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INTRODUCTION

Α. **General Description**

The United States Disciplinary Barracks (USDB) is located within the confines of Fort Leavenworth near Leavenworth, Kansas. Fort Leavenworth encompasses approximately 6000 acres of land in which approximately 2000 acres were developed for military use. The USDB is located to the northeast corner of the base.

Β. **Purpose of Report**

The purpose of this report is to observe any present energy usage by the USDB and consider opportunities to conserve energy. The report details evaluation of various Energy Conservation Opportunities (ECO) to determine their feasibility.

The report also includes programming or implementation documentation for those ECO's considered feasible. Any ECO having a Savings to Investment Ratio (SIR) greater than one is considered feasible. If the ECO had a SIR greater than one and a simple payback less than 10 years it was considered for Energy Conservation Investment Program (ECIP) funding.

С. Observations

During our field trips to the USDB, we noted many observations relating equipment in disrepair. In general, little of the heating, ventilating, and air conditioning equipment appeared to have been maintained. Because of a lack of preventative maintenance throughout the USDB, a considerable amount of energy is being consumed with no appreciable contribution to the operation of the facility. The equipment controls are in need of maintenance the worst. A large portion of the control systems for the equipment were disconnected due to the lack of funding for repair. A preventative maintenance plan is currently under consideration at the USDB, but because of lack funding and proper personnel, the program DIC QUALITY INSPECTED 2 could be in jeopardy.







Some of the feasible ECO's described in this report will replace equipment that might not have been replaced if the original equipment had had preventative maintenance.

Some of the equipment was not in service because of a pending repair, thus no energy was used. The calculations completed with an estimate of what the equipment might use if it were operating.

D. Computer Programs

A number of different computer programs were used in the development of this report. To calculate the energy usage of each of the buildings, we used a program entitled "Trace Ultra" provided by the Trane Company. This program uses an hour by hour energy calculation routine as presented in Chapter 25 of the American Society of Heating, Refrigeration, and Air conditioning Engineers (ASHRAE) Handbook of Fundamentals. Simplified energy calculations were completed using an electronic spreadsheet. The "Life Cycle Cost in Design" (LCCID) Economic Analysis Computer Program, developed by the Government thru the University of Illinois, was used to calculate the life cycle cost estimates.







PRESENT ENERGY CONSUMPTION

General Description

At the present time the energy usage associated with the United States Disciplinary Barracks (USDB) is in the form of three utilities. The first is electricity. The USDB uses electricity for all lighting, fan motors, and pump motors. The electricity used by the USDB is purchased from the electric utility for the area, Kansas Power and Light (KPL). The second utility used by the USDB is natural gas. Natural gas is used to fire the boilers in the boiler plant in the north section of the USDB. The boilers produce steam to be used in converters to make domestic hot water and in air handling unit coils for heating the spaces. The natural gas used to fire the boilers is purchased from the local gas utility Kansas Power and Light (KPL). Water is the third utility used in the USDB. The water is consumed in several different ways but in larger quantities by the inmate restrooms and showers. Water is purchased from a water plant owned and operated by Fort Leavenworth located on the grounds of the fort.

The following pages display the energy consumed per building studied and an overall energy consumption. Several buildings located in the USDB were not included in the scope of work to be studied. Therefore the overall energy usage would not be a total for the entire USDB. The energy usage included on the following pages is for the electrical and natural gas utilities. These energy usage amounts were calculated for each of the buildings. The USDB does not have metering available to check the amount of energy actually used.









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NATURAL GAS COST VS. ELECTRICITY COST





MONTHLY ENERGY COST FOR USDB FACILITY



ENERGY CONSUMPTION









ENERGY CONSUMPTION

SUMMARY OF ECO'S

ARCHITECTURAL

ECO A1. Reduce Infiltration

Presently, most of the windows and doors for the buildings located in the USDB have large cracks that allow outside air to infiltrate the buildings. Reduction of the air quantities entering the buildings is not difficult and can be accomplished by weatherstripping and caulking. This work can be performed by the maintenance staff at a low cost.

Because computer modeling of this ECO showed poor economic return, we do not recommend it.

ECO A2. Window Replacement

This ECO studied the installation of double glazed windows anywhere single glazed windows exist. The replacement windows are hermetically sealed with an air gap between the the two plates of glass. Infiltration into the building is usually decreased because the new windows seal the opening better.

The double glazed windows have much better insulating quality than single glazed windows. However, they are expensive to install and will not provide an adequate payback unless new windows are already required. Therefore, we are not recommending this ECO.

ECO A3. Attic Insulation

The addition of insulation to the building attics will reduce the overall heat transfer coefficient of their roofs, translating into a decreased amount of heat transferred to or from the interior spaces of the building.

Installation of 10" fiberglass batt insulation in the attics of the existing buildings is not difficult and can be accomplished by the maintenance staff.

This ECO is recommended for buildings 464, 472, and 475.

ECO A4. Dock Door Replacement

This opportunity for heating energy conservation relates to a dock door located in building 470. The existing overhead dock door is in poor condition. The energy savings associated with a new door is derived from a reduction in heat transferred from interior spaces and from





decreased infiltration. The USDB carpentry shop would be required to replace the door to make the project feasible.

ECO A5. Vestibules

Vestibules reduce energy consumption by limiting the amount of outside air infiltration into buildings through frequently used doors. The implementation of this project will change the appearance of the exterior of building #463. At the present time, no vestibules exist at the entrance or exit of this building.

Especially during the heating season, the heating equipment runs nonstop to satisfy the space conditions. Most of the time, however, the temperature conditions are not met. If the heating and cooling equipment were adequately sized, a return on the investment due to energy savings would be more likely. However, we do not recommend this ECO based on existing conditions.

ECO A6. Solar Window Shading

This energy conservation opportunity was studied for all the buildings having cooling. The reduction in solar gain through an unshaded window is beneficial during the cooling season but not during the heating season.

An increase in heating energy may be required to offset the reduced solar heat gain in the winter. Some of the buildings that are entirely air conditioned and that contain large amounts of glass will save energy dollars by the addition of solar film, while other buildings experience increased energy consumption.

The only building showing a payback on this ECO is building 450.

ECO A7. Exterior Wall Insulation

The addition of insulation to exterior building walls was studied and found to be difficult to implement in a facility of this nature. The materials necessary must have reasonable resistance to damage due to the nature of the occupants of the buildings. Because of the expense this type of construction, implementation of this ECO is not feasible.

A9. Architectural Repairs

This section is not an ECO, but a study of architectural repairs recommended for USDB buildings. Many of the items considered do not have a direct relationship to an energy savings but are listed as recommended service items for the USDB. The repairs are small in nature, and some may reduce energy consumption in the buildings, but this is difficult to calculate.





MECHANICAL

ECO M1. Schedule Air Handling Equipment

This ECO studied energy savings associated with scheduling of HVAC equipment for shutoff or setback during periods when heating or cooling are required. This can be accomplished by adding some of the equipment to the existing Energy Management System (EMS) network. This project is recommended for building 465.

ECO M2. Dry-Bulb Economizer Controls

This ECO studies the service or addition of economizer controls and dampers to air handling units utilizing outside air at the present time. The economizer functions by using outside air for cooling when the outdoor temperature is low enough to provide cooling for the building (Approximately 60°F). The air handling units studied now have or had economizer controls and dampers, but do not function properly at this time. This ECO is not recommended at this time.

ECO M3. Service Steam Piping and Traps

This ECO studied the service or replacement of faulty steam traps. Energy savings are shown by a reduction in steam use if the failed traps are repaired so that they do not pass steam into the condensate piping. Steam traps are devices that consistently fail, and are designed to be easily replaceable and repairable. These devices need to be regularly checked and serviced or replaced, if necessary, for maximum system efficiency.

Failure to maintain the steam traps properly results in wasted energy and prevents air from being vented from the piping system, which corrodes the piping, causing premature pipe failure. This ECO is recommended for the USDB.

ECO M5.

This ECO studied the addition of heat recovery systems for the exhausted air from the cell barracks in the Castle Building. The locations of the heat recovery systems are ideal because the exhaust air is directly adjacent to the intake air to be preheated. This ECO is recommended for buildings 475C, 475D, 475G, and 475F.

ECO M6. Insulate Ductwork

This ECO investigates the addition of exterior insulation to supply air ductwork. The heat transferred through the walls of the ductwork is a function of the heat transfer coefficient of the ductwork material. Adding



SUMMARY OF ECO'S

insulation to the ductwork improves the heat transfer resistance and therefore limits the amount of energy lost.

Uninsulated ductwork routed through unconditioned areas wastes energy. The only ductwork at the USDB facility that is in this category is located in the exterior walls of the Castle building, where installation of insulation is not feasible.

ECO M10. Central Plant Cooling

This ECO studies the replacement of all the packaged air cooling equipment with a central plant chiller producing chilled water for cooling coils located in the air handlers at the individual buildings. In almost all of the cases where a space is being cooled, a packaged direct expansion type of cooling system is utilized.

The cost per BTUH of cooling by a direct expansion type of machine is greater than the cost per BTUH of chilled water system cooling. Replacing the existing direct expansion cooling equipment with a centrifugal chiller plant with cooling towers for heat rejection can conserve energy. However, the cost of removing the existing cooling equipment and installing new chilled water equipment and installing the chilled water distribution piping in the existing tunnels makes this project not feasible.

ECO M11. Castle Air System Repair

This ECO studied the energy savings associated with properly heating and ventilating the cell barracks of the Castle Building. At the present time, the air within the cell barracks is stratified. Air stratification occurs when warm air rises to the upper level of a building and cooler air settles to the lower level. This causes overheating of the upper level in order to provide adequate heating in the lower level.

Repairing the air system in the Castle Building allows the warmer air at the upper level to be recirculated down to the lower level, thereby reducing energy consumption in the building. This ECO is recommended in buildings 475C, 475D, 475F, and 475G.

ECO M12. Reduce Steam Distribution Pressure

This energy conservation opportunity deals with reducing the steam pressure needed for the USDB facility. The laundry requires 120 psi steam, while steam used for space heating can be supplied at 80 psi pressure. Lower pressure steam costs less to generate.

We recommend that the laundry facility be served by a single 120 psi boiler when the existing boilers are replaced (within the next two years).







The space heating requirements of the facility can then be served by two boilers operating at 80 psi.

ECO M14. Service Condensate Return System

This ECO analyzes the energy savings associated with the repair and insulation of the condensate return system serving the Castle Building. The existing piping has holes drilled in the top of the piping in various locations. Repairing these holes will result in less energy loss from the condensate. This repairing and insulating of the condensate piping will result in higher temperature condensate returning to the boiler plant, thus requiring less boiler energy to produce steam. This ECO is recommended.

ECO M15. Boiler Plant Modifications

This ECO studies the boiler plant and any modifications that could save energy. The energy lost during a blowdown of a boiler can be recovered and used to preheat the boiler feedwater. Installing a boiler stack economizer is another possible method of heat recovery off of the boilers. Preheating the combustion air to the boilers will save boiler energy. Oxygen trim control will help improve the operating efficiency of the boilers.

Seven items of energy conservation for the Boiler Plant were investigated and five items were eliminated. The two remaining items, boiler stack economizer and boiler oxygen trim control, offer energy savings.

We recommend that oxygen trim controls be purchased when the existing boilers are replaced within the next two years. Incorporation of any improvements to the existing boilers would be injudicious, because the payback could not be realized before the existing boilers are replaced.

ECO M24. Convert from Steam to Hot Water

This ECO studied the conversion of the existing high pressure steam generation and distribution system to a high temperature hot water type system. The cost per BTUH for using steam is greater than the cost per BTUH for using hot water. The required increase in system efficiency to justify the construction cost is not obtainable, making this ECO not feasible.

ECO M25. Convert from Steam to Cogeneration

Due to the large capital investment and the impact of the operating costs, a very detailed analysis must be performed before funding is considered





SUMMARY OF ECO'S



for cogeneration. The scope of this ECO is to determine if the investment in a complete cogeneration feasibility study is justified.

Cogeneration is possible when a large heating energy and cooling energy requirement occur simultaneously and for a sufficient time period. The feasibility of cogeneration depends on the facility electrical and thermal loads and how they interrelate. This is especially true when the cost of both electricity and natural gas are moderate, as they are at the USDB.

The most efficient system, offering the best return on investment, would be a cogeneration system tied into a central cooling plant utilizing absorption chillers, which could use the waste heat for cooling purposes.

ECO M26. Reduce Hot Water Temperature

This ECO studied the energy savings associated with a reduction of the domestic hot water temperature used for restrooms and showers. An energy savings can be realized by lower heat losses from the system.

This ECO can be implemented at no cost by directing the maintenance staff to change the setpoint for all water heaters within the USDB from 180°F to 140°F. The reduction in water temperature will reduce the capacity of the domestic hot water system. This ECO is recommended, however, its impact will be reduced by implementation of ECO-M30.

ECO M29. Decentralize Hot Water System

This ECO studied the break-up of the domestic hot water system. At the present time several buildings are served from a hot water tank located in one building. By decentralizing the hot water system, the heat loss from a considerable amount of branch piping can be eliminated. Due to the cost of construction required to implement this ECO, the project is not feasible.

ECO M30. Domestic Water Pipe Insulation

This energy conservation opportunity evaluates the installation of pipe insulation for the domestic hot water piping. Energy is saved by reducing the amount of heat loss from the piping to the surrounding environment. This ECO offers attractive energy savings in the Castle building and in the pipe tunnels and is recommended for the USDB.

ECO M31. Heat Recovery for Laundry

This ECO studied the addition of heat recovery units for the laundry washwater, clothes dryers, and the steam irons to conserve energy usage. The best opportunity for implementation of this ECO would be when the laundry facility reaches a permanent location. By this means,



SUMMARY OF ECO'S

the heat recovery systems can be incorporated into the design more readily than for installation in an existing facility. Washwater and dryer heat recovery are recommended.

ECO M39. Water Heating Heat Pumps

This ECO studied the replacement of the existing heating and cooling equipment with a heat pump system to condition the interior spaces. In general, heat pumps have a greater efficiency than the existing types of heating and cooling equipment employed in the USDB buildings.

None of the buildings studied for heat pump installations were feasible due to the high construction costs. The heat pump system also has a higher maintenance cost than the existing heating and cooling equipment.



ELECTRICAL

ECO E1. Lighting Levels

This ECO investigates the reduction in lighting levels in areas where the existing lighting was considered to be more than necessary. Installation of motion sensors can provide a good payback in conference rooms and chapels where the lighting loads are high and the space is unoccupied 30% of the time.

ECO E2. Energy Efficient Lighting Systems

This ECO studies the replacement of existing lighting systems with more efficient lighting systems of the same light level. The replacement of lights would reduce the electrical consumption of the lighting system.

We recommend replacing the existing fluorescent lamps and ballasts with high efficiency lamps and ballasts during routine lighting maintenance by the USDB staff.

We also recommend replacement of the existing incandescent light fixtures in building #475A stairwells with high efficiency fluorescent fixtures.

ECO E3. Energy Efficient Motors

This ECO studied the replacement of existing motors that operate fans and pumps with high efficiency motors that have a higher KWh per horsepower rating. The increase in motor efficiency will decrease the amount of electrical energy used by the motors.

We recommend that the motors listed in Volume One of this report with calculated SIR values greater than 1.0 be replaced with high efficiency motors. We also recommend that all new motors installed at the USDB be high efficiency motors.



ALL ECO'S INVESTIGATED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
REDUCE	INFILTRATION						
A1	BUILDING #463 SOUTH GATE / VISITORS	12	\$49	\$10.617	\$11.254	217.43	0.07
Δ1	BUILDING #464	0	cv\$	\$5.540	\$5.992	102 72	0.12
	BUILDING #465		φ + 2	φ <u></u> σ,σ 4 5	\$0,002	120,70	0.12
<u> </u>	BUILDING #466	200		\$61,405	<u>365,089</u>	58.08	0.28
<u>A1</u>	BUILDING #472	1	\$8	\$18,112	\$19,199	4544.00	0.00
<u>A1</u>	PRINT SHOP / COLLEGE BUILDING #473	62	\$265	\$25,015	\$26,516	96.18	0.17
A1		12	\$54	\$12,250	\$12,985	215.67	0.07
A1	ROTUNDA	15	\$59	\$7,865	\$8,337	129.39	0.12
A1	INVESTIGATION	93	\$399	\$9,504	\$10,074	23.61	0.66
A1	BUILDING #475B DINING / LIBRARY	16	\$65	\$9,793	\$10,381	151.20	0.11
A1	BUILDING #475C HSG, UNIT / RECEPTION	42	\$171	\$31 812	\$33 721	186 69	0.09
A1	BUILDING #475D	40	\$105	¢07,740	¢40.010	100.00	0.03
	BUILDING #475E			\$37,748	\$40,013	193.27	
<u>A1</u>	BUILDING #475F	53	\$146	\$42,102	\$44,628	283.56	0.07
<u>_A1</u>	HSG. UNIT BUILDING #475G		\$365	\$37,990	\$40,269	105.02	0.15
<u>A1</u>	HSG. UNIT BUILDING #475H	41	\$169	\$32,708	\$34,670	196.54	0.08
A1	MSA / D&A BOARD / TDS	20	\$85	\$7,563	\$8,017	92.50	0.17
WINDOW		I					
A2	MENTAL HYGIENE	104	\$455	\$34,048	\$36,091	74.60	0.21
A2	INSIDE BARBER SHOP	217	\$892	\$369,241	\$391,395	414.93	0.04
A2	BUILDING #475 ROTUNDA	78	\$317	\$104,902	\$111.196	331.03	0.05
A2	BUILDING #475C HSG. UNIT / RECEPTION	161	\$658	\$208 538	\$221.050	318 52	0.05
Δ2	BUILDING #475D HSG_UNIT / 4-BASE	237	\$967	\$244,011	\$250,606	010.32	0.05
A2	BUILDING #475F	100	\$701	<u> </u>	<u>\$255,000</u>	254.10	0.06
<u> </u>	BUILDING #475G	081	\$/61	\$244,911	\$259,606	323.81	0.05
<u>A2</u>	HSG. UNIT / FEM HSG	164	\$671	\$208,538	\$221,050	312.81	0.05
ATTIC INS	BUILDING #464			T			
_A3	OUTSIDE BARBER SHOP	106	\$583	\$3,215	\$3,408	5.54	2.57
<u>A3</u>	PRINT SHOP / COLLEGE	34	\$194	\$2,438	\$2,584	11.72	1.19
A3	ROTUNDA	142	\$578	\$4,592	\$4,868	7.96	2.03
A3	DINING / LAUNDRY / GYM	40	\$169	\$30,487	\$32,316	187.69	0.09
оск ро	OR REPLACEMENT						
	ECO <u>REDUCE</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A1</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A2</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u> <u>A3</u>	ECO BUILDING NAME REDUCE INFILTRATION BUILDING #463 A1 SOUTH GATE / VISITORS BUILDING #463 A1 A1 SOUTH GATE / VISITORS BUILDING #464 A1 A1 OUTSIDE BARBER SHOP BUILDING #465 A1 INSIDE BARBER SHOP BUILDING #466 A1 CARPENTRY SHOP BUILDING #473 A1 CLASSIFICATION BUILDING #475 A1 CLASSIFICATION BUILDING #475 A1 ROTUNDA BUILDING #475B A1 INVESTIGATION BUILDING #475C A1 BUILDING #475C A1 HSG. UNIT / RECEPTION BUILDING #475C A1 HSG. UNIT BUILDING #475G A1 HSG. UNIT BUILDING #475G A1 HSG. UNIT BUILDING #4455 A2 MENTAL HYGIENE BUILDING #475D A2 MENTAL HYGIENE </td <td>BUILDING ENERGY SAVINGS MBTU'S/YR REDUCE INFILTRATION BUILDING #463 A1 SOUTH GATE / VISITORS 12 BUILDING #464 A1 12 BUILDING #465 A1 12 BUILDING #465 A1 12 BUILDING #465 A1 12 BUILDING #465 A1 12 BUILDING #465 A1 12 BUILDING #465 A1 12 BUILDING #466 A1 12 BUILDING #472 A1 13 PRINT SHOP / COLLEGE BUILDING #475 A1 62 BUILDING #475 A1 12 BUILDING #475 A1 12 BUILDING #475 A1 13 BUILDING #475 A1 13 BUILDING #475 A1 14 BUILDING #475 A1 14 BUILDING #475 A1 14 BUILDING #475 A1 14 BUILDING #475 A1 16 BUILDING #475 A1 17 BUILDING #475 A1 10 BUILDING #475 A2 10 BUILDING #475 A2 10 BUILDING #475 A2</td> <td>ECO BUILDING ENERGY SAVINGS MBTU'S/YR ENERGY SAVINGS SAVINGS (\$) REDUCE INFILTRATION BUILDING #463 12 \$449 A1 SOUTH GATE / VISITORS 12 \$449 A1 SOUTH GATE / VISITORS 12 \$449 A1 OUTSIDE BARBER SHOP 9 \$42 BUILDING #465 256 \$1.061 BUILDING #466 1 \$12 \$54 BUILDING #475 1 \$8 BUILDING #475 12 \$54 BUILDING #475 15 \$59 A1 PRINT SHOP / COLLEGE 62 \$265 BUILDING #4750 15 \$59 A1 ROTUNDA 12 \$54 BUILDING #4750 15 \$59 A1 INVESTIGATION 93 \$399 BUILDING #4750 41 \$16 \$655 BUILDING #4756 16 \$16 A1 HSG. UNIT / 4-BASE 48 \$195 BUILDING #4756 \$14 \$145</td> <td>ECO BUILDING NAME ENERGY SAVINGS SAVINGS ENERGY SAVINGS SAVINGS CONSTRUCTION COST REDUCE INFILTRATION BUILDING #463 12 \$49 \$10,617 BUILDING #463 12 \$49 \$10,617 BUILDING #465 9 \$42 \$5,549 A1 OUTSIDE BARBER SHOP 9 \$42 \$5,549 BUILDING #465 9 \$42 \$5,549 BUILDING #475 1 \$5 \$10,25 \$25,015 BUILDING #475 12 \$54 \$12,250 BUILDING #475 15 \$59 \$7,865 A1 NUKSTIG #475D 93 \$399 \$9,504 A1 DINING / LBRARY 16 \$65 \$9,793 BUILDING #475D 43 \$105 \$37,748 <</td> <td>ECO BUILDING NAME ENERGY SAVINGS ENERGY SAVINGS CONSTRUCTION COST* TOTAL PROJECT COST* REDUCE INFILTRATION BUILDING #463 (\$) COST* COST* BUILDING #463 12 \$49 \$10,617 \$11,254 BUILDING #465 12 \$49 \$10,617 \$11,254 BUILDING #465 12 \$49 \$10,617 \$11,254 A1 DUTBOE BARBER SHOP 9 \$42 \$5,549 \$5,882 A1 INSIDE BARBER SHOP 256 \$1,061 \$61,405 \$65,089 A1 CARPENTRY SHOP 1 \$8 \$18,112 \$19,199 A1 PRINT SHOP / COLLEGE 62 \$265 \$22,5015 \$26,516 BUILDING #475 12 \$54 \$12,250 \$12,965 BUILDING #475 12 \$54 \$12,250 \$12,965 BUILDING #475B 16 \$65 \$9,733 \$10,074 BUILDING #475B 16 \$465 \$9,733 \$10,074 BUILDING #</td> <td>ECO BUILDING NAME ENERGY SAVINGS ENERGY SAVINGS CONSTRUCTION COST TOTAL PROJECT SIMPLE PAYBACK COST REDUCE INFILTRATION BUILDING 4463 (S) COST CO</td>	BUILDING ENERGY SAVINGS MBTU'S/YR REDUCE INFILTRATION BUILDING #463 A1 SOUTH GATE / VISITORS 12 BUILDING #464 A1 12 BUILDING #465 A1 12 BUILDING #465 A1 12 BUILDING #465 A1 12 BUILDING #465 A1 12 BUILDING #465 A1 12 BUILDING #465 A1 12 BUILDING #466 A1 12 BUILDING #472 A1 13 PRINT SHOP / COLLEGE BUILDING #475 A1 62 BUILDING #475 A1 12 BUILDING #475 A1 12 BUILDING #475 A1 13 BUILDING #475 A1 13 BUILDING #475 A1 14 BUILDING #475 A1 14 BUILDING #475 A1 14 BUILDING #475 A1 14 BUILDING #475 A1 16 BUILDING #475 A1 17 BUILDING #475 A1 10 BUILDING #475 A2 10 BUILDING #475 A2 10 BUILDING #475 A2	ECO BUILDING ENERGY SAVINGS MBTU'S/YR ENERGY SAVINGS SAVINGS (\$) REDUCE INFILTRATION BUILDING #463 12 \$449 A1 SOUTH GATE / VISITORS 12 \$449 A1 SOUTH GATE / VISITORS 12 \$449 A1 OUTSIDE BARBER SHOP 9 \$42 BUILDING #465 256 \$1.061 BUILDING #466 1 \$12 \$54 BUILDING #475 1 \$8 BUILDING #475 12 \$54 BUILDING #475 15 \$59 A1 PRINT SHOP / COLLEGE 62 \$265 BUILDING #4750 15 \$59 A1 ROTUNDA 12 \$54 BUILDING #4750 15 \$59 A1 INVESTIGATION 93 \$399 BUILDING #4750 41 \$16 \$655 BUILDING #4756 16 \$16 A1 HSG. UNIT / 4-BASE 48 \$195 BUILDING #4756 \$14 \$145	ECO BUILDING NAME ENERGY SAVINGS SAVINGS ENERGY SAVINGS SAVINGS CONSTRUCTION COST REDUCE INFILTRATION BUILDING #463 12 \$49 \$10,617 BUILDING #463 12 \$49 \$10,617 BUILDING #465 9 \$42 \$5,549 A1 OUTSIDE BARBER SHOP 9 \$42 \$5,549 BUILDING #465 9 \$42 \$5,549 BUILDING #475 1 \$5 \$10,25 \$25,015 BUILDING #475 12 \$54 \$12,250 BUILDING #475 15 \$59 \$7,865 A1 NUKSTIG #475D 93 \$399 \$9,504 A1 DINING / LBRARY 16 \$65 \$9,793 BUILDING #475D 43 \$105 \$37,748 <	ECO BUILDING NAME ENERGY SAVINGS ENERGY SAVINGS CONSTRUCTION COST* TOTAL PROJECT COST* REDUCE INFILTRATION BUILDING #463 (\$) COST* COST* BUILDING #463 12 \$49 \$10,617 \$11,254 BUILDING #465 12 \$49 \$10,617 \$11,254 BUILDING #465 12 \$49 \$10,617 \$11,254 A1 DUTBOE BARBER SHOP 9 \$42 \$5,549 \$5,882 A1 INSIDE BARBER SHOP 256 \$1,061 \$61,405 \$65,089 A1 CARPENTRY SHOP 1 \$8 \$18,112 \$19,199 A1 PRINT SHOP / COLLEGE 62 \$265 \$22,5015 \$26,516 BUILDING #475 12 \$54 \$12,250 \$12,965 BUILDING #475 12 \$54 \$12,250 \$12,965 BUILDING #475B 16 \$65 \$9,733 \$10,074 BUILDING #475B 16 \$465 \$9,733 \$10,074 BUILDING #	ECO BUILDING NAME ENERGY SAVINGS ENERGY SAVINGS CONSTRUCTION COST TOTAL PROJECT SIMPLE PAYBACK COST REDUCE INFILTRATION BUILDING 4463 (S) COST CO

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ALL ECO'S INVESTIGATED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)		TOTAL PROJECT COST⁺	SIMPLE PAYBACK YEARS	SIR
VESTIBU	JLES						
A5	BUILDING #463 SOUTH GATE / VISITORS	12	\$49	\$88,238	\$93,532	1807.08	0.0
SOLARY	NINDOW SHADING						
JOLAN	BUILDING #450					Γ	
A6	MENTAL HYGIENE	80	\$498	\$2,001	\$2,121	7.84	1.6
	BUILDING #463						
A6	SOUTH GATE / VISITORS	-17	(\$53)	\$2,056	\$2,179	-73.68	-0.3
40	BUILDING #464	44	(406)	¢1 700	¢1 000	505.00	
AO	BUILDING #472	- 1 1	(φ20)	φ1,702	φ1,009	-590.00	-0.2
A6	PRINT SHOP / COLLEGE	18	\$74	\$835	\$885	37,41	0.3
	BUILDING #473						
A6	CLASSIFICATION	-11	\$11	\$2,565	\$2,719	85.80	-0.0
	BUILDING #475A		• • • •				
A6		32	\$406	\$8,020	\$8,501	20.22	0.5
46	DINING / LIBRARY	e e	\$7A	¢9 774	\$2 040	37 12	0.0
	BUILDING #475H	0		φ <u>ζ</u> ,174	φζιστυ	31.12	0.3
A6	MSA / D&A BOARD / TDS	5	\$60	\$2,610	\$2,767	42.26	0.2
EXTERIC	OR WALL INSULATION						
	BUILDING #472						
A7	PRINT SHOP / COLLEGE	229	\$1,507	\$57,916	\$61,391	54.83	· 0.2
	BUILDING #475C				• • • • • • • •		•
<u> </u>	HSG. UNIT / RECEPTION	154	\$628	\$158,675	\$168,196	253.55	0.0
ARCHITE	ECTURAL REPAIRS						
	BUILDING #463					ſ	
A9	SOUTH GATE / VISITORS			\$424	\$449		
40	BUILDING #465			64 074	A4 774		
<u>A9</u>	RUIL DING #466			\$1,6/1	\$1,771		
A9	CARPENTRY SHOP			\$582	\$617		
	BUILDING #472		~	QUUL			
A9	PRINT SHOP / COLLEGE			\$1,219	\$1,292		•
	BUILDING #473						
A9	RUU DING #475			\$2,132	\$2,260		
49	BOTUNDA			\$12 727	\$14 551		
	BUILDING #475A			ψι0,727	φ(- ,551		
A9	INVESTIGATION			\$1,221	\$1,294		
	BUILDING #475E						
<u>A9</u>	IDINING / LAUNDRY / GYM			\$50,302	\$53,320	I	
SCHEDU	LE AIR HANDLING EQUIPM	ENT					
	BUILDING #463						
<u>M1</u>	SOUTH GATE / VISITORS	10	\$51	\$464	\$492	9.32	0.9
144	BUILDING #464						
	BUILDING #465	45	\$396	\$8,731	\$9,255	21.85	0.4
M1	INSIDE BARBER SHOP	280	\$891	\$9,408	\$9,972	10.57	1.0
		<u></u>					
	IBUILDING #463						
M2	SOUTH GATE / VISITORS		\$2	\$1 450	\$1 547	100 00	0.0
	BUILDING #464	v		ψ1, 1 39		+00.00	0.0
M2	OUTSIDE BARBER SHOP	13	\$156	\$1,333	\$1,413	8.85	0.9
	BUILDING #473						
			A				

* TOTAL PROJECT COST IS CONSTRUCTION COST + 6% SIOH

ALL ECO'S INVESTIGATED

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$\langle \rangle$	ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YB	ENERGY SAVINGS (\$)		TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
	SERVICE	STEAM PIPING AND TRAP	S		0001			
	МЗ	OWNER TESTING	1,510	\$6,161	\$15,738	\$16,682	2.56	4.55
ĺ	MЗ	OUTSIDE TESTING	1,510	\$6,161	\$16,150	\$17,119	2.63	4.44
	EXHAUST	HEAT RECOVERY						
	M5	Q-DOT SYSTEM	453	\$2,130	\$12,178	\$12,909	6.66	1.76
	M5	Z-DUCT SYSTEM	294	\$1,568	\$12,795	\$13,563	10.81	1.08
	M5		301	\$953	\$15,352	\$16,273	12.81	0.92
1	INSULAT						r	
	M6	NOT COST EFFECTIVE						
ł	CENTRAL	<u>PLANT COOLING</u>	1					
	M10	USDB FACILITY	220	\$2,737	\$444,542	\$471,215	162.99	0.05
	CASTLE	AIR SYSTEM REPAIR					· · · · · · · · · · · · · · · · · · ·	
	M11	HSG. UNIT / RECEPTION	273	\$1,458	\$1,678	\$1,779	1.51	7.72
	M11	HSG. UNIT / 4-BASE	277	\$1,474	\$1,678	\$1,779	1.49	7.83
	M11	HSG. UNIT	307	\$1,641	\$1,678	\$1,779	1.34	8.68
	M11	HSG. UNIT	247	\$1,323	\$1,678	\$1,779	1.67	6.99
	REDUCE	STEAM DISTRIBUTION PR	ESSURE				·	
	M12	USDB FACILITY	605	\$2,470	\$9,369	\$9,931	3.81	3.06
	CONDEN	SATE RETURN SYSTEM SE		· · · · · · · · · · · · · · · · · · ·				
	M14	ALL BUILDINGS IN THE USDB FACILITY	1,687	\$6,883	\$35,958	\$38,115	5.24	2.23
_		LANT MODIFICATIONS						
	M15	ECONOMIZER HEAT RECOVERY	280	\$1,142	\$22,852	\$24,223	20.08	0.58
	M15	OXYGEN TRIM CONTROLS	3,397	\$13,860	\$36,865	\$39,077	2.67	4.37
-	CONVERT	FROM STEAM TO HOT W	ATER					
	M24	ALL BUILDINGS IN THE USDB FACILITY	14,464	\$52,024	\$634,367	\$672,429	12.24	1.00
_	CONVERT	FROM STEAM TO COGEN	ERATION					_
	M25	ALL BUILDINGS IN THE USDB FACILITY		\$58,138	\$1,200,000	\$1,272,000	21.00	



