

FINAL SUBMITTAL

ENERGY ENGINEERING ANALYSIS PROGRAM

LIMITED ENERGY STUDY

WATERVLIET ARSENAL

WATERVLIET, NEW YORK

VOLUME IV

PROGRAMMING DOCUMENTS

CONTRACT NO. DACA65-91-C-0072

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS
NORFOLK, VIRGINIA

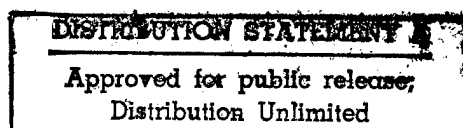
PREPARED BY:

REYNOLDS, SMITH AND HILLS, INC.
ENERGY AND ENVIRONMENTAL SERVICES DEPARTMENT
P.O. BOX 4850
JACKSONVILLE, FLORIDA 32201

PROJECT NO. 2900379002

AUGUST 1992

19971016 245



8/92

DTIC QUALITY INSPECTED 2

PROGRAMMING DOCUMENTS

VOLUME IV

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Section	Project Type	ECO #	Name
1	QRIP	6	Condensate Return
2			Not Used
3		12	Natural Gas Boilers
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5		10	High-Efficiency Motors
6	ECIP	8	High-Efficiency Lighting

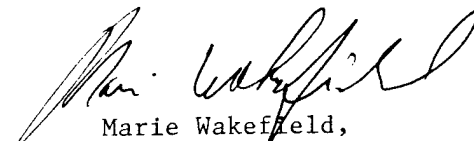


DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

REPLY TO
ATTENTION OF: TR-I Library

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Marie Wakefield,
Librarian Engineering

QRIP

1 August 1982

1, AR 5-4

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS For use of this form, see AR 5-4; the proponent agency is OCA.				1. PROJECT NO.		REQUIREMENT CONTROL SYMBOL DD-M(R) 1561	
2. TO: CDR, AMC (AMCRM-MP) 5001 Eisenhower Avenue Alexandria, VA 22333-0001		3. THRU:		4. FROM: CDR, AMCCOM Attn: AMSMC-MGP-P (R) Rock Island, IL 61299-6000		5. DOD COMP NAME Army	6. DOD COMP CODE A
9. PROJECT TITLE Condensate Return--Building 35 Plating Areas (ECO #6)		10. TYPE OF PROJECT (Check one) ☒ CRIP ☐ OSD PIF ☐ PECIP		11. AMORTIZATION YEARS/MONTHS \$ 17,700 + 23,300 x 12 (Project Cost) (Average Annual Savings) (No. Mos) = 0.76 or (years) (months)		7. COMMAND CODE W73QKK	8. DATE
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE 25 years		14. EXPECTED OPERATIONAL DATE			
15. SUBMITTING UNIT(S) Commander Watervliet Arsenal Attn: SMCWW-FE (W. Face) Building 120 Watervliet, NY 12189		16. UNIT ID CODE WOK9AA		17. PROJECT DESCRIPTION Install piping to return condensate from the plating areas in Building 35. pH sensors are used to divert the condensate to waste if contamination occurs.			
18. DETAILED JUSTIFICATION Returning 180°F condensate to the boilers will reduce the energy used that is presently used to heat 60°F make-up water to steam conditions.							
19. SAVINGS DISPOSITION Savings are used to reduce energy expenditures.							
20. OTHER REMARKS (Continue on page 5, if more space is needed)							

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY (Identify) Nat gas & #6 FO	\$245,000	\$221,700	\$221,700	\$221,700	\$221,700	\$23,300	\$23,300	\$23,300	\$23,300
CONTRACT COSTS									
OTHER (Identify)									
TOTALS	\$245,000	\$221,700	\$221,700	\$221,700	\$221,700	\$23,300	\$23,300	\$23,300	\$23,300

PRIORITIZATION

(1) INTERNAL RATE OF RETURN (IRR)

Divide estimated project cost \$17,700 by average annual savings \$23,300 = 0.76 factor. Based on factor and number of years economic life of the project, select the IRR from

Table H-3, App H, Ch 5, AR 5-4 = 300+ % IRR.

(2) SAVINGS TO INVESTMENT RATIO (S/I)

Multiply annual savings \$23,300 X discount factor 9.524 = 221,909 and divide by present value of investment (undiscounted) 17,700 = 12.5 S/I.

(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE (R/MS)

Divide estimated project cost -- by number of manpower space savings -- = -- R/MS. (Manpower requirements cannot be used in this computation.)

1 August 1982

COST FOR PROJECT TO BECOME OPERATIONAL

22.

EQUIPMENT TYPE <i>a</i>	PROPOSED SOURCE OF PROCUREMENT <i>b</i>	UNIT PRICE <i>c</i>	QUANTITY <i>d</i>	TOTAL COST <i>e</i>	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT <i>f</i>	FY FUNDS REQUIRED <i>g</i>
(1) Condensate Return System piping, valves, controls		\$17,700		\$17,700		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION (Equipment delivery)						
(7) EQUIPMENT MODIFICATION ¹						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT ²						
(10) FACILITIES MODIFICATION ³						
(11) TRAINING						
(12) OTHER (Specify):						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL ⁴				\$17,700		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$17,700		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵				--		
(16) TOTAL (Sum of (14) + (15) above)				\$17,700		

¹ Not to exceed 10% of equipment cost for QRIP projects.² Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.³ Normally not OPA funded.⁴ Used to compute amortization in Item 11.⁵ Specify source to include certification that funds are available, if financed from the regular budget.

SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)

23.

ITEMS <i>a</i>	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR <i>b</i>	TYPE PERS ⁶ <i>c</i>	DOLLARS <i>d</i>	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
				<i>e.</i> FROM	<i>f.</i> TO	<i>g.</i> FROM	<i>h.</i> TO	<i>i.</i> FROM	<i>j.</i> TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS ⁷									
(7) OTHER DOLLAR SAVINGS (Excluding Manpower), e.g., CONTRACT COSTS & UTILITIES			\$23,300						
(8)									
(9)									
(10)									
(11) TOTAL DOLLAR SAVINGS			\$23,300						

⁷Reflect specific duties being performed with additional manhours available (equivalent manyears)

6

- (1) US Graded
- (2) US Wage Board
- (3) DHEN
- (4) THEN
- (5) Officer
- (6) WO
- (7) Enlisted

REGULATORY APPROVAL/COORDINATION

INVESTMENT STATEMENT

This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints.

(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)

b. OTHER COORDINATION (Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)

25. SUBMITTED BY (Typed name, grade and title of Subordinate Command/Agency or Project Initiator)

SIGNATURE

DATE (YYMMDD)

AUTOVON

26. APPROVAL RECOMMENDED BY (MCOM/Agency)

SIGNATURE

DATE (YYMMDD)

AUTOVON

FOR USE BY HQDA ON OSD PIF PROJECTS ONLY

27. APPROVED BY

SIGNATURE

DATE (YYMMDD)

AUTOVON

20. OTHER REMARKS (Cont'd)



SUBJECT ECO #6 - Plating
Area Condensate Return
DESIGNER P. Hutchins
CHECKER B. Todd

AEP NO 290-0379-00
SHEET OF
DATE 7/11/91
DATE 9/16/91

ECO #6 - PLATING AREA CONDENSATE RETURN

- Estimate existing energy use for making steam

FY 90

BLDG 136 - 278,000 MBtu FSR

BLDG 35 - 29,500 MBtu N64S

- Calculate total steam generated

$$\text{Stm} = \text{FUEL USE} \times \text{BLR EFF} \quad (\text{App B, p. I-11})$$

	<u>BLR EFF</u>	<u>MBtu</u>	<u>#</u>
BLDG 136	0.83	230,700	232,133,000
BLDG 35	0.77	22,700	22,852,000

- Estimate condensate to be returned from plating area

Since Bldg 35 boiler supplies only the plating areas and no condensate is returned, the steam production during the summer months will be a good approximation for year-round use.

Average steam production for Aug and Sept '90

$$(3,676,600 + 3,983,500) / 2 \approx 3,830,000 \text{ \# / mon}$$

Plating area annual steam use is $\Rightarrow 3,830,000 \times 12 \approx 45,960,000 \text{ \# / yr}$
 $\approx 46,000 \text{ MBtu / yr}$



SUBJECT ECO #6
DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE 7/11/91
DATE _____

- Calculate energy savings by returning
plating area condensate

Assume 90% is returned at 180°F to
Bldg 35 and 150°F to Bldg 136.

$$\text{Fuel Energy Saved} = \frac{\text{condensate amount} \times (\text{cond. temp} - \text{make-up temp.})}{\text{BOILER EFF}}$$

$$\text{Bldg 35} \Rightarrow \frac{22,852,000^{\#} \times (180 - 60)^{\circ}\text{F} \times 1 \frac{\text{Btu}}{\text{lb}^{\circ}\text{F}} \times 0.9}{0.77}$$

$$= \underline{3205 \text{ MBtu}} \text{ Natural gas}$$

$$\text{Bldg 136} \Rightarrow \frac{(45,960,000 - 22,852,000) \times (150 - 60) \times 0.9}{0.83}$$

$$= \underline{2255 \text{ MBtu}} \text{ \#6 Fuel Oil}$$



SUBJECT ECO #6

DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

QRIP Calc.s

- Calculate present, proposed and savings costs

Present annual energy use to Bldg. 35 plating is estimated using natural gas use at donkey boiler in Bldg #35

	<u>Steam</u>		<u>Nat. Gas</u>	
	(lbs)	(MBtu)	(MCF)	(MBtu)
June '90	4,110,000	4110	51,373	5291
July '90	2,572,000	2572	32,494	3347
Aug. '90	3,676,000	3676	46,329	4772
Sept. '90	3,984,000	3984	49,696	5119
Oct. '90	3,155,000	3155	37,780	<u>3891</u>

Using Aug and Sept as avg., monthly use is:

$$\text{steam} = \frac{3676 + 3984}{2} = \underline{3830} \text{ MBtu/month.}$$

$$\text{n. gas} = \frac{4772 + 5119}{2} = \underline{4946} \text{ MBtu/month.}$$

$$\text{Annual N gas} = 4946 \frac{\text{MBtu}}{\text{mon}} \times 5 \text{ mos} \times \frac{\$4.16}{\text{MBtu}} = \underline{\$102,200}$$

$$\text{Annual Fuel Oil}^{\#6} = 3830 \frac{\text{MBtu}}{\text{mon}} \div 0.83 \times 7 \text{ mos} \times \frac{\$4.40}{\text{MBtu}} = \underline{\$142,100}$$

$$\text{TOTAL ENERGY COST} = \underline{\underline{\$245,000}}$$



SUBJECT ECO #6

DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

- Cost of proposed method

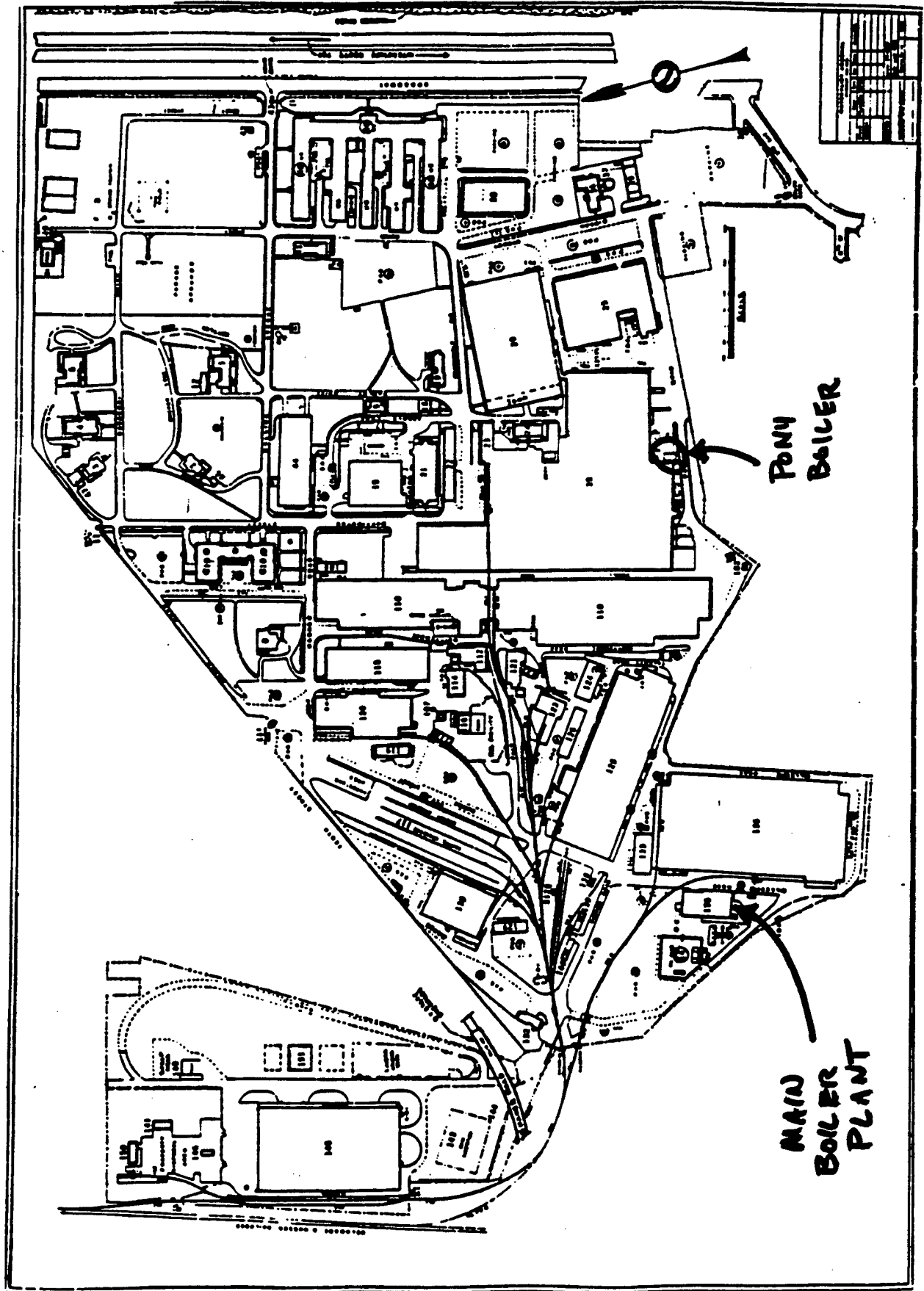
$$N_{\text{Gas}} = (4946 \times 5 - 3205) \times 4.16 = \$ 89,500$$

$$\#6 \text{ Fuel Oil} = \frac{(3830 \times 7 - 2255)}{0.83} \times 4.40 = \$ 132,200$$

$$\text{Total} \quad \$ 221,700$$

- Savings, annual

$$\begin{array}{r} \$ 245,000 \\ - 221,700 \\ \hline \$ 23,300 \end{array}$$



The diagram illustrates the flow of a plating system. It features two main plating tanks at the bottom: "Gun Tube Chrome Plating Bldg 35" on the left and "Small Parts Plating Bldg 35" on the right. Each tank has a "PH sensor" (represented by a box with a squiggle) connected to its outlet. The outlets from both tanks merge into a single line that leads to a "WASTE" tank. Above this line, there are two "ON/OFF" switches, each controlled by a "C" (controller). The line continues upwards, passing through two "EXISTING COND. RCR. BLDG 35" units. From here, it splits into two paths: one leading to a "NEW COND RCR BLDG 35 Small parts plate area" and another leading to a "NEW COND RCR BLDG 35 Gun tube Chrome plate area". Both new areas have "PH sensors" and are connected to a "DONKEY BOILER BLDG 35". The diagram also includes a "DURING HEATING SEASON" label with arrows pointing to the flow lines between the tanks and the new areas.

Gun Tube Chrome Plating Bldg 35

Small Parts Plating Bldg 35

PH sensor

PH sensor

WASTE

EXISTING COND. RCR. BLDG 35

EXISTING COND. RCR. BLDG 35

NEW COND RCR BLDG 35 Small parts plate area

NEW COND RCR BLDG 35 Gun tube Chrome plate area

PH sensor

PH sensor

DURING HEATING SEASON

DURING HEATING SEASON

TO DONKEY BOILER BLDG 35

TO BLDG 136 BOILERS

TO BLDG 136 BOILERS

"ON/OFF" "C" - CONTROLLER

Existing system flows to waste

New system consist of - 2 cond. rcr. tanks

C - CONTROLLER "ON/OFF"

- Existing system flows to waste
- New system consist of
- 2 cond. rcr. tanks
 - 2 manual 3-way valves
 - 2 pH sensors and controls for 2 mastergized 3-way valves

02/05/92

ECO Construction Cost Estimate Calculations

ECO Name: PLATING AREA STEAM CONDENSATE RETURN

ECO #: 6

1991 ECO "bare" costs (from cost estimate sheet)

Material	\$6,370
Labor	\$4,040

Subtotal bare costs	\$10,410
---------------------	----------

FICA Insurance (20% of Labor)	\$808
-------------------------------	-------

Sales Tax (not applicable for GOGO)	\$0
-------------------------------------	-----

Subtotal	\$11,218
----------	----------

Overhead (15%)	\$1,683
----------------	---------

Subtotal	\$12,901
----------	----------

Profit (10%)	\$1,290
--------------	---------

Subtotal	\$14,191
----------	----------

Bond (1%)	\$142
-----------	-------

Subtotal	\$14,333
----------	----------

Contingency (10%)	\$1,433
-------------------	---------

Subtotal (Construction Cost Input For LCCID *)	\$15,766
--	----------

SIOH (6% of Construction Cost)	\$946
--------------------------------	-------

Subtotal	\$16,712
----------	----------

Design (6% of Construction Cost)	\$946
----------------------------------	-------

Total Project Cost	\$17,658
--------------------	----------

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

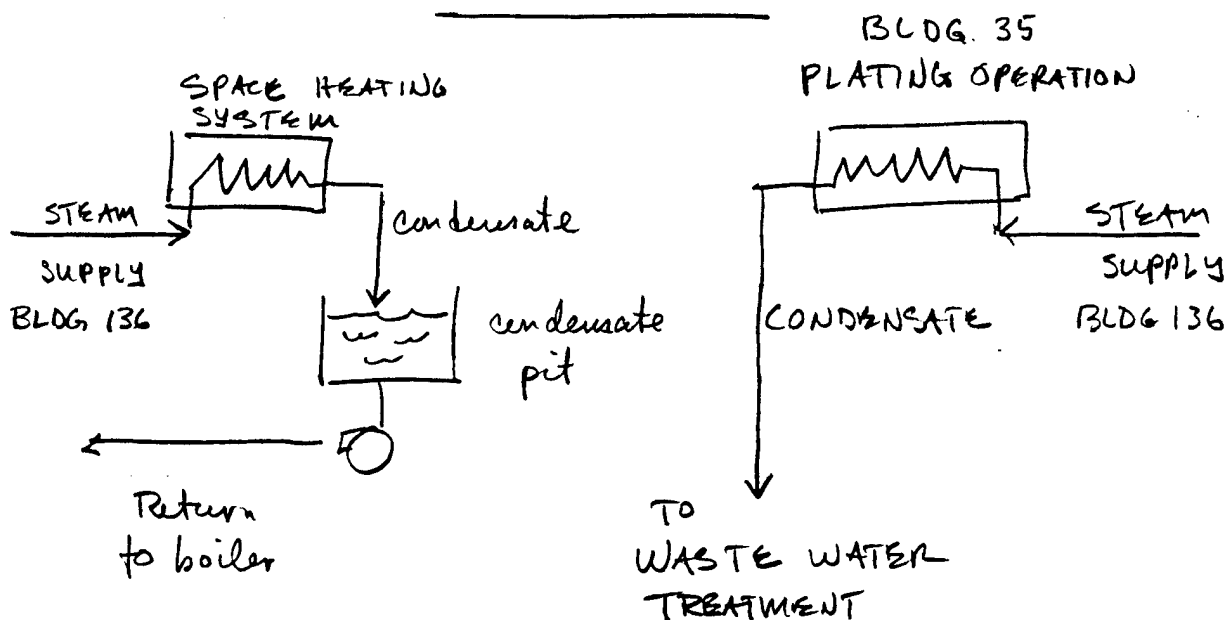


SUBJECT ECO # 6
COST ESTIMATE BACKUP
DESIGNER _____
CHECKER _____

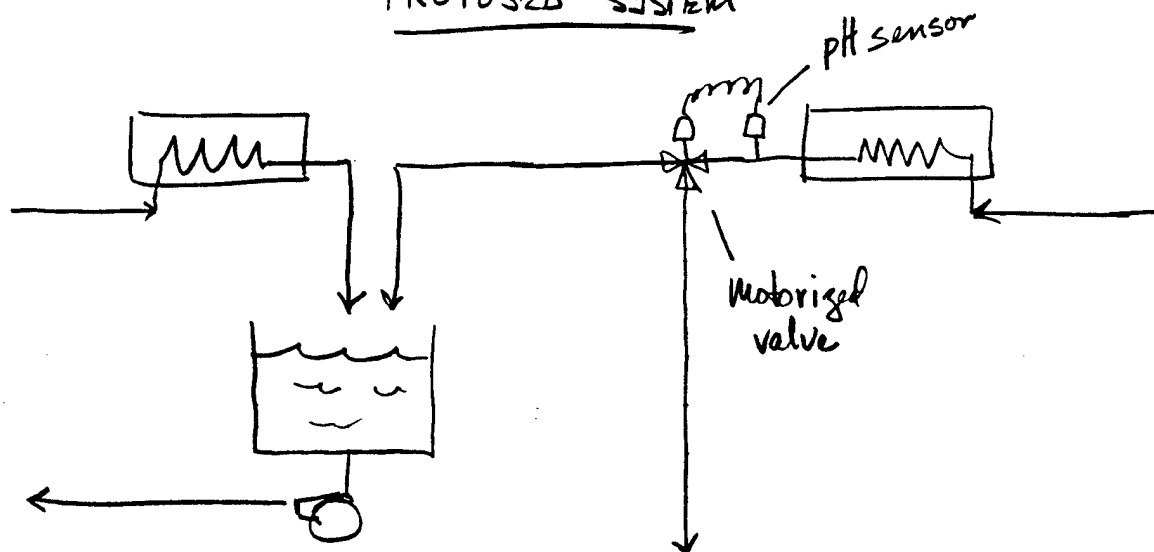
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SHEET _____ OF _____
DATE _____
DATE _____

Non-Summer Operation - Condensate return to Bldg 136

EXISTING SYSTEMS



PROPOSED SYSTEM



- The proposed system will require piping between the existing plating system condensate lines and the condensate pit, a motorized valve, pH sensor and associated controls. The pH sensor is used to divert the condensate to waste when the pH drops below a preset value.



SUBJECT ECD #6

DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

Summer Operation - Condensate return to
Bldg 35 boiler

Since the Bldg. 35 boiler has no condensate
return system, it will require all items
mentioned earlier for Bldg 136 condensate
return plus:

- condensate pit
- condensate pump
- pit/pump controls
- piping from pit pump
to boiler



SUBJECT ECO# 6
DESIGNER P. Hutchins
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE 8/7/91
DATE _____

- Determine condensate return requirements for donkey boiler from Bldg 36 plating areas
- Calculate condensate return pipe size

Ref.: "Flow of Fluids", Crane, 1979, p. 3-6, 7

- Reasonable velocities are:

Boiler Feed	8 to 15 fps
General Service	4 to 10 fps

The steam flow is ~ 7000 lbs/hr

The water density @ 200F is 60.1 lbs/cf

$$7000 \frac{\text{lbs}}{\text{hr}} \cdot \frac{\text{cf}}{60.1 \text{ lbs}} \cdot \frac{\text{hr}}{3600 \text{ sec}} = \underline{\underline{0.032 \frac{\text{cf}}{\text{sec}}}}$$

To keep the flow around 10 fps the pipe diameter should be

$$\begin{aligned} Q &= VA \\ A &= Q/V \\ A &= \pi D^2/4 \\ \pi D^2/4 &= Q/V \end{aligned}$$

$$0.032 \frac{\text{ft}^3}{\text{sec}} \cdot 7.5 \frac{\text{gal}}{\text{ft}^3} \cdot \frac{60 \text{ sec}}{\text{min}} = 14.4 \text{ gpm}$$

$$D = \sqrt{\frac{4Q}{\pi V}} = \sqrt{\frac{4(0.032 \frac{\text{cf}}{\text{sec}})}{3.14 \times 10 \frac{\text{ft}}{\text{sec}}}}$$

$$= 0.064 \text{ ft} = 0.77 \text{ inches}$$

or
3/4" pipe



SUBJECT ECO #6

DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

- Calculate condensate return pump size
Using Bernoulli's Egn.

$$H = 144 \frac{P_2 - P_1}{\rho} + \frac{V_2^2 - V_1^2}{2g} + z_2 - z_1 + h_f$$

where H = total head (ft)
 P_1 = pressure at ① (psig)
 P_2 = pressure at ② (psig)
 ρ = density of water @ 200°F (lbs/cf)
 $z_{1,2}$ = elevations at ①, ②
 h_f = friction loss (ft)

Pumping will be from the gun tube chrome plate area condensate tank to the pony boiler located due east of this area and outside of the building.

