

Limited Energy Study Energy Engineering Analysis Program (EEAP) Fort Knox, Kentucky

Final Report

*Volume 1
Sections 1-3*

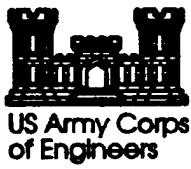
CONTRACT # DACA27-93-C-0096
SYSTEMS/CORP PROJECT # 93006.03
NOVEMBER 5, 1993

DISTRIBUTION STATEMENT A

Approved for public release
Distribution Unlimited

SYSTEMS_{corp}

SYSTEMS ENGINEERING AND MANAGEMENT CORPORATION



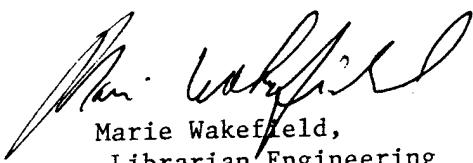


DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

--
REPLY TO
ATTENTION OF: TR-I Library

17 Sep 1997

Based on SOW, these Energy Studies are unclassified/unlimited.
Distribution A. Approved for public release.



Marie Wakefield,
Librarian Engineering

FINAL REPORT

TABLE OF CONTENTS

Volume 1	Page No.
1. EXECUTIVE SUMMARY	1-1
1.1 SYNOPSIS	1-1
1.2 INTRODUCTION	1-1
1.2.1 Scope of Work	1-1
1.2.2 Organization of the Final Report	1-2
1.3 PRESENT AND HISTORICAL ENERGY CONSUMPTION	1-2
1.3.1 Natural Gas Costs	1-2
1.3.2 Electric Costs	1-5
1.4 ENERGY CONSERVATION OPPORTUNITIES INVESTIGATED	1-5
1.4.1 ECOs Recommended	1-8
1.4.2 ECOs Rejected	1-8
1.4.3 ECIP Projects Developed	1-8
2. METHODS AND APPROACH	2-1
2.1 FIELD SURVEY	2-1
2.1.1 Building Lighting	2-2
2.1.2 Ballfield Lighting	2-5
2.2 CALCULATIONS	2-7
2.2.1 Baseline Energy Consumption	2-7
2.2.1.1 Baseline Energy Consumption: ECO - 1	2-7
2.2.1.2 Baseline Energy Consumption: ECO - 2	2-9
2.2.1.3 Baseline Energy Consumption: ECO - 3	2-9
2.2.1.4 Baseline Energy Consumption: ECO - 4	2-12
2.2.3 ENERGY CONSERVATION OPPORTUNITIES	2-14
2.3.1 ECO - 1: Ceiling Reflectance	2-14
2.3.2 ECO - 2: High Efficiency Indoor Lighting	2-15
2.3.3 ECO - 3: Indoor Lighting Controls	2-15
2.3.4 ECO - 4: Ballfield Lighting and Controls	2-16

19971017 087

DTIC QUALITY INSPECTED 2

3. PROGRAMMING DOCUMENT - ECIP PROJECT 1 3-1

Volume 2

3. PROGRAMMING DOCUMENT - ECIP PROJECT 1 3-340

APPENDICES

4. SCOPE OF WORK 4-1

5. INTERIM REVIEW MEETING MINUTES 5-1

6. INTERIM REVIEW COMMENTS AND RESPONSE 6-1

7. INTERIM REVIEW PRESENTATION 7-1

LIST OF TABLES

Table 1.3.1	Fort Knox Natural Gas	1-3
Table 1.3.2	Fort Knox Electric	1-6
Table 1.4.3	ECIP Project Summary	1-9
Table 2.1.1.1	Buildings Surveyed	2-3
Table 2.1.2.1	Ballfields Surveyed	2-6
Table 2.2.1.1.1	Baseline Energy Consumption ECO - 1	2-8
Table 2.2.1.2.1	Baseline Energy Consumption ECO - 2	2-10
Table 2.2.1.3.1	Baseline Energy Consumption ECO - 3	2-11
Table 2.2.1.4.1	Baseline Energy Consumption ECO - 4	2-13

LIST OF FIGURES

Figure 1.3.1	Fort Knox LES Natural Gas FY92	1-4
Figure 1.3.2	Fort Knox LES Electric FY92	1-7
Figure 3.1	Photocell Control Layout-Building 86	3-632
Figure 3.2	Photocell Control Layout-Building 94	3-633
Figure 3.3	Photocell Control Layout-Building 158	3-634
Figure 3.4	Photocell Control Layout-Building 159	3-635
Figure 3.5	Photocell Control Layout-Building 2730	3-636
Figure 3.6	Photocell Control Layout-Building 2942, 2943	3-637
Figure 3.7	Photocell Control Layout-Building 2944	3-638
Figure 3.8	Photocell Control Layout-Building 2963, 2969-2974, 2979, 2980 ..	3-639
Figure 3.9	Photocell Control Layout-Building 5220	3-640

Figure 3.10	Photocell Control Layout-Building 5222	3-641
Figure 3.11	Photocell Control Layout-Building 5253	3-642
Figure 3.12	Photocell Control Layout-Building 5256	3-643

1 EXECUTIVE SUMMARY

1.1 SYNOPSIS

Systems Corp surveyed and completed energy analyses for 37 buildings, and eight ballfields. The energy conservation opportunities (ECOs) evaluated were ceiling reflectance, high efficiency indoor lighting, indoor lighting controls, and ballfield lighting and control systems. Cost estimates were prepared using M-CACES. Life cycle cost analyses were performed using the Life Cycle Cost in Design (LCCID) computer program. Project development brochures (PDBs) and DD1391 forms were prepared for a Energy Conservation Investment Program (ECIP) project. The project that was developed represents \$93,956 in annual savings with favorable simple paybacks and saving to investment ratios (SIRs).

1.2 INTRODUCTION

Systems Engineering and Management Corporation (SYSTEMS/CORP) was contracted by the Louisville District of the United States Army Corps of Engineers in June 1993 to perform a limited energy study for 37 buildings at Fort Knox, Kentucky. In addition, the project includes a ballfield lighting survey of 8 locations.

1.2.1 Scope of Work

1. Evaluated selected energy conservation opportunities (ECOs) to determine their energy savings potential and economic feasibility.
2. Conduct a limited site survey of selected buildings or areas to insure that any methods of energy conservation which are practical and have not been evaluated in any previous energy study have been considered and the results documented.
3. Determine efficiency of existing systems. Determine the replacement option with the highest SIR.
4. Provide complete programming or implementation documentation for all recommended ECOs.

1 EXECUTIVE SUMMARY

5. Prepare a comprehensive report to document the work performed, the results, and the recommendations.

1.2.2 Organization of the Final Report

The submitted material for this report consists of the following:

Volume I: Executive Summary, Methods and Approach, and Programming Document-ECIP Project I

Volume II: Programming Document-ECIP Project (Continued), Scope of Work, Interim Review Meeting Minutes, Interim Review Comments and Responses, and Interim Review Presentation

1.3 PRESENT AND HISTORICAL ENERGY CONSUMPTION

The baseline energy consumption and energy conservation opportunity energy consumption were determined using speadsheets and manual calculating to model system energy consumption. These have been included in *Section 2* of this report.

1.3.1 Natural Gas Costs

The natural gas consumption and cost for FY92 (October 1991-September 1992) at Fort Knox are shown in *Table 1.3.1, Fort Knox Natural Gas*. *Figure 1.3.1* is a bar graph of the monthly consumption and costs. The natural gas cost used for evaluating the ECOs is as follows:

$$\text{COST}/\text{MBTU} = \$3.74/\text{MBTU}$$

TABLE 1.3.1

FORT KNOX NATURAL GAS

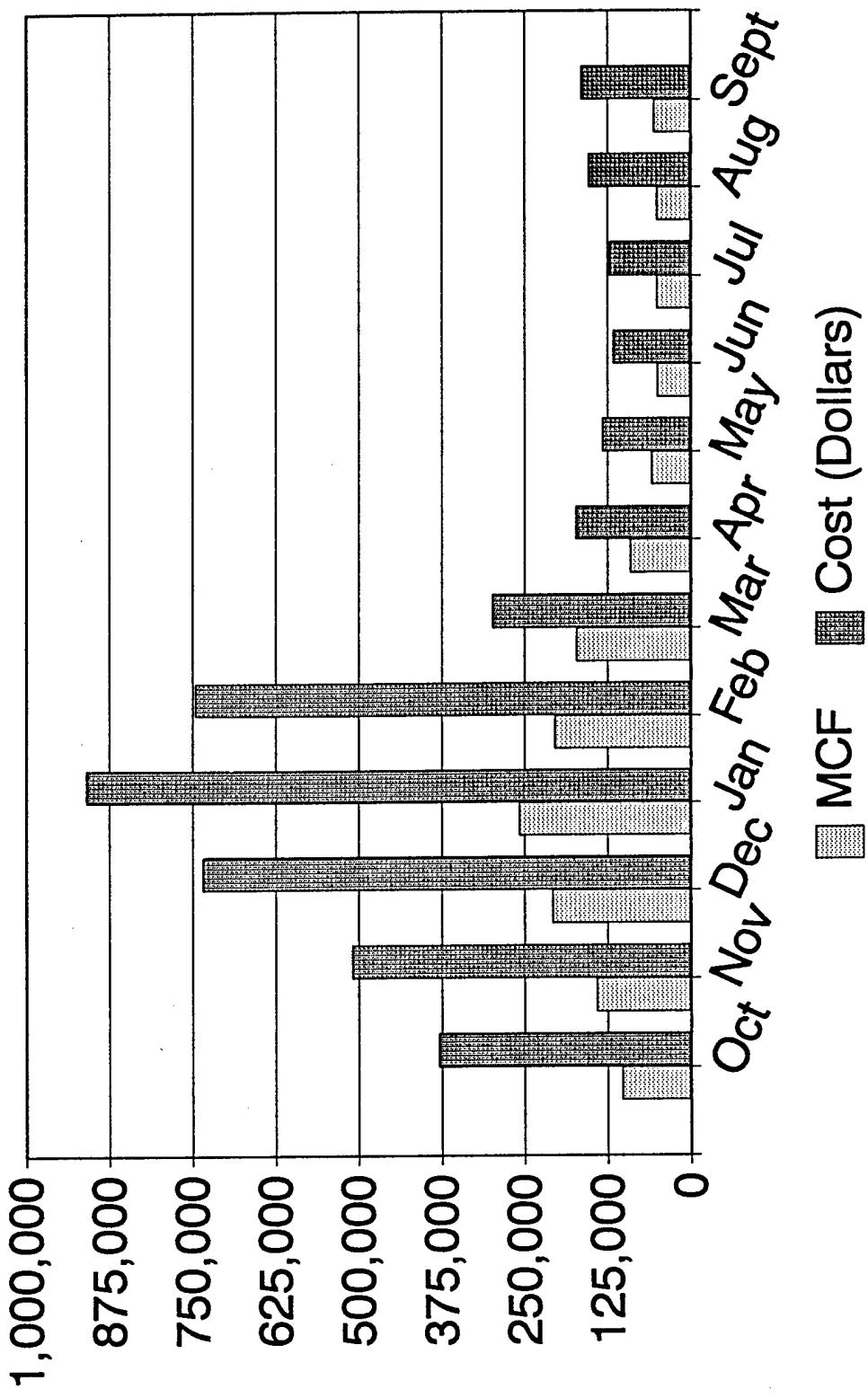
Oct 91 - Sept 92

MONTH	DEMAND	CONSUMPTION MCF	COST	COST/MCF
Oct 91	14,616	103,670	\$379,995	\$3,665
Nov	14,616	141,650	510,079	3,601
Dec	11,000	208,531	734,825	3,524
Jan	11,034	259,223	909,415	3,508
Feb	12,559	205,339	746,795	3,637
Mar	12,559	171,895	297,539	1,731
April	12,559	91,273	172,523	1,890
May	12,559	59,090	133,344	2,257
Jun	12,559	50,734	116,873	2,304
Jul	12,559	51,981	122,570	2,358
Aug	12,559	51,954	154,449	2,973
Sept	12,559	56,458	166,220	2,944
TOTAL	151,738	1,451,798	\$4,444,627	3.06
<i>Min</i>	11,000	50,734	116,873	1,731
<i>Max</i>	14,616	259,223	909,415	3,665
<i>Avg</i>	12,645	120,983	370,385	2,866

FIGURE 1.3.1

FORT KNOX

FY92 Natural Gas



Knoxville, TN

1 EXECUTIVE SUMMARY

1.3.2 Electric Costs

The electric energy consumption, demand, and costs for FY92 are shown in *Table 1.3.2 Fort Knox Electric*. *Figure 1.3.2* is a bar graph of the monthly consumption and cost. The electric cost used to calculate the electric cost savings for the project is as follows:

COST/KWH	= \$0.02506/KWH (No Demand)
COST/MBTU	= \$7.343/MBTU (No Demand)
COST/KW	= \$7.067/KW (Monthly Demand)

1.4 ENERGY CONSERVATION OPPORTUNITIES INVESTIGATED

Systems Corp analyzed four energy conservation opportunities (ECOs) at Fort Knox, Kentucky. The analysis was performed utilizing energy models developed by Systems Corp and data collected during the field survey of the facilities at Fort Knox. Each ECO was evaluated to determine the potential energy savings, dollar savings, implementation costs, simple payback, life cycle cost, and savings to investment ratio (SIR). The four ECOs that were evaluated are as follows:

ECO - 1 Ceiling Reflectance

ECO - 2 High Efficiency Indoor Lighting

ECO - 3 Indoor Lighting Controls

ECO - 4 Ballfield Lighting and Controls

Systems Corp's energy analysis models were used to determine the savings achieved for implementing each ECO in the facilities that were evaluated. The U.S Army Corp of Engineers M-CACES software was used to estimate the implementation cost of each ECO in each facility evaluated. The U.S Army Corp of Engineers Life Cycle Cost in Design, Version 1.0, Level 72, software was used to perform life cycle cost analyses and determine the SIR of each ECO for each facility evaluated.

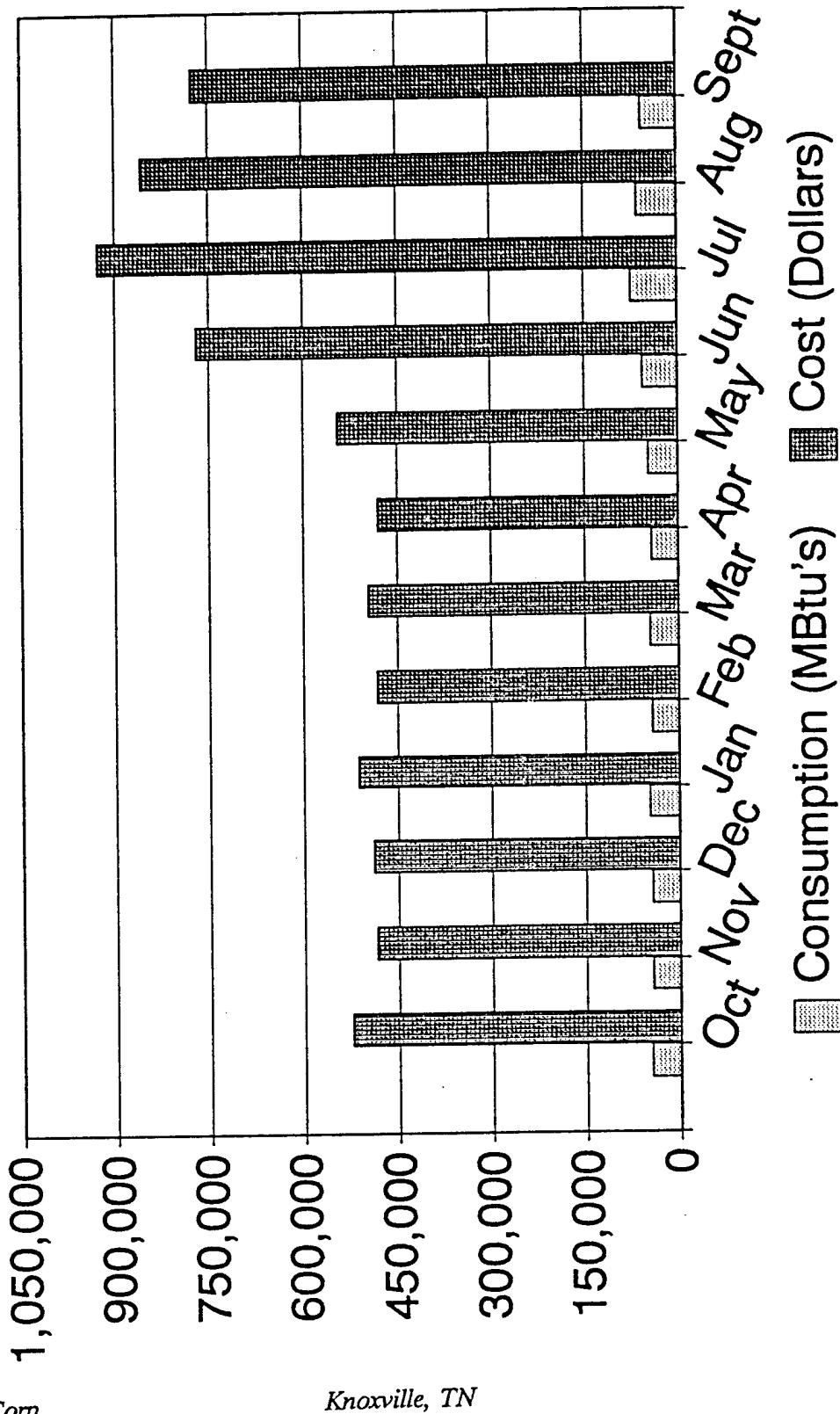
TABLE 1.3.2
FORT KNOX ELECTRIC
Oct 91 - Sept 92

MONTH	DEMAND KW	CONSUMPTION KWH	COST DEM & CONS	COST/kwh
Oct 91	28,950	13,601,000	\$524,094	\$.039
Nov	24,650	13,109,000	484,546	.037
Dec	24,950	13,205,000	488,850	.037
Jan	25,850	13,954,000	513,317	.037
Feb	25,250	12,886,000	482,755	.037
Mar	24,800	13,579,000	497,273	.037
April	25,100	12,891,000	481,931	.037
May	30,650	14,006,000	545,004	.039
Jun	41,700	16,504,000	769,708	.047
Jul	44,400	21,867,000	927,163	.042
Aug	44,300	19,172,000	858,772	.045
Sept	41,250	16,933,000	776,615	.046
TOTAL	381,850	181,707,000	\$7,350,028	\$.040
<i>Min</i>	24,650	12,886,000	\$481,931	\$.037
<i>Max</i>	44,400	21,867,000	927,163	.047
<i>Avg</i>	31,820	15,142,250	612,502	.040

FIGURE 1.3.2

FORT KNOX FY92 Electric

Systems Corp



1 EXECUTIVE SUMMARY

1.4.1 ECOs Recommended

Systems Corp recommended that the following ECOs be implemented due to favorable simple pay backs and savings investment ratios (SIRs).

ECO - 2 High Efficiency Indoor Lighting

ECO - 3.1 Indoor Lighting Controls (On/Off Photocells)

ECO - 4 Ballfield Lighting and Controls

1.4.2 ECOs Rejected

ECO-1, Ceiling Reflectance, was rejected due to the fact that the potential energy savings was found to be quite small for each building that was evaluated. The implementation costs for each building evaluated did not represent a large investment, but when compared to the savings resulted in simple paybacks in excess of thirty years. Improving the ceiling reflectance did not yield an acceptable simple payback in any of the buildings evaluated. ECO-3.2, Dimming and On/Off Photocell Control, was rejected. ECO-3.1, on/off photocell control, has a better SIR and SPB than ECO-3.2.

1.4.3 ECIP Projects Developed

Systems Corp developed one ECIP project. The project include the improvement of lighting efficiency in 16 buildings, installation of lighting controls in 23 buildings, and the improvement of lighting efficiency at 3 ballfields and lighting control at 8 ballfields. The following table summarizes the savings and investment for each ECO included in the ECIP project.

TABLE 1.4.3

ECIP PROJECT SUMMARY

	1st Yr Savings	Investment	SIR	SPB(yrs)
ECO-2 INDOOR LIGHTING EFFICIENCY	\$50,872	\$277,658	2.08	5.46
ECO-3.1 INDOOR LIGHTING CONTROLS	\$38,595	\$113,162	3.88	2.93
ECO-4 BALLFIELD LIGHTING & CONTROLS	\$4,489	\$20,122	2.60	4.48
TOTAL ECIP PROJECT	\$93,956	\$410,942	2.61	4.37

2 METHODS AND APPROACH

2.1 FIELD SURVEY

The field survey as performed by Systems Corp was designed to provide the necessary data required to complete the project. It was also designed to provide residual benefits to the installation by providing an organized and readily available source of information which can be used in future years. The information was transmitted in the form of field notes made on standardized survey forms. The field survey forms were submitted with the interim report.

The survey forms were designed to allow notations of all data which could be utilized (not necessarily required) to calculate the energy savings gained by implementing a specific energy conservation opportunity. These forms contain data obtained from as-built drawings and confirmed in the field as well as data obtained only in the field.

2 METHODS AND APPROACH

2.1.1 Buildings

Thorough preparation for the building survey was required to assure that the data required to perform the technical analysis is obtained. The building surveys were performed in a manner which assured the best results. A simple listing of each step of the process best describes our approach to the surveys.

1. The list of ECOs included in the work scope were reviewed in detail.
2. Each ECO was given an identification number which is used consistently throughout this project.
3. An expanded description of each ECO was formulated to outline the possible methods for implementation of the ECO.
4. Survey forms were developed for each ECO to provide space to enter and data which might possibly be used in performing the engineering and economic analysis of the ECO.
5. A list of the types of as-built drawings required for the buildings was prepared based on the information required on the ECO survey forms.
6. A Systems Corp representative assisted during the survey in gathering the necessary as-built drawings.
7. Due to the age of drawings, it was determined that most required information would need to be gathered during the survey at the buildings.
8. The building surveys were then performed, confirming or revising data obtained from the drawings. Additional data was obtained as required.
9. Systems Corp's survey team met with the post energy coordinator throughout the survey on an as needed basis.

Table 2.1.1.1 is a list of the buildings surveyed sorted by building type.

TABLE 2.1.1.1

BUILDINGS SURVEYED

BUILDING TYPE	BUILDING NUMBER	BUILDING AREA
ADMINISTRATIVE	63	21,054
	TOTAL AREA THIS TYPE	21,054
WAREHOUSE		
	86	21,716
	92	13,298
	58	10,091
	59	10,091
	60	10,091
	TOTAL AREA THIS TYPE	65,287
AIRCRAFT HANGAR		
	5220	50,027
	5222	35,392
	5256	20,179
	5253	18,905
	TOTAL AREA THIS TYPE	124,503
MACHINE SHOP		
	73	13,580
	TOTAL AREA THIS TYPE	13,580
GENERAL MAINTENANCE SHOP		
	94	30,894
	TOTAL AREA THIS TYPE	30,894
AIRCRAFT MAINTENANCE SHOP		
	5232	13,639
	TOTAL AREA THIS TYPE	13,639

TABLE 2.1.1.1

BUILDINGS SURVEYED

BUILDING TYPE	BUILDING NUMBER	BUILDING AREA
VEHICLE MAINTENANCE SHOP		
	2770	111,566
	2778	53,494
	2730	26,985
	5901	22,786
	159	20,833
	486	20,180
	158	18,271
	2942	17,220
	2943	17,220
	482	16,923
	483	16,479
	484	16,479
	485	16,479
	487	16,479
	TOTAL AREA THIS TYPE	391,394
TANK MAINTENANCE SHOP		
	2944	21,840
	2970	7,421
	2969	7,421
	2963	7,220
	2971	6,900
	2972	6,900
	2973	6,900
	2974	6,900
	2979	6,900
	2980	6,900
	TOTAL AREA THIS TYPE	85,302

2 METHODS AND APPROACH

2.1.2 Ballfield Lighting

The exterior lighting survey was performed in much the same way as the building survey. The approach for the ballfield lighting survey was to survey the specified locations on the post. A listing of the steps required to complete this task are as follows:

1. The ECO was reviewed in detail and given an identification number.
2. An expanded description of the ECO was formulated to outline the possible methods of implementation.
3. A survey form was developed.
4. Site maps were reviewed and survey locations were identified.
5. A preliminary site survey was performed to establish fixture distances, mounting height and fixture layouts.
6. Sketches of the locations and preliminary data were prepared for field notes.
7. Lamp wattage information was obtained from the high voltage electrical maintenance staff.
8. A daylight survey of each location was performed to identify fixture and lamp types, wattage and voltage.
9. A nighttime survey was performed to measure light levels at each of the surveyed locations.

Table 2.1.2.1 is a listing of the areas surveyed for ballfield lighting.

TABLE 2.1.2.1

BALLFIELDS SURVEYED

AREA NUMBER	AREA NAME	FIXTURES CURRENTLY IN USE			
		1000W INCAN	1500W QUARTZ	1000W MH	1500W MH
2358	GARY OWENS REGIMENT	36			
2388 N	BLACK HORSE/HELL ON WHEELS		29		
2388 S	BLACK HORSE/HELL ON WHEELS		28		
4557	KEYS PARK				26
5913	DISNEY AREA			39	
6532	2ND DRAGON/BACHLER			28	
6609	TURRETT FIELD				48
6647	EAST-WEST				50

2 METHODS AND APPROACH

2.2 CALCULATIONS

Energy calculations were performed using computerized techniques. Due to the large volume of calculations to be performed, standardized procedures were developed for the computer models. This assured consistent results and uniformity of quality in all of the calculations performed.

2.2.1 Baseline Energy Consumption

The following sections will describe the method for calculating the baseline energy consumption for each of the four ECOs.

2.2.1.1 Baseline Energy Consumption: ECO - 1

The baseline energy consumption for this ECO was calculated using a LOTUS123 spreadsheet. This spreadsheet modeled the energy consumption of the heating system with the existing insulation. The energy consumption was modeled using field measurements and weather bin data. The heating system efficiency was assumed to be 55%. This took into account boiler efficiency, distribution losses and unit heater efficiency.

Table 2.2.1.1 lists the baseline energy consumption for this ECO.

TABLE 2.2.1.1.1
BASELINE ENERGY
CONSUMPTION ECO-1

BUILDING NUMBER	BASELINE ENERGY CONSUMPTION (MBTU)
58	184.480
59	184.480
60	184.480
86	113.080
92	48.850
158	82.320
159	82.320
482	75.090
483	75.090
484	75.090
485	75.090
486	75.090
487	49.760
5253	41.160

2 METHODS AND APPROACH

2.2.1.2 Baseline Energy Consumption: ECO - 2

The baseline energy consumption for this ECO was calculated using a LOTUS 123 spreadsheet. This spreadsheet modeled the energy consumption of the existing lighting system by utilizing the following:

1. Existing fixture and lamp type (i.e. fluorescent, mercury vapor, etc.)
2. Lamp wattage.
3. Ballast wattage.
4. Hours of use.

The above information was obtained during the field survey. *Table 2.2.1.2.1* lists the baseline energy consumption for this ECO.

2.2.1.3 Baseline Energy Consumption: ECO - 3

The baseline energy consumption for this ECO was calculated using a LOTUS123 spreadsheet. The energy consumption was modeled using field measurements and local climatological data for Fort Knox. This spreadsheet modeled the energy consumption of the existing lighting control system by utilizing the following:

1. Existing fixture and lamp type (i.e. fluorescent, mercury vapor, etc.)
2. Lamp wattage.
3. Ballast wattage.
4. Hours of use.

The above information was obtained during the field survey. *Table 2.2.3.1* lists the baseline energy consumption for this ECO.

TABLE 2.2.1.2.1
BASELINE ENERGY
CONSUMPTION ECO-2

BUILDING NUMBER	BASELINE ENERGY CONSUMPTION (MBTU)
58	73.646
59	109.591
60	103.588
63	322.013
73	86.089
86	236.466
92	103.892
482	107.677
483	134.598
484	107.677
485	127.868
486	131.831
487	35.891
2770	2,786.940
2778	604.306
5232	16.355

TABLE 2.2.1.3.1
BASELINE ENERGY
CONSUMPTION ECO-3

BUILDING NUMBER	BASELINE ENERGY CONSUMPTION (MBTU)
86	23.770
94	445.640
158	220.960
159	820.250
2770	1,150.044
2730	193.800
2778	399.321
2942	108.940
2943	108.940
2944	207.970
2963	58.140
2969	58.140
2970	58.140
2971	58.140
2972	58.140
2973	58.140
2974	58.140
2979	58.140
2980	58.140
5220	1,016.730
5222	331.880
5253	248.910
5256	1,578.610

2 METHODS AND APPROACH

2.2.1.4 Baseline Energy Consumption: ECO - 4

The baseline energy consumption for this ECO was calculated using a LOTUS123 spreadsheet. This spreadsheet modeled the energy consumption of the existing lighting system by utilizing the following:

1. Existing fixture and lamp type (i.e. fluorescent, mercury vapor, etc.)
2. Lamp wattage.
3. Ballast wattage.
4. Hours of use.