ALL ECO'S INVESTIGATED

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	ECO	BUILDING NAME	ENERGY SAVINGS	ENERGY SAVINGS		TOTAL PROJECT	SIMPLE PAYBACK	SIR					
	REDUCE	HOT WATER TEMPERATU	RE	(Ψ)		0001							
	M26	BUILDING #475 ROTUNDA	23	\$92	\$0	\$0	IMMEDIATELY						
	M26	CASTLE BUILDINGS 475C, 475D, 475F, 475G	51	\$210	\$0	\$0	IMMEDIATELY						
	M26	BUILDING #475E DINING / LAUNDRY / GYM	33	\$134	\$0	\$0	IMMEDIATELY						
	M26 TUNNELS 73 \$299 \$0 \$0 IMMEDIATELY												
	DECENTRALIZE HOT WATER SYSTEM												
	M29	BLDGS. 450, 463, 464, 466, 467, 468, 472, & 473	243	\$1,296	\$19,599	\$20,775	19.85	0.59					
	DOMESTIC WATER PIPE INSULATION												
	M30	CASTLE BUILDING	147	\$787	\$1,365	\$1,447	2.28	5.11					
	M30	PIPE TUNNELS	55	\$293	\$454	\$481	2.03	5.75					
	HEAT RECOVERY FOR LAUNDRY												
	M31	WASH WATER HEAT RECOVERY	3,871	\$15,742	\$43,829	\$46,459	2.79	4.18					
•	M31	HEAT RECOVERY	2,748	\$10,597	\$111,688	\$118,389	10.58	1.13					
	WATER HEATING HEAT PUMPS												
-	M39	MENTALHYGIENE	9	\$117	\$73,293	\$77,691	656.70	0.01					
	<u>M39</u>	SOUTH GATE / VISITORS	1	\$106	\$53,565	\$56,779	521.87	0.02					
	M39	OUTSIDE BARBER SHOP	16	\$163	\$59,685	\$63,266	34.46	0.34					
	M39	INSIDE BARBER SHOP	307	\$1,342	\$39,012	\$41,353	29.11	0.39					
	<u>M</u> 39	PRINT SHOP / COLLEGE	166	\$851	\$159,692	\$169,274	189.65	0.06					
	M39	CLASSIFICATION	17	\$212	\$86,261	\$91,437	410.25	0.02					
	<u>M39</u>	INVESTIGATION	20	\$249	\$97,188	\$103,019	391.68	0.02					
	M39	DINING / LIBRARY	12	\$154	\$61,228	\$64,902	412.37	0.02					
	M39	MSA / D&A BOARD / TDS	9	\$115	\$46,915	\$49,730	420.35	0.02					
1	LIGHTING				······································								
	E1	CONFERENCE ROOM	3	\$34	\$201	\$213	5.90	1.90					
	E1	CONFERENCE ROOM	1	\$17	\$201	\$213	11.80	0.90					
	E1	CHAPEL	3	\$43	\$201	\$213	4.70	2.40					
	E1	CONFERENCE ROOM	1	\$13	\$201	\$213	15.70	0.70					
	E1	CHAPEL	3	\$40	\$201	\$213	5.00	2.20					
	E1	CHAPEL	2	\$21	\$201	\$213	9.50	1.20					



ALL ECO'S INVESTIGATED

	ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)		TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
_	ENERGY	EFFICIENT LIGHTING SYS	TEMS					
	E2	BUILDING #475A	8	\$100	\$124	\$131	1.24	9.00
	ENERGY	EFFICIENT MOTORS						
	E3	ALL BUILDINGS IN THE	248	\$3,085	\$20,929	\$22,185	6.80	1.60



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ALL ECO'S RECOMMENDED

Г		BUILDING	ENERGY	ENERGY	CONSTRUCTION		SIMPLE PAYBACK	SIR
\frown	ECO	NAME	SAVINGS	SAVINGS	COST	COST	YEARS	
	, ,	1	MBIUS/YR		00011			
ŕ	ATTICIN						= = 4	2 57
	43	OUTSIDE BABBER SHOP	106	\$583	\$3,215	\$3,408	5.54	2.07
ł		BUILDING #472				00 504	11 70**	1 19
	43	PRINT SHOP / COLLEGE	34	<u>\$194</u>	\$2.438	\$2,584	11.72	
ł		BUILDING #475				¢ 4 06 0	7 96	2.03
1	A3	ROTUNDA	142	\$578	\$4,592	\$4,600	7.591	
•								
_	DOCK DO	OOR REPLACEMENT			r	Γ		
		BUILDING #470	17	\$6Q	\$870	\$922	12.65**	1.28
L	A4	POPE HALL / VOC SHOP	1/1					
		WINDOW SHADING						
ſ	SOLAH	RUUDING #450					5 00	2 06
	16	MENTAL HYGIENE	80	\$498	\$2,001	\$2,121	5.00	2.30
L	A0	INCITAL IT GIERE						
	SCHEDU	LE AIR HANDLING EQUIPM	IENT			r		
[00	BUILDING #465			00.400	\$0.072	10 57**	1.03
	M1	INSIDE BARBER SHOP	280	\$891	\$9,408	39.972		
	SERVICE	E STEAM PIPING AND TRAF	<u>s</u>	·····		[
			1 510	\$6.161	\$15,738	\$16,682	2.56	4.55
	<u>M3</u>	OWNER TESTING	1,510					
.		OUTSIDE TESTING	1 510	\$6,161	\$16,150	\$17,119	2.63	4.44
1	<u>M3</u>		<u>, ,,,,,</u>					•
		• .						
	EXHAUS	T HEAT RECOVERY						
					¢10.170	\$12 009	6.66	1.76
<u>، ج</u>	<u>M5</u>	Q-DOT SYSTEM	453	\$2,130	\$12,170			
1.5				61 500	\$12 795	\$13,563	10.81**	1.08
	<u>M5</u>	Z-DUCT SYSTEM	294	\$1,508				
•	CASTLE		1	T				7 70
		BUILDING #4750	273	\$1,458	\$1,678	\$1,779	1.51	1.12
	<u>MI_I</u>	BUILDING #475D	<u>L/U</u>				1.40	7 83
	MIT	HSG LINIT / 4-BASE	277	\$1,474	\$1,678	\$1,779	1.49	. 1.00
		BUILDING #475F				A 770	1 34	8 68
	M11	HSG. UNIT	307	\$1,641	\$1,678	\$1,779	1.04	
		BUILDING #475G			e1 670	\$1 770	1.67	6.99
	M11	HSG. UNIT	247	7 <u>\$1,32</u> 3	\$1,678	<u> </u>		
	REDUC	E STEAM DISTRIBUTION PL	RESSURE	T	1	Т		
		ALL BUILDINGS IN THE	605	\$2 470	\$9.369	\$9,931	3.81	3.06
	M12		003	92,470				
	00105	NO ATE DETLION SVETEM S	FRVICE					
	CONDE	ALL BUILDINGS IN THE		T	T	T		0.00
	MIA	USDB FACILITY	1.687	7 \$6,883	\$35,958	3 \$38,115	5.24	L2.23
	<u>w</u>	100001/10/01/11						
	BOILEF	PLANT MODIFICATIONS				- <u>r-</u>		
		OXYGEN TRIM				\$30.077	2.67	4.37
	M15	CONTROLS	3,39	7 \$13,860	300,800	<u> </u>		

*TOTAL PROJECT COST IS CONSTRUCTION COST + 6% SIOH



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ALL ECO'S RECOMMENDED

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		ENERGY	ENERGY		TOTAL	SIMPLE	
-	BUILDING	SAVINGS	SAVINGS	CONSTRUCTION	PROJECT	PAYBACK	SIR
ECO	NAME	SAVINGS		COST	COST	YEARS	
L		MBIUSIT	(\\$/	0001			
REDUCE	HOT WATER TEMPERATU	RE				<u>-</u>	
	BUILDING #475				¢0.		
M26	ROTUNDA	23	\$92	\$0	50	INIVIEDIAICLI	
	CASTLE BUILDINGS				¢0	MANEDIATELY	
M26	475C, 475D, 475F, 475G	51	\$210				
	BUILDING #475E				\$0		
M26	DINING / LAUNDRY / GYM	33	\$134	<u>\$0</u>		INVIA CONTRACT	
		70	\$200	\$0	\$0	IMMEDIATELY	
M26	TUNNELS	/3	2293	ψυ			
DONCOT	TO WATER BIRE INSUL ATIC	NN.					
LOWE21	IC WATER FIFE INSOLATIO						5 4 4
M30	CASTLE BUILDING	147	\$787	\$1,365	\$1,447	2.28	5.11
- 1000						0.00	5 75
M30	PIPE TUNNELS	55	\$293	\$454	\$481	2.03	5.75
HEAT RE	COVERY FOR LAUNDRY				r <u> </u>	1	
	WASH WATER			***	\$46.450	2 79	4.18
M31	HEAT RECOVERY	3,871	\$15,742	\$43,829	340,439	2.70	
	DRYER EXHAUST			6111 600	\$118 389	10.58**	1.13
M31	HEAT RECOVERY	2,748	\$10,597	\$111,000	<u> </u>		
			1	· · · · · · · · · · · · · · · · · · ·			
	BUILDING #450	2	\$34	\$201	· \$213	5.90	. 1.90
E1		<u>_</u>	ψυ+				
E1		3	\$43	\$201	\$213	4.70	2.40
<u>-</u>		<u> </u>	1				
E1		3	\$40	\$201	\$213	5.00	2.20
	BUILDING #475H	[©]					1 00
E1	CHAPEL	2	\$21	\$201	\$213	9.50	1.20
	1. T						
ENERGY	EFFICIENT LIGHTING SYS	TEMS			·	1	
	BUILDING #475A				\$101	1 24	9.00
E2	INVESTIGATION	8	1 \$100	\$124	<u> </u>	1	
ENERGY	EFFICIENT MOTORS	T		1	1	T	
50	ALL BUILDINGS IN THE	040	\$3.005	. \$20.929	\$22,185	6.80	1.60
<u> </u>		248	φ <u>υ,060</u>	4.0,020			

*TOTAL PROJECT COST IS CONSTRUCTION COST + 6% SIOH



ALL ECO'S REJECTED



ECO	BUILDING NAME	ENERGY SAVINGS	ENERGÝ SAVINGS	CONSTRUCTION	TOTAL PROJECT	SIMPLE PAYBACK	SIR
`		MBTU'S/YR	(\$)	COST	COST	TEARS	<u></u>
EDUCE	INFILTRATION						
	BUILDING #463						
_ A1	SOUTH GATE / VISITORS	12	\$49	\$10,617	\$11,254	217.43	0.0
	BUILDING #464		¢ 40	#5 540	¢5 000	102 72	0.1
<u>AI</u>	DUISIDE BARBER SHOP	9	\$42	\$0,049	\$0,66 <u>2</u>	123.73	0.1
Δ1	INSIDE BARBER SHOP	256	\$1.061	\$61.405	\$65.089	58,08	0.2
	BUILDING #466	230	ψ1,001	ψ01,400			
A1	CARPENTRY SHOP	1	\$8	\$18.112	\$19,199	4544.00	0.00
	BUILDING #472						
A1	PRINT SHOP / COLLEGE	62	\$265	\$25,015	\$26,516	96.18	0.1
	BUILDING #473						
A1	CLASSIFICATION	12	\$54	\$12,250	\$12,985	215.67	0.07
	BUILDING #475						-
<u>A1</u>	ROTUNDA	15	\$59	\$7,865	\$8,337	129.39	0.12
	BUILDING #475A				* • • • • • • • •	00.01	0.6
<u>A1</u>		93	\$399	\$9,504	\$10,074	23.61	0.60
	BUILDING #4758	40	#CT	¢0.702	¢10 201	151 20	0.1-
AI	BUILDING #4750	16	\$65	\$9,793	\$10,381	151.20	0.1
A1	HSG LINIT / RECEPTION	40	\$171	\$31.812	\$33,721	186.69	0.09
<u></u>	IBUILDING #475D		Ψι/Ι	401,01E			
A1	HSG. UNIT / 4-BASE	48	\$195	\$37.748	\$40,013	193.27	0.08
	BUILDING #475E			•		-	
A1	DINING / LAUNDRY / GYM	53	\$146	\$42,102	\$44,628	283.56	0.07
	BUILDING #475F						<i>.</i>
_A1	HSG. UNIT	89	\$365	\$37,990	\$40,269	105.02	0.15
• •	BUILDING #475G		* ·		60 4 0 - 0	100 54	0.00
<u>A1</u>	HSG. UNI	41	\$169	\$32,708	\$34,670	196.54	0.08
	IBUILDING #475H		* ~	A7 500	¢0.017	0.0 50	0.1
AL	IMISA / D&A BOARD / IDS	20	. \$85	\$7,563	38,017	92.50	0.1

WINDOW REPLACEMENT

A2	BUILDING #450 MENTAL HYGIENE	104	\$455	\$34,048	\$36,091	74.60	0.21
A2	BUILDING #465 INSIDE BARBER SHOP	217	\$892	\$369,241	\$391,395	414.93	0.04
A2	BUILDING #475 ROTUNDA	78	\$317	\$104,902	\$111,196	331.03	0.05
A2	BUILDING #475C HSG. UNIT / RECEPTION	161	\$658	\$208,538	\$221,050	318.52	0.05
A2	BUILDING #475D HSG. UNIT / 4-BASE	237	\$967	\$244,911	\$259,606	254.16	0.06
A2	BUILDING #475F HSG. UNIT	186	\$761	\$244,911	\$259,606	323.81	0.05
A2	BUILDING #475G HSG. UNIT / FEM HSG	164	\$671	\$208,538	\$221,050	312.81	0.05

ATTIC INSULATION

	BUILDING #475E						
A3	DINING / LAUNDRY / GYM	40	\$169	\$30,487	\$32,316	187.69	0.09





ALL ECO'S REJECTED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)		TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR					
VESTIBU	LES											
A5	BUILDING #463 SOUTH GATE / VISITORS	12	\$49	\$88,238	\$93,532	1807.08	0.01					
SOLAR WINDOW SHADING												
A6	BUILDING #463	-17	(\$53)	\$2.056	\$2 179	-73.68	-0.37					
A6	BUILDING #464 OUTSIDE BARBER SHOP	-11	(\$26)	\$1,782	\$1,889	-596.00	-0.20					
A6	BUILDING #472 PRINT SHOP / COLLEGE	18	\$74	\$835	\$885	37.41	0.30					
A6	BUILDING #473 CLASSIFICATION	-11	\$11	\$2,565	\$2,719	85.80	-0.03					
A6	BUILDING #475A	32	\$406	\$8,020	\$8,501	20.22	0.55					
A6	BUILDING #475B DINING / LIBBABY	6	\$74	\$2.774	\$2,940	37.12	0.30					
A6	BUILDING #475H MSA / D&A BOARD / TDS	5	\$60	\$2,610	\$2,767	42.26	0.26					
EXTERIOR WALL INSULATION												
A7	BUILDING #472 PRINT SHOP / COLLEGE	229	\$1,507	\$57,916	\$61,391	54.83	0.28					
A7	BUILDING #475C HSG. UNIT / RECEPTION	154	\$628	\$158,675	\$168,196	253.55	0.06					
ARCHITE	CTURAL REPAIRS											
A9	BUILDING #463 SOUTH GATE / VISITORS			\$424	\$449							
A9	BUILDING #465 INSIDE BARBER SHOP			\$1,671	\$1,771							
A9	BUILDING #466 CARPENTRY SHOP			\$582	\$617							
A9	BUILDING #472 PRINT SHOP / COLLEGE			\$1,219	\$1,292							
A9	BUILDING #473 CLASSIFICATION			\$2,132	\$2,260							
A9	BUILDING #475 ROTUNDA			\$13,727	\$14,551							
A9	BUILDING #475A INVESTIGATION			\$1,221	\$1,294							
A9	BUILDING #475E DINING / LAUNDRY / GYM			\$50,302	\$53,320							
SCHEDU	LE AIR HANDLING EQUIPM	IENT		F 5								
M1	BUILDING #463 SOUTH GATE / VISITORS	10	\$51	\$464	\$492	9.32	0.93					
M1	BUILDING #464 OUTSIDE BARBER SHOP	45	\$396	\$8.731	\$9,255	21.85	0.42					
DRY-BUL		LS		• <u></u>								
M2	BUILDING #463 SOUTH GATE / VISITORS	0	\$3	\$1.459	\$1.547	488.00	0.02					
M2	BUILDING #464 OUTSIDE BARBER SHOP	13	\$156	\$1,333	\$1.413	8.85	0.97					
M2	BUILDING #473	1	\$7	\$1,333	\$1,413	191.00	0.05					
L			ι <u>Ψ</u>		······································							

EXHAUST HEAT RECOVERY

	1	1					
M5	COIL LOOP	301	\$953	\$15,352	\$16,273	12.81	0.92

ALL ECO'S REJECTED

BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)		TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
E DUCTWORK						
THIS ECO IS NOT						
NOT COST EFFECTIVE						
ALL BUILDINGS IN THE					ĭ	
	220	\$2 737	\$444 542	\$471 215	162,99	0.05
	220	φ2,707	<u>ιφ++,υ+2 ι</u>	Ψ+Υ 1,210	102.00	
PLANT MODIFICATIONS					T	
ECONOMIZER						
HEAT RECOVERY	280	\$1,142	\$22,852	\$24,223	20.08	0.58
	ATED					
		<u></u>			I	
USDB FACILITY	14 464	\$52 024	\$634,367	\$672.429	12.24	1.00
		40E,0E4				
T FROM STEAM TO COGEN	NERATION					
ALL BUILDINGS IN THE						
USDB FACILITY		\$58,138	\$1,200,000	\$1,272,000	21.00	
ALIZE HOT WATER SYST	EM				I	
DLUGS. 450, 463, 464,		#4 000	610 F00	400 77F	10.05	0 50
1400, 407, 408, 472, & 473	243	\$1,296	\$19,599	\$20,775	19.60	0.58
						•
IBUILDING #450	I	•				<u></u>
MENTALHYGIENE	9	\$117	\$73.293	\$77.691	656.70	0.01
BUILDING #463		<u></u>	<i></i>			
SOUTH GATE / VISITORS	1	\$106	\$53,565	\$56,779	521.87	0.02
BUILDING #464						
OUTSIDE BARBER SHOP	16	\$163	\$59,685	\$63,266	34.46	0.34
BUILDING #465						
INSIDE BARBER SHOP	307	\$1,342	\$39,012	\$41,353	29.11	0.39
BUILDING #472					100.07	
PRINT SHOP / COLLEGE	166	\$851	\$159,692	\$169,274	189.65	0.06
BUILDING #473		AA A	600 001	#01 407	410.05	0.00
	17	\$212	\$86,261	\$91,437	410.25	0.02
IDUILUING #475A		\$240	\$07 100	\$102.010	301 69	0.02
BUILDING #4758	20		عم ر, 188	a103,019	391.00	0.02
DINING / LIBBABY	10	\$154	\$61 228	\$64,902	412.37	0.02
BUILDING #475H	12	ψιυ ν	ψ01,220	\$07,00E		
			l	A 1 A - A A	100.05	0.00
	E DUCTWORK THIS ECO IS NOT NOT COST EFFECTIVE PLANT COOLING ALL BUILDINGS IN THE USDB FACILITY ANT MODIFICATIONS ECONOMIZER HEAT RECOVERY FROM STEAM TO HOT W ALL BUILDINGS IN THE USDB FACILITY FROM STEAM TO COGEN ALL BUILDINGS IN THE USDB FACILITY FROM STEAM TO COGEN ALL BUILDINGS IN THE USDB FACILITY SALIZE HOT WATER SYST BLDGS. 450, 463, 464, 466, 467, 468, 472, & 473 EATING HEAT PUMPS BUILDING #450 MENTALHYGIENE BUILDING #465 INSIDE BARBER SHOP BUILDING #465 INSIDE BARBER SHOP BUILDING #472 PRINT SHOP / COLLEGE BUILDING #475A INVESTIGATION BUILDING #475B DINING / LIBRARY BUILDING #475H	BUILDING NAME ENERGY SAVINGS MBTU'S/YR E DUCTWORK THIS ECO IS NOT NOT COST EFFECTIVE PLANT COOLING ALL BUILDINGS IN THE USDB FACILITY 220 PLANT MODIFICATIONS ECONOMIZER HEAT RECOVERY 280 FROM STEAM TO HOT WATER ALL BUILDINGS IN THE USDB FACILITY 14,464 FROM STEAM TO COGENERATION ALL BUILDINGS IN THE USDB FACILITY 14,464 FROM STEAM TO COGENERATION ALL BUILDINGS IN THE USDB FACILITY 14,464 FROM STEAM TO COGENERATION ALL BUILDINGS IN THE USDB FACILITY 14,464 FROM STEAM TO COGENERATION ALL BUILDINGS IN THE USDB FACILITY 14,464 FROM STEAM TO COGENERATION ALL BUILDINGS IN THE USDB FACILITY 14,464 FROM STEAM TO COGENERATION ALL BUILDINGS IN THE USDB FACILITY 14,464 BUILDING #450 MENTALHYGIENE 9 BUILDING #465 INSIDE BARBER SHOP 16 BUILDING #465 INSIDE BARBER SHOP 16 BUILDING #472 PRINT SHOP / COLLEGE 166 BUILDING #473 CLASSIFICATION 20 BUILDING #475B DINING / LIBRARY 12 B	BUILDING NAME ENERGY SAVINGS SAVINGS ENERGY SAVINGS E DUCTWORK SAVINGS SAVINGS THIS ECO IS NOT NOT COST EFFECTIVE (\$) PLANT COOLING ALL BUILDINGS IN THE USDB FACILITY 220 PLANT MODIFICATIONS ECONOMIZER HEAT RECOVERY 280 FROM STEAM TO HOT WATER ALL BUILDINGS IN THE USDB FACILITY 14,464 YEAR STEAM TO HOT WATER ALL BUILDINGS IN THE USDB FACILITY 14,464 SS2,024 FROM STEAM TO COGENERATION ALL BUILDINGS IN THE USDB FACILITY \$58,138 ALLZE HOT WATER SYSTEM BLDGS. 450, 463, 464, 466, 467, 468, 472, & 473 243 \$1,296 IEATING HEAT PUMPS BUILDING #463 \$106 \$117 BUILDING #463 \$1,296 \$117 BUILDING #464 \$106 \$163 BUILDING #465 1 \$106 BUILDING #465 16 \$163 BUILDING #465 307 \$1,342 BUILDING #472 166 \$851 BUILDING #473 17 \$212 BUILDING #475A 20 \$249 BUILDING #475B 12 \$154	BUILDING NAME ENERGY SAVINGS SAVINGS ENERGY SAVINGS CONSTRUCTION COST EDUCTWORK (\$) CONSTRUCTION COST THIS ECO IS NOT NOT COST EFFECTIVE	BUILDING NAME ENERGY SAVINGS MBTU'S/YR ENERGY SAVINGS (\$) CONSTRUCTION COST TOTAL PROJECT COST EDUCTWORK (\$) CONSTRUCTION COST PROJECT COST THIS ECO IS NOT NOT COST EFFECTIVE	BUILDING NAME ENERGY SAVINGS SAVINGS ENERGY CONSTRUCTION (\$) TOTAL COST SMPLE PROJECT E DUCTWORK THIS ECO IS NOT NOT COST EFFECTIVE

	BUILDING #475A		- · -	•••			0.00
El	CONFERENCE ROOM	1	\$17	\$201	\$213	11.80	0.90
	BUILDING #475E						
E1	CONFERENCE ROOM	1	\$13	\$201	\$213	15.70	0.70





			ENERGY	ENERGY	PROJECT	SIMPLE	
	PROJECT GROUP	ECO	SAVINGS	SAVINGS	COST	PAYBACK	SIR
			MBTU/YR	\$	\$	YRS	
L							
	GROUP 1						
	In House Low Cost No Cost						
470	Buildina 470	ECO-A4	17	\$69	\$922	12.65	1.28
464	Building 464	ECO-A3	106	\$583	\$3,408	5.54	2.57
475	Building 475	ECO-M26	23	\$92	\$0		
	Buildings 475C, 475D.				\$0		
	475F. and 475G	ECO-M26	51	\$210	\$0		
	Tunnels	ECO-M26	73	\$299	\$0		
	GROUP 1 TOTALS		270	\$1,253	\$4,330	6.09	1.75
	GROUP 1 FUNDING CATEGORY: L	OW COST/N	IO COST				
.							
	GROUP 2						
	Laundry Heat Recovery						
						1	
474	Wash Water Heat Recovery	ECO-M31	3,871	\$15,742	\$46,459	2.79	4.18
	GROUP 2 TOTALS		3,871	\$15,742	\$46,459	2.79	4.18
	GROUP 2 FUNDING CATEGORY: P	ECIP					
	· ·						
	GROUP 3						
	Insulate Water Piping						
	1 0						
475	Castle Building	M30	147	787	\$1,447	2.28	5.11
	Pipe Tunnels	M30	55	293	\$481	2.03	5.75
	GROUP 3 TOTALS		202	\$1,080	\$1,928	2.21	5.27
	GROUP 3 FUNDING CATEGORY: L	OW COST/N	IO COST				
	GROUP 4						
	Power Plant						
1							
474	Outside Testing - Steam Traps	MЗ	1,510	\$6,161	\$17,119	2.63	4.44
474	Reduce Steam Pressure	M12	605	\$2,470	\$9,931	3.81	3.06
474	Condensate Return System	M14	1,687	\$6,883	\$38,115	5.24	2.23
474	Oxygen Trim Controls	M15	3,397	\$13,860	\$39,077	2.67	4.37
	GROUP 4 TOTALS		7,199	\$29,374	\$104,242	3.36	3.47
	GROUP 4 FUNDING CATEGORY: C	OSD PIF					



5							SIMPLE	
				ENERGY	ENERGI	COST	DAVBACK	SIR
		PROJECT GROUP	ECO	SAVINGS	SAVINGS		VDe	0
				MBTU/YR	\$\$	5		
							I	
ſ		GROUP 5						
		Building 475 Repairs						
								0.00
	475	Attic Insulation - Rotunda	ECO-A3	142	\$578	\$4,868	7.96	2.03
	475	Exhaust Heat Recovery	ECO-M5	453	\$2,130	\$12,909	6.66	1.76
	475C	Air System Repair	ECO-M11	273	\$1,458	\$1,779	1.51	7.72
	475D	Air System Repair	ECO-M11	277	\$1,474	\$1,779	1.49	7,83
	475E	Air System Repair	ECO-M11	307	\$1,641	\$1,779	1.34	8.68
	4750	Air System Benair	FCO-M11	247	\$1,323	\$1,779	1.67	6.99
	4750	Lighting Levels - Chanel	FCO-F1	3	\$43	\$213	4.70	2.40
	4758	Lighting Levels - Onaper	ECO-E1	3	\$40	\$213	5.00	2.20
	4/30	Lighting Levels	ECO-E1	2	\$21	\$213	9.50	1.20
	4/50	Lighting Levels	ECO.E2	8	\$100	\$131	1.24	9.00
	4/5A		L00-L2	1 715	\$8,808	\$25,663	3.40	3.41
		GROUP 5 TUTALS		<u></u>				
l	.	GROUP 5 FUNDING CATEGORT.	- <u>EOIF</u>	•			•	
1		CPOUR 6	1	Γ				
	-	Building 450 Bapairs						
ł		Building 450 Repairs						
		O to Mindaw Chading	ECO AG	36	\$256	\$2,121	7.84	1.66
1	450	Solar Window Shading		3	\$34	\$213	5.90	1.90
1	450	Lighting Levels	<u> </u>	20	\$290	\$2,334	7.58	1.27
		GROUP 6 TOTALS			φ230	<u></u>		
1		GROUP 6 FUNDING CATEGORT.		10 0001				
1		000107	<u>. Г</u>	1				
		Energy Efficient Motors					1	
				240	\$3.085	\$22 185	6.81	1.64
		All Buildings in the USDB	<u> ECO-E3</u>	240	\$3.085	\$22 185	6.81	1.64
		GHOUP 7 TOTALS		240	- 40,000	<u> </u>		
		1CUCIED 7 ELINEVING COLEGORY 1	שנאעד				and the second	





ENERGY AND COST SAVINGS

		ENERGY	ENERGY
		SAVINGS	SAVINGS
		MBTU/YR	\$/YR
GROUP 1	IN HOUSE LOW COST/NO COST	270	\$1,253
GROUP 2	LAUNDRY HEAT RECOVERY	3,871	\$15,742
GROUP 3	INSULATE DOM. WATER PIPE	202	\$1,080
GROUP 4	POWER PLANT	7,199	\$29,374
GROUP 5	BUILDING 475 REPAIRS	1,715	\$8,808
GROUP 6	BUILDING 450 REPAIRS	39	\$290
GROUP 7	ENERGY EFFICIENT MOTORS	248	\$3,085

TOTAL POTENTIAL ENERGY AND COST SAVINGS

TOTAL		13,544	\$59,632
	•		

PERCENTAGE OF ENERGY CONSERVED

POTENTIAL ENERGY SAVINGS, MBTU	13,544
EXISTING ENERGY CONSUMPTION, MBTU	55,894
PERCENT ENERGY CONSERVED	24.2%

ENERGY USE AND COST

	ENERGY	ENERGY
	MBTU/YR	\$/YR
BEFORE ECO IMPLEMENTATION	55,894	\$323,459
AFTER ECO IMPLEMENTATION	42,350	\$263,827



GROUP 1

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PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	1					
GROUP 1						
In House Low Cost No Cost						
470 Building 470	ECO-A4	17	\$69	\$922	12.65	1.28
464 Building 464	ECO-A3	106	\$583	\$3,408	5.54	2.57
475 Building 475	ECO-M26	23	\$92	\$0		
Buildings 475C 475D				\$0	· ·	
475F, and 475G	ECO-M26	51	\$210	\$0		
Tunnels	FCO-M26	73	\$299	\$0		
GBOUR 1 TOTALS		270	\$1,253	\$4,330	6.09	1.75
GBOUR 1 FUNDING CATEGORY	OW COST/N	IO COST	<u></u>			

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GROUP 1 - PAGE 1

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ECO-A4

DOCK DOOR REPLACEMENT

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1	X in	
1		
1		

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VERGY /	ANALYSI	S WORKSI							
SHRAE N	AODIFIEI	D BIN MET	дон						
BIN TEMP	AVG. DB	BIN TEMP	BIN HOURS	EXIST Q1 U=1.28	NEW Q2 U=0.17	EXIST Q3 INFILT.	NEW Q4 INFILT.	EXIST (Q1+Q3)	NEW Q2+Q4
	TEMP	BELOW 68°F	PER YEAR	A=64	A=64	CFM= 52.98	CFM= 4.55	* (BIN HRS)	* (BIN HRS)
100/104	102		e						
95/99	97		41						
90/94	92		197						
85/89	87		436						
80/84	82		638						
75/79	77		788						
70/74	72		710						
65/69	67	-	717	81.92	10.88	57.48	4.94	99952	11341
60/64	62	9	681	491.52	65.28	344.90	29.62	569602	64627
55/59	57	11	587	901.12	119.68	632.32	54.30	900127	102129
50/54	52	16	584	1310.72	174.08	919.73	78.99	1302584	147792
45/49	47	21	539	1720.32	228.48	1207.15	103.67	1577906	179030
40/44	42	26	580	2129.92	282.88	1494.57	128.36	2102202	238517
35/39	37	31	678	2539.52	337.28	1781.98	153.04	2929979	332436
30/34	32	36	589	2949.12	391.68	2069.40	177.72	2955908	335378
25/29	27	41	347	3358.72	446.08	2356.82	202.41	1983291	225025
20/24	22	46	296	3768.32	500.48	2644.23	227.09	1898115	215361
15/19	17	51	153	4177.92	554.88	2931.65	251.77	1087764	123418
10/14	12	56	77	4587.52	609.28	3219.06	276.46	601107	68202
5/9	7	61	67	4997.12	663.68	3506.48	301.14	569741	64643
0/4	2	66	47	5406.72	718.08	3793.90	325.83	432429	49064
				A TOT			SULTA IN CV	10 010 202	
									2,156,962
									2, 100,000 16 853 745
				I O I AL YI	EANLY LUAI	J UILLENEIN	טום NI בי		>

Table A4.1

INS PR FIS	ENER STALLATION & OJECT NO. & T SCAL YEAR 199	LIFE CYCLE GY CONSERV LOCATION: F TITLE: 1496 0 D	COST ANALY ATION INVES ORT LEAVEN VISCRETE PO	SIS SUM TMENT F WORTH RTION N	IMARY PROGRAM (E - USDB RE IAME: 470A4 25 YEARS	CIP) GION NOS. 7 PREPAREI	STI	JDY: USDBAE LCCID 1.035 CENSUS: 2 CRB
1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE F. TOTAL INV	OST OST CREDIT CALC VALUE COST (ESTMENT (1E	(1A+1B+1C)X)-1E)	.9			\$ \$ \$ \$ \$ \$	870. 52. 48. 873. 0. 873.
2.	ENERGY SAVI	INGS (+) / COS TE ANNUAL S	T (-) AVINGS, UNIT	r cost 8		ED SAVINGS		
	FUEL	UNIT COS ⁻ \$/MBTU(1)	r savings Mbtu/yf	; ₹(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	-)	DISCOUNTED SAVINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$.00 \$.00 \$ 4.08 \$.00	0. . 0. . 0. 17. 0.	\$\$\$\$ \$\$ \$\$	0. 0. 69. 0.	11.16 17.19 17.12 16.15 13.92		0. 0. 0. 1114. 0.
	F. TOTAL		17.	\$	69.		\$	1114.
3.	NON ENERGY	/ SAVINGS(+) /	COST(-)					
	A. ANNUAL R (1) DISCOU (2) DISCOU	ECURRING (+/ UNT FACTOR	'-) (TABLE A) G/COST (3A	X 3A1)	11.65		\$ \$	0. 0.
	C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3Bd4)							0.
	D. PROJECT ((1) 25% M/ A IF 3D B IF 3D C IF 3C D IF 3D	NON ENERGY AX NON ENER 01 IS = OR > 30 01 IS < 3C CAL(01B IS = > 1 G(01B IS < 1 PRO	QUALIFICAT GY CALC (2F GO TO ITEM C SIR = (2F D TO ITEM 4 JECT DOES 1	ION TES 5 X .33) 1 4 5+3D1)/11 NOT QUA	T F)= \LIFY	\$ 368.	•	
4.	FIRST YEAR D	\$	69.					
5.	TOTAL NET DISCOUNTED SAVINGS (2F5+3C)							1114.
6.	DISCOUNTED (IF < 1 PROJE) SAVINGS RA ECT DOES NOT	TIO " QUALIFY)		(SIR)=(5 / 1F)= 1.28	3	
7.	SIMPLE PAYB	BACK PERIOD	(ESTIMATED)	SPB=	1F/4	12.65	5	