$P_1 = P_2$ = atmospheric pressure (pumping from one tank to another)

$$V_1 = V_2 = 0$$

$$H = z_2 - z_1 + h_f$$

$$h_f = f \frac{L}{D} \frac{V^2}{2g}$$



SUBJECT ECO#6

DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

- Calculate f , friction factor

f is read from the Moody friction factor chart
knowing the Reynolds number and ϵ/D
where $\epsilon = 0.0002$ for steel pipe

$$\epsilon/D = \frac{0.0002}{0.0687'} = 0.0029$$

$$N_{RE} = \frac{DV}{\nu} = \frac{0.0687 \text{ ft} \cdot 10 \text{ ft/sec}}{0.341 \times 10^{-5} \text{ ft}^2/\text{sec}} = 2.01 \times 5$$

For $\epsilon/D = 0.0029$ and $N_{RE} = 2.01 \times 5$, $f = 0.0265$

$$h_f = 0.0265 \frac{300 \text{ ft}}{0.0687 \text{ ft}} \frac{(10 \text{ ft/sec})^2}{2 (32.2 \text{ ft/sec}^2)}$$

$$h_f = 180 \text{ feet}$$

$$z_2 = -30 \text{ feet}$$

$$H = -30 + 180 = 150 \text{ ft}$$

$$bhp = \frac{QH}{3760 \eta_p}$$

where $Q = \text{gal/min}$ $H = \text{head in ft}$ $\eta_p = \text{pump eff}$

$$= \frac{14.4 \cdot 150}{3760 (0.7)} = 0.78 \text{ hp} - \text{use } \underline{1 \text{ hp pump}}$$



SUBJECT ECO #6

DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

For return from the small parts plating
area

$$H = z_2 - z_1 + h_f$$

$$z_2 - z_1 = 0$$

$$h_f = f \frac{L}{D} \frac{V^2}{2g} = 0.0265 \frac{300}{0.0687} \frac{10^2}{2 \cdot 32.2}$$

$$h_f = 180 \text{ ft}$$

$$\text{bhp} = \frac{14.4 \cdot 180}{3960 (0.7)} = 0.9 \text{ hp use } \underline{1 \text{ hp pump}}$$

Summary

Use 1" schedule 40 pipe - 600 ft
due to sensor requirements
and 2, 1 hp pumps



SUBJECT ECO #6 AEP NO _____
DESIGNER _____ SHEET _____ OF _____
CHECKER _____ DATE _____

- Determine equipment requirements for returning condensate from Bldg 35 plating areas to the Main Boiler Plant

Since condensate from the steam space heating system is already returned, the only requirements will be piping from the proposed receivers for returning condensate to the donkey boiler

Include 100' of $3/4$ " pipe plus valves

- Summarize total system requirements

The schematic on the following page shows the proposed condensate return system. pH sensors are used to divert condensate to waste drain if pH falls below a preset level, indicating acid contamination from plating areas. Otherwise, condensate flows to Bldg 136 during heating season and Bldg 35 donkey boiler during non-heating times.

QUOTATION



TO: REYNOLDS SMITH + HILLS
JACKSONVILLE, FL

DATE: 8/9/91

YOUR INQUIRY:
CONDENSATE DIVERTING
VALVES

ATTN MR PAUL HUTCHINS

GENTLEMEN:

WE HEREBY SUBMIT OUR QUOTATION WHICH IS SUBJECT TO IMMEDIATE ACCEPTANCE.

ITEM NO.	QUANTITY	DESCRIPTION	NET UNIT PRICE	TOTAL
		FOR CONDENSATE SERVICE AT 25 PSIG * 200°F.		
A	1	1" WORCESTER #D-446TTSEVI DIVERTING BALL VALVE CS BODY, 1" NPT(F), 316 TRIM, TEFLON SEATS + SEALS, Q10, ASSEMBLED WITH RCS #MAR 25-10-4 ELECTRIC ACTUATOR, N7, 115VAC, 0.75AMP LOCKED ROTOR DRAW, 2 EXTRA SWITCHES	\$ 602 ¹⁶	
3	2	1" WORCESTER #D-446TTSEVI DIVERTING BALL VALVE S/A ABOVE EXCEPT: WITH MANUAL LEVER 90°	123 ⁷⁰	

DELIVERY: 3 weeks

F.O.B. PHILA

PRICES IN EFFECT AT TIME OF SHIPMENT WILL APPLY.

TERMS: 2% 10TH AND 25TH - NET 30 UNLESS OTHERWISE INDICATED

HERMAN GOLDNER CO., INC.

PER

Brown



SPEC SHEET

PHCN-28

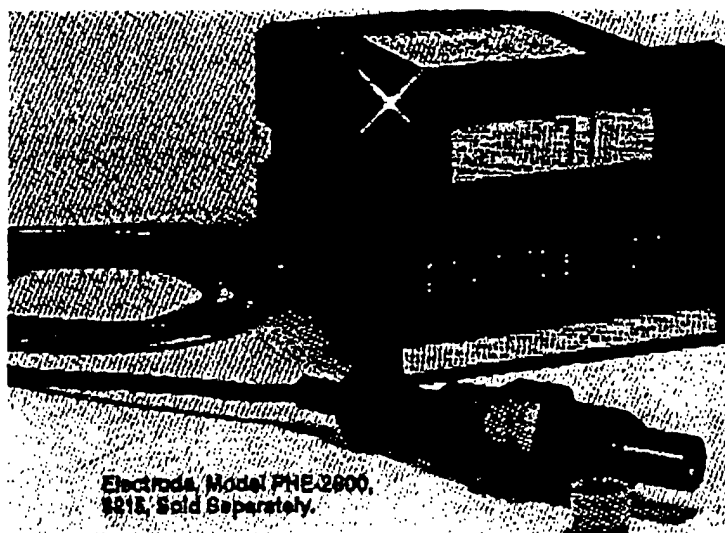
Versatile Microprocessor-Based pH Controller

From
\$625

- ✓ Compact NEMA-4X Polycarbonate Enclosure
- ✓ Two Independently Adjustable Alarm Contacts with Adjustable Deadband
- ✓ Choice of 4-20 mA dc or RS232C Output
- ✓ Auto Calibration, Dual Point or "Grab Sample"
- ✓ 10 Self Diagnostic Functions
- ✓ Direct or Reverse Analog Output with Span From 0.1 to 20 pH Units
- ✓ CSA Approved

The OMEGA PHCN-28 microprocessor pH controller features auto buffering, solution temperature compensation, self-diagnostics and communication capabilities. Designed with the end-user in mind, this controller is user friendly and easy to operate. Four tactile membrane keypads allow for the selection and input of set-up parameters, input of calibration data and alarm setpoint adjustments. The two 5 A, 230 Vac relays can be configured as high/low, high/high or low/low.

The PHCN-28 is offered with a choice of an isolated 4-20 or 0-20 mA dc output (field selectable) or an RS232C interface with a non-isolated 0-5 V analog output. The analog output is flexible enough to be used as either a proportional control output or recorder output. The self-diagnostics of the PHCN-28 can alert the user to such conditions as internal circuitry malfunction, pH out of range, pH slope out of normal range, ATC short or open, or electrode failure to stabilize in buffer.



Electrode, Model PHE-2800,
\$215, Sold Separately.

The PHCN-28 has an integral pre-amplifier and is designed for use with the PHE-2800 gel filled, double junction combination electrode with ATC. For locations where the electrode and controller must be separated by more than 50 ft, the PHCN-28-PA external pre-amplifier should be considered. The unit features a rugged NEMA-4X polycarbonate enclosure. If an application requires an electrode other than the PHE-2800, then the PHCN-28-PA must be used. In this case a Pt100 is necessary for ATC.

SPECIFICATIONS

Ranges: -4 to 16 pH, -100 to 200°C
Resolution: 0.01 pH, 0.1°C
Temperature Compensation: Automatic
 0 to 100°C, Pt100 ohm RTD
pH Accuracy: ±0.02 pH over range, -4 to 16 pH
Temp Accuracy: ±0.25°C over 0 to 100°C

Stability: ±0.01 pH, ±1 mV ORP over 30 days non-cumulative
Sensitivity: ±0.01 pH, ±1 mV ORP
Repeatability: ±0.01 pH, ±1 mV ORP

Ambient Temperature Coefficient: ±0.002 pH/°C

Power Input: 120 V 50/60 Hz 8 Watts, 240 V 50/60 Hz 8 Watts, jumper selectable (requires fuse change)

Outputs: 4-20 mA dc isolated, RS232C with 0-5 V non-isolated
Output Span: Any 0.1 to 20 pH span (0.1 pH increments) selectable reverse or direct acting

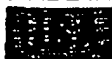
Alarms: 2 SPST electromechanical relays rated 5 A 230 Vac, resistive load; supplied as normally open; alarms can be configured H/H, H/L, L/L; alarm deadband fully adjustable over pH span

Dimensions: 4.45"H x 5.75"W x 6.95"D (113 x 146 x 177 mm)

Weight: 3 lbs (1.35 kg)



MADE IN



OMEGA ENGINEERING, INC.

One Omega Drive, Box 4047, Stamford, CT 06907
 Telex 996404 Cable OMEGA EASYLINK 62968934

1-800-82-66342

1-800-TC OMEGA

In CT Dial (203) 359-1660

24 Hour FAX: (203) 359-7700

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To Order (Specify Model No.)		
Model No.	Price	Description
PHCN-28-650	\$625	pH controller w/isolated 4-20 or 0-20 mA dc output
PHCN-28-D	730 760	pH controller w/RS232C interface and 0-5 V analog output (software available)
PHE-2800	215 235 250	Combination gel filled, double junction electrode w/ATC (integral Pt100); Kynar body construction; 1" MNPT connections at both ends for insertion or submersion, max pressure 100 PSIG at 65°C. Overall electrode length 5.67", insertion length 2.52"
PHCN-28-PA	318 365	Pre-amplifier for distances > 50 ft or for use w/electrodes other than PHE-2800; NEMA-4X enclosure (6.94" x 5.25" x 3.25")

OMEGACARE™ Extended Warranty: not available for this product.

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)															MONTH							
For use of this form, see AR 420-49; the proponent agency is USACE.															Bldg. No.							
INSTALLATION															PLANT							
WATERVLIET ARSENAL															Boiler Plant							
															136							
															May -90							
#	1000 LB.	STEAM PRODUCED				FEED WATER BOILER	FEED WATER BOILER	EVAP. PER UNIT	OUTSIDE TEMP. AV.	FEEDWATER HEATER		%BOILER	BOILER			FLUE GAS TEMPERATURE			FLUE MAKE	EFF.	INIT.	
		#1	#2	#3	#4					#5	TOTAL		1000 LB.	1000 LB.	1000 LB.	1000 LB.	1000 LB.	1000 LB.				1000 LB.
1	324.9																					
2	357.9																					
3	317.2																					
4	314.3																					
5	376.5																					
6	396.8																					
7	310																					
8																						
9																						
10																						
11																						
12																						
13																						
14																						
15																						
16																						
17																						
18																						
19																						
20																						
21																						
22																						
23																						
24																						
25																						
26																						
27																						
28																						
29																						
30																						
31																						
TOTAL	2796.4																					
MAXIMUM	203.2																					
MINIMUM	300.7																					
AVERAGE	559.3																					
EVAPORATION LB. STEAM PER LB. STD. FUEL																						
REMARKS: * total includes 17,300 gal of oil and 2 oil and 38,174 gal of oil																						
APPROVED BY															DATE							
R.D. Drank															6/11/90							
POST ENGINEER															DATE							

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)
For use of this form, see AR 420-49; the proponent agency is USACE.

INSTALLATION: **WATERVILLE ARSENAL**

PLANT: **BOILER PLANT**

BLDG. NO.: **35**

ONTH: **JUNE 90**

DATE	STEAM PRODUCED				FEED WATER TO BOILER 1,000 LB. (6)	GAS FUEL USED LB. M.C.F. (7)	EVAP. LB. PER UNIT (8)	PRESS. LB. (9)	TEMP. °F. (10)	MAKEUP GAL. (11)	%BO2 BOILER				FLUE GAS TEMPERATURE				TEMP. H.W. SUPPLY °F. (15)	TUBES CLEANED NUMBER OF TIMES (16)	PREVENT MAINT. CHECK (17)	EFF (18)		
	STEAM PRESSURE LB. (1)	2 1,000 LB. (2)	3 1,000 LB. (4)	TOTAL 1,000 LB. (5)							1 2 (12)	2 (13)	3 (14)	4 (15)	5 (16)	6 (17)	7 (18)	8 (19)						
1	135	138.4		138.4		1201	17.3	278	6	230	15.2													
2	135	103.6		103.6		1326	16.2	280	6	230	15.9													
3	135	143.4		143.4		1800	17.0	270	6	230	20.5													
4	135	223.4		223.4		2447	17.8	278	6	230	25.8													
5	135	204.7		204.7		2332	17.5	280	6	230	27.2													
6	135	193.5		193.5		1901	17.5	280	6	230	15.9													
7	135	151.1		151.1		1643	13.1	280	6	230	9.5													
8	135	40.7		40.7		1007	15.9	280	6	230	12.5													
9	135	75.4		75.4		2181	17.5	280	6	230	21.9													
10	135	174.4		174.4		2180	17.3	280	6	230	24.3													
11	135	169.3		169.3		2070	17.4	280	6	230	24.0													
12	135	169.2		169.2		2307	17.5	280	6	230	27.2													
13	135	190.0		190.0		1089	16.8	280	6	230	12.5													
14	135	86.4		86.4		1660	11.7	280	6	230	32.3													
15	135	92.0		92.0		3080	17.0	280	6	230	24.5													
16	135	167.0		167.0		3101	17.0	280	6	230	24.1													
17	135	169.3		169.3		2110	17.2	280	6	230	24.5													
18	135	171.4		171.4		2299	17.6	280	6	230	26.5													
19	135	189.2		189.2		939	16.1	280	6	230	12.7													
20	135	71.2		71.2		1752	16.9	280	6	230	19.4													
21	135	139.8		139.8		2558	17.7	280	6	230	20.8													
22	135	212.7		212.7		2434	17.2	280	6	230	20.7													
23	135	202.0		202.0		2446	17.5	282	6	230	20.4													
24	135	201.4		201.4		2328	17.6	277	6	230	29.0													
25	135	192.6		192.6		1745	17.0	283	6	230	22.3													
26	135	179.1		179.1		1251	15.0	285	6	230	15.3													
27	135	88.4		88.4		51373	453.1	7553	162	6195	111.6													
28	135	410.0		410.0		2666	17.8	285	6	230	32.2													
29	135	233.4		233.4		663	11.7	270	6	225	9.5													
30	135	40.7		40.7		19027	16.8	275.1	6	229	22.6													
31	135	152.5		152.5																				
TOTAL																								
MAXIMUM																								
MINIMUM																								
AVERAGE																								
EVAPORATION LB. STEAM PER LB. STD. FUEL																								

REMARKS:

APPROVED BY: *R.O. Drake*

DATE: 7/9/90

POST ENGINEER

DATE

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)															INSTALLATION		PLANT		BLDG. NO.		WITH	
For use of this form, see AR 420-49; the proponent agency is USACE.															WATERVLIET ARSENAL		Boiler Plant		35		July 90	
DATE	STEAM PRODUCED				FEED-WATER TO BOILER	GAS FUEL USED	EVAP. PER UNIT	BOILER PRESS.	TEMP. °F.	WATER HEAT	BOILER		FLUE GAS TEMPERATURE		TEMP. H.W. SUPPLY	TUBES CLEANED NUMBER OF TIMES	PREVENT MAINT. CHECK	EFF.	INIT			
	1	2	3	TOTAL							1	2	1	2						1	2	1
1	135	115.9		115.9		1591	15.5	285	8	230	18.7	7.7										
2	135	153.3		153.3		1881	17.3	283	8	230	22.7	6.3										
3	135	102.0		102.0		1346	16.1	280	8	230	15.5	6.2										
4	135	126.9		126.9		1716	15.7	280	8	230	15.3	6.2										
5	135	178.3		178.3		2185	17.4	280	8	230	26.8	5.6										
6	135	228.7		228.7		1082	17.4	280	8	230	12.3	5.9										
7																						
8	135	130.0		130.0		1557	17.7	280	8	230	15.9	3.7										
9	135	135.1		135.1		1705	16.8	280	8	230	19.0	6.1										
10	135	129.7		129.7		1645	16.7	280	8	230	18.6	6.8										
11	135	166.0		166.0		2051	17.2	280	8	230	27.0	6.0										
12	135	172.3		172.3		2115	17.3	280	8	230	26.6	6.2										
13	135	146.8		146.8		1789	17.5	285	8	230	23.9	6.5										
14	135	152.6		152.6		1903	17.1	280	8	230	23.1	6.0										
15	135	140.7		140.7		1781	16.8	280	8	230	16.8	6.0										
16	135	165.1		165.1		2055	17.0	300	8	230	21.8	6.0										
17	135	165.3		165.3		2053	17.0	300	8	230	25.7	5.5										
18	135	156.9		156.9		1965	17.0	293	8	230	25.5	5.6										
19	135	123.4		123.4		1597	16.4	290	8	230	21.7	5.8										
20	135	22.9		22.9		477	17.4	290	8	230	8.3	7.2										
21																						
22																						
23																						
24																						
25																						
26																						
27																						
28																						
29																						
30																						
31																						
TOTAL		571.9		571.9		3571.9	37.3	5406			344.7	115.3										
MAXIMUM		178.3		178.3		2185	17.7	300	8	230	27.0	7.7										
MINIMUM		22.9		22.9		1346	15.5	280	8	230	8.3	3.7										
AVERAGE		185.4		185.4		1716	16.4	285	8	230	20.2	6.1										
EVAPORATION LB. STEAM PER LB. STD FUEL																						
FUEL USED DURING MONTH (STANDARD TONS)															REMARKS							
PREPARED BY <i>R.D. Dwork</i>															APPROVED BY							
DATE 8/6/90															DATE							
POST ENGINEER															DATE							

DA FORM 3967 1 NOV 72 REPLACES DA FORM 5-96 1 JUN 58, WHICH WILL BE USED.

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)										INSTALLATION		PLANT		BLOG. NO.		INTH				
For use of this form, see AR 420-49; the proponent agency is USACE.										WATERBURY Arsenal		Boiler Plant		25		F116 00				
DATE	STEAM PRODUCED				FEED WATER TO BOILER	GAS FUEL USED	EVAP. LB. PER UNIT	FEEDWATER HEATER		%CO ₂		FLUE GAS TEMPERATURE				TUBES CLEANED NUMBER OF TIMES	PREVENT MAINT. CHECK	EFF	INIT	
	STEAM PRESSURE LB.	100 LB.	2	3				TEMP. °F.	MAKUP GAL.	6	2	3	6	2	3					6
1																				
2																				
3																				
4	135	122.5				10.0	16.8	290	8	120	21.2	5.0							89.9	DK
5	135	112.3				11.0	16.8	290	8	120	21.2	5.0							89.9	DK
6	135	159.8				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
7	135	129.5				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
8	135	157.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
9	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
10	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
11	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
12	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
13	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
14	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
15	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
16	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
17	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
18	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
19	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
20	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
21	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
22	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
23	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
24	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
25	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
26	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
27	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
28	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
29	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
30	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
31	135	162.1				10.5	16.8	290	8	120	21.2	5.0							89.9	DK
TOTAL																				
MAXIMUM																				
MINIMUM																				
AVERAGE																				

DA FORM 1 NOV 72 3967 REPLACES DA FORM 5-98 1 JUN 56 WHICH WILL BE USED.

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)

For use of this form, see AR 420-49; the proponent agency is USACE.

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)										PLANT		BLDG. NO.		MONTH							
WATERVILLE ARSENAL										BOILER PLANT		35		SEPT. 90							
DATE	STEAM PRESSURE LB.	STEAM PRODUCED			FEED WATER TO BOILER 1,000 LB.	GAS FUEL USED LB. M.C.F.	EVAP. LB. PER UNIT	FEED. PRESS. LB.	TEMP. °F.	MAKEUP GAL.	% BOILER			FLUE GAS TEMPERATURE			TUBES CLEANED NUMBER OF TIMES	PREVENT MAINT. CHECK	EFF	INIT	
		6	2	3							6	2	3	6	2	3					6
1	135	29.7			24.7		1491		260	8	230	25.3	133	3.4						68.6	PK
2	135	113.2			113.2		1326		250	8	230	25.3	61							73.3	PK
3	135	142.0			142.0		1792		250	8	230	24.9	1.3							89.3	
4	135	110.6			110.6		1436		250	8	230	19.7	5.2							87.3	
5	135	108.3			108.3		1466		250	8	230	23.9	5							91.2	
6	135	108.3			108.3		1466		250	8	230	19.1	6							93.7	
7	135	108.3			108.3		1466		250	8	230	11.1	8							94.3	
8	135	108.3			108.3		1466		250	8	230	15.9	6.5							95.2	
9	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
10	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
11	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
12	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
13	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
14	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
15	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
16	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
17	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
18	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
19	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
20	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
21	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
22	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
23	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
24	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
25	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
26	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
27	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
28	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
29	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
30	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
31	135	108.3			108.3		1466		250	8	230	17.1	4.5							95.2	
TOTAL																					
MAXIMUM																					
MINIMUM																					
AVERAGE																					

APPROVED BY	DATE	POST ENGINEER	DATE
	10/5/90		

REMARKS

FUEL USED DURING MONTH (STANDARD TONS)

EVAPORATION LB. STEAM PER LB. STD. FUEL

SEE REVERSE SIDE FOR INSTRUCTIONS

NA FORM 2067

6-22

FACILITIES ENGINEERING OPERATING LOG (Boiler Plant)

For use of this form, see AR 420-49; the proponent agency is USACE.

INSTALLATION										PLANT		BLOG. NO.		MONTH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
WATERVILLE AR, E. R.										Boiler Plant		T-35		OCT. 90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
DATE	STEAM PRODUCED				FEED-WATER BOILER 1,000 LB.	GAS FUEL USED LB. M.C.F. GAL.	EVAP. LB. PER UNIT	OUTSIDE TEMP. °F	PRESS. LB.	TEMP. °F	FEEDWATER HEATER		FLUE GAS TEMPERATURE				TEMP. H.W. SUPPLY °F.	TUBES CLEANED NUMBER OF TIMES	PREVENT. MAINT. CHECK	INIT.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	STEAM PRESSURE LB.	1,000 LB.	2,000 LB.	3,000 LB.							1,000 LB.	2,000 LB.	3,000 LB.	1,000 LB.	2,000 LB.	3,000 LB.					1,000 LB.	2,000 LB.	3,000 LB.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
1	135	173.2			173.2	2156	17.0	250	8	230	26.6	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000

EVAPORATION LB. STEAM PER LB. STD. FUEL	315.50
TOTAL	315.50
MAXIMUM	315.50
MINIMUM	315.50
AVERAGE	315.50

REMARKS	11/16/91
APPROVED BY	
POST ENGINEER	
DATE	

DA FORM 3967 1 NOV 72 REPLACES DA FORM 5-98 1 JUN 59, WHICH WILL BE USED.

1 August 1982

1, AR 5-4

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS For use of this form, see AR 5-4; the proponent agency is OCA.				1. PROJECT NO.		REQUIREMENT CONTROL SYMBOL DD-M(R) 1561	
2. TO: CDR, AMC (AMCRM-MP) 5001 Eisenhower Avenue Alexandria, VA 22333-0001		3. THRU:		4. FROM: CDR, AMCCOM Attn: AMSMC-MGP-P (R) Rock Island, IL 61299-6000		5. DOD COMP NAME Army	6. DOD COMP CODE A
9. PROJECT TITLE Natural Gas Boilers (ECO #12)		10. TYPE OF PROJECT (Check one) ☒ QRIIP ☐ OSD PIF ☐ PECIP		11. AMORTIZATION YEARS/MONTHS \$ 49,900 (Project Cost) x 12 (No. Mos) = 1.3 (years) or (amortization)		7. COMMAND CODE W73QKK	8. DATE
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE 25 years		14. EXPECTED OPERATIONAL DATE			
15. SUBMITTING UNIT(S)	16. UNIT ID CODE	17. PROJECT DESCRIPTION Install natural gas boilers to replace electric boilers used to provide humidification in Buildings 40, 44 and 125.					
Commander Watervliet Arsenal Attn: SMCWV-FE (W. Face) Building 120 Watervliet, NY 12189		WOK9AA					
18. DETAILED JUSTIFICATION Using natural gas to provide steam for humidification is less expensive than electricity.							
19. SAVINGS DISPOSITION Savings are used to reduce energy expenditures.							
20. OTHER REMARKS (Continue on page 5, if more space is needed)							

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY (Identify Elec & Nat Gas)	\$50,800	\$13,000	\$13,000	\$13,000	\$13,000	\$37,800	\$37,800	\$37,800	\$37,800
CONTRACT COSTS									
OTHER (Identify)									
TOTALS	\$50,800	\$13,000	\$13,000	\$13,000	\$13,000	\$37,800	\$37,800	\$37,800	\$37,800

PRIORITIZATION

(1) INTERNAL RATE OF RETURN (IRR)
Divide estimated project cost \$49,900 by average annual savings \$37,800 = 1.3 factor. Based on factor and number of years economic life of the project, select the IRR from Table H-3, App H, Ch. 5, AR 5-4 = 125 % IRR.

(2) SAVINGS TO INVESTMENT RATIO (\$/I)
Multiply annual savings \$37,800 X discount factor 9.524 = 360,007 and divide by present value of investment (undiscounted) 49,900 = 7.2 \$/I.
(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE (RIMS)
Divide estimated project cost -- by number of manpower space savings -- = -- RIMS. (Manpower requirements cannot be used in this computation.)

COST FOR PROJECT TO BECOME OPERATIONAL

22.

EQUIPMENT TYPE <i>a</i>	PROPOSED SOURCE OF PROCUREMENT <i>b</i>	UNIT PRICE <i>c</i>	QUANTITY <i>d</i>	TOTAL COST <i>e</i>	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT <i>f</i>	FY FUNDS REQUIRED <i>g</i>
(1) Natural Gas Boilers		\$49,900	1	\$49,900		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION (Equipment delivery)						
(7) EQUIPMENT MODIFICATION ¹						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT ²						
(10) FACILITIES MODIFICATION ³						
(11) TRAINING						
(12) OTHER (Specify):						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL ⁴				\$49,900		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$49,900		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵						
(16) TOTAL (Sum of (14) + (15) above)				\$49,900		

¹ Not to exceed 10% of equipment cost for QRIP projects.² Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.³ Normally not OPA funded.⁴ Used to compute amortization in Item 11.⁵ Specify source to include certification that funds are available, if financed from the regular budget.

SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)

ITEMS <i>a</i>	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR <i>b</i>	TYPE PERS ^d <i>c</i>	DOLLARS <i>d</i>	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
				<i>e</i> FROM	<i>f</i> TO	<i>g</i> FROM	<i>h</i> TO	<i>i</i> FROM	<i>j</i> TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS ⁷									
(7) OTHER DOLLAR SAVINGS (Excluding Manpower), e.g., CONTRACT COSTS & UTILITIES			\$37,800						
(8)									
(9)									
(10)									
(11) TOTAL DOLLAR SAVINGS			\$37,890						

⁷Reflect specific duties being performed with additional manhours available (equivalent manyears)

- 6
- (1) US Graded
 - (2) US Wage Board
 - (3) DHEN
 - (4) IHFN
 - (5) Officer
 - (6) WO
 - (7) Enlisted

REGULATORY APPROVAL/COORDINATION

24.

INVESTMENT STATEMENT

a.

This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints.