The above information was obtained during the field survey. *Table 2.2.4.1* lists the baseline energy consumption for this ECO.

TABLE 2.2.1.4.1
BALLFIELD LIGHTING
BASELINE ENERGY CONSUMPTION

ECO NUMBER	BALLFIELD NUMBER	BALLFIELD NAME	BASELINE ENERGY CONSUMPTION (MBTU)
4.1	2358	GARY OWENS REGIMENT	127.745
4.1	2388 N	BLACK HORSE/ HELL ON WHEELS	154.36
4.1	2388 S	BLACK HORSE/ HELL ON WHEELS	149.04
4.2	2358	GARY OWENS REGIMENT	33.915
4.2	2388 N	BLACK HORSE/ HELL ON WHEELS	38.096
4.2	2388 S	BLACK HORSE/ HELL ON WHEELS	34.181
4.2	4557	KEYS PARK	148.56
4.2	5913	DISNEY AREA	148.121
4.2	6532	2ND DRAGON/BACHLER	106.342
4.2	6609	TURRETT FIELD	274.306
4.2	6647	EAST-WEST	185.736

2 METHODS AND APPROACH

2.3 ENERGY CONSERVATION OPPORTUNITIES

Systems Corp analyzed four distinct energy conservation opportunities (ECOs) at Fort Knox, Kentucky. The analysis was performed utilizing energy models developed by Systems Corp and data collected during the field survey of the facilities at Fort Knox. Each ECO was evaluated to determine the potential energy savings, dollar savings, implementation costs, simple payback, life cycle cost and savings to investment ratio (SIR). The four ECOs that were evaluated are as follows:

ECO - 1 Ceiling Reflectance

ECO - 2 High Efficiency Indoor Lighting

ECO - 3 Indoor Lighting Controls

ECO - 4 Ballfield Lighting and Controls

Systems Corp's energy analysis models were used to determine the savings achieved for implementing each ECO in the facilities that were evaluated. The U.S Army Corp of Engineers M-CACES software was utilized to estimate the implementation cost of each ECO in each facility evaluated. The U.S Army Corp of Engineers Life Cycle Cost in Design, Version 1.0, Level 72, software was used to perform life cycle cost analyses and determine the SIR of each ECO for each facility evaluated.

2.3.1 ECO - 1: Ceiling Reflectance

This ECO evaluated the use of a spray-applied acoustical insulation. The objective was to increase the reflectance value of the ceiling as well as improve the ceiling's insulation value. The energy savings were based on the heating system savings due to the added insulation. The calculations for this ECO were performed using weather bin data field notes and manufacturer's data. It is estimated the spray-applied acoustical insulation will cost between \$.60 and \$.80 per square foot for material and labor. It was determined based on the energy savings and current roof and ceiling conditions that no building will meet the required twenty (20) years or less simple payback. No life cycle cost analysis or cost estimate were performed.

2 METHODS AND APPROACH

2.3.2 ECO - 2: High Efficiency Indoor Lighting

Many options were available which would fulfill this ECO. The goal was to increase the lighting efficiency in the buildings as much as possible while still being cost effective. The following is a list and description of the options implemented in the buildings. All options are not evaluated in all buildings due to applicability.

1. *Four (4) Foot Fluorescent Fixtures:* Replace existing T12 lamps with T8 lamps and electronic ballasts. Reflectors are used in some fixtures to reduce the required number of lamps. This is a one-for-one fixture replacement.
2. *Eight (8) Foot Fluorescent Fixtures:* Replace existing fixtures with high pressure sodium fixtures. The number of fixtures are reduced while maintaining or increasing the lighting levels to the recommended settings.
3. *Incandescent Lighting:* Existing incandescents are replaced with T8 fluorescent lamps and electronic ballasts or high pressure sodium fixtures.
4. *Mercury Vapor Fixtures:* Existing mercury vapor fixtures are replaced with high pressure sodium fixtures. This is a one-for-one replacement.

2.3.3 Indoor Lighting Controls

The objective in this ECO was to reduce the hours required to operate the building lighting system while maintaining the required light levels. The buildings evaluated under this ECO receive significant daylighting through highbay doors or building windows for at least six (6) months throughout of the year. The amount of daylight available to the Fort Knox area was determined using the Climatological Data. All options are not evaluated in all buildings due to applicability. The following is a list and a description of the options implemented in the buildings.

1. *On/Off Photocell Control:* Based on the light readings obtained during the field survey, a quantity of fixtures were identified to be controlled by photocells. If a photocell indicates the recommended light level is being contributed by the daylight, the lighting fixtures controlled by the photocell will turn off automatically.

2 METHODS AND APPROACH

2. *Dimming and On/Off Photocell Controls:* This option is the same as Option 1 except the lighting fixtures not controlled by the on/off photocells can be controlled by a dimming system. This second option allows for an additional amount of savings due to the available daylighting. The dimming fixtures will also be controlled by a photocell. In addition, the dimming system will allow those fixtures to be reduced to a 60% energy load when the necessary daylight is available.

2.3.4 ECO - 4: Ballfield Lighting and Controls

This ECO evaluated two (2) savings opportunities. The goal for ECO-4.1 was to increase the lighting efficiency at the ballfields as much as possible while still being cost effective. All ballfields were evaluated to use metal halide fixtures to replace the existing lighting system. It was assumed the ballfield lighting systems operate approximately 1,040 hours each year. ECO-4.2 evaluated the use of a control system on the ballfield lights. The following describes the controls evaluated for ECO-4.2:

1. *Photocell:* A photocell would eliminate the unnecessary use of the ballfield lighting system during daylight hours.
2. *Four (4) Hour Timer:* A timer would reduce the unnecessary use of the ballfield lighting system during night time hours.

facility

**INTERIOR/BALLFIELD LIGHTING REPLACEMENT AND
LIGHTING CONTROL INSTALLATION
Fort Knox, Kentucky**

**project coordinator for
using service**

Gary Meredith

functional requirements summary, PDB-1

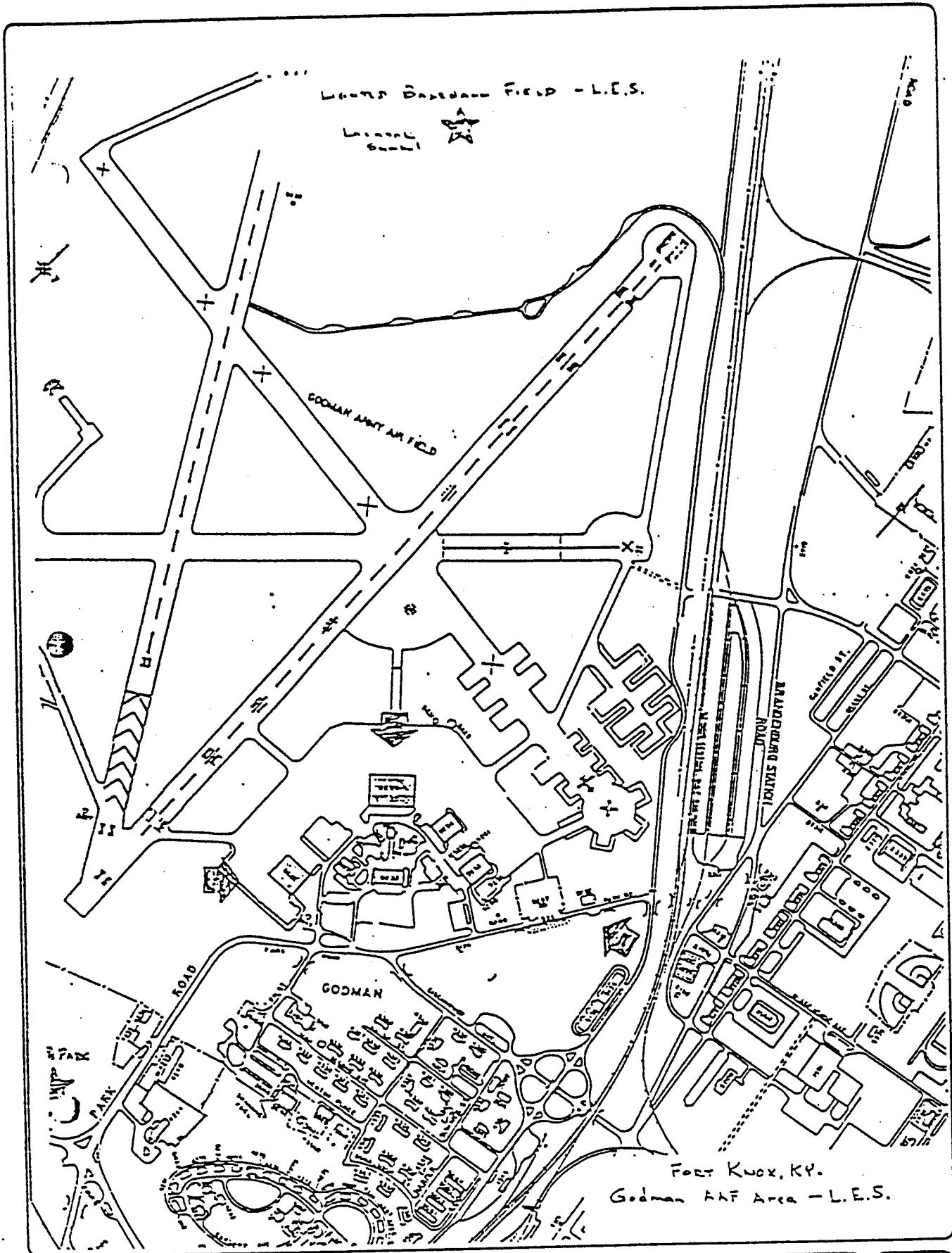
3-1

OBJECTIVE:

The objective of this project is to install lighting controls and replace existing interior and ballfield lighting with higher efficiency fixtures and lamps. The installation of controls and replacement of the existing lighting will reduce energy consumption and life cycle operating costs for the subject facilities in accordance with the Army Energy Resources Management Plan (ERMP) and Executive Order 12759.

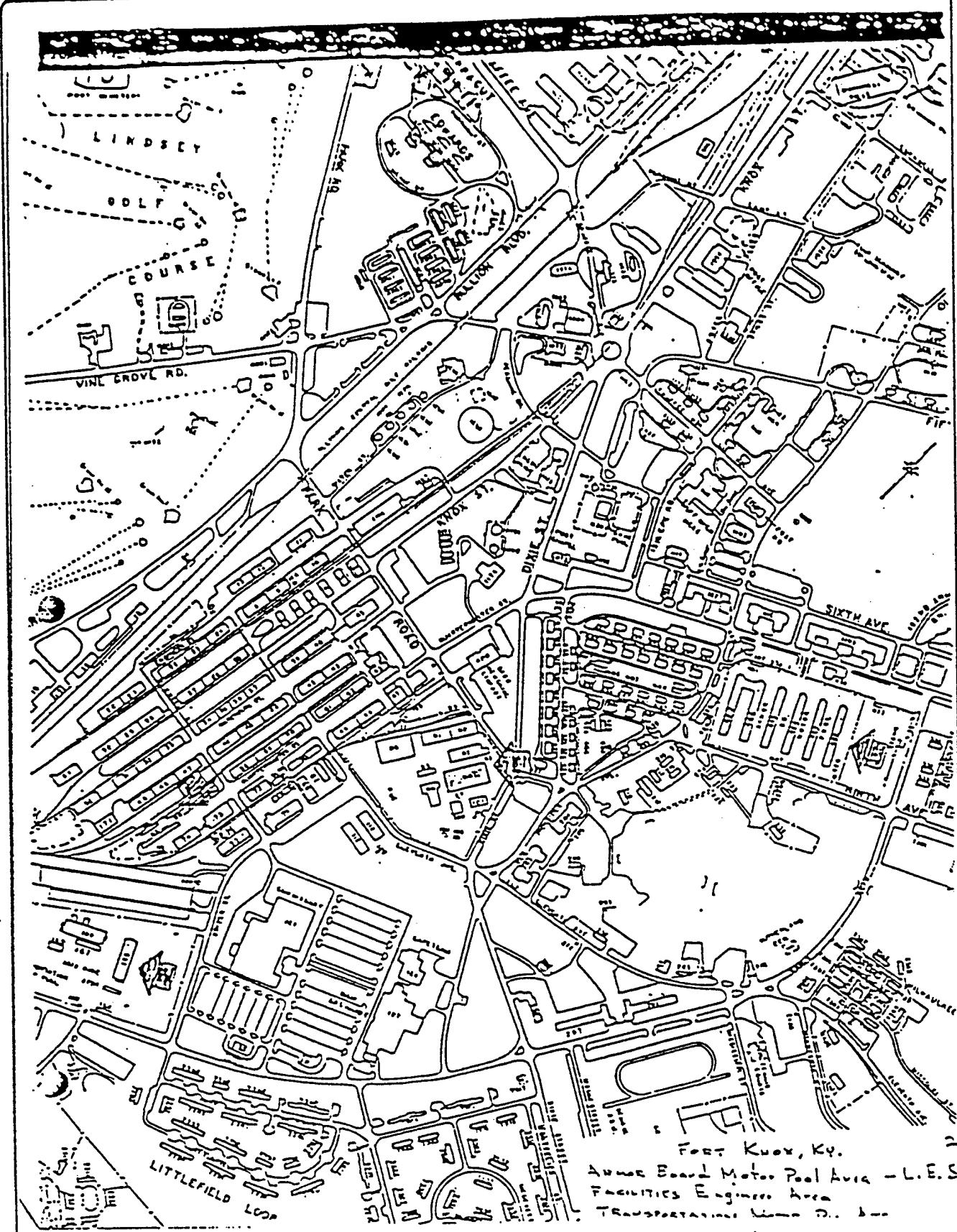
functional requirements summary, PDB-1

13-2



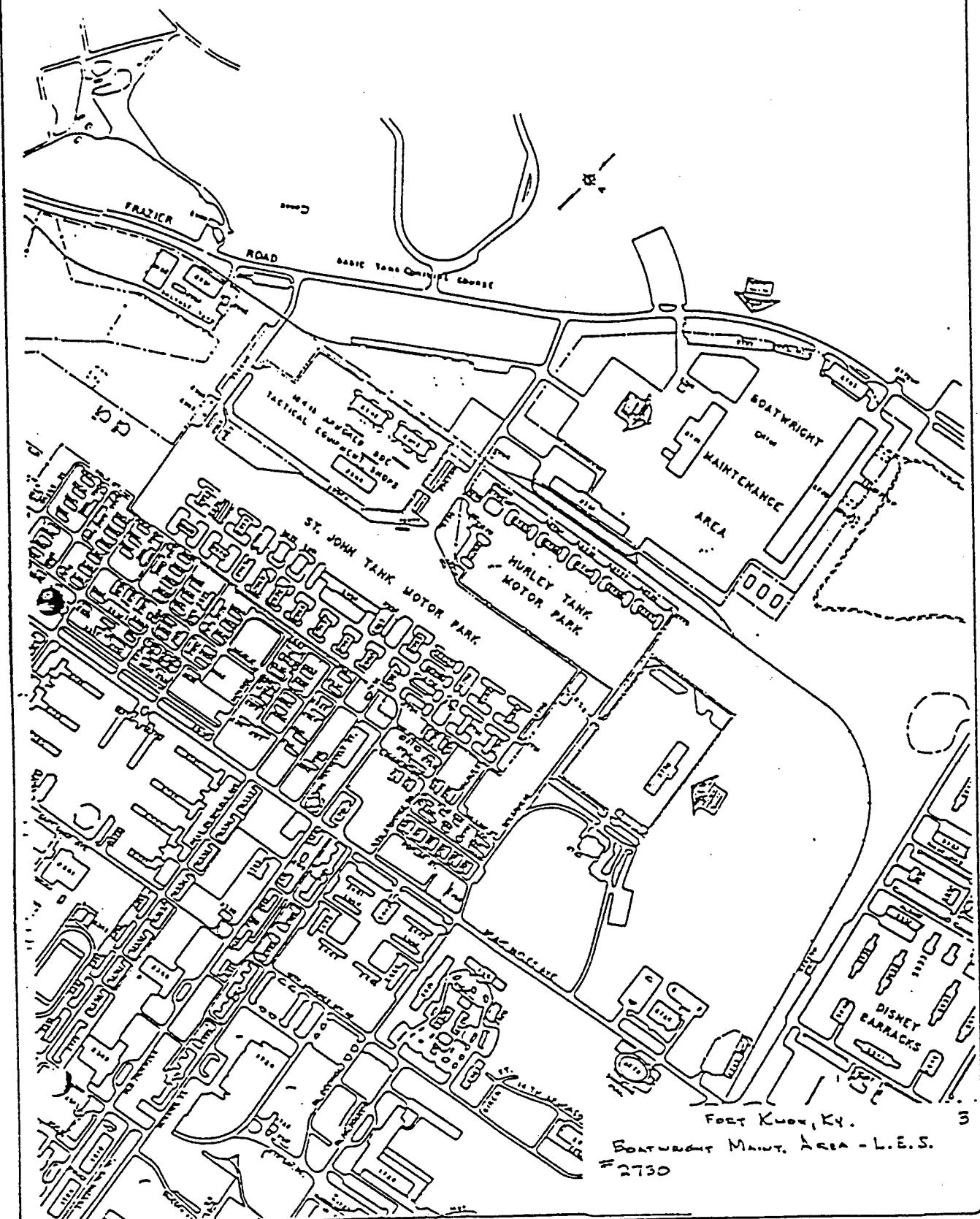
facilities requirements sketch, PDB- 1/2

3-3



facilities requirements sketch, PDB- 1/2

3-4



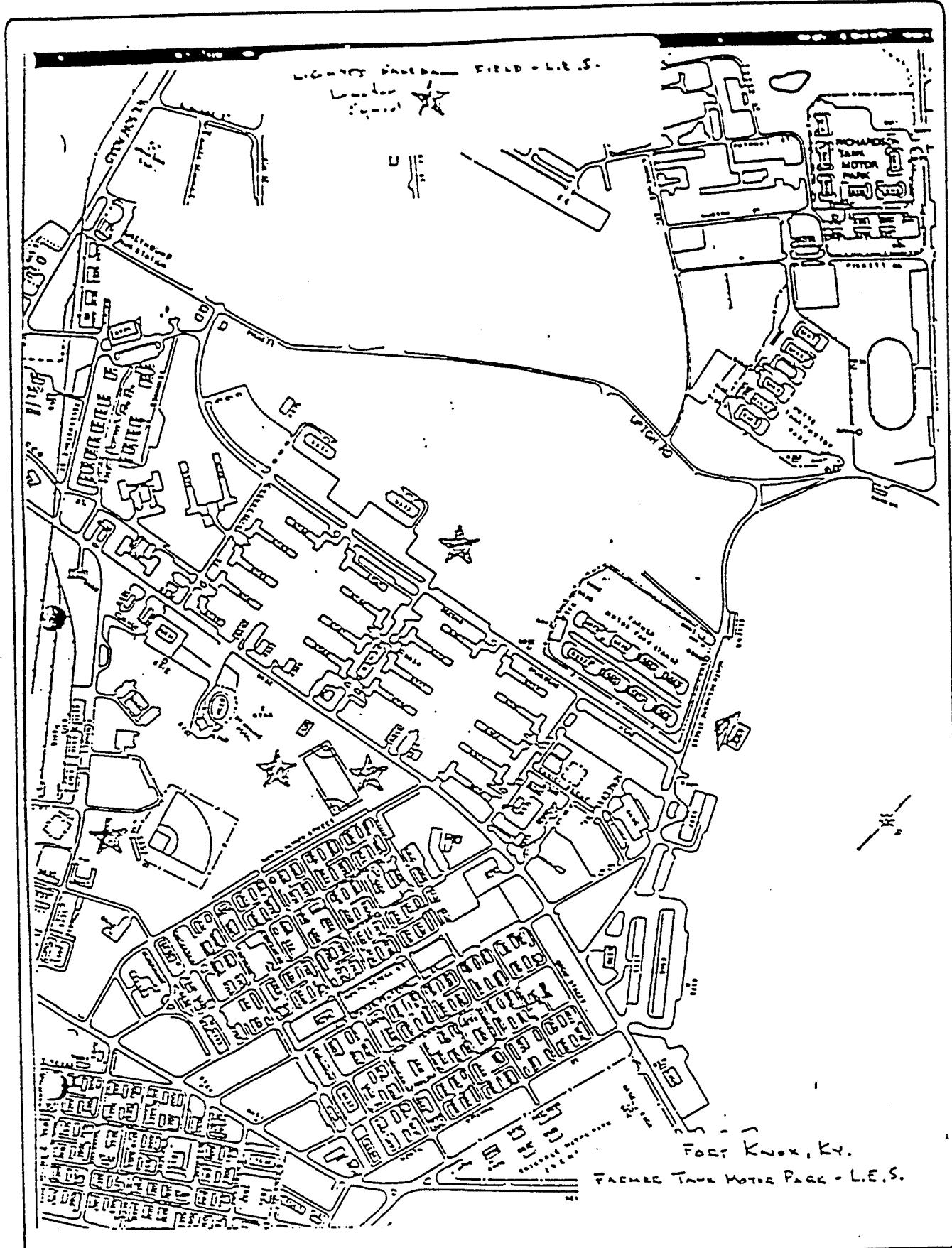
facilities requirements sketch, PDB- 1/2

3-5



facilities requirements sketch, PDB- 1/2

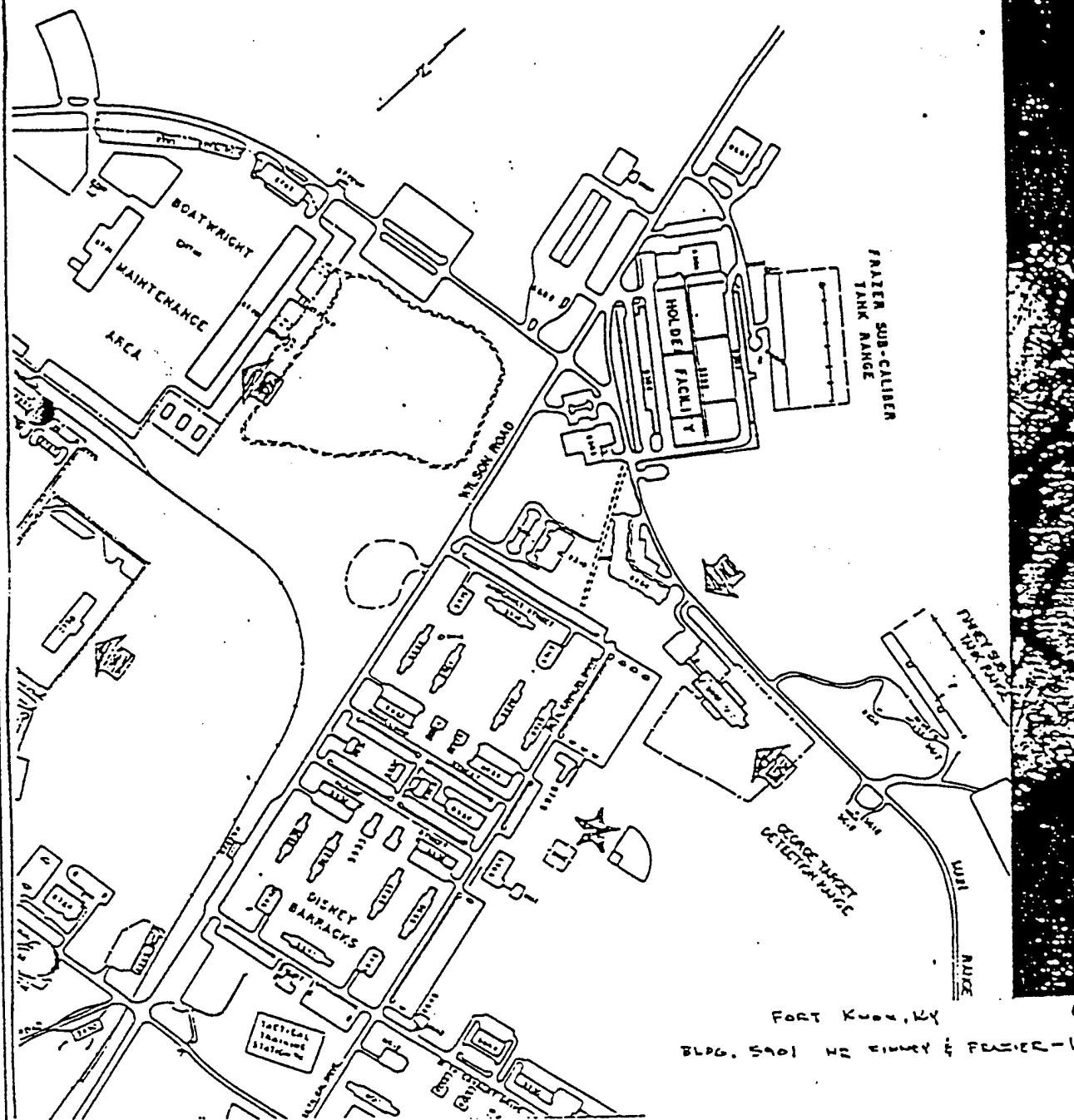
3-6



facilities requirements sketch, PDB- 1/2

3-7

LICENCED BASE AREA FORT - L.E.S.



facilities requirements sketch, PDB- 1/2

3-8

**APPENDIX C
DOCUMENTATION CHECKLIST**

A. SPECIAL CONSIDERATIONS

	ITEM
A-1	Cost estimates for each primary and supporting facility
A-2	Telecommunications system coordination with USACC and authorization for exceptions
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)
A-4	Assignment of airspace
A-5	Economic analysis of alternatives
A-6	Approval for new starts
A-7	International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates)
A-8	Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation
A-9	Exceptions to established criteria
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)
A-11	Identification of related or support projects (so projects can be coordinated)
A-12	Required completion date
	Other Special Considerations (List and number items)
	1. See Appendix A

Required or Not Required	To Be Determined	Comments Attached	Documents Attached
R	D		1
NR			
R	A		
NR			
R	D		
NR			
R			
R			
R			
R			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

* BY WHOM (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

3-10

B. SITE DEVELOPMENT

ITEM	
B-1	Consultation with the District Office to determine and evaluate flood plain hazards
B-2	Preparation, submission, and/or approval of new (A) General Site Plan (B) Annotated General Site Plan (C) Sketch Site Plan (D) Facilities Requirements Sketch
B-3	Preparation of (A) Site Survey (B) Subsoil Information
B-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan
	Other Site Development Considerations (List and number items) 1. See Project Development Brochure, PDB-1/2

Required or Not Required	To Be Determined	Comment Attached	Document Attached
NR			
R			
NR			
NR			
NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

documentation checklist

3-11

C. ARCHITECTURAL & STRUCTURAL

ITEM	
C-1	Reconciliation with troop housing programs and requirements
C-2	Evaluation of existing facilities (including degree of utilization)
C-3	Approval for removal and relocation of existing usable facilities
C-4	Evaluation of off-post community facilities
C-5	Storage and maintenance facilities (including nuclear weapons)
C-6	Coordination hospitals, medical and dental facilities with Surgeon General
C-7	Coordination of aviation facilities with FAA
C-8	Coordination air traffic control and navigational aids with USACC
C-9	Tabulation of types and numbers of aircraft
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities
C-11	Coordination chapels with Chief of Chaplains
C-12	Review food service facilities by USATSA
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not collocated with related facilities
C-14	Coordination postal facilities with U.S. Postal Service Regional Director
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)
C-16	Tenant facilities coordination with installation where sited
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)
C-18	Analysis of deficiencies
C-19	Consideration of alternatives
C-20	Determination whether occupants will include physically handicapped or disabled persons
C-21	As-build drawings for alterations or additions
C-22	Availability of Standard Design or site adaptable designs
	Other Architectural & Structural (List and number items) <ol style="list-style-type: none"> 1. See Supplemental Data Detailed Project Justification Paragraph D3. 2. See Supplemental Data Detailed Project Justification Paragraph D4.

Required or Not Required	To Be Determined	Comment Attached	Document Attached
NR			
R	D		1
NR			
R	D		1
R	D		2
NR			
R	C		
NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

* BY WHOM (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

documentation checklist

3-12

D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

ITEM	
D-1	Fuel considerations and cost comparison analysis
D-2	Energy requirements appraiser (ERAA)
D-3	Conformance with DOD Energy Reduction requirements
D-4	Evaluation of existing and/or proposed utility systems
	Other Mechanical and Utility Systems (List and number items)
	1. See Special Requirements, Paragraph 3 (SRP-3)

Required or Not Required	To Be Determined	Comment Attached	Document Attached
R	D		
R	D		1
R	D		
R	D		

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

*BY WHOM (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

documentation checklist

3-13

E. ENVIRONMENTAL CONSIDERATIONS

ITEM	
E-1	Environmental impact assessment
E-2	EIA conclusions require Environmental Impact Statement
E-3	Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency)
E-4	Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level
E-5	Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.
	Other environmental considerations (list and number items) <ol style="list-style-type: none"> 1. See Supplemental Data Detailed Project Justification Paragraph D9.