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CONSTRUCTION COST ESTIMATE					4/2/90		1	
PROJECT USDB ENERGY STUDY			BASIS FOR E	STIMATE				
OCATION FORT LEAVENWORTH, KS				X	CODE A CODE B	(NO DESIGN (PRELIMINAR	COMPLETED) Y DESIGN)	
ARCHITECT/ENGINEER CLARK RICHARDSON & BISP		(FINAL DESIG	iN)					
DRAWING NO.	ESTIM	ATOR	DLS		CHECKED B	Y TOL		
ECO-A4 DOCK DOOR REPLACEMENT	NO. UNITS	UNIT	PER UNIT	ATERIAL TOTAL	PER UNIT	ABOR TOTAL	TOTAL COST	
BUILDING 470					-			
DEMOLITION	1	EA			50.00	50	4	
ROLLING DOOR/HARDWARE	1	EA	745.00	745	75.00	75	\$8	
		<u> </u>						
	_							
		1	1	1	1	l	\$	



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ECO-A3

ATTIC INSULATION


ECO-A3 ECONOMIC ANALYSIS

	STEAM CON	SUMPTION		ELECTRIC (ON		
BUILDING NUMBER	BASE ENERGY (THEBMS)	ECO-A3 LOAD (THEBMS)	ENERGY SAVINGS (MBTU)	BASE LOAD (KW)	ECO-A3 LOAD (KW)	ENERGY SAVINGS (MBTU)	TOTAL SAVINGS (\$)
L	(111211110)		(110107	<u></u>	1 <u>}</u>		
463	1 577	1 379	20	83.903	82.814	4	\$127
464	2,195	1.311	88	91,802	86,441	18	\$588
472	15,515	15.241	27	234,490	232,543	7	\$194
475	13,619	12,203	142	58,399	58,386	0	\$578
475E	21 657	21,253	40	611,712	611,617	0	\$169
				<u></u>			\$1,657

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INS PR FIS AN	ENER STALLATION & OJECT NO. & T CAL YEAR 199 ALYSIS DATE:	LIFE GY C LOCA ITLE 0 03-	E CYCLE CC ONSERVAT ATION: FOF : 1496 DIS 30-90	OST ANALYSI ION INVEST IT LEAVENW CRETE POR ECONOMIC	IS SUM MENT I ORTH TION N C LIFE	IMARY PROGRAM (E - USDB RE IAME: 464A3 25 YEARS	CIP) GION NC PREI	DS. 7 PARED	ST BY:	UDY: USDBAE LCCID 1.035 CENSUS: 2 CRB
1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE F. TOTAL INV	OST REDI /ALU ESTN	N COST IT CALC (14 E COST MENT (1D-1	4+1B+1C)X.9 E)					\$\$ \$ \$ \$\$ \$ \$ \$\$	3215. 193. 177. 3227. 0. 3227.
2.	ENERGY SAVI ANALYSIS DA	NGS TE AI	(+) / COST (NNUAL SAV	(-) INGS, UNIT (COST 8		ED SAVIN	NGS		
	FUEL	U \$/	NIT COST MBTU(1)	SAVINGS MBTU/YR(2	2)	ANNUAL \$ SAVINGS(3)	DISC FAC	OUNT FOR(4)		DISCOUNTED SAVINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$	12.44 .00 .00 4.08 .00	18. 0. 88. 0.	\$ \$ \$ \$ \$	224. 0. 0. 359. 0.		11.16 17.19 17.12 16.15 13.92		2500. 0. 0. 5798. 0.
	F. TOTAL			106.	\$	583.			\$	8298.
 3.	NON ENERGY	SAV	INGS(+) / C	OST(-)						
	A. ANNUAL R (1) DISCO (2) DISCO	ECUF JNT I JNTE	RRING (+/-) FACTOR (TA D SAVING/0	ABLE A) COST (3A X	3A1)	11.65			\$ \$	0. 0.
	C. TOTAL NO	N EN	ERGY DISC	OUNTED SA	VINGS	(+) /COST(-)	(3A2+3B	d4)	\$	0.
	D. PROJECT ((1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D	NON AX N(1 IS = 1 IS ~ 01B IS 1B IS	ENERGY Q ON ENERGY = OR > 3C G < 3C CALC S = > 1 GO T S < 1 PROJE	UALIFICATIO Y CALC (2F5 O TO ITEM 4 SIR = (2F5+ FO ITEM 4 CT DOES NO	0N TES X .33) J 3D1)/1 0T QU/	T F)= ALIFY	\$	2738.		
4.	FIRST YEAR D	OLL	AR SAVING	S 2F3+3A+(3	B1D/(Y	EARS ECON	OMIC LIF	E))	\$	583.
5.	TOTAL NET D	ISCO	UNTED SAV	/INGS (2F5+3	3C)				\$	8298.
6.	DISCOUNTED (IF < 1 PROJE	SAV CT D	INGS RATIO) ∂UALIFY)		(SIR)=(5 / 1F)=	2.57		
7.	SIMPLE PAYB	ACK	PERIOD (E	STIMATED)	SPB=	1F/4		5.54		



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CONSTRUCTION COST ESTIMATE			DATE PR	EPARED	4/2/90		2 5
PROJECT				BASIS FOR E	STIMATE		
OCATION FORT LEAVENWORTH, KS				X	CODE A	(NO DESIGN ((PRELIMINAR)	COMPLETED) Y DESIGN)
ARCHITECT/ENGINEER	119				CODE C OTHER ((FINAL DESIG	N)
DRAWING NO.	.01	ESTIM	ATOR			CHECKED BY	TOL
NONE ECO-A3	QU		M	ATERIAL	L	ABOR	TOTAL
ATTIC INSULATION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL		TOTAL	
BUILDING 464							
10" BATT INSULATION	2271	SQ FT	0.70	1,590	0.15	341	\$1,930
MOBILIZATION	2271	<u>SQ FT</u>			0.10	227	\$227
	_						
······································							
<u>}</u>							
<u></u>							
SUPTOTAL				\$1,590		\$568	\$2,15
CONTINGENCY 10%			10%	\$159	10%	\$57	\$21
SUBTOTAL				\$1,749		\$625	\$2,37
WORK COMP, TAX, SOC.SEC., INS			3.50%	\$61	13.0%	\$81	\$14
DIRECT COST				\$1,810		\$706	\$2,51
OVERHEAD AND PROFIT			25%	\$452	25%	s176	\$62
SUBTOTAL		ļ		\$2,262	 	\$882	\$3,14
							\$3,14

PREVIOUS EDITION MAY BE USED



ECO-M26

REDUCE HOT WATER TEMPERATURE



		CALCULAT	ION SHEET	•			Mar-90			1	01
30	DJECT	USDB			<u> </u>		BASIS FOR	CALC	ULATION	1	
_		ENERGY S	AVINGS OP	PORTUNIT	Y SURVEY		y I	наир			
ŝ	CATION							COMPL	JTER	_	
ō	CHITECT/EN	IGINEER						CONTR	ACTOR	BID	1
2		CLARK RIC	HARDSON	& BISKUP			COMPLITE	D BY	CHEC	KED	BY
C	D MEASURE	ECO-M26						RGB			M
	TEST DATA	, BTUH LOS	S PER LINE	AL FOOT	dinas						
!	REF: Guidlir Federal Fine	ies for Saving	ation Office	of Enerav C	Conservation	and Enviro	onment				
	reveral Elle	iyy Aunimou		0. 2.10.97 0							
	Tables were	developed fr	om fig. 44 o	f the Guidlin	les for Savin	g Energy i	n Existing Bu	ildings			
	=	, -									
	Ambient Ter	nperature 6	8° F ht of bare pir	be							
	BIUH LUSS	per inteat 100	r or oare pit								
	Bare Pipe	· · · · · · · · · · · · · · · · · · ·		1400'	1000						
	Bare Pipe Pipe Sizo	180° Water	160° Water	140°' Water	120° Water						
	Bare Pipe Pipe Size	180° Water	160° Water	140° Water 55	120° Water		· .				
	Bare Pipe Pipe Size 3/4"	180° Water 85	160° Water 70	140°' Water 55	120° Water 39		· .				
	Bare Pipe Pipe Size 3/4" 1"	180° Water 85 105	160° Water 70 85	140°' Water 55 66	120° Water 39 46		· _				
	Bare Pipe Pipe Size 3/4" 1" 1-1/4"	180° Water 85 105 126	160° Water 70 85 104	140° Water 55 66 81	120° Water 39 46 57		· .				
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2"	180° Water 85 105 126 150	160° Water 70 85 104 121	140°' Water 55 66 81 95	120° Water 39 46 57 67		· .				
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2"	180° Water 85 105 126 150 171	160° Water 70 85 104 121 140	140° Water 55 66 81 95 110	120° Water 39 46 57 67 80		· •				
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2" 2-1/2"	180° Water 85 105 126 150 171 205	160° Water 70 85 104 121 140 169	140° Water 55 66 81 95 110 133	120° Water 39 46 57 67 80 94	·	· .				
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2" 2-1/2"	180° Water 85 105 126 150 171 205	160° Water 70 85 104 121 140 169	140° [°] Water 55 66 81 95 110 133	120° Water 39 46 57 67 80 94		· _				
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2" 2-1/2" Table M26-1	180° Water 85 105 126 150 171 205 a	160° Water 70 85 104 121 140 169	140° Water 55 66 81 95 110 133	120° Water 39 46 57 67 80 94						
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2" 2-1/2" Table M26-1	180° Water 85 105 126 150 171 205 a	160° Water 70 85 104 121 140 169	140° Water 55 66 81 95 110 133	120° Water 39 46 57 67 80 94						
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2" 2-1/2" Table M26-1	180° Water 85 105 126 150 171 205 a	160° Water 70 85 104 121 140 169	140° Water 55 66 81 95 110 133	120° Water 39 46 57 67 80 94						
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 2" 2-1/2" Table M26-1	180° Water 85 105 126 150 171 205 a	160° Water 70 85 104 121 140 169	140° Water 55 66 81 95 110 133	120° Water 39 46 57 67 80 94						
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2" 2-1/2" Table M26-1 Ambient Te BTUH Loss	180° Water 85 105 126 150 171 205 a mperature 6 s per lineal fo	160° Water 70 85 104 121 140 169 58° F ot of insulate	140°' Water 55 66 81 95 110 133 ed pipe	120° Water 39 46 57 67 80 94						
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2" 2-1/2" Table M26-1 Ambient Te BTUH Loss 1/2" Fibergl	180° Water 85 105 126 150 171 205 a mperature 6 s per lineal fo	160° Water 70 85 104 121 140 169 58° F ot of insulate	140° Water 55 66 81 95 110 133 ed pipe	120° Water 39 46 57 67 80 94						
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 2-1/2" Z" 2-1/2" Table M26-1 Ambient Te BTUH Loss 1/2" Fibergl Pipe Size	180° Water 85 105 126 150 171 205 a mperature 6 s per lineal fo ass Insulation 180° Water	160° Water 70 85 104 121 140 169 	140° Water 55 66 81 95 110 133 ed pipe	120° Water 39 46 57 67 80 94 94						
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2" 2-1/2" Table M26-1 Ambient Te BTUH Loss 1/2" Fibergl Pipe Size	180° Water 85 105 126 150 171 205 a mperature 6 s per lineal fo ass Insulation 180° Water	160° Water 70 85 104 121 140 169 58° F ot of insulate n 160° Water	140°' Water 55 66 81 95 110 133 ed pipe 140° Water	120° Water 39 46 57 67 80 94 94 120° Water 8						
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2" 2-1/2" Table M26-1 Ambient Te BTUH Loss 1/2" Fibergl Pipe Size 3/4"	180° Water 85 105 126 150 171 205 a mperature a mperature a 180° Water 20	160° Water 70 85 104 121 140 169 88° F ot of insulate 160° Water 15	140°' Water 55 66 81 95 110 133 ed pipe 140° Water 11	120° Water 39 46 57 67 80 94 94 120° Water 8						
	Bare Pipe Pipe Size 3/4" 1-1/4" 1-1/2" 2" 2-1/2" Table M26-1 Ambient Te BTUH Loss 1/2" Fibergl Size 3/4"	180°Water85105126150171205aamperatureaasper lineal foass Insulation180°Water2021	160° Water 70 85 104 121 140 169 08° F ot of insulate 160° Water 15 17	140°' Water 55 66 81 95 110 133 ed pipe 140° Water 11 12	120° Water 39 46 57 67 80 94 94 120° Water 8 9	•					
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 2-1/2" 2" 2-1/2" Table M26-1 Ambient Te BTUH Loss 1/2" Fibergl Pipe 3/4" 1" 1-1/4"	180° Water 85 105 126 150 171 205 a mperature 6 s per lineal fo 180° Water 20 21 26	160° Water 70 85 104 121 140 169 	140° Water 55 66 81 95 110 133 ed pipe 140° Water 11 12 16	120° Water 39 46 57 67 80 94 94 120° Water 8 9 11						
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 2-1/2" 2-1/2" Table M26-1 Ambient Te BTUH Loss 1/2" Fibergl Pipe Size 3/4" 1" 1-1/4" 1-1/4"	180° Water 85 105 126 150 171 205 a mperature a mperature a 205 a 205 a 205 20 21 26 30	160° Water 70 85 104 121 140 169 0 88° F ot of insulate n 160° Water 15 17 20 24	140° Water 55 66 81 95 110 133 ed pipe 140° Water 11 12 16 19	120° Water 39 46 57 67 80 94 94 120° Water 8 9 11 13						
	Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2" 2-1/2" Table M26-1 Ambient Te BTUH Loss 1/2" Fibergl Size 3/4" 1" 1-1/4" 1-1/4"	180° Water 85 105 126 150 171 205 a mperature a mperature a 205 a 205 20 21 26 30 36	160° Water 70 85 104 121 140 169 0 58° F ot of insulate n 160° Water 15 17 20 24 30	140° Water 55 66 81 95 110 133 ed pipe 140° Water 11 12 16 19 23	120° Water 39 46 57 67 80 94 94 120° Water 8 9 11 13 15						

		CALCULAT	ION SHEET	-			DATE Mar-90		SHEET	01	F 5
PRC	OJECT	USDB ENERGY S	AVINGS OP	PORTUNIT	Y SURVEY		BASIS FOR C	CALCU	JLATION		
-00	CATION										
ARC	CHITECT/EN		HARDSON	& BISKUP			C	OTHE	R (SPECI	FY)	
ECC	O MEASURE	ECO-M26		<u>u 5.0</u>				BY GB		ED BY	IAW
		OT1 11 1 0 0									
	TEST DATA REF: Guidlin Federal Ener Tables were Ambient Ten	BTUH LOS es for Saving gy Administr developed fin perature 6	S PER LINE g Energy in I ration Office rom fig. 44 o 8° F	AL FOOT Existing Buil of Energy C	ldings Conservatior nes for Savir	n and Enviro ng Energy in	nment n Existing Build	lings			
	TEST DATA REF: Guidlin Federal Ener Tables were Ambient Ten BTUH Loss	BTUH LOS es for Saving gy Administr developed fi nperature 6 per lineal for	S PER LINE g Energy in I ration Office rom fig. 44 o 8° F ot of bare pip	AL FOOT Existing Buil of Energy C	ldings Conservatior nes for Savir	n and Enviro ng Energy in	nment n Existing Build	lings			
	TEST DATA REF: Guidlin Federal Ener Tables were Ambient Ten BTUH Loss Bare Pipe Pipe Size	BTUH LOS es for Saving gy Administr developed fin perature 6 per lineal for Btuh loss @ 180°	S PER LINE g Energy in I ration Office rom fig. 44 0 8° F bt of bare pip Btuh loss @ 140°	AL FOOT Existing Buil of Energy C If the Guidlin De Btuh Savings	ldings Conservation hes for Savir Hours per Year	n and Enviro ng Energy in \$ Savings per L.F.	nment	lings			
	TEST DATA REF: Guidlin Federal Ener Tables were Ambient Ten BTUH Loss Bare Pipe Pipe Size 3/4"	BTUH LOS es for Saving gy Administr developed fin perature 6 per lineal foo Btuh loss @ 180° 85	S PER LINE g Energy in I ration Office rom fig. 44 o 8° F ot of bare pip Btuh loss @ 140° 55	AL FOOT Existing Buil of Energy C If the Guidlin be Btuh Savings 30	dings Conservation hes for Savir Hours per Year 4380	and Enviro ng Energy in \$ Savings per L.F. \$0.70	nment	lings			
	TEST DATA REF: Guidlin Federal Ener Tables were Ambient Ten BTUH Loss Bare Pipe Size 3/4" 1"	BTUH LOS es for Saving gy Administr developed fr perature 6 per lineal foo Btuh loss @ 180° 85 105	S PER LINE g Energy in I ration Office rom fig. 44 o 8° F ot of bare pip Btuh loss @ 140° 55 66	AL FOOT Existing Buil of Energy C f the Guidlin De Btuh Savings 30 39	dings Conservation hes for Savir Hours per Year 4380 4380	and Enviro ng Energy in \$ Savings per L.F. \$0.70 \$0.91	nment	lings			
	TEST DATA REF: Guidlin Federal Ener Tables were Ambient Ten BTUH Loss Bare Pipe Pipe Size 3/4" 1" 1-1/4"	BTUH LOS es for Saving gy Administr developed fr nperature 6 per lineal for Btuh loss @ 180° 85 105 126	S PER LINE g Energy in 1 ration Office rom fig. 44 o 8° F bt of bare pip Btuh loss @ 140° 55 66 81	AL FOOT Existing Buil of Energy C If the Guidlin De Btuh Savings 30 39 45	dings Conservation hes for Savir Hours per Year 4380 4380	and Enviro ng Energy in \$ Savings per L.F. \$0.70 \$0.91 \$1.05	nment Existing Build	lings			
	TEST DATA REF: Guidlin Federal Ener Tables were Ambient Ten BTUH Loss Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2"	BTUH LOS es for Saving gy Administr developed fin perature 6 per lineal foo Btuh loss @ 180° 85 105 126 150	S PER LINE g Energy in I ration Office rom fig. 44 o 8° F ot of bare pip Btuh loss @ 140° 55 66 81 95	AL FOOT Existing Buil of Energy C f the Guidlin De Btuh Savings 30 39 45 55	dings Conservation hes for Savin Hours per Year 4380 4380 4380 4380	and Enviro ng Energy in \$ Savings per L.F. \$0.70 \$0.91 \$1.05 \$1.29	nment Existing Build	lings			
	TEST DATA REF: Guidlin Federal Ener Tables were Ambient Ten BTUH Loss Bare Pipe Pipe Size 3/4" 1" 1-1/4" 1-1/2" 2"	BTUH LOS es for Saving gy Administr developed fr nperature 6 per lineal for Btuh loss @ 180° 85 105 126 150 171	S PER LINE g Energy in 1 ration Office rom fig. 44 o 8° F bt of bare pip Btuh loss @ 140° 55 66 81 95 110	AL FOOT Existing Buil of Energy C f the Guidlin De Btuh Savings 30 39 45 55 61	dings Conservation hes for Savir Hours per Year 4380 4380 4380 4380	and Enviro ng Energy in \$ Savings per L.F. \$0.70 \$1.05 \$1.29 \$1.43	nment	lings			

Table M26-2a

Ambient Temperature 68° F BTUH Loss per lineal foot of insulated pipe

1/2" Fiberglass Insulation

Pipe Size	Btuh loss @ 180°	Btuh loss @ 140°	Btuh Savings	Hours per Year	\$ Savings per L.F.
3/4"	20	15	5	4380	\$0.12
1"	22	17	5	4380	\$0.12
1-1/4"	26	20	6	4380	\$0.14
1-1/2"	30	24	6	4380	\$0.14
2*	36	30	6	4380	\$0.14
2-1/2"	45	35	10	4380	\$0.23