(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)

b. OTHER COORDINATION (Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)

25. SUBMITTED BY (Typed name, grade and title of Subordinate Command/Agency or Project Initiator)

SIGNATURE

DATE (YYMMDD)

AUTOVON

26. APPROVAL RECOMMENDED BY (MACOM/Agency)

SIGNATURE

DATE (YYMMDD)

AUTOVON

FOR USE BY HQDA ON OSD PIF PROJECTS ONLY

27. APPROVED BY

SIGNATURE

DATE (YYMMDD)

AUTOVON

20. OTHER REMARKS (Cont'd)



SUBJECT WVA - Bldgs. 40, 44 & 125
Replace Electric Boilers
DESIGNER W.T. Todd
CHECKER _____

AEP NO 290-0379-002
SHEET 1 OF 6
DATE 1-31-92
DATE _____

ECO #12

Replace Electric Boilers with Natural Gas Boilers

The electric boilers located in Buildings 40, 44, 125N and 125S are used for humidification purposes. The boiler sizes are 90 Kw, 210 Kw, 58 Kw and 58 Kw, respectively.

By replacing these boilers with boilers that utilize natural gas the cost for energy to humidify this building will be reduced by over \$15 per MBtu.

The annual hours that humidification is required was calculated by a spreadsheet computer program. The results are shown on page 3. Assuming an operating diversity of 0.30, the boilers will operate:

$$5862 \text{ hrs/yr} \times 0.30 = 1759 \text{ hrs/year}$$

Current energy use (Electricity):

$$416 \text{ Kw} \times 1759 \frac{\text{Hrs}}{\text{yr}} = 731,744 \text{ KWH/year}$$

$$731,744 \frac{\text{KWH}}{\text{yr}} \times 3413 \frac{\text{Btu}}{\text{KWH}} \times \frac{1 \text{ MBtu}}{10^6 \text{ Btu}} = \underline{2497.4 \text{ MBtu/yr}}$$

Future energy use (Natural Gas):

$$2497.4 \frac{\text{MBtu}}{\text{yr}} \div 0.80 \text{ (eff.)} = \underline{3121.8 \text{ MBtu/yr}}$$



SUBJECT WVA - Bldgs. 40, 44 & 125
Replace Electric Boilers
DESIGNER W.T. Todd
CHECKER _____

AEP NO 290-0379-002
SHEET 2 OF _____
DATE 1-31-92
DATE _____

The Future energy use calculation assumes the same output will be required and the efficiency of the N.G. boiler is 80%.

Energy Savings = Current energy use - Future energy use

$$\text{Electricity Savings} = 2497.4 \frac{\text{MBtu}}{\text{yr}} - 0 = \underline{2497.4 \frac{\text{MBtu}}{\text{yr}}}$$

$$\text{Natural Gas Savings} = 0 - 3121.8 \frac{\text{MBtu}}{\text{yr}} = \underline{(3121.8) \frac{\text{MBtu}}{\text{yr}}}$$

Total Savings:

$$\text{Energy: } 2497.4 \frac{\text{MBtu}}{\text{yr}} - 3121.8 \frac{\text{MBtu}}{\text{yr}} = \underline{(624.4) \frac{\text{MBtu}}{\text{yr}}}$$

Project Implementation Cost:

$$\text{Total Project Cost} = \underline{\$49,944}$$

See Cost Estimate Sheets for details



SUBJECT ECO #12

DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

QRIP Calculations

Present Method

$$\text{Elec} = 2497.4 \frac{\text{MBtu}}{\text{yr}} + \frac{\$20.35}{\text{MBtu}} = \$50,800$$

Proposed Method

$$\text{N. Gas} = 3121.8 \frac{\text{MBtu}}{\text{yr}} + \frac{\$4.16}{\text{MBtu}} = \$13,000$$

$$\text{Savings} = \overline{\$37,800}$$

PROJECT: WATERLIET ARSENAL LIMITED ENERGY STUDY

01/31/92

INPUTS: 1) Days Per Week That HVAC Operates 7 Days/Week
 2) Summer Room Dry Bulb Temperature 75 °F (db)
 Room Wet Bulb Temperature 63 °F (wb)
 3) Winter Room Dry Bulb Temperature 68 °F (db)
 If RH Controlled, wb Temp. 57 °F (wb)
 and Ground Water Temperature 50 °F
 4) Outside Air Quantity (cfm) 1 cfm
 5) HVAC Oper. Hrs/Shift: 12 M → 8 AM 8 Hrs/Shift
 8 AM → 4 PM 8 Hrs/Shift
 4 PM → 12 M 8 Hrs/Shift

Temperatures		Hours of Occurrence			Total Oper. Hours	Outside Air Load (MBtu/Yr)			
db-Range	wb	00-08	08-16	16-24		Cooling	Dehumid	Heating	Humid.
120	124				0	0.0000	0.0000	0.0000	0.0000
115	119				0	0.0000	0.0000	0.0000	0.0000
110	114				0	0.0000	0.0000	0.0000	0.0000
105	109				0	0.0000	0.0000	0.0000	0.0000
100	104				0	0.0000	0.0000	0.0000	0.0000
95	99	75	0	7	0	0.0002	0.0001	0.0000	0.0000
90	94	72	0	28	6	0.0006	0.0004	0.0000	0.0000
85	89	71	0	95	28	0.0016	0.0018	0.0000	0.0000
80	84	68	4	177	73	0.0020	0.0024	0.0000	0.0000
75	79	66	27	248	140	0.0009	0.0032	0.0000	0.0000
70	74	64	115	257	222	0.0000	0.0039	0.0000	0.0000
65	69	61	234	235	271	0.0000	0.0019	0.0000	0.0000
60	64	57	263	212	252	0.0000	0.0000	0.0048	0.0000
55	59	52	274	190	236	0.0000	0.0000	0.0085	0.0009
50	54	48	263	183	214	0.0000	0.0000	0.0116	0.0036
45	49	43	242	183	205	0.0000	0.0000	0.0146	0.0069
40	44	38	229	202	205	0.0000	0.0000	0.0182	0.0099
35	39	34	261	241	251	0.0000	0.0000	0.0257	0.0133
30	34	30	295	220	262	0.0000	0.0000	0.0308	0.0152
25	29	25	216	156	191	0.0000	0.0000	0.0254	0.0128
20	24	20	163	112	130	0.0000	0.0000	0.0205	0.0103
15	19	16	110	79	96	0.0000	0.0000	0.0160	0.0074
10	14	11	84	43	65	0.0000	0.0000	0.0118	0.0053
5	9	6	60	27	38	0.0000	0.0000	0.0084	0.0036
0	4	2	37	16	22	0.0000	0.0000	0.0054	0.0022
-5	-1	-3	27	3	9	0.0000	0.0000	0.0030	0.0012
-10	-6	-8	10	0	4	0.0000	0.0000	0.0012	0.0004
-15	-11	-13	5	0	0	0.0000	0.0000	0.0004	0.0002
-20	-16	-17	3	0	0	0.0000	0.0000	0.0003	0.0001
-25	-21					0.0000	0.0000	0.0000	0.0000
-30	-26					0.0000	0.0000	0.0000	0.0000
-35	-31					0.0000	0.0000	0.0000	0.0000
-40	-36					0.0000	0.0000	0.0000	0.0000
-45	-41					0.0000	0.0000	0.0000	0.0000
Totals		2922	2914	2920	8756	0.0053	0.0138	0.2066	0.0935
Total operating hours for each system						833	2167	6589	5862

CONSTRUCTION COST ESTIMATE

DATE PREPARED

1-31-92

SHEET 4 OF

PROJECT

ENERGY ENGINEERING ANALYSIS

LOCATION

WATERVLIET ARSENAL

ARCHITECT ENGINEER

REYNOLDS, SMITH AND HILLS

BASIS FOR ESTIMATE

- ☒ CODE A (No design completed)
☐ CODE B (Preliminary design)
☐ CODE C (Final design)
☐ OTHER (Specify) _____

DRAWING NO.

ESTIMATOR

W. T. Todd

CHECKED BY

Replace Ele. Boiler SUMMARY
 Bldgs. 40 & 125

QUANTITY

NO.
UNITSUNIT
MEAS.

LABOR

PER
UNIT

TOTAL

MATERIAL

PER
UNIT

TOTAL

TOTAL
COST

320 MBH Gas-Fired Boiler

1

EA

1125

1125

2640

2640

3765

203 MBH Gas-Fired Boiler

2

EA

865

1730

1840

3680

5410

Automatic Flue Damper

3

EA

17

51

118

354

405

6"Ø Gal. Steel Flue Chimney

90

VLF

7.20

648

5.00

450

1098

Sch. 40 Black Steel Pipe

300

LF

7.20

2160

3.98

1194

3354

Electric Switching

3

EA

91

273

485

1455

1728

6"Ø Roof Flashing

3

EA

12

36

9

27

63

Remove Exist. Boiler

3

EA

400

1200

-0-

-0-

1200

Pressure Regulator

3

EA

18.55

56

389

1167

1223

Sub-total

\$7,279

\$10,967

\$18,246

Source : Means Mechanical Cost Data, 1991
 Means Electrical Cost Data, 1991

(1) 20% added for fittings, includes rain cap.

(2) Includes Hangers, 20% added for fittings

(3) 2 men at \$25 per hour for 2 days

CONSTRUCTION COST ESTIMATE

DATE PREPARED

2-5-92

SHEET 5 OF

PROJECT

ENERGY ENGINEERING ANALYSIS

LOCATION

WATERVLIET ARSENAL

ARCHITECT ENGINEER

REYNOLDS, SMITH AND HILLS

BASIS FOR ESTIMATE

- ☒ CODE A (No design completed)
☐ CODE B (Preliminary design)
☐ CODE C (Final design)
☐ OTHER (Specify) _____

DRAWING NO.

ESTIMATOR

W. T. Todd

CHECKED BY

Replace Elec. Boilers
 Building 44

QUANTITY

LABOR

MATERIAL

TOTAL COST

NO.
UNITSUNIT
MEAS.PER
UNIT

TOTAL

PER
UNIT

TOTAL

765 MBH Gas-fired Boiler

1

EA

1725

1725

5740

5740

7465

Automatic Flue Damper

1

EA

18

18

128

128

146

8"Ø Gal. Steel Flue chimney

30

VLF

8.28

249

8.21

247

496

Sch. 40 Blk. Steel Pipe

50

LF

7.20

360

3.98

199

559

Pressure Regulator

1

EA

18.55

19

389

389

408

8"Ø Roof Flashing

1

EA

13.85

14

12.40

13

27

Electric Switching

1

EA

91

91

485

485

576

Remove Exist. Boiler

1

EA

400

400

-0-

-0-

400

Excavate & Backfill Trench, 8"

150

LF

0.21

32

0.17

26

58

Sch. 40 Steel, Coated Pipe

155

LF

3.34

518

4.21

653

1171

Crushed Stone Bedding, 6"

2

CY

3.01

6

14.17

29

35

Subtotal

\$3432

\$7909

\$11,341

Source: Means Mechanical Cost Data, 1991
 Means Electrical Cost Data, 1991

(1) 20% added for fittings, includes rain cap

(2) Includes Hangers, 20% added for fittings

(3) 2 men at \$25 per hour for 2 days

02/05/92

ECO Construction Cost Estimate Calculations

ECO Name: Replace Electric Boilers with Natural Gas Boilers

ECO #:

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$18,876
Labor		\$10,711
	Subtotal bare costs	\$29,587
FICA Insurance (20% of Labor)		\$2,142
Sales Tax (Not Applicable For GOGO)		\$0
	Subtotal	\$31,729
Overhead (15%)		\$4,759
	Subtotal	\$36,488
Profit (10%)		\$3,649
	Subtotal	\$40,137
Bond (1%)		\$401
	Subtotal	\$40,538
Contingency (10%)		\$4,054
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$44,592
		+-----+
SIOH (6.0% of Construction Cost)		\$2,676

	Subtotal	\$47,268
Design (6.0% of Construction Cost)		\$2,676

Total Project Cost		\$49,944

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

OSD PIF

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS <i>For use of this form, see AR 5-4; the proponent agency is OCA.</i>			1. PROJECT NO.		REQUIREMENT CONTROL SYMBOL DD-M(R) 1561	
2. TO: HQ. DA (EACA-RMP) Rm 3B719 (Pentagon) Washington, DC 20310-2070		3. THRU: CDR, AMC (AMCRM-MP) 5001 Eisenhower Avenue Alexandria, VA 22333-0001		4. FROM: CDR, AMCCOM Attn: AMSMC-MGP-P (R) Rock Island, IL 61299-6000		5. DOD COMP NAME Army
9. PROJECT TITLE Dip Tank Covers and Variable Speed Drives (ECO #4)		10. TYPE OF PROJECT (Check one) ☐ QRIIP ☒ OSD PIF ☐ PECIP		6. DOD COMP CODE A		7. COMMAND CODE W73QKK
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE 25 years		11. AMORTIZATION YEARS/MONTHS \$ 214,043 (Project Cost) * \$141,900 (Average Annual Savings) x 12 (No. Mos) = 1.5 (years) or (months) (amortization)		8. DATE
15. SUBMITTING UNIT(S) Commander Watervliet Arsenal Attn: SMCWV-FE (W. Face) Building 120 Watervliet, NY 12189	16. UNIT ID CODE WOK9AA	17. PROJECT DESCRIPTION Install flexible, chemically resistant cover on dip tanks in the Small Parts Plating Area in Building 35. Also install variable speed drives on exhaust fan motor and associated controls to provide a constant pressure differential across the fan.				
18. DETAILED JUSTIFICATION By installing the tank covers and VSDs/controls, energy can be saved. When the covers are in place, the VSD/controls will reduce the motor speed to maintain the same pressure differential across the fan without the cover.						
19. SAVINGS DISPOSITION Savings are used to reduce energy expenditures.						
20. OTHER REMARKS (Continue on page 5, if more space is needed)						

SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY (Identify #6 F.O. & Etc.)	\$505,000	\$354,700	\$354,700	\$354,700	\$354,700	\$141,900	\$141,900	\$141,900	\$141,900
CONTRACT COSTS									
OTHER (Identify)									
TOTALS	\$505,000	\$354,700	\$354,700	\$354,700	\$354,700	\$141,900	\$141,900	\$141,900	\$141,900

PRIORITIZATION

(1) INTERNAL RATE OF RETURN (IRR)

Divide estimated project cost 214,043 by average annual savings \$141,900 = 1.5 factor. Based on factor and number of years economic life of the project, select the IRR from

Table H-3, App H, Ch. 5, AR 5-4 = 95 % IRR.

(2) SAVINGS TO INVESTMENT RATIO (S/I)

Multiply annual savings \$141,900 X discount factor 9.524 = 1,351,456 and divide by present value of investment (undiscounted) 214,043 = 6.3 S/I.

(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE (RIMS)

Divide estimated project cost --- by number of manpower space savings --- = --- RIMS. (Manpower requirements cannot be used in this computation.)

22

COST FOR PROJECT TO BECOME OPERATIONAL

EQUIPMENT TYPE <i>a</i>	PROPOSED SOURCE OF PROCUREMENT <i>b</i>	UNIT PRICE <i>c</i>	QUANTITY <i>d</i>	TOTAL COST <i>e</i>	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT <i>f</i>	FY FUNDS REQUIRED <i>g</i>
(1) Tank Covers and Variable-Speed Drives				\$214,043		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION (Equipment delivery)						
(7) EQUIPMENT MODIFICATION ²						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT ³						
(10) FACILITIES MODIFICATION ¹						
(11) TRAINING						
(12) OTHER (Specify):						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL ⁴				\$214,043		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$214,043		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵						
(16) TOTAL (Sum of (14) + (15) above)				\$214,043		

¹ Not to exceed 10% of equipment cost for QRIP projects.² Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.³ Normally not OPA funded.⁴ Used to compute amortization in Item 11.⁵ Specify source to include certification that funds are available, if financed from the regular budget.

SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)										
ITEMS a	SAVINGS			REAPPLICATION OF SAVINGS						
	NO. MPR OR MHR b	TYPE PERS ^d c	DOLLARS d	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE		
				e. FROM	f. TO	g. FROM	h. TO	i. FROM	j. TO	
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED										
(2) REQUIREMENTS ONLY ELIMINATED										
(3) BORROWED MILITARY MANPOWER RELEASED										
(4) OVERHIRES OR TEMPORARIES TERMINATED										
(5) HOURS OVERTIME ELIMINATED										
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS ^e										
(7) OTHER DOLLAR SAVINGS (Excluding Manpower), e.g., CONTRACT COSTS & UTILITIES			\$141,900							
(8)										
(9)										
(10)										
(11) TOTAL DOLLAR SAVINGS			\$141,900							
6	*Reflect specific duties being performed with additional manhours available (equivalent manyears)									
	(1) US Graded (2) US Wage Board (3) DHFN (4) IHFN (5) Officer (6) WO (7) Enlisted									

REGULATORY APPROVAL/COORDINATION

24.

INVESTMENT STATEMENT

a.

This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints.

(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)

b. OTHER COORDINATION (Functional Coordination at local level, e.g., For Eng, Log, Pers, etc.)

25. SUBMITTED BY (Typed name, grade and title of Subordinate Command/Agency or Project Initiator)

SIGNATURE

DATE (YYMMDD)

AUTOVON

26. APPROVAL RECOMMENDED BY (MACOM/Agency)

SIGNATURE

DATE (YYMMDD)

AUTOVON

FOR USE BY HQDA ON OSD PIF PROJECTS ONLY

27. APPROVED BY

SIGNATURE

DATE (YYMMDD)

AUTOVON

28. OTHER REMARKS (Cont'd)

SUBJECT ECO#4 WVAAEP NO 290-0379-002DIP TANK

SHEET _____ OF _____

DESIGNER P. HutchinsDATE 7/22/91CHECKER B. ToddDATE 9/16/91

ECO#4 Dip Tank Covers with Exhaust Fan Controllers

Assumptions:

- Room Temperature = 68°F
- Heat Load Factor (HLF) (Vol II, App B. p I-8 thru I-10)
 - $\text{HLF}_1 = 0.145 \text{ MBtu/yr/cfm (24h/d, 5d/w)}$
 - $\text{HLF}_2 = 0.092 \text{ MBtu/yr/cfm (16h/d, 5d/w)}$
 - $\text{HLF}_3 = 0.044 \text{ MBtu/yr/cfm (8h/d, 5d/w)}$
 - $\text{HLF}_4 = 0.204 \text{ MBtu/yr/cfm (24h/d, 7d/w)}$
- Fan and motor efficiency = 0.5
- Steam Generation Efficiency Avg. = 0.80 (ECO#6)
- Fan AP = 3 in. w.c.
- Leakage with cover in place - 10% of uncovered
- Calculate present energy use - fuel oil for heating OSA replacing exhausted air and electricity used by fan motors

Fuel Oil

$$E_{\text{OSA}} = \frac{\text{CFM} \times 0.204 \text{ MBtu/yr/cfm}}{\text{STEAM Gen. eff}}$$

$$\text{hp} = \frac{\text{cfm} \cdot \Delta P}{6356 \cdot \eta_{\text{fan}}} \Rightarrow \text{cfm} = \frac{0.75 \text{ hp} \times 6356 \cdot \eta_{\text{fan}}}{\Delta P}$$

- Calculate current fan energy use

$$\frac{E_{\text{elec}}}{E_{\text{fan}}} = \frac{2545}{\text{hp} \times \text{Btu/hp} \times 8760 \text{ hr/yr} \times \frac{1 \text{ MBtu}}{10^6 \text{ Btu}} \times 0.75}$$

$$\text{where } \text{hp} = \frac{\text{cfm} \cdot \Delta P}{6356 \cdot \eta_{\text{fan}}}$$

Assume fan/motor operate at 75% of rated hp

SUBJECT ECO # 4

AEP NO _____

SHEET _____ OF _____

DESIGNER _____

DATE _____

CHECKER _____

DATE _____

- Calculate energy use with tank covers and VSDs

Plating operations are active for 1, 2 or 3 shifts
five days per week

# shifts	Hours/yr	
	<u>covered</u>	<u>uncovered</u>
1	6240	2520
2	4600	4160
3	2080	6680

With covers in place it is estimated that the
cfm will be reduced to 10% of the original flows

Fuel Oil

$$\text{Energy Use} = \frac{\text{CFM}_c * \text{HLF}_c}{0.80} + \frac{\text{CFM}_{uc} * \text{HLF}_{uc}}{0.80}$$

where the subscript c and uc represent covered and
uncovered events

$$\text{CFM}_c = \text{CFM}_{uc} \div 10$$

$$\text{CFM}_{uc} = \frac{\text{hp} * 6356 * \eta_{fan}}{\Delta P}$$

$$\text{HLF}_{uc} = \text{HLF}_4 - \text{HLF}_{\# \text{SHIFTS}}$$

Elec

hp varies with the cube of the flow

$$\frac{\text{hp}_2}{\text{hp}_1} = \left(\frac{\text{cfm}_2}{\text{cfm}_1} \right)^3 \quad \frac{\text{hp}_2}{\text{hp}_1} = \left(\frac{\text{cfm}_1 * 0.10}{\text{cfm}_1} \right)^3 = 0.001$$

Therefore, if the flow is reduced to 10% of original
the hp is reduced to 0.001 times the original hp.



SUBJECT ECO#4

DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

$$\text{Energy use} = h_{pc} * 2545 * 0.75 * H_c +$$

$$h_{puc} * 2545 * 0.75 * H_{uc}$$

where H = hours

c = covered

uc = uncovered

$$h_{puc} = h_{pc} * 0.001$$

0.75 = fraction of rated hp for actual operation

- Savings equal the difference between the present energy use and use with proposed covers $\frac{1}{2}$ USD.

The following spreadsheet implements these equations.

Small Parts Plating Exhaust Fans

	Exhaust Fan ID	hp	Est. CFM	Supply Fan ID	hp	Tanks Served (IDs)	Type *
Line 1	103	60	47,670	?	?	3,7,8,9,11,15,16,21,22,23,24	PP
	106	10 **	7,945	103	10	14	PP
	107	10 **	7,945	103	10	19	PP
	104	40 **	31,780	103	10	28,29,30	PP
	105	60	47,670	103	10	31,32,33	BL
Line 2	101	25	19,863	101	1.5	3,5,13,16	PP
	102	40	31,780	102	2	19,20,21,30,31	PP
Line 3	108	60 **	47,670	104	?	2,3,4,5,6,7,8,9,10,11,12,13,14	PP
	109	40 **	31,780	-	-	19,20,25,26	BL
Line 4	110	15 **	11,918	-	-	4,5	BL
	111	40 **	31,780	-	-	6,7,8,9,11	BL
	112	10	7,945	-	-	10	BL

*Exhaust system

PP = push-pull

BL = bilateral pull only

**Estimated

	Exhaust Fan ID	# Shifts	# Tanks	Present Use (MBtu/yr)			Proposed Use (MBtu/yr)			Savings (MBtu/yr)		
				#6 F.O.	N Gas	Elec	#6 F.O.	N Gas	Elec	#6 F.O.	N Gas	Elec
Line 1	103	3	11	12,156	0	1,003	8,987	0	767	3,168	0	236
	106	3	1	2,026	0	167	1,498	0	128	528	0	39
	107	3	1	2,026	0	167	1,498	0	128	528	0	39
	104	3	3	8,104	0	669	5,992	0	512	2,112	0	157
	105	3	3	12,156	0	1,003	8,987	0	767	3,168	0	236
Line 2	101	2	4	5,065	0	418	3,745	0	201	1,320	0	217
	102	2	5	8,104	0	669	5,992	0	321	2,112	0	348
Line 3	108	1	13	12,156	0	1,003	8,987	0	296	3,168	0	707
	109	1	4	8,104	0	669	5,992	0	197	2,112	0	472
Line 4	110	3	2	3,039	0	251	2,247	0	192	792	0	59
	111	3	5	8,104	0	669	5,992	0	512	2,112	0	157
	112	3	1	2,026	0	167	1,498	0	128	528	0	39
Totals			53	83,065	0	6,855	61,415	0	4,148	21,650	0	2,707



SUBJECT ECO #4 AEP NO _____
DESIGNER _____ SHEET _____ OF _____
CHECKER _____ DATE _____

Additional O & M :

Covers should be replaced every five years.
On an annual basis assume $\frac{1}{5}$ th are replaced every year

$$\text{Annual cost} = \frac{1}{5} \$800 \times 53 = \underline{\underline{\$8480/\text{yr}}}$$

QREP/OSD PIF CALC'S

Present Cost of Energy

Fuel oil	=	83,065	*	4.40	=	\$ 365,486
Elec.	=	6855	*	20.35	=	<u>139,499</u>
TOTAL					=	\$ 504,985

Proposed

Fuel Oil	=	61,415	*	4.40	=	\$ 270,226
Elec	=	4148	*	20.35	=	<u>84,412</u>
Total	=				=	\$ 354,638

Savings

Fuel Oil	=	21,650	*	4.40	=	\$ 95,260
Elec	=	2707	*	20.35	=	<u>55,087</u>
Total	=				=	\$ 150,347

02/05/92

ECO Construction Cost Estimate
Calculations

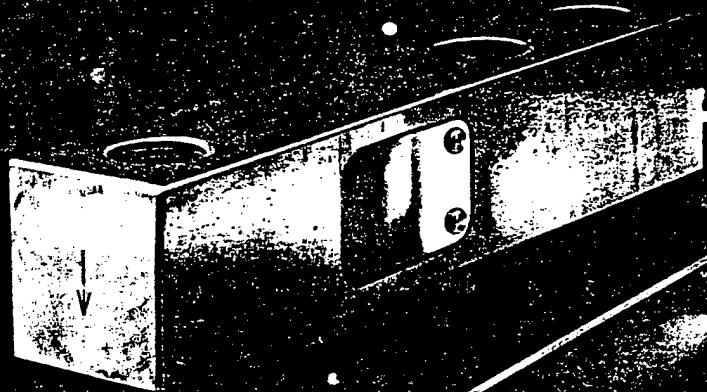
ECO Name: DIP TANK COVERS & EXHAUST FAN VSD

ECO #: 4

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$109,700
Labor		\$21,900
	Subtotal bare costs	\$131,600
FICA Insurance (20% of Labor)		\$4,380
Sales Tax (not applicable for GOGO)		\$0
	Subtotal	\$135,980
Overhead (15%)		\$20,397
	Subtotal	\$156,377
Profit (10%)		\$15,638
	Subtotal	\$172,015
Bond (1%)		\$1,720
	Subtotal	\$173,735
Contingency (10%)		\$17,374
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$191,109
		+-----+
SIOH (6% of Construction Cost)		\$11,467
	Subtotal	\$202,576
Design (6% of Construction Cost)		\$11,467
		+-----+
Total Project Cost		\$214,043

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

THE PRESSURE STRAIN AND FORCE HANDBOOK™



Ω OMEGA
An OMEGA Technologies Company

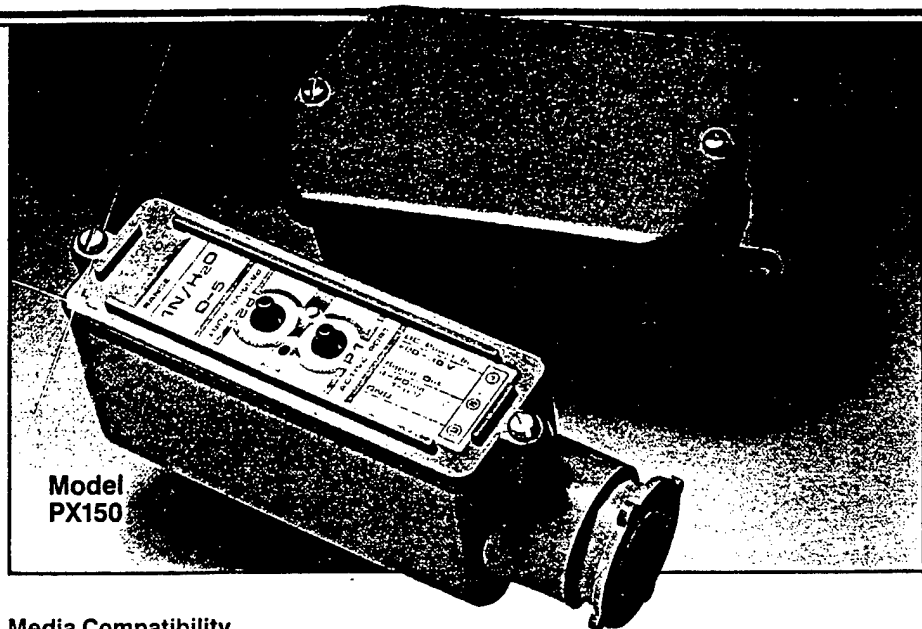
LOW PRESSURE DIFFERENTIAL TRANSDUCERS

PX150/154 Series 0-1" to 0-25" H₂O

MADE IN
USA

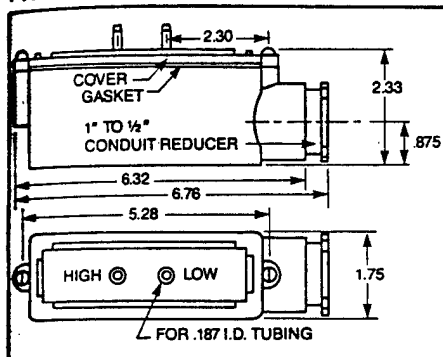
- Weatherproof NEMA-4 Enclosure or Electrical Conduit Enclosure
- Zero and Span Controls Are Provided For Easy Field Adjustment

From
\$305



Model
PX150

PX150



Media Compatibility

PX150

Low: Dry gases only

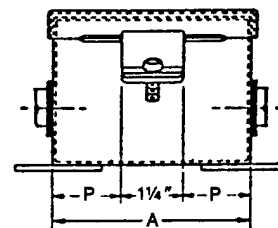
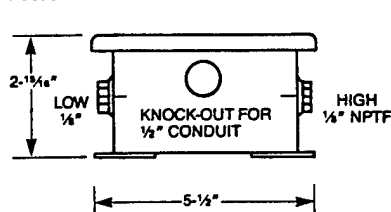
High: Liquids or gases, except highly ionic solutions (acids, lye, etc.)