Required or Not Required	To Be Determined	Comment Attached	Document Attached
R	D		1
NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

* **BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

3-14

APPENDIX D
TECHNICAL DATA CHECKLIST

A. SPECIAL CONSIDERATIONS

	ITEM	Required or Not Required	To Be Determined	Comment Attached	Document Attached
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages	NR			
A-2	Construction phasing requirements	R	P		
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in	NR			
A-4	Equipment in place and justification	NR			
A-5	Other equipment and furniture (O&MA, OPA) and costs	NR			
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)	NR			
A-7	Type of construction (permanent, temporary, semi-permanent)	NR			
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.	NR			
	Other special considerations (list and number items)				

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

* BY WHOM (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

technical data checklist

3-16

B. SITE DEVELOPMENT

ITEM	
B-1	Construction restrictions or guidelines pertaining to site access and preferred construction routes
(A)	
(B)	Airfield clearance, explosive storage, working hours, safety, etc.
(C)	Facilities and/or functions or adjoining areas (structures, materials, impact)
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)
B-3	Demolition/relocation required (data)
(A)	Special considerations due to explosives/radioactivity/chemical contamination/asbestos emissions/toxic gases
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)
B-5	Landscape considerations
(A)	Protection of existing vegetation
(B)	Stockpile topsoil
	Other Site Development (List and number items)
	1. There is a possibility that the existing lighting may contain PCB's in the ballasts.

Required or Not Required	To Be Determined	Comment Attached	Document Attached
R	A		
NR	- - - - -		
R	A		
NR			
R	A	1	
NR			
R	A		
NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

"BY WHOM" (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

technical data checklist

3-17

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be Determined	Comment Attached	Document Attached
C-1	Vibration-producing equipment requiring isolation	R	D		
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)	NR			
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)	NR			
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)	NR			
C-5	Designation and strength of units to be accommodated	NR			
C-6	Requirements and data for special design projects	NR			
C-7	Unusual floor and roof loads (water, equipment)	NR			
C-8	Security features (arms rooms, vaults, interior secure areas)	NR			
Other Architectural & Structural (List and number items)					

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

technical data checklist

D. MECHANICAL, ELECTRICAL & UTILITY SYSTEMS

ITEM		Required or Not Required	To Be Determined	Comment Attached	Document Attached
D-1	Special mechanical requirements or considerations (elevator, crane, hoist, etc.)	NR			
D-2	Special peak usage periods and peak leveling techniques	NR			
D-3	Maintenance considerations (accessibility of equipment, compatibility with existing equipment)	R	D		
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	R	D		
D-5	Heating—availability, general system type and characteristics (proposed and/or existing)	NR			
D-6	Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)	R	D		
D-7	Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing)	NR			
D-8	Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)	NR			
D-9	Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)	R	D		
D-10	Solar energy evaluation	NR			
Other Mechanical & Utility Systems (List and number items)					

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

* **BY WHOM** (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

E. ENVIRONMENTAL CONSIDERATIONS

ITEM		Required or Not Required	To Be Determined	Comment Attached	Document Attached
E-1	<p>Waste water treatment, air quality, and solid waste disposal criteria</p> <p>Other Environmental Considerations (List and number items)</p>	NR	-	-	-

REQUIRED OR NOT REQUIRED - Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED - Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED - Significant information summarized or explained and attached.

DOCUMENT ATTACHED - Significant information is in an existing document which is attached.

***BY WHOM** (Check and insert appropriate letter)

- A - DFAE
- B - Using Service
- C - Construction Service
- D - Designer
- E - Other (Check Comments Attached and explain)

F. FIRE PROTECTION

ITEM		Required or Not Required	To Be Determined	Comment Attached	Document Attached
F.1	<p>Special fire protection systems or features (detection and suppression equipment, hazards, etc.)</p> <p>Other Fire Protection Considerations (List and number items)</p>	NR			

REQUIRED OR NOT REQUIRED — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

TO BE DETERMINED — Information needed but not currently available. Enter code for information source.

COMMENT ATTACHED — Significant information summarized or explained and attached.

DOCUMENT ATTACHED — Significant information is in an existing document which is attached.

* BY WHOM (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

technical data checklist

3-21

1. COMPONENT ARMY	FY 19 94 MILITARY CONSTRUCTION PROJECT DATA			2. DATE 05 November 93
3. INSTALLATION AND LOCATION Fort Knox, Kentucky		4. PROJECT TITLE INTERIOR/BALLFIELD LIGHTING REPLACEMENT AND LIGHTING CONTROL INSTALLATION		
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER ECIP #1	8. PROJECT COST (\$000) \$411	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST (\$000)	COST (\$000)
Primary Facility				
Interior and Exterior Light Fixtures and Controls	Lot	1	\$355,794	\$356
Subtotal				\$356
Contingency (10%)				\$36
Total Contract Cost				\$392
Supervision, Inspection and Overhead (5.0%)				\$19
Total Request				\$411
10. DESCRIPTION OF PROPOSED CONSTRUCTION				
<p>The existing interior lighting is a combination of standard efficiency fluorescent fixtures, incandescents, and mercury vapor. The existing ballfield lighting is a combination of incandescents and quartz. The proposed project will replace the interior lighting fixtures with T-8's fluorescents and high efficiency electronic ballasts or high pressure sodium fixtures. The implementation of this project will save 5436 MBtu/Yr of electrical energy. The first year savings is \$93,956 and the Savings to Investment Ratio (SIR) is 2.61.</p>				
11. REQUIREMENT				
<p>Project: The proposed interior/ballfield lighting and light control project replaces sixteen (16) buildings and three (3) ballfield locations lighting with energy efficient lighting and installs lighting controls at twenty-three (23) buildings and (8) ballfields.</p> <p>Requirement: The project is required to reduce the energy consumption of lighting and to comply with the Army Energy Resources Management Plan (ERMP) and Executive Order 12759. The proposed project will reduce annual energy consumption by 5736 MBTU/YR and annual energy cost by \$93,956</p> <p>Current Situation: The existing lighting in building numbers T58, T59, T60, 63, 73, 86, 92, 482-487, 2770, 2778, 5232, and ballfields 2358, 2388N and 2388S is inefficient fluorescent, incandescent, quartz and mercury vapor. The controls at buildings 86, 94, 158 159, 2770, 2730, 2778, 2942-2944, 2963, 2969-2974, 2979, 2980, 5220, 5222, 5253, 5256 and ballfields 2358, 2358N, 2388S, 4557, 5913, 6532, 6609, and 6647 are on/off switches.</p>				

1. COMPONENT ARMY	FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA		2. DATE 05 November 93
3. INSTALLATION AND LOCATION Fort Knox, Kentucky			
4. PROJECT TITLE INTERIOR/BALLFIELD LIGHTING REPLACEMENT AND LIGHTING CONTROL INSTALLATION	5. PROJECT NUMBER ECIP #1		

Impact if not provided: If the proposed project is not funded, a reduction of 5725 MBtu/YR cannot be achieved, and excessive amounts of energy will continue to be used. There will be no contribution to energy reduction goals established for United States Army facilities by Army Headquarters.

Colonel, USA
Commanding

ESTIMATED CONSTRUCTION START:	October 1994	INDEX:
ESTIMATED MIDPOINT OF CONSTRUCTION:	April 1995	INDEX:
ESTIMATED CONSTRUCTION COMPLETION:	November 1995	INDEX:

DETAILED JUSTIFICATIONS

D1. GENERAL

The proposed project encompasses the replacement of lighting in sixteen (16) buildings and three (3) ballfields, and installation of lighting controls in twenty-three (23) buildings and eight (8) ballfields. The project will decrease the energy consumption of the lighting system without reducing light levels except where necessary.

D2. ACCOMMODATIONS NOW IN USE:

The existing lighting systems are comprised of standard efficiency fluorescent, incandescent, quartz, and mercury vapor fixtures.

D3. ANALYSIS OF DEFICIENCY:

Currently, sixteen (16) buildings and three (3) ball fields are using standard or low efficiency fixtures for lighting. The purpose of this project is to replace the existing lighting with new light fixtures which are much more efficient, and install lighting controls at twenty-three (23 buildings and eight (8) ballfields. The current deficiency results in large amount of energy usage to maintain adequate lighting.

1. COMPONENT ARMY	FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA		2. DATE 05 November 93
3. INSTALLATION AND LOCATION Fort Knox, Kentucky			
4. PROJECT TITLE INTERIOR/BALLFIELD LIGHTING REPLACEMENT AND LIGHTING CONTROL INSTALLATION	5. PROJECT NUMBER ECIP #1		
D4. CONSIDERATION OF ALTERNATIVES: The only alternatives to proposed project are to install lower efficiency light fixtures. The disadvantages of using lower efficiency light fixtures is that less energy savings can be realized without significantly reducing the construction cost. If a less efficient light fixture is selected, the project would have a lower SIR.			
D5. CRITERIA FOR PROPOSED PROJECT: The proposed project will conform with all applicable federal and United States Army Regulations.			
D6. PROGRAM FOR RELATED EQUIPMENT: No equipment funded from appropriations other than MCA are required.			
D7. DISPOSAL OF PRESENT ASSETS: Light fixtures in sixteen (16) buildings and three (3) ballfields will be disposed.			
D8. SURVIVAL FACILITIES: The proposed project is not suitable for inclusion of protective shelters.			
D9. SUMMARY OF ENVIRONMENTAL CONSEQUENCES: The proposed project has been analyzed and will not adversely impact the environment. Energy savings resulting from the project will conserve natural resources.			
D10. EVALUATION OF FLOOD HAZARDS AND ENCROACHMENT ON WETLANDS: It has been determined that these facilities are not located in a flood plain and they do not encroach on wetlands.			
D11. ECONOMIC JUSTIFICATION: The proposed project qualifies under ECIP Guidelines in AR-415-15. SIR for the project is 2.61 with a simple payback of 4.37 years. See Economic Analysis, SRP-1			

1. COMPONENT ARMY	FY 19 94 MILITARY CONSTRUCTION PROJECT DATA		2. DATE 05 November 93
3. INSTALLATION AND LOCATION Fort Knox, Kentucky			
4. PROJECT TITLE INTERIOR/BALLFIELD LIGHTING REPLACEMENT AND LIGHTING CONTROL INSTALLATION		5. PROJECT NUMBER ECIP #1	
<p>D12. UTILITY AND COMMUNICATION SUPPORT:</p> <p>A. No related utility support projects are programmed. Adequate utilities are available to support the project.</p> <p>B. No telecommunication support is required.</p> <p>D13. PROTECTION OF HISTORIC PLACES AND ARCHEOLOGICAL SITES:</p> <p>The project involves the replacement of light fixtures located in existing buildings and family housing areas. Review procedures have been implemented for this project in accordance with 36 CFR 800. The review has established that there will be no effect.</p> <p>D14. PROJECT DEVELOPMENT BROCHURE (PART 1):</p> <p>A Project Development Brochure was prepared on 05 November 93 and is attached as a part of the programming documentation.</p> <p>D15. ENERGY REQUIREMENTS:</p> <p>The proposed project will reduce present energy consumption by 5436 MBtu/Yr at the cost savings of \$93,956 per year. See Energy Requirements Appraisal (ERA) in Special Requirements, Paragraph 3 (SRP-3).</p> <p>D16. PROVISION FOR THE HANDICAPPED:</p> <p>No provisions for the handicapped will be made since the scope of the project is in no way applicable to designing for the handicapped.</p> <p>D17. REAL PROPERTY MAINTENANCE ACTIVITY (RPMA) ANALYSIS:</p> <p>A. Physical impact: There will be light fixtures removed and replace by the same number of light fixtures. No new structures will be added.</p>			

1. COMPONENT ARMY	FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA	2. DATE 05 November 93
3. INSTALLATION AND LOCATION Fort Knox, Kentucky		
4. PROJECT TITLE INTERIOR/BALLFIELD LIGHTING REPLACEMENT AND LIGHTING CONTROL INSTALLATION	5. PROJECT NUMBER ECIP #1	

B. Operations and Maintenance (O&M) impact:

<u>YEAR</u>	O&M <u>NET CHANGE (\$000)</u>
1994	0.0
(BOD)	0.0
1995	0.0
1996	0.0

C. Backlog of Maintenance and Repair (BMAR) impact:

There will be no net change in the number of fixtures or in fixture life expectancy. There will be no effect on BMAR.

D18. COMMERCIAL ACTIVITIES:

The proposed project is not a "New Start Expansion" as defined by DA Circular 235-1. The project has been reviewed in light of the requirements of commercial and industrial facilities. It has been determined that whereas the project does not affect commercial facilities, the requirements of DA Circular 235-1 does not apply.

1. COMPONENT ARMY	FY 19 94 MILITARY CONSTRUCTION PROJECT DATA			2. DATE 05 November 93																																										
3. INSTALLATION AND LOCATION Fort Knox, Kentucky																																														
4. PROJECT TITLE INTERIOR/BALLFIELD LIGHTING REPLACEMENT AND LIGHTING CONTROL INSTALLATION		5. PROJECT NUMBER ECIP #1																																												
SPECIAL REQUIREMENTS PARAGRAPH 1 (SRP-1):																																														
<p>Life Cycle Cost Analysis Project Title: Interior/Exterior Lighting Replacements Fiscal Year: 1994 Analysis Date 11/05/93 Economic Life: Fifteen (15) Years</p>																																														
<p>1. INVESTMENT</p> <table> <tr> <td>A. CONSTRUCTION COST</td> <td>\$373,580</td> </tr> <tr> <td>B. SICB</td> <td>\$18,681</td> </tr> <tr> <td>C. DESIGN COST</td> <td>\$18,681</td> </tr> <tr> <td>D. ENERGY CREDIT CALC</td> <td>-0-</td> </tr> <tr> <td>E. SALVAGE VALUE</td> <td>-0-</td> </tr> <tr> <td>F. TOTAL INVESTMENT</td> <td>\$410,942</td> </tr> </table>					A. CONSTRUCTION COST	\$373,580	B. SICB	\$18,681	C. DESIGN COST	\$18,681	D. ENERGY CREDIT CALC	-0-	E. SALVAGE VALUE	-0-	F. TOTAL INVESTMENT	\$410,942																														
A. CONSTRUCTION COST	\$373,580																																													
B. SICB	\$18,681																																													
C. DESIGN COST	\$18,681																																													
D. ENERGY CREDIT CALC	-0-																																													
E. SALVAGE VALUE	-0-																																													
F. TOTAL INVESTMENT	\$410,942																																													
<p>2. ENERGY SAVINGS ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS</p> <table> <thead> <tr> <th>FUEL</th> <th>COST \$Mbtu (1)</th> <th>SAVINGS MBtu/YR(2)</th> <th>ANNUAL \$ SAVINGS(3)</th> <th>DISCOUNT FACTOR(4)</th> <th>DISCOUNTED SAVINGS(5)</th> </tr> </thead> <tbody> <tr> <td>A. ELECT</td> <td>7.34</td> <td>5436</td> <td>\$89,404</td> <td>11.77</td> <td>\$1,020,077</td> </tr> <tr> <td>B. DIST</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C. RESID</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>D. NG</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>E. COAL</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>F. TOTAL</td> <td></td> <td>5436</td> <td>\$89,401</td> <td></td> <td>\$1,020,077</td> </tr> </tbody> </table>					FUEL	COST \$Mbtu (1)	SAVINGS MBtu/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)	A. ELECT	7.34	5436	\$89,404	11.77	\$1,020,077	B. DIST						C. RESID						D. NG						E. COAL						F. TOTAL		5436	\$89,401		\$1,020,077
FUEL	COST \$Mbtu (1)	SAVINGS MBtu/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)																																									
A. ELECT	7.34	5436	\$89,404	11.77	\$1,020,077																																									
B. DIST																																														
C. RESID																																														
D. NG																																														
E. COAL																																														
F. TOTAL		5436	\$89,401		\$1,020,077																																									
<p>3. NON-ENERGY SAVINGS</p> <table> <tr> <td>A. ANNUAL RECURRING</td> <td>\$4,555</td> </tr> <tr> <td>(1)DISCOUNT FACTOR</td> <td>11.12</td> </tr> <tr> <td>(2)DISCOUNTED SAVINGS</td> <td>\$50,692</td> </tr> <tr> <td>B. NON-RECURRING SAVINGS</td> <td></td> </tr> <tr> <td>ITEM</td> <td>SAVINGS(+) COST(-)(1)</td> <td>YEAR OF OCCURRENCE(2)</td> <td>DISCOUNT FACTOR</td> <td>DISCOUNTED SAVINGS(+) COST (-)(4)</td> </tr> <tr> <td>a. Lighting Replacement</td> <td>-0-</td> <td>-0-</td> <td>-0-</td> <td>-0-</td> </tr> <tr> <td>b. Lighting Controls</td> <td>-0-</td> <td>-0-</td> <td>-0-</td> <td>-0-</td> </tr> <tr> <td>c.</td> <td></td> <td>-0-</td> <td>-0-</td> <td>-0-</td> </tr> <tr> <td>d. Total</td> <td>-0-</td> <td>-0-</td> <td>-0-</td> <td>-0-</td> </tr> <tr> <td>C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+)COST(-)</td> <td></td> <td></td> <td></td> <td>\$50,652</td> </tr> </table>					A. ANNUAL RECURRING	\$4,555	(1)DISCOUNT FACTOR	11.12	(2)DISCOUNTED SAVINGS	\$50,692	B. NON-RECURRING SAVINGS		ITEM	SAVINGS(+) COST(-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR	DISCOUNTED SAVINGS(+) COST (-)(4)	a. Lighting Replacement	-0-	-0-	-0-	-0-	b. Lighting Controls	-0-	-0-	-0-	-0-	c.		-0-	-0-	-0-	d. Total	-0-	-0-	-0-	-0-	C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+)COST(-)				\$50,652				
A. ANNUAL RECURRING	\$4,555																																													
(1)DISCOUNT FACTOR	11.12																																													
(2)DISCOUNTED SAVINGS	\$50,692																																													
B. NON-RECURRING SAVINGS																																														
ITEM	SAVINGS(+) COST(-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR	DISCOUNTED SAVINGS(+) COST (-)(4)																																										
a. Lighting Replacement	-0-	-0-	-0-	-0-																																										
b. Lighting Controls	-0-	-0-	-0-	-0-																																										
c.		-0-	-0-	-0-																																										
d. Total	-0-	-0-	-0-	-0-																																										
C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+)COST(-)				\$50,652																																										

1. COMPONENT ARMY	FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA		2. DATE 05 November 93
3. INSTALLATION AND LOCATION Fort Knox, Kentucky			
4. PROJECT TITLE INTERIOR/BALLFIELD LIGHTING REPLACEMENT AND LIGHTING CONTROL INSTALLATION	5. PROJECT NUMBER ECIP #1		
SPECIAL REQUIREMENTS PARAGRAPH 1 (SRP-1) (continued)			
D. PROJECT NON ENERGY QUALIFICATION TEST			
(1) 25% NON ENERGY CALC			
4. FIRST YEAR DOLLAR SAVINGS	\$93,956		
5. TOTAL NET DISCOUNTED SAVINGS	\$1,070,729		
6. DISCOUNTED SAVINGS RATIO	2.61		

1. COMPONENT ARMY	FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA		2. DATE 05 November 93
3. INSTALLATION AND LOCATION Fort Knox, Kentucky			
4. PROJECT TITLE INTERIOR/BALLFIELD LIGHTING REPLACEMENT AND LIGHTING CONTROL INSTALLATION	5. PROJECT NUMBER ECIP #1		
SPECIAL REQUIREMENTS PARAGRAPH 3 (SRP-3):			
<p>Energy Requirements Appraisal (ERA)</p> <ol style="list-style-type: none"> 1. Project Description: Replace existing lighting systems with more efficient lighting systems without reducing the light levels. 2. Estimated Energy Consumption: The building are currently lit by standard efficiency lighting. The existing lighting system consumes 14,041 MBtu/Yr of energy. Replacing the existing lighting with high efficiency lighting will result in 5436 MBtu/Yr of electrical energy savings, a thirty-nine percent (39%) reduction in current energy consumption. 3. Energy Sources: No new energy sources are required for the proposed project. The use of solar energy for this project is impractical. 4. Energy Use Impacts: The proposed project will substantially reduce the consumption of electricity for lighting. The burden on the existing base distribution system will be lessened. 5. Energy Conservation: The proposed project will reduce annual energy consumption by 5436 MBtu/Yr with annual energy cost savings of \$93,956. The project complies with Army Resources Management Plan (ERMP) and Executive Order 12759. 6. Energy Alternatives: The proposed project represents the greatest possible reduction in energy consumption thirty-nine (39%), without reducing the current lighting levels. The current levels do not exceed the levels recommended by ASHRAE. 7. Energy Effects: The proposed project provides positive environmental effects. It reduces the current energy consumption by thirty-nine (39%), effectively reducing the consumption of non-renewable fuel sources. The degrading of environmental standards would not make more efficient energy sources available. 8. Basis of Approval: Total energy requirements and alternative fuel sources have been considered and included in this appraisal or discarded as applicable. 			

FORT KNOX LIMITED ENERGY STUDY

SUMMARY OF ENERGY SAVINGS

ECO NUMBER	BUILDING NUMBER	BASELINE ENERGY (MBTU)	ECO ENERGY (MBTU)	ENERGY SAVINGS (MBTU)	1ST YEAR SAVINGS	INVESTMENT COSTS	SPB (YR)	SIR
2	T58	73.646	27.395	46.251	\$1,068	\$6,889	6.45	1.76
2	T59	109.591	29.360	80.231	\$1,880	\$7,382	3.93	2.88
2	T60	103.588	31.313	72.275	\$1,309	\$7,873	6.01	1.89
2	63	322.013	97.341	224.672	\$4,194	\$49,984	11.92	0.95
2	73	86.090	39.131	46.959	\$1,036	\$9,841	9.50	1.19
2	86	236.466	96.399	140.067	\$3,050	\$7,977	2.62	4.33
2	92	103.892	62.181	41.711	\$1,160	\$15,747	13.57	0.83
2	482	107.677	74.037	33.640	\$652	\$8,622	13.23	0.86
2	483	134.598	74.037	60.551	\$1,188	\$8,622	7.26	1.57
2	484	107.677	74.037	33.640	\$652	\$8,622	13.23	0.86
2	485	127.868	74.037	53.823	\$1,048	\$8,622	8.22	1.38
2	486	131.831	88.468	43.363	\$837	\$10,241	12.24	0.93
2	487	35.891	24.678	11.213	\$240	\$2,875	11.99	0.95
2	2770	2,786.940	1,150.523	1636.417	\$28,871	\$91,073	3.15	3.61
2	2778	604.306	399.381	204.925	\$3,594	\$31,624	8.80	1.29
2	5232	16.355	11.501	4.854	\$98	\$1,674	17.13	0.66
3.1	86	97.369	46.559	50.810	\$936	\$9,410	10.05	1.13
3.1	94	445.642	177.192	268.450	\$4,806	\$7,192	1.50	7.61
3.1	158	220.964	109.014	111.950	\$2,242	\$4,616	2.06	5.52
3.1	159	820.250	739.330	80.920	\$1,187	\$1,754	1.48	7.74
3.1	2770	1,150.044	630.464	519.580	\$9,312	\$9,410	1.01	11.27
3.1	2730	193.804	135.184	58.620	\$1,050	\$5,295	5.04	2.26
3.1	2778	399.321	218.911	180.410	\$3,229	\$9,410	2.91	3.91
3.1	2942	108.936	79.746	29.190	\$608	\$4,185	6.88	1.65
3.1	2943	108.936	79.746	29.190	\$608	\$4,185	6.88	1.65
3.1	2944	207.968	155.418	52.550	\$1,099	\$7,692	7.00	1.62
3.1	2963	58.140	41.000	17.140	\$356	\$3,077	8.65	1.31
3.1	2969	58.140	41.000	17.140	\$356	\$3,077	8.65	1.31
3.1	2970	58.140	41.000	17.140	\$356	\$3,077	8.65	1.31
3.1	2971	58.140	41.000	17.140	\$356	\$3,077	8.65	1.31
3.1	2972	58.140	41.000	17.140	\$356	\$3,077	8.65	1.31
3.1	2973	58.140	41.000	17.140	\$356	\$3,077	8.65	1.31
3.1	2974	58.140	41.000	17.140	\$356	\$3,077	8.65	1.31
3.1	2979	58.140	41.000	17.140	\$356	\$3,077	8.65	1.31
3.1	2980	58.140	41.000	17.140	\$356	\$3,077	8.65	1.31
3.1	5220	1,016.726	768.826	247.900	\$3,312	\$5,903	1.78	6.44
3.1	5222	331.880	224.670	107.210	\$2,138	\$5,474	2.56	4.44
3.1	5253	248.910	171.280	77.630	\$1,553	\$5,044	3.25	3.50
3.1	5256	1,578.608	1,330.718	247.890	\$3,312	\$5,903	1.78	6.44
4.1	2358	127.745	33.905	93.840	\$837	\$7,385	8.82	1.32
4.1	2388N	154.360	37.970	116.390	\$1,246	\$4,055	3.25	3.55
4.1	2388S	149.040	34.170	114.870	\$1,228	\$3,650	2.97	3.89
4.2	2358	33.915	28.831	5.084	\$37	\$629	16.80	0.70
4.2	2388N	37.980	32.285	5.695	\$42	\$629	15.03	0.78
4.2	2388S	34.181	29.056	5.125	\$37	\$629	16.80	0.70
4.2	4557	148.582	126.302	22.280	\$164	\$629	3.84	3.06
4.2	5913	148.121	125.909	22.212	\$163	\$629	3.86	3.05
4.2	6532	106.342	90.398	15.944	\$117	\$629	5.39	2.18
4.2	6609	274.306	233.174	41.132	\$302	\$629	2.09	5.64
4.2	6647	285.736	242.888	42.848	\$314	\$629	2.00	5.88
TOTALS		14,041.360	8,604.769	5,436.572	\$93,956	\$410,942	4.37	2.61

FORT KNOX LIMITED ENERGY STUDY

SUMMARY OF COST ESTIMATES

ECO NUMBER	BUILDING NUMBER	MATERIAL COSTS (\$)	LABOR COSTS (\$)	ADDITIONAL COSTS (\$)	TOTAL COST ESTIMATE (\$)
2	T58	\$2,968.00	\$1,574.00	\$2,347.00	\$6,889.00
2	T59	\$3,180.00	\$1,686.00	\$2,516.00	\$7,382.00
2	T60	\$3,392.00	\$1,799.00	\$2,682.00	\$7,873.00
2	63	\$28,560.00	\$4,078.00	\$17,346.00	\$49,984.00
2	73	\$4,240.00	\$2,248.00	\$3,353.00	\$9,841.00
2	86	\$4,050.00	\$1,180.00	\$2,747.00	\$7,977.00
2	92	\$8,612.00	\$1,686.00	\$5,449.00	\$15,747.00
2	482	\$4,308.00	\$1,349.00	\$2,965.00	\$8,622.00
2	483	\$4,308.00	\$1,349.00	\$2,965.00	\$8,622.00
2	484	\$4,308.00	\$1,349.00	\$2,965.00	\$8,622.00
2	485	\$4,308.00	\$1,349.00	\$2,965.00	\$8,622.00
2	486	\$5,090.00	\$1,630.00	\$3,521.00	\$10,241.00
2	487	\$1,436.00	\$450.00	\$989.00	\$2,875.00
2	2770	\$47,520.00	\$12,144.00	\$31,409.00	\$91,073.00
2	2778	\$16,500.00	\$4,217.00	\$10,907.00	\$31,624.00
2	5232	\$818.00	\$281.00	\$575.00	\$1,674.00
3.1	86	\$4,931.00	\$1,234.00	\$3,245.00	\$9,410.00
3.1	94	\$3,679.00	\$1,037.00	\$2,476.00	\$7,192.00
3.1	158	\$2,479.00	\$542.00	\$1,595.00	\$4,616.00
3.1	159	\$926.00	\$222.00	\$606.00	\$1,754.00
3.1	2770	\$4,931.00	\$1,234.00	\$3,245.00	\$9,410.00
3.1	2730	\$2,905.00	\$558.00	\$1,832.00	\$5,295.00
3.1	2778	\$4,931.00	\$1,234.00	\$3,245.00	\$9,410.00
3.1	2942	\$2,279.00	\$460.00	\$1,446.00	\$4,185.00
3.1	2943	\$2,279.00	\$460.00	\$1,446.00	\$4,185.00
3.1	2944	\$4,131.00	\$903.00	\$2,658.00	\$7,692.00
3.1	2963	\$1,652.00	\$361.00	\$1,064.00	\$3,077.00
3.1	2969	\$1,652.00	\$361.00	\$1,064.00	\$3,077.00
3.1	2970	\$1,652.00	\$361.00	\$1,064.00	\$3,077.00
3.1	2971	\$1,652.00	\$361.00	\$1,064.00	\$3,077.00
3.1	2972	\$1,652.00	\$361.00	\$1,064.00	\$3,077.00
3.1	2973	\$1,652.00	\$361.00	\$1,064.00	\$3,077.00
3.1	2974	\$1,652.00	\$361.00	\$1,064.00	\$3,077.00
3.1	2979	\$1,652.00	\$361.00	\$1,064.00	\$3,077.00
3.1	2980	\$1,652.00	\$361.00	\$1,064.00	\$3,077.00
3.1	5220	\$3,079.00	\$790.00	\$2,034.00	\$5,903.00
3.1	5222	\$2,879.00	\$707.00	\$1,888.00	\$5,474.00
3.1	5253	\$2,679.00	\$625.00	\$1,740.00	\$5,044.00
3.1	5256	\$3,079.00	\$790.00	\$2,034.00	\$5,903.00
4.1	2358	\$2,940.00	\$1,773.00	\$2,672.00	\$7,385.00
4.1	2388N	\$1,750.00	\$844.00	\$1,461.00	\$4,055.00
4.1	2388S	\$1,575.00	\$760.00	\$1,315.00	\$3,650.00
4.2	2358	\$250.00	\$165.00	\$214.00	\$629.00
4.2	2388N	\$250.00	\$165.00	\$214.00	\$629.00
4.2	2388S	\$250.00	\$165.00	\$214.00	\$629.00
4.2	4557	\$250.00	\$165.00	\$214.00	\$629.00
4.2	5913	\$250.00	\$165.00	\$214.00	\$629.00
4.2	6532	\$250.00	\$165.00	\$214.00	\$629.00
4.2	6609	\$250.00	\$165.00	\$214.00	\$629.00
4.2	6647	\$250.00	\$165.00	\$214.00	\$629.00
TOTALS		\$211,918.00	\$57,111.00	\$141,913.00	\$410,942.00

* INCLUDED SALES TAX, OVERHEAD, PROFIT, BOND, CONTINGENCIES, SICB & DESIGN.