Table M26-2b

				г			DATE	SHE	ET OF
		CALGULAI					Mar-90		3 5
PRC	JECT	USDB					BASIS FOR CAI	LCULATION	l
000		ENERGY S	AVINGS OF	PORTUNIT	YSURVEY			D	
	ATION						CON	IPUTER	
RC	HITECT/EN	GINEER					CON		
~~~		CLARK RIC	HARDSON	& BISKUP			COMPLITED BY	CHE	CKED BY
CC	MEASURE	FCO-M26					RGB		MAW
	REDUCED D	OMESTIC H	OT WATER	TEMPERAT	URE				
	Tm= (Q1*T ⁻	1) +(Q2*T2	2) / (Q1+Q2	2)		Assumpti Tm =110 T1= 40°	on:		
	The temper	a water te ature of fl	(Cold Wate	er Temp.)		T2= X			
ſ	Tm (°)	T1 (°)	Q1_(Gal.)	T2 (°)	Q2 (Gal.)				
	110.00	40.00	68.18	180.00	31.82	1			
	110.00	40.00	66.67	170.00	33.33	-			
	110.00	40.00	65.00	160.00	. 35.00	4			
	110.00	40.00	63.16	150.00	36.84	4		•	
	110.00	40.00	61.11	140.00	38.89	4			
	110.00	40.00	58.82	130.00	41.18	4			
l	110.00	40.00	56.25	120.00	43.75	Ţ			
	Table M26-3								
						•			
								÷	

	С	ALCULAT	ION SHEET	•			DATE Mar-90		SHEET 5-	0F
PROJECT	U	ISDB				_,,,	BASIS FOR	CALCUL	ATION	
OCATION	Ε	NERGY S	AVINGS OP	PORTUNIT	YSURVEY		x	HAND		
									R TOR BID	
ARCHITEC	I/ENG C	LARK RIC	HARDSON	& BISKUP				OTHER	(SPECIFY	<u>)</u>
CO MEAS	URE						COMPUTEI	D BY RGB	CHECKE	MAW
TEST D REF: Gu Federal	ATA, E uidlines Energy	3TUH LOSS s for Saving y Administr	S PER LINE Energy in E ation Office	AL FOOT Existing Buil of Energy C	dings conservation	and Envirol	nment			
Length o	of pipe	estimated	from field ins	spection and	d plans.		·			
Pipe	<del></del>	Feet of	\$ Savings	Feet of	\$ Savings		\$ Savings	•.		
Size	e	Bare Pipe	per Ht.	Insulated	 €0.10	<u></u>	so			
3/4			\$0.70		\$0.12 \$0.12		<u> </u>			
	4.	100	\$1.91		\$0.12 \$0.14		\$105			
1-1/-	2"	20	\$1.00	20	\$0.14		\$29			
2"	<u> </u>		\$1.29	20	\$0.14		\$0			
			φτ.20		<u> </u>					
L				L	Energy Sav	ings =	\$134.00			
Tunnels Pipe Siz 3/4 1" 1-1/ 1-1/ 2"	s betwe e " 4" 2"	een building Feet of Bare Pipe 60 55	\$ 468, 466, 4 \$ Savings per Ft. \$0.70 \$0.91 \$1.05 \$1.29 \$1.29	67, 463, 46 Feet of Insulated 180 90 355	4, 472, 473 \$ Savings per FT. \$0.23 \$0.23 \$0.28 \$0.28 \$0.28		\$ Savings Year \$0 \$41 \$88 \$170 \$0			
					Energy Sav	vings =	\$299.00			

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CALCULATION SHEET

	CALCULATION SHEET	DATE Mar-90	SHEET OF 4 5
PROJECT	USDB ENERGY SAVINGS OPPORTUNITY SURVEY	BASIS FOR CALCU	ATION
LOCATION		X HAND COMPUT	ER
ARCHITECT/			CTOR BID (SPECIFY)
ECO MEASU	RE ECO-M26	COMPUTED BY RGB	CHECKED BY MAW

TEST DATA, BTUH LOSS PER LINEAL FOOT REF: Guidlines for Saving Energy in Existing Buildings Federal Energy Administration Office of Energy Conservation and Environment

Tables derived from Tables M26-2a and M26-2b Length of pipe estimated from field inspection and plans.

Building 475

Dullung 470					
Pipe	Feet of	\$ Savings	Feet of	\$ Savings	\$ Savings
Size	Bare Pipe	per Ft.	Insulated	per FT.	Year
3/4"		\$0.70		\$0.12	 \$0
1"		\$0.91		\$0.12	 \$0
1-1/4"	60	\$1.05		\$0.14	\$63
1-1/2"	20	\$1.29	20	\$0.14	 \$29
2"		\$1.29		\$0.14	 \$0

Energy Savings = \$92.00

#### Buildings 475C ,475D, 475F, 475G

Bananigo ire	<u>, , , , , , , , , , , , , , , , , , , </u>	<u>, ,,,,,,,,</u>			 
Pipe	Feet of	\$ Savings	Feet of	\$ Savings	\$ Savings
Size	Bare Pipe	per Ft.	Insulated	per FT.	Year
3/4"		\$0.70		\$0.23	\$0
1"		\$0.91		\$0.23	\$0
1-1/4"	200	\$1.05	0	\$0.28	\$210
1-1/2"		\$1.29		\$0.28	\$0
2"		\$1.29		\$0.28	\$0

Energy Savings = \$2

\$210.00



INS PR FIS AN	ENER STALLATION & OJECT NO. & 1 SCAL YEAR 199 IALYSIS DATE:	LIF GY C LOC, TITLE 90 12-	E CYCLE CO ONSERVAT ATION: FOR : 1496 DIS 5-90	OST ANALYS TON INVESTI RT LEAVENW CRETE POR ECONOMIC	IS SUM MENT F ORTH TION N C LIFE	MARY PROGRAM (E - USDB RE AME: GROU 15 YEARS	ECIP) GION NO IP #1 PREP	S. 7 ARED	STU I BY: C	DY: USDBAE _CCID 1.035 CENSUS: 2 RB
1.	INVESTMENT A. CONSTRUG B. SIOH C. DESIGN CO D. ENERGY C E. SALVAGE F. TOTAL INV	CTIO OST RED VALL ESTM	N COST IT CALC (1. IE COST MENT (1D-1	A+1B+1C)X.9 E)					\$\$\$\$\$	4085. 245. 225. 4100. 0. 4100.
2.	ENERGY SAV ANALYSIS DA	INGS TE A	(+) / COST NNUAL SAV	(-) 'INGS, UNIT (	COST &		ED SAVIN	GS		
	FUEL	U \$	NIT COST /MBTU(1)	SAVINGS MBTU/YR(2	2)	ANNUAL \$ SAVINGS(3)	DISC( FACT	OUNT OR(4)	D S	ISCOUNTED AVINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$\$ <del>(} (} (</del>	12.44 .00 .00 4.08 .00	18. 0. 0. 110. 0.	\$\$ \$\$ \$\$ \$\$ \$	224. 0. 0. 449. 0.		8.69 12.42 12.21 11.67 10.36		1947. 0. 0. 5240. 0.
	F. TOTAL			128.	\$	673.			\$	7187.
З.	NON ENERGY	' SAV	/INGS(+) / C	OST(-)						
	A. ANNUAL R	ECU UNT	RRING (+/-) FACTOB (T	ABLE A)		9.11			\$	0.
	(2) DISCO	UNTE	ED SAVING/	COST (3A X	3A1)				\$	0.
	C. TOTAL NO	N EN	ERGY DISC	OUNTED SA	VINGS	+) /COST(-)	(3A2+3Bd	4)	\$	0.
	D. PROJECT (1) 25% M/ A IF 3D B IF 3D C IF 3E D IF 3D	NON AX N 1 IS 1 IS 01B I 01B IS	ENERGY Q ON ENERG = OR > 3C G < 3C CALC S = > 1 GO S < 1 PROJE	UALIFICATIO Y CALC (2F5 30 TO ITEM 4 SIR = (2F5+ TO ITEM 4 CT DOES NO	N TES X .33) 3D1)/1F )T QUA	r F)= LIFY	\$	2372.		
4.	FIRST YEAR	OLL	AR SAVING	S 2F3+3A+(3I	B1D/(YI	EARS ECON	OMIC LIFE	E))	\$	673.
5.	TOTAL NET D	ISCC	UNTED SAV	VINGS (2F5+3	3C)				\$	7187.
6.	DISCOUNTED (IF < 1 PROJE	SAV	INGS RATIO	) ∂UALIFY)		(SIR)=(5 / 1F)	)=	1.75		
7.	SIMPLE PAYE	ACK	PERIOD (E	STIMATED)	SPB=	1F/4		6.09		



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Factors as A20-17 and DA Part 420-17 and DA Part 420-63 and A20-63	T – XFA, XF8, XFC Perov is the Office of the Objects.
TAANS Z REQ SERIAL Y & NUMBER SUFFIX YR MO DA OTHER FUND CITATION	SHORT JOB DESCRIPTION NUMBER SUFFIX
: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	عد 1/2 المارية من 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2
XIFIA T T T T T T T T T T T T T T T T T T T	oisit i Tanditioiviem leinitisi i i i P.0.1416141.
C DOCUMENT NUMBER SUILDING/FACILITY BUILDING/FACILITY BUILDING/FACILITY BUILDING	G/FACILITY BUILDING/FACILITY BUILDING/FACILITY BUILDING/FACILITY
TRANS Z REG SERIAL Z COE Z REG SERIAL Z COE Z REG SUFFIX NUMBER SUFFIX NUMBER NUMBER NUMBER NUMBER	R SUFFIX NUMBER SUFFIX NUMBER SUFFIX NUMBER SUFFIX BLA
1 2 3 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 24 35 35 37 33 39 40 41 42 42 23 44	45 46 47 48 49 50 51 52 52 52 54 55 56 57 58 59 60 61 52 62 64 65 66 57 58 69 70 71 72 73 74 74 75 77 78
xFE18 C 1 1 1 1 1 2 0 4 7 5 1 1 2 10 417 5 C 1 2 10 417 5 D 1 1 2 0 417 5 D	
DESCRIPTION AND JUSTIFICATION OF WORK TO BE ACCOMPLISHED	. езеянат will наррем if work is not accomplished
ace the dock door in building 470. Its poor condition and high heat	If the leaky, poorly insulated dock door in building 470 is
transmission coefficient result in high heat losses by infiltration and conduction. Add 10" of batt insulation to the attic in building 464. This	not replaced, approximately 17 million more BTU's per year will be lost by conduction and infiltration. Approximately
will result in substantial heating season energy savings. Reduce the	106 million BTU's per year will continue to be lost from
domestic hot water temperature from 185 °F to 140 °F in buildings 4/5, 475D, 475D, 475F, and 475G. This cost-free measure reduces the amount of	building 464 if the attic is not insulated. Heat Will continue to be wasted from domestic hot water piping if the
heat radiated from piping to the surroundings.	temperature is not reduced.
REQUESTER INFORMATION	PERSON TO CALL FOR ADDITIONAL INFORMATION
AME ORGANIZATION TELEPHONE NO. SIGNATURE N.	AME ORGANIZATION TELEPHONE N
FORWARD FOR APPROVAL	APPROVED FOR DESIGN SOURCE OF FUNDS
RECOMMENDED ENVIRONMENTAL INPACT ESTIMATED COST WORK TO BE FROM ACTION NO YES	
	OFACT
PPROVING AUTHORITY	
	REMARKS
APPROVAL ACTION  A   DATE   PATE   FORWARI	DED TO
AVS O SERIAL K ACTION TAKEN MO DA	ESTIMATOR
Mo 0	MO   DA   23134755126
C	
FORM 4283 EDITION OF 1 FEB 78 WILL BE USED UNTIL EXHAUSTED. GROUP 1 - PAGE 14 WHITE LOAI	IGINAL) - PROJECT FILE COPY GREEN - FORWARD TO KEYPUNCH AFTER COMPLETION OF "APPROVAL" BLOCK OF "APPROVAL" BLOCK

# **GROUP 2**

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.)			2000				
	PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YB	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
L						- 	
	GROUP 2 Laundry Heat Recovery						
	Alwash Water Heat Becovery	ECO-M31	3.871	\$15,742	\$46,459	2.79	4.18
4/4	GBOLIP 2 TOTALS		3,871	\$15,742	\$46,459	2.79	4.18
	GROUP 2 FUNDING CATEGORY:	PECIP					

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### ENERGY CONSERVATION ANALYSIS ESOS



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GROUP 2 - PAGE 1

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## HEAT RECOVERY FOR LAUNDRY





	CALCULATION SHEET	DATE Mar-90	SHEET OF
PROJECT	USDB	BASIS FOR CALCULA	TION
OCATION	ENERGY SAVINGS OPPORTUNITY SURVEY	X HAND	
J.OCATION	FORT LEAVENWORTH, KANSAS	COMPUTE	R
ARCHITECT/E	NGINEER		
500 MEACUD	CLARK RICHARDSON & BISKUP	COMPUTED BY	CHECKED BY
ECO MEASUR	ECO-M31 WASH WATER HEAT RECOVERY	BMS	MAW
	GIVEN: HOT WATER USE TEMP., °F AVERAGE COLD WATER INLET TEMPERATURE, °F GALLONS WATER/LB. OF LAUNDRY PERCENT OF WASTE WATER THAT IS HOT HOURS OF OPERATION PER WEEK ELECTRICITY COST, DOLLARS/MBTU GAS COST IN DOLLARS/MBTU BOILER SEASONAL EFFICIENCY, %	160 50 2.5 70 40 12.44 4.08 74	
	CALCULATED WASTE WATER TEMP., °F WASTE WATER TEMP USED IN ANALYSIS, °F	127 124	
,	BASED ON HEAT EXCHANGER MANUFACTURER'S PERFORMANCE DATA FOR 30 GPM UNIT:		
	SHELL SIDE TEMPERATURE, °F IN/OUT TUBE SIDE TEMPERATURE, °F IN/OUT	124 / 91 50 / 96	
	STEAM HEAT RECOVERED, MBTU/YR: GAS HEAT RECOVERED, MBTU/YR:	2,870 3,878	
	(2) 30 GPM UNITS ARE REQUIRED.		
	PUMP ENERGY CALCULATION FOR THIS ECO		
	FRESH WATER PUMP CAPACITY, GPM: FRESH WATER PUMP HEAD, FT. W: FRESH WATER PUMP EFFICIENCY, %: WASTE WATER PUMP CAPACITY, GPM: WASTE WATER PUMP HEAD, FT. W: WASTE WATER PUMP EFFICIENCY, %:	60 38 65 84 10 65	
	FRESH WATER PUMP POWER CONSUMPTION, WATTS: FRESH WATER PUMP ENERGY USE, MBTU/YEAR:	: 662 4.70	
	WASTE WATER PUMP POWER CONSUMPTION, WATTS WASTE WATER PUMP ENERGY USE, MBTU/YEAR:	:: 244 1.73	
	TOTAL PUMP ENERGY, MBTU/YR.:	6.43	
	NET ENERGY SAVINGS FOR WASH WATER H.R., MBTU	J/YR.: 3,872	
	NET ENERGY SAVINGS, \$/YR:	15,742	2

CALCULATION SHEET

INS PR FIS AN	ENER STALLATION & OJECT NO. & T SCAL YEAR 199 IALYSIS DATE:	LIFE CYCL GY CONSEF LOCATION: TITLE: 1496 00 03-27-90	E COST ANALYS VATION INVES FORT LEAVEN DISCRETE POP ECONOM	SIS SUN TMENT WORTH RTION N IC LIFE	IMARY PROGRAM (E - USDB RE IAME: ECOM 15 YEARS	ECIP) GION NOS. 131W PREPAI	7 RED E	STUI L BY: CI	DY: USDBAE CCID 1.035 CENSUS: 2
1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE ^V F. TOTAL INV	CTION COS OST CREDIT CALO VALUE COS VESTMENT (	Г С (1А+1В+1С)Х. Т 1D-1Е)	9				<del>0000000000000000000000000000000000000</del>	43829. 2630. 2411. 43983. 0. 43983.
2.	ENERGY SAV	INGS (+) / C TE ANNUAL	OST (-) SAVINGS, UNIT	COST		ED SAVING	S		
	FUEL	UNIT CC \$/MBTU(	ST SAVINGS 1) MBTU/YR	(2)	ANNUAL \$ SAVINGS(3)	DISCOL FACTO	JNT R(4)	D S	ISCOUNTED AVINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	-6. 0 0. 0 0. 3 3878. 0 0.	\$ \$ \$ \$	-75. 0. 15822. 0.	8 12 12 11 11	3.69 2.42 2.21 1.67 ).36		-652. 0. 0. 184643. 0.
	F. TOTAL		3872.	\$	15747.			\$	183991.
 3.	NON ENERGY	SAVINGS(+	-) / COST(-)						
	A. ANNUAL R (1) DISCO (2) DISCO	ECURRING UNT FACTO UNTED SAV	(+/-) R (TABLE A) ING/COST (3A )	K 3A1)	9.11			\$ \$	0. 0.
	C. TOTAL NO	N ENERGY	DISCOUNTED S	AVINGS	(+) /COST(-)	(3A2+3Bd4)	i	\$	0.
	D. PROJECT (1) 25% M/ A IF 3D B IF 3D C IF 3E D IF 3D	NON ENER( AX NON ENI 01 IS = OR > 01 IS < 3C CA 01B IS = > 1 01B IS < 1 PF	BY QUALIFICATI ERGY CALC (2F5 3C GO TO ITEM ALC SIR = (2F5 GO TO ITEM 4 ROJECT DOES N	ON TES 5 X .33 4 +3D1)/1	T ) F)= ALIFY	\$ 607	717.		
4.	FIRST YEAR D	DOLLAR SAV	/INGS 2F3+3A+(	3B1D/(Y	EARS ECON	OMIC LIFE))	l .	\$	15747.
5.	TOTAL NET D	ISCOUNTED	) SAVINGS (2F5-	⊦3C)				\$	183991.
6.	DISCOUNTED (IF < 1 PROJE	SAVINGS F	ATIO OT QUALIFY)		(SIR)=(5 / 1F	)= 4	1.18		
7.	SIMPLE PAYB	BACK PERIO	D (ESTIMATED)	SPB=	1F/4	2	2.79		

	CONSTRUCTION COST ESTIMA	TE		DATE PR	EPARED			SHEET OF
	PROJECT			L	BASIS FOR E	STIMATE		· · · · · · · · · · · · · · · · · · ·
	USDB ENERGY STUDY				x	CODE A CODE E CODE C	(NO DESIGI (PRELIMINA (FINAL DES	N COMPLETED) RY DESIGN) IGN)
	CLARK RICHARDSON & BISKU	P	COTIN	4708		OTHER	(SPECIFY)	
	DRAWING NO. NONE		ESTIM		BMS			MAW
	ECO-M31	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	COST
	WASH WATER HEAT							
		2	FA	\$9,500	\$19.000	\$1.010	\$2.020	\$21,020
	FRESH WATER PUMP (59 GPM, 50 FT, HD.)	2	EA	\$1,070	\$1,070	\$180	\$180	\$1,250
	WASTE WATER PLIMP (94 GPM, 10 FT, HD.)	1	EA	\$500	\$500	\$40	\$40	\$540
	STRATIFIED WATER STORAGE TANK	1	EA	\$6,500	\$6,500	\$355	\$355	\$6,855
	2" SCHEDULE 40 STEEL PIPING	100	1 F	\$3	\$289	\$6	\$555	\$844
							<u> </u>	
					;			
	>							
							•	
	SUBTOTAL				\$27,359		\$3,150	\$30,509
	CONTINGENCY 10%		ļ	10%	\$2,736	10%	\$315	\$3,051
	SUBTOTAL				\$30,095		\$3,465	\$33,560
	WORK COMP, TAX, SOC. SEC., INS			3.50%	\$1,053	13.0%	\$450	\$1,503
	DIRECT COST				\$31,148		\$3,915	\$35,063
	OVERHEAD AND PROFIT		ļ	25%	\$7,787	25%	\$979	\$8,766
	SUBTOTAL		ļ		\$38,935		\$4,894	\$43,829
	CONSTRUCTION COST							\$43,829
	ENG. FORM 150							

ENG. FORM 1AVC-59

PREVIOUS EDITION MAY BE USED

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i. F	INS PR FIS AN	ENERG STALLATION & LO OJECT NO. & TIT CAL YEAR 1990 ALYSIS DATE:	LIFE CYCLE CO Y CONSERVAT OCATION: FOF TLE: 1496 DIS 03-27-90	OST ANALYSIS ION INVESTM RT LEAVENWO CRETE PORT ECONOMIC	S SUMMA ENT PRO ORTH - I ION NAM LIFE 15	ARY OGRAM (E USDB REC IE: GROUI YEARS	CIP) GION NOS. P #2 PREPAF	S 7 RED BY	TUDY: USDBAE LCCID 1.035 CENSUS: 2 : CRB
	1.	INVESTMENT A. CONSTRUCT B. SIOH C. DESIGN COS D. ENERGY CR E. SALVAGE V/ F. TOTAL INVES	TION COST ST REDIT CALC (1/ ALUE COST STMENT (1D-1	4+1B+1C)X.9 E)					43829. 2630. 2411. 43983. 0. 43983.
	2.	ENERGY SAVIN ANALYSIS DATI	IGS (+) / COST E ANNUAL SAV	(-) INGS, UNIT C	OST & D	ISCOUNTE	D SAVINGS	6	
		FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	AN SA	NUAL \$ VINGS(3)	DISCOU FACTOF	INT R(4)	DISCOUNTED SAVINGS(5)
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	-6. 0. 0. 3878. 0.	\$ \$ \$ \$ \$ \$ \$	-75. 0. 0. 15822. 0.	8 12 12 11 11	.69 .42 .21 .67 .36	-652. 0. 0. 184643. 0.
}		F. TOTAL		3872.	\$	15747.		,	\$ 183991.
¢	3.	NON ENERGY S	SAVINGS(+) / C	OST(-)					
		A. ANNUAL RE (1) DISCOUI (2) DISCOUI	CURRING (+/-) NT FACTOR (T/ NTED SAVING/	ABLE A) COST (3A X (	3A1)	9.11		:	6 0. 6 0.
		C. TOTAL NON	ENERGY DISC	OUNTED SAV	'INGS(+)	/COST(-)	(3A2+3Bd4)		\$ O.
		D. PROJECT N (1) 25% MAX A IF 3D1 B IF 3D1 C IF 3D1 D IF 3D1	ON ENERGY Q X NON ENERG` IS = OR > 3C G IS < 3C CALC IB IS = > 1 GO B IS < 1 PROJE	UALIFICATION Y CALC (2F5 X O TO ITEM 4 SIR = (2F5+3 TO ITEM 4 CT DOES NO	N TEST X .33) D1)/1F)= T QUALII	- -Y	\$ 607		
	4.	FIRST YEAR DO	OLLAR SAVING	S 2F3+3A+(3B	1D/(YEA	RS ECONO	OMIC LIFE))	:	\$ 15747.
	5.	TOTAL NET DIS	SCOUNTED SAY	/INGS (2F5+3	C)			:	\$ 183991.
	6.	DISCOUNTED S (IF < 1 PROJEC	SAVINGS RATIONT OF THE SAVINGS RATION SAVINGS RATIONES NOT O	) }UALIFY)	(S	IR)=(5 / 1F)	= 4	1.18	
	7.	SIMPLE PAYBA	CK PERIOD (E	STIMATED)	SPB=1F	/4	2	2.79	





		NUMBER SUFFIX		TTY   SULDING/FACTUTY		UFFIX NUMBER SUFFIX		Ģ	nstalled, approximately ashwater will continue		L INFORMATION	2.02.0	SOURCE OF FUNDS		01860	C AUTOMATIC REIMB.	DATE			· ·			EEN - FORWARD TO KEYPUNCH AFTE: COMPLETION OF "FORWARD FC APPROLAL" BLOCK
rs, xrc Ittice of the Chiel of Engineers.		andar Jua de Juanto a ser se				X NUMBER SUFFIX NUMBER SI	29 50 51 52 52 52 55 55 55 57 58 59 60 61 52 55 54 64 60	HAT WILL HAPPEN IF WORK IS NOT ACCOMPLISHE	is heat recovery unit is not i million BTU's per year from w	wasted.	PERSON TO CALL FOR ADCITIONAL	ORGANIZAZION	APPROVED FOR DESIGN				SIGNATORE	REMARKS					ROJECT FILE COPY DRWARD TO KEYPUNCH AFTER COMPLETION 5 "APPROVAL ACTION" BLOCK
FACILITIES ENGINEERING WORK REQUEST - XFA, X orm. ise AR 420-17 and DA Pam 420-6: the proponent agency is the O			In the local set and and an enterior in the former of the former of the set o		EACILITY I BUILDING/FACILITY I BUILUING/FACILITY	SUFFIX NUMBER SUFFIX NUMBER SUFFI	28/29/30/31/32 33/34/35/35/37/38/39/40/41 /42/43/45/45/46/47/43/4	DESCAIBE W	anger in building 474, the If th Pot dirty washwater from 3,878	fresh washwater is currently to be		PHONE NO. SIGNATURE	a	WATED COST WORK TO SE FROM	аео 3 469 С IN-HOUSE FACILITIES ENGINEER		NOE0 \$ 2/112 [ TROOP		OT CECHARDES	OESIGN SSTIMATOR	19 20 21   2223 24 25   26	MATURE OF APPROVAL AUTHORITY	GROUP 2 - PAGE 7 PINK - FO
For use of this fi	DOCUMENT NUMBER   BUILDING/FACILITY   DATE		2 2 2 2 2 3 7 3 6 6 10 11 12 12 12 14 12 12 16 11 18 19 20 21 22 22 22 24 25 25 25 25 25 25 25 25 25 25 25 25 25	P10113	DOCUMENT NUMBER BUILDING/FACILITY BUILDING/	REG SERIAL Y Y NUMBER SUFFIX NUMBER	5 6 7 8 9 10 11 12 13 17 18 10 11 24 22 22 12 17 12 12 13 20 21 22 23 24 25 27	ON AND JUSTIFICATION OF WORK TO SE ACCOMPLISHED	a counterflow, helical coil heat exch	rent location of the USDB faunury factified ch heat could be recovered for preheat of ng wasted to drain.	REQUESTER INFORMATION	ORGANIZATION	UDE894 ROT DRAWADS	RECOMMENDED ENVIRCHMENTAL INPACT 5571	C APPROVAL C CNSIDERATIONS WC X	COISAPPROVAL CISCELA WC			APPROVAL ACTION		15 7 8 9 101111212112114		8 4283 EDITION OF 1 FEB 78 WILL BE USED UNTIL EXMAUSTED.

# GROUP 3

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PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
GROUP 3 Insulate Water Piping						
475 Castle Building	M30 M30	147	787 293	\$1,447 \$481	2.28 2.03	5.11 5.75
GROUP 3 TOTALS	LOW COST/	202 NO COST	\$1,080	\$1,928	2.21	_5.27

### ENERGY CONSERVATION ANALYSIS ESOS





# ECO-M30

### DOMESTIC WATER PIPE INSULATION



	CALCULATI	ON SHEET	•			DATE Mar-9	0	SHEET		2
PROJECT						BASIS FO	OR CALCI	JLATION		
	ENLINGTOP					<u>x</u>	_HAND _COMPU	ITER	_	
ARCHITECT/E			& BISKUP				_CONTR OTHE	ACTOR BIL	י איי	
ECO MEASUF	ECO-M30	ANDOON	<u>a biortor</u>			COMPUT	ED BY RGB	CHECK	ED B	Y IAW
TEST DAT	A, BTUH LOSS		AL FOOT	Idinas						
TEST DAT REF: Guid Federal Er	A, BTUH LOSS lines for Saving hergy Administra	PER LINE Energy in I ation Office	AL FOOT Existing Buil of Energy C	ldings Conservatior	and Enviro	onment				
TEST DAT REF: Guid Federal Er	A, BTUH LOSS lines for Saving hergy Administra	S PER LINE Energy in I ation Office	AL FOOT Existing Buil of Energy C	ldings Conservatior s for Saving	and Enviro	onment Existing Bu	ildings			
TEST DAT REF: Guid Federal Er Table was Ambient T Domestic I	A, BTUH LOSS lines for Saving hergy Administra developed from emperature 68 Hot Water Temp	S PER LINE Energy in I ation Office n fig. 44 of t 3° F perature 1	AL FOOT Existing Buil of Energy C he Guidline: 80°	ldings Conservatior s for Saving	n and Enviro Energy in E	onment Existing Bu	ildings			
TEST DAT REF: Guid Federal Er Table was Ambient T Domestic I	A, BTUH LOSS lines for Saving hergy Administra developed from emperature 68 Hot Water Temp	S PER LINE Energy in I ation Office n fig. 44 of t 3° F perature 11	AL FOOT Existing Buil of Energy C he Guidline: 80°	ldings Conservatior s for Saving	Energy in E	onment Existing Bu	ildings			
TEST DAT REF: Guid Federal Er Table was Ambient T Domestic I	A, BTUH LOSS lines for Saving hergy Administra developed from emperature 68 Hot Water Temp BTUH Loss Bare Pipe	S PER LINE Energy in I ation Office n fig. 44 of t 3° F perature 1 BTUH Loss Insulated	AL FOOT Existing Buil of Energy C he Guidline 80° BTUH Savings	ldings Conservatior s for Saving Hours per Year	Energy in E Savings per L.F.	onment Existing Bu	ildings	:		
TEST DAT REF: Guid Federal Er Table was Ambient T Domestic I	A, BTUH LOSS lines for Saving hergy Administra developed from emperature 68 Hot Water Temp BTUH Loss Bare Pipe 85	S PER LINE Energy in I ation Office n fig. 44 of t 3° F perature 18 BTUH Loss Insulated 19	AL FOOT Existing Buil of Energy C he Guidlines 80° BTUH Savings 66	ldings Conservatior s for Saving Hours per Year 4380	Energy in E \$ Savings per L.F. \$1.54	onment Existing Bu	ildings			

4380

4380

4380

4380

26

31

37

45

126

150

171

250

100

119

134

205

\$2.34

<u>\$2.78</u>

\$3<u>.13</u>

\$4.79



1-1/4"

1-1/2"

2"

2-1/2"

CALCULATION SHEET

	CALCULATION SHEET	DATE Mar-90	SHEE1 0F
PROJECT	USDB ENERGY SAVINGS OPPORTUNITY SURVEY	BASIS FOR CALCU	LATION
LOCATION		X HAND COMPUT	ER
ARCHITECT/I	NGINEER CLABK BICHABDSON & BISKUP	CONTRA OTHER	CTOR BID R (SPECIFY)
ECO MEASUI	RE FCO-M30	COMPUTED BY RGB	CHECKED BY MAW

TEST DATA, BTUH LOSS PER LINEAL FOOT REF: Guidlines for Saving Energy in Existing Buildings Federal Energy Administration Office of Energy Conservation and Environment

Tables derived from Tables M26-2a and M26-2b Length of pipe estimated from field inspection and plans.

Castle Buildings

Pipe Size	Feet of Bare Pipe	\$ Savings	\$ Savings Year
3/4"	80	\$1.54	\$123
1"		\$1.92	\$0
1-1/4"	260	\$2.34	\$608
1-1/2"	20	\$2.78	\$56
2"		\$3.13	\$0

Energy Savings = \$787.00

**Pipe Tunnels** 

Pipe Size	Feet of Bare Pipe	\$ Savings per Ft.	\$ Savings Year
3/4"		\$1.54	\$0
1"		\$1.92	\$0
1-1/4"	60	\$2.34	\$140
1-1/2"	55	\$2.78	\$153
2"		\$3.13	\$0

Energy Savings =

\$293.00



INS PR	ENERG TALLATION & LO OJECT NO. & TI	LIFE CYCLE CC Y CONSERVAT OCATION: FOF TLE: 1496	OST ANALYSI ION INVESTI IT LEAVENW	S SUMMA MENT PRO ORTH - L	RY )GRAM (EC JSDB REG		S. 7	STUDY LC	: USDBAE CID 1.035 CENSUS: 2
FIS AN	CAL YEAR 1990 ALYSIS DATE:	DIS 03-30-90	ECONOMIC	LIFE 15	E: ECOM3 (EARS	PREP	ARED	BY: CRB	
1.	INVESTMENT A. CONSTRUCT B. SIOH C. DESIGN COS D. ENERGY CR E. SALVAGE V/ F. TOTAL INVE	TION COST ST REDIT CALC (1/ ALUE COST STMENT (1D-1	4+1B+1C)X.9 E)					\$ \$ \$ \$ \$ \$ \$ \$	1365. 82. 75. 1370. 0. 1370.
2.	ENERGY SAVIN ANALYSIS DATI	IGS (+) / COST E ANNUAL SAV	(-) INGS, UNIT (	COST & DI	SCOUNTE	D SAVIN	GS		
	FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2	AN 2) SA	NUAL \$ VINGS(3)	DISCO FACT	OUNT OR(4)	DIS( SAV	COUNTED 'INGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	0. 0. 0. 147. 0.	\$\$ \$\$ \$\$ \$\$	0. 0. 600. 0.	 	8.69 12.42 12.21 11.67 10.36		0. 0. 7002. 0.
	F. TOTAL		147.	\$	600.			\$	7002.
 З.	NON ENERGY	SAVINGS(+) / C	OST(-)						
	A. ANNUAL RE	CURRING (+/-)	ABLE A)		9.11			\$	0.
	(2) DISCOU	NTED SAVING/	COST (3A X	3A1)				\$	0.
	C. TOTAL NON	I ENERGY DISC	OUNTED SA	VINGS(+)	/COST(-) (	3A2+3Bc	14)	\$	0.
	D. PROJECT N (1) 25% MAX A IF 3D1 B IF 3D1 C IF 3D7 D IF 3D1	ION ENERGY Q X NON ENERG' IS = OR > 3C G IS < 3C CALC 1B IS = > 1 GO B IS < 1 PROJE	UALIFICATIC Y CALC (2F5 O TO ITEM 4 SIR = (2F5+ FO ITEM 4 CT DOES NO	N TEST X .33) 3D1)/1F)= DT QUALIF	ŦΥ	\$	2311.		
4.	FIRST YEAR DO	OLLAR SAVING	S 2F3+3A+(3	B1D/(YEA	RS ECONC	MIC LIFI	Ξ))	\$	600.
5.	TOTAL NET DIS	SCOUNTED SAV	/INGS (2F5+3	BC)				\$	7002.
6.	DISCOUNTED S (IF < 1 PROJEC	SAVINGS RATIO	) IUALIFY)	(SI	R)=(5 / 1F):	-	5.11		
7.	SIMPLE PAYBA	CK PERIOD (E	STIMATED)	SPB=1F/	4		2.28		

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    INS PRO FIS	ENERG TALLATION & L DJECT NO. & TI CAL YEAR 1990	LIFE CYCLE CC GY CONSERVAT LOCATION: FOR 1TLE: 1496 0 DIS	OST ANALYSIS ION INVESTME IT LEAVENWO CRETE PORTIG	SUMMAF ENT PROC RTH - US ON NAME	RY GRAM (EC SDB REG E: ECOM3 EARS	IP) ION NOS. 0PT PREPAI	7 RED B	STUDY: LCC C SY: CRB	USDBAE ID 1.035 ENSUS: 2
AN/ 1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY CI E. SALVAGE V F. TOTAL INVE	OS-SU-90 CTION COST OST REDIT CALC (1/ VALUE COST 'ESTMENT (1D-1	4+1B+1C)X.9 E)					\$\$ <del>\$\$ \$\$ \$\$ \$</del>	454. 27. 25. 455. 0. 455.
2.	ENERGY SAVI ANALYSIS DAT	INGS (+) / COST TE ANNUAL SAV	(-) 'INGS, UNIT C(	OST & DIS	SCOUNTE	D SAVING	S		
	FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANN SAV	NUAL \$ /INGS(3)	DISCOU FACTO	JNT R(4)	DISC SAV	OUNTED
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	0. 0. 55. 0.	\$	0. 0. 224. 0.	1: 1: 1: 1: 1: 1:	8.69 2.42 2.21 1.67 0.36		0. 0. 2614. 0.
	F. TOTAL		55.	\$	224.			\$	2614.
 3.	NON ENERGY	Y SAVINGS(+) / C	OST(-)						
	A. ANNUAL R (1) DISCO	RECURRING (+/-) OUNT FACTOR (T OUNTED SAVING	ABLE A) /COST (3A X (	3A1)	9.11			\$ \$	0. 0.
	C. TOTAL NO	ON ENERGY DISC	COUNTED SAV	/INGS(+) /	COST(-) (	3A2+3Bd4	)	\$	0.
	D. PROJECT (1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D	NON ENERGY ( IAX NON ENERG D1 IS = OR > 3C ( D1 IS < 3C CALC D1B IS = > 1 GO D1B IS < 1 PROJI	QUALIFICATION Y CALC (2F5 X 30 TO ITEM 4 SIR = (2F5+3 TO ITEM 4 ECT DOES NO	N TEST X .33) ND1)/1F)= T QUALIF	·γ	\$	863.		
4.	FIRST YEAR [	DOLLAR SAVING	GS 2F3+3A+(3E	1D/(YEAF	RS ECONO	OMIC LIFE	))	\$	224.
5.	TOTAL NET D	DISCOUNTED SA	VINGS (2F5+3	C)				\$	2614.
6.	DISCOUNTED (IF < 1 PROJE	D SAVINGS RATI ECT DOES NOT	O QUALIFY)	(SI	R)=(5 / 1F)	=	5.75		
7.	SIMPLE PAYE	BACK PERIOD (E	ESTIMATED)	SPB=1F/	4		2.03		

1672 |_____ .

CONSTRUCTION COST ESTIMAT	ΓE		DATE PR	EPARED			SHEET OF
PROJECT	•		L	BASIS FOR E	STIMATE		
USDB ENERGY STUDY COCATION FORT LEAVENWORTH, KS				X	CODE A CODE B	(NO DESIGN (PRELIMINA	I COMPLETED) RY DESIGN)
RCHITECT/ENGINEER	5				CODE C OTHER	(FINAL DES (SPECIFY)	IGN)
DRAWING NO.		ESTIM	ATOR			CHECKED BY	NR A 34/
Castle Buildings	004		ГМ	<u>R.G.B.</u> ATERIAL I	l	ABOR	TOTAL
1/2" FIBERGLASS PIPE INSULATION W/ ALL SERVICE JACKET	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	COST
3/4" PIPE	80	L. F.	\$0.87	\$69.60	\$1.44	\$115.20	\$184.80
1-1/4" PIPE	260	L. F.	\$1.01	\$262.60	\$1.57	\$408.20	\$670.80
1-1/2" PIPE	20	L. F.	\$1.10	\$22.00	\$1.57	\$31.40	\$53.40
			·				
·							
			<u> </u>				
CLIPTOTAL		<u> </u>		\$354		\$555	\$909
			\$0.10	\$35	10%	\$55	\$90
SUBTOTAL				\$389		\$610	\$999
WORK COMP,TAX.SOC.SECINS			\$0.04	\$14	13.0%	\$79	\$93
DIRECT COST				\$403		\$689	\$1,092
OVERHEAD AND PROFIT			\$0.25	\$101	25%	\$172	\$273
SUBTOTAL			<u> </u>	\$504		\$861	\$1,365
							\$1,365

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PREVIOUS EDITION MAY BE USED

CONSTRUCTION COST ESTIM	ATE		DATE PR	EPARED			SHEET	OF 2
PROJECT				BASIS FOR E	STIMATE		<u></u>	
FORT LEAVENWORTH, KS				x	CODE A CODE E CODE (	A (NO DESIGN B (PRELIMINA C (FINAL DES	N COMPLE RY DESIG IGN)	ETED) iN)
CLARK RICHARDSON & BISK	(UP				OTHER	(SPECIFY)	/	
DRAWING NO.		ESTIM	ATOR	R.G.B.		CHECKED	M.A.W.	
Pipe fullitiens	QUA	NTITY	M	ATERIAL	L	ABOR	тс	TAL DST
1/2" FIBERGLASS PIPE INSULATION W/ ALL SERVICE JACKET	NO. UNITS	UNIT MEAS.						
1-1/4" PIPE	60	L. F.	\$1.01	\$60.60	\$1.57	\$94.20		\$154.80
1-1/2" PIPE	55	<u>L. F.</u>	\$1.10	\$60.50	\$1.57	\$86.35		\$146.85
								<u></u>
					<u></u>			
	-							
				· · · · ·		<u>.</u>		
$\bigcirc$			<u> </u>					
		[						
							<u> </u>	
SUBTOTAL				\$121		\$181		\$302
CONTINGENCY 10%			\$0.10	\$12	10%	\$18	<u> </u>	\$30
SUBTOTAL				\$133		\$199	<u> </u>	\$332
WORK COMP, TAX, SOC.SEC., INS		ļ	\$0.04	\$5	13.0%	\$26		\$31
DIRECT COST		<u> </u>		\$138		\$225		\$363
OVERHEAD AND PROFIT			\$0.25	\$35	25%	\$56		\$91
SUBTOTAL				\$173		\$281	1	\$454
CONSTRUCTION COST			<u> </u>	<u> </u>	l	1	<u> </u>	\$454

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1AVC-59

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	INS PR( FIS AN/	ENERC TALLATION & L DJECT NO. & T CAL YEAR 1990 ALYSIS DATE:	LIFE CYC GY CONSE LOCATION ITLE: 149 0 12-5-90	CLE CO ERVATI N: FOR 96 DISC	ST ANALYSIS ON INVESTM T LEAVENWO CRETE PORTI ECONOMIC	S SUMMA ENT PRO ORTH - ION NAM LIFE 15	ARY OGRAM (EC USDB REG 1E: GROUF YEARS	CIP) GION NOS P #3 PREPA	. 7 .RED	STUE L BY: CF	DY: USDBAE CCID 1.035 CENSUS: 2 RB
	1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE V F. TOTAL INVI	CTION CO DST REDIT CA VALUE CO ESTMENT	OST ALC (1A DST T (1D-11	.+1B+1C)X.9 Ξ)					00 00 00 00 00 00 00 00 00 00 00	1819. 109. 100. 1825. 0. 1825.
	2.	ENERGY SAVI ANALYSIS DA	INGS (+) / TE ANNU	COST ( AL SAVI	-) NGS, UNIT C	OST & D	ISCOUNTE	D SAVINO	ŝS		
		FUEL	UNIT ( \$/MBT	COST 'U(1)	SAVINGS MBTU/YR(2)	) SA	INUAL \$ \VINGS(3)	DISCO FACTO	UNT DR(4)	DI S/	ISCOUNTED AVINGS(5)
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12 \$ \$ \$ 4 \$	.44 .00 .00 .08 .00	0. 0. 202. 0.	\$\$ \$ <del>\$</del> \$ <del>\$</del> \$ <del>\$</del>	0. 0. 824. 0.	1 1 1	8.69 2.42 2.21 1.67 0.36		0. 0. 9616. 0.
(		F. TOTAL			202.	\$	824.			\$	9616.
	3.	NON ENERGY	SAVING	S(+) / C(	OST(-)						
		A. ANNUAL R (1) DISCO (2) DISCO	ECURRIN UNT FAC UNTED S	IG (+/-) TOR (TA AVING/0	ABLE A) COST (3A X	3A1)	9.11			\$ \$	0. 0.
		C. TOTAL NO	N ENERG	AY DISC	OUNTED SAV	/INGS(+)	) /COST(-)	(3A2+3Bd4	4)	\$	0.
		D. PROJECT (1) 25% M A IF 3D B IF 3D C IF 3I D IF 3D	NON ENE AX NON E 01 IS = OF 01 IS < 3C D1B IS = = = 01B IS < 1	RGY Q ENERGY > 3C G CALC > 1 GO T PROJE	UALIFICATION ( CALC (2F5 O TO ITEM 4 SIR = (2F5+3 TO ITEM 4 CT DOES NO	N TEST X .33) 3D1)/1F): DT QUALI	= IFY	\$	3173.		
	4.	FIRST YEAR	DOLLAR	SAVING	S 2F3+3A+(3E	31D/(YE/	ARS ECON	OMIC LIFE	E))	\$	824.
	5.	TOTAL NET D	SCOUN	TED SAV	VINGS (2F5+3	BC)				\$	9616.
	6.	DISCOUNTED (IF < 1 PROJE	D SAVING	S RATIO	D QUALIFY)	(\$	SIR)=(5 / 1F	)=	5.27		
	7.	SIMPLE PAY	BACK PE	RIOD (E	STIMATED)	SPB=1	F/4		2.21		

FACILITIES ENGINE ERING WORK REQUEST - XFA, XFB, XFC       FACILITIES ENGINE ERING WORK REQUEST - XFA, XFB, XFD       vn     vonte     stand intermination     stand intermination     stand intermination       value     onte     onte     stand intermination     stand intermination       value     onte     onte     onter runo citation     stand intermination       value     onte     onter runo citation     stand intermination       value     onte     onter runo     stand intermination       value     onte     onter runo     stand intermination       value     out     out     out     stand intermination       value     out     out     out     out     stand intermination       value     out     out     out     out     out     out       value <t< th=""><th></th><th>BUILDING/FALLLIT BLANK NUMBER SUFFIX BLANK</th><th>57 58 59 60 61 62 63 64 65 66 67 63 59 70 71 72 73 74 75 79 77 78 7</th><th></th><th></th><th>FIX NUMBER SUFFIX NUMBER SUFFIX BLA</th><th>27 58 59 50 51 52 53 54 55 56 57 56 59 70 71 72 79 74 74 74 79 77 78 7</th><th>JRK IS NOT ACCOMPLISHED</th><th>to be wasted from the exposed piping</th><th>3. Currently, approximately 147 r is wasted from Castle domestic hot</th><th>ipproximately 55 million BTU's per year</th><th>to lower point-of-use temperatures.</th><th>TO CALL FOR ADDITIONAL INFORMATION</th><th>ORGANIZATION TELEPHONE .</th><th>ROVED FOR DESIGN SOURCE OF FUNDS</th><th></th><th>018607</th><th>U AUTOMATIC REIMB.</th><th>DATE DATE</th><th></th><th>2</th><th>•</th><th></th><th></th><th>GREEN – FORWARD TO KEYPUNCH AFTE AFTER COMPLETION COMPLETION OF "FORWARD F. SLOCK APPROVAL" SLOCK</th></t<>		BUILDING/FALLLIT BLANK NUMBER SUFFIX BLANK	57 58 59 60 61 62 63 64 65 66 67 63 59 70 71 72 73 74 75 79 77 78 7			FIX NUMBER SUFFIX NUMBER SUFFIX BLA	27 58 59 50 51 52 53 54 55 56 57 56 59 70 71 72 79 74 74 74 79 77 78 7	JRK IS NOT ACCOMPLISHED	to be wasted from the exposed piping	3. Currently, approximately 147 r is wasted from Castle domestic hot	ipproximately 55 million BTU's per year	to lower point-of-use temperatures.	TO CALL FOR ADDITIONAL INFORMATION	ORGANIZATION TELEPHONE .	ROVED FOR DESIGN SOURCE OF FUNDS		018607	U AUTOMATIC REIMB.	DATE DATE		2	•			GREEN – FORWARD TO KEYPUNCH AFTE AFTER COMPLETION COMPLETION OF "FORWARD F. SLOCK APPROVAL" SLOCK
FACILITIES ENGINEERING         Forus of this form, see AR 420-17 and DA Pam 420-6         YR       DATE         YR       OATE         YR       OATE         YR       OATE         Sullong/Factury       BUILDING/FACTURY         BUILDING/FACTURY       BUILDING/FACTURY         SULLONG/FACTURY       BUILDING/FACTURY         SULLONG/FACTURY       BUILDING/FACTURY         SULLONG/FACTURY       BUILDING/FACTURY         SULLONG/FACTURY       BUILDING/FACTURY         SULLONG/FACTURY       BUILDING/FACTURY         SULLONG/FACTURY       BUILDING/FACTURY         SULL       I       I       I         SULL       I       I       I       I         BUILDING/FACTURY       BUILDING/FACTURY       SUFFIX         NUMBER       SUFFIX       NUMBER       SUFFIX         NUMBER       SUFFIX       NUMBER       SUFFIX         NUMBER       SUFFIX       NUMBER       SUFFIX         SURATURE       SUFFIX       NUMBER       SUFFIX         SURATION       TELEPHONE       NO       SIGNATURE         PEOR APPROVAL       SIGNATURE       SUPERFORMED       SUPURA         POR       SIGN	ORK REQUEST – XFA, XFB, XFC : the proponent agency is the Otlice of the Chief of Engines	SHOAT JOB DESCRIPTION	20/41 22 43 44 45 46 47 48 49 50 51 52 53 54 55 56	Linisuiliaitie, Wialtier, Ibiil	BUILDING/FACILITY BUILDING/FACILI	IX NUMBER SUFFIX NUMBER SUF	40 41  42  43  44   45  46  47  48  49  50 51  52  53  54  55  56  5	DESCRIBE WHAT WILL HAPPEN IF WC	n USDB Energy will continue	to surrounding spaces	water piping, while a	will be consumed due	PERSON 1	NAME	64V	WOR	FACILITIES ENGINEER		DATE	REMARKS	OT USUB V MOOS	DESIGN ESTIMATOR	19 20 21 2223 24 25 26		WHITE (ORIGINAL) – PROJECT FILE COPY - FORWARD TO KEYPUNCH PINK - FORWARD TO KEYPUNCH
	For use of this form, see AR 420–17 and DA Pam 420–6	DATE DATE OTHER FUND CITATION	23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39	9,10,13,11,1,1,1,1,1,1,1	BUILDING/FACILITY BUILDING/FACILITY	NUMBER, SUFFIX NUMBER SUFF	23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 33 39	٥	ed domestic hot water piping ir	ess heat loss from the water to			OBM & TION	TELEPHONE NO. SIGNATURE		WPACT _ ESTIMATED COST WORK TO BE F	WENTAL FUNDED 5 01.028 01.0005	WC L S CONTRACT	UNFUNDED 5 88 CTROOP		IOVAL ACTION	DATE O DA	16 17 18	SIGNATURE OF APPROVAL AUTHORIT	L EXHAUSTED. GROUP 3 - PAGE 9

# GROUP 4

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PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YB	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
L1		<u></u>	<del>_</del>			
GROUP 4 Power Plant						
474 Outside Testing - Steam Traps 474 Reduce Steam Pressure 474 Condensate Return System 474 Oxygen Trim Controls	M3 M12 M14 M15	1,510 605 1,687 <u>3,397</u>	\$6,161 \$2,470 \$6,883 <u>\$13,860</u>	\$17,119 \$9,931 \$38,115 <u>\$39,077</u>	2.63 3.81 5.24 <u>2.67</u>	4.44 3.06 2.23 <u>4.37</u> 3.47
GROUP 4 TOTALS		7,199	\$29,374	<u>\$104,242</u>	3.36	3.47
GROUP 4 FUNDING CATEGORY: C	SD PIF					

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#### ENERGY CONSERVATION ANALYSIS ESOS

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### SERVICE STEAM PIPING AND TRAPS





CALCULATION SHEET		DATE March,1987	SHEET OF
PROJECT USDB	SURVEY	BASIS FOR CALCUL	ATION
JCATION		X HAND	TER
ARCHITECT/ENGINEER	<u> </u>	CONTRA	ACTOR BID
CLARK RICHARDSON & BISKUP		COMPUTED BY	CHECKED BY
STEAM TRAP PROGRAM - OWNER	TESTING	I IGD	
COST OF STEAM AT FORT LEAVENWORTH - US	<u>SDB</u>		
ENTHALPY OF WATER AT 160° F. = ENTHALPY OF STEAM AT 120 PSIG = SYSTEM EFFICIENCY =	1 1,1	28 BTU/LBM 92 BTU/LBM 74%	
NATURAL GAS COST = HEAT CONTENT OF NAT. GAS =	1.000.000	\$4.08 MCF BTU/MCF	
[(1192-128) x \$4.08) / (0.74 x 1,000)]	\$5.87	PER THOUSAND LB	S. OF STEAM
COST OF INSPECTING TRAPS AFTER TEST VA	LVES ARE INSTAL	LED.	
ASSUMING AN AVERAGE OF 50 TRAPS PER DA	Y 8 HOURS PER D	AY.	
8 MH x \$36.75 PER H	IOUR =	\$294 PER DAY	
\$294 / 50 TRAPS PE	R DAY =	\$5.88 PER TRAP	
COST OF INSTALLING TEST VALVES ON EACH	TRAP =	\$137	
SAVINGS FROM TRAP INSPECTION			
USING 100 TRAPS AS A BASE WITH A 10% FAIL	URE RATE; 350 LE	3/HR F&T TRAP	
COST OF INSPECTING TRAPS ONCE DURING THE HEATING SEASON	100 X \$	5.88 = \$5	88 PER YEAR
NUMBER OF TRAPS FAILED	100 X 10	)% =	10 TRAPS
COST OF REPAIRING TRAPS	10 X \$14	\$1,4	50 PER YEAR
TOTAL COST OF INSPECTING AND REPAIRING	TRAPS	<u>\$2.03</u>	<u>8</u> PER YEAR
65 lbs/hr x 4380 hrs/yr x 0.5 (sys. modulation facto	r) = 142,35	0 LBS. OF STEAM PE	R YEAR
142,350 x (1192-128) / 1,000,000 =	15	1 MBTU / YEAR / TRA	ΥP
151 x \$5.87 =	\$886	B PER TRAP / YEAR	
ENERGY LOST DUE TO FAILED TRAPS	10 X 151	= 1510 MBTU'	S PER YEAR
COST OF STEAM LOST DUE TO FAILED TRAPS	S 10 X \$886	= \$8,860 PER Y	EAR
INITIAL INVESTMENT FOR TEST VALVES	100 X \$137	= \$13,700	
CONSTRUCTION COST	\$2,038 + \$13,700 =	= \$15,738	

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······································	CALCULATION SHEET		DATE March,1987	SHEET OF
PROJECT	USDB		BASIS FOR CALCU	JLATION
	ENERGY SAVINGS OPPORTUNITY S	SURVEY		
ATION			COMPU	ITER
ARCHITECT/	ENGINEER		CONTR	
	CLARK RICHARDSON & BISKUP		COMPLITED BY	CHECKED BY
ECO MEASU	STEAM TRAP PROGRAM - OUTSIDE	TESTING	TGD	MAW
COST OF	STEAM AT FORT LEAVENWORTH - US	DB		
ENTHALP	Y OF WATER AT 160° F. =	12	8 BTU/LBM	
ENTHALP	Y OF STEAM AT 120 PSIG =	1,19	2 B I U/LBM 74%	
SYSTEME	EFFICIENCY =		7 - 70	
NATURAL	GAS COST =	4 000 000	\$4.08 MCF	
HEAT CON	TENT OF NAT. GAS =	<u>1,000,000</u>	BIU/MCF	
[(1192-128	) x \$4.08) / (0.74 x 1,000)]	\$5.87	PER THOUSAND L	BS. OF STEAM
COST OF	INSPECTING TRAPS USING AN OUTSI	DE TESTING SERV	/ICE.	
			ΔΥ	
THE COST	IS A FLAT FEE OF \$500 PER DAY.	r, 8 HOUNS I EN D		
•	• \$500/50 TRAPS = \$10 PE	R TRAP	•	
COST OF	INSTALLING TEST VALVES ON EACH 1	FRAP = \$137		
SAVINGS	FROM TRAP INSPECTION			
LISING 10	OTRAPS AS A BASE WITH A 10% FAIL I	JRE RATE: 350 LB/	HR F&T TRAP	
USING IO			-	
COST OF	INSPECTING TRAPS ONCE DURING	100 X \$1	0 = \$1,	UUU PERTEAN
THE HE	ating season			•
NUMBER	OF TRAPS FAILED	100 X 10	% =	10 TRAPS
COST OF	REPAIRING TRAPS	10 X \$14	l5 = \$1,	450 PER YEAR
TOTAL CO	OST OF INSPECTING AND REPAIRING	TRAPS	<u>\$2.</u>	450_ PER YEAR
65 lbs/hr x	4380 hrs/yr x 0.5 (sys. modulation factor)	) = 142,350	LBS. OF STEAM P	ER YEAR
142.350 x	(1192-128)/1,000,000 =	151	MBTU / YEAR / TR	AP
151 x \$5.8	87 =	\$886	PER TRAP / YEAR	
ENERGY	LOST DUE TO FAILED TRAPS	10 X 151=	= 1510 MBTU'S	S PER YEAR
COST OF	STEAM LOST DUE TO FAILED TRAPS	10 X \$886=	= \$8,860 PER YE	EAR
		100 X \$137 -	= \$13.700	
	IVESTIVIENT FOR TEST VALVES	100 X \$107.	£16 150	
CONSTRU	JCTION COST	\$2,450 + \$13,700 =	: \$10,130	
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CALCULATION SHEET

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INS PR FIS AN	ENERC TALLATION & I OJECT NO. & T CAL YEAR 199 ALYSIS DATE:	LIFE CYCL GY CONSEF LOCATION: TTLE: 1496 0 03-23-90	E COST ANALYS RVATION INVEST FORT LEAVENW DISCRETE POR ECONOMI	MENT PR MENT PR VORTH - RTION NAM C LIFE 15	ARY OGRAM (EC USDB REG ME: ECOM3 YEARS	CIP) GION NOS. 7 - OWNER TES PREPARED	STUD' LC TING BY: CR	Y: USDBAE CCID 1.035 CENSUS: 2 B
1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE V F. TOTAL INVI	CTION COS OST REDIT CAL VALUE COS ESTMENT	T C (1A+1B+1C)X.S ST (1D-1E)	9			\$ \$ \$ \$ \$ \$ \$ \$	15738. 944. 866. 15793. 0. 15793.
2.								
	FUEL	UNIT CO \$/MBTU	OST SAVINGS (1) MBTU/YR(	(2) AM	NUAL \$ AVINGS(3)	DISCOUNT FACTOR(4)	DIS SA	SCOUNTED VINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.4 \$ .0 \$ .0 \$ 4.0 \$ .0	4 0. 0 0. 0 0. 8 1510. 0 0.	\$\$ \$\$ \$\$ \$\$	0. 0. 6161. 0.	8.69 12.42 12.21 11.67 10.36		0. 0. 0. 71899. 0.
	F. TOTAL		1510.	\$	6161.		\$	71899.
3.	NON ENERGY	SAVINGS	+) / COST(-)					
	A. ANNUAL RI (1) DISCOU	ECURRING UNT FACTO	(+/-) )R (TABLE A)		9.11		\$	0.
	(2) DISCOU	UNTED SAV	/ING/COST (3A X	( 3A1)			\$	0.
	C. TOTAL NO	N ENERGY	DISCOUNTED SA	AVINGS(+)	)/COST(-) (	3A2+3Bd4)	\$	0.
4.	FIRST YEAR D	DOLLAR SA	VINGS 2F3+3A+(3	B1D/(YEA	ARS ECONC	MIC LIFE))	\$	6161.
5.	TOTAL NET D	ISCOUNTE	) SAVINGS (2F5+	-3C)			\$	71899.
6.	DISCOUNTED (IF < 1 PROJE	SAVINGS I CT DOES N	RATIO IOT QUALIFY)	(S	ilR)=(5 / 1F):	= 4.55		
7.	SIMPLE PAYB	ACK PERIC	D (ESTIMATED)	SPB=1F	/4	2.56		



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	IN: PF FIS AN	LIFE CYCLE COST ANALYSIS SUMMARY ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) INSTALLATION & LOCATION: FORT LEAVENWORTH - USDB REGION NOS. 7 PROJECT NO. & TITLE: 1496 FISCAL YEAR 1990 DISCRETE PORTION NAME: ECOM3 - OUTSIDE TES ANALYSIS DATE: 03-23-90 ECONOMIC LIFE 15 YEARS PREPARED B										
	<ol> <li>INVESTMENT         <ul> <li>A. CONSTRUCTION COST</li> <li>B. SIOH</li> <li>C. DESIGN COST</li> <li>D. ENERGY CREDIT CALC (1A+1B+1C)X.9</li> <li>E. SALVAGE VALUE COST</li> <li>F. TOTAL INVESTMENT (1D-1E)</li> </ul> </li> <li>ENERGY SAVINGS (+) / COST (-)         <ul> <li>ANALYSIS DATE ANNUAL SAVINGS, UNIT COST &amp; DISCOUNTED SAVINGS</li> </ul> </li> </ol>									16150. 969. 888. 16206. 0. 16206.		
		UNIT COS FUEL \$/MBTU(1			T SAVINGS ANNUAL \$ MBTU/YR(2) SAVINGS(3)			DISCOUNT FACTOR(4	- )	DISCOUNTED SAVINGS(5)		
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$\$ \$ <del>\$</del> \$\$ \$\$	12.44 .00 .00 4.08 .00	0. 0. 0. 1510. 0.	\$ \$ \$ \$ \$	0. 0. 6161. 0.	8.69 12.42 12.21 11.67 10.36	) 2 7	0. 0. 0. 71899. 0 <i>.</i>		
		F. TOTAL			1510.	\$	6161.		\$	71899.		
	З.	NON ENERGY										
		A. ANNUAL RECURRING (+/-) (1) DISCOUNT FACTOR (TABLE A) 911								0.		
		(2) DISCOU	\$	. 0.								
		C. TOTAL NO	N ENE	RGY DISC	OUNTED SA	VINGS	(+) /COST(-)	(3A2+3Bd4)	\$	0.		
		D. PROJECT I (1) 25% MA A IF 3D B IF 3D C IF 3D D IF 3D	NON E AX NO 1 IS = 1 IS < 01B IS 1B IS	ENERGY Q IN ENERGY OR > 3C G 3C CALC = > 1 GO < 1 PROJE	UALIFICATIO Y CALC (2F5 O TO ITEM 4 SIR = (2F5+ TO ITEM 4 CT DOES NO	N TES X .33) 3D1)/11 )T QUA	T F)= LIFY	\$    23727. 				
	4.	FIRST YEAR D	OLLA	R SAVING	S 2F3+3A+(38	31D/(Y	EARS ECONO	OMIC LIFE))	\$	6161.		
	5.	TOTAL NET DI	\$	71899.								
	6.	DISCOUNTED (IF < 1 PROJEC	SAVII CT DC	NGS RATIO	) (UALIFY)		(SIR)=(5 / 1F)	= 4.44				
	7.	SIMPLE PAYB	ACK F	PERIOD (E	STIMATED)	SPB=	1F/4	2.63	ł			

GROUP 4 - PAGE 5

CONSTRUCTION COST ESTIM	CONSTRUCTION COST ESTIMATE				DATE PREPARED SHEET			
PROJECT			1	BASIS FOR ESTIMATE				
CATION FORT LEAVENWORTH, KS				x	N COMPLETED) ARY DESIGN) IGN)			
CLARK RICHARDSON & BISK	UP	ESTIM	ATOR	I	OTHER	CHECKED B	Υ	
			N		1	ABOB		
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	COST	
INSTALL TEST VALVE (PER TRAP)								
CREW 1 STEAM FITTER, 1 APPRENTICE								
	1.00	мн	\$22.27	\$22	\$20.00	\$20	\$42	
INSTALL TEE AND TEST LINE	0.75	мн	\$22.27	\$17	\$5.40	\$4	\$21	
INSTALL GLOBE VALVE	0.75	мн	\$22.27	\$17	\$17.10	\$13	\$30	
<u>}</u>								
SUBTOTAL				\$56		\$37	\$93	
CONTINGENCY 10%			10%	\$6	10%	\$4	\$10	
SUBTOTAL				\$62		\$41	\$103	
WORK COMP, TAX, SOC.SEC., INS			3.50%	\$2	13.0%	\$5	\$7	
DIRECT COST				\$64		\$46	\$110	
OVERHEAD AND PROFIT			25%	\$16	25%	\$11	\$27	
SUBTOTAL				\$80		\$57	\$137	
CONSTRUCTION COST PER TRAP							\$137	

1AVC-59

## ECO-M12

#### REDUCE STEAM DISTRIBUTION PRESSURE

	CALCULATION SHEET		DATE Mar-90	SHEET OF				
PROJECT	USDB ENERGY SAVINGS OPPORTL	JNITY SURVEY	BASIS FOR CALCULATION					
LOCATION	STEAM PLANT							
ARCHITECT/ENG	G <b>INEER</b> CLARK RICHARDSON & BISK	UP		HER (SPECIFY)				
ECO MEASURE	ECO M12		COMPUTED BY TGD	CHECKED BY				
	2002							
STEAM PRESSURE	ENTHALPY BTU/LB. OF STEAM	SYSTEM EFFICIENCY	STEAM COST PER 1000 LBS.	ESTIMATED ANNUAL SAVINGS				
120 PSIG	1,192.4	74.000%	\$5.754	NONE				
115 PSIG	1,191.7	74.094%	\$5.742	\$326				
110 PSIG	1,191.0	74.188%	\$5.731	\$624				
105 PSIG	1,190.4	74.282%	\$5.721	\$896				
100 PSIG	1,189.6	74.376%	\$5.709	\$1,222				
95 PSIG	1,188.8	74.470%	\$5.698	\$1,520				
90 PSIG	1,188.0	· 74.564% ·	\$5.686	\$1,846				
85 PSIG	1,187.2	74.658%	\$5.675	\$2,145				
80 PSIG	1,186.3	74.752%	\$5.663	\$2,470				

AVERAGE STEAM USE FOR SPACE HEATING: 74,375 LBS PER DAY ANNUAL ENERGY SAVINGS (AT 80 PSIG):

605 MBTU'S PER YEAR

SYSTEM EFFICIENCY CALCULATED FROM:

.

IMPROVING BOILER EFFICIENCY BY S.G. DUKELOW

SPONSORED BY KANSAS STATE UNIVERSITY AND KANSAS ENERGY OFFICE

CHAPTER 6: EFFECT OF BOILER STEAM PRESSURE ON FLUE GAS TEMPERATURE AND BOILER EFFICIENCY

CALCULATION SHEET

		DATE PREPARED				SHEET OF	
PROJECT			I	BASIS FOR E	STIMATE		<u></u>
OCATION FORT LEAVENWORTH, KS				X CODE A (NO D CODE B (PREL CODE C (FINAL OTHER (SPEC		(NO DESIGN (PRELIMINA (FINAL DES	I COMPLETED) RY DESIGN) IGN)
CLARK RICHARDSON & BISKL	JP					(SPECIFY)	,
DRAWING NO. NONE		ESTIM	MATOR TGD			CHECKED BY	MAW
ECO-M12	QU/ NO. UNITS	UNIT MEAS.	PER UNIT	ATERIAL TOTAL	PER UNIT	ABOR TOTAL	COST
SCHEDULE 40 STEEL PIPE 5" DIAMETER	85	LF	\$18	\$1,530	\$18	\$1,530	\$3,060
90° ELBOWS	4	EA	\$113	\$452	\$68	\$272	\$724
TEES	1	EA	\$194	\$194	\$116	\$116	\$310
BUTTERFLY VALVES	2	EA	\$208	\$416	\$115	\$230	\$646
2" INSULATION / 5" DIAMETER PIPE	154	LF	\$6	\$924	\$3	\$462	\$1,386
GASKET AND BOLT SETS	10	EA	\$13	\$130	\$8	\$80	\$210
							<u></u>
						•	· .
			<u> </u>				•
		<u> </u>		\$2.646		\$2 690	\$6.336
			1.0%	\$3,040 \$365	10%	\$269	\$634
SUBTOTAL	1		10/0	\$4.011		\$2.959	\$6,970
WORK COMP,TAX,SOC.SECINS			3.50%	\$140	13.0%	\$385	\$525
DIRECT COST				\$4,151		\$3,344	\$7,495
OVERHEAD AND PROFIT			25%	\$1,038	25%	\$836	\$1,874
SUBTOTAL		L		\$5,189		\$4,180	\$9,369
							\$9,369

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1AVC-59

PREVIOUS EDITION MAY BE USED

	INS PR FIS AN	ENER STALLATION & OJECT NO. & T SCAL YEAR 199 IALYSIS DATE:	STUE L BY: CF	OY: USDBAE CCID 1.035 CENSUS: 2					
	1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE F. TOTAL INV	OST OST CREDIT CALC ( VALUE COST /ESTMENT (1D	1A+1B+1C)X.9 -1E)				\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	9369. 562. 515. 9401. 0. 9401.
	2.	ENERGY SAVI ANALYSIS DA	'INGS (+) / COS' TE ANNUAL SA	T (-) VINGS, UNIT (	COST & D	ISCOUNTE	D SAVINGS		
		FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2	AN 2) SA	INUAL \$ VINGS(3)	DISCOUNT FACTOR(4)	DI SA	SCOUNTED AVINGS(5)
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	0. 0. 605. 0.	\$ \$ \$ \$ \$	0. 0. 2468. 0.	8.69 12.42 12.21 11.67 10.36		0. 0. 28802. 0.
		F. TOTAL		605.	\$	2468.		\$	28802.
1. in 19	3.	NON ENERGY	Y SAVINGS(+) /	COST(-)					
		A. ANNUAL R (1) DISCO	RECURRING (+/- OUNT FACTOR (	) TABLE A)		9.11		\$	0.
		(2) DISCO	UNTED SAVING	G/COST (3A X	3A1)			\$	0.
		C. TOTAL NO	N ENERGY DIS	COUNTED SA	VINGS(+)	/COST(-) (3	3A2+3Bd4)	\$	0.
		D. PROJECT I (1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D	NON ENERGY ( AX NON ENERC 01 IS = OR > 3C 01 IS < 3C CALC D1B IS = > 1 GO 01B IS < 1 PROJ	QUALIFICATIO GY CALC (2F5 GO TO ITEM 4 SIR = (2F5+ TO ITEM 4 ECT DOES NO	N TEST X .33) 3D1)/1F)= )T QUALIF	- -Y	\$		
	4.	FIRST YEAR D	DOLLAR SAVING	GS 2F3+3A+(3E	B1D/(YEA	RS ECONO	MIC LIFE))	\$	2468.
	5.	TOTAL NET DI	SCOUNTED SA	VINGS (2F5+3	C)			\$	28802.
	6.	DISCOUNTED (IF < 1 PROJEC	SAVINGS RAT	IO QUALIFY)	(SI	R)=(5 / 1F)=	= 3.06		
	7.	SIMPLE PAYB	BACK PERIOD (B	ESTIMATED)	SPB=1F/	'4	3.81		



# ECO-M14

#### SERVICE CONDENSATE RETURN SYSTEM



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CALCUL	ATION SHEET	DATE	SHEET OF
		Mar-90	1
PROJECT USDB		<b>BASIS FOR CALCULA</b>	TION
ENERGY	SAVINGS OPPORTUNITY SURVEY		
LOCATION		X HAND	
		COMPUTER	
ARCHITECT/ENGINEER		CONTRACTO	r Bid
CLARK F	RICHARDSON & BISKUP	OTHER (SP	ECIFY)
ECO MEASURE		COMPUTED BY	CHECKED BY
SERVICE CONDENSATE	RETURN SYSTEM ECO-M14	TGD	MAW

Γ			0	0
	TOTAL	Ц	71,04	371,64
	FINAL	TEMP	201.1	154.9
	EMISS		0.9	0.9
	SPEC	HEAT	1.05	1.05
	FLOW	#/HR	6200	6200
	PIPE	LEN	700	700
	ERISTIC	CON 2	0.25	0.25
	ARACTE	T2	100	100
	<b>FION CH</b>	CON1	0.5	0.5
	<b>INSULA</b>	T 1	460	460
	PIPE	DIA	8.625	8.625
	MIND	VEL	-	+
	INSUL	THICK	2	0.001
	AMB	TEMP	75	75
	INIT	TEMP	212	212

