuel-Natural Gas	8,405	6,870	7,216
Fuel Costs	\$3,663	\$2,656	\$2,366
Electric	43,280	42,840	45,560
Electric Costs	\$2,410	\$3,671	\$4,315
Fuel Cost per CCF	\$.436	\$.387	\$.328
Elec Cost per KWH	\$.056	\$.086	\$.095
INDICATORS			
Btu per sqft/HDD	23.40	20.84	20.23
KWH per sqft	6.87	6.80	7.23
Cost per sqft	\$.964	\$1.004	\$1.060
Cost per Student	ERR	ERR	ERR

DATA AND INDICATORS FOR CLAYTON HIGH SCHOOL-AG BUILDING

	84-85	85-86	86-87
DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	58,312	58,312	58,312
Students			
Fuel-Natural Gas	37,311	29,653	28,425
Fuel Costs	\$15,881	\$11,176	\$9,112
Electric	56,480	50,160	55,040
Electric Costs	\$4,776	\$4,763	\$5,161
Fuel Cost per CCF	\$.426	\$.377	\$.321
Elec Cost per KWH	\$.085	\$.095	\$.094
INDICATORS			
Btu per sqft/HDD	11.23	9.72	8.61
KWH per sqft	.97	.86	.94
Cost per sqft	\$.354	\$.273	\$.245
Cost per Student	ERR	ERR	ERR

DATA AND INDICATORS FOR CLAYTON HIGH SCHOOL-ARTS, CHORUS, AUDITORIUM

	84-85	85-86	86-87
DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	15,904	15,904	15,904
Students			
Fuel-Natural Gas	18,203	14,603	17,528
Fuel Costs	\$8,438	\$5,626	\$5,845
Electric	21,648	28,168	15,185
Electric Costs	\$1,870	\$2,549	\$2,559
Fuel Cost per CCF	\$.464	\$.385	\$.333
Elec Cost per KWH	\$.086	\$.090	\$.169
INDICATORS			
Btu per sqft/HDD	20.08	17.56	19.47
KWH per sqft	1.36	1.77	.95
Cost per sqft	\$.648	\$.514	\$.528
Cost per Student	ERR	ERR	ERR

DATA AND INDICATORS FOR CLAYTON HIGH SCHOOL-GYM, HOME EC, BAND

	84-85	85-86	86-87

DATA			
Heating Degree Days	5,106	4,685	5,070
Area (Sq. Ft.)	27,045	27,045	27,045
Students			
Fuel-Natural Gas	29,621	29,621	31,014
Fuel Costs	\$12,465	\$11,013	\$9,810
Electric	18,144	57,806	66,744
Electric Costs	\$1,909	\$5,536	\$6,765
Fuel Cost per CCF	\$.421	\$.372	\$.316
Elec Cost per KWH	\$.105	\$.096	\$.101
INDICATORS			
Btu per sqft/HDD	19.22	20.94	20.26
KWH per sqft	.67	2.14	2.47
Cost per sqft	\$.531	\$.612	\$.613
Cost per Student	ERR	ERR	ERR

CLAYTON High School
* SR. High Computer

7-1-88

GARAGE
9
SUPPLY

PINE Street

10
AUDITORIUM

INDUSTRIAL
8
ARTS

CHORUS
7

5. Sixth Street

OAK STREET

70

SUPERINTENDENTS
OFFICE

AGRICULTURE
3
Building

MACHINE SHOP
2

OLD CLAYTON JUNIOR HIGH
5

HOME ECONOMICS

CAFETERIA

PATIO

6

CLAYTON High School

HUFF Gymnasium

4

Swimming Pool

GOLF Building
1