LIFE CYCLE COST ANALYSIS SUMMARY
 ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)
 INSTALLATION & LOCATION: FT KNOX REGION NOS. 4 CENSUS: 3
 PROJECT NO. & TITLE: TLT1 ECO 2, 3.1, 4.1, 4.2
 FISCAL YEAR 1994 DISCRETE PORTION NAME: LIGHTING
 ANALYSIS DATE: 10-14-93 ECONOMIC LIFE 15 YEARS PREPARED BY: JULIE HOLLENS

STUDY: TOTAL1

LCCID 1.072

1. INVESTMENT

A. CONSTRUCTION COST	\$ 373580.
B. SIOH	\$ 18681.
C. DESIGN COST	\$ 18681.
D. TOTAL COST (1A+1B+1C)	\$ 410942.
E. SALVAGE VALUE OF EXISTING EQUIPMENT	\$ 0.
F. PUBLIC UTILITY COMPANY REBATE	\$ 0.
G. TOTAL INVESTMENT (1D - 1E - 1F)	\$ 410942.

2. ENERGY SAVINGS (+) / COST (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1992

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 7.34	5436.	\$ 39900.	11.77	\$ 469626.
B. DIST	\$.00	0.	\$ 0.	13.83	\$ 0.
C. RESID	\$.00	0.	\$ 0.	16.15	\$ 0.
D. NAT G	\$.00	0.	\$ 0.	15.34	\$ 0.
E. COAL	\$.00	0.	\$ 0.	12.82	\$ 0.
F. PPG	\$.00	0.	\$ 0.	11.12	\$ 0.
M. DEMAND SAVINGS			\$ 49501.	11.12	\$ 550451.
N. TOTAL		5436.	\$ 89401.		\$ 1020077.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)	\$ 4555.
(1) DISCOUNT FACTOR (TABLE A)	11.12
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$ 50652.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) COST(-)	YR OC	DISCNT FACTR	DISCOUNTED SAVINGS(+)/ COST(-)(4)
	(1)	(2)	(3)	

d. TOTAL	\$ 0.			0.
----------	-------	--	--	----

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-) (3A2+3Bd4)	\$ 50652.
--	-----------

4. FIRST YEAR DOLLAR SAVINGS 2N3+3A+(3B1d/(YRS ECONOMIC LIFE)) \$ 93956.

5. SIMPLE PAYBACK PERIOD (1G/4) 4.37 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) \$ 1070729.

7. SAVINGS TO INVESTMENT RATIO (SIR)=(5 / 1G)= 2.61
 (IF < 1 PROJECT DOES NOT QUALIFY)

8. ADJUSTED INTERNAL RATE OF RETURN (AIRR): 10.86 %

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING
30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: T58
BUILDING FUNCTION: WAREHOUSE

BUILDING USE:
HOURS/DAY 9.5
DAYS/WEEK 5

ELECTRIC COSTS:
ENERGY CHARGE \$0.02506 PER KWH
DEMAND CHARGE \$7.067 PER KW

EXISTING FIXTURE DATA

4 FOOT
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS
8 4 LAMP @ 192 WATTS/FIXT = 1,536 WATTS

8 FOOT
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS

INCANDESCENT
36 1 LAMP @ 200 WATTS/FIXT = 7,200 WATTS
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS

MERCURY VAPOR
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
AVERAGE FOOTCANDLES

TOTAL EXISTING KW
TOTAL EXISTING KWH

NET ENERGY SAVINGS

REPLACEMENT FIXTURE DATA

4 FOOT
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS
0 1 LAMP W/
REFLECTORS 37 WATTS/FIXT = 0 WATTS
56 2 LAMP W/ 58 WATTS/FIXT = 3,248 WATTS

METAL HALIDE
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS
HIGH PRESSURE SODIUM
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 300 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
AVERAGE FOOTCANDLES

TOTAL REPLACEMENT KW
TOTAL REPLACEMENT KWH

NET DOLLAR SAVINGS

0.45
16.00

3.2
8.023

\$805.08

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:26:29

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING T58

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T58

TIME 08:26:29

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T58
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:26:29

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALES/TX	DIRECT \$
<hr/>									
16500 LIGHTING									
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS									
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	*** UNIT COSTS: ***	0.93 56.00 EA	EELEF	52	28.11 1,574	0.13 7	53.00 2,968	2.65 148	83.88 4,697
TOTAL DIVISION 16 ELECTRICAL				52	1,574	7	2,968	148	4,697
TOTAL FACILITY AA. ELECTRICAL				52	1,574	7	2,968	148	4,697
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				52	1,574	7	2,968	148	4,697
TOTAL BASE BID				52	1,574	7	2,968	148	4,697
TOTAL ADDITIVE				0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				52	1,574	7	2,968	148	4,697

* * * END OF DETAIL REPORT * * *

Wed 15 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T58

TIME 08:26:29

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T58

TIME 08:26:29

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	4,697	10.0%	0.0%	7.5%	2.5%	0.0%	5,693 5693.48
			470	0	388	139	0		
	BID ITEM TOTAL	1.00 EA	4,697	470	0	388	139	0	5,693 5693.48
	TOTAL BASE BID		4,697	470	0	388	139	0	5,693
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		4,697	470	0	388	139	0	5,693

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T58

TIME 08:26:29

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1. BUILDING TO THE 5 FOOT LINE	1.00 EA	5,694		5,694	5693.50
TOTAL CURRENT CONTRACT COST		5,694	0	5,694	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
ESCALATED CONTRACT COST		5,694	0	5,694	
Government-Furnished Property		0		0	
SUBTOTAL		5,694	0	5,694	
Contingencies	10.0%	569	0	569	
SUBTOTAL		6,263	0	6,263	
SIOH (S&A)	5.0%	313	0	313	
CURRENT WORKING ESTIMATE		6,576	0	6,576	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
CONTRACTOR DIRECT SUMMARY ECO-2: BUILDING T58

TIME 08:26:29

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	** TOTAL DIRECT * * SUBCON *		W/OH&P	SUBTOTAL			
						LABOR	EQUIPMENT			MAT W/TX	AMOUNT	PCT
AA	GENERAL/PRIME		1.00	EA	52	1,574	7	3,116	4,697 100.0%	0	4,697	
TOTAL DIRECT						52	1,574	7	3,116	4,697 100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T58

TIME 08:26:29

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****				AMOUNT	PCT	UNIT COST			
				AMOUNT	PCT	HOFCS	AMOUNT				PCT	BOND%	OTHR%
AA	GENERAL/PRIME		4,697	470	10.0%	0.0	388	7.5%	2.5%	0.0%	5,693	100.0%	5693.48
			TOTAL OVERHEAD & PROFIT	470	10.0%		388	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T58

TIME 08:26:29

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	52	1,574	7	2,968	148	4,697
TOTAL DIRECT	52	1,574	7	2,968	148	4,697

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T58

TIME 08:26:29

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	52	1,574	7	2,968	148	4,697
TOTAL DIRECT	52	1,574	7	2,968	148	4,697

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T58

TIME 08:26:29

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	5	7
TOTAL PROJECT EQUIPMENT HOURS										5	7

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

3-44

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T58

TIME 08:26:29

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	-- UPB	**** TOTAL ****	COST
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	52	1,574
TOTAL PROJECT MANHOURS										52 1,574

* * * END OF SUMMARY REPORT * * *

FORT KNOX LIMITED ENERGY STUDY

ECO₂: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING
30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: T59
BUILDING FUNCTION: SMALL PARTS WAREHOUSE

BUILDING USE:
HOURS/DAY 9.5
DAYS/WEEK 5

ELECTRIC COSTS:
ENERGY CHARGE \$0.02506 PER KWH
DEMAND CHARGE \$7.067 PER KW

EXISTING FIXTURE DATA

4 FOOT
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS

8 FOOT
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS

INCANDESCENT
65 1 LAMP @ 200 WATTS/FIXT = 13,000 WATTS
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS

MERCURY VAPOR
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 1.31
AVERAGE FOOTCANDLES 7.50

TOTAL EXISTING KW 13.0
TOTAL EXISTING KWH 32,110

REPLACEMENT FIXTURE DATA

4 FOOT
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS
60 2 LAMP W/ 58 WATTS/FIXT = 3,480 WATTS

METAL HALIDE
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS

0 FIXTURES @ 300 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.43
AVERAGE FOOTCANDLES 15.00

TOTAL REPLACEMENT KW 3.5
TOTAL REPLACEMENT KWH 8,596

NET ENERGY SAVINGS 80,231 MBTU/YR NET DOLLAR SAVINGS \$1,396,57

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:33:33

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING T59

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59

TIME 08:33:33

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:33:33

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16500 LIGHTING									
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS									
CD=3 EL 8004 4 FOOT 2 LAMP	*** UNIT COSTS: ***		0.93	28.11	0.13	53.00	2.65	83.88	
WC=1100	60.00 EA	EELEF	56	1,686	8	3,180	159		5,033
TOTAL DIVISION 16 ELECTRICAL			56	1,686	8	3,180	159		5,033
TOTAL FACILITY AA. ELECTRICAL			56	1,686	8	3,180	159		5,033
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE			56	1,686	8	3,180	159		5,033
TOTAL BASE BID			56	1,686	8	3,180	159		5,033
TOTAL ADDITIVE			0	0	0	0	0		0
TOTAL INCL ADD LIMITED ENERGY STUDY			56	1,686	8	3,180	159		5,033

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59

TIME 08:33:33

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59

TIME 08:33:33

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA ELECTRICAL	1.00 EA	5,033	503	0	415	149	0	6,100	6100.17
BID ITEM TOTAL	1.00 EA	5,033	503	0	415	149	0	6,100	6100.17
TOTAL BASE BID		5,033	503	0	415	149	0	6,100	
TOTAL ADDITIVE		0	0	0	0	0	0	0	0
TOTAL INCL ADD		5,033	503	0	415	149	0	6,100	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59

TIME 08:33:33

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00	EA	6,100		6,100	6100.20
	TOTAL CURRENT CONTRACT COST			6,100	0	6,100	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			6,100	0	6,100	
	Government-Furnished Property			0		0	
	SUBTOTAL			6,100	0	6,100	
	Contingencies	10.0%		610		610	
	SUBTOTAL			6,710	0	6,710	
	SIOH (S&A)	5.0%		336		336	
	CURRENT WORKING ESTIMATE			7,046	0	7,046	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59

TIME 08:33:33

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	** TOTAL DIRECT * * SUBCON *			W/OH&P	SUBTOTAL		
						LABOR	EQUIPMENT	MAT W/TX			AMOUNT	PCT
AA	GENERAL/PRIME		1.00	EA	56	1,686	8	3,339	5,033	100.0%	0	5,033
TOTAL DIRECT					56	1,686	8	3,339	5,033	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

CONTRACTOR INDIRECT SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59

TIME 08:33:33

SUMMARY PAGE 5

*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****												
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOFCS	AMOUNT	PCT	BOND% OTHR%	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		5,033	503	10.0%	0.0	415	7.5%	2.5% 0.0%	6,100	100.0%	6100.16
TOTAL OVERHEAD & PROFIT												
				503	10.0%		415	7.5%				

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59

TIME 08:33:33

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	56	1,686	8	3,180	159	5,033
TOTAL DIRECT	56	1,686	8	3,180	159	5,033

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59

TIME 08:33:33

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	56	1,686	8	3,180	159	5,033
TOTAL DIRECT	56	1,686	8	3,180	159	5,033

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59

TIME 08:33:33

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	5	8
TOTAL PROJECT EQUIPMENT HOURS										5	8

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T59

TIME 08:33:33

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY -- UPB **** TOTAL ****			
							RATE	RATE	HOURS	COST
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	56	1,686
							56	1,686		
TOTAL PROJECT MANHOURS										

* * * END OF SUMMARY REPORT * * *

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: T60
BUILDING FUNCTION: WAREHOUSE

BUILDING USE:
HOURS/DAY 9.5
 DAYS/WEEK 5

ELECTRIC COSTS:
ENERGY CHARGE \$0.02506 PER KWH
DEMAND CHARGE \$7.067 PER KW

EXISTING FIXTURE DATA

<u>4 FOOT</u>	<u>0</u> LAMP @ <u>48</u> WATTS/FIXT = <u>0</u> WATTS
<u>0</u> 2 LAMP @ <u>96</u> WATTS/FIXT = <u>0</u> WATTS	
<u>64</u> 4 LAMP @ <u>192</u> WATTS/FIXT = <u>12,288</u> WATTS	

8 FOOT 0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS

<u>INCANDESCENT</u>	<u>0</u> WATTS/FIXT = <u>0</u> WATTS
<u>0</u> 1 LAMP @ <u>0</u> WATTS/FIXT = <u>0</u> WATTS	

<u>MERCURY VAPOR</u>	<u>0</u> 1 LAMP @ <u>454</u> WATTS/FIXT = <u>0</u> WATTS
AVERAGE WATTS/SQ FT	<u>1.23</u>
AVERAGE FOOTCANDLES	<u>20.00</u>

TOTAL EXISTING KW 12.8
TOTAL EXISTING KWH 30,351

0.46
20.00

3.7
9,169

REPLACEMENT FIXTURE DATA

<u>4 FOOT</u>	<u>0</u> 1 LAMP @ <u>37</u> WATTS/FIXT = <u>0</u> WATTS
<u>0</u> 1 LAMP W/ REFLECTORS	<u>37</u> WATTS/FIXT = <u>0</u> WATTS
<u>64</u> 2 LAMP W/	<u>58</u> WATTS/FIXT = <u>3,712</u> WATTS

<u>METAL HALIDE</u>	<u>0</u> FIXTURES @ <u>185</u> WATTS/FIXT = <u>0</u> WATTS
<u>0</u> FIXTURES @ <u>215</u> WATTS/FIXT = <u>0</u> WATTS	

<u>HIGH PRESSURE SODIUM</u>	<u>0</u> FIXTURES @ <u>115</u> WATTS/FIXT = <u>0</u> WATTS
<u>0</u> FIXTURES @ <u>300</u> WATTS/FIXT = <u>0</u> WATTS	
<u>0</u> FIXTURES @ <u>465</u> WATTS/FIXT = <u>0</u> WATTS	

AVERAGE WATTS/SQ FT
AVERAGE FOOTCANDLES

TOTAL REPLACEMENT KW 3.7
TOTAL REPLACEMENT KWH 9,169

NET ENERGY SAVINGS 72,275 MBTU/YR
NET DOLLAR SAVINGS \$1,258.08

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:41:10

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING T60

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T60

TIME 08:41:10

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Wed 15 Sep 1993

DETAILED ESTIMATE

U.S. ARMY CORPS of ENGINEERS M-CACES
 LIMITED ENERGY STUDY / FT KNOX, KY
 ECO-2: BUILDING T60
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:41:10

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16500 LIGHTING									
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS									
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	*** UNIT COSTS: ***	0.93 64.00 EA	EELEF	60	28.11 1,799	0.13 8	53.00 3,392	2.65 170	83.88 5,368
TOTAL DIVISION 16 ELECTRICAL				60	1,799	8	3,392	170	5,368
TOTAL FACILITY AA. ELECTRICAL				60	1,799	8	3,392	170	5,368
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				60	1,799	8	3,392	170	5,368
TOTAL BASE BID				60	1,799	8	3,392	170	5,368
TOTAL ADDITIVE				0	0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY				60	1,799	8	3,392	170	5,368

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T60

TIME 08:41:10

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T60

TIME 08:41:10

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA ELECTRICAL	1.00 EA	5,368	537	0	443	159	0	6,507	6506.84
BID ITEM TOTAL	1.00 EA	5,368	537	0	443	159	0	6,507	6506.84
TOTAL BASE BID		5,368	537	0	443	159	0	6,507	
TOTAL ADDITIVE		0	0	0	0	0	0	0	
TOTAL INCL ADD		5,368	537	0	443	159	0	6,507	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T60

TIME 08:41:10

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1. BUILDING TO THE 5 FOOT LINE	1.00 EA	6,507		6,507	6506.80
TOTAL CURRENT CONTRACT COST		6,507	0	6,507	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
ESCALATED CONTRACT COST		6,507	0	6,507	
Government-Furnished Property		0		0	
SUBTOTAL		6,507	0	6,507	
Contingencies	10.0%	651	0	651	
SUBTOTAL		7,157	0	7,157	
SIOH (S&A)	5.0%	358	0	358	
CURRENT WORKING ESTIMATE		7,515	0	7,515	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
CONTRACTOR DIRECT SUMMARY ECO-2: BUILDING T60

TIME 08:41:10

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON **													
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL	
AA	GENERAL/PRIME		1.00	EA	60	1,799		8	3,562	5,368	100.0%	0	5,368
TOTAL DIRECT					60	1,799		8	3,562	5,368	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T60

TIME 08:41:10

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PH	SUBTOTAL	*** OVERHEAD ***			**** PROFIT ****			***** TOTAL CONTRACT *****			
				AMOUNT	PCT	HOFC%	AMOUNT	PCT	BOND%	OTHER%	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		5,368	537	10.0%	0.0	443	7.5%	2.5%	0.0%	6,507	100.0%	6506.84
TOTAL OVERHEAD & PROFIT				537	10.0%		443	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T60

TIME 08:41:10

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
16 ELECTRICAL	60	1,799	8	3,392	170	5,368	
TOTAL DIRECT	60	1,799	8	3,392	170	5,368	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T60

TIME 08:41:10

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	60	1,799	8	3,392	170	5,368
TOTAL DIRECT	60	1,799	8	3,392	170	5,368

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

3-69

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T60

TIME 08:41:10

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****											
	LIFE	HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS									1.40	1.40	6	8
TOTAL PROJECT EQUIPMENT HOURS											6	8

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING T60

TIME 08:41:10

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY -- UPB **** TOTAL *****	RATE	RATE	HOURS	COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79		60	1,799
TOTAL PROJECT MANHOURS									60	1,799

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

3-71

FORT KNOX LIMITED ENERGY STUDY

ECO₂: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING
30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: 63
BUILDING FUNCTION: ADMINISTRATIVE

BUILDING USE:
HOURS/DAY 9
DAYSWEEK 5

ELECTRIC COSTS:
ENERGY CHARGE \$0.02506
DEMAND CHARGE \$7.067 PER KW

EXISTING FIXTURE DATA

4 FOOT
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS
210 4 LAMP @ 192 WATTS/FIXT = 40,320 WATTS

8 FOOT
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS

INCANDESCENT
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS

MERCURY VAPOR
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
AVERAGE FOOTCANDLES
1.72
50.00

TOTAL EXISTING KW
TOTAL EXISTING KWH
40.3
94,349

REPLACEMENT FIXTURE DATA

4 FOOT
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS
0 1 LAMP W/
REFLECTORS 37 WATTS/FIXT = 0 WATTS
210 2 LAMP W/
REFLECTORS 58 WATTS/FIXT = 12,180 WATTS

METAL HALIDE
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 300 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
AVERAGE FOOTCANDLES
0.64
50.00

TOTAL REPLACEMENT KW
TOTAL REPLACEMENT KWH
12.2
28,501

NET ENERGY SAVINGS
224,672 MBTU/YR

NET DOLLAR SAVINGS
\$4,036.41

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 07:50:41

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 63

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

TABLE OF CONTENTS

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 63

TIME 07:50:41

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
 LIMITED ENERGY STUDY / FT KNOX, KY
 ECO-2: BUILDING 63

TIME 07:50:41

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALES	TX	DIRECT	\$
16500 LIGHTING											
16512 7000 FLUORESCENT - RECESSED T8 ELECTRONIC BALLAST											
CD=3 EL 7003 4 FT 2 LAMP PARABOLIC LOUVRE W/ REFLECTOR	0.59		19.42		0.08	136.00		6.80		162.29	
WC=1100	210.00 EA	EELEB	124	4,078	16	28,560		1,428		34,082	
TOTAL DIVISION 16 ELECTRICAL	124		4,078		16	28,560		1,428		34,082	
TOTAL FACILITY AA. ELECTRICAL	124		4,078		16	28,560		1,428		34,082	
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE	124		4,078		16	28,560		1,428		34,082	
TOTAL BASE BID	124		4,078		16	28,560		1,428		34,082	
TOTAL ADDITIVE	0		0		0	0		0		0	
TOTAL INCL ADD LIMITED ENERGY STUDY	124		4,078		16	28,560		1,428		34,082	

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 63

TIME 07:50:41

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 63

TIME 07:50:41

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL		10.0%	0.0%	7.5%	2.5%	0.0%		
	1.00 EA	34,082	3,408	0	2,812	1,008	0	41,309	41309.08
<hr/>		<hr/>		<hr/>		<hr/>		<hr/>	
BID ITEM TOTAL		1.00 EA	34,082	3,408	0	2,812	1,008	0	41,309
<hr/>		<hr/>		<hr/>		<hr/>		<hr/>	
TOTAL BASE BID			34,082	3,408	0	2,812	1,008	0	41,309
<hr/>		<hr/>		<hr/>		<hr/>		<hr/>	
TOTAL ADDITIVE			0	0	0	0	0	0	0
<hr/>		<hr/>		<hr/>		<hr/>		<hr/>	
TOTAL INCL ADD			34,082	3,408	0	2,812	1,008	0	41,309

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

PROJECT CWE SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 63

TIME 07:50:41

SUMMARY PAGE 3

ID BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1. BUILDING TO THE 5 FOOT LINE	1.00 EA	41,309		41,309	41309.10
TOTAL CURRENT CONTRACT COST		41,309	0	41,309	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
ESCALATED CONTRACT COST		41,309	0	41,309	
Government-Furnished Property		0		0	
SUBTOTAL		41,309	0	41,309	
Contingencies	10.0%	4,131	0	4,131	
SUBTOTAL		45,440	0	45,440	
SIOH (S&A)	5.0%	2,272	0	2,272	
CURRENT WORKING ESTIMATE		47,712	0	47,712	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 63

TIME 07:50:41

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON **													
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL	
AA	GENERAL/PRIME		1.00	EA	124	4,078		16	29,988	34,082	100.0%	0	34,082
TOTAL DIRECT													
					124	4,078		16	29,988	34,082	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 63

TIME 07:50:41

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****				AMOUNT	PCT	UNIT COST			
				AMOUNT	PCT	HOPC%	AMOUNT				PCT	BOND%	OTHR%
AA	GENERAL/PRIME		34,082	3,408	10.0%	0.0	2,812	7.5%	2.5%	0.0%	41,309	100.0%	41309.08
TOTAL OVERHEAD & PROFIT				3,408	10.0%		2,812	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 63

TIME 07:50:41

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	124	4,078	16	28,560	1,428	34,082
TOTAL DIRECT	124	4,078	16	28,560	1,428	34,082

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 63

TIME 07:50:41

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
11 INTERIOR ELECTRICAL	124	4,078	16	28,560	1,428	34,082	
TOTAL DIRECT	124	4,078	16	28,560	1,428	34,082	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 63

TIME 07:50:41

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	11	16
TOTAL PROJECT EQUIPMENT HOURS										11	16

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
LABOR SUMMARY ECO-2: BUILDING 63

TIME 07:50:41

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	-- UPB	**** TOTAL ****	COST
							RATE	RATE	HOURS	
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	124	4,078
TOTAL PROJECT MANHOURS								124	4,078	

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

3-84

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING
30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: 73
BUILDING FUNCTION: MACHINE SHOP

BUILDING USE:
HOURS/DAY
DAYS/WEEK

9.5
5

ELECTRIC COSTS:	
ENERGY CHARGE	\$0.02506 PER KWH
DEMAND CHARGE	\$7.067 PER KW

EXISTING FIXTURE DATA

4 FOOT 0 1 LAMP @	48 WATTS/FIXT =	0 WATTS	4 FOOT 0 1 LAMP @	37 WATTS/FIXT =	0 WATTS
0 2 LAMP @	96 WATTS/FIXT =	0 WATTS	0 1 LAMP W/ REFLECTORS	37 WATTS/FIXT =	0 WATTS
41 4 LAMP @	192 WATTS/FIXT =	7,872 WATTS	80 2 LAMP W/	58 WATTS/FIXT =	4,640 WATTS
 8 FOOT 0 2 LAMP @	 158 WATTS/FIXT =	 0 WATTS	METAL HALIDE 0 FIXTURES @	 185 WATTS/FIXT =	 0 WATTS
 INCANDESCENT 26 1 LAMP @	 90 WATTS/FIXT =	 2,340 WATTS	0 FIXTURES @	 215 WATTS/FIXT =	 0 WATTS
 0 1 LAMP @	 0 WATTS/FIXT =	 0 WATTS	HIGH PRESSURE SODIUM 0 FIXTURES @	 115 WATTS/FIXT =	 0 WATTS
 MERCURY VAPOR 0 1 LAMP @	 454 WATTS/FIXT =	 0 WATTS	0 FIXTURES @	 300 WATTS/FIXT =	 0 WATTS
 AVERAGE WATTS/SQ FT AVERAGE FOOTCANDLES	 0.98 22.00	 	0 FIXTURES @	 465 WATTS/FIXT =	 0 WATTS
 TOTAL EXISTING KW TOTAL EXISTING KWH	 10.2 25,224	 	 	 	

AVERAGE WATTS/SQ FT
AVERAGE FOOTCANDLES

TOTAL REPLACEMENT KW
TOTAL REPLACEMENT KWH

NET ENERGY SAVINGS

46,959 MBTU/YR NET DOLLAR SAVINGS \$817.40

0.54
30.00

4.6
11,461

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:01:43

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 73

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73

TIME 08:01:43

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:01:43

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALES	TAX	DIRECT	\$
<hr/>											
16500 LIGHTING											
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS											
CD=3 EL 8004 4 FOOT 2 LAMP WC-1100	*** UNIT COSTS: ***	0.93 80.00 EA	EELEF	75	28.11 2,248	0.13 10	53.00 4,240	2.65 212	83.88 6,711		
TOTAL DIVISION 16 ELECTRICAL				75	2,248	10	4,240	212	6,711		
TOTAL FACILITY AA. ELECTRICAL				75	2,248	10	4,240	212	6,711		
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				75	2,248	10	4,240	212	6,711		
TOTAL BASE BID				75	2,248	10	4,240	212	6,711		
TOTAL ADDITIVE				0	0	0	0	0	0		
TOTAL INCL ADD LIMITED ENERGY STUDY				75	2,248	10	4,240	212	6,711		

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73

TIME 08:01:43

PROJECT NOTES

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73

TIME 08:01:43

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA ELECTRICAL			10.0%	0.0%	7.5%	2.5%	0.0%		
	1.00 EA	6,711	671	0	554	198	0	8,134	8133.55
BID ITEM TOTAL	1.00 EA	6,711	671	0	554	198	0	8,134	8133.55
TOTAL BASE BID		6,711	671	0	554	198	0	8,134	
TOTAL ADDITIVE		0	0	0	0	0	0	0	0
TOTAL INCL ADD		6,711	671	0	554	198	0	8,134	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73