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	CALCULATION SHEET	· _		DATE Mar-90	)	SHEET	0F
$\sim$	PROJECT USDB ENERGY SAVINGS OPPORTUN	NITY SURVE	(	BASIS FO	R CALCUL	ATION	
[	LOCATION			<u>x</u>	_HAND _COMPUTE	R	
		מו			_CONTRAC	TOR BID	
	ECO MEASURE SERVICE CONDENSATE RETURN SYSYTE	M ECO-M14		COMPUTE	TGD	CHECKEL	ЭBY
			1100 (				
	120 PSIG STEAM PRESSURE:		1192.4	BIU/LB. E	NIHALPY		
	155°F CONDENSATE RETURN TEMPERATU	JRE:	123 BT	U/LB. ENT	HALPY		
	201°F CONDENSATE RETURN TEMPERATU	JRE:	169 BT	U/LB. ENT	HALPY		
	SYSTEM EFFCIENCY:		74%				
	AVERAGE DAILY STEAM CONSUMPTION:		148,75	0 LBS.			
	STEAM LOAD SERVED BY WEST TUNNEL:		50%				
	DAYS PER YEAR:		365				
	ъ.			• •	•		
: ج ب	(1192.4 - 123) - (1192.4 - 169) / 0.74	=	62.16	BTU/LB.			
	) (62.16 X 148,750 X .5 X 365)/1,000,000	=	1,687	MBTU/YE	٩R		

IN	ENER STALLATION &	LIFE GY CO LOCAT	CYCLE CONSERVATION: FOI	OST ANALYS FION INVESTI RT LEAVENW	IS SUM MENT F ORTH	MARY PROGRAM (E - USDB RE	CIP) GION N	IOS. 7	STU	DY: USDBAE _CCID 1.035 CENSUS: 2
PF FI AN	ROJECT NO. & SCAL YEAR 199 NALYSIS DATE:	03-30 03-30	1496 DIS 0-90		TION N	AME: ECOM 15 YEARS	14 PRI	EPARED	BY: CI	RB
1.	INVESTMENT A. CONSTRUE B. SIOH C. DESIGN CO D. ENERGY C E. SALVAGE F. TOTAL INV	CTION OST REDIT VALUE ESTME	COST CALC (1 COST ENT (1D-1	A+1B+1C)X.9 E)					\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	35958. 2157. 1978. 36084. 0. 36084.
2.	ENERGY SAV	INGS (- TE ANI	+) / COST NUAL SAV	(-) 'INGS, UNIT (	COST &	DISCOUNTE	ED SAV	INGS		
	FUEL	UN \$/M	IT COST IBTU(1)	SAVINGS MBTU/YR(2	2) 3	ANNUAL \$ SAVINGS(3)	DIS FAC	COUNT TOR(4)	Di Si	ISCOUNTED AVINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	<del>\$\$ \$\$ \$\$ \$\$</del>	12.44 .00 .00 4.08 .00	0. 0. 1687. 0.	\$ \$ \$ \$ \$	0. 0. 6883. 0.		8.69 12.42 12.21 11.67 10.36		0. 0. 0. 80325. 0.
	F. TOTAL			1687.	\$	6883.			\$	80325.
З.	NON ENERGY	SAVIN	IGS(+) / C	OST(-)						
	A. ANNUAL RI	ECURF	RING (+/-)			9.11			\$	0.
	(2) DISCOU	JNTED	SAVING/	COST (3A X	3A1)	••••			\$	0.
	C. TOTAL NO	N ENER	RGY DISC	OUNTED SAV	/INGS(	+)/COST(-) (	3A2+3E	3d4)	\$	0.
	D. PROJECT I (1) 25% MA A IF 3D B IF 3D C IF 3D D IF 3D	NON EI AX NON 1 IS = 0 1 IS < 3 1B IS = 1B IS <	NERGY Q N ENERGY DR > 3C G C CALC = > 1 GO T 1 PROJE	UALIFICATIO CALC (2F5 O TO ITEM 4 SIR = (2F5+3 O ITEM 4 CT DOES NO	N TEST X .33) 3D1)/1F T QUAI	- )= _IFY	\$	26507.		
4.	FIRST YEAR D	OLLAF	R SAVING	S 2F3+3A+(3E	81D/(YE	ARS ECONC	MIC LI	FE))	\$	6883.
5.	TOTAL NET DI	scour	NTED SAV	'INGS (2F5+3	C)				\$	80325.
6.	DISCOUNTED (IF < 1 PROJEC	SAVIN CT DOE	GS RATIC ES NOT Q	) UALIFY)	(	SIR)=(5 / 1F):	=	2.23		
7.	SIMPLE PAYE	ACK PE	ERIOD (ES	STIMATED)	SPB=1	F/4		5.24		

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الرهان المسادية المائم كالتصبير بالمتار بمستعدة فتمتم

	CONSTRUCTION COST ESTIMA	TE		DATE PR	EPARED Mar-90			SHEET OF	
	PROJECT		<u>.                                    </u>		BASIS FOR E	STIMATE			
	USDB ENERGY STUDY LOCATION FORT LEAVENWORTH, KS ARCHITECT/ENGINEER				X	CODE A CODE E CODE C	(NO DESIGN (PRELIMINA (FINAL DES	N COMPLETED) RY DESIGN) IGN)	
	CLARK RICHARDSON & BISKU	Р	ESTIM	ATOR	I <u></u>	OTHER	CHECKED BY	(	
		<u> </u>			TGD		4800	MAW	
		NO. UNITS	UNIT MEAS.		TOTAL	PER UNIT	TOTAL	COST	
	6" DIA 2" THICK FIBERGLASS INSULATION	400	LF	\$5.87	\$2,348	\$3.45	\$1,380	\$3,728	
	ALUMINUM JACKET	400	LF	\$0.54	\$216	\$2.87	\$1,148	\$1,364	
	8" DIA. SCH. 80 STEEL PIPE	100	LF	\$37.66	\$3,766	\$22.00	\$2,200	\$5,966	
	8" DIA 2" THICK FIBERGLASS INSULATION	200	LF	\$7.25	\$1,450	\$4.31	\$862	\$2,312	
	ALUMINUM JACKET	200	LF	\$0.54	\$108	\$2.87	\$574	\$682	
	PIPE RACKS	6	EA	\$400	\$2,400	\$200	\$1,200	\$3,600	
	REPAIR HOLES IN PIPING	3	DAYS			\$252	\$756	\$756	
	8" DIA. TEE	2	EA	\$71	\$142	\$71	\$142	\$284	
	8" DIA. 90° ELBOW	2	EA	\$100	\$200	.\$140	\$280	\$480	
	DEMOLITION	100	LF			\$3.95	\$395	\$395	
-									
-	2								
	SUBTOTAL				\$10,630		\$8,937	\$19,567	
	DIFFICULTY FACTOR 50%					50%	\$4,469	\$4,469	
	SUBTOTAL						\$13,406	\$24,036	
	CONTINGENCY 10%			10%	\$1,063	10%	\$1,341	\$2,404	
	SUBTOTAL				\$11,693		\$14,747	\$26,440	
	WORK COMP, TAX, SOC.SEC., INS			3.50%	\$409	13.0%	\$1,917	\$2,326	
	DIRECT COST				\$12,102		\$16,664	\$28,766	
	OVERHEAD AND PROFIT			25%	\$3,026	25%	\$4,166	\$7,192	
	SUBTOTAL				\$15,128		\$20,830	\$35,958	
	CONSTRUCTION COST ENG. FORM 150							\$35,958	

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1AVC-59



## ECO-M15

#### BOILER PLANT MODIFICATIONS

		CALCULAT	ION SHEET	<del>- ,</del>		0	DATE Mar-90	SHEET	<b>0F</b>
	PROJECT	USDB ENEBGY SA				E	BASIS FOR CALC	ULATION	
	LOCATION						X HAND	UTER	
	ARCHITECT/E			DIOKUD					
	ECO MEASUR		HARDSON &	BISKUP		c	COMPUTED BY	CHECKE	DBY
		ECO-M15 O	2 TRIM CON	TROLS		I	BW2	<b>_</b>	
	BUILDING 4	<u> 474 - CENTRA</u>	AL HEATING	PLANT					
	TEST DATA	BOILER #2							
	% OXYGEN			6.3 %					
	% EXCESS	AIR		37.%					
	%CO 2	ON EFFICIEN	ICY	80.50% 8.3 %					
	STEAM PRO	DUCTION, A	CCORDING	TO BOILE	R PLANT OP	ERATORS	:		
	SUMMER WINTER			75,000 370,000	LBS/DAY LBS/DAY				
	AVERAGE (	CALCULATE	D)	148,750	LBS/DAY		,		
	BOILER TR	IM CONTROL	REDUCES	EXCESS A	NR TO 15%	• • ·			
	FROM "GAS KANSAS ST	S COMBUSTIC	ON EFFICIEN SITY, MANH	ICY CHAF ATTAN KS	rt" publishe S.:	D BY COC	OPERATIVE EXTE	ENSION SERV	ICE,
	15% EXCES	SS AIR AT 317	7°F =	84.50%	COMBUSTION	IEFF.			
	84.50%		80.50%	=	4.00% IN	CREASE I	N COMB. EFF.		
	ENTHALPY ENTHALPY ENTHALPY	OF STEAM L OF CONDEN DIFFERENCE	EAVING BOI SATE RETU E	LERS RNING TC	) BOILERS	1192.4 E 128 E 1064.4 E	BTU/LB BTU/LB BTU/LB		
	148,750	) LBS/DAY X	1,064 B	TU/LB X	365 DA	YS/YR >	0.000001 MBTU	/BTU =	
		57,769 N	MBTU/YR.						
	THIS TRAN	SLATES TO G	GAS CONSU	MPTIONS	OF				
	57,769	) /	80.50%	=	71,763 MI	BTU/YR.			
	AND								
	57,769	) (	84.50%	=	68,366 Mi	BTU/YR. W	ITH O2 TRIM CO	NTROLS.	
	SAVINGS								
	71,763	3 -	68,366	=	3,397 MI	BTU/YR.			
	4.08	в х	3,397	=	\$13,860 PE	R YEAR			
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IN PF FI AN	ENER STALLATION & ROJECT NO. & T SCAL YEAR 199 IALYSIS DATE:	LIFE CYCI GY CONSE LOCATION FITLE: 1496 00 03-28-90	LE COST ANALYS RVATION INVES FORT LEAVEN DISCRETE POI ECONOM	SIS SUMM IMENT PR WORTH - RTION NAI IC LIFE 15	ARY OGRAM (EG USDB REC ME: ECOM1 YEARS	CIP) GION NOS 1502 PREP	8. 7 ARED	STU I BY: C	DY: USDBAE _CCID 1.035 CENSUS: 2 RB
1.	INVESTMENT A. CONSTRUG B. SIOH C. DESIGN CO D. ENERGY C E. SALVAGE F. TOTAL INV	CTION COS OST CREDIT CAL VALUE COS 'ESTMENT	ST .C (1A+1B+1C)X. ST (1D-1E)	9				\$\$ \$\$ \$\$ \$\$ \$\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	36865. 2212. 2028. 36995. 0. 36995.
2.	ENERGY SAV ANALYSIS DA	INGS (+) / C TE ANNUAI	OST (-) _ SAVINGS, UNIT	COST & D	DISCOUNTE	D SAVIN	GS		
	FUEL	UNIT CO \$/MBTU	OST SAVINGS (1) MBTU/YR	(2) Al	NNUAL \$ AVINGS(3)	DISCO FACTO	DUNT DR(4)	D S	ISCOUNTED AVINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.4 \$ .0 \$ .0 \$ 4.0 \$ .0	4 0. 0 0. 0 0. 8 3397. 0 0.	\$ \$ \$ \$ \$	0. 0. 0. 13860. 0.	 	8.69 12.42 12.21 11.67 10.36		0. 0. 0. 161746. 0.
	F. TOTAL		3397.	\$	13860.			\$	161746.
3.	NON ENERGY	SAVINGS	+) / COST(-)						
	A. ANNUAL R	ECURRING	(+/-) )R (TABLE A)		9.11			\$	0.
	(2) DISCO	UNTED SAV	/ING/COST (3A >	( 3A1)				\$	0.
	C. TOTAL NO	N ENERGY	DISCOUNTED S	AVINGS(+)	) /COST(-) (	3A2+3Bd4	4)	\$	0.
	D. PROJECT (1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D	NON ENER AX NON EN 1 IS = OR > 1 IS < 3C C. 01B IS = > 1 1B IS < 1 PI	GY QUALIFICATI ERGY CALC (2F5 3C GO TO ITEM ALC SIR = (2F5 GO TO ITEM 4 ROJECT DOES N	ON TEST 5 X .33) 4 +3D1)/1F)= OT QUALI	= FY	\$5	3376.		
4.	FIRST YEAR D	DOLLAR SA	VINGS 2F3+3A+(	3B1D/(YEA	ARS ECONC	MIC LIFE	))	\$	13860.
5.	TOTAL NET D	ISCOUNTEI	D SAVINGS (2F5-	⊦3C)				\$	161746.
6.	DISCOUNTED (IF < 1 PROJE	SAVINGS I CT DOES N	RATIO IOT QUALIFY)	(S	ilR)=(5 / 1F)=	=	4.37		
7.	SIMPLE PAYB	ACK PERIC	D (ESTIMATED)	SPB=1F	-/4		2.67		

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CONSTRUCTION COST ESTIM		DATE PR	SHEET OF						
PROJECT			L	BASIS FOR E		·			
				x	CODE A CODE B CODE C	(NO DESIGN (PRELIMINA (FINAL DES	<b>DESIGN COMPLETED)</b> :LIMINARY DESIGN) AL DESIGN)		
CLARK RICHARDSON & BISK	UP				OTHER	(SPECIFY)			
DRAWING NO.		ESTIM	ATOR	BMS		CHECKED B	MAW		
ECO-M15			M PEB	ATERIAL TOTAL	PER L	ABOR TOTAL	TOTAL COST		
	UNITS	MEAS.	UNIŤ		UNIT				
OXYGEN TRIM CONTROL	3	EA	\$2,100	\$6,300	\$5,985	\$17,955	\$24,255		
	-								
		·							
· · ·									
SUBTOTAL				\$6,300		\$17,955	\$24,255		
CONTINGENCY 10%	<u></u>		10%	\$630	10%	\$1,796	\$2,426		
SUBTOTAL				\$6,930		\$19,751	\$26.681		
WORK COMP, TAX, SOC.SEC., INS			3.50%	\$243	13.0%	\$2,568	\$2,811		
DIRECT COST				\$7,173		\$22,319	\$29,492		
OVERHEAD AND PROFIT	-		25%	\$1,793	25%	\$5,580	\$7,373		
SUBTOTAL				\$8,966		\$27,899	\$36,865		
							\$36,865		

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1AVC-59

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IN PF	ENER STALLATION & COJECT NO. & 1	LIFE CYCLE IGY CONSERV LOCATION: F TITLE: 1496	COST ANALYS ATION INVESTI ORT LEAVENW	IS SUMI MENT P /ORTH	MARY ROGRAM (EC - USDB REC	CIP) GION NOS. 7	STUD	OY: USDBAE CCID 1.035 CENSUS: 2
	IALYSIS DATE:	12-5-90 L	ECONOMIC	CLIFE 1	5 YEARS	PREPARED	BY: CF	B
1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CO D. ENERGY C E. SALVAGE F. TOTAL INV	OST OST CREDIT CALC VALUE COST VESTMENT (11	(1A+1B+1C)X.9 D-1E)			·	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	98342. 5901. 5409. 98687. 0. 98687.
2.	ENERGY SAV	INGS (+) / COS TE ANNUAL S	ST (-) AVINGS, UNIT (	COST &	DISCOUNTE	D SAVINGS		
	FUEL	UNIT COS \$/MBTU(1)	T SAVINGS MBTU/YR(2	2) A	NNUAL \$ AVINGS(3)	DISCOUNT FACTOR(4)	DI SA	SCOUNTED VINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	0. 0. 0. 7199. 0.	\$ \$ \$ \$ \$	0. 0. 29372. 0.	8.69 12.42 12.21 11.67 10.36		0. 0.
	F. TOTAL		7199.	\$	29372.		\$	342771.
З.	NON ENERGY	( SAVINGS(+) /	COST(-)					
	A. ANNUAL R (1) DISCO	ECURRING (+. UNT FACTOR	/-) (TABLE A)		9.11		\$	0.
	(2) DISCO	UNTED SAVIN	G/COST (3A X	3A1)			\$	0.
	C. TOTAL NO	N ENERGY DI	SCOUNTED SA	VINGS(-	-) /COST(-) (	3A2+3Bd4)	\$	0.
	D. PROJECT (1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D	NON ENERGY AX NON ENER 01 IS = OR > 30 01 IS < 3C CAL 01B IS = > 1 G 01B IS < 1 PRO	QUALIFICATIO GY CALC (2F5 GO TO ITEM 4 C SIR = (2F5+ O TO ITEM 4 JECT DOES NO	N TEST X .33) 3D1)/1F )T QUAL	)= .IFY	\$ 113114. 		
4.	FIRST YEAR D	DOLLAR SAVIN	IGS 2F3+3A+(3I	B1D/(YE	ARS ECONC	MIC LIFE))	\$	29372.
5.	TOTAL NET D	SCOUNTED S	SAVINGS (2F5+3	3C)			\$	342771.
6.	DISCOUNTED (IF < 1 PROJE	) SAVINGS RA ECT DOES NOT	TIO F QUALIFY)	(	SIR)=(5 / 1F)=	= 3.47		
7.	SIMPLE PAYB	BACK PERIOD	(ESTIMATED)	SPB=1	F/4	3.36		

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بما الدعية الارتيان فيدافك رهايها

IILDING/FACILITY	BLANK BLANK	163 69 70 71 72 73 74 74 74 77 78 7		SULLDING/FACILITY	NUMBER SUFFIX	153 169 701 71 72 751 74 75 751 75 78 7		continue to waste year that could be				RMATION	- DZOZEWJW-	SOURCE OF FUNDS			C ORECT C AUTOMATIC AEIMB.	L TUNOED REIMS.							- FORWARD TO KEYPUNCH AFTE COMPLETION OF "FORWARD FC APPROVAL" BLOCK
AFC of the Chief of Engineers.	T JOB OESCAIPTION	0 21 22 23 23 23 28 28 29 20 21 28 29 20 21 27 23 23 23 23 23 23 23 23 23 23 23 23 23	i Mro,dri fric, a tri o n S 1	SULDING/FACILITY SULLDING/FACILITY	NUMBER SUFFIX NUMBER SUFFIX	ası [32 53  54   55   56   57   58   59   50   51   52   52   54   55   56   67	WILL HAPPEN IF WORK IS NOT ACCOMPLISHED	wiler plant in building 474 will timately 7,199 million BTU's per by implementing these measures.				PERSON TO CALL FOR ADDITIONAL INFO	04611124124	APPROVED FOR DESIGN				SIGNATURE DATE	REMARKS			•			CT FILE COPY AD TO KEYPUNCH AFTER COMPLETION PROVAL ACTION" BLOCK
FACICLITES ENGINEERING WORK REUUEST - ATA, AFG. storm, ise AR 420-17 and DA Pan 420-6; the proponent agency is the Office	DA OTHER FUND CITATION	27 28 29 20 31 32 33 33 35 35 37 38 39 40 41 42 43 44 45 45 47 48 49 5	3,1	2/FACILITY SUILDING/FACILITY SUILDING/FACILITY	SUFFIX NUMBER SUFFIX NUMBER SUFFIX	7 23 29 30 31 32 33 32 23 35 37 33 39 40 41 42 43 45 45 46 47 43 49 50	DESCAIBE WHAT	ications: The bo traps. approx , reduce steam distribution saved	r all steam loads at the USDB rate 120 psig boiler.	condensate piping. insulate and 200 feet of 8" piping. / new boilers.	11 show economic payback.		LEPHONE VO. SIGVATURE			MORY TO SE FROM PERFORMED PERFORMED Second	с slot.242 С IN-ноизе FACILITIES ENGINEER	S 00716 001 001 001 001 001 001 001 001 001 0			FORWARDED TO	DESIGN ESTIMATOR	19 20 21  22 23 24  25  25	GNATURE OF APPROVAL AUTHORITY	GROUP 4 - PAGE 18 PINK CORIGINAL) - PROJEC
Focuse of this Factor in DIAC/FACILITY DATE		·   4   5   6   7   8   9   10   11   12   12   14   15   16   17   18   19   20   21   22   23   24   25   25	P 10 4 17 4 1 1 1 9 11 0 11 3	ן ק ססכמשנאד אחשוני ן פחורסואפעדאכורודץ ו פחורסואכ	Z REQ SEALAL Y WUMBER SUFFIX NUMBER	1 ± 1 5 6 7 7 8 9 10 11 12 12 12 15 15 15 15 17 18 19 20 21 22 22 24 25 26 21	TION AND JUSTIFICATION OF WORK TO 85 ACCOMPLISHED	Make the following boiler plant modifi -Inspect and service or replace steam -Upon replacement of existing boilers,	pressure from 120 psig to 80 psig fo. except the laundry, served by a sepai	-kepiace approximately 100 reet of 8" approximately 400 feet of 6" piping a -Purchase oxvgen trim controls for anv	These energy conservation measures wil	REQUESTER INFORMATION	02024110M		FORWARD FOR APPROV	ACTION NO YES ENVIRONMENTAL INPACT 551 ACTION NO YES ACTION	CAPPROVAL CONSIGNATIONS WC		-	APPROVAL ACTION	DOCUMENT NUMBER	SERIAL Y Y O DA			X 73 4283 EDITION OF 1 FEB 78 WILL BE USED UNTIL EXHAUSTED.

### **GROUP** 5

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#### ENERGY CONSERVATION ANALYSIS ESOS

PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
GROUP 5 Building 475 Repairs 475 Attic Insulation - Rotunda 475 Exhaust Heat Recovery 475C Air System Repair 475D Air System Repair 475F Air System Repair 475G Air System Repair 475G Air System Repair 475A Lighting Levels - Chapel 475B Lighting Levels 475H Lighting Levels 475A Energy Efficient Lighting GROUP 5 TOTALS	ECO-A3 ECO-M5 ECO-M11 ECO-M11 ECO-M11 ECO-E1 ECO-E1 ECO-E1 ECO-E2	142 453 273 277 307 247 3 3 2 2 8 1.715	\$578 \$2,130 \$1,458 \$1,474 \$1,641 \$1,323 \$43 \$40 \$21 \$100 \$8,808	\$4,868 \$12,909 \$1,779 \$1,779 \$1,779 \$1,779 \$213 \$213 \$213 \$213 \$131 \$25,663	7.96 6.66 1.51 1.49 1.34 1.67 4.70 5.00 9.50 1.24 3.40	2.03 1.76 7.72 7.83 8.68 6.99 2.40 2.20 1.20 9.00 3.41
IGROUP 5 FUNDING CATEGORY:						

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GROUP 5 - PAGE 1



## ECO-A3

### ATTIC INSULATION



#### ECO-A3 ECONOMIC ANALYSIS

	STEAM CONS	SUMPTION		ELECTRIC (	CONSUMPTI	ON	TOTAL
BUILDING NUMBER	BASE ENERGY	ECO-A3 LOAD	ENERGY SAVINGS	BASE LOAD	ECO-A3 LOAD (KW)	ENERGY SAVINGS (MBTU)	SAVINGS (\$)
	(THERMS)	(THERIVIS)					
				00.000	00.014	4	\$127
463	1,577	1,379	20	83,903	02,014	+	\$598
161	2 1 9 5	1311	88	91.802	86,441	18	3000
404	2,100	15.0.11	27	234 490	232,543	•7	\$194
472	15,515	15,241	21		50 206	0	\$578
475	13,619	12,203	142	58,399	50,500		¢160
4755	21.657	21 253	40	611.712	611,617	0	0103
4755	21,007	21,200	L, <b>v</b>	<u></u>			\$1,657





(	INS		LIFE CYCLE GY CONSERV LOCATION: F	COST ANALYS ATION INVESTI ORT LEAVENW	IS SUMMA MENT PRO ORTH - 1	NRY DGRAM (EC USDB REG	CIP) HON NOS. 7	STUD) LC	7: USDBAE CID 1.035 CENSUS: 2
	PR FIS AN	CAL YEAR 199 ALYSIS DATE:	0 E 03-30-90	ECONOMIC	TION NAM C LIFE 25 \	IE: 475A3 YEARS	PREPARED	BY: CRI	3
	1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CO D. ENERGY C E. SALVAGE V F. TOTAL INV	CTION COST OST REDIT CALC VALUE COST 'ESTMENT (11	(1A+1B+1C)X.9 D-1E)	)			\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4592. 276. 253. 4609. 0. 4609.
	2.	ENERGY SAVI ANALYSIS DA	INGS (+) / COS TE ANNUAL S	ST (-) AVINGS, UNIT (	COST & D	ISCOUNTE	D SAVINGS		
		FUEL	UNIT COS \$/MBTU(1)	T SAVINGS MBTU/YR(	AN 2) SA	NUAL \$ VINGS(3)	DISCOUNT FACTOR(4)	DIS SA	COUNTED VINGS(5)
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	0. 0. 0. 142. 0.	\$ \$ \$ \$ \$	0. 0. 579. 0.	11.16 17.19 17.12 16.15 13.92		0. 0. 9351. 0.
		F. TOTAL		142.	\$	579.		\$	9351.
	3.	NON ENERGY	SAVINGS(+)	COST(-)					
		A. ANNUAL R	ECURRING (+	/-) (ταρι ε Δ)		11.65		\$	0.
		(2) DISCO	UNTED SAVIN	G/COST (3A X	3A1)			\$	0.
		C. TOTAL NO	N ENERGY DI	SCOUNTED SA	VINGS(+)	/COST(-) (:	3A2+3Bd4)	\$	0.
		D. PROJECT I (1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D	NON ENERGY AX NON ENER 01 IS = OR > 30 01 IS < 3C CAL 01B IS = > 1 G 01B IS < 1 PRC	QUALIFICATIO GY CALC (2F5 GO TO ITEM 4 O TO ITEM 4 DECT DOES NO	DN TEST X .33) 4 -3D1)/1F)= DT QUALIF	-Y	\$		
	4.	FIRST YEAR D	DOLLAR SAVI	1GS 2F3+3A+(3	B1D/(YEA	RS ECONO	MIC LIFE))	\$	579.
	5.	TOTAL NET D	ISCOUNTED S	SAVINGS (2F5+	3C)			\$	9351.
	6.	DISCOUNTED (IF < 1 PROJE	SAVINGS RA	TIÓ F QUALIFY)	(SI	IR)=(5 / 1F)=	= 2.03		
	7.	SIMPLE PAYB	BACK PERIOD	(ESTIMATED)	SPB=1F	/4	7.96		

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CONSTRUCTION COST ESTIMATE			DATE PR	EPARED		SHEET OF 4 5		
PROJECT				BASIS FOR E		·		
USDB ENERGY STUDY				x	CODE A	(NO DESIGN	COMPLETED)	
FORT LEAVENWORTH, KS					CODE B	PRELIMINAR	Y DESIGN)	
CLARK RICHARDSON & BISK	UP				OTHER	SPECIFY)		
DRAWING NO.		ESTIM/	TOR			CHECKED B	Y TOL	
NONE	QUA		М	ATERIAL	l	ABOR	TOTAL	
ATTIC INSULATION	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL		TOTAL		
BUILDING 475								
10" BATT INSULATION	3316	SQ FT	0.70	2,321	0.15	497	\$2,819	
MOBILIZATION	3316	SQ FT			0.10	332	\$332	
	_							
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					·		·	
						-		
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	-							
	_							
		1						
SUBTOTAL				\$2.321		\$829	\$3,150	
			10%	\$232	10%	\$83	\$315	
SUBTOTAL				\$2,553		\$912	\$3,465	
WORK COMP, TAX, SOC.SEC., INS			3.50%	\$89	13.0%	\$119	\$208	
DIRECT COST				\$2,642		\$1,031	\$3,673	
OVERHEAD AND PROFIT			25%	\$661	25%	\$258	\$919	
SUBTOTAL				\$3,303	ļ	\$1,289	\$4,592	
CONSTRUCTION COST					<u> </u>		\$4,592	

ENG. FORM 1AVC-59

## ECO-M5

#### EXHAUST HEAT RECOVERY



INS PR FIS	ENERG STALLATION & I OJECT NO. & T SCAL YEAR 199	LIFE CY( GY CONSI LOCATION TLE: 149 0	CLE COS ERVATION: FOR DISC	ST ANALYSIS ON INVESTM I LEAVENWO	S SUMMA IENT PRO DRTH - L	RY OGRAM (EC JSDB REG E: ECOM5	CIP) NON NOS. 7		Y: USDBAE CCID 1.035 CENSUS: 2
AN	ALYSIS DATE:	03-30-90	)	ECONOMIC	LIFE 15 \	/EARS	PREPARED	BA: CH	5
1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE V F. TOTAL INV	CTION CO DST REDIT CA VALUE CO ESTMENT	ST LC (1A ST (1D-1E	+1B+1C)X.9 :)				\$\$ \$ <del>\$</del> \$\$ \$ <del>\$</del> \$	12178. 731. 670. 12221. 0. 12221.
2.	ENERGY SAVI ANALYSIS DA	NGS (+) / TE ANNU/	COST (- AL SAVII	) NGS, UNIT C	OST & DI	SCOUNTE	D SAVINGS		
	FUEL	UNIT ( \$/MBT	COST U(1)	SAVINGS MBTU/YR(2)	ANI SAY	NUAL \$ VINGS(3)	DISCOUNT FACTOR(4)	DIS	COUNTED VINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12. \$ . \$ . \$ 4. \$ .	44 00 00 08 00	-1. 0. 0. 453. 0.	\$ \$ \$ \$ \$	-12. 0. 0. 1848. 0.	8.69 12.42 12.21 11.67 10.36		-104. 0. 21566. 0.
<u>x</u>	F. TOTAL			452.	\$	1836.		\$	21462.
3.	NON ENERGY	SAVINGS	S(+) / CC	ST(-)			•		
	A. ANNUAL R		G (+/-)			0.11		\$	0.
	(1) DISCOU (2) DISCOU	UNT FACT	VING/C	OST (3A X	3A1)	9.11		\$	0.
	C. TOTAL NO	N ENERG	Y DISCO	DUNTED SAV	/INGS(+)	/COST(-) (	3A2+3Bd4)	\$	0.
	D. PROJECT (1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D	NON ENE AX NON E 1 IS = OR 1 IS < 3C D1B IS = > 1B IS < 1	RGY QL NERGY > 3C G( CALC 1 GO T PROJE(	IALIFICATIO CALC (2F5 D TO ITEM 4 SIR = (2F5+3 O ITEM 4 CT DOES NO	N TEST X .33) 3D1)/1F)= T QUALIF	-γ	\$ 7082.		
.4.	FIRST YEAR	OOLLAR S	AVINGS	2F3+3A+(3E	B1D/(YEA	RS ECONC	MIC LIFE))	\$	1836.
5.	TOTAL NET D	ISCOUNT	ED SAV	INGS (2F5+3	C)			\$	21462.
6.	DISCOUNTED (IF < 1 PROJE	SAVINGS CT DOES	S RATIO NOT QI	JALIFY)	(SI	R)=(5 / 1F):	= 1.76		
7.	SIMPLE PAYB	ACK PER	IOD (ES	TIMATED)	SPB=1F/	4	6.66		



CONSTRUCTION COST ESTIM/		DATE PRI	EPARED		SHEET OF 1		
PROJECT				BASIS FOR ES	STIMATE		
				X	CODE A	(NO DESIGN	N COMPLETED) RY DESIGN)
CI ARK RICHARDSON & BISK	UP				OTHER	(SPECIFY)	(GN)
DRAWING NO.		ESTIM	ATOR	RGB		CHECKED	MAW
Q-Dot Air to Air Heat Recovery System	QU/ NO. UNITS	NTITY UNIT MEAS.	PER UNIT	ATERIAL TOTAL	PER UNIT	ABOH TOTAL	COST
					<u></u>		
Q-Dot Air to Air Units	1	EA	\$3,467	\$3,467	\$2,000	\$2,000	\$5,467
MISC. CONTROLS	1	EA	\$400	\$400	\$100	\$100	\$500
SEALED SHEET METAL BLOCK OFF	63	SQ. FT	\$2	\$126	\$12	\$756	\$882
PROP. FAN W/ SHEET METAL HOUSING	1	EA	\$900	\$900	\$500	\$500	\$1,400
	-		·				
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		ļ					<u> </u>
<u>}</u>							
					 	· ·	
		<u> </u>					
SURTOTAL		-	-	\$4,893		\$3,356	\$8,249
CONTINGENCY 10%		·	10%	\$489	10%	\$336	\$825
SUBTOTAL				\$5,382		\$3,692	\$9,074
WORK COMP.TAX.SOC.SECINS			3.50%	\$188	13.09	\$480	\$668
DIBECT COST				\$5,570		\$4,172	\$9,742
OVERHEAD AND PROFIT			25%	\$1,393	25%	<u> </u>	\$2,430
SUBTOTAL		_		\$6,963		\$5,215	5 \$12,178
CONSTRUCTION COST							\$12,178

ENG. FORM 1AVC-59

PREVIOUS EDITION MAY BE USED



### ECO-M11

#### CASTLE AIR SYSTEM REPAIR





### ECO-M11 ECONOMIC ANALYSIS

BUILDING NUMBER	STEAM CONS BASE ENERGY (THERMS)	SUMPTION ECO-M11 LOAD (THERMS)	ENERGY SAVINGS (MBTU)	ELECTRIC BASE LOAD (KW)	CONSUMPTI ECO-M11 LOAD (KW)	ON ENERGY SAVINGS (MBTU)	TOTAL SAVINGS (\$)
			070	AE 179	45 427	0	\$1,115
475C	13,472	10,745	2/3	45,470	52 317	0	\$1,130
475D	15,188	12,422	277	53,358	50,011	0	\$1 254
475E	15,926	12,856	307	53,357	53,324		\$1 011
475G	12 853	10.380	247	45,481	45,427	0	01,011
4/30	1						34,310

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	INS PR FIS AN	ENERO STALLATION & I OJECT NO. & T SCAL YEAR 199 ALYSIS DATE:	.STU ) BY: (	JDY: USDBAE LCCID 1.035 CENSUS: 2 CRB							
	1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CO D. ENERGY C E. SALVAGE F. TOTAL INV	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1678. 101. 92. 1684. 0. 1684.							
	2.	ENERGY SAVI	'INGS (+) / COST ATE ANNUAL SAV	(-) INGS, UNIT C	OST & D	ISCOUNTE	D SAVINGS				
		FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	AN ) SA	INUAL \$ VINGS(3)	DISCOUNT FACTOR(4	)	DISCOUNTED SAVINGS(5)		
		A. ELECT B. DIST C. RESID D. NAŢG E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	0. 0. 273. 0.	\$ \$ \$ \$	0. 0. 1114. 0.	8.69 12.42 12.21 11.67 10.36		0. 0. 0. 13000. 0.		
17 A		F. TOTAL		273.	\$	1114.		\$	13000.		
te A	3.	NON ENERGY SAVINGS(+) / COST(-)									
		A. ANNUAL R (1) DISCO (2) DISCO	\$ \$	0. 0.							
		C. TOTAL NO	ON ENERGY DISC	OUNTED SA	/INGS(+)	/COST(-) (	3A2+3Bd4)	\$	0.		
		D. PROJECT (1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D	NON ENERGY Q IAX NON ENERG D1 IS = OR > 3C G D1 IS < 3C CALC D1B IS = > 1 GO D1B IS < 1 PROJE	UALIFICATION Y CALC (2F5 O TO ITEM 4 SIR = (2F5+3 TO ITEM 4 CT DOES NO	N TEST X .33) 3D1)/1F)= T QUALI	= FY	\$ 4290				
	4.	FIRST YEAR [	\$	1114.							
	5.	TOTAL NET D	\$	13000.							
	6.	. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 7.72 (IF < 1 PROJECT DOES NOT QUALIFY)									
	7.	SIMPLE PAYE	BACK PERIOD (E	STIMATED)	SPB=1F	/4	1.5 ⁻	I			

	LIFE CYCLE COST ANALYSIS SUMMARY ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) INSTALLATION & LOCATION: FORT LEAVENWORTH - USDB REGION NOS. 7 PROJECT NO. & TITLE: 1496 FISCAL YEAR 1990 DISCRETE PORTION NAME: ECOM11D DISCRETE PORTION NAME: ECOM11D									STUI I	DY: USDBAE LCCID 1.035 CENSUS: 2
	ANALYSIS DATE: 03-30-90 ECONOMIC LIFE 15 YEARS PREPARED									DT. U	nD