PX154

P1 P2: Non-corrosive, non-aqueous liquids or gases

PX155: SLIGHTLY CORROSIVE LIQUIDS OR GASES

PX154



SPECIFICATIONS

Excitation: 24 Vdc (18 to 30 Vdc)

Output: 4 to 20 mA, 2 wire system

Maximum Loop Resistance: 400 ohms @ 18 Vdc, 700 ohms @ 24 Vdc, 1000 ohms @ 30 Vdc

Accuracy: (linearity & hysteresis) PX154 0.1% FS; PX150 2.0% FS

Zero and Span Adjustments: ±10%

Compensated Temperature Range: 32 to 122°F (0 to 50°C)

Zero and Span Thermal Effects: PX154 (.311/FS range) % FS/°F; PX150 (3.9/FS range) % FS/°F

Proof Pressure: PX150 3 PSI; PX154 15 PSI

Burst Pressure: PX150 5 PSI; PX154 20 PSI

Gages: Solid state piezoresistive

Cover Material: PX150 PVC-1" electrical access enclosure; PX154 NEMA-4 gasketed steel enclosure with enamel finish

Pressure Port: PX150 0.187" diameter tube fitting ports; PX154 1/4" NPT female

Electrical Connection: Internal screw terminations

To Order (Specify Model Number)

RANGE Inches of H ₂ O	MODEL	PRICE	COMPATIBLE METER
NEMA-4 Enclosure Models			
0 to 1"	PX154-001DI	\$305	DP100R8, DP2000P9, TX81
0 to 3"	PX154-003DI	305	DP100R8, DP2000P9, TX81
0 to 5"	PX154-005DI	305	DP100R8, DP2000P9, TX81
0 to 10"	PX154-010DI	305	DP100R8, DP2000P9, TX81
0 to 25"	PX154-025DI	305	DP100R8, DP2000P8, TX81
Conduit Enclosure Models			
0 to 1"	PX150-001DI	315	DP100R8, DP2000P9, TX81
0 to 3"	PX150-003DI	315	DP100R8, DP2000P9, TX81
0 to 5"	PX150-005DI	315	DP100R8, DP2000P9, TX81
0 to 10"	PX150-010DI	315	DP100R8, DP2000P9, TX81
0 to 25"	PX150-025DI	315	DP100R8, DP2000P8, TX81

PROCESS CONTROLLER

CN 2000 SERIES

MADE IN

USA

OMEGA

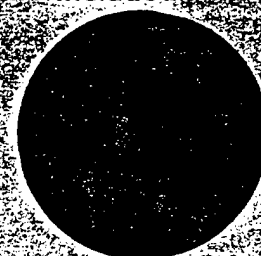


Continuous analog output
Control loop with integral
action

Wide range of output and
alarm options available

Features

- PID Control
- User Friendly Tuning Via Front Keypad
- Continuous Indication of Output, Alarm, and Operating Status
- Comprehensive Manual Included



To Order (Specify model number)

Model No.	Price	1st Output and Mode	2nd Output and Mode	Alarms
CN2001 (*)	\$415	1A SSR PID	—	None
CN2002 (*)	445		1 A SSR, ON/OFF	
CN2001A (*)	465		—	Dual
CN2002A (*)	505		1A SSR, ON/OFF	

*Insert input code. Price includes range premiums.

INPUT TYPES

Code	Range	Type
mA	4-20 mA	Current
mV	0-100 mV dc	Voltage
V5	0-5 V dc	Voltage
V10	0-10 V dc	Voltage

Units factory scaled for 0-100% display.
Zero and span field selectable. Max. display
is 3200 counts.

OUTPUT OPTIONS

Ordering Suffix	Price	Description
-F1	N/C	4-20mA, output 1, reverse
-F2	N/C	4-20mA, output 2, direct
-DC1	N/C	0-5 Vdc, output 1, reverse
-DC2	N/C	0-5 Vdc, output 2, direct

EXCITATION OPTIONS*

Excitation	Code	Price	Description
*Not Available with Options D2-D6 or Model CN2000A.			
5 V dc	X5 V	\$50	5 V dc @ 40 mA
10 V dc	X10 V	50	10 V dc @ 100 mA

COMMUNICATION OPTIONS

Code	Price	Description
D1	\$ 50	remote analog setpoint (n/a with 2000A)
D2	195	non-isolated RS-232C
D3	195	isolated RS-232C
D4	195	non-isolated RS-422
D5	195	isolated RS-422
D6	195	isolated 20 mA loop
D7	50	remote start/stop (N/A with 2000A)

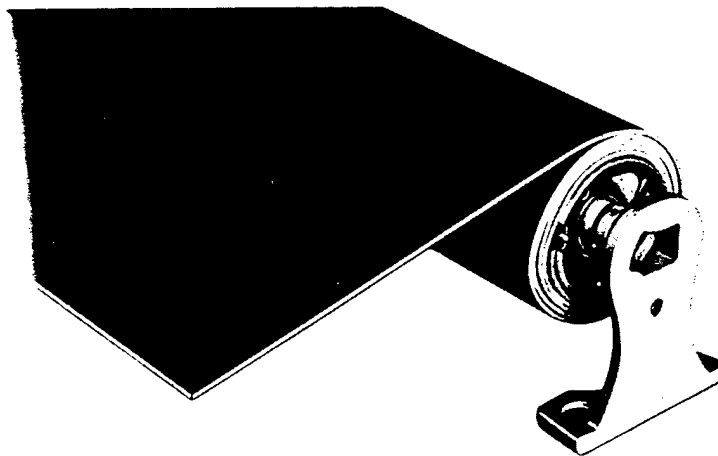
Also Available Auto/Manual Output Control. To Order, Add Suffix AM to Model No., and Add \$50 to Price.

GORTITE

SHADE ROLLER COVERS

PROTECT WAYS AGAINST CHIPS AND COOLANTS

GORTITE SHADE ROLLERS AND COVERS ARE AVAILABLE FOR ALL APPLICATIONS THAT REQUIRE PROTECTION FROM CHIPS, ABRASIVES, OIL AND COOLANTS WITHOUT THE SEAL OF A BELLOWS COVER. VARIOUS DIAMETER SPRING LOADED METAL ROLLERS ARE AVAILABLE WITH COVER MATERIALS TO SUIT THE SIZE AND SEVERITY OF THE APPLICATION.



— DESCRIPTION OF COVER MATERIALS —

COVER MATERIALS *

DESCRIPTION

18NN

.018 GAUGE NEOPRENE COATED NYLON - FOR LIGHT DUTY PROTECTION AGAINST COOLANTS AND CHIPS

33NN

.033 GAUGE NEOPRENE COATED NYLON - FOR MODERATE DUTY PROTECTION AGAINST COOLANTS AND CHIPS

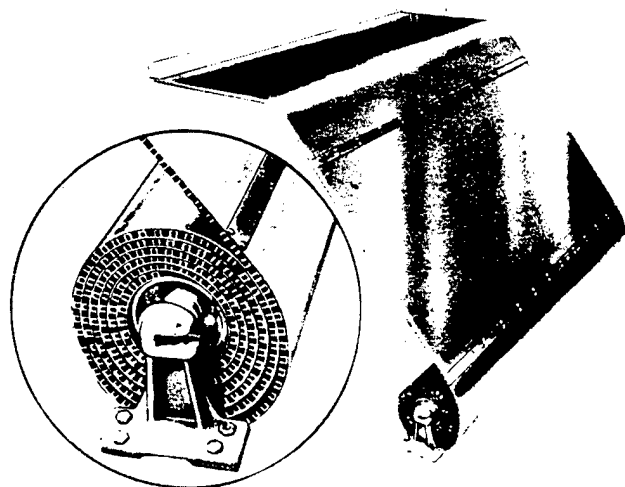
60HN

.060 GAUGE HYPALON COATED NYLON - HEAVY DUTY PROTECTION AGAINST ABRASION, COOLANT, AND CHIPS INCLUDING MODERATE HOT CHIP LOADS

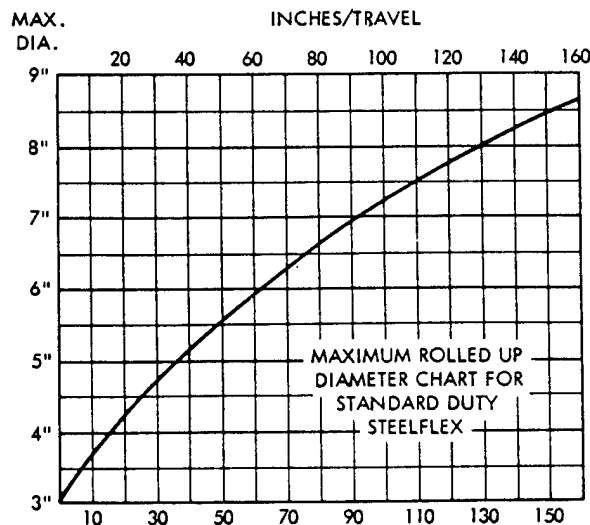
STANDARD DUTY
STEEFLEX

CONTINUOUS STAINLESS STEEL TOP SURFACE WITH SUPPORTING ALUMINUM RIBS. FOR HEAVY DUTY PROTECTION AGAINST LARGE CHIP LOADS, COOLANT, HOT CHIPS, ETC.

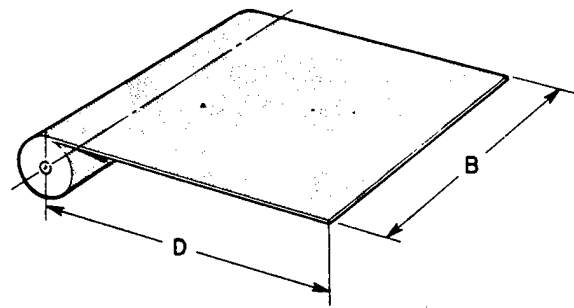
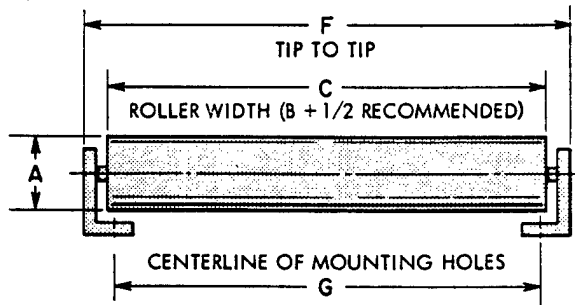
*SPECIAL MATERIALS AVAILABLE UPON REQUEST.



STANDARD DUTY STEEFLEX ON SPRING LOADED ROLLER

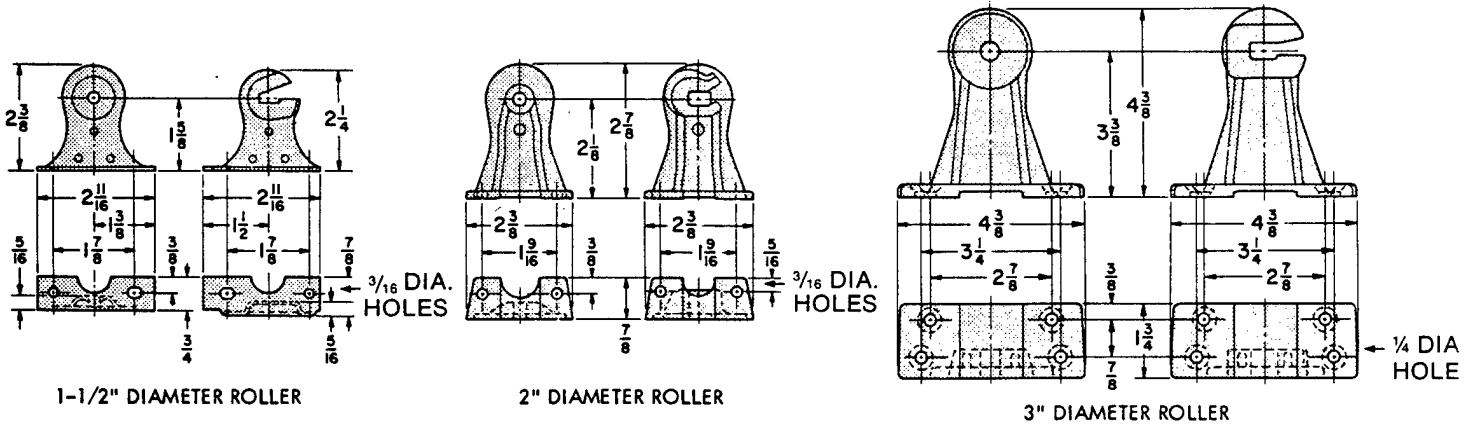


— ROLLER DIMENSIONS AND COVER MATERIALS —



ROLLER DIAMETER	TIP TO TIP	CENTERLINE OF MTG. HOLES	COVER MATERIALS AVAILABLE ON VARIOUS ROLLER DIAMETERS			
A	F	G	18NN	33NN	60HN	STD. DUTY STEELFLEX
1-1/2"	C + 1-1/8"	C + 1/8"	X			
2" HD	C + 1-5/16"	C + 5/16"	X	X	X	
3" HD	C + 1-1/2"	C - 1 1/4", C + 1/2"	X	X	X	X

— DIMENSIONS OF ROLLER MOUNTING BRACKETS —



— HOW TO ORDER —

TO ORDER OR FOR QUOTATION, PLEASE SPECIFY THE FOLLOWING DIMENSIONS AND INFORMATION.

A ROLLER DIAMETER _____
 B COVER WIDTH _____
 (WAY WIDTH + 2" RECOMMENDED)
 C ROLLER WIDTH _____
 (COVER + 1/2" RECOMMENDED)
 D MAX. OPEN LENGTH OF COVER _____
 (FOR _____ MACHINE TRAVEL)
 MAX. MACHINE TRAVEL SPEED _____ IN./MIN.
 COVER MATERIAL PREFERRED
 _____ 18NN _____ 33NN _____ 60HN
 _____ STANDARD DUTY STEELFLEX _____ OTHER
 _____ WITH _____ WITHOUT MOUNTING BRACKETS

DATE _____ FOR QUOTATION ONLY _____
 QUANTITY REQUIRED _____
 DATE REQUIRED _____
 ORDER NUMBER _____
 COMPANY NAME _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP _____
 ATTENTION _____

PLEASE BE SURE YOU HAVE FILLED IN AS MUCH OF THE REQUESTED INFORMATION AS IS AVAILABLE.

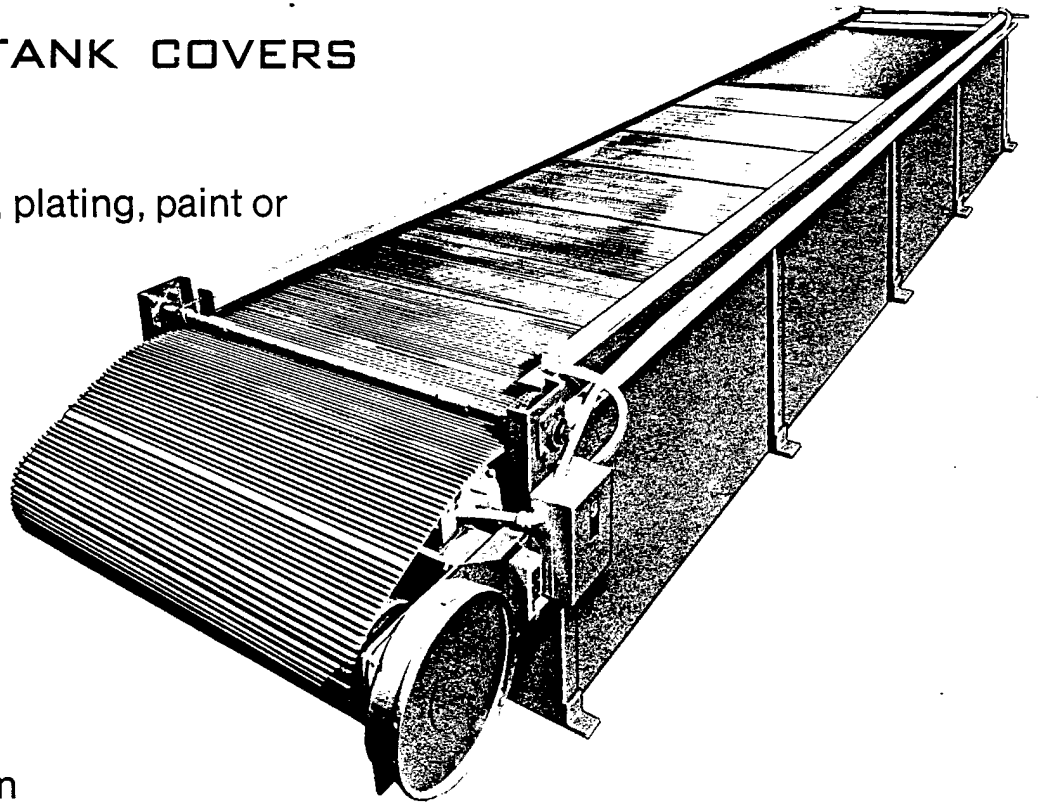
A and A Manufacturing Company

2300 So. Calhoun Rd., New Berlin, Wis. 53151 • Phone 414-786-1500

STEELFLEX[®]

MOTOR-DRIVEN TANK COVERS

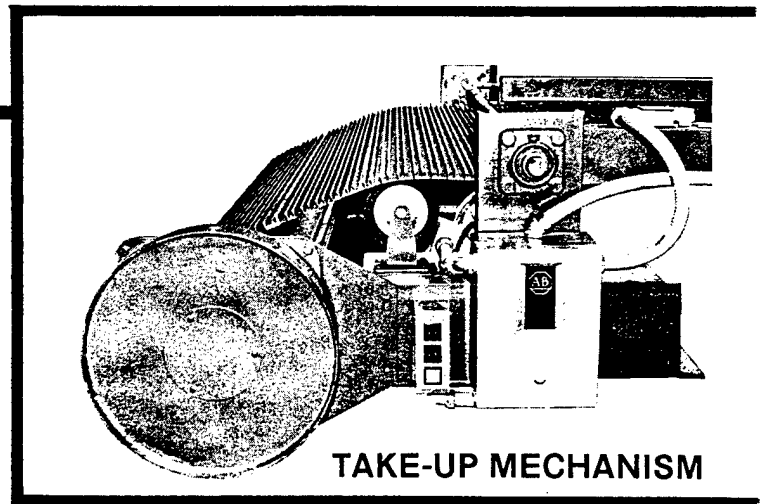
for chemical, degreasing, plating, paint or any other type of tank



- Protect Personnel
- Control Evaporative Emissions For Energy Savings
- Prevent Contamination
- Contain Dangerous Fumes

CONSTRUCTION

STEELFLEX motor-driven tank covers are designed to provide a complete system for covering all types of tanks. Steelflex covers are made of continuous stainless steel surface reinforced with aluminum, steel or stainless steel support ribs which allow personnel to walk on the cover. The support ribs are bonded to top for strong, durable construction. Stainless steel or aluminum guide channels can be provided for the sides of the tank to contain the cover. Tank covers can be furnished stainless steel side on top or bottom. Any tank width or length can be accommodated.



TAKE-UP MECHANISM

Steelflex Tank Covers are supplied with electric motor drive and take-up mechanism with electrical control for forward, reverse and stop.

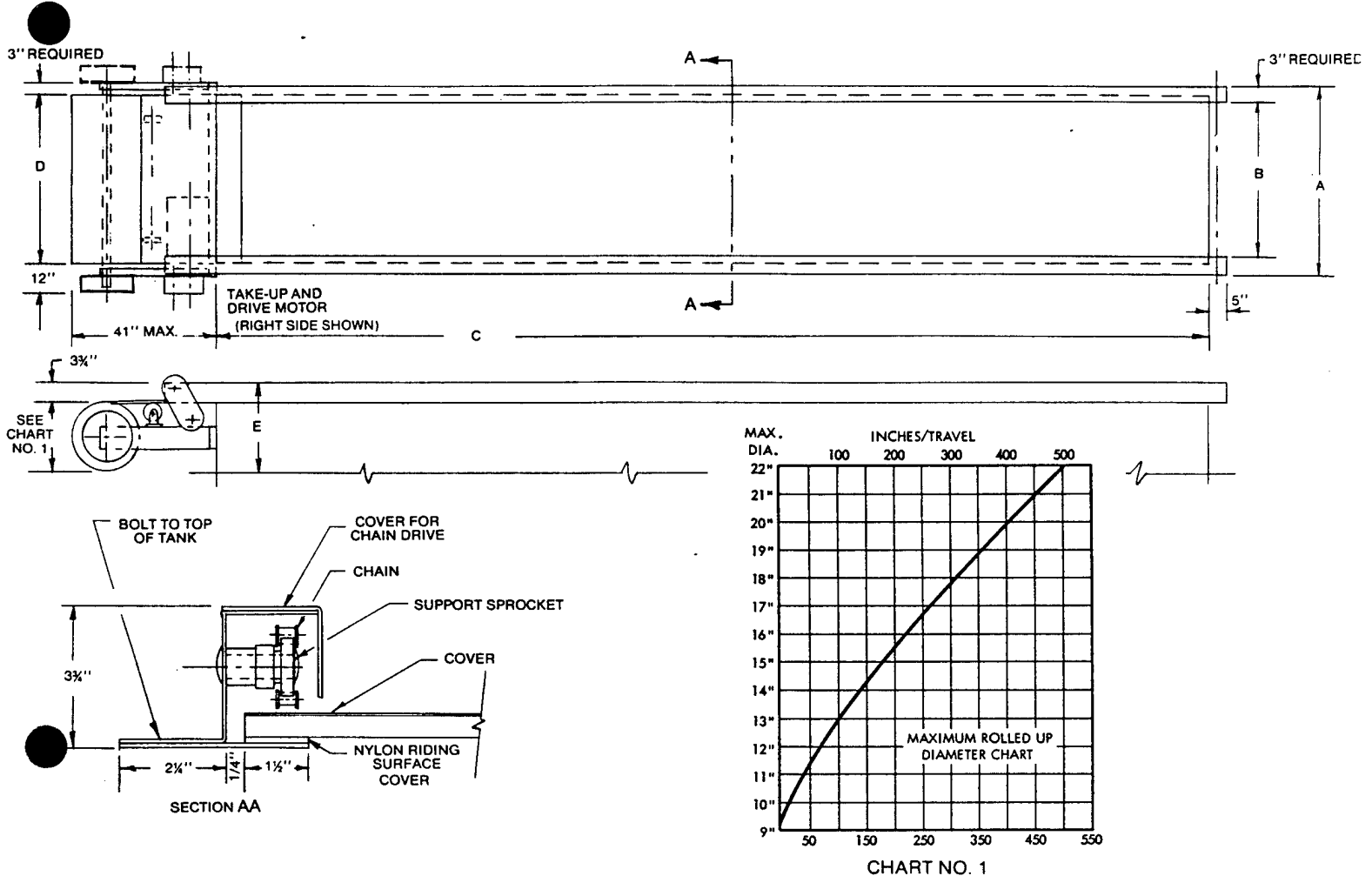


A and A Manufacturing Co. Inc.