TIME 08:01:43

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	8,134		8,134	8133.50
	TOTAL CURRENT CONTRACT COST		8,134	0	8,134	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		8,134	0	8,134	
	Government-Furnished Property		0		0	
	SUBTOTAL		8,134	0	8,134	
	Contingencies	10.0%	813	0	813	
	SUBTOTAL		8,947	0	8,947	
	SIOH (S&A)	5.0%	447	0	447	
	CURRENT WORKING ESTIMATE		9,394	0	9,394	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73

TIME 08:01:43

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON **																	
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL					
AA	GENERAL/PRIME		1.00	EA	75	2,248		10	4,452	6,711	100.0%	0	6,711				
TOTAL DIRECT												75	2,248	10	4,452	6,711	100.0%

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

3-92

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73

TIME 08:01:43

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****			AMOUNT	PCT	UNIT COST			
				AMOUNT	PCT	HFPC%						
AA	GENERAL/PRIME		6,711	671	10.0%	0.0	554	7.5%	2.5% 0.0%	8,134	100.0%	8133.55
TOTAL OVERHEAD & PROFIT							671	10.0%		554	7.5%	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

3-93

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73

TIME 08:01:43

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * ----- DIRECT
16 ELECTRICAL	75	2,248	10	4,240	212	6,711
TOTAL DIRECT	75	2,248	10	4,240	212	6,711

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

3-94

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73

TIME 08:01:43

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * ----- DIRECT
11 INTERIOR ELECTRICAL	75	2,248	10	4,240	212	6,711
TOTAL DIRECT	75	2,248	10	4,240	212	6,711

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73

TIME 08:01:43

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	7	10
TOTAL PROJECT EQUIPMENT HOURS										7	10

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

3-96

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 73

TIME 08:01:43

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	--	UPB	****	TOTAL	****
							RATE	RATE	HOURS	COST		
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	75	2,248		
TOTAL PROJECT MANHOURS											75	2,248

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

3-97

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING
30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: 86
BUILDING FUNCTION: WAREHOUSE

BUILDING USE:
HOURS/DAY 9.5
 DAYS/WEEK 5

EXISTING FIXTURE DATA		REPLACEMENT FIXTURE DATA	
<u>4 FOOT</u>	<u>0</u> LAMP @ <u>48</u> WATTS/FIXT = <u>0</u> WATTS	<u>4 FOOT</u>	<u>0</u> 1 LAMP @ <u>37</u> WATTS/FIXT = <u>0</u> WATTS
<u>0</u> 2 LAMP @ <u>96</u> WATTS/FIXT = <u>0</u> WATTS		<u>0</u> 1 LAMP W/ REFLECTORS	<u>37</u> WATTS/FIXT = <u>0</u> WATTS
<u>0</u> 4 LAMP @ <u>192</u> WATTS/FIXT = <u>0</u> WATTS		<u>0</u> 2 LAMP W/ REFLECTORS	<u>58</u> WATTS/FIXT = <u>0</u> WATTS
<u>8 FOOT</u>	<u>0</u> 2 LAMP @ <u>158</u> WATTS/FIXT = <u>0</u> WATTS	<u>METAL HALIDE</u>	<u>0</u> FIXTURES @ <u>185</u> WATTS/FIXT = <u>0</u> WATTS
<u>INCANDESCENT</u>	<u>13</u> 1 LAMP @ <u>750</u> WATTS/FIXT = <u>9,750</u> WATTS	<u>0</u> FIXTURES @ <u>215</u> WATTS/FIXT = <u>0</u> WATTS	
	<u>61</u> 1 LAMP @ <u>300</u> WATTS/FIXT = <u>18,300</u> WATTS	<u>HIGH PRESSURE SODIUM</u>	<u>0</u> FIXTURES @ <u>115</u> WATTS/FIXT = <u>0</u> WATTS
<u>MERCURY VAPOR</u>	<u>0</u> 1 LAMP @ <u>454</u> WATTS/FIXT = <u>0</u> WATTS	<u>36</u> FIXTURES @ <u>240</u> WATTS/FIXT = <u>8,640</u> WATTS	
		<u>6</u> FIXTURES @ <u>465</u> WATTS/FIXT = <u>2,790</u> WATTS	
AVERAGE WATTS/SQ FT AVERAGE FOOTCANDLES	<u>1.29</u>	AVERAGE WATTS/SQ FT AVERAGE FOOTCANDLES	<u>0.53</u> <u>21.00</u>
TOTAL EXISTING KW TOTAL EXISTING KWH	<u>28.1</u> <u>69,284</u>	TOTAL REPLACEMENT KW TOTAL REPLACEMENT KWH	<u>11.4</u> <u>28,232</u>
NET ENERGY SAVINGS	<u>140.067</u> MBTU/YR	NET DOLLAR SAVINGS	<u>\$2,438.12</u>

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:10:13

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 86

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

Wed 15 Sep 1993

TABLE OF CONTENTS

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 86

TIME 08:10:13

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 86
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:10:13

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
<hr/>									
16500 LIGHTING									
16512 9000 HIGH INTENSITY DISCHARGE									
CD=3 EL 9003 200 W HPS FIXTURE AND LAMP WC=1100	*** UNIT COSTS: *** 36.00 EA	EELEF	0.93 34	28.11 1,012	0.13 5	95.00 3,420	4.75 171	127.98 4,607	
CD=3 EL 9004 400 W HPS FIXTURE AND LAMP WC=1100	*** UNIT COSTS: *** 6.00 EA	EELEF	0.93 6	28.11 169	0.13 1	105.00 630	5.25 32	138.48 831	
<hr/>									
TOTAL DIVISION 16 ELECTRICAL			39	1,180	5	4,050	203	5,438	
<hr/>									
TOTAL FACILITY AA. ELECTRICAL			39	1,180	5	4,050	203	5,438	
<hr/>									
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE			39	1,180	5	4,050	203	5,438	
<hr/>									
TOTAL BASE BID			39	1,180	5	4,050	203	5,438	
<hr/>									
TOTAL ADDITIVE			0	0	0	0	0	0	0
<hr/>									
TOTAL INCL ADD LIMITED ENERGY STUDY			39	1,180	5	4,050	203	5,438	

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

Wed 15 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 86

TIME 08:10:13

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 86

TIME 08:10:13

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL								
	1.00 EA	5,438	544	0	449	161	0	6,591	6591.46
	BID ITEM TOTAL	1.00 EA	5,438	544	0	449	161	0	6,591
	TOTAL BASE BID		5,438	544	0	449	161	0	6,591
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		5,438	544	0	449	161	0	6,591

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-103

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 86

TIME 08:10:13

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00	EA	6,592		6,592	6591.50
	TOTAL CURRENT CONTRACT COST			6,592	0	6,592	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			6,592	0	6,592	
	Government-Furnished Property			0		0	
	SUBTOTAL			6,592	0	6,592	
	Contingencies	10.0%		659	0	659	
	SUBTOTAL			7,251	0	7,251	
	SIOH (S&A)	5.0%		363	0	363	
	CURRENT WORKING ESTIMATE			7,613	0	7,613	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
CONTRACTOR DIRECT SUMMARY ECO-2: BUILDING 86

TIME 08:10:13

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON **													
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL	
AA	GENERAL/PRIME		1.00	EA	39	1,180		5	4,253	5,438	100.0%	0	5,438
TOTAL DIRECT													
					39	1,180		5	4,253	5,438	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-105

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 86

TIME 08:10:13

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***			**** PROFIT ****			***** TOTAL CONTRACT *****			
				AMOUNT	PCT	HOF% C%	AMOUNT	PCT	BOND% OTH% C%	AMOUNT	PCT	UNIT COST	
AA	GENERAL/PRIME		5,438	544	10.0%	0.0	449	7.5%	2.5%	0.0%	6,591	100.0%	6591.45
TOTAL OVERHEAD & PROFIT				544	10.0%		449	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-106

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 86

TIME 08:10:13

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
16 ELECTRICAL	39	1,180	5	4,050	203	5,438	
TOTAL DIRECT	39	1,180	5	4,050	203	5,438	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-107

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 86

TIME 08:10:13

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
11 INTERIOR ELECTRICAL	39	1,180	5	4,050	203	5,438	
TOTAL DIRECT	39	1,180	5	4,050	203	5,438	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-108

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 86

TIME 08:10:13

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE ***		ADJ FACTOR	ADJUSTD	BOOK OP --	HRLY ---	UPB	**** TOTAL ****	
	LIFE HRS	TL HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE HOURS COST
EMI20 SMALL TOOLS							1.40	1.40	4 5
TOTAL PROJECT EQUIPMENT HOURS									4 5

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-109

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 86

TIME 08:10:13

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY --	UPB	**** TOTAL ****	COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	39	1,180
TOTAL PROJECT MANHOURS								39	1,180

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-110

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: 92
BUILDING FUNCTION: WAREHOUSE

BUILDING USE:
HOURS/DAY 10.5
 DAYS/WEEK 5

ELECTRIC COSTS:
ENERGY CHARGE \$0.02506 PER KWH
DEMAND CHARGE \$7.067 PER KW

EXISTING FIXTURE DATA

4 FOOT 0 LAMP @ 48 WATTS/FIXT = 0 WATTS
50 2 LAMP @ 96 WATTS/FIXT = 4,800 WATTS
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS

8 FOOT 0 LAMP @ 158 WATTS/FIXT = 0 WATTS

INCANDESCENT 7 LAMP @ 150 WATTS/FIXT = 1,050 WATTS
53 1 LAMP @ 100 WATTS/FIXT = 5,300 WATTS

MERCURY VAPOR 0 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
AVERAGE FOOTCANDLES

TOTAL EXISTING KW
TOTAL EXISTING KW/H

NET ENERGY SAVINGS

REPLACEMENT FIXTURE DATA

4 FOOT 0 LAMP @ 37 WATTS/FIXT = 0 WATTS
0 LAMP W/
REFLECTORS 37 WATTS/FIXT = 0 WATTS
4 LAMP W/ 58 WATTS/FIXT = 232 WATTS

METAL HALIDE 0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS
HIGH PRESSURE SODIUM 56 FIXTURES @ 115 WATTS/FIXT = 6,440 WATTS
0 FIXTURES @ 300 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
AVERAGE FOOTCANDLES

TOTAL REPLACEMENT KW
TOTAL REPLACEMENT KW/H

NET DOLLAR SAVINGS

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:18:25

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 92

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-112

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92

TIME 08:18:25

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS SUMMARY PAGE

PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE DETAIL PAGE

1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:18:25

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
<hr/>									
16500 LIGHTING									
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS									
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	*** UNIT COSTS: *** 4.00 EA	EELEFF	0.93 4	28.11 112	0.13 1	53.00 212	2.65 11	83.88 336	
16512 9000 HIGH INTENSITY DISCHARGE									
CD=3 EL 9002 100 W HPS FIXTURE AND LAMP FOR WC=1100 LOW BAY W/ 13' HEIGHT	*** UNIT COSTS: *** 56.00 EA	EELEFF	0.93 52	28.11 1,574	0.13 7	150.00 8,400	7.50 420	185.73 10,401	
TOTAL DIVISION 16 ELECTRICAL	56		1,686		8	8,612	431	10,736	
TOTAL FACILITY AA. ELECTRICAL	56		1,686		8	8,612	431	10,736	
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE	56		1,686		8	8,612	431	10,736	
TOTAL BASE BID	56		1,686		8	8,612	431	10,736	
TOTAL ADDITIVE	0		0		0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY	56		1,686		8	8,612	431	10,736	

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-114

Wed 15 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92

TIME 08:18:25

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-115

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92

TIME 08:18:25

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	10,736	10.0%	0.0%	7.5%	2.5%	0.0%	13,013 13013.28
				1,074	0	886	317	0	
	BID ITEM TOTAL	1.00 EA	10,736	1,074	0	886	317	0	13,013 13013.28
	TOTAL BASE BID		10,736	1,074	0	886	317	0	13,013
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		10,736	1,074	0	886	317	0	13,013

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-116

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92

TIME 08:18:25

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	13,013		13,013	13013.30
	TOTAL CURRENT CONTRACT COST		13,013	0	13,013	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		13,013	0	13,013	
	Government-Furnished Property		0		0	
	SUBTOTAL		13,013	0	13,013	
	Contingencies	10.0%	1,301	0	1,301	
	SUBTOTAL		14,315	0	14,315	
	SIOH (S&A)	5.0%	716	0	716	
	CURRENT WORKING ESTIMATE		15,030	0	15,030	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92

TIME 08:18:25

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON **														
ID	CONTRACTOR	PM	QUANTITY UOM MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL				
AA	GENERAL/PRIME	1.00 EA	56	1,686	8	9,043	10,736	100.0%	0	10,736				
TOTAL DIRECT									56	1,686	8	9,043	10,736	100.0%

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-118

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92

TIME 08:18:25

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****													
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOF&%	AMOUNT	PCT	BOND% OTHR%	AMOUNT	PCT	UNIT COST	
AA	GENERAL/PRIME		10,736	1,074	10.0%	0.0	886	7.5%	2.5%	0.0%	13,013	100.0%	13013.28
TOTAL OVERHEAD & PROFIT													
				1,074	10.0%		886	7.5%					

REW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-119

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92

TIME 08:18:25

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
16 ELECTRICAL	56	1,686	8	8,612	431	10,736	
TOTAL DIRECT	56	1,686	8	8,612	431	10,736	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-120

Wed 15 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92

TIME 08:18:25

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	56	1,686	8	8,612	431	10,736
TOTAL DIRECT	56	1,686	8	8,612	431	10,736

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-121

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92

TIME 08:18:25

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP	DESCRIPTION	*** BOOK VALUE ***		ADJ FACTOR	ADJUSTD	BOOK OP --	HRLY	--- UPB	**** TOTAL ****			
		LIFE HRS	TL HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS	COST
EMI20	SMALL TOOLS						1.40	1.40	5		8	
TOTAL PROJECT EQUIPMENT HOURS											5	8

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-122

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 92

TIME 08:18:25

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	-- UPB	**** TOTAL ****	
						RATE	RATE	HOURS	COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	56	1,686
TOTAL PROJECT MANHOURS								56	1,686

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-123

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING
30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: 482
BUILDING FUNCTION: MOTOR POOL/VEHICLE MAINTENANCE

BUILDING USE:
HOURS/DAY 8
 DAYS/WEEK 5

ELECTRIC COSTS:
ENERGY CHARGE \$0.02506
DEMAND CHARGE \$7.067 PER KW

EXISTING FIXTURE DATA

4 FOOT	48 WATTS/FIXT =	0 WATTS	0 LAMP @	37 WATTS/FIXT =	0 WATTS	
<u>0</u>	<u>1 LAMP @</u>	<u>96 WATTS/FIXT =</u>	<u>0 WATTS</u>	<u>0 LAMP W/</u>	<u>37 WATTS/FIXT =</u>	<u>0 WATTS</u>
<u>0</u>	<u>2 LAMP @</u>	<u>192 WATTS/FIXT =</u>	<u>0 WATTS</u>	<u>REFLECTORS</u>	<u>58 WATTS/FIXT =</u>	<u>348 WATTS</u>
<u>0</u>	<u>4 LAMP @</u>	<u>384 WATTS/FIXT =</u>	<u>0 WATTS</u>	<u>6 2 LAMP W/</u>		
8 FOOT	158 WATTS/FIXT =	15,168 WATTS	METAL HALIDE	185 WATTS/FIXT =	0 WATTS	
<u>96</u>	<u>2 LAMP @</u>	<u>31,360 WATTS</u>	<u>0 FIXTURES @</u>	<u>215 WATTS/FIXT =</u>	<u>0 WATTS</u>	
INCANDESCENT	0 WATTS/FIXT =	0 WATTS	HIGH PRESSURE SODIUM	115 WATTS/FIXT =	0 WATTS	
<u>0</u>	<u>1 LAMP @</u>	<u>0 WATTS/FIXT =</u>	<u>0 FIXTURES @</u>	<u>240 WATTS/FIXT =</u>	<u>10,080 WATTS</u>	
<u>0</u>	<u>1 LAMP @</u>	<u>0 WATTS/FIXT =</u>	<u>42 FIXTURES @</u>	<u>465 WATTS/FIXT =</u>	<u>0 WATTS</u>	
MERCURY VAPOR	454 WATTS/FIXT =	0 WATTS				
<u>0</u>	<u>1 LAMP @</u>	<u>0 WATTS</u>				

REPLACEMENT FIXTURE DATA

4 FOOT	37 WATTS/FIXT =	0 WATTS	
<u>0</u>	<u>1 LAMP @</u>	<u>37 WATTS/FIXT =</u>	<u>0 WATTS</u>
<u>0</u>	<u>2 LAMP W/</u>	<u>37 WATTS/FIXT =</u>	<u>0 WATTS</u>
<u>0</u>	<u>REFLECTORS</u>	<u>58 WATTS/FIXT =</u>	<u>348 WATTS</u>
8 FOOT	185 WATTS/FIXT =	0 WATTS	
<u>0</u>	<u>FIXTURES @</u>	<u>215 WATTS/FIXT =</u>	<u>0 WATTS</u>
INCANDESCENT	0 WATTS/FIXT =	0 WATTS	
<u>0</u>	<u>1 LAMP @</u>	<u>0 WATTS/FIXT =</u>	<u>0 WATTS</u>
HIGH PRESSURE SODIUM	115 WATTS/FIXT =	0 WATTS	
<u>0</u>	<u>FIXTURES @</u>	<u>240 WATTS/FIXT =</u>	<u>10,080 WATTS</u>
MERCURY VAPOR	465 WATTS/FIXT =	0 WATTS	
<u>0</u>	<u>1 LAMP @</u>	<u>0 WATTS</u>	
AVERAGE WATTS/SQ FT AVERAGE FOOTCANDLES	1.40 20.00	AVERAGE WATTS/SQ FT AVERAGE FOOTCANDLES	0.93 30.00
TOTAL EXISTING KW	15.2	TOTAL REPLACEMENT KW	10.4
TOTAL EXISTING KWH	31,549	TOTAL REPLACEMENT KWH	21,690
NET ENERGY SAVINGS	39,640 MBTU/YR	NET DOLLAR SAVINGS	\$649.02

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:00:07

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 482

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-125

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482

TIME 15:00:07

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * *

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:00:07

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALES	TAX	DIRECT	\$
16500 LIGHTING											
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS											
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	*** UNIT COSTS: *** 6.00 EA EELEF	0.93 6	28.11 169		0.13 1	53.00 318		2.65 16	83.88 503		
16512 9000 HIGH INTENSITY DISCHARGE											
CD=3 EL 9003 200 W HPS FIXTURE AND LAMP WC=1100	*** UNIT COSTS: *** 42.00 EA EELEF	0.93 39	28.11 1,180		0.13 5	95.00 3,990		4.75 200	127.98 5,375		
TOTAL DIVISION 16 ELECTRICAL											
	45		1,349		6	4,308		215		5,879	
TOTAL FACILITY AA. ELECTRICAL											
	45		1,349		6	4,308		215		5,879	
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE											
	45		1,349		6	4,308		215		5,879	
TOTAL BASE BID											
	45		1,349		6	4,308		215		5,879	
TOTAL ADDITIVE											
	0		0		0	0		0		0	
TOTAL INCL ADD LIMITED ENERGY STUDY											
	45		1,349		6	4,308		215		5,879	

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

Tue 14 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482

TIME 15:00:07

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482

TIME 15:00:07

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL								
	1.00 EA	5,879	588	0	485	174	0	7,125	7125.11
	BID ITEM TOTAL	1.00 EA	5,879	588	0	485	174	0	7,125
	TOTAL BASE BID		5879	588	0	485	174	0	7,125
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		5,879	588	0	485	174	0	7,125

Tue 14 Sep 1993

PROJECT CWE SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482

TIME 15:00:07

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	7,125		7,125	7125.10
	TOTAL CURRENT CONTRACT COST		7,125	0	7,125	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		7,125	0	7,125	
	Government-Furnished Property		0		0	
	SUBTOTAL		7,125	0	7,125	
	Contingencies	10.0%	713	0	713	
	SUBTOTAL		7,838	0	7,838	
	SIOH (S&A)	5.0%	392	0	392	
	CURRENT WORKING ESTIMATE		8,229	0	8,229	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-130

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482

TIME 15:00:07

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON **													
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL	
AA	GENERAL/PRIME		1.00	EA	45	1,349		6	4,523	5,879	100.0%	0	5,879
TOTAL DIRECT													
					45	1,349		6	4,523	5,879	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-131

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482

TIME 15:00:07

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****				AMOUNT	PCT	UNIT COST			
				AMOUNT	PCT	HOF% 0.0	AMOUNT				PCT	BOND% 2.5%	OTHR% 0.0%
AA	GENERAL/PRIME		5,879	588	10.0%	0.0	485	7.5%	2.5%	0.0%	7,125	100.0%	7125.11
TOTAL OVERHEAD & PROFIT				588	10.0%		485	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-132

Tue 14 Sep 1993

CSI DIVISION SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482

TIME 15:00:07

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
16 ELECTRICAL	45	1,349	6	4,308	215	5,879	
TOTAL DIRECT	45	1,349	6	4,308	215	5,879	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-133

Tue 14 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482

TIME 15:00:07

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
11 INTERIOR ELECTRICAL	45	1,349	6	4,308	215	5,879	
TOTAL DIRECT	45	1,349	6	4,308	215	5,879	

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS N-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482

TIME 15:00:07

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ***										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	4	6
TOTAL PROJECT EQUIPMENT HOURS										4	6

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 482

TIME 15:00:07

ABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	-- UPB	**** TOTAL ****	
						RATE	RATE	HOURS	COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	45	1,349
TOTAL PROJECT MANHOURS								45	1,349

* * * END OF SUMMARY REPORT * * *

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING
30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: **483**
BUILDING FUNCTION: MOTOR POOL/VEHICLE MAINTENANCE

<u>BUILDING USE:</u>	<u>8</u>
<u>HOURS/DAY</u>	<u>5</u>
<u>DAYS/WEEK</u>	

<u>ELECTRIC COSTS:</u>	
<u>ENERGY CHARGE</u>	<u>\$0.02506</u>
<u>DEMAND CHARGE</u>	<u>\$7.067</u>
<u>PER KWH</u>	
<u>PER KW</u>	

EXISTING FIXTURE DATA

4 FOOT	48 WATTS/FIXT =	0 WATTS
<u>0 1 LAMP @</u>	<u>48 WATTS/FIXT =</u>	<u>0 WATTS</u>
0 2 LAMP @	96 WATTS/FIXT =	0 WATTS
<u>0 4 LAMP @</u>	<u>192 WATTS/FIXT =</u>	<u>0 WATTS</u>

8 FOOT	158 WATTS/FIXT =	18,960 WATTS
<u>120 2 LAMP @</u>	<u>158 WATTS/FIXT =</u>	<u>18,960 WATTS</u>

INCANDESCENT	0 WATTS/FIXT =	0 WATTS
<u>0 1 LAMP @</u>	<u>0 WATTS/FIXT =</u>	<u>0 WATTS</u>
<u>0 1 LAMP @</u>	<u>0 WATTS/FIXT =</u>	<u>0 WATTS</u>

MERCURY VAPOR	454 WATTS/FIXT =	0 WATTS
<u>0 1 LAMP @</u>	<u>454 WATTS/FIXT =</u>	<u>0 WATTS</u>

<u>AVERAGE WATTS/SQ FT</u>	<u>1.76</u>
<u>AVERAGE FOOTCANDLES</u>	<u>25.00</u>

TOTAL EXISTING KW	19.0
TOTAL EXISTING KWH	39,437

REPLACEMENT FIXTURE DATA

4 FOOT	37 WATTS/FIXT =	0 WATTS
<u>0 1 LAMP @</u>	<u>37 WATTS/FIXT =</u>	<u>0 WATTS</u>
0 1 LAMP W/	37 WATTS/FIXT =	0 WATTS
REFLECTORS		
<u>6 2 LAMP W/</u>	<u>58 WATTS/FIXT =</u>	<u>348 WATTS</u>

METAL HALIDE		
<u>0 FIXTURES @</u>	<u>185 WATTS/FIXT =</u>	<u>0 WATTS</u>
<u>0 FIXTURES @</u>	<u>215 WATTS/FIXT =</u>	<u>0 WATTS</u>

HIGH PRESSURE SODIUM		
<u>0 FIXTURES @</u>	<u>115 WATTS/FIXT =</u>	<u>0 WATTS</u>
<u>42 FIXTURES @</u>	<u>240 WATTS/FIXT =</u>	<u>10,080 WATTS</u>
<u>0 FIXTURES @</u>	<u>465 WATTS/FIXT =</u>	<u>0 WATTS</u>

<u>AVERAGE WATTS/SQ FT</u>	<u>0.93</u>
<u>AVERAGE FOOTCANDLES</u>	<u>30.00</u>

TOTAL REPLACEMENT KW	10.4
TOTAL REPLACEMENT KWH	21,690

NET ENERGY SAVINGS **60,551 MBTU/YR** **NET DOLLAR SAVINGS** **\$1,168.24**

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:10:53

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 483

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
<hr/>									
16500 LIGHTING									
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS									
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	*** UNIT COSTS: *** 6.00 EA	EELEF	0.93 6	28.11 169	0.13 1	53.00 318	2.65 16	83.88 503	
16512 9000 HIGH INTENSITY DISCHARGE									
CD=3 EL 9003 200 W HPS FIXTURE AND LAMP WC=1100	*** UNIT COSTS: *** 42.00 EA	EELEF	0.93 39	28.11 1,180	0.13 5	95.00 3,990	4.75 200	127.98 5,375	
<hr/>									
TOTAL DIVISION 16 ELECTRICAL			45	1,349	6	4,308	215	5,879	
<hr/>									
TOTAL FACILITY AA. ELECTRICAL			45	1,349	6	4,308	215	5,879	
<hr/>									
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE			45	1,349	6	4,308	215	5,879	
<hr/>									
TOTAL BASE BID			45	1,349	6	4,308	215	5,879	
<hr/>									
TOTAL ADDITIVE			0	0	0	0	0	0	0
<hr/>									
TOTAL INCL ADD LIMITED ENERGY STUDY			45	1,349	6	4,308	215	5,879	

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

Tue 14 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-141

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	5,879	588	0	485	174	0	7,125 7125.11
	BID ITEM TOTAL	1.00 EA	5,879	588	0	485	174	0	7,125 7125.11
	TOTAL BASE BID		5,879	588	0	485	174	0	7,125
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		5,879	588	0	485	174	0	7,125

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

Tue 14 Sep 1993

PROJECT CWE SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

SUMMARY PAGE 3

ID BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1. BUILDING TO THE 5 FOOT LINE	1.00 EA	7,125		7,125	7125.10
TOTAL CURRENT CONTRACT COST		7,125	0	7,125	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
ESCALATED CONTRACT COST		7,125	0	7,125	
Government-Furnished Property		0		0	
SUBTOTAL		7,125	0	7,125	
Contingencies	10.0%	713	0	713	
SUBTOTAL		7,838	0	7,838	
SIOH (S&A)	5.0%	392	0	392	
CURRENT WORKING ESTIMATE		8,229	0	8,229	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON *													
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL	
AA	GENERAL/PRIME		1.00	EA	45	1,349		6	4,523	5,879	100.0%	0	5,879
TOTAL DIRECT													
					45	1,349		6	4,523	5,879	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-144

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****				AMOUNT	PCT	UNIT COST			
				AMOUNT	PCT	HOPC%	AMOUNT				PCT	BOND%	OTHR%
AA	GENERAL/PRIME		5,879	588	10.0%	0.0	485	7.5%	2.5%	0.0%	7,125	100.0%	7125.11
TOTAL OVERHEAD & PROFIT				588	10.0%		485	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-145

Tue 14 Sep 1993

CSI DIVISION SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
16 ELECTRICAL	45	1,349		6	4,308	215	5,879
TOTAL DIRECT	45	1,349		6	4,308	215	5,879

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-146

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	45	1,349	6	4,308	215	5,879
TOTAL DIRECT	45	1,349	6	4,308	215	5,879

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-147

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP EXPENSE	RATE	RATE	HOURS	COST
EMI20 SMALL TOOLS							1.40	1.40	4	-----	6
TOTAL PROJECT EQUIPMENT HOURS									4	-----	6

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-148

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 483

TIME 15:10:53

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	-- UPB	**** TOTAL ****	COST
							RATE	RATE	HOURS	
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	45	1,349
								45	1,349	
TOTAL PROJECT MANHOURS										