	1.	INVESTMENT A. CONSTRUCTION COST B. SIOH C. DESIGN COST D. ENERGY CREDIT CALC (1A+1B+1C)X.9 E. SALVAGE VALUE COST F. TOTAL INVESTMENT (1D-1E)									1678. 101. 92. 1684. 0. 1684.
	2.	ENERGY SAVI ANALYSIS DAT	NGS ( FE AN	+) / COST NUAL SAV	(-) INGS, UNIT C	OST &	DISCOUNTE	ED SAVIN	GS		
		FUEL	UN \$/N	IIT COST IBTU(1)	SAVINGS MBTU/YR(2	).	ANNUAL \$ SAVINGS(3)	DISC( FACT	OUNT OR(4)	D S	ISCOUNTED AVINGS(5)
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ <del>\$</del> \$ \$	12.44 .00 .00 4.08 .00	0. 0. 277. 0.	\$\$ \$\$ \$\$ \$\$	0. 0. 0. 1130. 0.		8.69 12.42 12.21 11.67 10.36		0. 0. 13187. 0.
		F. TOTAL			277.	\$	1130.			\$	13187.
14 an 1	З.	NON ENERGY SAVINGS(+) / COST(-)									
		A. ANNUAL RI (1) DISCOU	ECURI JNT F	RING (+/-) ACTOR (T/	ABLE A)		9.11			\$	0.
		(2) DISCOU	JNTE	) SAVING/	COST (3A X	3A1)				\$	0.
		C. TOTAL NO	N ENE	RGY DISC	OUNTED SAV	/INGS(	+) /COST(-)	(3A2+3Bd	4)	\$	0.
		D. PROJECT NON ENERGY QUALIFICATION TEST (1) 25% MAX NON ENERGY CALC (2F5 X .33) $$4352$ . A IF 3D1 IS = OR > 3C GO TO ITEM 4 B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)= C IF 3D1B IS = > 1 GO TO ITEM 4 D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY									
	4.	FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))								\$	1130.
	5.	TOTAL NET D	ISCOL	INTED SAV	/INGS (2F5+3	C)				\$	13187.
	6.	DISCOUNTED (IF < 1 PROJE	SAVII CT DC	NGS RATIO	) IUALIFY)		(SIR)=(5 / 1F	)=	7.83		
	7.	7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 1.49									



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	INS PRO FIS AN	ENERC TALLATION & L OJECT NO. & T CAL YEAR 1990 ALYSIS DATE:	STI	STUDY: USDBAE LCCID 1.035 CENSUS: 2 BY: CRB					
	1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE V F. TOTAL INVI	\$\$ \$\$ \$\$ \$\$ \$\$	1678. 101. 92. 1684. 0. 1684.					
	2.	ENERGY SAVI ANALYSIS DA	INGS (+) / COST TE ANNUAL SA	⁻ (-) VINGS, UNIT C	OST &	DISCOUNTE	D SAVINGS		
		FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	) S	NNUAL \$ AVINGS(3)	DISCOUNT FACTOR(4	- )	DISCOUNTED SAVINGS(5)
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	0. 0. 307. 0.	\$ \$ \$ \$ \$ \$ \$ \$	0. 0. 1253. 0.	8.69 12.42 12.21 11.67 10.36	) 2	0. 0. 0. 14623. 0.
		F. TOTAL		307.	\$	1253.		\$	14623.
N. 19	3.	NON ENERGY							
		A. ANNUAL R	ECURRING (+/-	) FABLE A)		9.11		\$	0.
		(2) DISCO	UNTED SAVING	COST (3A X	3A1)			\$	0.
		C. TOTAL NO	N ENERGY DIS	COUNTED SA	VINGS(-	-) /COST(-) (	(3A2+3Bd4)	\$	0.
		D. PROJECT (1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D							
	4.	FIRST YEAR	DOLLAR SAVIN	GS 2F3+3A+(3E	31D/(YE	ARS ECONO	OMIC LIFE))	\$	1253.
	5.	TOTAL NET D	SCOUNTED SA	VINGS (2F5+3	IC)			\$	14623.
	6.	DISCOUNTED (IF < 1 PROJE	) SAVINGS RAT	IO QUALIFY)	(	SIR)=(5 / 1F)	= 8.68	3	
	7.	SIMPLE PAYE	BACK PERIOD (	ESTIMATED)	SPB=1	F/4	1.34	4	

INS PR FIS AN	ENER STALLATION & OJECT NO. & T CAL YEAR 199 ALYSIS DATE:	STU D BY: C	STUDY: USDBAE LCCID 1.035 CENSUS: 2 BY: CRB					
1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CO D. ENERGY C E. SALVAGE F. TOTAL INV	\$\$ \$\$ \$\$ \$ <del>\$</del> \$	1678. 101. 92. 1684. 0. 1684.					
2.	ENERGY SAVI							
	FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2	A 2) S	NNUAL \$ AVINGS(3)	DISCOUN FACTOR(4	T ( 4) S	DISCOUNTED SAVINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	0. 0. 247. 0.	***	0. 0. 0. 1008. 0.	8.6 12.4 12.2 11.6 10.3	9 2 1 7 6	0. 0. 0. 11763. 0.
	F. TOTAL		247.	\$	1008.		\$	11763.
3.	NON ENERGY							
	A. ANNUAL R (1) DISCO	\$	0.					
	(2) DISCO	OUNTED SAVING		3A1)			ф Ф	0.
	C. TOTAL NO	φ	0.					
	D. PROJECT (1) 25% M. A IF 3D B IF 3D C IF 3I D IF 3D	-						
4.	FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))							1008.
5.	TOTAL NET D	DISCOUNTED SA	VINGS (2F5+3	IC)			\$	11763.
6.	. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 6.99 (IF < 1 PROJECT DOES NOT QUALIFY)							·
7.	SIMPLE PAYE	BACK PERIOD (E	ESTIMATED)	SPB=1	F/4	1.6	7	

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CONSTRUCTION COST ESTIM	ATE		DATE PR	EPARED			SHEET	OF 1
PROJECT	L	BASIS FOR E						
USDB ENERGY STUDY				X	CODE A	(NO DESIGN (PRELIMINA	RY DESIG	TED) N)
ACHITECT/ENGINEER				<u> </u>		(FINAL DES (SPECIFY)	IGN)	
CLARK RICHARDSON & BISP DRAWING NO.		ESTIM	ATOR		OTTICI	CHECKED BY	(	
NONE			M			ABOR	MAW TC	TAL
ECO-M11	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	C	OST
METAL DOORS	2	EA	\$137	\$274	\$80	\$160		\$434
SHEET METAL ≈	50	SQ FT	\$1	\$63	\$1	\$70		\$133
	400	LF	\$1	\$224	\$1	\$336		\$560
			ļ					<u> </u>
	_							
					-			
						•		
	_		1					
								<u> </u>
SUBTOTAL		<u> </u>	ļ	\$560		\$566		\$1,120
CONTINGENCY 10%		<u> </u>	10%	\$56	10%	\$57	<u> </u>	\$11:
SUBTOTAL		<u> </u>		\$616		\$623		\$1,23
WORK COMP, TAX, SOC.SEC., INS			3.50%	\$22	13.0%	\$81	<u> </u>	\$10
		<u> </u>		\$638		\$704		\$1,34
OVERHEAD AND PROFIT			25%	\$160	25%	\$176		\$33
SUBTOTAL				\$798		\$880		\$1,67
		<u> </u>	1	<u> </u>	1		<u>l</u>	\$1,67

1AVC-59

PREVIOUS EDITION MAY BE USED



# ECO-E1

#### LIGHTING LEVELS


	CALCULATION	SHEET			DATE	-	SHEET	0F 1
					Mar-90	041 0111 17		i
PROJECT	USDB				BASIS FOR	CALCULAI	ION	
188 1940 <u></u>	ENERGY SAVI	NGS OPPOR	TUNITY SUP	RVEY				
OCATION					X	HAND		
L	FORT LEAVEN	<u>IWORTH, KS</u>				COMPUTER		
ARCHITECT/EN	GINEER					CONTRACT	ORBID	
	CLARK RICHA	RDSON & BI	<u>SKUP</u>			OTHER (	SPECIFY)	
ECO MEASURE					COMPUTED	BY	CHECKED E	3Y
	ECO-E1					DJG	l	MAW
\$0.0425 11.16	PER KWH ELE 25-YEAR DISC	CTRICITY CO OUNT FACT	OST OR					
BUILDING # AND ROOM TY	PE	LIGHTING WATTS	ANNUAL NORMAL HOURS	ANNUAL HOURS SAVED	ANNUAL KWH SAVED	ANNUAL SAVINGS	PAYBACK IN YEARS	SIR
450 CONFERENCE	BOOM	1280	2080	624	799	\$33.96	5.9	1.9
475A	BOOM	640	2080	624	399	\$16.96	11.8	0.9
475A		1620	2080	624	1011	\$42.97	4.7	2.4
475E	BOOM	480	2080	624	300	\$12.75 ·	15.7	0.7
475B		1500	2080	624	936	\$39.78	5.0	2.2
		800	2080	624	499	\$21.21	9.5	1.2
(SIR >1)		5200	2080	624	3245	\$137.91	8.7	1.3

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Γ		CALCULATION SHEET		DATE Oct-90	SHEET 1	0F 1
F	ROJECT		= Y	BASIS FOR CALCUL	ATION	
ľ	ATION	ENERGY SAVINGS OFFORTOUT TOOTA	<u> </u>	X HAND	FD	
	2.4 	FORT LEAVENWORTH, KS			ER CTOR BID	
F	RCHITECT/EI	CLARK RICHARDSON & BISKUP		OTHER	(SPECIFY	)
E	CO MEASURI			COMPUTED BY DJG	CHECKEL	MAW
	VERAGE PAY	BACK TIME FOR REPLACING EXISTING S	WITCHES			
Ī	VITH INFRARE	ED MOTION SENSORS FOR VARIOUS SPAC	<u>ES</u>			
E	LL COSTS AF	E BASED ON MEANS CONSTRUCTION/DEN COST FOR FORT LEAVENWORTH USDB IS	MOLITION COS \$0.0425 PER K	T DATA WH		
N	NOTION SENS	OR INSTALLATION COST				
1	DEMO EXIS	TING SWITCH BOX	\$2.66 \$5.76			
	DEMO 8' EN		\$53.60			
	INSTALL 20	r, #12 CONDUCTORS	\$13.60			
	INSTALL M	OTION SENSOR	<u>\$125.00</u>			
	TOTAL COS	ST PER INSTALLATION	\$200.02			
E	OSSIBLE EN	ERGY SAVINGS FOR TYPICAL CONFERENC	720 WATTS	•		
	ANNUALLI		2080 HOURS			
	ANNUAL C	OST @ \$0.0425 PER KWH	\$63.65			
	ANNUAL S	AVINGS IF LIGHTS ARE OFF 30% OF TIME	\$19.10			
	PAYBACK	TIME	10.5 YEARS			
				•		
		-RGY SAVINGS FOR TYPICAL SMALL OFFIC	CE ROOM			
ľ	LIGHTING	LOAD	320 WATTS			
	ANNUAL LI		2080 HOURS \$28.29			
	ANNUAL C	AVINGS IF LIGHTS ARE OFF 25% OF TIME	\$7.07			
	COST OF I	NSTALLATION	\$200.62			
	PAYBACK	TIME	28.4 YEARS			
,	NOTE SAVING	35 ARE VERY DEPENDENT ON SEVERAL	TEMS, WHICH	INCLUDE THE FOLLO	WING:	
ľ	1) CURRE	NT PRACTICES IN SWITCHING LIGHTS OFF	. IF PEOPLE N	ORMALLY TURN LIG	HTS OFF V	VHEN NOT
	IN USE, EN	IERGY SAVINGS WILL BE MINIMAL.		VE ESTIMATES MAY	VARY	
		AL SAVINGS WILL FLUCTUATE ACCORDING	GLY.	VE LOTIMATEO MART	•••••	
Ń						
	مختفران					

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CALCULATION SHEET

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		<b>.</b>	•		,			a e e e e e e e e e e e e e e e e e e e			به د <del>این از از</del> دیک بیک از این از ا
	INS PR FIS AN	ENEF STALLATION & OJECT NO. & SCAL YEAR 19 IALYSIS DATE	LIFE GY CC LOCA TITLE: 90 : 03-3	CYCLE CC NSERVAT TION: FOF 1496 DIS 0-90	OST ANALYSI ION INVESTM T LEAVENWO CRETE PORT ECONOMIC	S SUMM MENT PF ORTH - TION NA	ARY OGRAM (EG USDB REG ME: ECOE1 YEARS	CIP) GION NOS. PREPAF	ST 7 RED BY:	UDY: USDBAU LCCID 1.03 CENSUS: CRB	E 5 2
	1.	INVESTMENT A. CONSTRU B. SIOH C. DESIGN C D. ENERGY ( E. SALVAGE F. TOTAL INV	- ICTION CREDIT VALUE VESTM	COST I CALC (1/ E COST ENT (1D-1	A+1B+1C)X.9 E)				\$\$\$ \$ \$ \$ \$ \$	802 48 44 805 0 805	2. 3. 5. 5.
	2.	ENERGY SAV	/INGS ( ATE AN	+) / COST NUAL SAV	(-) 'INGS, UNIT C	OST & I	DISCOUNTE	D SAVING	5		
		FUEL	UN \$/1	NT COST MBTU(1)	SAVINGS MBTU/YR(2	A 2) S	NNUAL \$ AVINGS(3)	DISCOU FACTOR	INT R(4)	DISCOUNTEE SAVINGS(5)	)
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	12.44 .00 .00 4.08 .00	11. 0. 0. 0. 0.	\$\$ \$\$ \$\$ \$\$	137. 0. 0. 0. 0.	11 17 17 16 13	.16 .19 .12 .15 .92	1529 0 0 0 0 0	). ). ). ).
		F. TOTAL			11.	\$	137.		\$	1529	).
	3.	NON ENERG	Y SAVI	NGS(+) / C	OST(-)						
		A. ANNUAL					11.65		\$	; (	).
		(1) DISCC (2) DISCC	DUNTE	D SAVING/	COST (3A X	3A1)			\$	; (	).
		C. TOTAL N	ON EN	ERGY DISC	COUNTED SA	VINGS(+	-) /COST(-)	(3A2+3Bd4)	\$	; (	).
		D. PROJECT (1) 25% M A IF 3 B IF 3 C IF 3 D IF 3	T NON   MAX NO D1 IS = D1 IS < 3D1B IS D1B IS	ENERGY C ON ENERG OR > 3C C 3C CALC S = > 1 GO < 1 PROJE	QUALIFICATIO Y CALC (2F5 GO TO ITEM 4 SIR = (2F5+ TO ITEM 4 ECT DOES NO	N TEST X .33) 3D1)/1F) DT QUAL	)= .IFY	\$ <del>.</del>	505.		
	4.	FIRST YEAR	DOLL	AR SAVING	S 2F3+3A+(3	B1D/(YE	ARS ECON	OMIC LIFE)	) 4	5 13	7.
	5.	TOTAL NET	DISCO	UNTED SA	VINGS (2F5+3	3C)			ŝ	6 152 ⁹	9.
	6.	DISCOUNTE (IF < 1 PROJ	D SAV	NGS RATI	O QUALIFY)	(	SIR)=(5 / 1F	)=	1.90		
	7.	SIMPLE PAY	васк	PERIOD (E	STIMATED)	SPB=1	F/4		5.88		



## ECO-E2

#### ENERGY EFFICIENT LIGHTING SYSTEMS

Г		CALCULATION SHEET		DATE		SHEET	0F	
$\left  \right $	PROJECT	USDB		Mar-90 BASIS FOR	CALCUL		1	
		ENERGY SAVINGS OPPORTUNI	TY SURVEY	<u>x</u>	HAND			
	ABCHITECT	FORT LEAVENWORTH, KS				R TOR BID		
Ľ		CLARK RICHARDSON & BISKUP		COMPLITE	OTHER	(SPECIFY	) D BY	
ľ	ECO MEASUR	RE ECO-E2		COMPUTEL	DJG		MAW	
4	AVERAGE PA	YBACK TIME FOR RELAMPING A	ND REBALLASTING FL	UORESCEN	<u>T LIGHT F</u>	IXTURES		
	ALL COSTS A	RE BASED ON MEANS CONSTRU	CTION/DEMOLITION CC	OST DATA				
	ELECTRICITY	COST FOR FORT LEAVENWORT	H USDB IS \$0.0425 PER	KWH				
	ASSUME FIXT	TURES ARE ON FOR 365 DAYS x 1	2 HOURS PER DAY = 4	380 HOURS	PER YEAI	F		
	2 LAMP FLUC	RESCENT LIGHT FIXTURE						
	COST TO COST TO TOTAL C	D REBALLAST LIGHT FIXTURE D RELAMP LIGHT FIXTURE WITH : COST PER FIXTURE	34W LAMPS \$9.25 x 2 =	\$58.00 \$18.50 \$76.50				
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1								
	ELECTR 8W PER	ICITY SAVINGS LAMP x 2 LAMPS PER FIXTURE	= 16W PEF	R FIXTURE P	ER HOUR	i		
	\$0.0425	PER KWH x 0.016 KWH x 4380 HR	= 0.016 K S = \$2.98 PE	(WH PER FI) R YEAR	TURE			
	SIMDI E							
	TOTAL	COST PER FIXTURE	\$76.50					
	ELECTR SIMPLE	ICITY SAVINGS PER YEAR PAYBACK IN YEARS	\$2.98 25.7					
	4 LAMP FLUC	DRESCENT LIGHT FIXTURE						
	COST TO COST TO TOTAL (	O REBALLAST LIGHT FIXTURE O RELAMP LIGHT FIXTURE WITH S COST PER FIXTURE	\$58.00 x 2 = 34W LAMPS \$9.25 x 4 =	\$116.00 \$37.00 \$153.00				
	ELECTR	ICITY SAVINGS						
	8W PER	LAMP x 4 LAMPS PER FIXTURE	= 32W PEF = 0.032 F	R FIXTURE F WH PER FI	YER HOUF	{		
	\$0.0425	5 PER KWH x 0.032 KWH x 4380 HF	RS = \$5.97 PE	R YEAR				
	SIMPLE		¢153.00					
		JUSI FER FIXIURE	φ100.00					
	ELECTR	RICITY SAVINGS PER YEAR	\$5.97					

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		Mar-90		-		
USDB		14161 50	1	1	1	
		BASIS FOR CA	LCULATIC	)N		
ENERGY SAVINGS OFFORTUNIT	Y SURVEY	Y I	ΗΔΝΠ			
FORT LEAVENWORTH KS		<u> </u>	COMPUTE	R		
NGINEER			CONTRAC	TOR BID		
CLARK RICHARDSON & BISKUP			OTHER	(SPECIFY)		
E		COMPUTED BY		CHECKED	BY MA\//	
ECO-E2		<u></u>	000			
NS FOR RETROFITTING INCANDES	SCENT FIXT	URES TO FLUO	RESCENT	FIXTURES		
A STAIRWELL						
RE BASED ON MEANS CONSTRUC	TION/DEMO	LITION COST D	ATA			
COST FOR FORT LEAVENWORTH	USDR IS \$0.	.0425 PER KWH				
URES ARE ON FOR 365 DAYS × 24	HOURS PE	R DAY = 8760 H	OURS PER	RYEAR		
UNES AND ON I ON 505 DATE X 24						
	NUMBER		ΤΟΤΔΙ	ENERGY	TOTA	L
4	(FACH)	COST	COST	USE (W)	ENERGY	USE
LAST	6	\$11.00	\$66	3	. 18	
TWIN TUBE FLUORESCENT LAMP	6	\$5.84	\$35	13	78	
	6	\$3.75	\$23	0	0	
	<u> </u>	11	\$124		0.096K	<u></u>
CTRICITY USAGE = 6 LAMPS x 60	W PER LAMP	P = 360 W OR .36	5KW/H			
ICITY USAGE = 0.096 KW/H		_				
RICTY SAVED = 0.36 KW/H - 0.096	KW/H = 0.26	54 KW/H				
		100/VEAR - \$98		FAR		
$NGS = 0.264 \text{ KW/H} \times $0.0425 \text{ /KWH}$	x 8/60 HOU	JNS/ 1 EAR = \$30	29 FLN N			
	CLARK RICHARDSON & BISKUP E ECO-E2 NS FOR RETROFITTING INCANDES A STAIRWELL RE BASED ON MEANS CONSTRUC COST FOR FORT LEAVENWORTH URES ARE ON FOR 365 DAYS x 24 URES ARE ON FOR 365 DAYS x 24 LAST TWIN TUBE FLUORESCENT LAMP ECTRICITY USAGE = 6 LAMPS x 60' ICITY USAGE = 0.096 KW/H RICTY SAVED = 0.36 KW/H - 0.096 NGS = 0.264 KW/H x \$0.0425 /KWH	NUMPER         E         ECO-E2         NS FOR RETROFITTING INCANDESCENT FIXT         A STAIRWELL         RE BASED ON MEANS CONSTRUCTION/DEMC         COST FOR FORT LEAVENWORTH USDB IS \$0         'URES ARE ON FOR 365 DAYS x 24 HOURS PE         I       NUMBER (EACH)         LAST       6         TWIN TUBE FLUORESCENT LAMP       6         CTRICITY USAGE = 6 LAMPS x 60W PER LAMI         ICITY USAGE = 0.096 KW/H       0.096 KW/H = 0.26         NGS = 0.264 KW/H x \$0.0425 /KWH x 8760 HOL	CLARK RICHARDSON & BISKUP CLARK RICHARDSON & BISKUP ECO-E2 NS FOR RETROFITTING INCANDESCENT FIXTURES TO FLUO A STAIRWELL RE BASED ON MEANS CONSTRUCTION/DEMOLITION COST D. COST FOR FORT LEAVENWORTH USDB IS \$0.0425 PER KWH URES ARE ON FOR 365 DAYS x 24 HOURS PER DAY = 8760 HO (EACH) COST LAST 6 \$11.00 TWIN TUBE FLUORESCENT LAMP 6 \$5.84 6 \$3.75 ECTRICITY USAGE = 6 LAMPS x 60W PER LAMP = 360 W OR .30 ICITY USAGE = 0.096 KW/H RICITY SAVED = 0.36 KW/H - 0.096 KW/H = 0.264 KW/H NGS = 0.264 KW/H x \$0.0425 /KWH x 8760 HOURS/YEAR = \$98	NUMBER       OTHER         E       COMPUTED BY         ECO-E2       DJG         NS FOR RETROFITTING INCANDESCENT FIXTURES TO FLUORESCENT         A STAIRWELL         RE BASED ON MEANS CONSTRUCTION/DEMOLITION COST DATA         COST FOR FORT LEAVENWORTH USDB IS \$0.0425 PER KWH         'URES ARE ON FOR 365 DAYS x 24 HOURS PER DAY = 8760 HOURS PER         I       NUMBER         'URES ARE ON FOR 365 DAYS x 24 HOURS PER DAY = 8760 HOURS PER         I       (EACH)         COST       COST         LAST       6         S11.00       \$5.64         G       \$11.00         S6       \$3.75         S23       \$124	NGINEER       OTHER (SPECIFY)         CLARK RICHARDSON & BISKUP       OTHER (SPECIFY)         ECO-E2       DJG         NS FOR RETROFITTING INCANDESCENT FIXTURES TO FLUORESCENT FIXTURES         A STAIRWELL         RE BASED ON MEANS CONSTRUCTION/DEMOLITION COST DATA         COST FOR FORT LEAVENWORTH USDB IS \$0.0425 PER KWH         'URES ARE ON FOR 365 DAYS x 24 HOURS PER DAY = 8760 HOURS PER YEAR         'URES ARE ON FOR 365 DAYS x 24 HOURS PER DAY = 8760 HOURS PER YEAR         'URES ARE ON FOR 365 DAYS x 24 HOURS PER DAY = 8760 HOURS PER YEAR         'UNIN TUBE FLUORESCENT LAMP       6         'S5.84       \$33.75         'USAGE = 6 LAMPS x 60W PER LAMP = 360 W OR .36KW/H         IOTTY USAGE = 6 LAMPS x 60W PER LAMP = 360 W OR .36KW/H         IOTTY SAVED = 0.36 KW/H - 0.096 KW/H = 0.264 KW/H         'NGS = 0.264 KW/H x \$0.0425 /KWH x 8760 HOURS/YEAR = \$98.29 PER YEAR	NUMBER       OTHER (SPECIFY)         E       COMPUTED BY       CHECKED BY         ECO-E2       DJG       MAW         NS FOR RETROFITTING INCANDESCENT FIXTURES TO FLUORESCENT FIXTURES       MAW         A STAIRWELL       STAIRWELL       MAW         RE BASED ON MEANS CONSTRUCTION/DEMOLITION COST DATA       COST FOR FORT LEAVENWORTH USDB IS \$0.0425 PER KWH         URES ARE ON FOR 365 DAYS × 24 HOURS PER DAY = 8760 HOURS PER YEAR         V       NUMBER INSTALLED TOTAL ENERGY TOTAL (EACH)         COST       COST       USE (W)         LAST       6       \$11.00         STAIR TUBE FLUORESCENT LAMP 6       \$5.84       \$35         MIN TUBE FLUORESCENT LAMP 6       \$3.75       \$23       0         CETRICITY USAGE = 6 LAMPS × 60W PER LAMP = 360 W OR .36KW/H       0.096K         ICITY USAGE = 0.096 KW/H       "       0.264 KW/H       NGS = 0.264 KW/H × \$0.0425 /KWH × 6760 HOURS/YEAR = \$98.29 PER YEAR

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CALCULATION SHEET

INS PR FIS	ENER STALLATION & OJECT NO. & T SCAL YEAR 199	LIFE GY CO LOCAT TITLE: 0 03-23	CYCLE CC NSERVAT ION: FOF 1496 DIS 3-90	OST ANAL ION INVE IT LEAVE CRETE P	YSIS S STME NWOF ORTIC	SUMM NT PR TH - N NAM	ARY OGRAM (E USDB RE ME: ECOE YEARS	ECIP) GION N 2 PR	NOS. 7 EPARED	ST BY:	UDY: USDBAE LCCID 1.035 CENSUS: 2 CRB
1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CO D. ENERGY C E. SALVAGE ' F. TOTAL INV	CTION OST REDIT VALUE ESTME	COST CALC (1/ COST ENT (1D-1	A+1B+1C) E)	X.9		· _ / · · ·			\$ \$ \$ \$ \$ \$ \$ \$	124. 7. 7. 124. 0. 124.
2.	ENERGY SAV	INGS (- TE ANI	+) / COST NUAL SAV	(-) 'INGS, UN		ST & D	ISCOUNTI	ED SAV	/INGS		
	FUEL	UN \$/M	IT COST IBTU(1)	SAVINO MBTU/\	3S ′R(2)	AN SA	NUAL \$ VINGS(3)	DIS FA	SCOUNT CTOR(4)		DISCOUNTED SAVINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	12.44 .00 .00 4.08 .00		3. ). ). ).	\$\$ \$ <del>\$</del> \$\$ \$ <del>\$</del>	100. 0. 0. 0. 0.	· .	11.16 17.19 17.12 16.15 13.92		1116. 0. 0. 0. 0.
	F. TOTAL			8	3.	\$	100.			\$	1116.
3.	NON ENERGY	SAVIN	IGS(+) / C	OST(-)							
	A. ANNUAL R	ECURF UNT FA	RING (+/-) ACTOR (T/	ABLE A)			11.65			\$	0.
	(2) DISCOU	UNTED	SAVING/	COST (ЗА	ХЗА	(1)				\$	0.
	C. TOTAL NO	N ENEI	RGY DISC	OUNTED	SAVIN	IGS(+)	/COST(-)	(3A2+3	Bd4)	\$	0.
	D. PROJECT I (1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D	NON E AX NON 1 IS = ( 1 IS < 3 01B IS = 1B IS <	NERGY Q N ENERGY DR > 3C G 3C CALC = > 1 GO 1 < 1 PROJE	UALIFICA ( CALC (2 0 TO ITE SIR = (21 10 ITEM 4 CT DOES	TION 7 F5 X M 4 F5+3D NOT (	TEST .33) 1)/1F)= QUALII	- FY	\$	368.		
4.	FIRST YEAR D	OLLAF	R SAVING	S 2F3+3A	+(3B1[	D/(YEA	RS ECON	OMIC L	IFE))	\$	100.
5.	TOTAL NET D	ISCOU	NTED SA	/INGS (2F	5+3C)					\$	1116.
6.	DISCOUNTED (IF < 1 PROJE	SAVIN CT DO	IGS RATIO	) IUALIFY)		(S	IR)=(5 / 1F)	)=	9.00		
7.	SIMPLE PAYB		ERIOD (ES	STIMATE	)) SI	PB=1F	/4		1.24		

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	INS PR FIS AN	ENER TALLATION & OJECT NO. & CAL YEAR 199 ALYSIS DATE:	LIFE IGY CO LOCA TITLE: 90 12-5	CYCLE CC DNSERVAT TION: FOF 1496 DIS 5-90	OST ANALYSIS ION INVESTM IT LEAVENWO CRETE PORT ECONOMIC	S SUMM IENT PR DRTH - TION NAM LIFE 15	ARY OGRAM (E0 USDB REC ME: GROUI YEARS	CIP) GION NOS. 7 P #5 PREPARE	STUD La D BY: CR	Y: USDBAE CCID 1.035 CENSUS: 2 B	
	1.	INVESTMENT A. CONSTRU B. SIOH C. DESIGN C D. ENERGY C E. SALVAGE F. TOTAL INV	OST CREDI VALUI /ESTM	I COST T CALC (1/ E COST IENT (1D-1	4+1B+1C)X.9 E)	·			\$ \$ \$ \$ \$ \$ \$	24206. 1452. 1331. 24290. 0. 24290.	
	2.	ENERGY SAV	INGS	(+) / COST INUAL SAV	(-) INGS, UNIT C	OST & D	ISCOUNTE	DSAVINGS			
		FUEL	U1 \$/	NIT COST MBTU(1)	SAVINGS MBTU/YR(2)	AN ) SA	INUAL \$ AVINGS(3)	DISCOUN ⁻ FACTOR(4	T DIS ) SA	SCOUNTED VINGS(5)	
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$	12.44 .00 .00 4.08 .00	17. 0. 0. 1699 <i>.</i> 0.	\$\$ \$ <del>\$</del> \$ <del>\$</del> \$ <del>\$</del>	211. 0. 0. 6932. 0.	8.69 12.42 12.2 11.67 10.39	) 2 7 3	1834. 0. 0. 80896. 0.	
$\bigcirc$		F. TOTAL			1716.	\$	7143.		\$	82730.	
	3.	NON ENERG	Y SAV	NGS(+) / C	OST(-)		·				
		A. ANNUAL F	RECUP	RING (+/-)			9.11		\$	0.	
		(2) DISCO	UNTE	D SAVING/	COST (3A X	3A1)			\$	0.	
		C. TOTAL NO	ON ENI	ERGY DISC	OUNTED SAV	/INGS(+)	/COST(-)	(3A2+3Bd4)	\$	0.	
		D. PROJECT (1) 25% M A IF 30 B IF 30 C IF 3 D IF 31	NON IAX NO D1 IS = D1 IS < D1B IS D1B IS	ENERGY Q ON ENERG' OR > 3C G $CALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCALCCAL$	UALIFICATIOI Y CALC (2F5 O TO ITEM 4 SIR = (2F5+3 FO ITEM 4 CT DOES NO	N TEST X .33) 3D1)/1F) <del>:</del> T QUALI	= FY	\$ 27301			
	4.	FIRST YEAR	DOLL	AR SAVING	S 2F3+3A+(3E	81D/(YE4	ARS ECONO	OMIC LIFE))	\$	7143.	
	5.	TOTAL NET	DISCO	UNTED SA	VINGS (2F5+3	C)			\$	82730.	
	6.	DISCOUNTE	D SAV ECT D	INGS RATIO	D QUALIFY)	(S	SIR)=(5 / 1F)	)= 3.4	1		
	7.	SIMPLE PAY	BACK	PERIOD (E	STIMATED)	SPB=1	-/4	3.4	0		
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GROUP 5 - PAGE 20



FACULTIES RADIAGES AND GUEST - KFA, XFB, XFB, XFB, XFB, XFB, XFB, XFB, XFB			NUMBER SUFFIX BLANK	3 64 65 66 67 63 69 70 71 72 73 74 75 78 77 78	1 P 0 14 17 15 A 1 1 1 1 1 1	FACILITY BUILDING/FACILITY	SUFFIX NUMBER SUFFIX BLA	3 64 65 66 67 68 69 70 71 72 73 74 79 76 77 78 7	H I I I I I I I I I I I I I I I I I I I	PLISHED	ed in building 475. Heat rinsulated attic.	iste heat to the outdoors,	tify in the Castle,	sted energy. Failure to	ourt in continued waste of gy will also continue to	ixtures are not used.	TIONAL INFORMATION		N SOURCE OF FUNDS		<ul> <li>DIRECT</li> <li>AUTOMATIC REIMB.</li> </ul>	C FUNDED REIMB.	DATE				•			GREEN - FORWARD TO KEYPUNCH AFTE
FACILITIES ENGINE ENNOW ONR REQUEST - JEAL       FACILITY FOR LAND CONCOMMENT FACILITY ONTE       SUFFIX YR MO     DAF     OTE     OTE       SUFFIX YR MO     DA     OTE     OTE     OTE       SUFFIX YR MO     DA     OTE     OTE     OTE       SUFFIX YR MO     DA     OTE     OTE     OTE       SUFFIX NUMBER     SUFFIX     NUMBER     SUFFIX     NUMBER       SUFFIX     NUMBER     SUFFIX     NUMBER     SUFFIX       SUFFIX     SUFFIX     NUMBER     SUFFIX     NUMBER       SUFFIX     SUFFIX     NUMBER     SUFFIX     NUMBER       SUFFIX     NUMBER     SUFFIX     NUMBER     SUFFIX       SUFFIX     SUFFIX     NUMBER     SUFFIX     NUMBER       SUFFIX     NUMBER     SUFFIX     NUMBER     SUFFIX       SUFFIX     NUMBER     SUFFIX     SUFFIX     NUMBER       SUFFIX     NUMBER     SUFFIX     SUFFIX     SUFFIX       SUFFIX     NUMBER     SUFFIX     SUFFIX     SUFFIX       SUFFIX     SUFFIX     SUFFIX     SUFFIX     SUFFIX       SUFFIX     NUMBER     SUFFIX     SUFFIX     SUFFIX       SUFFIX     SUFFIX     SUFFIX	XFB, XFC Office of the Chief of Engineers.		SHORT JOB DESCRIPTION	8 49 50 51 52 53 54 55 56 57 58 59 50 51 52 5	14,715; Rielpaulings, 1,1	Y SUILDING/FACILITY BUILDING	EIX NUMBER SUFFIX . NUMBER	3 49 50 51 52 53 54 55 56 57 58 59 60 61 62 6	1 P10 14 17 15 1G 1 1 P10 14 17 5	WHAT WILL HAPPEN IF WORK IS NOT ACCOMI	gy will continue to be wast be wasted through the unde	ust air will continue to wa	Air will continue to stra	Iting in discomfort and was	all motion sensors will res ting energy. Lighting ener	asted if energy efficient f	PERSON TO CALL FOR ADDI	ORGANIZATIO	APPROVED FOR DESIG				SIGNATURE	REMARKS		· · · · · · · · · · · · · · · · · · ·	r	2		FORMARD TO KEYPUNCH AFTER COMPLETIO
FACILITIES FACILITY FACILITY SUFFIX YR MO DA OTHER FL SUFFIX YR MO DA OTHER FL SUFFIX YR MO DA OTHER FL SUFFIX NUMBER, SUFFIX R SUFFIX R SUFFIX NUMBER, SUFFIX R SUFFIX R S	5 ENGINEERING WORK REQUEST - XFA, 17 and DA Parn 420-6; the proconent agency is the		IND CITATION	33 34 35 35 37 38 39 40 41 42 43 44 45 46 47 4	IIII ABIULIAIDIGE	חורסואפיבאכורודץ פחורסואפיבאכורוד	VUMBER SUFFIX NUMBER SUF	3 34 35 36 37 33 39 40 41 42 43 44 45 46 47 48	1417 15 10 1 1 P 10 1417 15 F	DESCRIBE	ngs: Ener will	xhaust air to Exha	fan room walls in air.	resu	ings 4/5A, 4/5B, Inst ligh	units.		2XATURE ZAME		WORK TO 35 FROM PERFORMED	C IN-HOUSE FACILITIES ENGINEER	CONTRACT	DATE DATE			- LOAWAADA	MO DA MO DA	19 20 21 2223 24 25 2	PROVAL AUTHORITY	