2300 South Calhoun Road
New Berlin, WI 53151 Phone 414-786-1500

**STEELFLEX[®]**

MOTOR-DRIVEN

TANK COVERS DATA SHEET**HOW TO ORDER**

TO ORDER OR FOR QUOTATION, PLEASE SPECIFY THE FOLLOWING DIMENSIONS AND INFORMATION.

A. OVERALL TANK WIDTH _____

B. INSIDE TANK WIDTH _____

C. OVERALL TANK LENGTH (INSIDE) _____

D. COVER WIDTH _____

E. TANK HEIGHT ABOVE FLOOR _____

SUBSTANCE BEING COVERED _____

TAKE-UP & DRIVE MOTOR LOCATION

RIGHT SIDE _____ LEFT SIDE _____

MOTOR STARTER VOLTAGE REQUIRED _____

_____ VOLT _____ PHASE

DATE _____ FOR QUOTATION ONLY _____

QUANTITY REQUIRED _____

DATE REQUIRED _____

ORDER NUMBER _____

COMPANY NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

ATTENTION _____

TELEPHONE _____

**A and A Manufacturing Co. Inc.**

2300 South Calhoun Road
New Berlin, WI 53151 Phone 414-786-1500

PLEASE BE SURE YOU HAVE FILLED IN AS MUCH OF THE REQUESTED INFORMATION AS IS AVAILABLE.

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS For use of this form, see AR 5-4; the proponent agency is OCA.				1. PROJECT NO.		REQUIREMENT CONTROL SYMBOL DD-M(R) 1561	
2. TO: HQ. DA (EACA-RMP) Rm 3B719 (Pentagon) Washington, DC 20310-2070		3. THRU: CDR, AMC (AMCRM-MP) 5001 Eisenhower Avenue Alexandria, VA 22333-0001		4. FROM: CDR, AMCCOM Attn: AMSMC-MGP-P (R) Rock Island, IL 61299-6000		5. DOD COMP NAME Army	6. DOD COMP CODE A
9. PROJECT TITLE Install High-Efficiency Motors (ECO #10)		10. TYPE OF PROJECT (Check one) ☐ QRIIP ☒ OSD PIF ☐ PECIP		11. AMORTIZATION YEARS/MONTHS \$ 117,500 (Project Cost) + 33,000 (Average Annual Savings) x 12 (No. Mos) = 3.6 (years) or (months) (amortization)			
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE 25 years		14. EXPECTED OPERATIONAL DATE			
15. SUBMITTING UNIT(S)		16. UNIT ID CODE		17. PROJECT DESCRIPTION			
Commander Watervliet Arsenal Attn: SMCWV-FE (W. Face) Building 120 Watervliet, NY 12189		WOK9AA		Install high-efficiency motors for the fans and pumps in two plating areas located in Building 35--Small parts plating and medium gun tube plating.			
18. DETAILED JUSTIFICATION High-efficiency electric motors use less energy than standard motors while operating under identical loads.							
19. SAVINGS DISPOSITION Savings are used to reduce energy expenditures.							
20. OTHER REMARKS (Continue on page 5, if more space is needed)							

DA FORM 5108-R, MAY 82

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R).

SUMMARY OF DOLLAR SAVINGS
(ROUND OFF TO THE NEAREST DOLLAR)

Attach computation sheet identifying the method and source of data for savings

SAVINGS BREAKOUT	PRESENT METHOD	PROPOSED METHOD				DIFFERENCE/SAVINGS			
		1ST YR	2D YR	3D YR	4TH YR	1ST YR	2D YR	3D YR	4TH YR
SALARY/LABOR/ OVERTIME									
MATERIAL/ SUPPLIES									
UTILITIES									
MAINTENANCE/ REPAIR									
TRANSPORTATION									
LEASE COSTS									
SALVAGE/ TURN-IN									
ENERGY (Identify) Electricity	\$533,800	\$500,900	\$500,900	\$500,900	\$500,900	\$33,000	\$33,000	\$33,000	\$33,000
CONTRACT COSTS									
OTHER (Identify)									
TOTALS	\$533,800	\$500,900	\$500,900	\$500,900	\$500,900	\$33,000	\$33,000	\$33,000	\$33,000

PRIORITIZATION

(1) INTERNAL RATE OF RETURN (IRR)

Divide estimated project cost \$117,500 by average annual savings \$33,000 = 3.6 factor. Based on factor and number of years economic life of the project, select the IRR from

Table H-3, App H, Ch. 5, AR 5-4 = 35 % IRR.

(2) SAVINGS TO INVESTMENT RATIO (S/I)

Multiply annual savings \$33,000 X discount factor 9.524 = 314,292 and divide by present value of investment (undiscounted) 117,500 = 2.7 S/I.

(Based on economic life 25 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

(3) RATE OF INVESTMENT PER MANPOWER SPACE (RIMS)

Divide estimated project cost -- by number of manpower space savings -- = -- RIMS. (Manpower requirements cannot be used in this computation.)

COST FOR PROJECT TO BECOME OPERATIONAL

22

EQUIPMENT TYPE <i>a</i>	PROPOSED SOURCE OF PROCUREMENT <i>b</i>	UNIT PRICE <i>c</i>	QUANTITY <i>d</i>	TOTAL COST <i>e</i>	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT <i>f</i>	FY FUNDS REQUIRED <i>g</i>
(1) High-Efficiency Electric Motors		\$117,500	1	\$117,500		
(2)						
(3)						
(4)						
(5)						
(6) TRANSPORTATION (Equipment delivery)						
(7) EQUIPMENT MODIFICATION ¹						
(8) EQUIPMENT INSTALLATION						
(9) MAINTENANCE CONTRACT ²						
(10) FACILITIES MODIFICATION ³						
(11) TRAINING						
(12) OTHER (Specify):						
(13) TOTAL REQUIRED FOR PROJECT TO BECOME OPERATIONAL ⁴				\$117,500		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$117,500		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵				--		
(16) TOTAL (Sum of (14) + (15) above)				\$117,500		

¹ Not to exceed 10% of equipment cost for QRIP projects.
² Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.
³ Normally not OPA funded.
⁴ Used to compute amortization in Item 11.
⁵ Specify source to include certification that funds are available, if financed from the regular budget.

Figure H-1. Documentation for Productivity Capital Investment Program (DA Form 5108-R)--Continued.

SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)

23.

ITEMS <i>a</i>	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR <i>b</i>	TYPE PERS ^e <i>c</i>	DOLLARS <i>d</i>	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE	
				<i>e.</i> FROM	<i>f.</i> TO	<i>g.</i> FROM	<i>h.</i> TO	<i>i.</i> FROM	<i>j.</i> TO
(1) REQUIREMENTS AND AUTHORIZATIONS ELIMINATED									
(2) REQUIREMENTS ONLY ELIMINATED									
(3) BORROWED MILITARY MANPOWER RELEASED									
(4) OVERHIRES OR TEMPORARIES TERMINATED									
(5) HOURS OVERTIME ELIMINATED									
(6) MANHOURS SAVED FROM MULTIPLE POSITIONS ^f									
(7) OTHER DOLLAR SAVINGS (Excluding Manpower), ^{g,h} CONTRACT COSTS & UTILITIES			\$33,000						
(8)									
(9)									
(10)									
(11) TOTAL DOLLAR SAVINGS			\$33,000						
⁶ (1) US Graded (2) US Wage Board (3) DBEN (4) IBFN (5) Officer (6) WO (7) Enlisted									

⁷Reflect specific duties being performed with additional manhours available (equivalent manyears)

REGULATORY APPROVAL/COORDINATION

INVESTMENT STATEMENT

This proposal has been reviewed and it cannot be implemented with existing equipment or facilities. This investment is in accordance with established investment planning. The project complies with public laws, OSD policies and regulations, and all other regulatory constraints.

(Cite regulatory approvals, e.g., TAGO Control No.) (Ex. New Start, TAGO Approval, etc.)

OTHER COORDINATION (Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)

25. SUBMITTED BY (Typed name, grade and title of Subordinate Command/Agency or Project Initiator)

SIGNATURE

DATE (YYMMDD)

AUTOVON

28. APPROVAL RECOMMENDED BY (MACOM/Agency)

SIGNATURE

DATE (YYMMDD)

AUTOVON

FOR USE BY HQDA ON OSD PIF PROJECTS ONLY

27. APPROVED BY

SIGNATURE

DATE (YYMMDD)

AUTOVON

20. OTHER REMARKS (Cont'd)



SUBJECT EC 010
ENERGY EFFICIENT MOTORS
DESIGNER C. WARREN
CHECKER R. H. H. H.

AEP NO 290-0379-002
SHEET 1 OF 1
DATE 9/9/91
DATE _____

BUDG 35

Replace motors in small parts plating line and medium tube plating line w/ energy-efficient ones.

ASSUMPTIONS:

- ① Consider motors for fans, pumps, blowers > 3 HP
- ② Motors run 24 HR/DA, 7 DA/WK, 52 WK/YR, MED TUBE PLATING
 $\Rightarrow 8760$ HRS/YR

RUN 24 HR/DA, 5 DA, WK, 52 WK/YR, SMALL PARTS PLATING
 $\Rightarrow 6240$ HRS/YR

- ③ Labor charges are doubled to account for old motor removal time

CALCULATIONS

Preliminary screening calculation using spreadsheet on following page (10-2). Material costs from Reliance 1991 catalog - labor from 1991 Means

$\Rightarrow$ Consider motors ≤ 100 HP ONLY

ECO #10 - WATERVLIET ARSENAL
 INSTALL ENERGY EFFICIENT MOTORS
 FILENAME: REPEEM

DATE: 29 AUG 91 OPERATING HOURS = 6000

LIST PRICE		CONTRACTOR	LABOR	MAT'L & LABOR	EFFICIENCIES				
MOTOR SIZE (HP)	RELIANCE ENERGY-EFF. ENCLOSED (1991\$)	RELIANCE ENERGY-EFF. ENCLOSED (1991\$)	REMOVE OR INSTALL MOTOR (1991\$)	PRICE W/ MARKUPS (1991\$)	RELIANCE STD MOTOR NOM. EFF. (%)	RELIANCE ENERGY-EFF. ENCLOSED (%)	ENERGY SAVINGS (KWH/YR)	COST SAVINGS (\$/YR)	SIMPLE PAYBACK (YRS)
3	395	296	45	609	77.0%	87.5%	2093	142	4.3
5	478	359	45	703	81.3%	88.5%	2256	153	4.6
8	636	477	48	892	82.0%	89.8%	3556	241	3.7
10	795	596	50	1079	84.0%	90.2%	3663	248	4.3
15	1042	782	63	1406	84.8%	90.9%	5360	363	3.9
20	1345	1009	77	1799	85.8%	91.7%	6774	459	3.9
25	1608	1206	80	2107	86.3%	92.3%	8504	576	3.7
30	1905	1429	84	2457	88.0%	92.7%	7737	524	4.7
40	2563	1922	100	3259	88.0%	93.3%	11557	783	4.2
50	3207	2405	125	4077	89.3%	93.3%	10745	728	5.6
60	4487	3365	145	5596	89.3%	93.1%	12444	843	6.6
75	5820	4365	170	7193	90.3%	94.0%	14839	1005	7.2
100	7140	5355	225	8884	90.6%	94.5%	20389	1382	6.4
125	9275	6956	285	11514	92.3%	94.9%	16608	1125	10.2
150	10942	8207	335	13579	91.7%	95.1%	26176	1774	7.7
200	12961	9721	400	16096	93.0%	95.1%	21256	1440	11.2
250	16652	12489	450	20448	93.6%	95.4%	22557	1528	13.4
300	17748	13311	500	21868	94.1%	95.6%	22390	1517	14.4

ASSUMPTIONS: CONTRACTORS DISCOUNT FACTOR = 0.65 FOR STANDARD DUTY, 0.75 FOR ENERGY EFFICIENT

MOTORS ARE TOTALLY ENCLOSED, T-FRAME, 1800 RPM, 460 VOLT, 3 PHASE

SAVINGS = HP * 0.746 * [(1/ST EFF) - (1/EN EFF)] * HRS/YR * ELCCOST

OPERATING TIMES: 24 HR/DA

5 DA/ 6000 HRS/YR

ELECTRICITY COST: AVERAGE OF ENERGY & DEMAND CHARGES \$0.0678 /KWH



SUBJECT ECO 10
Energy Efficient Motors
DESIGNER C Warren
CHECKER _____

AEP NO 290-0379-002
SHEET _____ OF _____
DATE 9/9/91
DATE _____

• Motor list taken from WVA Property Records

WV 12110 - Small parts plating

WV 12050 - Medium tube plating

• $KW(SAVINGS) = HP * 0.746 * (1/STD. EFFICIENCY - 1/ENERGY EFFICIENCY)$

• $AUG ELECT COST = \$20.35 / MBtu$

WATERVLIT ARSENAL
ECO#10 - INSTALL ENERGY EFFICIENT MOTORS

WV 12110 SMALL PARTS PLATING

NO.	HP	PRESENT METHOD				FUTURE METHOD				SAVINGS	
		HP	ENERGY USE			ENERGY USE					
		(KW)	(MBTU/YR)	(\$/YR)	(KW)	(MBTU/YR)	(\$/YR)	(MBTU/YR)	(\$/YR)		
3	3	9	8.7	186	\$3,779	7.7	163	\$3,326	22	\$453	
3	5	15	13.8	293	\$5,969	12.6	269	\$5,480	24	\$489	
3	7.5	22.5	20.5	436	\$8,871	18.7	398	\$8,101	38	\$771	
11	10	110	97.7	2,081	\$42,339	91.0	1,938	\$39,429	143	\$2,910	
1	15	15	13.2	281	\$5,722	12.3	262	\$5,335	19	\$387	
1	20	20	17.4	371	\$7,541	16.3	347	\$7,052	24	\$489	
4	25	100	86.5	1,842	\$37,486	80.8	1,721	\$35,029	121	\$2,457	
2	30	60	50.9	1,083	\$22,044	48.3	1,028	\$20,926	55	\$1,118	
5	40	200	169.5	3,611	\$73,480	159.9	3,406	\$69,306	205	\$4,174	
2	60	120	100.3	2,136	\$43,471	96.2	2,048	\$41,673	88	\$1,798	
35		672	578.5	12,320	\$250,702	543.7	11,580	\$235,656	739	\$15,046	

WV 12050 MEDIUM TUBE PLATING

NO.	HP	TOTAL HP	PRESENT METHOD			FUTURE METHOD			SAVINGS	
			ENERGY USE			ENERGY USE				
			(KW)	(MBTU/YR)	(\$/YR)	(KW)	(MBTU/YR)	(\$/YR)		
			(KW)	(MBTU/YR)	(\$/YR)	(KW)	(MBTU/YR)	(\$/YR)		
4	3	12	8.7	261	\$5,305	7.7	229	\$4,669	31	\$637
6	5	30	27.5	824	\$16,759	25.3	756	\$15,386	67	\$1,373
4	7.5	30	27.3	816	\$16,605	24.9	745	\$15,163	71	\$1,442
2	15	30	26.4	790	\$16,067	24.6	736	\$14,980	53	\$1,087
12	20	240	208.8	6,242	\$127,034	195.2	5,837	\$118,792	405	\$8,243
3	40	120	101.7	3,041	\$61,893	95.9	2,869	\$58,377	173	\$3,516
1	60	60	50.2	1,499	\$30,513	48.1	1,437	\$29,251	62	\$1,262
32		522	450.6	13,473	\$274,176	421.8	12,610	\$256,617	863	\$17,559

TOTALS

67		1193.5	1,029	25,793	\$524,879	966	24,190	\$492,273	1,602	\$32,605
----	--	--------	-------	--------	-----------	-----	--------	-----------	-------	----------

ELECTRICITY PRICE = \$20.35 /MBTU

OPERATING HOURS PER YEAR MEDIUM TUBE PLATING = 8760
SMALL PARTS PLATING = 6240

10 - 4

8/92

02/05/92

ECO Construction Cost Estimate Calculations

ECO Name: ENERGY EFFICIENT MOTORS

ECO #: 10

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$63,817
Labor		\$9,038
	Subtotal bare costs	\$72,855
FICA Insurance (20% of Labor)		\$1,808
Sales Tax (not applicable for GOGO)		\$0
	Subtotal	\$74,663
Overhead (15%)		\$11,199
	Subtotal	\$85,862
Profit (10%)		\$8,586
	Subtotal	\$94,448
Bond (1%)		\$944
	Subtotal	\$95,392
Contingency (10%)		\$9,539
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$104,931
		+-----+
SIOH (6% of Construction Cost)		\$6,296
	Subtotal	\$111,227
Design (6% of Construction Cost)		\$6,296

Total Project Cost		\$117,523

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE				DATE PREPARED 9-6-91		SHEET 1 OF	
PROJECT ENERGY ENGINEERING ANALYSIS				BASIS FOR ESTIMATE ☐ CODE A (No design completed) ☒ CODE B (Preliminary design) ☐ CODE C (Final design) ☐ OTHER (Specify) _____			
LOCATION WVA							
ARCHITECT ENGINEER REYNOLDS, SMITH AND HILLS A.E.P., INC.							
DRAWING NO.			ESTIMATOR C. WARREN		CHECKED BY J. Hutchins		

MOTORS WV12110 SUMMARY SMALL PARTS PLATING	QUANTITY		LABOR		MATERIAL		TOTAL COST
	NO. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	
HP							
<u>3</u>	3		90	270	296	889	1159
5	3		90	270	359	1076	1346
7.5	3		96	288	477	1431	1719
10	11		100	1100	596	6559	7659
15	1		126	126	782	782	908
20	1		154	154	1009	1009	1163
25	4		160	640	1206	4824	5464
30	2		168	336	1429	2858	3194
40	5		200	1000	1922	9611	10611
60	2		290	580	3365	6731	7311
	<u>35</u>			<u>4764</u>		<u>35768</u>	<u>40,532</u>
WV 12050							
MED. TUBE PLATING							
3	4		90	360	296	1184	1544
5	6		90	540	359	2154	2694
7.5	4		96	384	477	1908	2292
15	2		126	252	782	1564	1816
20	12		154	1848	1009	12108	13956
40	3		200	600	1922	5766	6366
60	1		290	290	3365	3365	3655
	<u>32</u>			<u>4274</u>		<u>28049</u>	<u>32323</u>
TOTALS —	67			9,038		63,817	72,855

ECIP

FORM 1391

ECIP 1 - HIGH EFFICIENCY LIGHTING

1. COMPONENT ARMY	FY 19 <u>96</u> MILITARY CONSTRUCTION PROJECT DATA			2. DATE 2 April 92
3. INSTALLATION AND LOCATION Watervliet Arsenal, New York		4. PROJECT TITLE High Efficiency Lighting (ECIP)		
5. PROGRAM ELEMENT	6. CATEGORY CODE 80000	7. PROJECT NUMBER	8. PROJECT COST (\$000) 430	
9. COST ESTIMATES				
ITEM	U/M	QUANTITY	UNIT COST	COST (\$000)
Primary Facility				369
32W T8 Fluorescent Lamps	ea	308	\$ 6.13	(2)
Electronic Ballasts for 32W Lamps	ea	102	69.67	(7)
34W Fluorescent Lamps	ea	7845	5.75	(45)
60W Fluorescent Lamps	ea	6248	8.88	(56)
Electronic Ballasts for 60W Lamps	ea	3124	83.05	(259)
Subtotal				369
Contingency (10%)				37
Total Contract Lost				406
SIOH (6%)				24
Total Request				430
10. DESCRIPTION OF PROPOSED CONSTRUCTION				
Fluorescent lamps and ballasts will be replaced in fixtures throughout the installation. In non-production areas standard 40W lamps are replaced by 34W lamps. In production areas 40W lamps and standard ballasts are replaced by 32W T8 lamps and electronic ballasts; 80W lamps and standard ballasts are replaced by 60W lamps and electronic ballasts. This project also calls for participation in the Niagara-Mohawk Power Corporation rebate program on fluorescent lamps and ballasts. Annual savings are 5184 MBtu/yr of electricity or \$105,500/yr. The SIR is 3.6 and payback is 4.3 years.				

1. COMPONENT ARMY	FY 19<u>96</u> MILITARY CONSTRUCTION PROJECT DATA	2. DATE 3 April 92									
3. INSTALLATION AND LOCATION Watervliet Arsenal, New York											
4. PROJECT TITLE High Efficiency Lighting (ECIP)		5. PROJECT NUMBER									
11. QUANTITATIVE DATA, JUSTIFICATION, AND ADDITIONAL DATA Requirement: -0- LS Substandard: -0- LS Adequate: -0- LS Project: The proposed project calls for replacements of standard lighting system components to high efficiency types. Requirement: This project is required to reduce energy consumption at Watervliet Arsenal (WVA) pursuant to Executive Order 12003 and 12759. Current Situation: Energy is being wasted at WVA due to inefficiencies in the fluorescent lighting system. Impact If Not Provided: If the proposed project is not funded, energy waste will continue at WVA due to inefficiencies in the fluorescent lighting. Installation Commander <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Estimated Construction:</td> <td style="width: 25%;">April 1996</td> <td style="width: 25%;">Index: 2072</td> </tr> <tr> <td>Estimated Midpoint of Construction:</td> <td>May 1996</td> <td>Index: 2078</td> </tr> <tr> <td>Estimated Construction Completion:</td> <td>June 1996</td> <td>Index: 2084</td> </tr> </table>			Estimated Construction:	April 1996	Index: 2072	Estimated Midpoint of Construction:	May 1996	Index: 2078	Estimated Construction Completion:	June 1996	Index: 2084
Estimated Construction:	April 1996	Index: 2072									
Estimated Midpoint of Construction:	May 1996	Index: 2078									
Estimated Construction Completion:	June 1996	Index: 2084									

DETAILED PROJECT JUSTIFICATION

1. General:

The proposed project will reduce energy consumption at Watervliet Arsenal (WVA) increasing the efficiency of the fluorescent lighting systems. The result is that less energy will be required to provide lighting.

2. Accommodations Now in Use:

Numerous permanent structures.

3. Analysis of Deficiency:

The fluorescent lighting at WVA uses standard lamps and ballasts. Implementing this project will improve the efficiency of the lighting systems.

4. Consideration of Alternatives:

Alternatives were considered and evaluated. The most cost-effective solutions were recommended.

5. Criteria for Proposed Construction:

The proposed project will conform with all Federal and U.S. Army regulations.

6. Program for Related Furnishings and Equipment:

No furnishings or equipment funded from appropriations other than MCA are required.

7. Disposal of Present Assets:

No buildings will be disposed.

8. Survival Measures:

This project is not suitable for inclusion for protective shelter.

9. Summary of Environmental Consequences:

Ballasts may contain PCBs and should be properly disposed. WVA has an existing program for ballast disposal.

10. Evaluation of Flood Hazards and Encroachment on Wetlands:

These facilities are not located in a flood plain and do not encroach on wetlands.

11. Economic Justification

The ECIP Economic Analysis Summary is attached.

12. Utility and Telecommunication Support:

No related utility support is programmed. The existing utility systems are adequate.

No telecommunications support is required. Coordination has been made between the DEH and USACC as authenticated by:

Date

13. Protection of Historic Places and Archeological Sites:

Review procedures have been implemented for this project in accordance with 36 CFR Part 800, "Procedures for the Protection of Historic and Cultural Properties." The review has established that there will be no adverse effect.

14. Project Development Brochure (Part 1):

A PDB is provided in a separate document.

15. Energy Requirements:

An Energy Requirements Appraisal has been prepared for this project and is attached (ERA in SRP-3).

16. Provisions for the Handicapped:

No provisions for the handicapped will be made since the scope of this project is in no way applicable to designing for the handicapped.

17. Real Property Maintenance Activity (RPMA):

No additional RPMA will be required.

18. Commercial Activities:

This project has been reviewed considering the requirements of commercial and industrial type facilities, and it has been determined that whereas this project does not affect commercial facilities, those requirements do not apply.

SRP-3, ENERGY REQUIREMENT APPRAISAL

1. Project Description:

- a. Installation: Watervliet Arsenal, New York
- b. Project No.:
- c. Project Title: High Efficiency Lighting
- d. Geographical Location: New York
- e. Physical Description: Replacement of standard fluorescent lamps and ballasts with high efficiency types.

2. Estimated Energy Consumption:

It is estimated that the proposed system will result in a net decrease in energy consumption of 5184 MBtu/yr.

3. Energy Sources:

No additional energy sources will be required as a result of implementing this project.

4. Energy Use Impacts:

All the existing utility systems will support the energy requirements without system expansion.

5. Energy Conservation:

It is estimated that the proposed system will result in a net decrease in energy consumption of 5184 MBtu/yr.

6. Energy Alternatives:

An investigation revealed that no energy alternatives exist which might reduce total demand or reduce loading on critical energy sources.

7. Energy Effects:

No adverse environmental effects are anticipated. Degradation of environmental standards will not allow the use of more efficient energy sources.

8. Basis of Appraisal:

In consideration of energy sources and energy requirements, total energy and selective energy have been considered and disregarded as inapplicable.

PROJECT DEVELOPMENT BROCHURE

ECIP-1 - HIGH EFFICIENCY LIGHTING

installation: Watervliet Arsenal

project: High Efficiency Lighting (ECIP)

project number _____
temporary: _____ program year FY 96

permanent: _____ category code 80000

point of contact:

user
name William B. Face date 3 April 1992

title Energy Coordinator phone 518/266-4228

autovon _____

dfae
name R. G. Wells date 3 April 1992

title Director, Engineering & Housing phone 518/266-4228

autovon _____

engineer district
name _____ date _____

title _____ phone _____

autovon _____

other (A-E)
name _____ date _____

title _____ phone _____

autovon _____

reviewed by:

installation facility engineer
name R. G. Wells date 3 April 1992

title Director, Engineering & Housing phone 518/266-4228

autovon _____

approved by:

macom engineer
name _____ date _____

title _____ phone _____

autovon _____

project development brochure, PDB-1

facility

Buildings:

10, 15, 20, 21, 23, 24, 25, 40, 44, 110, 115, 120, 124, 125,
130, 145

project coordinator for using service

William B. Face

518/266-4226

functional requirements summary, PDB-1

This project is required to meet stated goals of energy use reduction pursuant to Executive Order 12003 and 12759. It is submitted as part of the Energy Conservation Investment Program (ECIP).