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-149

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: 484
 BUILDING FUNCTION: MOTOR POOL/VEHICLE MAINTENANCE

BUILDING USE:
 HOURS/DAY _____
 DAYS/WEEK _____

ELECTRIC COSTS:
 ENERGY CHARGE _____ PER KWH
 DEMAND CHARGE _____ \$7.067 PER KW

EXISTING FIXTURE DATA

4 FOOT 0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS

0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS

0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS

8 FOOT 96 2 LAMP @ 158 WATTS/FIXT = 15,168 WATTS

INCANDESCENT 0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS

0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS

MERCURY VAPOR 0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
 AVERAGE FOOTCANDLES _____

TOTAL EXISTING KW _____
 TOTAL EXISTING KWH _____

REPLACEMENT FIXTURE DATA

4 FOOT 0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS

0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS

6 2 LAMP W/ 58 WATTS/FIXT = 348 WATTS

METAL HALIDE 0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS

0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS

HIGH PRESSURE SODIUM 0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS

42 FIXTURES @ 240 WATTS/FIXT = 10,080 WATTS

0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
 AVERAGE FOOTCANDLES _____

TOTAL REPLACEMENT KW _____
 TOTAL REPLACEMENT KWH _____

0.93
 30.00
 10.4
 21,690
 33,640 MBTU/YR
 NET ENERGY SAVINGS
 NET DOLLAR SAVINGS \$649.02

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:18:09

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 484

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484

TIME 15:18:09

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:18:09

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16500 LIGHTING									
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS									
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	*** UNIT COSTS: *** 6.00 EA	EELEF	0.93 6	28.11 169	0.13 1	53.00 318	2.65 16	83.88 503	
16512 9000 HIGH INTENSITY DISCHARGE									
CD=3 EL 9003 200 W HPS FIXTURE AND LAMP WC=1100	*** UNIT COSTS: *** 42.00 EA	EELEF	0.93 39	28.11 1,180	0.13 5	95.00 3,990	4.75 200	127.98 5,375	
TOTAL DIVISION 16 ELECTRICAL	45		1,349		6	4,308	215	5,879	
TOTAL FACILITY AA. ELECTRICAL	45		1,349		6	4,308	215	5,879	
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE	45		1,349		6	4,308	215	5,879	
TOTAL BASE BID	45		1,349		6	4,308	215	5,879	
TOTAL ADDITIVE	0		0		0	0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY	45		1,349		6	4,308	215	5,879	

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

Tue 14 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484

TIME 15:18:09

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-154

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484

TIME 15:18:09

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL		10.0%	0.0%	7.5%	2.5%	0.0%		
		1.00 EA	5,879	588	485	174	0	7,125	7125.11
BID ITEM TOTAL		1.00 EA	5,879	588	485	174	0	7,125	7125.11
TOTAL BASE BID			5,879	588	485	174	0	7,125	
TOTAL ADDITIVE			0	0	0	0	0	0	0
TOTAL INCL ADD			5,879	588	485	174	0	7,125	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484

TIME 15:18:09

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	7,125		7,125	7125.10
	TOTAL CURRENT CONTRACT COST		7,125	0	7,125	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		7,125	0	7,125	
	Government-Furnished Property		0		0	
	SUBTOTAL		7,125	0	7,125	
	Contingencies	10.0%	713	0	713	
	SUBTOTAL		7,838	0	7,838	
	SIOH (S&A)	5.0%	392	0	392	
	CURRENT WORKING ESTIMATE		8,229	0	8,229	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

Tue 14 Sep 1993

CONTRACTOR DIRECT SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484

TIME 15:18:09

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	** TOTAL DIRECT * * SUBCON *			W/OH&P	SUBTOTAL			
						LABOR	EQUIPMENT	MAT W/TX			AMOUNT	PCT	
AA	GENERAL/PRIME		1.00	EA	45	1,349	6	4,523	5,879	100.0%	0	5,879	
TOTAL DIRECT						45	1,349	6	4,523	5,879	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-157

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484

TIME 15:18:09

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***			**** PROFIT ****			***** TOTAL CONTRACT *****			
				AMOUNT	PCT	HOFC%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		5,879	588	10.0%	0.0	485	7.5%	2.5%	0.0%	7,125	100.0%	7125.11
TOTAL OVERHEAD & PROFIT				588	10.0%		485	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-158

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484

TIME 15:18:09

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	45	1,349	6	4,308	215	5,879
TOTAL DIRECT	45	1,349	6	4,308	215	5,879

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-159

Tue 14 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484

TIME 15:18:09

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	45	1,349	6	4,308	215	5,879
TOTAL DIRECT	45	1,349	6	4,308	215	5,879

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-160

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484

TIME 15:18:09

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	4	6
TOTAL PROJECT EQUIPMENT HOURS										4	6

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-161

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 484

TIME 15:18:09

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY --	UPB	**** TOTAL ****	COST
						RATE	RATE	HOURS	
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	45	1,349
TOTAL PROJECT MANHOURS								45	1,349

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-162

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: 485
 BUILDING FUNCTION: MOTOR POOL/VEHICLE MAINTENANCE

BUILDING USE:
HOURS/DAY
5
DAYS/WEEK

ELECTRIC COSTS:
ENERGY CHARGE
\$0.02506
DEMAND CHARGE
\$7.067
KW

EXISTING FIXTURE DATA

4 FOOT
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS

8 FOOT
114 2 LAMP @ 158 WATTS/FIXT = 18,012 WATTS

INCANDESCENT
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS

MERCURY VAPOR
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
 AVERAGE FOOTCANDLES

1.67
20.00

TOTAL EXISTING KW
 TOTAL EXISTING KWH

18.0
37,465

REPLACEMENT FIXTURE DATA

4 FOOT
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS
0 1 LAMP W/
 REFLECTORS 37 WATTS/FIXT = 0 WATTS
6 2 LAMP W/ 58 WATTS/FIXT = 348 WATTS

METAL HALIDE
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS
 HIGH PRESSURE SODIUM
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS
42 FIXTURES @ 240 WATTS/FIXT = 10,080 WATTS
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
 AVERAGE FOOTCANDLES

0.93
30.00

TOTAL REPLACEMENT KW
 TOTAL REPLACEMENT KWH

10.4
21,690

NET ENERGY SAVINGS
 53,823 MBTU/YR

\$1,038.44

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:25:24

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 485

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-164

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485

TIME 15:25:24

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:25:24

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALES	TAX	DIRECT	\$
16500 LIGHTING											
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS											
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	*** UNIT COSTS: *** 6.00 EA EELEF	0.93 6	28.11 169	0.13 1	53.00 318	2.65 16	83.88 503				
16512 9000 HIGH INTENSITY DISCHARGE											
CD=3 EL 9003 200 W HPS FIXTURE AND LAMP WC=1100	*** UNIT COSTS: *** 42.00 EA EELEF	0.93 39	28.11 1,180	0.13 5	95.00 3,990	4.75 200	127.98 5,375				
TOTAL DIVISION 16 ELECTRICAL			45	1,349		6	4,308	215		5,879	
TOTAL FACILITY AA. ELECTRICAL			45	1,349		6	4,308	215		5,879	
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE			45	1,349		6	4,308	215		5,879	
TOTAL BASE BID			45	1,349		6	4,308	215		5,879	
TOTAL ADDITIVE			0	0		0	0	0		0	
TOTAL INCL ADD LIMITED ENERGY STUDY			45	1,349		6	4,308	215		5,879	

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

Tue 14 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485

TIME 15:25:24

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485

TIME 15:25:24

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA ELECTRICAL	1.00 EA	5,879	588	0	485	174	0	7,125	7125.11
BID ITEM TOTAL	1.00 EA	5,879	588	0	485	174	0	7,125	7125.11
TOTAL BASE BID		5,879	588	0	485	174	0	7,125	
TOTAL ADDITIVE		0	0	0	0	0	0	0	0
TOTAL INCL ADD		5,879	588	0	485	174	0	7,125	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

Tue 14 Sep 1993

PROJECT CWE SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485

TIME 15:25:24

SUMMARY PAGE 3

ID BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1. BUILDING TO THE 5 FOOT LINE	1.00 EA	7,125		7,125	7125.10
TOTAL CURRENT CONTRACT COST		7,125	0	7,125	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
ESCALATED CONTRACT COST		7,125	0	7,125	
Government-Furnished Property		0		0	
SUBTOTAL		7,125	0	7,125	
Contingencies	10.0%	713	0	713	
SUBTOTAL		7,838	0	7,838	
SIOH (S&A)	5.0%	392	0	392	
CURRENT WORKING ESTIMATE		8,229	0	8,229	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-169

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485

TIME 15:25:24

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	** TOTAL DIRECT * * SUBCON *			W/OH&P	SUBTOTAL		
						LABOR	EQUIPMENT	MAT W/TX				
AA	GENERAL/PRIME		1.00	EA	45	1,349	6	4,523	5,879 100.0%	0	5,879	
TOTAL DIRECT						45	1,349	6	4,523	5,879 100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-170

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485

TIME 15:25:24

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***			**** PROFIT ****			***** TOTAL CONTRACT *****			
				AMOUNT	PCT	HOFCS%	AMOUNT	PCT	BOND% OTHR%	AMOUNT	PCT	UNIT COST	
AA	GENERAL/PRIME		5,879	588	10.0%	0.0	485	7.5%	2.5%	0.0%	7,125	100.0%	7125.11
TOTAL OVERHEAD & PROFIT				588	10.0%		485	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-171

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485

TIME 15:25:24

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	45	1,349	6	4,308	215	5,879
TOTAL DIRECT	45	1,349	6	4,308	215	5,879

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-172

Tue 14 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485

TIME 15:25:24

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
11 INTERIOR ELECTRICAL	45	1,349	6	4,308	215	5,879	
TOTAL DIRECT	45	1,349	6	4,308	215	5,879	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-173

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485

TIME 15:25:24

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	4	6
TOTAL PROJECT EQUIPMENT HOURS										4	6

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-174

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 485

TIME 15:25:24

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY --	UPB	****	TOTAL	****
							RATE	RATE	HOURS		COST
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	45	1,349	
TOTAL PROJECT MANHOURS											45 1,349

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-175

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: **486**
 BUILDING FUNCTION: **MOTOR POOL/VEHICLE MAINTENANCE**

BUILDING USE:
 HOURS/DAY 8
 DAYS/WEEK 5

ELECTRIC COSTS:
 ENERGY CHARGE \$0.02506 PER KWH
 DEMAND CHARGE \$7.067 PER KW

EXISTING FIXTURE DATA

4 FOOT
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS

8 FOOT
93 2 LAMP @ 158 WATTS/FIXT = 14,694 WATTS

INCANDESCENT
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS

MERCURY VAPOR
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
 AVERAGE FOOTCANDLES

0.93
30.00

TOTAL EXISTING KW
 TOTAL EXISTING KWH

10.4
21,690

REPLACEMENT FIXTURE DATA

4 FOOT
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS
0 1 LAMP W/
REFLECTORS 37 WATTS/FIXT = 0 WATTS
6 2 LAMP W/ 58 WATTS/FIXT = 348 WATTS

METAL HALIDE
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS
HIGH PRESSURE SODIUM
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS
42 FIXTURES @ 240 WATTS/FIXT = 10,080 WATTS
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
 AVERAGE FOOTCANDLES

0.93
30.00

TOTAL REPLACEMENT KW
 TOTAL REPLACEMENT KWH

10.4
21,690

NET ENERGY SAVINGS

30,276 MBTU/YR

NET DOLLAR SAVINGS

\$584.12

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING
30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: 486 CONNECTOR
BUILDING FUNCTION: MOTORPOOL/VEHICLE MAINTENANCE

BUILDING USE:
 HOURS/DAY
 5
 DAYS/WEEK
 5

ELECTRIC COSTS:
ENERGY CHARGE
\$0.02506
DEMAND CHARGE
\$7.067
PER KW

EXISTING FIXTURE DATA

4 FOOT
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS
12 2 LAMP @ 96 WATTS/FIXT = 1,152 WATTS
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS

8 FOOT
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS

INCANDESCENT
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS

MERCURY VAPOR
6 1 LAMP @ 454 WATTS/FIXT = 2,724 WATTS

AVERAGE WATTS/SQ FT
AVERAGE FOOTCANDLES
 25.00

AVERAGE WATTS/SQ FT
AVERAGE FOOTCANDLES
 0.59
 30.00

TOTAL EXISTING KW
TOTAL EXISTING KWH
 3.9
 8,062

TOTAL REPLACEMENT KW
TOTAL REPLACEMENT KWH
 2.0
 4,227

REPLACEMENT FIXTURE DATA

4 FOOT
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS
0 1 LAMP W/ REFLECTOR
4 2 LAMP W/ 58 WATTS/FIXT = 232 WATTS

METAL HALIDE
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS
HIGH PRESSURE SODIUM
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS
6 FIXTURES @ 300 WATTS/FIXT = 1,800 WATTS
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

NET ENERGY SAVINGS 13,087 MBTU/YR
NET DOLLAR SAVINGS \$252.49

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:40:45

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 486

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-178

Tue 14 Sep 1993

U.S. ARMY CORPS OF ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486

TIME 15:40:45

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:40:45

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALES	STY	DIRECT \$
16500 LIGHTING										
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS										
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	*** UNIT COSTS: *** 6.00 EA EEELEF	0.93 6	28.11 169	0.13 1	53.00 318	2.65 16	83.88 503			
16512 9000 HIGH INTENSITY DISCHARGE										
CD=3 EL 9003 200 W HPS FIXTURE AND LAMP WC=1100	*** UNIT COSTS: *** 42.00 EA EEELEF	0.93 39	28.11 1,180	0.13 5	95.00 3,990	4.75 200	127.98 5,375			
TOTAL DIVISION 16 ELECTRICAL			45	1,349	6	4,308	215	5,879		
TOTAL FACILITY AA. ELECTRICAL			45	1,349	6	4,308	215	5,879		
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE			45	1,349	6	4,308	215	5,879		
TOTAL BASE BID			45	1,349	6	4,308	215	5,879		
TOTAL ADDITIVE			0	0	0	0	0	0		
TOTAL INCL ADD LIMITED ENERGY STUDY			45	1,349	6	4,308	215	5,879		

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-180

Tue 14 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486

TIME 15:40:45

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-181

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486

TIME 15:40:45

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL								
	1.00 EA	5,879	588	0	485	174	0	7,125	7125.11
	BID ITEM TOTAL	1.00 EA	5,879	588	0	485	174	0	7,125
	TOTAL BASE BID		5,879	588	0	485	174	0	7,125
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		5,879	588	0	485	174	0	7,125

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-182

Tue 14 Sep 1993

PROJECT CWE SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486

TIME 15:40:45

SUMMARY PAGE 3

ID BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1. BUILDING TO THE 5 FOOT LINE	1.00 EA	7,125		7,125	7125.10
TOTAL CURRENT CONTRACT COST		7,125	0	7,125	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
ESCALATED CONTRACT COST		7,125	0	7,125	
Government-Furnished Property		0		0	
SUBTOTAL		7,125	0	7,125	
Contingencies	10.0%	713	0	713	
SUBTOTAL		7,838	0	7,838	
SIOH (S&A)	5.0%	392	0	392	
CURRENT WORKING ESTIMATE		8,229	0	8,229	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-183

Tue 14 Sep 1993

CONTRACTOR DIRECT SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486

TIME 15:40:45

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON **													
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL	
AA	GENERAL/PRIME		1.00	EA	45	1,349		6	4,523	5,879	100.0%	0	5,879
TOTAL DIRECT													
					45	1,349		6	4,523	5,879	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-184

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486

TIME 15:40:45

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	*** OVERHEAD ***				**** PROFIT ****				***** TOTAL CONTRACT *****			
			SUBTOTAL	AMOUNT	PCT	HOF&%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT COST	
AA	GENERAL/PRIME		5,879	588	10.0%	0.0		485	7.5%	2.5%	0.0%	7,125	100.0%	7125.11
TOTAL OVERHEAD & PROFIT				588	10.0%			485	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-185

Tue 14 Sep 1993

CSI DIVISION SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486

TIME 15:40:45

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
16 ELECTRICAL	45	1,349	6	4,308	215	5,879	
TOTAL DIRECT	45	1,349	6	4,308	215	5,879	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-186

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486

TIME 15:40:45

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
11 INTERIOR ELECTRICAL	45	1,349	6	4,308	215	5,879	
TOTAL DIRECT	45	1,349	6	4,308	215	5,879	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-187

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486

TIME 15:40:45

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	4	6
TOTAL PROJECT EQUIPMENT HOURS										4	6

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486

TIME 15:40:45

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TYS/INS	FRNG	TRVL	HRLY	--	UPB	****	TOTAL	****
							RATE	RATE	HOURS	COST		
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	45		1,349	
								45		1,349		
TOTAL PROJECT MANHOURS												

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-189

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:32:43

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-190

Tue 14 Sep 1993

U.S. ARMY CORPS OF ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:32:43

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALES	TAX	DIRECT \$
<hr/>										
16500 LIGHTING										
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS										
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	***	UNIT COSTS: ***	0.93 4.00 EA EELEF	4	28.11 112	0.13 1	53.00 212	2.65 11	83.88 336	
16512 9000 HIGH INTENSITY DISCHARGE										
CD=3 EL 9003 200 W HPS FIXTURE AND LAMP WC=1100	***	UNIT COSTS: ***	0.93 6.00 EA EELEF	6	28.11 169	0.13 1	95.00 570	4.75 29	127.98 768	
<hr/>										
TOTAL DIVISION 16 ELECTRICAL				9	281	1	782	39	1,103	
<hr/>										
TOTAL FACILITY AA. ELECTRICAL				9	281	1	782	39	1,103	
<hr/>										
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE				9	281	1	782	39	1,103	
<hr/>										
TOTAL BASE BID				9	281	1	782	39	1,103	
<hr/>										
TOTAL ADDITIVE				0	0	0	0	0	0	0
<hr/>										
TOTAL INCL ADD LIMITED ENERGY STUDY				9	281	1	782	39	1,103	

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-192

Tue 14 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-193

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	1,103	10.0%	0.0%	7.5%	2.5%	0.0%	1,337 1337.41
				110	0	91	33	0	
	BID ITEM TOTAL	1.00 EA	1,103	110	0	91	33	0	1,337 1337.41
	TOTAL BASE BID		1,103	110	0	91	33	0	1,337
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		1,103	110	0	91	33	0	1,337

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-194

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	1,337		1,337	1337.40
	TOTAL CURRENT CONTRACT COST		1,337	0	1,337	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		1,337	0	1,337	
	Government-Furnished Property		0		0	
	SUBTOTAL		1,337	0	1,337	
	Contingencies	10.0%	134	0	134	
	SUBTOTAL		1,471	0	1,471	
	SIOH (S&A)	5.0%	74	0	74	
	CURRENT WORKING ESTIMATE		1,545	0	1,545	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-195

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON **													
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL	
AA	GENERAL/PRIME		1.00	EA	9	281		1	821	1,103	100.0%	0	1,103
TOTAL DIRECT													
					9	281		1	821	1,103	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-196

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***			**** PROFIT ****			***** TOTAL CONTRACT *****			
				AMOUNT	PCT	HOFCS	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		1,103	110	10.0%	0.0	91	7.5%	2.5%	0.0%	1,337	100.0%	1337.40
TOTAL OVERHEAD & PROFIT				110	10.0%		91	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-197

Tue 14 Sep 1993

CSI DIVISION SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	9	281	1	782	39	1,103
TOTAL DIRECT	9	281	1	782	39	1,103

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-198

Tue 14 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	9	281	1	782	39	1,103
TOTAL DIRECT	9	281	1	782	39	1,103

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-199

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE ***		ADJ FACTOR	ADJUSTD	BOOK OP --	HRLY ---	UPB	**** TOTAL ****			
	LIFE HRS	TL HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS	COST
EMI20 SMALL TOOLS							1.40	1.40	1	1	
TOTAL PROJECT EQUIPMENT HOURS									1	1	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-200

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLV --	UPB	**** TOTAL ****	COST
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	9	281
TOTAL PROJECT MANHOURS										9 281

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-201

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: 487 AREA 3
 BUILDING FUNCTION: MOTORPOOL/VEHICLE MAINTENANCE

BUILDING USE:
HOURS/DAY
DAYS/WEEK 8
 5

ELECTRIC COSTS:
ENERGY CHARGE
DEMAND CHARGE \$0.02506 PER KWH
 \$7.067 PER KW

EXISTING FIXTURE DATA

4 FOOT
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS

8 FOOT
32 2 LAMP @ 158 WATTS/FIXT = 5,056 WATTS

INCANDESCENT
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS

MERCURY VAPOR
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
 AVERAGE FOOTCANDLES

TOTAL EXISTING KW
 TOTAL EXISTING KWH

NET ENERGY SAVINGS

REPLACEMENT FIXTURE DATA

4 FOOT
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS
2 2 LAMP W/ 58 WATTS/FIXT = 116 WATTS

METAL HALIDE
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS
HIGH PRESSURE SODIUM
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS

14 FIXTURES @ 240 WATTS/FIXT = 3,360 WATTS
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT
 AVERAGE FOOTCANDLES

TOTAL REPLACEMENT KW
 TOTAL REPLACEMENT KWH

NET DOLLAR SAVINGS

\$216.34

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:48:02

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Tue 14 Sep 1993

U.S. ARMY CORPS OF ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:48:02

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16500 LIGHTING									
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS									
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	*** UNIT COSTS: *** 2.00 EA	EELEF	0.93 2	28.11 56	0.13 0	53.00 106	2.65 5	83.88 168	
16512 9000 HIGH INTENSITY DISCHARGE									
CD=3 EL 9003 200 W HPS FIXTURE AND LAMP WC=1100	*** UNIT COSTS: *** 14.00 EA	EELEF	0.93 13	28.11 393	0.13 2	95.00 1,330	4.75 67	127.98 1,792	
<hr/>									
TOTAL DIVISION 16 ELECTRICAL			15	450	2	1,436	72	1,960	
<hr/>									
TOTAL FACILITY AA. ELECTRICAL			15	450	2	1,436	72	1,960	
<hr/>									
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE			15	450	2	1,436	72	1,960	
<hr/>									
TOTAL BASE BID			15	450	2	1,436	72	1,960	
<hr/>									
TOTAL ADDITIVE			0	0	0	0	0	0	0
<hr/>									
TOTAL INCL ADD LIMITED ENERGY STUDY			15	450	2	1,436	72	1,960	

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

Tue 14 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS OF ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST	
AA	ELECTRICAL	1.00 EA	1,960	10.0% 196	0.0% 0	7.5% 162	2.5% 58	0.0% 0	2,375	2375.04
	BID ITEM TOTAL	1.00 EA	1,960	196	0	162	58	0	2,375	2375.04
	TOTAL BASE BID		1,960	196	0	162	58	0	2,375	
	TOTAL ADDITIVE		0	0	0	0	0	0	0	
	TOTAL INCL ADD		1,960	196	0	162	58	0	2,375	

Tue 14 Sep 1993

PROJECT CWE SUMMARY

U.S. ARMY CORPS OF ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00	EA	2,375		2,375	2375.00
	TOTAL CURRENT CONTRACT COST			2,375	0	2,375	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			2,375	0	2,375	
	Government-Furnished Property			0		0	
	SUBTOTAL			2,375	0	2,375	
	Contingencies	10.0%		238	0	238	
	SUBTOTAL			2,613	0	2,613	
	SIOH (S&A)	5.0%		131	0	131	
	CURRENT WORKING ESTIMATE			2,743	0	2,743	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

Tue 14 Sep 1993

CONTRACTOR DIRECT SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	** TOTAL DIRECT * * SUBCON **			
									AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	15	450	2	1,508	1,960	100.0%	0	1,960
TOTAL DIRECT												

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-209

Tue 14 Sep 1993

CONTRACTOR INDIRECT SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

SUMMARY PAGE 5

ID	CONTRACTOR	PM	*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****				AMOUNT	PCT	UNIT COST				
			SUBTOTAL	AMOUNT	PCT	HOF% 0.0				AMOUNT	PCT	BOND% 2.5%	OTHR% 0.0%
AA	GENERAL/PRIME		1,960	196	10.0%	0.0	162	7.5%	2.5%	0.0%	2,375	100.0%	2375.04
TOTAL OVERHEAD & PROFIT				196	10.0%		162	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-210

Tue 14 Sep 1993

CSI DIVISION SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	15	450	2	1,436	72	1,960
TOTAL DIRECT	15	450	2	1,436	72	1,960

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-211

Tue 14 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	15	450	2	1,436	72	1,960
TOTAL DIRECT	15	450	2	1,436	72	1,960

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-212

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	1	2
TOTAL PROJECT EQUIPMENT HOURS										1	2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-213

Tue 14 Sep 1993

LABOR SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	--	UPB	****	TOTAL	****	
							RATE	RATE	HOURS	COST			
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	15		450		
TOTAL PROJECT MANHOURS												15	450

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-214

FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

FACILITY LIGHTING REPLACEMENT

BUILDING #: 5232
 BUILDING FUNCTION: MAINTENANCE SHOP/STORAGE

BUILDING USE:
 HOURS/DAY
 DAYS/WEEK

 8

 5

ELECTRIC COSTS:	
ENERGY CHARGE	\$0.02506 PER KWH
DEMAND CHARGE	\$7.067 PER KW

EXISTING FIXTURE DATA

4 FOOT 0 1 LAMP @	48 WATTS/FIXT =	0 WATTS
18 2 LAMP @	96 WATTS/FIXT =	1,728 WATTS
3 4 LAMP @	192 WATTS/FIXT =	576 WATTS

8 FOOT 0 2 LAMP @	158 WATTS/FIXT =	0 WATTS
----------------------	------------------	---------

INCANDESCENT 0 1 LAMP @	0 WATTS/FIXT =	0 WATTS
0 1 LAMP @	0 WATTS/FIXT =	0 WATTS

MERCURY VAPOR 0 1 LAMP @	454 WATTS/FIXT =	0 WATTS
-----------------------------	------------------	---------

AVERAGE WATTS/SQ FT
 AVERAGE FOOTCANDLES

TOTAL EXISTING KW
 TOTAL EXISTING KWH

NET ENERGY SAVINGS

REPLACEMENT FIXTURE DATA

4 FOOT 0 1 LAMP @	37 WATTS/FIXT =	0 WATTS
REFLECTORS 2 2 LAMP W/	37 WATTS/FIXT =	0 WATTS
	58 WATTS/FIXT =	116 WATTS

METAL HALIDE 0 FIXTURES @	185 WATTS/FIXT =	0 WATTS
HIGH PRESSURE SODIUM 0 FIXTURES @	215 WATTS/FIXT =	0 WATTS
	115 WATTS/FIXT =	0 WATTS

8 FIXTURES @	188 WATTS/FIXT =	1,504 WATTS
0 FIXTURES @	465 WATTS/FIXT =	0 WATTS

AVERAGE WATTS/SQ FT
 AVERAGE FOOTCANDLES

TOTAL REPLACEMENT KW
 TOTAL REPLACEMENT KWH

NET DOLLAR SAVINGS

\$93.66

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 13:01:09

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-2: BUILDING 5232

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-216

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232

TIME 13:01:09

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Thu 16 Sep 1993

U.S. ARMY CORPS OF ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 13:01:09

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALES	STX	DIRECT	\$
<hr/>											
16500 LIGHTING											
16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS											
CD=3 EL 8004 4 FOOT 2 LAMP WC=1100	***	UNIT COSTS: *** 2.00 EA	EELEF	0.93 2	28.11 56	0.13 0	53.00 106	2.65 5	83.88 168		
16512 9000 HIGH INTENSITY DISCHARGE											
CD=3 EL 9005 150 W HPS FIXTURE AND LAMP WC=1100	***	UNIT COSTS: *** 8.00 EA	EELEF	0.93 7	28.11 225	0.13 1	89.00 712	4.45 36	121.68 973		
<hr/>											
TOTAL DIVISION 16 ELECTRICAL	9				281	1	818	41	1,141		
<hr/>											
TOTAL FACILITY AA. ELECTRICAL	9				281	1	818	41	1,141		
<hr/>											
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE	9				281	1	818	41	1,141		
<hr/>											
TOTAL BASE BID	9				281	1	818	41	1,141		
<hr/>											
TOTAL ADDITIVE	0				0	0	0	0	0	0	0
<hr/>											
TOTAL INCL ADD LIMITED ENERGY STUDY	9				281	1	818	41	1,141		

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-218

Thu 16 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232

TIME 13:01:09

SUMMARY PAGE 1

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-219

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232

TIME 13:01:09

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA ELECTRICAL			10.0%	0.0%	7.5%	2.5%	0.0%		
	1.00 EA	1,141	114	0	94	34	0	1,383	1383.22
BID ITEM TOTAL		1.00 EA	1,141	114	0	94	34	0	1,383
TOTAL BASE BID			1,141	114	0	94	34	0	1,383
TOTAL ADDITIVE			0	0	0	0	0	0	0
TOTAL INCL ADD			1,141	114	0	94	34	0	1,383