	For use of this form, see AR 420-1	FACILITY DATE	SUFFIX YR MO DA OTHERFU	19 20 21 22 23 24 25 25 25 28 29 30 31 32 3		ACILITY BUILDING/FACILITY BU		19 20 21 22 23 24 25 26 27 28 29 30 31 32 3	B I P 0 4175 C I P 10	COMPLISHED	tions to the Castle buildin to the attic of the rotune	it to transfer heat from en	seal pipe penetrations in	, and 475G.	lighting control in build:	cures with high efficiency	UESTER INFORMATION	ON TELEPHONE NO. SIG	FORWARD FOR APPROVAL	IROWMENTAL IMPACT ESTIMATED COST YES	CONSIDERATIONS WC K S 25,66		COMPLETED UNFUNDED 5 1,166 COMPLETED TOTAL 526,829		APPROVAL ACTION	DATE	KO DA	15 16 17 18	ED SIGNATURE OF APP	GBOL

## GROUP 6

	PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	GROUP 6 Building 450 Repairs						
450	Solar Window Shading Lighting Levels	ECO-A6 ECO-E1	36 3	\$256 \$34	\$2,121 \$213	7.84 5.90	1.66 <u>1.90</u>
	GROUP 6 TOTALS	LOW COST/N	39 NO COST	\$290	\$2,334	7.58	1.27

#### ENERGY CONSERVATION ANALYSIS ESOS

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## ECO-A6

#### SOLAR WINDOW SHADING

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#### ECO-A6 ECONOMIC ANALYSIS

	STEAM CONS	SUMPTION		ELECTRIC (	CONSUMPTI	ON	
BUILDING NUMBER	BASE ENERGY (THERMS)	ECO-A6 LOAD (THERMS)	ENERGY SAVINGS (MBTU)	BASE LOAD (KW)	ECO-A6 LOAD (KW)	ENERGY SAVINGS (MBTU)	TOTAL SAVINGS (\$)
tt							<b>0</b> 407
450	3.629	2,920	71	135,466	132,697	9	\$407
463	1 577	1,796	-22	83,903	82,425	5	(\$27)
460	2 195	2 352	-16	91,802	90,467	5	(\$7)
404	15 515	15 515	0	234,490	229,344	18	\$218
472	2 407	2 600	-20	148 420	145,653	9	\$35
4/3	2,407	10 772	-20	146 357	136,920	32	\$401
4/5A	12,773	12,77		05 207	93 496	6	\$73
<u>4/5B</u>	8,4//	8,477	<u> </u>	07 050	86 474	5	\$59
<u>475H</u>	8,137	8,137	<u> </u>	07,000	00,474	L	\$751

GROUP 6 - PAGE 2

	PR FIS AN	ENERC STALLATION & I OJECT NO. & T SCAL YEAR 199 ALYSIS DATE:	LIFE C GY CON LOCATIO ITLE: 1 0 03-30-	YCLE CC SERVAT ON: FOF 496 DIS 90	OST ANALYS ION INVEST IT LEAVENW CRETE POR ECONOMIC	IS SUMM MENT PF ORTH - TION NAI CLIFE 25	ARY OGRAM (E USDB RE( ME: 450A6 YEARS	CIP) GION NOS. PREPAF	7 RED B	STUDY: LCC C Y: CRB	USDBAE ID 1.035 ENSUS: 2
	1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE V F. TOTAL INVI	OST REDIT ( ALUE ( ESTMEN	CALC (14 COST NT (1D-1	4+1B+1C)X.9 E)					\$\$ \$\$ \$\$ \$\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	2001. 120. 110. 2008. 0. 2008.
	2.	ENERGY SAVI ANALYSIS DAT	NGS (+) FE ANNI	/ COST	(-) INGS, UNIT (	COST & [	DISCOUNTE	ED SAVINGS	S		
		FUEL	UNIT \$/ME	COST STU(1)	SAVINGS MBTU/YR(2	A1 2) S7	NNUAL \$ AVINGS(3)	DISCOU FACTOR	JNT 7(4)	DISC SAVI	OUNTED NGS(5)
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$1 \$ \$ \$ \$	2.44 .00 .00 4.08 .00	13. 0. 0. 23. 0.	\$\$ \$\$ \$\$ \$	162. 0. 0. 94. 0.	11 17 17 16 13	.16 7.19 7.12 9.15 9.92		1808. 0. 0. 1518. 0.
		F. TOTAL			36.	\$	256.			\$	3326.
1.24	3.	NON ENERGY	SAVINO	GS(+) / C(	OST(-)						
		A. ANNUAL RE (1) DISCOU (2) DISCOU	ECURRI JNT FAC JNTED	NG (+/-) CTOR (TA SAVING/(	ABLE A) COST (3A X	3A1)	11.65			\$ \$	0. 0.
		C. TOTAL NO	N ENER	GY DISC	OUNTED SA	VINGS(+	) /COST(-)	(3A2+3Bd4)		\$	0.
		D. PROJECT M (1) 25% MA A IF 3D B IF 3D C IF 3D D IF 3D	NON EN AX NON 1 IS = 0 1 IS < 30 1 IS < 30 1 IS IS = 1 IS IS <	ERGY Q ENERGY R > 3C G C CALC > 1 GO T 1 PROJE	UALIFICATIO ( CALC (2F5 O TO ITEM 4 SIR = (2F5+ TO ITEM 4 CT DOES NO	N TEST X .33) 3D1)/1F) DT QUAL	= FY	\$ 10 	98.		
	4.	FIRST YEAR D	OLLAR	SAVING	S 2F3+3A+(3	B1D/(YE/	ARS ECON	OMIC LIFE))		\$	256.
	5.	TOTAL NET DI	SCOUN	TED SAV	/INGS (2F5+3	BC)				\$	3326.
	6.	DISCOUNTED (IF < 1 PROJEC	SAVINO CT DOE	S RATIO	) UALIFY)	(5	6IR)=(5 / 1F)	)= 1	.66		
	7.	SIMPLE PAYB	ACK PE	RIOD (ES	STIMATED)	SPB=1F	-/4	7	7.84		

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CONSTRUCTION COST ESTIMATE			DATE PRI	EPARED	4/2/90		SHEET (	DF 8
PROJECT				BASIS FOR E	STIMATE			
OCATION FORT LEAVENWORTH, KS				<u>x</u>	CODE A CODE B	(NO DESIGN ( (PRELIMINAR)	COMPLETED Y DESIGN)	))
ARCHITECT/ENGINEER CLARK RICHARDSON & BISI	KUP				OTHER (	SPECIFY)	·····	
DRAWING NO.		ESTIM	ATOR	DIS		CHECKED B	r TOL	
ECO-A6	QUA	NTITY	M	ATERIAL	L		TOT	AL ST
SOLAR WINDOW SHADING	NO. UNITS	UNIT MEAS.						
BUILDING 450								
SOLAR FILM	488	SQ FT	1.30	634	1.30	634		\$1,269
MOBILIZATION	488	SQ FT			0.15	73		\$73
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			<u> </u>					
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			<u> </u>				<u> </u>	
SUBTOTAL			<u> </u>	\$634		\$708		\$1,343
CONTINGENCY 10%			10%	\$63	10%	\$71		\$134
SUBTOTAL				\$697		\$779		\$1,470
WORK COMP, TAX, SOC.SEC., INS			3.50%	\$24	13.0%	\$101		\$12
DIRECT COST				\$721		\$880		\$1,60
			25%	\$180	25%	\$220 \$1.100		\$2.00
SUBTOTAL				\$901		31,100		\$2,00
ENG. FORM 150		<u> </u>	I	<u></u>	1	1	<u> </u>	. <u></u>

1AVC-59



PREVIOUS EDITION MAY BE USED



# ECO-E1

### LIGHTING LEVELS





<b></b>	CALCULATION SHEET	DATE	SHEET 1	0F	1
PROJECT	USDB ENERGY SAVINGS OPPORTUNITY SURVEY	BASIS FOR CALCULAT	ION		
ARCHITECT/EN	FORT LEAVENWORTH, KS IGINEER CLARK RICHARDSON & BISKUP	COMPUTER CONTRACT OTHER (	R OR BID SPECIFY)	DV	
ECO MEASURE	ECO-E1	COMPUTED BY DJG		MAW	1
BASED ON THE \$200.62 \$0.0425 11.16	FOLLOWING INFORMATION: FOR TYPICAL MOTION SENSOR INSTALLATION PER KWH ELECTRICITY COST 25-YEAR DISCOUNT FACTOR				

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BUILDING # AND ROOM TYPE	LIGHTING WATTS	ANNUAL NORMAL HOURS	ANNUAL HOURS SAVED	ANNUAL KWH SAVED	ANNUAL SAVINGS	PAYBACK IN YEARS	SIR
450	1280	2080	624	799	\$33.96	5.9	1.9
CONFERENCE ROOM	640	2080	624	399	\$16.96	11.8	0.9
CONFERENCE ROOM	1620	2080	624	1011	\$42.97	4.7	2.4
CHAPEL	480	2080 .	624	300	\$12.75	15.7	0.7
CONFERENCE ROOM	1500	2080	624	936	\$39.78	5.0	2.2
475B CHAPEL	1500	2000	624	499	\$21.21	9.5	1.2
475H APEL	800	2080	624	3245	\$137.91	8.7	1.3
(SIR >1)	5200	2080	024	5245			]

#### CALCULATION SHEET

			DATE	SHEET	OF
	CALCULATION SHEET		Oct-90		11
	USOB		BASIS FOR CALCUL		
ROJECI	ENERGY SAVINGS OPPORTUNITY SURVEY		Y HAND		
ATION			COMPUT	ER	
	FORT LEAVENWORTH, KS		CONTRA	CTOR BID	×
ARCHITECT/E	NGINEER		OTHER	ICHECKE	DBY
FOO MEASUE	CLARK HIGHARDOOM C		DIG		MAW
ECO MEASOR	ECO-E1	UES	000		
AVERAGE PA	YBACK TIME FOR REPLACING EXISTING SWITC				
WITH INFRAR	ED MOTION SENSORS FOR MANY				
ALL COSTS A ELECTRICITY	RE BASED ON MEANS CONSTRUCTION/DEMOLI COST FOR FORT LEAVENWORTH USDB IS \$0.04	FION COS 125 PER K	WH		
MOTION SEN	SOR INSTALLATION COST	\$2.66			
DEMO EXI	STING SWITCH BOX	\$2.00			
DEMO 8' E	MT WITH WIRING	\$53.60			
INSTALL 2	or #12 CONDUCTORS	\$13.60			
INSTALL A	AOTION SENSOR	\$200.62	-		
TOTAL CO	OST PER INSTALLATION	9200.04			
		•			
	· · · ·				
	CONFERENCE R	MOC			•
POSSIBLE EN	VERGY SAVINGS FOR TIFICAL COM CITY	20 WATTS	5		
	ICHTING TIME 208		<b>S</b>		
ANNUAL	COST @ \$0.0425 PER KWH	\$03.00			
ANNUAL	SAVINGS IF LIGHTS ARE OFF 30% OF TIME	\$200.62	2		
COST OF	INSTALLATION 10	0.5 YEARS	S .		
PATBACK					
POSSIBLE E	NERGY SAVINGS FOR TYPICAL SMALL OFFICE F	20 WATT	s		
LIGHTING	G LOAD 20	80 HOUR	S		
ANNUAL		\$28.29	9		
	SAVINGS IF LIGHTS ARE OFF 25% OF TIME	\$7.07	/ >		
COST OF	INSTALLATION	\$200.04 98 4 YFAR	2 S		
PAYBAC	KTIME				
			HINCLUDE THE FOL	LOWING:	
NOTE: SAV	INGS ARE VERY DEPENDENT ON SEVERAL ITEM	PEOPLE	NORMALLY TURN L	IGHTS OF	F WHEN NO
1) CURF	RENT PRACTICES IN SWITCHING LIGHTO OFFE				
IN USE, I	INT OF TIME THAT LIGHTS WILL NOT BE IN USE	, THE ABO	OVE ESTIMATES WA		
AND AC	TUAL SAVINGS WILL FLUCTUATE ACCORDINGLY	•			
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CALCULATION SHEET

INS	ENERO	LIFE CYCLE CO GY CONSERVAT LOCATION: FO	OST ANALYSI TION INVESTM RT LEAVENWO	S SUMMA IENT PRO ORTH - 1	ARY OGRAM (EC USDB REC	CIP) SION NOS. 7	STU	IDY: USDBAE LCCID 1.035 CENSUS: 2
PR FIS AN	OJECT NO. & 1 CAL YEAR 199 ALYSIS DATE:	0 DIS 03-30-90	CRETE PORT ECONOMIC	ION NAM	IE: ECOE1 YEARS	PREPARED	) BY: C	RB
1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE Y F. TOTAL INV	CTION COST OST CREDIT CALC (1 VALUE COST 'ESTMENT (1D-'	A+1B+1C)X.9 1E)				\$\$ \$\$ \$\$ \$ <del>\$</del>	802. 48. 44. 805. 0. 805.
2.	ENERGY SAVI ANALYSIS DA	INGS (+) / COST TE ANNUAL SA	(-) /INGS, UNIT C	OST & D	ISCOUNTE	D SAVINGS		
	FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2	AN ) SA	INUAL \$ .VINGS(3)	DISCOUNT FACTOR(4)	· [ ) \$	DISCOUNTED SAVINGS(5)
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ 12.44 \$ .00 \$ .00 \$ 4.08 \$ .00	11. 0. 0. 0. 0.	\$\$ \$\$ \$\$ \$\$	137. 0. 0. 0. 0.	11.16 17.19 17.12 16.15 13.92	- ·	1529. 0. 0. 0. 0. 0.
	F. TOTAL		11.	\$	137.		\$	1529.
3.	NON ENERGY	Y SAVINGS(+) / C	COST(-)				•	0
	A. ANNUAL R (1) DISCO	ECURRING (+/-)	ABLE A)		11.65		\$	0.
	(2) DISCO	UNTED SAVING	/COST (3A X	3A1)			\$ \$	0.
	C. TOTAL NO	ON ENERGY DIS	COUNTED SA	VINGS(+)	/COST(-)	(3A2+3Bd4)	\$	0.
	D. PROJECT (1) 25% M A IF 3D B IF 3D C IF 3I D IF 3D	NON ENERGY ( AX NON ENERG 1 IS = $OR > 3C$ 1 IS < $3C$ CALC D1B IS = > 1 GO D1B IS < 1 PROJ	QUALIFICATIO SY CALC (2F5 GO TO ITEM 4 SIR = (2F5+ TO ITEM 4 ECT DOES NO	N TEST X .33) 3D1)/1F)= )T QUALI	= FY	\$ 505		
4.	FIRST YEAR	DOLLAR SAVING	GS 2F3+3A+(31	B1D/(YEA	RS ECONO	OMIC LIFE))	\$	137.
5.	TOTAL NET D	DISCOUNTED SA	VINGS (2F5+3	3C)			\$	1529.
6.	DISCOUNTEE (IF < 1 PROJE	D SAVINGS RAT ECT DOES NOT	IO QUALIFY)	(S	iR)=(5 / 1F)	)= 1.90	כי ביי	
7.	SIMPLE PAY	BACK PERIOD (I	ESTIMATED)	SPB=1F	-/4	5.8	8	

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Ĵ	INS PR(	ENERO TALLATION & I DJECT NO. & T CAL YEAB 199	LIFE ( GY COI LOCAT ITLE:	CYCLE CC NSERVAT ION: FOR 1496 DIS	OST ANALYSIS ION INVESTM IT LEAVENWO	S SUM 1ENT P ORTH 10N N	MARY ROGRAM (E0 - USDB REC AME: GROUI	CIP) GION NOS P #6	6. 7	STU	DY: USDBAE LCCID 1.035 CENSUS: 2
	AN	ALYSIS DATE:	12-5-	90	ECONOMIC	LIFE 1	5 YEARS	PREP	ARED	BY: C	RB
	1.	INVESTMENT A. CONSTRUC B. SIOH C. DESIGN CC D. ENERGY C E. SALVAGE \ F. TOTAL INVI	CTION DST REDIT /ALUE ESTME	COST CALC (14 COST ENT (1D-1	4+1B+1C)X.9 E)					\$\$ \$\$ \$\$ \$\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	2214. 133. 122. 2222. 0. 2222.
	2.	ENERGY SAVI ANALYSIS DA	NGS (- TE ANI	+) / COST NUAL SAV	(-) 'INGS, UNIT C	OST &	DISCOUNTE	D SAVIN	GS		
		FUEL	UN \$/M	IT COST IBTU(1)	SAVINGS MBTU/YR(2	)	ANNUAL \$ SAVINGS(3)	DISCO FACTO	DUNT OR(4)	C S	DISCOUNTED SAVINGS(5)
		A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$\$ \$\$ \$\$ \$ <b>\$</b>	12.44 .00 .00 4.08 .00	16. 0. 0. 23. 0.	\$\$ \$\$ \$ <del>\$</del> \$\$	199. 0. 0. 94. 0.		8.69 12.42 12.21 11.67 10.36		1729. 0. 0. 1097. 0.
		F. TOTAL			39.	\$	293.			\$	2826.
e5,75w	3.	NON ENERGY	SAVIN	IGS(+) / C	OST(-)						
		A. ANNUAL R		RING (+/-)			0.11			\$	0.
		(1) DISCO		) SAVING/	COST (3A X	3A1)	3.11			\$	0.
		C. TOTAL NO	N ENE	RGY DISC	OUNTED SAY	VINGS	(+) /COST(-)	(3A2+3Bd	4)	\$	0.
		D. PROJECT (1) 25% M/ A IF 3D B IF 3D C IF 3D D IF 3D	NON E AX NO 1 IS = 1 IS < 01B IS 01B IS	NERGY Q N ENERG OR > 3C G 3C CALC = > 1 GO < 1 PROJE	UALIFICATIO Y CALC (2F5 GO TO ITEM 4 SIR = (2F5+ TO ITEM 4 ECT DOES NO	N TES X .33) 3D1)/11 )T QUA	T F)= NLIFY	\$	933.		
	4.	FIRST YEAR [	DOLLA	R SAVING	IS 2F3+3A+(31	B1D/(Y	EARS ECON	OMIC LIFI	Ξ))	\$	293.
	5.	TOTAL NET D	ISCOL	INTED SA	VINGS (2F5+3	3C)				\$	2826.
	6.	DISCOUNTED (IF < 1 PROJE	SAVII CT DC	NGS RATIO	O QUALIFY)		(SIR)=(5 / 1F	)=	1.27		
	7.	SIMPLE PAYE	BACK F	PERIOD (E	STIMATED)	SPB=	1F/4		7.58		

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GROUP 6 - PAGE 8

				For use of	FA this form see	CILITIES E	NGINEERINC	WORK RE	QUEST	XFA, XFB, is the Office	XFC of the Chief of	Engineers.					
20	DOCUMENT NUMBE	בא פחורסו	ING/FACILITY	A0	TE									108	ILDING/FACI	נודץ	
ANS ANS	EQ SERIAL	NUMBE	ER SUFFI	IX YR MC	y VO C	JTHER FUN	D CITATION			SHOR	T JOB DESCRI	PTION		אר	имвея	SUFFIX	BLANK
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450.	This will	reduce th	o the sou le solar	ltn, eas heat ga	it and w in, res	est win ulting	aows in b in coolin	д елегд	ح	LI THE Will CO	windows intinue t	remain u o experi	intinted, ence lar	· spaces ·ge solar	in buil r loads	ding 450 in the	<b>-</b>
savi by t	lngs. Insta. urning light	ll motion ts off dur	sensors ting unoc	in buil	ding 45 times.	0. Thi	s will sa	ve ener	дy	cooling result	r season. in contin	Failur nued was	te to ins	tall mot chting e	tion sen energy b	SOLS COL	uld of
I	1		'n	ı						lights	being le	ft on du	iring uno	ccupied	times.	) ) 5 )	l
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FORM AUG 78	4283 EDITION C	)F 1 FEB 78 WILI	L BE USED UN	ITIL EXHAUS	ITED.	GROUP	6 - PAGE 9	1HW XNIG	TE IORIGIN	AL) - PROJE - FORW	ECT FILE COP ARD TO KEYF PPROVAL AC	Y PUNCH AFTEI TION" BLOCK	R COMPLETIO	C REEZ	- FORWARD COMPLETIC APPROVAL	TO KEYPUN N OF "FORV " BLOCK	CH AFTE VARD FC
															•	•	:

## **GROUP** 7

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PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
GROUP 7 Energy Efficient Motors						
All Buildings in the USDB	ECO-E3	248	\$3,085	\$22,185	6.81	1.64
		248	\$3,085	\$22,185	6.81	1.64
GROUP 7 FUNDING CATEGORY: NO	ONE	· · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · · ·				

#### ENERGY CONSERVATION ANALYSIS ESOS

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GROUP 7 - PAGE 1

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# ECO-E3

### ENERGY EFFICIENT MOTORS

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#### AVERAGE EFFICIENCIES AND ENERGY SAVINGS FOR VARIOUS MOTOR SIZES STANDARD VS HIGH EFFICIENCY PAYBACKS FOR REPLACING AN EXISTING MOTOR

		LICES	STANDARD	HIEFF	WATT	INSTALLED
HORSE-	STANDARD		MOTOR	MOTOR	LOSS	HIEFF MTR
POWER	MOIOR		WATTLOSS	WATTIOSS	DIFFERENCE	COST
	EFFICIENCY	EFFICIENCE	WATT 2000	142	87	\$420
1	76.5	84.0	229	142	117	\$442
1.5	78.5	85.5	306	190	117	C 466
2	80.8	86.5	355	233	122	\$460
	79.9	88.5	563	291	272	\$582
	13.5	90.5	759	438	321	\$644
5	83.1	89.5	1000	608	474	\$820
7.5	83.8	90.2	1082	000	506	\$966
10	85.0	90.2	1316	811	300	¢1 255
15	86.5	91.7	1746	1013	/34	\$1,200
	87.5	93.0	2131	1123	1008	\$1,527
20	07.5	03.0	2543	1404	1139	\$1,780
25	88.0	93.0	2022	1685	1338	\$2,030
30	88.1	93.0	3023	0040	1498	\$2,623.
40	89.4	93.6	3538	2040	1490	\$2,232
50	90.4	94.1	3961	2339	1622	33,232

		8760	HOURS			5000	HOURS	
HORSE-				010	ENERGY	COST	SIMPLE	SIR
POWER	ENERGY	COST	SIMPLE	SIR	SAVINGS	SAVINGS	PAYBACK	
	SAVINGS	SAVINGS	PAYBACK		SAVINOS	\$19	22.7	0.5
1	763	\$32	13.0	0.9	435	\$25	17.8	0.6
1.5	1,022	\$43	10.2	1.1	584		18.0	0.6
2	1,066	\$45	10.3	1.1	608	\$20	10.0	1.1
3	2,384	\$101	5.7	1.9	1,361	\$58	10.1	12
5	2,812	\$119	5.4	2.0	1,605	\$68	9.4	1.4
7.5	4,150	\$176	4.6	2.4	2,369	\$101	0.1	12
1.0	4,432	\$188	5.1	2.2	2,530	\$108	9.0	1.4
15	6,426	\$273	4.6	2.4	3,668	\$156	8.1	1.7
20	8 834	\$375	4.1	2.7	5,042	\$214	7.1	1.5
25	9 981	\$424	4.2	2.6	5,697	\$242	7.4	1.5
20	11 725	\$498	4.1	2.7	6,692	\$284	7.1	
40	13 120	\$558	4.7	2.3	7,489	\$318	8.2	1.3
<u>+0</u>	14 212	\$604	5.4	2.1	8,112	\$345	9.4	1.2

		4380	HOURS			2920	HOURS	
HORSE- POWER	ENERGY	COST	SIMPLE	SIR	ENERGY	COST	SIMPLE	SIR
	SAVINGS	SAVINGS	PAYBACK		SAVINGS	SAVINGS	38.9	0.3
1	381	\$16	25.9	0.4	254	\$14	30.5	0.4
1.5	511	\$22	20.3	0.5	355	\$15	30.9	0.4
2	1 1 9 2	\$23	11.5	1.0	795	\$34	17.2	0.6
5	1,406	\$60	10.8	1.0	937	\$40	16.2	0.7
7.5	2,075	\$88	9.3	1.2	1,383	\$59	15.4	0.0
10	2,216	\$94	10.3	1.1	1,477	\$03	13.8	0.8
15	3,213	\$137	9.2	1.4	2,945	\$125	12.2	0.9
20	4,417	\$100	8.4	1.3	3,327	\$141	12.6	. 0.9
30	5.862	\$249	8.1	1.4	3,908	\$166	12.2	0.9
40	6,560	\$279	9.4	1.2	4,373	\$186	14.1	0.7
50	7,106	\$302	10.7	1.0	4,737	\$201	L	<u></u>

25 YEAR DISCOUNT FACTOR = 11.16

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ELECTRICITY COST = 4.25¢/KWH

GROUP 7 - PAGE 2



	CALCULAT	ION SHEE	T		DATE		SHEET	0F 2
					Mar-90		I!	6
PROJECT	USDB ENERGY SA	VINGS OF	PORTUNI	TY SURVEY	ASIS FOR C	HAND	-	
LOCATION	FORTLEAV	ENWORTH	- KS			COMPUTER		
ABCHITECT/E	NGINEER	LINIOITI				CONTRACTO		
	CLARK RICI	HARDSON	& BISKUP			OTHER (SP	CHECK	FD BY
ECO MEASUR	E				COMPUTED		Cheon	MAW
	ECO-E3					000	· · · · · · · · · · · · · · · · · · ·	
			ODED	SAVINGS	SAVINGS	INSTALLED	SIR	PAYBAC
BUILDING # A			HOURS/	PER YEAR	PER YEAR	COST		YEARS
MOTOR DESC			YEAR	MBTU'S	DOLLARS			20.9
BUILDING 463		1.5	4380	1.7	\$21.15	\$442	0.5	20.9
FAN					050.71	\$644	1.0	10.8
<b>BUILDING 463</b>		5	4380	4.8	\$59.71	, <del>4</del> 044		
CONDENSING			4290	17	\$21,15	\$442	0.5	20.9
BUILDING 464		1.5	4380		<b>4-0</b>		L	
FAN		1.5	4380	1.7	\$21.15	\$442	0.5	20.9
FAN	•	1.5		· .		0011	1 1 2	94
BUILDING 465	;	5	5000	5.5	\$68.42	\$644	1.2	5.4
COMPRESSO	R				000.40	\$644	1.2	9.4
<b>BUILDING 465</b>	5	5	5000	5.5	\$68.42			
COMPRESSO	R		1000	17	\$21.15	\$442	0.5	20.9
BUILDING 465		1.5	4380	1.7	φειιο			
COLD WATEH		75	4380	7.1	\$88.32	\$820	1.2	9.3
HOT WATER	PIMP	/.5	1000				0.5	20.8
BLIII DING 465	5	2	4380	1.8	\$22.39	\$466	0.5	20.0
IR HANDLIN	G UNIT				01017	\$420	0.4	26.0
BUILDING 465	5	1	4380	1.3	\$10.17	\$ <del>4</del> 20		
AIR HANDLIN	<u>G UNIT</u>		1000	12	\$16.17	\$420	0.4	26.0
BUILDING 465		1	4380	1.5	ψισ	· · · · · · · · · · · · · · · · · · ·		
AIR HANDLIN	G UNII		4380	4.1	\$51.00	\$582	1.0	11.4
HOT WATER								20.0
BUILDING 472	2	1.5	4380	1.7	\$21.15	\$442	0.5	20.5
FAN					051.00	\$592	10	11.4
BUILDING 473	3	3	4380	4.1	\$51.00	\$502	1.0	
HOT WATER	PUMP		4290	1.8	\$59.71	\$644	1.0	10.8
BUILDING 473		5	4360	4.0	<b>400</b>			
HUI WATER	PUMP	40	8760	44.8	\$557.31	\$2,623	2.4	4.7
BOILDING 474							1	51
BUILDING 474	4	10	8760	15.1	\$187.84	\$966	2.2	5.1
FAN					\$197.94	\$966	2.2	5.1
BUILDING 474	4	10	8760	15.1	\$107.04	\$300		
FAN			9760	15.1	\$187.84	\$966	2.2	5.1
BUILDING 474	4	10	8700	10.1	•			
BUILDING 47	4	10	8760	15.1	\$187.84	\$966	2.2	5.1
CONDENSAT							1	51
BUILDING 47	4	10	8760	15.1	\$187.84	\$966	2.2	
CONDENSAT	E PUMP				\$100.76	\$582	1.9	5.8
BUILDING 47	4	3	8760	8.1	a100.70	WUUL		
AIR COMPRE	SSOR		9760	34 1	\$424.20	\$1,780	2.7	4.2
BUILDING 47	4	25	0/00	54.1				
AIR COMPRE	<u></u>							

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25-YEAR DISCOUNT FACTOR= 11.16

					DATE		SHEET	OF				
	CALCULATION SI	HEET	DATE		2	- 2						
PROJECT	USDB		BASIS FOR C	ALGULAHOR								
	ENERGY SAVING	S OPPO	JRVEY									
CATION				×	COMPLITER							
	FORT LEAVENWO	DRTH, KS										
ARCHITECT/E	NGINEER		OTHER (SPECIFY)									
	CLARK RICHARD	<u>SON &amp; B</u>	CONDUTED		CHECKED BY							
ECO MEASUF	<u>}E</u>				COMPUTED		MAW					
	ECO-E3				L							
		·		CAVINCE	SAVINGS	INSTALLED	SIR	PAYBACK				
BUILDING # A	ND	HP	OPER.	SAVINGS		COST		YEARS				
MOTOR DESC	CRIPTION		HOURS/	PER TEAR	DOLLARS							
		ļ	YEAH	MBIUS	\$51.00	\$582	1.0	11.4				
BUILDING 475	5	3	4380	4.1	401.00							
ROTUNDA CC	ONDENSING UNIT	<u> </u>	+	71	\$88.32	\$820	1.2	9.3				
BUILDING 47	5	7.5	4380	1.1								
ROTUNDA CO	ONDENSING UNIT	Ļ	+	1.9	\$59.71	\$644	1.0	10.8				
BUILDING 47	5C	5	4380	4.0	φυυ							
FAN		<u> </u>	+ 1000	1 9	\$59.71	\$644	1.0	10.8				
BUILDING 47	5C	5	4380	4.0	ψοσ., ι							
FAN		<u> </u>	1 1000	1.8	\$59.71	\$644	1.0	10.8				
BUILDING 47	5D	5	4380	4.0	<b>400</b>		<u> </u>					
FAN		+	1000	4.8	\$59.71	\$644	1.0	10.8				
BUILDING 47.	5D	5	4380	4.0								
FAN		<u> </u>	4000	1.8	\$59.71	\$644	1.0	10.8				
BUILDING 47	5F	5	4380	4.0								
FAN		<u> </u>	4290	48	\$59.71	\$644	1.0	10.8				
BUILDING 47	5F .	5	4380	4.5								
FAN		+	1200	4.8	\$59.71	\$644	1.0	10.8				
BUILDING 47	'5G	5	4380	7.0								
<u>'AN</u>		+	1380	48	\$59.71	\$644	1.0	10.8				
പ്UILDING 47	'5G	5	4300	7.0								
FAN				248	\$3,085.00	\$20,929	1.6	6.8				
TOTAL							_	1				
(SIR > 1)	-				_1							

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INS PR FIS	LIFE CYCLE COST ANALYSIS SUMMARY ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) NSTALLATION & LOCATION: FORT LEAVENWORTH - USDB REGION NOS. 7 PROJECT NO. & TITLE: 1496 FISCAL YEAR 1990 DISCRETE PORTION NAME: GROUP #7												STUDY: USDBAE LCCID 1.035 CENSUS: 2 BY: CRB			
AN 1.	ALYSIS DATE: 03-19-90 INVESTMENT A. CONSTRUCTION COST B. SIOH C. DESIGN COST D. ENERGY CREDIT CALC (1A+1B+1C)X.9 E. SALVAGE VALUE COST F. TOTAL INVESTMENT (1D-1E)												20929. 1256. 1151. 21002. 0. 21002.			
2.		Y SAVI	NGS ( TE AN	(+) / COST NUAL SA	(-) VINGS, UI		ST & C	ISCOUNTE	ED SA	/INGS						
	FUEL		UN \$/1	IT COST MBTU(1)	SAVIN MBTU/	GS YR(2)	AN SA	NUAL \$ AVINGS(3)	DI: FA	SCOUNT CTOR(4)	:	DISCO SAVINO	UNTED GS(5)			
	A. ELE B. DIS C. RES D. NAT E. COA		\$	12.44 .00 .00 4.08 .00	24	48. 0. 0. 0. 0.	\$\$ \$\$ \$\$ \$\$ \$	3085. 0. 0. 0. 0.		11.16 17.19 17.12 16.15 13.92			34429. 0. 0. 0. 0. 0.			
J.	F. TOT	AL			24	48.	\$	3085.			\$		34429.			
3.	NON EI															
	A. ANNUAL RECURRING (+/-) (1) DISCOUNT FACTOR (TABLE A) (2) DISCOUNTED SAVING/COST (3A X 3A1)												0. 0.			
	C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3Bd4)												0.			
	D. PROJECT NON ENERGY QUALIFICATION TEST (1) 25% MAX NON ENERGY CALC (2F5 X .33) \$ 11362. A IF 3D1 IS = OR > 3C GO TO ITEM 4 B IF 3D1 IS < 3C CALC SIR = $(2F5+3D1)/1F$ )= C IF 3D1B IS = > 1 GO TO ITEM 4 D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY															
4.	FIRST	YEAR [	DOLLA	AR SAVING	GS 2F3+3	A+(3B1	D/(YE)	ARS ECON	OMIC	LIFE))	\$		3085.			
5.	TOTAL	NET D	ISCO	UNTED SA	VINGS (2	2F5+3C	)				\$		34429.			
6.	DISCO (IF < 1	UNTED PROJE	SAVI	NGS RAT DES NOT	IO QUALIFY	)	(5	SIR)=(5 / 1F	)=	1.64						
7.	SIMPL	E PAYE	васк	PERIOD (I	ESTIMATE	ED) S	SPB=11	=/4		6.81						



	aullding/FACILITY NUMBER SUFFIX BLAD	54   53   54   57   53   59   70   71   72   72   74   75 78 77   7		כירודץ פטורטואפ/באכורודץ	SUFFIX NUMBER SUFFIX	122156157153159 2017117275/7477575175	SHED	ed by operation of		יאר וארכתאת דוסא	W Z O S K W L W L W L W L W L W L W L W L W L W	SCURCE OF FUNDS		OIASCT					•		REEN FORWARD TO KEYPUNCH AFTE COMPLETION OF "FORWARD F APPROVAL" 5LOCK
V.YFS, XFC 43N. ■ Office of the Chickhof Snaincers.	SHORT JOB DESCRIPTION	28 49 50 51 52 53 54 55 55 57 58 59 50 61 62 63 6	<u>Erfiloitie intri i Mioitioirisi i</u>	TY SULDING/FACILITY SULLDING/FAI	ארואפנא ארואפנא ארואפנא	3149 50 51 52 53 54 55 55 55 57 52 59 60 51 52 53 54	WHAT WILL HAPPEN IF WORK IS NOT ACCOMPLIS	ergy willicontinue to be waste andard efficiency motors.		אנעטא דס כארג גסא אסטרוטא	0401-1104	APPROVED FOR DESIGN			210 X Y - C X E	NO REMARKS					ROJECT FILE COPY ORWARD TO REYPUNCH AFTER COMPLETION E "APPROVAE ACTION" BLOCK
TIES ENGINEERING WORK REQUEST - XFA	REUND CITATION	32 3332 35 35 37 38 39 40 41 22 43 44 45 46 45		<u>אורטואפיבאכורודץ אטורטואפ/דאכונוז</u>		12 23 34 35 35 37 33 39 40 41 42 43 45 45 46 47 4.	DESCRIBE	h efficiency motors, btors when replacing in higher compley	consumption.		SIGNATURE 21046		PERFORMED	185 CIN-HOUSE FACILITIES ENGINEER	00 0 17800P			DESIGN ESTIMATOR	19/20/21 / 22/23/24 /25 /25	PPROVAL AUTHORITY	UP 7 - PAGE 6 . PINK SCHICKALL - PINK
For use of this form, ise AR 4:	BUILDING/FACILITY DATE OATE OTHER NUMBER SUFFIX YR MO DA DA OTHER	15 15 17 18 19 20 21 22 22 22 24 25 25 25 28 29 30 31	· S ID IB1-1 - 1 - 9 11 0 11 3 11 - 1 - 1	וחורסואפיבשכורובא מחורסואפיבשכורובא	UMBER SUFFIX NUMBER, SUFFIX	s 1 18 1 17 1 18 1 18 1 20 21 22 22 24 25 27 28 28 28 20 31 3	C TO RE ACCOMPLISHED	ard efficiency motors with high Motors with high the sible. Use energy efficient mo Maintenance, this will result	3DB and less electrical energy	REQUESTER INFORMATION	ANIZATION TELEPHONE NO.	FORVIARD FOR APPROVAL	NO YES	C ENVIRCNMENTAL FUNCEO S	C C C C C C C C C C C C C C C C C C C		APPROVAL ACTION	ION TAKEN MO DA	15 15 17 18		GRO. שורר גנש אשטצדבס. הורר גנש טעדור גישאשטגדבס.
		1 2 5 6 7 3 9 10 11 12 12 12 14		C OOCUMENT NUMBER 3	Z REQ SERIAL FYER		TION AND JUSTIFICATION OF WORK	Repare existing stands here economically feas otors during regular m	ower factors at the US				PECONNANOUD FCTION	C JPPROVAL C OISJPPROVAL	21-1207-1-0-			SCALAL Y PE . ACT	5 6 7 8 9 10 11 12 12 14		78 4283 EDITION OF 1 FEB 781