The objective of this project is to improve the efficiency of the WVA fluorescent lighting systems. Existing fluorescent fixtures use standard lamps and ballasts. This project replaces 40 watt lamps in non-production areas with 34 watt lamps; 40 watt fluorescent lamps and standard ballasts in production areas with 32 watt T8 lamps and electronic ballasts; and 80 watt lamps and standard ballasts in production areas with 60 watt lamps and electronic ballasts.

Implementation of this project will save approximately 5184 MBtu of electricity each year which currently costs \$105,000. The SIR is 3.6 and the payback is 4.3 years.

List of Occupants

N/A

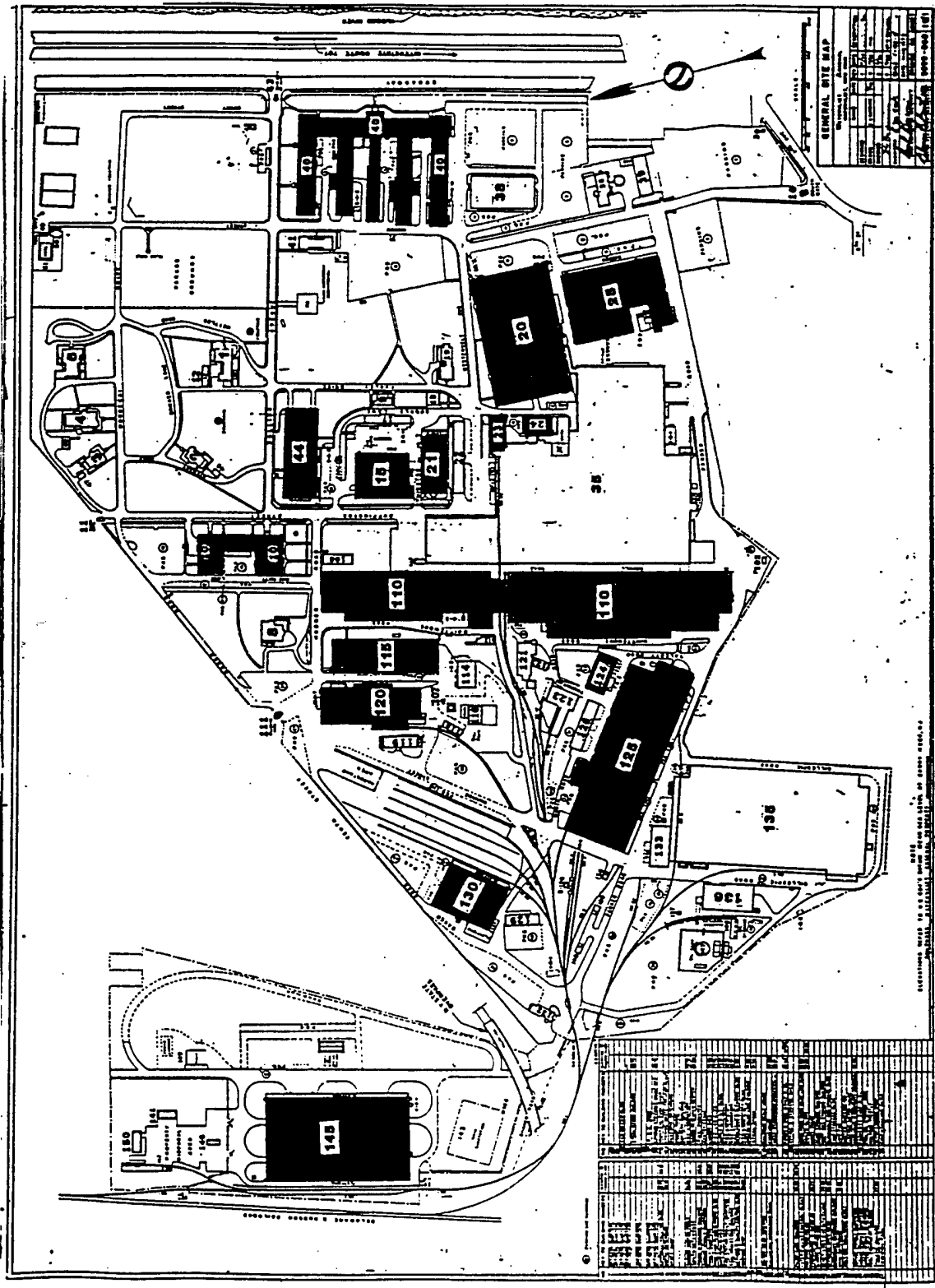
Space and Requirements

N/A

Summary of Future Changes and Impacts

N/A

functional requirements summary, PDB-1



SITE OF CONSTRUCTION
Buildings affected are darkened.

facilities requirements sketch, PDB- 1/2

		Required or Not Required	* To Be Determined	Comment Attached	Document Attached
ITEM					

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

A. SPECIAL CONSIDERATIONS

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
A-1	Cost estimates for each primary and supporting facility	R			X
A-2	Telecommunications system coordination with USACC and authorization for exceptions	NR			
A-3	Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)	NR			
A-4	Assignment of airspace	NR			
A-5	Economic analysis of alternatives	R			X
A-6	Approval for new starts	NR			
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)	NR			
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	NR			
A-9	Exceptions to established criteria	NR			
A-10	Coordination with various staff agencies (Provost Marshall-physical security, etc.)	NR			
A-11	Identification of related or support projects (so projects can be coordinated)	NR			
A-12	Required completion date	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.

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

A — DFAE

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D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

B. SITE DEVELOPMENT

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
B-1	Consultation with the District Office to determine and evaluate flood plain hazards	NR			
B-2	Preparation, submission, and/or approval of new	NR			
(A)	General Site Plan	NR			
(B)	Annotated General Site Plan	NR			
(C)	Sketch Site Plan	NR			
(D)	Facilities Requirements Sketch	NR			
B-3	Preparation of				
(A)	Site Survey	NR			
(B)	Subsoil information	NR			
B-4	Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan	NR			
Other Site Development 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.

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A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

C. ARCHITECTURAL & STRUCTURAL

ITEM		Required or Not Required	To Be Determined *	Comment Attached	Document Attached
C-1	Reconciliation with troop housing programs and requirements	NR			
C-2	Evaluation of existing facilities (including degree of utilization)	NR			
C-3	Approval for removal and relocation of existing useable facilities	NR			
C-4	Evaluation of off-post community facilities	NR			
C-5	Storage and maintenance facilities (including nuclear weapons)	NR			
C-6	Coordination hospitals, medical and dental facilities with Surgeon General	R	B		
C-7	Coordination of aviation facilities with FAA	NR			
C-8	Coordination air traffic control and navigational aids with USACC	NR			
C-9	Tabulation of types and numbers of aircraft	NR			
C-10	Evaluation of laboratory, research and development, and technical maintenance facilities	NR			
C-11	Coordination chapels with Chief of Chaplains	NR			
C-12	Review food service facilities by USATSA	NR			
C-13	Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities	NR			
C-14	Coordination postal facilities with U.S. Postal Service Regional Director	NR			
C-15	Laundry and dry cleaning facilities coordination with ASD(I&L)	NR			
C-16	Tenant facilities coordination with installation where sited	NR			
C-17	Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)	NR			
C-18	Analysis of deficiencies	R			X
C-19	Consideration of alternatives	R			X
C-20	Determination whether occupants will include physically handicapped or disabled persons	NR			
C-21	As-build drawings for alterations or additions	NR			
C-22	Availability of Standard Design or site adaptable designs	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.

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

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B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

documentation checklist

COMMENTS
DOCUMENTATION CHECK LIST

ITEM	COMMENT
D-2	The ERA is part of the 1391 package.
D-3	This project will reduce energy consumption at Watervliet Arsenal

A. SPECIAL CONSIDERATIONS

ITEM	
A-1	Factors of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages
A-2	Construction phasing requirements
A-3	Functional support equipment (mechanical, electrical, structural, and security) to be built in
A-4	Equipment in place and justification
A-5	Other equipment and furniture (O&MA, OPA) and costs
A-6	Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)
A-7	Type of construction (permanent, temporary, semi-permanent)
A-8	Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement.
	Other special considerations (list and number-items)

Required or Not Required	To Be * Determined	Comment Attached	Document Attached
NR	A, B		
NR			
NR			
NR			
NR			
NR			
NR			

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***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

DA FORM 5024-A-R, Feb 82

TM 5-800-3

D-5

B. SITE DEVELOPMENT

ITEM		Required or Not Required	To Be Determined	Comment Attached	Document Attached
B-1	Construction restrictions or guidelines pertaining to site access and preferred construction routes	NR			
(A)	Airfield clearance, explosive storage, working hours, safety, etc.	NR			
(B)	Facilities and/or functions or adjoining areas (structures, materials, impact)	NR			
(C)					
B-2	Real estate actions (acquisition, disposal, lease, right-of-way)	NR			
B-3	Demolition/relocation required (data)				
(A)	Special considerations due to explosives/radioactivity/chemical contamination/asbestos emissions/toxic gases	NR			
(B)	Restrictions on disposal of demolished/relocated material including hazardous waste	NR			
B-4	Pavement types and requirements (including traffic surveys and MTMC coordination)	NR			
B-5	Landscape considerations				
(A)	Protection of existing vegetation	NR			
(B)	Stockpile topsoil	NR			
Other Site Development (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.

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B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

technical data checklist

C. ARCHITECTURAL & STRUCTURAL

ITEM	
C-1	Vibration-producing equipment requiring isolation
C-2	Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)
C-3	Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)
C-4	Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing)
C-5	Designation and strength of units to be accommodated
C-6	Requirements and data for special design projects
C-7	Unusual floor and roof loads (safes, equipment)
C-8	Security features (arms rooms, vaults, interior secure areas)
	Other Architectural & Structural (List and number items)

Required or Not Required	To Be * Determined	Comment Attached	Document Attached
NR			
NR			
NR			
NR			
NR			
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.

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***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)	NR			
D-4	Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)	NR			
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)	NR			
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.)	NR			
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.

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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

E. ENVIRONMENTAL CONSIDERATIONS

ITEM	
E-1	Waste water treatment, air quality, and solid waste disposal criteria
	Other Environmental 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

F. FIRE PROTECTION

ITEM		Required or Not Required	To Be * Determined	Comment Attached	Document Attached
F-1	Special fire protection systems or features (detection and suppression equipment, hazards, etc.)	NR			
	Other Fire Protection 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.

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- D — Designer
- E — Other (Check Comments Attached and explain)

technical data checklist

COMMENTS

TECHNICAL DATA CHECK LIST

ITEM	COMMENT
E-1	Standard ballasts to be removed may contain PCBs, especially if manufactured before 1978. To meet federal hazardous waste disposal requirements PCB-containing ballasts must be sealed in EPA-approved drums and either sent to approved storage sites or incinerated. Watervliet Arsenal currently has a program for proper disposal of these ballasts.



SUBJECT ECIP # 1
LAMPS / DALLAS
DESIGNER C. Warren
CHECKER _____

AEP NO 290-0379-002
SHEET 1 OF 1
DATE 4/1/92
DATE _____

SAVINGS CALCULATIONS

From ECO Projects

<u>ECO #</u>	<u>ANNUAL ELECT</u> <u>SAVINGS (WATS/yr)</u>	<u>DIFFERENTIAL</u> <u>LAMP REPL</u> <u>COSTS (\$/yr)</u>	<u>REBATE AMT.</u> <u>(\$)</u>
8C	117	96	2203
8D	589	809	3138
8H	4478	2530	64979
TOTAL	5,184	3,435	70,320

04/01/92

ECO Construction Cost Estimate
Calculations

ECO Name: Energy Efficient Fluorescent Lights & Ballasts

ECO #: ECIP 1

1991 ECO "bare" costs (from cost estimate sheet)

Material	\$151,780
Labor	\$114,206

Subtotal bare costs	\$265,986
FICA Insurance (20% of Labor)	\$22,841
Sales Tax (not applicable for GOGO)	\$0

Subtotal	\$288,827
Overhead (15%)	\$43,324

Subtotal	\$332,151
Profit (10%)	\$33,215

Subtotal	\$365,366
Bond (1%)	\$3,654

Subtotal	\$369,020
Contingency (10%)	\$36,902

Subtotal (Construction Cost Input For LCCID *)	\$405,922
--	-----------

SIOH (6% of Construction Cost)	\$24,355
--------------------------------	----------

Subtotal	\$430,277
Design (6% of Construction Cost)	\$24,355

Total Project Cost	\$454,632
--------------------	-----------

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

ECIP 1 - HIGH EFFICIENCY LIGHTING

ECIP COST ESTIMATE CALCULATIONS

	#	LABOR	MATERIAL	
32W T8 LAMPS	308	\$693	\$647	
FICA (20% LAB)		\$139		
SUBTOTAL		\$832	\$647	
OVERHEAD (15%)		\$125	\$97	
SUBTOTAL		\$956	\$744	
PROFIT (10%)		\$96	\$74	
SUBTOTAL		\$1,052	\$818	
BOND (1%)		\$11	\$8	
SUBTOTAL		\$1,062	\$827	
PER UNIT		\$3.45	\$2.68	\$6.13

	#	LABOR	MATERIAL	
32W T8 BALLASTS	102	\$2,142	\$2,992	
FICA (20% LAB)		\$428		
SUBTOTAL		\$2,570	\$2,992	
OVERHEAD (15%)		\$386	\$449	
SUBTOTAL		\$2,956	\$3,441	
PROFIT (10%)		\$296	\$344	
SUBTOTAL		\$3,252	\$3,785	
BOND (1%)		\$33	\$38	
SUBTOTAL		\$3,284	\$3,823	
PER UNIT		\$32.20	\$37.48	\$69.67

	#	LABOR	MATERIAL	
34W LAMPS	7845	\$17,651	\$14,121	
FICA (20% LAB)		\$3,530		
SUBTOTAL		\$21,181	\$14,121	
OVERHEAD (15%)		\$3,177	\$2,118	
SUBTOTAL		\$24,358	\$16,239	
PROFIT (10%)		\$2,436	\$1,624	
SUBTOTAL		\$26,794	\$17,863	
BOND (1%)		\$268	\$179	
SUBTOTAL		\$27,062	\$18,042	
PER UNIT		\$3.45	\$2.30	\$5.75

	#	LABOR	MATERIAL	
60W LAMPS	6248	\$15,620	\$24,680	
FICA (20% LAB)		\$3,124		
SUBTOTAL		\$18,744	\$24,680	
OVERHEAD (15%)		\$2,812	\$3,702	
SUBTOTAL		\$21,556	\$28,382	
PROFIT (10%)		\$2,156	\$2,838	
SUBTOTAL		\$23,711	\$31,220	
BOND (1%)		\$237	\$312	
SUBTOTAL		\$23,948	\$31,532	

	#	LABOR	MATERIAL	
60W LAMP BALLASTS	3124	\$78,100	\$109,340	
FICA (20% LAB)		\$15,620		
SUBTOTAL		\$93,720	\$109,340	
OVERHEAD (15%)		\$14,058	\$16,401	
SUBTOTAL		\$107,778	\$125,741	
PROFIT (10%)		\$10,778	\$12,574	
SUBTOTAL		\$118,556	\$138,315	
BOND (1%)		\$1,186	\$1,383	
SUBTOTAL		\$119,741	\$139,698	

PER UNIT \$3.82 \$5.05 \$8.88 PER UNIT \$38.33 \$44.72 \$83.05

(E-4)

FORM 1391 - COST ESTIMATE

32W LAMPS	308	\$6.13	2	1,889	1,889
ELECT. BALL	102	\$69.67	7	7,107	7,107
34W LAMPS	7845	\$5.75	45	55,481	45,104
60W LAMPS	6248	\$8.88	56	45,104	55,481
EL BALL	3124	\$83.05	259	259,440	259,440

SUB			369		369,020
CONT (10%)			37		36,902
TOT CONTRACT			406		405,922
SIGN (6%)			24		24,355

TOTAL REQUEST			430		430,277
---------------	--	--	-----	--	---------

308	2.25	693	2.10	647
102	21.00	2,142	29.33	2,992
7845	2.25	17,651	1.80	14,121
6248	2.50	15,620	3.95	24,680
3124	25.00	78,100	35.00	109,340

114,206	151,779
---------	---------



SUBJECT ENERGY-EFFICIENT
FLUORESCENT LAMPS/BALLASTS
DESIGNER C. WARREN
CHECKER _____

AEP NO 290-0379-002
SHEET 1 OF _____
DATE 3/26/92
DATE _____

ECO 8 -

REPLACEMENT OF STANDARD FLUORESCENT LAMPS AND/OR
BALLASTS WITH ENERGY-EFFICIENT TYPES

- 1/ SURVEY OF BUILDINGS ON WVA TABULATED IN TABLES B-1 and B-2, SHOWING TYPES OF FLUORESCENT LAMPS, NUMBERS OF LAMPS AND FIXTURES; WATTS AND KWH/YR, respectively.

ASSUMPTIONS - PRODUCTION AREAS ENERGIZE LIGHTS
24 HRS/DAY X 5 DAYS/WK X 50 WKS/YR

$$= 6000 \text{ HRS/YR}$$

NON-PRODUCTION AREAS

$$11 \text{ HRS/DAY} \times 5 \text{ DAYS/WK} \times 50 \text{ WKS/YR}$$

$$= 2,750 \text{ HRS/YR}$$

STANDARD FIXTURE POWER DRAWS TAKEN FROM LIGHTING TEXTS - SURVEY NOTES CONTAIN DATA FOR EACH BUILDING THAT IS SUMMARIZED IN TABLES B-1, B-2.

2/ PREDOMINANT TYPES

$$F40T12 = 1,134,612 / 6,140,625 \text{ KWH/YR} = 18.5\%$$

$$F96T12 = 3,528,527 / 6,140,625 \text{ KWH/YR} = 57.5\%$$

$$F90T12 = 1,156,800 / 6,140,625 \text{ KWH/YR} = 18.8\%$$



SUBJECT ENERGY LAMPS/BALLASTS
DESIGNER C. WARREN
CHECKER _____

AEP NO 290-0379-002
SHEET 2 OF _____
DATE 3/26/92
DATE _____

CONSIDER F40T12 & F96T12 FOR REPLACEMENT - F90T12 IS
REPLACEMENT FOR F90T17 AND IS ENERGY-EFFICIENT.

REPLACEMENTS FOR F40T12 LAMPS

- ① 34 W
- ② 32 W T-8 SYSTEM - REQUIRES ELECTRONIC BALLAST

BALLASTS FOR F40

- ① ENERGY ELECTROMAGNETIC
- ② ELECTRONIC

REPLACEMENTS FOR F96T12 LAMPS

- ① 60 W

BALLASTS - ELECTRONIC

SPECIFICATIONS AND PRICES TABLES B-3 AND B-4, resp.

3/ PERFORM CALCULATIONS TO DETERMINE INPUT DATA FOR LCCID CALCULATIONS

CASES CONSIDERED -

- 8 A. REPLACE 40-W LAMPS IN PRODUCTION AREAS WITH 34W LAMPS
LAMPS 300 (TABLE B-1) 300 IN 100 FIXTURES
8 IN 4 FIXTURES

EXISTING 3-TUBE FIXTURES DRAW 144 W / FIXTURE

" 2-TUBE FIXTURES DRAW 96 W / FIXTURE

REPLACING W/ 34 WATT TUBES

15.9% DROP IN LUMENS

144 W / FIX $\Rightarrow$ 120 W / FIX

96 W / FIX $\Rightarrow$ 80 W / FIX



SUBJECT ENERGY LAMPS/BALLASTS
DESIGNER C. WARREN
CHECKER _____

AEP NO 290-0319-002
SHEET 3 OF _____
DATE 3/26/92
DATE _____

8B. SAME AS A; REPLACE BALLASTS WITH ENERGY-EFFICIENT ELECTROMAGNETIC BALLASTS

1 BALLAST / 2 LAMPS (WVA ELECT. DEPT.)
152 BALLASTS

3-TUBE FIXTURES FROM 144 W/FIX $\Rightarrow$ 95 W/FIX

2-TUBE FIXTURES FROM 96 W/FIX $\Rightarrow$ 66 W/FIX

8C. REPLACE 40 W LAMPS & BALLASTS WITH FLUORESCENT LAMPS (32 W) AND ELECTRONIC BALLASTS $\Rightarrow$ 7.9% DROP IN LUMENS FROM EXISTING

3 TUBE FIXTURES USE 1 BALLAST/FIXTURE

DRAW 88 W/FIXTURE

2 TUBE FIXTURES / 1 BALLAST

DRAW 58 W/FIXTURE

8D. SAME AS A; MIXTURE OF 2, 3, 4 TUBE FIXTURES
ALL USE 1 BALLAST / 2 TUBES - NON PRODUCTION BLDGS

8E. SAME AS B, NON-PRODUCTION BLDGS

8F. SAME AS C, EXCEPT 1 BALLAST / 2 LAMPS;
NON-PRODUCTION BLDGS

8G. REPLACE 75 W F96T12 LAMPS WITH 60 W F96T12 LAMPS
PRODUCTION BUILDINGS $\Rightarrow$ 10.6% DROP IN LUMENS
175 W/FIXTURE $\Rightarrow$ 163 W/FIXTURE

8H. SAME AS G, WITH BALLAST REPLACEMENT (ELECTRONIC)
1 BALLAST / 2 LAMPS

175 W/FIXTURE $\Rightarrow$ 105 W/FIXTURE

(MAJORITY OF LAMPS IN BLDG 25 WITH 3.9 W/SF - LOSS OF LUMENS SHOULD NOT AFFECT WORK)



SUBJECT ENERGY LAMPS/BALLASTS AEP NO 290-0379-002
DESIGNER C. WARREN SHEET 4 OF
CHECKER DATE 3/26/92
DATE

8I. SAME AS G ; NON-PRODUCTION BUDGS

8J. SAME AS H ; NON-PRODUCTION BUDGS

LABOR AND MATERIAL COSTS / CONSTRUCTION COSTS
SITDOWN ON FOLLOWING COST ESTIMATE SHEETS

REPLACEMENT COSTS

ASSUMPTIONS - 20,000 HRS LIFETIME FOR ALL LAMPS
NO BALLAST REPLACEMENTS
25 YR PROJECT LIFETIME
LABOR COSTS ARE SAME FOR STD VS ENERGY LAMPS
AUG LAMP REPLACEMENTS PER YR

① PRODUCTION AREAS F40 LAMPS & F96

$$\frac{20,000 \text{ HRS/LAMP}}{6,000 \text{ HRS/YR}} = 3.33 \frac{\text{YRS}}{\text{LAMP}}$$

$$\frac{308 \text{ LAMPS}}{3.33 \text{ YRS}} = 92.4 \text{ REPLACEMENTS/YR}$$

② NON-PRODUCTION F40/F96

$$\frac{20,000}{2750} = 7.27 \text{ YRS/LAMP}$$

$$\frac{7845}{7.27} = 1079 \text{ LAMPS/YR REPLACED}$$



SUBJECT ENERGY LAMP/BALLASTS
DESIGNER C. WARREN
CHECKER _____

AEP NO 290-0379-002
SHEET 5 OF _____
DATE 3/26/92
DATE _____

③ PRODUCTION AREAS F96 LAMPS

$$\frac{6248 \text{ LAMPS}}{3.33 \text{ yrs}} = 1,876 \text{ REPL/YR}$$

④ NON-PRODUCTION F96

$$\frac{1032}{7.27} = 142 \text{ REPL/YR}$$

REPLACEMENT LAMP COSTS -

	# REPLACEMENTS/YR	LAMP PRICE (EA)	TOTAL
<u>PRODUCTION AREAS</u>			
F40T12 (STD)	92	1.05	97
F40T12/WM	92	1.80	166
F32TB	92	2.10	193
F96T12 (STD)	1876	2.60	4878
F96T12/WM	1876	3.95	7410
<u>NON-PRODUCTION AREAS</u>			
F40T12 (STD)	1079	1.05	1133
F40T12/WM	1079	1.80	1942
F32TB	1079	2.10	2266
F96T12 (STD)	142	2.60	369
F96T12/WM	142	3.95	560

SUMMARY OF SAVINGS FOR EACH ECO - PROJECT SUMMARY DATA
FOLLOW ON PAGES 8-10 thru 8-14

FLUORESCENT LIGHTING S
WATERVILLE ARSENAL
DATES: 15 OCT 91 - 18
PROJECT # 290-0379-00

TABLE B-1 FLUORESCENT LIGHTING
INVENTORY

PROJECT # 270-0377-00																			
BLDG #	AREA	AVG W/SF	F40T12 # LTS	F40T12 # FXTRS	F96T112 # LTS	F96T112 # FXTRS	F96T112H0 # LTS	F96T112H0 # FXTRS	F90T112 # LTS	F90T112 # FXTRS	F72P617 # LTS	F72P617 # FXTRS	F96P617 # LTS	F96P617 # FXTRS	TOTAL LTS	TOTAL FXTRS			
20	MANUF	1.9			1,728	864									1,728	864			
25	MANUF	3.9			5,600	2,800									5,600	2,800			
35	MANUF	N/A													0	0			
110	MANUF	1.3	300	100	648	324			200	100					1,148	524			
125	MANUF	1.5	8	4			184	92							192	96			
135	MANUF	N/A													0	0			
TOTAL MANUF			308	104	6,248	3,124	184	92	1,928	964	0	0	0	0	8,668	4,284			
10	OFFICES	0.9	1,042	377	4	2									1,046	379			
15	NTR POOL	0.5	182	91	4	2									186	93			
15	OFFICES	0.5	62	31											62	31			
20	OFFICES	1.8	372	124											372	124			
21	CAFETERIA	0.4	124	62											124	62			
22	FIRE STA	N/A													0	0			
22	FIRE STA	N/A													302	127			
23	MANUF/SPLY	0.9	212	82	90	45									114	57			
24	OFFICES	1.2	114	57											1,048	524			
40	OFFICES/LABS	1.3	860	430	188	94									1,678	537			
44	OFFICES	1.4	1,512	454	166	83									1,471	608			
115	OFFICES	1.2	1,451	598	20	10									262	131			
120	STORAGE	0.6	104	52	158	79			252	126					252	126			
120	SHOPS	1.1													362	181			
120	OFFICES	1.2	352	176	10	5					60	30			1,010	505			
120	LABS	1.8	950	475			42	21					24	12	66	33			
123	CLEANING	1.3													360	180			
124	OFFICES/LABS	1.2	360	180											252	126			
130	WAREHOUSE	0.7	72	36	162	81			18	9					318	159			
145	WAREHOUSE	0.2	76	38	230	115			12	6									
TOTAL OTHER			7,845	3,263	1,032	516	42	21	0	282	141	60	30	24	12	9,285	3,983		
TOTAL WVA			1.4	8,153	3,367	7,280	3,640	226	113	1,928	964	282	141	60	30	24	12	17,953	8,267