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-220

Thu 16 Sep 1993

PROJECT CWE SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232

TIME 13:01:09

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	1,383		1,383	1383.20
	TOTAL CURRENT CONTRACT COST		1,383	0	1,383	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		1,383	0	1,383	
	Government-Furnished Property		0		0	
	SUBTOTAL		1,383	0	1,383	
	Contingencies	10.0%	138	0	138	
	SUBTOTAL		1,522	0	1,522	
	SIOH (S&A)	5.0%	76	0	76	
	CURRENT WORKING ESTIMATE		1,598	0	1,598	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-221

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232

TIME 13:01:09

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	** TOTAL DIRECT * * SUBCON *		SUBTOTAL	
									AMOUNT	PCT		
AA	GENERAL/PRIME		1.00	EA	9	281	1	859	1,141	100.0%	0	1,141
TOTAL DIRECT												
					9	281	1	859	1,141	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-222

Thu 16 Sep 1993

CONTRACTOR INDIRECT SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232

TIME 13:01:09

SUMMARY PAGE 5

*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****												
ID	CONTRACTOR	PM	SUBTOTAL	AMOUNT	PCT	HOPC%	AMOUNT	PCT	BOND% OTHR%	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		1,141	114	10.0%	0.0	94	7.5%	2.5% 0.0%	1,383	100.0%	1383.22
TOTAL OVERHEAD & PROFIT												
114 10.0% 94 7.5%												

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-223

Thu 16 Sep 1993

CSI DIVISION SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232

TIME 13:01:09

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	9	281	1	818	41	1,141
TOTAL DIRECT	9	281	1	818	41	1,141

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-224

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232

TIME 13:01:09

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
11 INTERIOR ELECTRICAL	9	281	1	818	41	1,141	
TOTAL DIRECT	9	281	1	818	41	1,141	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-225

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232

TIME 13:01:09

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	1	1
TOTAL PROJECT EQUIPMENT HOURS										1	1

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-226

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-2: BUILDING 5232

TIME 13:01:09

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY --	UPB	**** TOTAL ****	COST
							RATE	RATE	HOURS	
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	9	281
								9	281	
TOTAL PROJECT MANHOURS										

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-227

FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE
30 SEPTEMBER 1993

FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #:	86 - CENTER ISLE	BUILDING USE:	9.6
BUILDING FUNCTION:	WAREHOUSE	HOURS/DAY	5
EXISTING FIXTURE DATA:	HIGH PRESSURE SODIUM	ENERGY CHARGE	\$0.02506 PER KWH
LAMP TYPE	465 WATTS	DEMAND CHARGE	\$7.067 PER KW
Fixture Wattage	465		
Number of Fixtures	6		

EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT *	0 HR/YR = 0 KWH/YR	6 FIXTS. @ 0.465 KW @ 0% OUTPUT *	2,246 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 10% OUTPUT *	0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 10% OUTPUT *	HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 20% OUTPUT *	0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 20% OUTPUT *	HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 40% OUTPUT *	0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 40% OUTPUT *	HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 60% OUTPUT *	0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 60% OUTPUT *	HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 80% OUTPUT *	0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 80% OUTPUT *	HR/YR = 0 KWH/YR
6 FIXTS. @ 0.465 KW @ 100% OUTPUT *	2,466 HR/YR = 6,964 KWH/YR	6 FIXTS. @ 0.465 KW @ 100% OUTPUT *	250 HR/YR = 697 KWH/YR

TOTAL EXISTING KWH 6,964

TOTAL REVISED CONTROL KWH

697

NET ENERGY SAVINGS 21.38 MBTU/YR

NET DOLLAR SAVINGS \$394/MYR

FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE
30 SEPTEMBER 1993

FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 86 - STORAGE ISLES
BUILDING FUNCTION: WAREHOUSE

BUILDING USE:
HOURS/DAY _____
DAYS/WEEK 5

EXISTING FIXTURE DATA:
LAMP TYPE: HIGH PRESSURE SODIUM
Fixture Wattage 240 WATTS
Number of Fixtures 36

ELECTRIC COSTS:
ENERGY CHARGE \$0.02506 PER KWH
DEMAND CHARGE \$7.067 PER KW

EXISTING LIGHTING CONTROL DATA

<u>0</u> FIXTS. @ <u>0.240</u> KW @ 0% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>16</u> FIXTS. @ <u>0.240</u> KW @ 0% OUTPUT • <u>2,246</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.240</u> KW @ 10% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.240</u> KW @ 10% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.240</u> KW @ 20% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.240</u> KW @ 20% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.240</u> KW @ 40% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.240</u> KW @ 40% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.240</u> KW @ 60% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.240</u> KW @ 60% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.240</u> KW @ 80% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.240</u> KW @ 80% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR
<u>36</u> FIXTS. @ <u>0.240</u> KW @ 100% OUTPUT • <u>2,496</u> HR/YR = <u>21,565</u> KWH/YR	<u>16</u> FIXTS. @ <u>0.240</u> KW @ 100% OUTPUT • <u>250</u> HR/YR = <u>960</u> KWH/YR
	<u>20</u> FIXTS. @ <u>0.240</u> KW @ 100% OUTPUT • <u>2,496</u> HR/YR = <u>11,981</u> KWH/YR

TOTAL REVISED CONTROL KWH

12,941

NET ENERGY SAVINGS 29.43 MBTU/YR

\$542 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:21:30

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-3.1: BUILDING 86

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-230

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86

TIME 14:21:30

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 14:21:30

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
<hr/>									
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION ***	UNIT COSTS: ***	7.14		215.37		0.97		72.72	3.64
WC=1100	1.80 MLF EELEF	13		388		2		131	7
292.69									
527									
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET									
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL	*** UNIT COSTS: ***	0.63		20.63		0.08		600.00	30.00
WC=1100 BASED ON FOOTCANDLE READING	5.00 EA EELEB	3		103		0		3,000	150
650.71									
3,254									
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR	*** UNIT COSTS: ***	1.25		41.26		0.16		100.00	5.00
WC=1100 ON/OFF PHOTOCELL CONTROL	18.00 EA EELEB	23		743		3		1,800	90
146.42									
2,636									
TOTAL DIVISION 16 ELECTRICAL			38	1,234		5	4,931	247	6,416
TOTAL FACILITY AA. ELECTRICAL			38	1,234		5	4,931	247	6,416
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE			38	1,234		5	4,931	247	6,416
TOTAL BASE BID			38	1,234		5	4,931	247	6,416
TOTAL ADDITIVE			0	0		0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY			38	1,234		5	4,931	247	6,416

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86

TIME 14:21:30

PROJECT NOTES

SUMMARY PAGE 1

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-233

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86

TIME 14:21:30

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA ELECTRICAL	1.00 EA	6,416	10.0% 642	0.0% 0	7.5% 529	2.5% 190	0.0% 0	7,777	7776.63
BID ITEM TOTAL	1.00 EA	6,416	642	0	529	190	0	7,777	7776.63
TOTAL BASE BID		6,416	642	0	529	190	0	7,777	
TOTAL ADDITIVE		0	0	0	0	0	0	0	0
TOTAL INCL ADD		6,416	642	0	529	190	0	7,777	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-234

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86

TIME 14:21:30

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00	EA	7,777		7,777	7776.60
	TOTAL CURRENT CONTRACT COST			7,777	0	7,777	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			7,777	0	7,777	
	Government-Furnished Property			0		0	
	SUBTOTAL			7,777	0	7,777	
	Contingencies	10.0%		778	0	778	
	SUBTOTAL			8,554	0	8,554	
	SIOH (S&A)	5.0%		428	0	428	
	CURRENT WORKING ESTIMATE			8,982	0	8,982	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-235

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86

TIME 14:21:30

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR		EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL	
AA	GENERAL/PRIME		1.00	EA		38		1,234	5	5,177	6,416	100.0%	0	6,416
<hr/>														
TOTAL DIRECT														
						38		1,234	5	5,177	6,416	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-236

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86

TIME 14:21:30

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***			**** PROFIT ****			***** TOTAL CONTRACT *****				
				AMOUNT	PCT	HOF&%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT COST	
AA	GENERAL/PRIME		6,416	642	10.0%	0.0	529	7.5%	2.5%	0.0%	7,777	100.0%	7776.62	
TOTAL OVERHEAD & PROFIT							642	10.0%		529	7.5%			

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-237

Fri 17 Sep 1993

CSI DIVISION SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86

TIME 14:21:30

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	38	1,234	5	4,931	247	6,416
TOTAL DIRECT	38	1,234	5	4,931	247	6,416

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-238

Fri 17 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86

TIME 14:21:30

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	38	1,234	5	4,931	247	6,416
TOTAL DIRECT	38	1,234	5	4,931	247	6,416

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-239

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86

TIME 14:21:30

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE ***		ADJ FACTOR	ADJUSTD	BOOK OP --	HRLY ---	UPB	**** TOTAL ****		
	LIFE HRS	TL HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS							1.40	1.40	4	5
TOTAL PROJECT EQUIPMENT HOURS									4	5

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-240

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 86

TIME 14:21:30

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	--	UPB	****	TOTAL	****		
							RATE		RATE	HOURS		COST		
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91		25.79	38		1,234		
												TOTAL PROJECT MANHOURS	38	1,234

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-241

FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE
30 SEPTEMBER 1993

FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 94
BUILDING FUNCTION: WAREHOUSE/MAINTENANCE SHOP

EXISTING FIXTURE DATA:
LAMP TYPE: HIGH PRESSURE SODIUM
Fixture Wattage: 465 WATTS
Number of Fixtures: 108

BUILDING USE:
HOURS/DAY: 10
DAYS/WEEK: 5

ELECTRIC COSTS:
ENERGY CHARGE: \$0.02506 PER KWH
DEMAND CHARGE: \$7.067 PER KW

EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT • 0 HR/YR = 0 KWH/YR	72 FIXTS. @ 0.465 KW @ 0% OUTPUT • 2,350 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 10% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 10% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 20% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 20% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 40% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 40% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 60% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 60% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 80% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 80% OUTPUT • 0 HR/YR = 0 KWH/YR
108 FIXTS. @ 0.465 KW @ 100% OUTPUT • 2,600 HR/YR = 130,572 KWH/YR	108 FIXTS. @ 0.465 KW @ 100% OUTPUT • 250 HR/YR = 12,555 KWH/YR
36 FIXTS. @ 0.465 KW @ 100% OUTPUT • 2,350 HR/YR = 39,339 KWH/YR	36 FIXTS. @ 0.465 KW @ 100% OUTPUT • 2,350 HR/YR = 39,339 KWH/YR

TOTAL EXISTING KWH 130,572

TOTAL REVISED CONTROL KWH 51,694

NET ENERGY SAVINGS 268,451 MBTU/YR

\$4,811 /YR

NET DOLLAR SAVINGS

Fri 17 Sep 1993

U.S. ARMY CORPS OF ENGINEERS M-CACES

TIME 13:55:40

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-3.1: BUILDING 94

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-243

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94

TIME 13:55:40

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 13:55:40

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL		QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTY	DIRECT \$
<hr/>										
16050 BASIC MATERIALS AND METHODS										
16120 1100 SINGLE SOLID CONDUCTOR.										
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***	7.14		215.37		0.97		72.72	3.64		292.69
WC=1100		1.08 MLF EELEF	8	233		1	79	4		316
<hr/>										
16900 CONTROLS AND INSTRUMENTATION										
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLES AND BRACKET										
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL BASED ON FOOTCANDLE READING	*** UNIT COSTS: ***	0.63		20.63		0.08	600.00	30.00		650.71
WC=1100	3.00 EA EELEB	2	62		0	1,800	90			1,952
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR ON/OFF PHOTOCELL CONTROL	*** UNIT COSTS: ***	1.25		41.26		0.16	100.00	5.00		146.42
WC=1100	18.00 EA EELEB	23	743		3	1,800	90			2,636
<hr/>										
TOTAL DIVISION 16 ELECTRICAL		32	1,037		4		3,679	184		4,904
<hr/>										
TOTAL FACILITY AA. ELECTRICAL		32	1,037		4		3,679	184		4,904
<hr/>										
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE		32	1,037		4		3,679	184		4,904
<hr/>										
TOTAL BASE BID		32	1,037		4		3,679	184		4,904
<hr/>										
TOTAL ADDITIVE		0	0		0		0	0		0
<hr/>										
TOTAL INCL ADD LIMITED ENERGY STUDY		32	1,037		4		3,679	184		4,904

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

Fri 17 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94

TIME 13:55:40

SUMMARY PAGE 1

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-246

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94

TIME 13:55:40

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL		10.0%	0.0%	7.5%	2.5%	0.0%		
	1.00 EA	4,904	490	0	405	145	0	5,944	5943.80
<hr/>									
BID ITEM TOTAL		1.00 EA	4,904	490	0	405	145	0	5,944
<hr/>									
TOTAL BASE BID			4,904	490	0	405	145	0	5,944
<hr/>									
TOTAL ADDITIVE			0	0	0	0	0	0	0
<hr/>									
TOTAL INCL ADD			4,904	490	0	405	145	0	5,944

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-247

Fri 17 Sep 1993

PROJECT CWE SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94

TIME 13:55:40

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY	UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00	EA	5,944		5,944	5943.80
	TOTAL CURRENT CONTRACT COST			5,944	0	5,944	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%		0	0	0	
	ESCALATED CONTRACT COST			5,944	0	5,944	
	Government-Furnished Property			0		0	
	SUBTOTAL			5,944	0	5,944	
	Contingencies	10.0%		594	0	594	
	SUBTOTAL			6,538	0	6,538	
	SIOH (S&A)	5.0%		327	0	327	
	CURRENT WORKING ESTIMATE			6,865	0	6,865	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-248

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94

TIME 13:55:40

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	** TOTAL DIRECT * * SUBCON *		SUBTOTAL	
									AMOUNT	PCT		W/OH&P
AA	GENERAL/PRIME		1.00	EA	32	1,037	4	3,862	4,904	100.0%	0	4,904
<hr/>												
TOTAL DIRECT												
					32	1,037	4	3,862	4,904	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-249

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94

TIME 13:55:40

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***			**** PROFIT ****			***** TOTAL CONTRACT *****			
				AMOUNT	PCT	HOF&%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		4,904	490	10.0%	0.0	405	7.5%	2.5%	0.0%	5,944	100.0%	5943.79
TOTAL OVERHEAD & PROFIT				490	10.0%		405	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-250

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94

TIME 13:55:40

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	32	1,037	4	3,679	184	4,904
TOTAL DIRECT	32	1,037	4	3,679	184	4,904

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-251

Fri 17 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94

TIME 13:55:40

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	32	1,037	4	3,679	184	4,904
TOTAL DIRECT	32	1,037	4	3,679	184	4,904

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-252

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94

TIME 13:55:40

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****											
	LIFE	HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS									1.40	1.40	3	4
TOTAL PROJECT EQUIPMENT HOURS											3	4

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-253

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 94

TIME 13:55:40

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	--	UPB	****	TOTAL	****
							RATE	RATE	HOURS	COST		
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	32		1,038	
								32		1,038		
TOTAL PROJECT MANHOURS												

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-254

FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE
30 SEPTEMBER 1993

FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 158
BUILDING FUNCTION: MOTOR REPAIR SHOP

EXISTING FIXTURE DATA:
LAMP TYPE: HIGH PRESSURE SODIUM
Fixture Wattage: 465 WATTS
Number of Fixtures: 63

BUILDING USE:
HOURS/DAY: 8.5
DAYS/WEEK: 5

ELECTRIC COSTS:
ENERGY CHARGE: \$0.02506 PER KWH
DEMAND CHARGE: \$7.067 PER KW

EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT • 0 HR/YR = 0 KWH/YR	36 FIXTS. @ 0.465 KW @ 0% OUTPUT • 1,860 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 10% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 10% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 20% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 20% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 40% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 40% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 60% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 60% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 80% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 80% OUTPUT • 0 HR/YR = 0 KWH/YR
63 FIXTS. @ 0.465 KW @ 100% OUTPUT • 2,210 HR/YR = 64,742 KWH/YR	63 FIXTS. @ 0.465 KW @ 100% OUTPUT • 250 HR/YR = 7,324 KWH/YR
	27 FIXTS. @ 0.465 KW @ 100% OUTPUT • 1,860 HR/YR = 24,608 KWH/YR
TOTAL EXISTING KWH	64,742
NET ENERGY SAVINGS	111.95 MBTU/YR
	NET DOLLAR SAVINGS
	\$2,242/YR

REVISED LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT • 0 HR/YR = 0 KWH/YR	36 FIXTS. @ 0.465 KW @ 0% OUTPUT • 1,860 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 10% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 10% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 20% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 20% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 40% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 40% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 60% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 60% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 80% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 80% OUTPUT • 0 HR/YR = 0 KWH/YR
63 FIXTS. @ 0.465 KW @ 100% OUTPUT • 250 HR/YR = 7,324 KWH/YR	63 FIXTS. @ 0.465 KW @ 100% OUTPUT • 250 HR/YR = 7,324 KWH/YR
	27 FIXTS. @ 0.465 KW @ 100% OUTPUT • 1,860 HR/YR = 24,608 KWH/YR
TOTAL REVISED CONTROL KWH	31,932

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:11:43

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-3.1: BUILDING 158

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-256

Fri 17 Sep 1993

U.S. ARMY CORPS OF ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 158

TIME 14:11:43

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS SUMMARY PAGE

PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE DETAIL PAGE

1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
DETAILED ESTIMATE ECO-3.1: BUILDING 158
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 14:11:43

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***	7.14		215.37		0.97	72.72		3.64	292.69
WC=1100	1.08	MLF EELEF	8	233	1	79		4	316
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET									
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL BASED ON FOOTCANDLE READING	***	UNIT COSTS: ***	0.63	20.63	0.08	600.00	30.00	650.71	
WC=1100	3.00	EA EELEB	2	62	0	1,800	90	1,952	
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR ON/OFF PHOTOCELL CONTROL	***	UNIT COSTS: ***	1.25	41.26	0.16	100.00	5.00	146.42	
WC=1100	6.00	EA EELEB	8	248	1	600	30	879	
TOTAL DIVISION 16 ELECTRICAL	17		542		2	2,479		124	3,147
TOTAL FACILITY AA. ELECTRICAL	17		542		2	2,479		124	3,147
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE	17		542		2	2,479		124	3,147
TOTAL BASE BID	17		542		2	2,479		124	3,147
TOTAL ADDITIVE	0		0		0	0		0	0
TOTAL INCL ADD LIMITED ENERGY STUDY	17		542		2	2,479		124	3,147

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

Fri 17 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 158

TIME 14:11:43

SUMMARY PAGE 1

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-259

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 158

TIME 14:11:43

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	3,147	10.0% 315	0.0% 0	7.5% 260	2.5% 93	0.0% 0	3,814 3814.09
	BID ITEM TOTAL	1.00 EA	3,147	315	0	260	93	0	3,814 3814.09
	TOTAL BASE BID		3,147	315	0	260	93	0	3,814
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		3,147	315	0	260	93	0	3,814

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-260

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 158

TIME 14:11:43

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	3,814		3,814	3814.10
	TOTAL CURRENT CONTRACT COST		3,814	0	3,814	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		3,814	0	3,814	
	Government-Furnished Property		0		0	
	SUBTOTAL		3,814	0	3,814	
	Contingencies	10.0%	381	0	381	
	SUBTOTAL		4,196	0	4,196	
	SIOH (S&A)	5.0%	210	0	210	
	CURRENT WORKING ESTIMATE		4,405	0	4,405	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-261

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 158

TIME 14:11:43

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON *

ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL	
AA	GENERAL/PRIME		1.00	EA		17	542	2	2,602	3,147	100.0%	0	3,147
<hr/>													
TOTAL DIRECT													
						17	542	2	2,602	3,147	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-262

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 158

TIME 14:11:43

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***			**** PROFIT ****			***** TOTAL CONTRACT *****			
				AMOUNT	PCT	HOFCS	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		3,147	315	10.0%	0.0	260	7.5%	2.5%	0.0%	3,814	100.0%	3814.09
TOTAL OVERHEAD & PROFIT				315	10.0%		260	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-263

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 158

TIME 14:11:43

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	17	542	2	2,479	124	3,147
TOTAL DIRECT	17	542	2	2,479	124	3,147

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-264

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 158

TIME 14:11:43

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * ----- DIRECT
11 INTERIOR ELECTRICAL	17	542	2	2,479	124	3,147
TOTAL DIRECT	17	542	2	2,479	124	3,147

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-265

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 158

TIME 14:11:43

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	2	2
TOTAL PROJECT EQUIPMENT HOURS										2	2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-266

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 158

TIME 14:11:43

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION							HRLY	--	UPB	****	TOTAL	****
		BASE	OVERTM	TXS/INS	FRNG	TRVL	RATE	RATE	HOURS	COST			
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	17	543			
TOTAL PROJECT MANHOURS												17	543

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-267

FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE

30 SEPTEMBER 1993

FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 159
BUILDING FUNCTION: MOTOR REPAIR SHOP

BUILDING USE:
HOURS/DAY 24
DAYS/WEEK 7

EXISTING FIXTURE DATA:
LAMP TYPE HIGH PRESSURE SODIUM
Fixture Wattage 465 WATTS
Number of Fixtures 59

ELECTRIC COSTS:
ENERGY CHARGE \$0.02506 PER KWH
DEMAND CHARGE \$7.067 PER KW

EXISTING LIGHTING CONTROL DATA

<u>0</u> FIXTS. @ <u>0.465</u> KW @ 0% OUTPUT * <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>15</u> FIXTS. @ <u>0.465</u> KW @ 0% OUTPUT * <u>3,400</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.465</u> KW @ 10% OUTPUT * <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.465</u> KW @ 10% OUTPUT * <u>HR/YR</u> = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.465</u> KW @ 20% OUTPUT * <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.465</u> KW @ 20% OUTPUT * <u>HR/YR</u> = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.465</u> KW @ 40% OUTPUT * <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.465</u> KW @ 40% OUTPUT * <u>HR/YR</u> = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.465</u> KW @ 60% OUTPUT * <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.465</u> KW @ 60% OUTPUT * <u>HR/YR</u> = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.465</u> KW @ 80% OUTPUT * <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.465</u> KW @ 80% OUTPUT * <u>HR/YR</u> = <u>0</u> KWH/YR
<u>59</u> FIXTS. @ <u>0.465</u> KW @ 100% OUTPUT * <u>8,760</u> HR/YR = <u>240,331</u> KWH/YR	<u>15</u> FIXTS. @ <u>0.465</u> KW @ 100% OUTPUT * <u>5,360</u> HR/YR = <u>37,386</u> KWH/YR
	<u>44</u> FIXTS. @ <u>0.465</u> KW @ 100% OUTPUT * <u>8,760</u> HR/YR = <u>170,230</u> KWH/YR

TOTAL EXISTING KW
TOTAL EXISTING KWH

27.44
240,331

TOTAL REVISED CONTROL KW
TOTAL REVISED CONTROL KWH

20.46
216,616

NET ENERGY SAVINGS 80,921 MBTU/YR

NET DOLLAR SAVINGS \$1,186 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:28:49

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-3.1: BUILDING 159

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-269

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159

TIME 14:28:49

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	.1
BID ITEM AND FACILITY SUMMARY.....	.2
PROJECT CWE SUMMARY.....	.3
CONTRACTOR DIRECT SUMMARY.....	.4
CONTRACTOR INDIRECT SUMMARY.....	.5
CSI DIVISION SUMMARY.....	.6
SYSTEMS SUMMARY.....	.7
EQUIPMENT SUMMARY.....	.8
LABOR SUMMARY.....	.9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	.1

* * * END TABLE OF CONTENTS * * *

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 14:28:49

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
<hr/>									
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: *** WC=1100	7.14	215.37	0.97	72.72	3.64	292.69			
	0.36 MLF EELEF	3	78	0	26	105			
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTOC-CELL, RELAY, LIGHTING ARRESTER, RECEPTAC- E AND BRACKET									
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL WC=1100 BASED ON FOOTCANDLE READING	*** UNIT COSTS: *** 1.00 EA EELEB	0.63 1	20.63 21	0.08 0	600.00 600	30.00 30	650.71 651		
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR WC=1100 ON/OFF PHOTOCELL CONTROL	*** UNIT COSTS: *** 3.00 EA EELEB	1.25 4	41.26 124	0.16 0	100.00 300	5.00 15	146.42 439		
TOTAL DIVISION 16 ELECTRICAL	7	222	1	926	46	1,195			
TOTAL FACILITY AA. ELECTRICAL	7	222	1	926	46	1,195			
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE	7	222	1	926	46	1,195			
TOTAL BASE BID	7	222	1	926	46	1,195			
TOTAL ADDITIVE	0	0	0	0	0	0			
TOTAL INCL ADD LIMITED ENERGY STUDY	7	222	1	926	46	1,195			

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

Fri 17 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159

TIME 14:28:49

SUMMARY PAGE 1

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-272

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159

TIME 14:28:49

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL								
	1.00 EA	1,195	10.0% 120	0.0% 0	7.5% 99	2.5% 35	0.0% 0	1,449	1448.84
	BID ITEM TOTAL	1.00 EA	1,195	120	.0	99	35	0	1,449
	TOTAL BASE BID		1,195	120	0	99	35	0	1,449
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		1,195	120	0	99	35	0	1,449

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-273

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159

TIME 14:28:49

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	1,449		1,449	1448.80
	TOTAL CURRENT CONTRACT COST		1,449	0	1,449	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		1,449	0	1,449	
	Government-Furnished Property		0		0	
	SUBTOTAL		1,449	0	1,449	
	Contingencies	10.0%	145	0	145	
	SUBTOTAL		1,594	0	1,594	
	SIOH (S&A)	5.0%	80	0	80	
	CURRENT WORKING ESTIMATE		1,673	0	1,673	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-274

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159

TIME 14:28:49

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON *																
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL				
AA	GENERAL/PRIME		1.00	EA		7	222	1	972	1,195	100.0%	0	1,195			
										7	222	1	972	1,195	100.0%	
TOTAL DIRECT																

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-275

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159

TIME 14:28:49

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD ***			**** PROFIT ****			***** TOTAL CONTRACT *****			
				AMOUNT	PCT	HOF&%	AMOUNT	PCT	BOND%	OTHR%	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		1,195	120	10.0%	0.0	99	7.5%	2.5%	0.0%	1,449	100.0%	1448.84
TOTAL OVERHEAD & PROFIT				120 10.0%			99 7.5%						

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-276

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159

TIME 14:28:49

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
16 ELECTRICAL	7	222	1	926	46	1,195	
TOTAL DIRECT	7	222	1	926	46	1,195	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-277

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159

TIME 14:28:49

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
11 INTERIOR ELECTRICAL	7	222	1	926	46	1,195	
TOTAL DIRECT	7	222	1	926	46	1,195	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-278

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159

TIME 14:28:49

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE ***		ADJ FACTOR	ADJUSTD	BOOK OP -- HRLY	--- UPB	**** TOTAL ****	COST		
	LIFE HRS	TL HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE			
EMI20 SMALL TOOLS							1.40	1.40	1	1
TOTAL PROJECT EQUIPMENT HOURS									1	1

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-279

Fri 17 Sep 1993

U.S. ARMY CORPS OF ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 159

TIME 14:28:49

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY --	UPB	**** TOTAL ****	COST
							RATE	RATE	HOURS	
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	7	222
								7	222	
TOTAL PROJECT MANHOURS										

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-280

FORT KNOX LIMITED ENERGY STUDY

ECOS 1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE
30 SEPTEMBER 1993

FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2730

BUILDING FUNCTION: VEHICLE REPAIR SHOP

BUILDING USE:

HOURS/DAY
5

DAYS/WEEK

EXISTING FIXTURE DATA:

LAMP TYPE METAL HALIDE

Fixture Wattage 455 WATTS

Number of Fixtures 48

ELECTRIC COSTS:
ENERGY CHARGE \$0.02506 PER KWH
DEMAND CHARGE \$7.067 PER KW

EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 10% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 20% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 40% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 60% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 80% OUTPUT * 0 HR/YR = 0 KWH/YR

48 FIXTS. @ 0.455 KW @ 100% OUTPUT * 2,800 HR/YR = 56,784 KWH/YR

REVISED LIGHTING CONTROL DATA

32 FIXTS. @ 0.455 KW @ 0% OUTPUT * 1,180 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 10% OUTPUT * HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 20% OUTPUT * HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 40% OUTPUT * HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 60% OUTPUT * HR/YR = 0 KWH/YR

0 FIXTS. @ 0.455 KW @ 80% OUTPUT * HR/YR = 0 KWH/YR

16 FIXTS. @ 0.455 KW @ 100% OUTPUT * 1,420 HR/YR = 20,675 KWH/YR

TOTAL EXISTING KWH 56,784

TOTAL REVISED CONTROL KWH

39,603

NET ENERGY SAVINGS 58.62 MBTU/YR

NET DOLLAR SAVINGS \$1,048/YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:36:27

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-3.1: BUILDING 2730

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-282

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730

TIME 14:36:27

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 14:36:27

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
<hr/>									
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: *** WC=1100	7.14	215.37	0.97	72.72	3.64	292.69			
	1.44 MLF EELEF	10	310	1	105	5	421		
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACL-E AND BRACKET									
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL WC=1100 BASED ON FOOTCANDLE READING	*** UNIT COSTS: *** 4.00 EA EELEB	0.63 3	20.63 83	0.08 0	600.00 2,400	30.00 120	650.71 2,603		
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR WC=1100 ON/OFF PHOTOCELL CONTROL	*** UNIT COSTS: *** 4.00 EA EELEB	1.25 5	41.26 165	0.16 1	100.00 400	5.00 20	146.42 586		
TOTAL DIVISION 16 ELECTRICAL		18	558	2	2,905	145	3,610		
TOTAL FACILITY AA. ELECTRICAL		18	558	2	2,905	145	3,610		
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE		18	558	2	2,905	145	3,610		
TOTAL BASE BID		18	558	2	2,905	145	3,610		
TOTAL ADDITIVE		0	0	0	0	0	0		
TOTAL INCL ADD LIMITED ENERGY STUDY		18	558	2	2,905	145	3,610		

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

Fri 17 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730

TIME 14:36:27

SUMMARY PAGE 1

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-285

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730

TIME 14:36:27

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL								
		1.00 EA	3,610	361	0	298	107	0	4,376 4375.57
	BID ITEM TOTAL	1.00 EA	3,610	361	0	298	107	0	4,376 4375.57
	TOTAL BASE BID		3,610	361	0	298	107	0	4,376
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		3,610	361	0	298	107	0	4,376

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

Fri 17 Sep 1993

PROJECT CWE SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730

TIME 14:36:27

SUMMARY PAGE 3

ID BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1. BUILDING TO THE 5 FOOT LINE	1.00 EA	4,376		4,376	4375.60
TOTAL CURRENT CONTRACT COST		4,376	0	4,376	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
ESCALATED CONTRACT COST		4,376	0	4,376	
Government-Furnished Property		0		0	
SUBTOTAL		4,376	0	4,376	
Contingencies	10.0%	438	0	438	
SUBTOTAL		4,813	0	4,813	
SIOH (S&A)	5.0%	241	0	241	
CURRENT WORKING ESTIMATE		5,054	0	5,054	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730

TIME 14:36:27

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON *																
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL				
AA	GENERAL/PRIME		1.00	EA	18	558	2	3,050	3,610	100.0%	0	3,610				
										TOTAL DIRECT	18	558	2	3,050	3,610	100.0%

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-288

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730

TIME 14:36:27

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****									
				AMOUNT	PCT	HOFCS	AMOUNT	PCT	BOND%	OTHR\$	AMOUNT	PCT	UNIT COST
AA	GENERAL/PRIME		3,610	361	10.0%	0.0	298	7.5%	2.5%	0.0%	4,376	100.0%	4375.56
TOTAL OVERHEAD & PROFIT				361	10.0%		298	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-289

Fri 17 Sep 1993

CSI DIVISION SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730

TIME 14:36:27

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	18	558	2	2,905	145	3,610
TOTAL DIRECT	18	558	2	2,905	145	3,610

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-290

Fri 17 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730

TIME 14:36:27

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	18	558	2	2,905	145	3,610
TOTAL DIRECT	18	558	2	2,905	145	3,610

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-291

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730

TIME 14:36:27

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	2	2
TOTAL PROJECT EQUIPMENT HOURS										2	2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-292

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2730

TIME 14:36:27

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY -- UPB	**** TOTAL ****	COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	18 558
TOTAL PROJECT MANHOURS							18	558

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-293

FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE
30 SEPTEMBER 1993

FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2942

BUILDING FUNCTION: MOTOR REPAIR SHOP

EXISTING FIXTURE DATA:

LAMP TYPE: HIGH PRESSURE SODIUM
Fixture Wattage: 465 WATTS
Number of Fixtures: 33

BUILDING USE:
HOURS/DAY: 8
DAYS/WEEK: 5

ELECTRIC COSTS:
ENERGY CHARGE: \$0.02506 PER KWH
DEMAND CHARGE: \$7.067 PER KW

EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT * 0 HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 10% OUTPUT * 0 HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 20% OUTPUT * 0 HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 30% OUTPUT * 0 HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 40% OUTPUT * 0 HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 50% OUTPUT * 0 HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 60% OUTPUT * 0 HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 70% OUTPUT * 0 HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 80% OUTPUT * 0 HRS/YR = 0 KWH/YR

33 FIXTS. @ 0.465 KW @ 100% OUTPUT * 2,080 HRS/YR = 31,918 KWH/YR

REVISED LIGHTING CONTROL DATA

20 FIXTS. @ 0.465 KW @ 0% OUTPUT * 920 HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 10% OUTPUT * HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 20% OUTPUT * HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 30% OUTPUT * HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 40% OUTPUT * HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 50% OUTPUT * HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 60% OUTPUT * HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 70% OUTPUT * HRS/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 80% OUTPUT * HRS/YR = 0 KWH/YR

20 FIXTS. @ 0.465 KW @ 100% OUTPUT * 1,160 HRS/YR = 10,788 KWH/YR

13 FIXTS. @ 0.465 KW @ 100% OUTPUT * 2,080 HRS/YR = 12,574 KWH/YR

TOTAL EXISTING KWH

TOTAL REVISED CONTROL KWH

23,362

NET ENERGY SAVINGS 29,19 MBTU/YR

NET DOLLAR SAVINGS \$809 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:43:43

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-3.1: BUILDING 2942

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-295

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2942

TIME 14:43:43

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2942
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 14:43:43

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
<hr/>									
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: *** WC=1100	7.14 1.08 MLF EELEF		8	215.37 233		0.97 1	72.72 79	3.64 4	292.69 316
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET									
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL WC=1100 BASED ON FOOTCANDLE READING	*** UNIT COSTS: *** 3.00 EA EELEB		0.63 2	20.63 62		0.08 0	600.00 1,800	30.00 90	650.71 1,952
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR WC=1100 ON/OFF PHOTOCELL CONTROL	*** UNIT COSTS: *** 4.00 EA EELEB		1.25 5	41.26 165		0.16 1	100.00 400	5.00 20	146.42 586
TOTAL DIVISION 16 ELECTRICAL			15	460		2	2,279	114	2,854
TOTAL FACILITY AA. ELECTRICAL			15	460		2	2,279	114	2,854
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE			15	460		2	2,279	114	2,854
TOTAL BASE BID			15	460		2	2,279	114	2,854
TOTAL ADDITIVE			0	0		0	0	0	0
TOTAL INCL ADD LIMITED ENERGY STUDY			15	460		2	2,279	114	2,854

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

Fri 17 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2942

TIME 14:43:43

SUMMARY PAGE 1

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-298

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2942

TIME 14:43:43

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST	
AA	ELECTRICAL	1.00 EA	2,854	10.0% 285	0.0% 0	7.5% 235	2.5% 84	0.0% 0	3,459	3459.15
	BID ITEM TOTAL	1.00 EA	2,854	285	0	235	84	0	3,459	3459.15
	TOTAL BASE BID		2,854	285	0	235	84	0	3,459	
	TOTAL ADDITIVE		0	0	0	0	0	0	0	
	TOTAL INCL ADD		2,854	285	0	235	84	0	3,459	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-299

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2942

TIME 14:43:43

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1.	BUILDING TO THE 5 FOOT LINE	1.00 EA	3,459		3,459	3459.20
	TOTAL CURRENT CONTRACT COST		3,459	0	3,459	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		3,459	0	3,459	
	Government-Furnished Property		0		0	
	SUBTOTAL		3,459	0	3,459	
	Contingencies	10.0%	346	0	346	
	SUBTOTAL		3,805	0	3,805	
	SIOH (S&A)	5.0%	190	0	190	
	CURRENT WORKING ESTIMATE		3,995	0	3,995	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-300

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2942

TIME 14:43:43

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

ID CONTRACTOR	PM	QUANTITY UOM MANHRS	** TOTAL DIRECT * * SUBCON *			AMOUNT	PCT	W/OH&P	SUBTOTAL	
			LABOR	EQUIPMENT	MAT W/TX					
AA GENERAL/PRIME		1.00 EA	15	460	2	2,392	2,854	100.0%	0	2,854
TOTAL DIRECT			15	460	2	2,392	2,854	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-301

Fri 17 Sep 1993

U.S. ARMY CORPS OF ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
CONTRACTOR INDIRECT SUMMARY ECO-3.1: BUILDING 2942

TIME 14:43:43

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****				AMOUNT	PCT	UNIT COST			
				AMOUNT	PCT	HOF% %	AMOUNT				PCT	BOND% %	OTHR% %
AA	GENERAL/PRIME		2,854	285	10.0%	0.0	235	7.5%	2.5%	0.0%	3,459	100.0%	3459.15
TOTAL OVERHEAD & PROFIT				285	10.0%		235	7.5%					

REW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-302

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
CSI DIVISION SUMMARY ECO-3.1: BUILDING 2942

TIME 14:43:43

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
16 ELECTRICAL	15	460	2	2,279	114	2,854	
TOTAL DIRECT	15	460	2	2,279	114	2,854	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-303

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2942

TIME 14:43:43

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
11 INTERIOR ELECTRICAL	15	460	2	2,279	114	2,854	
TOTAL DIRECT	15	460	2	2,279	114	2,854	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-304

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2942

TIME 14:43:43

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	1	2
TOTAL PROJECT EQUIPMENT HOURS										1	2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-305

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2942

TIME 14:43:43

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY -- UPB **** TOTAL ****	RATE	RATE	HOURS	COST
LELEC ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79		15	460
TOTAL PROJECT MANHOURS									15	460

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-306

FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE
30 SEPTEMBER 1993

FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #:	2943	BUILDING USE:	8 HOURS/DAY DAYS/WEEK
BUILDING FUNCTION:	MOTOR REPAIR SHOP	ELECTRIC COSTS:	\$0.02506 PER KWH ENERGY CHARGE DEMAND CHARGE \$7.067 PER KW
EXISTING FIXTURE DATA:	LAMP TYPE Fixture Wattage Number of Fixtures	HIGH PRESSURE SODIUM 465 WATTS 33	

EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT • 0 HR/YR = 0 KWH/YR	20 FIXTS. @ 0.465 KW @ 0% OUTPUT • 920 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 10% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 10% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 20% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 20% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 40% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 40% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 60% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 60% OUTPUT • 0 HR/YR = 0 KWH/YR
0 FIXTS. @ 0.465 KW @ 80% OUTPUT • 0 HR/YR = 0 KWH/YR	0 FIXTS. @ 0.465 KW @ 80% OUTPUT • 0 HR/YR = 0 KWH/YR
33 FIXTS. @ 0.465 KW @ 100% OUTPUT • 2,080 HR/YR = 31,918 KWH/YR	20 FIXTS. @ 0.465 KW @ 100% OUTPUT • 1,160 HR/YR = 10,788 KWH/YR
	13 FIXTS. @ 0.465 KW @ 100% OUTPUT • 2,980 HR/YR = 12,574 KWH/YR

TOTAL EXISTING KWH 31,918

TOTAL REVISED CONTROL KWH

23,362

NET ENERGY SAVINGS 29.19 MBTU/YR NET DOLLAR SAVINGS \$609 /MR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:50:51

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-3.1: BUILDING 2943

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-308

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2943

TIME 14:50:51

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2943
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 14:50:51

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALES	TX	DIRECT	\$
16050 BASIC MATERIALS AND METHODS											
16120 1100 SINGLE SOLID CONDUCTOR.											
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: *** WC=1100	7.14	215.37	0.97	72.72	3.64	292.69					
	1.08 MLF EELEF	8	233	1	79	4	316				
16900 CONTROLS AND INSTRUMENTATION											
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET											
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL WC=1100 BASED ON FOOTCANDLE READING	*** UNIT COSTS: *** 3.00 EA EELEB	0.63 2	20.63 62	0.08 0	600.00 1,800	30.00 90	650.71 1,952				
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR WC=1100 ON/OFF PHOTOCELL CONTROL	*** UNIT COSTS: *** 4.00 EA EELEB	1.25 5	41.26 165	0.16 1	100.00 400	5.00 20	146.42 586				
TOTAL DIVISION 16 ELECTRICAL		15	460	2	2,279	114	2,854				
TOTAL FACILITY AA. ELECTRICAL		15	460	2	2,279	114	2,854				
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE		15	460	2	2,279	114	2,854				
TOTAL BASE BID		15	460	2	2,279	114	2,854				
TOTAL ADDITIVE		0	0	0	0	0	0				
TOTAL INCL ADD LIMITED ENERGY STUDY		15	460	2	2,279	114	2,854				

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2943

TIME 14:50:51

PROJECT NOTES

SUMMARY PAGE 1

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-311

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2943

TIME 14:50:51

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST	
AA	ELECTRICAL	1.00 EA	2,854	10.0% 285	0.0% 0	7.5% 235	2.5% 84	0.0% 0	3,459	3459.15
BID ITEM TOTAL		1.00 EA	2,854	285	0	235	84	0	3,459	3459.15
TOTAL BASE BID			2,854	285	0	235	84	0	3,459	
TOTAL ADDITIVE			0	0	0	0	0	0	0	
TOTAL INCL ADD			2,854	285	0	235	84	0	3,459	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-312

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2943

TIME 14:50:51

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	3,459		3,459	3459.20
	TOTAL CURRENT CONTRACT COST		3,459	0	3,459	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		3,459	0	3,459	
	Government-Furnished Property		0		0	
	SUBTOTAL		3,459	0	3,459	
	Contingencies	10.0%	346	0	346	
	SUBTOTAL		3,805	0	3,805	
	SIOH (S&A)	5.0%	190	0	190	
	CURRENT WORKING ESTIMATE		3,995	0	3,995	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-313

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2943

TIME 14:50:51

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON **							
ID	CONTRACTOR	PM	QUANTITY UOM MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT PCT W/OH&P SUBTOTAL
AA	GENERAL/PRIME		1.00 EA	15	460	2	2,392 2,854 100.0% 0 2,854
TOTAL DIRECT 15 460 2 2,392 2,854 100.0%							

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-314

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
CONTRACTOR INDIRECT SUMMARY
ECO-3.1: BUILDING 2943

TIME 14:50:51

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****				AMOUNT	PCT	UNIT COST			
				AMOUNT	PCT	HOF% 0.0	AMOUNT				PCT	BOND% 2.5%	OTHR% 0.0%
AA	GENERAL/PRIME		2,854	285	10.0%	0.0	235	7.5%	2.5%	0.0%	3,459	100.0%	3459.15
TOTAL OVERHEAD & PROFIT				285	10.0%		235	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-315

Fri 17 Sep 1993

CSI DIVISION SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2943

TIME 14:50:51

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * ***** DIRECT
16 ELECTRICAL	15	460	2	2,279	114	2,854
TOTAL DIRECT	15	460	2	2,279	114	2,854

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-316

Fri 17 Sep 1993

SYSTEMS SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2943

TIME 14:50:51

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
11 INTERIOR ELECTRICAL	15	460	2	2,279	114	2,854
TOTAL DIRECT	15	460	2	2,279	114	2,854

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-317

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2943

TIME 14:50:51

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE ***		ADJ FACTOR	ADJUSTD	BOOK OP --	HRLY ---	UPB	**** TOTAL ****			
	LIFE HRS	TL HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS	COST
EMI20 SMALL TOOLS							1.40	1.40	1		2
TOTAL PROJECT EQUIPMENT HOURS									1		2

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-318

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2943

TIME 14:50:51

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	--	UPB	****	TOTAL	****
							RATE	RATE	HOURS	COST		
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	15	460		
TOTAL PROJECT MANHOURS												
									15	460		

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-319

FORT KNOX LIMITED ENERGY STUDY

ECOS 1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE
30 SEPTEMBER 1993

FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2944

BUILDING FUNCTION: TANK REPAIR SHOP

EXISTING FIXTURE DATA:

LAMP TYPE: HIGH PRESSURE SODIUM
Fixture Wattage: 465 WATTS
Number of Fixtures: 63

BUILDING USE:

HOURS/DAY 8
DAYS/WEEK 5

ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH
DEMAND CHARGE \$7.067 PER KW

EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 10% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 20% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 30% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 40% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 50% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 60% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 70% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 80% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 90% OUTPUT * 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 100% OUTPUT * 2,080 HR/YR = 60,934 KWH/YR

36 FIXTS. @ 0.465 KW @ 100% OUTPUT * 1,160 HR/YR = 10,418 KWH/YR

27 FIXTS. @ 0.465 KW @ 100% OUTPUT * 2,080 HR/YR = 26,114 KWH/YR

TOTAL EXISTING KWH 60,934

36 FIXTS. @ 0.465 KW @ 100% OUTPUT * 2,080 HR/YR = 26,114 KWH/YR

TOTAL REVISED CONTROL KWH

45,532

NET ENERGY SAVINGS 52.55 MBTU/YR

NET DOLLAR SAVINGS \$1,096/YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:05:25

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-3.1: BUILDING 2944

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-321

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944

TIME 15:05:25

TABLE OF CONTENTS

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Fri 17 Sep 1993

U.S. ARMY CORPS OF ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:05:25

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

DIVISION 16 ELECTRICAL	QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
<hr/>									
16050 BASIC MATERIALS AND METHODS									
16120 1100 SINGLE SOLID CONDUCTOR.									
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***	7.14		215.37		0.97	72.72		3.64	292.69
WC=1100 1.80 MLF EELEF		13	388		2	131		7	527
<hr/>									
16900 CONTROLS AND INSTRUMENTATION									
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET									
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL BASED ON FOOTCANDLE READING	*** UNIT COSTS: ***	0.63	20.63		0.08	600.00	30.00	650.71	
WC=1100 5.00 EA EELEB		3	103		0	3,000	150	3,254	
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR ON/OFF PHOTOCELL CONTROL	*** UNIT COSTS: ***	1.25	41.26		0.16	100.00	5.00	146.42	
WC=1100 10.00 EA EELEB		13	413		2	1,000	50	1,464	
<hr/>									
TOTAL DIVISION 16 ELECTRICAL			28	903	4	4,131	207	5,245	
<hr/>									
TOTAL FACILITY AA. ELECTRICAL			28	903	4	4,131	207	5,245	
<hr/>									
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE			28	903	4	4,131	207	5,245	
<hr/>									
TOTAL BASE BID			28	903	4	4,131	207	5,245	
<hr/>									
TOTAL ADDITIVE			0	0	0	0	0	0	0
<hr/>									
TOTAL INCL ADD LIMITED ENERGY STUDY			28	903	4	4,131	207	5,245	

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-323

Fri 17 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944

TIME 15:05:25

SUMMARY PAGE 1

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-324

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944

TIME 15:05:25

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

ID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HOME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	5,245	10.0% 524	0.0% 0	7.5% 433	2.5% 155	0.0% 0	6,357 6356.83
	BID ITEM TOTAL	1.00 EA	5,245	524	0	433	155	0	6,357 6356.83
	TOTAL BASE BID		5,245	524	0	433	155	0	6,357
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		5,245	524	0	433	155	0	6,357

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944

TIME 15:05:25

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
1. BUILDING TO THE 5 FOOT LINE	1.00 EA	6,357		6,357	6356.80
TOTAL CURRENT CONTRACT COST		6,357	0	6,357	
Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
ESCALATED CONTRACT COST		6,357	0	6,357	
Government-Furnished Property		0		0	
SUBTOTAL		6,357	0	6,357	
Contingencies	10.0%	636	0	636	
SUBTOTAL		6,992	0	6,992	
SIOH (S&A)	5.0%	350	0	350	
CURRENT WORKING ESTIMATE		7,342	0	7,342	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-326

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944

TIME 15:05:25

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

** TOTAL DIRECT * * SUBCON *												
ID	CONTRACTOR	PM	QUANTITY	UOM	MANHRS	LABOR	EQUIPMENT	MAT W/TX	AMOUNT	PCT	W/OH&P	SUBTOTAL
AA	GENERAL/PRIME		1.00	EA	28	903	4	4,337	5,245	100.0%	0	5,245
<hr/>												
TOTAL DIRECT												
					28	903	4	4,337	5,245	100.0%		

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-327

Fri 17 Sep 1993

CONTRACTOR INDIRECT SUMMARY

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944

TIME 15:05:25

SUMMARY PAGE 5

ID	CONTRACTOR	PM	SUBTOTAL	*** OVERHEAD *** ----- **** PROFIT **** ----- ***** TOTAL CONTRACT *****				AMOUNT	PCT	UNIT COST			
				AMOUNT	PCT	HOFC%	AMOUNT				PCT	BOND%	OTHR%
AA	GENERAL/PRIME		5,245	524	10.0%	0.0	433	7.5%	2.5%	0.0%	6,357	100.0%	6356.82
TOTAL OVERHEAD & PROFIT				524	10.0%		433	7.5%					

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-328

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944

TIME 15:05:25

CSI DIVISION SUMMARY

SUMMARY PAGE 6

ID CSI DIVISION	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	***** TOTAL * DIRECT
16 ELECTRICAL	28	903	4	4,131	207	5,245
TOTAL DIRECT	28	903	4	4,131	207	5,245

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-329

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944

TIME 15:05:25

SYSTEMS SUMMARY

SUMMARY PAGE 7

ID SYSTEM	MANHOURS	LABOR	EQUIPMENT	MATERIAL	SALES TAX	DIRECT	***** TOTAL *
11 INTERIOR ELECTRICAL	28	903	4	4,131	207	5,245	
TOTAL DIRECT	28	903	4	4,131	207	5,245	

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-330

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944

TIME 15:05:25

EQUIPMENT SUMMARY

SUMMARY PAGE 8

EQUIP DESCRIPTION	*** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL ****										
	LIFE HRS	TL	HRLY	OWNRSHP	OWNS	OVTM	OWNRSHP	EXPENSE	RATE	RATE	HOURS
EMI20 SMALL TOOLS								1.40	1.40	3	4
TOTAL PROJECT EQUIPMENT HOURS										3	4

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-331

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2944

TIME 15:05:25

LABOR SUMMARY

SUMMARY PAGE 9

CRAFT	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	HRLY	--	UPB	****	TOTAL	****
							RATE	RATE	HOURS	COST		
LELEC	ELECTRICIANS	20.50	0.0%	24.0%	7.49	0.00	32.91	25.79	28	-----	904	-----
TOTAL PROJECT MANHOURS								28	904			

* * * END OF SUMMARY REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-332

FORT KNOX LIMITED ENERGY STUDY

ECO 31: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE
30 SEPTEMBER 1993

FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2963
 BUILDING FUNCTION: TANK REPAIR SHOP

EXISTING FIXTURE DATA:
 LAMP TYPE: METAL HALIDE
 FIXTURE WATTAGE: 455 WATTS
 NUMBER OF FIXTURES: 18

BUILDING USE:
 HOURS/DAY 8
 DAYS/WEEK 5

ELECTRIC COSTS:
 ENERGY CHARGE \$0.02506 PER KWH
 DEMAND CHARGE \$7.067 PER KW

EXISTING LIGHTING CONTROL DATA

<u>0</u> FIXTS. @ <u>0.455</u> KW @ 0% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>12</u> FIXTS. @ <u>0.455</u> KW @ 0% OUTPUT • <u>920</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.455</u> KW @ 10% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.455</u> KW @ 10% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.455</u> KW @ 20% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.455</u> KW @ 20% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.455</u> KW @ 40% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.455</u> KW @ 40% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.455</u> KW @ 60% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.455</u> KW @ 60% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR
<u>0</u> FIXTS. @ <u>0.455</u> KW @ 80% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR	<u>0</u> FIXTS. @ <u>0.455</u> KW @ 80% OUTPUT • <u>0</u> HR/YR = <u>0</u> KWH/YR
<u>18</u> FIXTS. @ <u>0.455</u> KW @ 100% OUTPUT • <u>2,080</u> HR/YR = <u>17,035</u> KWH/YR	<u>12</u> FIXTS. @ <u>0.455</u> KW @ 100% OUTPUT • <u>1,160</u> HR/YR = <u>6,334</u> KWH/YR
<u>6</u> FIXTS. @ <u>0.455</u> KW @ 100% OUTPUT • <u>2,080</u> HR/YR = <u>5,678</u> KWH/YR	

TOTAL EXISTING KWH

TOTAL REVISED CONTROL KWH

12,012

NET ENERGY SAVINGS

17,14 MBTU/YR

NET DOLLAR SAVINGS

\$357 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:13:33

TITLE PAGE

LIMITED ENERGY STUDY
FT KNOX, KY
ECO-3.1: BUILDING 2963

Contract No: 27-93-C-0096

Prepared By: Systems Corp
Estimator: Julie A. Hollensbe
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N
COMPOSER Plus Copyright (C) 1985, 1988
by Building Systems Design, Inc.
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-334

Fri 17 Sep 1993

TABLE OF CONTENTS

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2963

TIME 15:13:33

CONTENTS PAGE 1

SUMMARY REPORTS	SUMMARY PAGE
PROJECT NOTES.....	1
BID ITEM AND FACILITY SUMMARY.....	2
PROJECT CWE SUMMARY.....	3
CONTRACTOR DIRECT SUMMARY.....	4
CONTRACTOR INDIRECT SUMMARY.....	5
CSI DIVISION SUMMARY.....	6
SYSTEMS SUMMARY.....	7
EQUIPMENT SUMMARY.....	8
LABOR SUMMARY.....	9

DETAILED ESTIMATE	DETAIL PAGE
1. BUILDING TO THE 5 FOOT LINE	
AA. ELECTRICAL.....	1

* * * END TABLE OF CONTENTS * * *

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2963

TIME 15:13:33

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

DIVISION 16 ELECTRICAL		QUANTITY	UOM	CREW	MANHR	LABOR	EQUIPMENT	MATERIAL	SALESTX	DIRECT \$
16050 BASIC MATERIALS AND METHODS										
16120 1100 SINGLE SOLID CONDUCTOR.										
CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***	7.14	215.37		0.97	72.72	3.64	292.69			
WC=1100	0.72 MLF EELEF	5	155	1	52	3	211			
16900 CONTROLS AND INSTRUMENTATION										
16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET										
CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL BASED ON FOOTCANDLE READING	*** UNIT COSTS: ***	0.63	20.63	0.08	600.00	30.00	650.71			
WC=1100	2.00 EA EELEB	1	41	0	1,200	60	1,301			
CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR ON/OFF PHOTOCELL CONTROL	*** UNIT COSTS: ***	1.25	41.26	0.16	100.00	5.00	146.42			
WC=1100	4.00 EA EELEB	5	165	1	400	20	586			
TOTAL DIVISION 16 ELECTRICAL		11	361	2	1,652	83	2,098			
TOTAL FACILITY AA. ELECTRICAL		11	361	2	1,652	83	2,098			
TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE		11	361	2	1,652	83	2,098			
TOTAL BASE BID		11	361	2	1,652	83	2,098			
TOTAL ADDITIVE		0	0	0	0	0	0			
TOTAL INCL ADD LIMITED ENERGY STUDY		11	361	2	1,652	83	2,098			

* * * END OF DETAIL REPORT * * *

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

Fri 17 Sep 1993

PROJECT NOTES

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2963

TIME 15:13:33

SUMMARY PAGE 1

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-337

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2963

TIME 15:13:33

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

ID	FACILITY	COST TO PRM	OVERHEAD	HME OFC	PROFIT	BOND	OTHR FCTR	TOTAL COST	UNIT COST
AA	ELECTRICAL	1.00 EA	2,098	10.0% 210	0.0% 0	7.5% 173	2.5% 62	0.0% 0	2,543 2542.73
	BID ITEM TOTAL	1.00 EA	2,098	210	0	173	62	0	2,543 2542.73
	TOTAL BASE BID		2,098	210	0	173	62	0	2,543
	TOTAL ADDITIVE		0	0	0	0	0	0	0
	TOTAL INCL ADD		2,098	210	0	173	62	0	2,543

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-338

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES
LIMITED ENERGY STUDY / FT KNOX, KY
ECO-3.1: BUILDING 2963

TIME 15:13:33

PROJECT CWE SUMMARY

SUMMARY PAGE 3

ID	BID ITEM	QUANTITY UOM	BASE BID	ADDITIVE	TOTAL COST	UNIT COST
	1. BUILDING TO THE 5 FOOT LINE	1.00 EA	2,543		2,543	2542.70
	TOTAL CURRENT CONTRACT COST		2,543	0	2,543	
	Cost Growth from 09/93 to 09/94 Index Values: 0000 0000	0.0%	0	0	0	
	ESCALATED CONTRACT COST		2,543	0	2,543	
	Government-Furnished Property		0		0	
	SUBTOTAL		2,543	0	2,543	
	Contingencies	10.0%	254	0	254	
	SUBTOTAL		2,797	0	2,797	
	SIOH (S&A)	5.0%	140	0	140	
	CURRENT WORKING ESTIMATE		2,937	0	2,937	

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-339