FLUORESCENT LIGHTING SURVEY - SUMMARY

WATERVLIET ARSENAL

DATES: 15 OCT 91 - 18 OCT 91

PROJECT # 290-0379-002

FLUORESCENT LIGHTING
CURRENT ENERGY USE

TABLE B-2

BLDG #	AREA	AVG W/SF	F40T12 WATTS	F40T12 KWH/YR	F96T12 WATTS	F96T12 KWH/YR	F96T12H0 WATTS	F96T12H0 KWH/YR	F90T12 WATTS	F90T12 KWH/YR	F90T17 WATTS	F90T17 KWH/YR	F72P617 WATTS	F72P617 KWH/YR	F96P617 WATTS	F96P617 KWH/YR	TOTAL WATTS	TOTAL KWH/YR
20	MANUF	1.9							172,800	1,036,800							172,800	1,036,800
25	MANUF	3.9			490,000	2,940,000											490,000	2,940,000
35	MANUF	N/A															0	0
110	MANUF	1.3	14,400	86,400	56,700	340,200			20,000	120,000							91,100	546,600
125	MANUF	1.5	384	2,304			23,460	140,760									23,844	143,064
135	MANUF	N/A															0	0
=====																		
TOTAL MANUF			14,784	88,704	546,700	3,280,200	23,460	140,760	192,800	1,156,800	0	0	0	0	0	0	777,744	4,666,464
=====																		
10	OFFICES	0.9	50,016	137,544	350	963											50,366	138,507
15	MTR POOL	0.5	8,736	24,024	350	963											9,086	24,987
15	OFFICES	0.5	2,976	8,184													2,976	8,184
20	OFFICES	1.8	17,856	49,104													17,856	49,104
21	CAFETERIA	0.4	5,952	16,368													5,952	16,368
22	FIRE STA	N/A															0	0
23	MANUF/SPLY	0.9	10,176	38,352	7,875	21,656											18,051	60,008
24	OFFICES	1.2	5,472	15,048													5,472	15,048
40	OFFICES/LABS	1.3	41,280	113,520	16,450	45,238											57,730	158,758
44	OFFICES	1.4	72,576	199,584	14,525	39,944											87,101	239,528
115	OFFICES	1.2	69,648	191,532	1,750	4,813											71,398	196,345
120	STORAGE	0.6	4,992	13,728	13,825	38,019											18,817	51,747
120	SHOPS	1.1									27,090	74,498					27,090	74,498
120	OFFICES	1.2	16,896	46,464	875	2,406											17,771	48,870
120	LABS	1.8	45,600	125,400									11,385				56,985	156,709
123	CLEANING	1.3					5,355	32,130							5,520	33,120	10,875	65,250
124	OFFICES/LABS	1.2	17,280	47,520													17,280	47,520
130	WAREHOUSE	0.7	3,456	9,504	14,175	38,981					1,935	5,321					19,566	53,806
145	WAREHOUSE	0.2	3,648	10,032	20,125	55,344					1,290	3,548					25,063	68,924
=====																		
TOTAL OTHER			376,560	1,045,908	90,300	248,327	5,355	32,130	0	0	30,315	83,367	11,385		31,309	5,520	519,435	1,474,161
=====																		

TOTAL WVA 1.5 391,344 1,134,612 637,000 3,528,527 28,815 172,890 192,800 1,156,800 30,315 83,367 11,385 31,309 5,520 33,120 1,297,179 6,140,625

TABLE B-3

FLUORESCENT LAMP SPECIFICATIONS
WVA - #290-0379-002
10-Feb-92

LAMP(1)	BULB DIAM *		WATTS	BASE	LIFE (HRS) 12-HR START	LUMENS	CURRENT (MA)	PRICE (\$)
F40CW(GE)	1.5	STD	40	BIPIN	20000	3050	425	
F40CW(P)	1.5	STD	40	BIPIN	20000	3150	425	
F40CW/RS/WM(GE)	1.5	ENERGY	34	BIPIN	20000	2650	425	\$1.80
F40CW/RS/EW-II(P)	1.5	ENERGY	34	BIPIN	20000	2775	425	
F40/CW/EW-PH(P)	1.5	ENERGY	34	BIPIN	15000	2850	425	
F40CW/RS/WM(P)	1.5	ENERGY	32	BIPIN	15000	2525	425	\$2.10
F40T8(GE)	1.0	STD	40	BIPIN	20000	3600	265	
F40T8(P)	1.0	STD	40	BIPIN	20000	3650	265	
F32T8(P)	1.0	ENERGY	32	BIPIN	20000	2900	265	\$2.10
F040T8(S)	1.0	STD	40	BIPIN	20000	3650	265	
F032T8(S)	1.0	ENERGY	32	BIPIN	20000	2900	265	
F72P617(GE)	2.125	STD	165	RDC	15000	11000	1500	
F96T12/CW(GE)	1.5	STD	75	SINGLE	18000	6150	425	
F96T12/CW(P)	1.5	STD	75	SINGLE	12000	6300	425	
F96T12/CW/WM(GE)	1.5	ENERGY	60	SINGLE	18000	5500	425	\$3.95
F96T12/CW/EW(P)	1.5	ENERGY	60	SINGLE	12000	5600	425	
F96T12/CW/HO(GE)	1.5	STD	105	RDC	18000	8900	800	
F96T12/CW/HO(P)	1.5	STD	105	RDC	12000	9200	800	
F96T12/CW/HO/WM(GE)	1.5	ENERGY	95	RDC	18000	8000	800	\$5.30
F96T12/CW/HO/EW(P)	1.5	ENERGY	95	RDC	12000	8300	800	
F96P617/CW(GE)	2.125	STD	215	RDC	15000	15300	1500	
F96P617/CW/WM(GE)	2.125	ENERGY	185	RDC	15000	13500	1500	\$11.45
F90T17/CW(GE)	2.125	STD	90	MOG BIP	15000	6000	425	
F90T17/CW/WM(GE)	2.125	ENERGY	82	MOG BIP	15000	5750	425	\$9.00
F90T12/CW/60/EW(P)	1.5	ENERGY	84	MOG BIP	9000	6250	425	\$9.00
(REPLACES F90T17/CW)								

(1) GENERAL ELECTRIC (GE)
PHILIPS (P)
SYLVANIA (S)

SOURCES : SPECIFICATIONS FROM MANUF. CATALOGS
PRICE QUOTES FROM VENDORS

TABLE 8-4

FLUORESCENT BALLAST SPECIFICATIONS

WVA - #290-0379-002

12-Feb-92

LAMPS	WATTS	BALLASTS	BALLAST INPUT (W)	PRICE (\$)
F40T12/RS STD	40	ADV MARK IV	80	\$20.00
		EBT ELECTRONIC	71	
		GE OPTIMISER	71	
		GE PERFORMANCE SS	70	
		STANDARD	96	
F40T12/RS ENERGY	34	ADV MARK IV	66	\$20.00
		EBT ELECTRONIC	59	\$25.20
		GE OPTIMISER	59	
F40T12/RS ENERGY	32	GE MAXI-MISER II	72	
F40T8/IS STD	40	EBT ELECTRONIC	70	
F32T8/IS ENERGY	32	EBT ELECTRONIC	58	\$26.90
		T8 MAGNETIC	66	
F96T12/IS STD	75	GE MAXI-MISER II	158	
		EBT ELECTRONIC	130	
		STANDARD	175	
F96T12/IS ENERGY	60	GE MAXI-MISER II	136	
		EBT ELECTRONIC	105	\$35.00
F96T12/HO STD	105	GE WATT-MISER	237	
		GE MAXI-MISER II	254	
		STANDARD	255	
		EBT ELECTRONIC	190	
F96T12/HO ENERGY	95	GE MAXI-MISER II	212	
		EBT ELECTRONIC	160	\$44.00
F96PG17 STD	215	STANDARD	460	
F96PG17 ENERGY	185	STANDARD	400	
F90T17 STD	90	STANDARD	215	
		STANDARD	200	
F90T12	84	STANDARD	200	

SOURCES: SPECIFICATIONS FROM
MANUF. CATALOGS
PRICES FROM VENDORS

PROJECT SUMMARY DATA
WATERVLIET ARSENAL

PROJECT: ECO #8
ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS

8A
Replace 40-Watt Fluorescents with 34-Watt Lamps
Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T12/WM Std. Bal.	Savings
Number Lamps	308.0	308.0	0.0
Number Fixtures	104.0	104.0	0.0
Number Ballasts	152.0	152.0	0.0
Load, kW	14.8	12.4	2.5
Use, Hrs/yr	6000.0	6000.0	0.0
Use MBtu/yr	303.7	253.1	50.6
Lamp Repl Cost, \$/yr	97.0	166.0	-69.0
Rebate Amt., \$	0.0	-123.2	123.2

8B
Replace 40-Watt Fluorescents with 34-Watt Lamps
Replace Standard Ballasts with Energy - Efficient Electromagnetic Ballasts
Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T12/WM EM Bal.	Savings
Number Lamps	308.0	308.0	0.0
Number Fixtures	104.0	104.0	0.0
Number Ballasts	152.0	152.0	0.0
Load, kW	14.8	9.8	5.0
Use, Hrs/yr	6000.0	6000.0	0.0
Use MBtu/yr	302.7	200.4	102.4
Lamp Repl Cost, \$/yr	97.0	166.0	-69.0
Rebate Amt., \$	0.0	-3163.2	3163.2

PROJECT SUMMARY DATA
WATERVLIET ARSENAL

PROJECT: ECO #8
ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS

8C

Replace 40-Watt Lamps and Ballasts with T8 System
Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T8 Elect. Bal.	Savings
Number Lamps	308.0	308.0	0.0
Number Fixtures	104.0	104.0	0.0
Number Ballasts	152.0	102.0	50.0
Load, kW	14.8	9.1	5.7
Use, Hrs/yr	6000.0	6000.0	0.0
Use MBtu/yr	302.7	185.6	117.1
Lamp Repl Cost, \$/yr	97.0	193.0	-96.0
Rebate Amt., \$	0.0	-2203.2	2203.2

8D

Replace 40-Watt Fluorescents with 34-Watt Lamps
Non-Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T12/WM Std. Bal.	Savings
Number Lamps	7845.0	7845.0	0.0
Number Fixtures	3263.0	3263.0	0.0
Number Ballasts	3923.0	3923.0	0.0
Load, kW	376.6	313.8	62.7
Use, Hrs/yr	2750.0	2750.0	0.0
Use MBtu/yr	3534.3	2945.6	588.7
Lamp Repl Cost, \$/yr	1133.0	1942.0	-809.0
Rebate Amt., \$	0.0	-3138.0	3138.0

PROJECT SUMMARY DATA
WATERVLIET ARSENAL

PROJECT: ECO #8
ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS

8E

Replace 40-Watt Fluorescents with 34-Watt Lamps

Replace Standard Ballasts with Energy - Efficient Electromagnetic Ballasts

Non-Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T12/WM EM Bal.	Savings
Number Lamps	7845.0	7845.0	0.0
Number Fixtures	3263.0	3263.0	0.0
Number Ballasts	3923.0	3923.0	0.0
Load, kW	376.6	258.9	117.6
Use, Hrs/yr	2750.0	2750.0	0.0
Use MBtu/yr	3534.3	2430.1	1104.2
Lamp Repl Cost, \$/yr	1133.0	1942.0	-809.0
Rebate Amt., \$	0.0	-81598.0	81598.0

8F

Replace 40-Watt Lamps and Ballasts with T8 System

Non-Production Areas

	Existing F40T12 Std. Bal.	Proposed F40T8 Elect. Bal.	Savings
Number Lamps	7845.0	7845.0	0.0
Number Fixtures	3263.0	3263.0	0.0
Number Ballasts	3923.0	3923.0	0.0
Load, kW	376.6	227.5	149.0
Use, Hrs/yr	2750.0	2750.0	0.0
Use MBtu/yr	3534.3	2135.6	1398.7
Lamp Repl Cost, \$/yr	1133.0	2266.0	-1133.0
Rebate Amt., \$	0.0	-81598.0	81598.0

PROJECT SUMMARY DATA
WATERVLIET ARSENAL

PROJECT: ECO #8
ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS

8G

Replace 75-Watt Fluorescents with 60-Watt Lamps
Production Areas

	Existing F96T12 Std. Bal.	Proposed F96T12/WM Std. Bal.	Savings
Number Lamps	6248.0	6248.0	0.0
Number Fixtures	3124.0	3124.0	0.0
Number Ballasts	3124.0	3124.0	0.0
Load, kW	546.7	509.2	37.5
Use, Hrs/yr	6000.0	6000.0	0.0
Use MBtu/yr	11195.3	10427.4	767.9
Lamp Repl Cost, \$/yr	4878.0	7410.0	-2532.0
Rebate Amt., \$	0.0	-2499.2	2499.2

8H

Replace 75-Watt Fluorescents with 60-Watt Lamps
Replace Standard Ballasts with Energy - Efficient Electronic Ballasts
Production Areas

	Existing F96T12 Std. Bal.	Proposed F96T12/WM Elect. Bal.	Savings
Number Lamps	6248.0	6248.0	0.0
Number Fixtures	3124.0	3124.0	0.0
Number Ballasts	3124.0	3124.0	0.0
Load, kW	546.7	328.0	218.7
Use, Hrs/yr	6000.0	6000.0	0.0
Use MBtu/yr	11195.3	6717.2	4478.1
Lamp Repl Cost, \$/yr	4878.0	7410.0	-2532.0
Rebate Amt., \$	0.0	-64979.2	64979.2

PROJECT SUMMARY DATA
WATERVLIET ARSENAL

PROJECT: ECO #8
ENERGY EFFICIENT FLUORESCENT LAMPS AND BALLASTS

8I

Replace 75-Watt Fluorescents with 60-Watt Lamps
Non-Production Areas

	Existing F96T12 Std. Bal.	Proposed F96T12/WM Std. Bal.	Savings
Number Lamps	1032.0	1032.0	0.0
Number Fixtures	516.0	516.0	0.0
Number Ballasts	516.0	516.0	0.0
Load, kW	90.3	84.1	6.2
Use, Hrs/yr	2750.0	2750.0	0.0
Use MBtu/yr	847.5	789.3	58.2
Lamp Repl Cost, \$/yr	369.0	560.0	-191.0
Rebate Amt., \$	0.0	-412.8	412.8

8J

Replace 75-Watt Fluorescents with 60-Watt Lamps
Replace Standard Ballasts with Energy - Efficient Electronic Ballasts
Non-Production Areas

	Existing F96T12 Std. Bal.	Proposed F96T12/WM Elect. Bal.	Savings
Number Lamps	1032.0	1032.0	0.0
Number Fixtures	516.0	516.0	0.0
Number Ballasts	516.0	516.0	0.0
Load, kW	90.3	54.2	36.1
Use, Hrs/yr	2750.0	2750.0	0.0
Use MBtu/yr	847.5	508.5	339.0
Lamp Repl Cost, \$/yr	369.0	560.0	-191.0
Rebate Amt., \$	0.0	-10732.8	10732.8

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 34-Watt Lamps
Production Areas

ECO #: 8A

1991 ECO "bare" costs (from cost estimate sheet)

Material	\$554
Labor	\$693

Subtotal bare costs	\$1,247
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FICA Insurance (20% of Labor)	\$139
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Sales Tax (not applicable for GOGO)	\$0
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Subtotal	\$1,386
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Overhead (15%)	\$208
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Subtotal	\$1,594
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Profit (10%)	\$159
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Subtotal	\$1,753
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Bond (1%)	\$18
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Subtotal	\$1,771
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Contingency (10%)	\$177
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Subtotal (Construction Cost Input For LCCID *)	\$1,948
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SIOH (6% of Construction Cost)	\$117
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Subtotal	\$2,065
----------	---------

Design (6% of Construction Cost)	\$117
----------------------------------	-------

Total Project Cost	\$2,182
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* The SIOH costs (6.0%) and Design costs (6.0%) are automatically
added in the Life Cycle Cost In Design (LCCID) analysis program.

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 34-Watt Lamps
Replace Standard Ballasts With Energy EM Ballasts
Production Areas

ECO #: 8B

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$3,594
Labor		\$3,885
	Subtotal bare costs	\$7,479
FICA Insurance (20% of Labor)		\$777
Sales Tax (not applicable for GOGO)		\$0
	Subtotal	\$8,256
Overhead (15%)		\$1,238
	Subtotal	\$9,494
Profit (10%)		\$949
	Subtotal	\$10,443
Bond (1%)		\$104
	Subtotal	\$10,547
Contingency (10%)		\$1,055
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$11,602
		+-----+
SIOH (6% of Construction Cost)		\$696
	Subtotal	\$12,298
Design (6% of Construction Cost)		\$696

Total Project Cost		\$12,994

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically
added in the Life Cycle Cost In Design (LCCID) analysis program.

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 32-Watt Lamps
Replace Standard Ballasts With Electronic Ballasts
Production Areas

ECO #: 8C

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$3,639
Labor		\$2,835
	Subtotal bare costs	\$6,474
FICA Insurance (20% of Labor)		\$567
Sales Tax (not applicable for GOGO)		\$0
	Subtotal	\$7,041
Overhead (15%)		\$1,056
	Subtotal	\$8,097
Profit (10%)		\$810
	Subtotal	\$8,907
Bond (1%)		\$89
	Subtotal	\$8,996
Contingency (10%)		\$900
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$9,896
		+-----+
SIOH (6% of Construction Cost)		\$594
	Subtotal	\$10,490
Design (6% of Construction Cost)		\$594
		+-----+
Total Project Cost		\$11,084

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically
added in the Life Cycle Cost In Design (LCCID) analysis program.

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 34-Watt Lamps
Non-Production Areas

ECO #: 80

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$14,121
Labor		\$17,651
	Subtotal bare costs	\$31,772
FICA Insurance (20% of Labor)		\$3,530
Sales Tax (not applicable for GOGO)		\$0
	Subtotal	\$35,302
Overhead (15%)		\$5,295
	Subtotal	\$40,597
Profit (10%)		\$4,060
	Subtotal	\$44,657
Bond (1%)		\$447
	Subtotal	\$45,104
Contingency (10%)		\$4,510
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$49,614
		+-----+
SIOH (6% of Construction Cost)		\$2,977

	Subtotal	\$52,591
Design (6% of Construction Cost)		\$2,977

Total Project Cost		\$55,568

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically
added in the Life Cycle Cost In Design (LCCID) analysis program.

03/19/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 40-Watt Fluorescents With 34-Watt Lamps
Replace Standard Ballasts With Energy EM Ballasts
Non-Production Areas

ECO #: 8E

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$92,581
Labor		\$100,034
Subtotal bare costs		\$192,615
FICA Insurance (20% of Labor)		\$20,007
Sales Tax (not applicable for GOGO)		\$0
Subtotal		\$212,622
Overhead (15%)		\$31,893
Subtotal		\$244,515
Profit (10%)		\$24,452
Subtotal		\$268,967
Bond (1%)		\$2,690
Subtotal		\$271,657
Contingency (10%)		\$27,166
Subtotal (Construction Cost Input For LCCID *)		\$298,823
SIOH (6% of Construction Cost)		\$17,929
Subtotal		\$316,752
Design (6% of Construction Cost)		\$17,929
Total Project Cost		\$334,681

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/19/92

ECO Construction Cost Estimate Calculations

ECO Name: Replace 40-Watt Fluorescents With 32-Watt Lamps
Replace Standard Ballasts With Electronic Ballasts
Non-Production Areas

ECO #: 8F

1991 ECO "bare" costs (from cost estimate sheet)

Material	\$122,395
Labor	\$100,034

Subtotal bare costs	\$222,429
FICA Insurance (20% of Labor)	\$20,007
Sales Tax (not applicable for GOGO)	\$0

Subtotal	\$242,436
Overhead (15%)	\$36,365

Subtotal	\$278,801
Profit (10%)	\$27,880

Subtotal	\$306,681
Bond (1%)	\$3,067

Subtotal	\$309,748
Contingency (10%)	\$30,975

Subtotal (Construction Cost Input For LCCID *)	\$340,723
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SIOH (6% of Construction Cost)	\$20,443
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Subtotal	\$361,166
Design (6% of Construction Cost)	\$20,443

Total Project Cost	\$381,609
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* The SIOH costs (6.0%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

03/23/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 75-Watt Fluorescents With 60-Watt Lamps
Production Areas

ECO #: 8G

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$24,680
Labor		\$15,620
	Subtotal bare costs	\$40,300
FICA Insurance (20% of Labor)		\$3,124
Sales Tax (not applicable for GOGO)		\$0
	Subtotal	\$43,424
Overhead (15%)		\$6,514
	Subtotal	\$49,938
Profit (10%)		\$4,994
	Subtotal	\$54,932
Bond (1%)		\$549
	Subtotal	\$55,481
Contingency (10%)		\$5,548
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$61,029
		+-----+
SIOH (6% of Construction Cost)		\$3,662

	Subtotal	\$64,691
Design (6% of Construction Cost)		\$3,662

Total Project Cost		\$68,353

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically
added in the Life Cycle Cost In Design (LCCID) analysis program.

03/23/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 75-Watt Fluorescents With 60-Watt Lamps
Replace Standard Ballasts With Electronic Ballasts
Production Areas

ECO #: 8H

1991 ECO "bare" costs (from cost estimate sheet)

Material	\$134,020
Labor	\$93,720

Subtotal bare costs	\$227,740
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FICA Insurance (20% of Labor)	\$18,744
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Sales Tax (not applicable for GOGO)	\$0
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Subtotal	\$246,484
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Overhead (15%)	\$36,973
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Subtotal	\$283,457
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Profit (10%)	\$28,346
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Subtotal	\$311,803
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Bond (1%)	\$3,118
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Subtotal	\$314,921
----------	-----------

Contingency (10%)	\$31,492
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Subtotal (Construction Cost Input For LCCID *)	\$346,413
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SIOH (6% of Construction Cost)	\$20,785
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Subtotal	\$367,198
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Design (6% of Construction Cost)	\$20,785
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Total Project Cost	\$387,983
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* The SIOH costs (6.0%) and Design costs (6.0%) are automatically
added in the Life Cycle Cost In Design (LCCID) analysis program.

03/23/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 75-Watt Fluorescents With 60-Watt Lamps
Non-Production Areas

ECO #: 8I

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$4,076
Labor		\$2,580
	Subtotal bare costs	\$6,656
FICA Insurance (20% of Labor)		\$516
Sales Tax (not applicable for GOGO)		\$0
	Subtotal	\$7,172
Overhead (15%)		\$1,076
	Subtotal	\$8,248
Profit (10%)		\$825
	Subtotal	\$9,073
Bond (1%)		\$91
	Subtotal	\$9,164
Contingency (10%)		\$916
Subtotal (Construction Cost Input For LCCID *)		\$10,080
SIOH (6% of Construction Cost)		\$605
	Subtotal	\$10,685
Design (6% of Construction Cost)		\$605
Total Project Cost		\$11,290

* The SIOH costs (6.0%) and Design costs (6.0%) are automatically
added in the Life Cycle Cost In Design (LCCID) analysis program.

03/23/92

ECO Construction Cost Estimate
Calculations

ECO Name: Replace 75-Watt Fluorescents With 60-Watt Lamps
Replace Standard Ballasts With Electronic Ballasts
Non-Production Areas

ECO #: 8J

1991 ECO "bare" costs (from cost estimate sheet)

Material	\$22,136
Labor	\$15,480

Subtotal bare costs	\$37,616
FICA Insurance (20% of Labor)	\$3,096
Sales Tax (not applicable for GOGO)	\$0

Subtotal	\$40,712
Overhead (15%)	\$6,107

Subtotal	\$46,819
Profit (10%)	\$4,682

Subtotal	\$51,501
Bond (1%)	\$515

Subtotal	\$52,016
Contingency (10%)	\$5,202

Subtotal (Construction Cost Input For LCCID *)	\$57,218
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SIOH (6% of Construction Cost)	\$3,433
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Subtotal	\$60,651
Design (6% of Construction Cost)	\$3,433

Total Project Cost	\$64,084
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* The SIOH costs (6.0%) and Design costs (6.0%) are automatically
added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE

DATE PREPARED

2/13/92

SHEET 2 OF 2

PROJECT

ENERGY ENGINEERING ANALYSIS

LOCATION

WVA

ARCHITECT ENGINEER

REYNOLDS, SMITH AND HILLS A.E.P., INC.

BASIS FOR ESTIMATE

- ☐ CODE A (No design completed)
☐ CODE B (Preliminary design)
☐ CODE C (Final design)
☐ OTHER (Specify) _____

DRAWING NO.

ESTIMATOR

C. WARREN

CHECKED BY

ECO 8

SUMMARY

QUANTITY

NO. UNITS

UNIT MEAS.

PER UNIT

LABOR

TOTAL

MATERIAL

PER UNIT

TOTAL

TOTAL COST

F96T12 LAMP &

BALLAST REPLACEMENTS

PRODUCTION AREAS

8G 60 W LAMPS

6248

EA

2.50

15,620

3.95

24,680

40,300

NO BALLAST REPLACE

8H 60 W LAMPS

6248

EA

2.50

15,620

3.95

24,680

40,300

ELECTRONIC BALLASTS

3124

EA

25.00

78,100

35.00

109,340

187,440

93,720

134,020

227,740

NON-PRODUCTION AREAS

8I 60 W LAMPS

1032

EA

2.50

2,580

3.95

4,076

6,656

NO BALLAST REPLACE

8J 60 W LAMPS

1032

EA

2.50

2,580

3.95

4,076

6,656

ELECTRONIC BALLASTS

516

EA

25.00

12,900

35.00

18,060

30,960

15,480

22,136

37,616

02/10/92 18:33 0904 279 2491

RS&H

001

RS&H

Architecture, Engineering and Planning

Reynolds, Smith and Mills, Inc.
451 Salisbury Road
Jacksonville, Florida 32256

FACSIMILE TRANSMITTAL LETTER

DATE 2/10/92

(813) 282-1151

From ELECTRONIC BALLAST TECHNOLOGY - Swanson & Co.
Tampa

To DR CARLOS WARREN, PE (904) 279-2275

FAX NO. (213) 534-8214

PTAC NUMBER 599361

PROJECT NUMBER:

TASK NO:

SENDER'S DEPARTMENT NUMBER 2ASH

WE ARE TRANSMITTING 1 PAGES INCLUDING COVER

IF YOU DO NOT RECEIVE ALL PAGES PLEASE TELEPHONE:

904-296-2000

IF YOU WISH TO TRANSMIT FAX COPY TO US PLEASE TELEPHONE: 904-279-2491

COMMENTS: I NEED PRICE QUOTES FOR BULK PURCHASES
OF FOLLOWING BALLASTS

SSB1 - 120 - 2/40 LH	25.20 ea.
SSB1 - 277 - 2/96 HO LH	44.80 ea.
SSB2 - 120 - 2/96 IS LH	35.00 ea.
SSB1 - 120 - 2/96 HO LH	44.80 ea.
SSB2 - 120 - 2/32 IS LH	26.90 ea.

PLEASE QUOTE ASAP Thanks OTL

SSB2 - 120 - 3/32 IS LH 29.33

From ~~Jim~~ Jim REYNOLDS

to ~~From~~ Carlos Warren
RS&H

Quotes on the following (bulk quantities)

Lamps =

<u>GE</u> F40CW/RS/wm	1.80 ea
F40 ^{LD} RS/wm plus	2.10 ea
F96T12/cw/wm	3.95 ea
F96T12/cw/HO/wm 5.30 ea	or equivalent
F96DG17/cw/wm 11.45 ea	Philips, Sylvania
F96T17/cw/wm	9.00 ea

<u>Philips</u> F96T12CW/60/EW	\$ 9.00
FO32/35	\$ 2.10

Ballasts (2 lamp fixtures)

Advance Powercut Mark IV	RK-2540-TP 20.00 ea
	VK-2540-TP 27.00 ea

GE Optimizer M28-120

Maxi-Merc II BG1028W, BG1148W, BG1144W,
BG1008W, BG1004W

EBT SSB1-120-2/40 LH SSB1-120-2/46 HO LH

SSB1-277-2/46 HO LH SSB1-120-2/27 T6 LH

SELF-SERVICE SUPPLY CENTER
- MASTER LIST OF SUPPLIES -
REPAIR & UTILITY

STOCK NUMBER	NOMENCLATURE	MAT-CAT	UNIT ISSUE	UNIT PRICE
624000000022	LAMP, INDICATOR, #CM/-7632	T	EA	\$ 1.52
62400000726127	LAMP, INDICATOR, G.E. #253X	T	EA	\$ 3.34
62400005191152	LAMP, INSIDE FROST, 50 WATT, 250 VOLT, A19 BULB, MEDIUM BASE, G.E. #50A	T	EA	\$ 1.16
6240010978687	LAMP, LOW PRESSURE SODIUM, CLEAR, T-12 BULB, BASE BT22D, 90 WATT	T	EA	\$ 31.38
6240010978686	LAMP, LOW PRESSURE SODIUM, CLEAR, T-17 BULB, BASE BY22D, 55 WATT	T	EA	\$ 21.95
62400008856852	LAMP, MERCURY, 400 WATTS, E-37 BULB, MOGUL BASE, DELUXE WHITE G.E. #H-400DX33-1	T	EA	\$ 10.34
6240000X000001	LAMP, QUARTZ, 85 WATTS, 13.8 VOLTS	T	EA	\$ 12.26
62400009516643	LAMP, REFRIGERATOR, G.E. #15 S11/A02	T	EA	\$.96
6240001863264	LAMP, SHOWCASE, CLEAR, G.E. #40-T10	T	EA	\$ 1.13
62400005042507	LAMP, SHOWCASE, G.E. #25T6-1/2IF	T	EA	\$.40
62400009855239	LAMP, 40 WATT BULB, NO. T-10, BASE; 4-PIN, (11A) COOL WHITE, RAPID START, 16"DIA., G.E., #FC16T10/CW/RS	T	EA	\$ 4.00
6240001520000	LAMP, 40 WATT, 115/125 VOLTS, INSIDE FROST STANDARD BASE. COLOR: RED	T	EA	\$.83
> 62400005190158	LAMP, FLOURESCENT F40 CW STANDARD, NON-OS	T	EA	\$ 1.05
> 62400009892421	LAMP, FLOURESCENT, 75 WATTS, T-12 BULB SINGLE PIN BASE, 525 MA, LENGTH 96" F96T12/CW	T	EA	\$ 2.60
6240000X800002	LAMP, FLOURESCENT, TUBE, F6T5	T	EA	\$ 2.30
> 62400009738237	LAMP, FLOURESCENT, 110 VOLTS, BULB #T12, BASE RECESS DC, MAX OVERALL LENGTH INCHES F96T12/CW/HO HIGH OUTPUT	T	EA	\$ 1.94
> 62400002477348	LAMP, FLOURESCENT, 90 WATT, T-12 BULB, B20 COLOR: COOL WHITE, BASE BIPIN 540 LONG SPECIAL, 11000'S SPEC. F90712	T	EA	\$ 6.99

WATER ARSENAL
SELF-SERVICE SUPPLY CENTER
- MASTER LIST OF SUPPLIES -
REPAIR & UTILITY

H05DXL014L

PAGE 2

STOCK NUMBER

NOMENCLATURE

MAT-CAT UNIT ISSUE

UNIT PRICE

6240007522081

LAMP, FLUORESCENT, POWER GROOVE
F96PG17/CW

EA

\$ 10.15

6240005190445

LAMP, FLUORESCENT, WATTS 32, BULB NO. T-10
BASE, 4-PIN, COOL WHITE, RAPID START, 12"DIA

EA

\$ 4.00

6240008200470

LAMP, FLUORESCENT, WATT 14, BULB T-12, MED.
BI-PIN BASE, WARM WHITE

EA

\$ 3.86

6240000671021

LAMP, FLUORESCENT, TUBE, 6FOOT, POWER GROOVE
"POWER GROOVE" 1500M.A. 165 WATTS *F72T12AG*
RAIPID START

EA

\$ 4.92

6240006354480

LAMP, INCANDESCENT 60 WATT, 120 VOLTS MED.
SCREW BASE, INSIDE FROSTED, A-19 BULB

EA

\$.38

6240002239097

LAMP, INCANDESCENT CLEAR, 1/4 WATT, 105-125
VOLT CANDLE BASE

EA

\$ 4.67

6240001433049

LAMP, INDICATOR, 6 WATTS, 110 VOLTS, CLEAR
G.E. #6S6

EA

\$.16

6240001558001

LAMP, INDICATOR, CLEAR, CANDLEABRA BASE
10 WATTS 230 VOLTS, G.E. 1056-10

EA

\$ 2.26

6240007123090

LAMP, REFLECTOR, INFRE-RED, RED BOWL, 250
WATTS, 125 VOLTS, OR 120 VOLTS

EA

\$ 3.08

6240007818372

LAMP, STREET LIGHTING, 6000 LUMENEARS
BULB 6.6, MOGUL BASE, CLEAR

EA

\$ 7.50

6240005003643

LAMP, TRAFFIC SIGNAL, CLEAR, 60 WATTS, 120
VOLTS, BULB A21

EA

\$.81

6240000X810003

LAMP, U SHAPED *FLK*

EA

\$ 5.88

6240006171713

LAMP, WHITE 7-1/2 WATTS, 120 VOLTS

EA

\$.85

6250006906155

LAMPHOLDER THREE GANG COVER ONLY

EA

\$ 1.50

6250002996327

LAMPHOLDER, BRASS, PULLCHAIN, MED. BASE

EA

\$ 1.50

6250006906165

LAMPHOLDER, FLOODLIGHT, WITHOUT COVER-
PLATE

EA

\$ 2.25

UNIT

UNIT

WATERWAY GENERAL
SELF-SERVICE SUPPLY CENTER
- MASTER LIST OF SUPPLIES
REPAIR & UTILITY

INVENTORY

DATE

PAGE

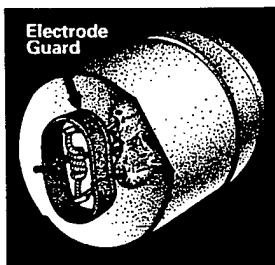
STOCK NUMBER	DESCRIPTION	UNIT	PRICE
4730000X879009	ADAPTER, MALE COPPER SWEAT TO PIPE THREAD 1-1/2"	EA	\$ 1.47
80400002254548	ADHESIVE SEALANT, WHITE SILICONE RUBBER CAULKING, R.T.V.	EA	\$ 2.29
9510000X830002	ALL THREADED ROD, 1/4" X 6' LENGTH	EA	\$.63
59750000001985	ANCHOR, SCREW, PLASTIC, 1" LONG FOR #12X1" SHEET METAL SCREW	EA	\$.03
53400005402270	ANCHOR, WOOD SCREW MULTI SIZE FOR USE WITH #10 TO #14 WOOD SCREW, 1-1/2" LONG	EA	\$.06
59750006908890	ANCHOR, WOOD SCREW, MULTI SIZE, FOR USE WITH #10 TO #14 WOOD SCREW, 1" LONG, DIAMOND #5316	EA	\$.03
81050002811158	BAG, BROWN PAPER 2 LB.	PK	\$ 3.90
81050005592561	BAG, BROWN PAPER GROCERS TYPE #1	BE	\$.15
81050002811163	BAG, GROCERS, 35 LB WT, POPULAR WEIGHT, 5 LB 500 EACH PACKAGE, 3000 EACH PER BALE	PK	\$ 3.90
> 62500006906030	BALLAST, 118 VOLT, 1.55 AMP, G.E. CAT. 761011 FOR USE WITH LAMP 96112 OR EQUAL	EA	\$ 11.76
62500008259422	BALLAST, ADVANCE, 1-14, 15, 20 OR 22 WATT FLOURESCENT, RLQ-120	EA	\$ 5.86
> 6250000X889034	BALLAST, ELECTRONIC, LIGHTING FOR TWO F96/277 VOLT FLOURESCENT LAMPS. SINGLE PIN. MODEL #US-800SS	EA	\$ 19.10
> 62500006906125	BALLAST, FOR USE WITH TWO, 40 WATT, RAPID START LAMPS IN SERIES (REF. ADVANCE CAT. RQM 2540) NO SUBSTITUTE	EA	\$ 7.75
4820000X889012	BALLCOCK, FLUIDMASTER, 400A SERIES	EA	\$ 7.40
59200006915304	BASE, FUSE CUTOFF, SINGLE POLE, FOR TYPE BBS FUSES, 600 VOLTS PORCELAIN	EA	\$ 1.54

00-31

TL 80 Series Fluorescent Lamps
Electrical, Technical and Ordering Data (Subject to change without notice)

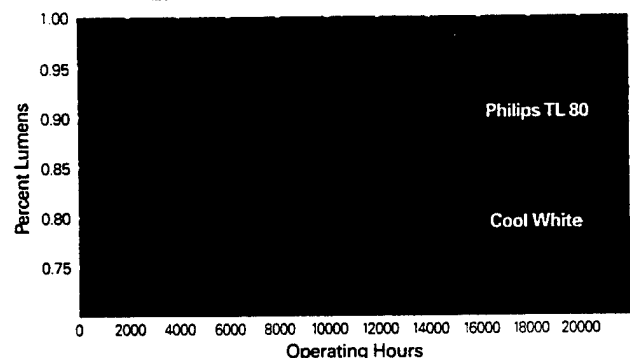
Product Number	Description	Nominal Watts	Bulb	Base	Std Pkg Qty	Lamp Current (Amps)	Color Temp (Kelvin)	Color Rendering (CRI)	Nominal Length (Feet)	Rated Average Life (Hrs) ⁽¹⁾	Approx. Initial Lumens	Design Lumens ⁽²⁾
31980-6	F17T8/TL830	17	T-8	Md. Bipin	25	0.265	3000	85	2	20,000	1400	1300
32304-8	F17T8/TL835	17	T-8	Md. Bipin	25	0.265	3500	85	2	20,000	1400	1300
31983-0	F17T8/TL841	17	T-8	Md. Bipin	25	0.265	4100	85	2	20,000	1400	1300
31984-8	F25T8/TL830	25	T-8	Md. Bipin	25	0.265	3000	85	3	20,000	2250	2100
25798-0	F25T8/TL835	25	T-8	Md. Bipin	25	0.265	3500	85	3	20,000	2250	2100
31989-7	F25T8/TL841	25	T-8	Md. Bipin	25	0.265	4100	85	3	20,000	2250	2100
31991-3	F32T8/TL830	32	T-8	Md. Bipin	25	0.265	3000	85	4	20,000	3050	2850
31993-9	F32T8/TL835	32	T-8	Md. Bipin	25	0.265	3500	85	4	20,000	3050	2850
31994-7	F32T8/TL841	32	T-8	Md. Bipin	25	0.265	4100	85	4	20,000	3050	2850
31996-2	F40T8/TL830	40	T-8	Md. Bipin	25	0.265	3000	85	5	20,000	3800	3550
25799-8	F40T8/TL835	40	T-8	Md. Bipin	25	0.265	3500	85	5	20,000	3800	3550
31998-8	F40T8/TL841	40	T-8	Md. Bipin	25	0.265	4100	85	5	20,000	3800	3550

(1) Average life under specified test conditions with lamps turned off and restarted no more than once every 3 operating hours.
(2) Approximate lumens at 40% of rated average life (8000 Hours).



For maximum lumen maintenance, TL 80 Series lamps feature an "electrode guard" around each electrode to effectively reduce lamp darkening and retain a clean appearance for thousands of hours.

Lumen Maintenance: TL 80 vs. Cool White



Philips Lighting specialists are ready to help.

Philips Lighting has a team of specialists dedicated to commercial/office and retail lighting applications. They can provide a free lighting analysis which demonstrates how Philips TL 80 Series lamps can reduce energy costs in your building and improve the quality of light at the same time.

Call your Philips Lighting representative for a free fluorescent lighting analysis today:

1-800-631-1259.

TL 80 System - lamp specification

"Lamps shall be Philips TL 80 Series lamps having:

- Color rendering index of 85
- T-8 diameter bulb
- Medium bi-pin bases
- Color temperature of _____ K (3000, 3500 or 4100)
- Initial lumens of _____ (1400, 2250, 3050 or 3800)
- Nominal wattage of _____ (17, 25, 32, 40)
- Powered by electronic ballasts designed for 265ma T-8 lamps
- An electrode guard."

SYSTEM PERFORMANCE

Because the 32-watt, T8 lamp would not operate properly on existing forty-watt, 430 ma. ballasts, design of the Octron lamp system was accomplished without the constraints of existing fluorescent systems. The goal was to optimize total system performance to the F40T12 system in a luminaire while reducing wattage significantly. The result is the most efficient full light output energy-saving fluorescent lighting system.

In designing the Octron lamp system, a number of factors did have to be taken into consideration. One was the ballast factor (ratio of light output when operated on commercially-available ballasts as compared to a reference circuit.) The ballast factor of the Octron magnetic ballast was set at nominal .95; rated lumens and lamp wattage were then established.

Other factors considered were the thermal effects, i.e. 2900 rated lumens of the Octron lamp versus the 3050 lumen rating of F40CW lamps, versus the lumen output of the same lamps when operated in a stabilized condition in the luminaire. Then there were the optical effects to be considered, i.e. better lighting control, and the trapping of less light by the fixture walls and bulb itself.

The true metric for comparison of the fluorescent lamps is their actual performance in a lighting system. The data shown in Figure 7 are the result of the systems approach to lamp design taking into consideration all of the above mentioned factors. In these tests, each fluorescent system was operated in the same 4-lamp recessed lensed troffer, in a room ambient temperature of 77°F. The plenum was allowed to stabilize prior to collection of system wattage and relative lumen output data. The F40CW/standard magnetic ballast was used as the base system, and set at 100% Relative Light Output. As Figure 8 illustrates, data were collected concerning watts, Relative Light Output and RLO/watt for each lamp type and ballast tested.

Results show that Octron lamps operated on magnetic ballasts deliver system efficiency equal to T12 34-watt energy-saving lamps operated on electronic ballasts. Furthermore, the tests show that Octron lamps operated on T8 electronic ballasts provide the highest system efficiency — 166 RLO/watt.

(FIGURE 7)

FIXTURE COMPARISON DATA (77° TEST ROOM - 4-LAMP RECESSED TROFFER, PLASTIC LENS)

LAMP TYPE	BALLAST	BALLAST FACTOR ¹	WATTS	RELATIVE LIGHT OUTPUT (RLO) ²	RLO/W
SYLVANIA F40CW	STD. MAGNETIC	.95	174	100	100
SYLVANIA 34W					
SUPERSAVER® D841	STD. MAGNETIC	.90	155	95	107
SYLVANIA 32W					
SUPERSAVER PLUS D841	STD. MAGNETIC	.90	144	93	113
SYLVANIA F40CW	ENERGY SAVING MAGNETIC	.95	162	101	108
SYLVANIA 34W					
SUPERSAVER D841	ENERGY SAVING MAGNETIC	.88	139	93	116
SYLVANIA 32W					
SUPERSAVER PLUS D841	ENERGY SAVING MAGNETIC	.88	131	91	122
SYLVANIA 34W					
SUPERSAVER D841	ELECTRONIC	.75	119	93	136
SYLVANIA FO32 OCTRON®	T8 MAGNETIC	.95	132	104	137
SYLVANIA FO32 OCTRON® ³	T8 ELECTRONIC	.92	106	101	166

1 DATA IN TEST NORMALIZED TO BALLAST FACTORS SHOWN IN THIS COLUMN FOR MAGNETIC BALLASTS. FACTORS SHOWN FOR ELECTRONIC BALLASTS ARE MEASURED VALUES OF SAMPLE.

2 RELATIVE LIGHT OUTPUT BASED ON INITIAL (100 HOUR) RATED LAMP LUMEN OUTPUT AS OF 8/22/83.

3 LIFE RATED AT 15,000 HOURS. ALL OTHER SYSTEMS SHOWN ARE RATED AT 20,000 HOURS.

OCTRON CURVALUME LAMPS

An Octron Curvalume family has been introduced to provide greater lighting design, flexibility and higher efficiency than conventional U-lamp systems having T-12 bulbs. These lamps are available in 16-, 24- and 31-watt sizes and are designed to operate on Octron ballasts available for the 2-, 3-, and 4-foot straight lamps respectively. Their medium bipin bases will fit existing sockets designed for ordinary T-12 Curvalume lamps.

The new size of the Octron Curvalume family allows for the design of more compact luminaires for a wide variety of applications. The tight-bend U-lamps have a center to center leg spacing of

1 $\frac{5}{8}$ " and have overall lengths of 10 $\frac{1}{2}$ " for the 16-watt, 16 $\frac{1}{2}$ " for the 24-watt and 22 $\frac{1}{2}$ " for the 31-watt lamps. When operated on rapid start magnetic ballasts, the Octron Curvalume lamps have an average rated life of 20,000 hours.

Available in the three standard Octron colors of 3100K, 3500K and 4100K, these lamps may be used in conjunction with other members of the Octron family to fit the varied requirements of a lighting installation. Octron Curvalume lamps also have a color rendering index of 75, common to other Octron lamp types. Table 2, in this bulletin describes the physical, electrical, and photometric performance data for the Octron Curvalume family of lamps.

OCTRON CURVALUME LAMP COLOR & PERFORMANCE DATA

FB016 (16 watt)				FB024 (24 watt)		
Ordering Abbreviation	FB016/31K	FB016/35K	FB016/41K	FB024/31K	FB024/35K	FB024/41K
Sylvania Item Number	21801	21800	21802	21803	21810	21804
Correlated Color Temp.	3100K	3500K	4100K	3100K	3500K	4100K
Color Rendering Index	75	75	75	75	75	75
Initial Lumens	1250	1250	1250	2050	2050	2050

FB031 (31 watt)			
Ordering Abbreviation	FB031/31K	FB031/35K	FB031/41K
Sylvania Item Number	21805	21807	21806
Correlated Color Temp.	3100K	3500K	4100K
Color Rendering Index	75	75	75
Initial Lumens	2800	2800	2800

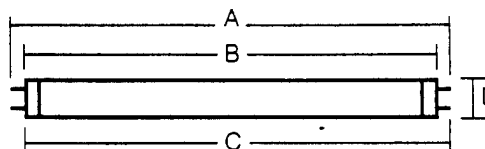
EFFECT OF BURNING PERIODS ON LAMP LIFE

Due to slight variations in the lamp making process, it is impossible to have each lamp operate for exactly the life for which it was designed. For this reason, lamp life is rated as the average life of a large group of lamps, operated under controlled laboratory conditions. Average rated life is the point at which approximately 50 percent of the lamps in a large test group have burned out and 50 percent remain burning as shown in Figure 8.

During the operation of a fluorescent lamp, the emissive material is gradually depleted from the cathodes. The normal end of life is reached when there is insufficient emissive material remaining

on either cathode to strike the arc. Since published average rated life figures are based on a three hour burning cycle, these ratings reflect the effects of both starting and operating. Changes in the burning cycle will affect life in service. Shorter burning cycles (more frequent starts) shorten lamp life and extended burning cycles (less frequent starts) increase lamp life. Figure 9 lists the average life in hours for Octron fluorescent lamps at various burning cycles. Data is provided for Octron lamps operated at 60Hz. in the rapid start mode as well as for high frequency operation in the instant start mode.

STRAIGHT OCTRON PERFORMANCE DATA



(TABLE I)

	F017		F025		F032		F040	
I. Physical Characteristics	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Overall Length (A)	23.67"	23.78"	35.67"	35.78"	47.67"	47.78"	59.50"	59.61"
Face to Face (B)		23.22"		35.22"		47.22"		59.05"
Face to End of Opposite Pin (C)	23.41"	23.50"	35.41"	35.50"	47.41"	47.50"	59.24"	59.33"
Bulb Diameter (D)	.94"	1.1"	.94"	1.10"	.94"	1.10"	.94"	1.10"
Base Type	medium bipin		medium bipin		medium bipin		medium bipin	
II. Electrical Characteristics								
60 Hz Rapid Start Lamp								
Rated Power	17 watts		25 watts		32 watts		40 watts	
Lumens per Watt	79 LPW		86 LPW		90.6 LPW		91.3 LPW	
Lamp Current	265 ma.		265 ma.		265 ma.		265 ma.	
Lamp Voltage	73 v.		106 v.		139 v.		172 v.	
Lamp Life (3 hrs./start)	20,000 hrs.		20,000 hrs.		20,000 hrs.		20,000 hrs.	
Ballast Requirements (2-lamp)								
Starting Time	0.75-2.0 sec.		0.75-2.0 sec.		0.75-2.0 sec.		0.75-2.0 sec.	
Open Circuit Voltage ¹	210		260		300		385	
Starting Aid Voltage ¹ (peak)	350		350		290		350	
Filament Voltage ¹								
Dummy Load (11 ohms)	3.4-4.5 v.		3.4-4.5 v.		3.4-4.5 v.		3.4-4.5 v.	
Operational	2.5-4.0 v.		2.5-4.0 v.		2.5-4.3 v.		2.5-4.0 v.	
Lamp Current Crest Factor	1.7 max.		1.7 max.		1.7 max.		1.7 max.	
III. Electrical Characteristics								
25 KHz Instant Start Lamp								
Rated Power	14 watts		21 watts		28 watts		35 watts	
Lumens per Watt	97 LPW		102 LPW		103.6 LPW		104 LPW	
Lamp Current	210 ma.		210 ma.		210 ma.		210 ma.	
Lamp Voltage	66 v.		101 v.		136 v.		172 v.	
Lamp Life (3 hrs./start)	15,000 hrs.		15,000 hrs.		15,000 hrs.		15,000 hrs.	
Ballast Requirements								
Open Circuit Voltage	425 v. min. ⁴		425 v. min. ⁴		500 v. min. ⁴		575 v. min. ⁴	
Starting Time	50 ms. max.		50 ms. max.		50 ms. max.		50 ms. max.	
Current Crest Factor	1.7 max.		1.7 max.		1.7 max.		1.7 max.	
IV. Photometric Characteristics								
Ordering Abbreviation	F017/31K	F017/41K	F025/31K	F025/41K	F032/31K	F032/41K	F040/31K	F040/41K
Sylvania Item Number	21830	21831	21828	21829	21825	21824	21826	21827
Correlated Color Temp.	3100K	4100K	3100K	4100K	3100K	4100K	3100K	4100K
Color Rendering Index	75	75	75	75	75	75	75	75
Initial Lumens	1350	1350	2150	2150	2900	2900	3650	3650
Mean Lumens (8000 Hrs) ²	1215	1215	1935	1935	2600	2600	3285	3285
Mean Lumens (6000 Hrs) ³	1235	1235	1965	1965	2650	2650	3335	3335

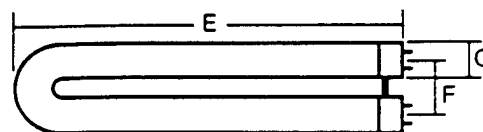
1. For Starting at 50° F and above

2. Mean Lumens at 40% of 20,000 Hr rated Life—Rapid Start Operation

3. Mean Lumens at 40% of 15,000 Hr rated Life—Instant Start Operation—High Frequency

4. Single lamp requirement

OCTRON CURVALUME PERFORMANCE DATA



(TABLE II)

	FB016		FB024		FB031	
I. Physical Characteristics	Min.	Max.	Min.	Max.	Min.	Max.
Base face to Outside of glass bend (E)	10.25"	10.60"	16.25"	16.60"	22.25"	22.60"
Center to Center of bases (F)	1.50"	1.75"	1.50"	1.75"	1.50"	1.75"
Bulb Diameter (G)	.94"	1.10"	.94"	1.10"	.94"	1.10"
Base Type	medium bipin		medium bipin		medium bipin	
II. Electrical Characteristics						
60 Hz Rapid Start						
Lamp						
Rated Power	16 watts		24 watts		31 watts	
Lumens per Watt	78 LPW		85 LPW		90 LPW	
Lamp Current	265 ma.		265 ma.		265 ma.	
Lamp Voltage	67 v.		100 v.		133 v.	
Lamp Life (3 hrs./start)	20,000 hrs.		20,000 hrs.		20,000 hrs.	
Ballast Requirements (2-lamp)						
Starting Time	.75-2.0 sec.		.75-2.0 sec.		.75-2.0 sec.	
Open Circuit Voltage ¹	210		260		300	
Starting Aid Voltage ¹ (peak)	350		350		290	
Filament Voltage ¹						
Dummy Load (11 ohms)	3.4-4.5 v.		3.4-4.5 v.		3.4-4.5 v.	
Operational	2.5-4.0 v.		2.5-4.0 v.		2.5-4.0 v.	
Lamp Current Crest Factor	1.7 max.		1.7 max.		1.7 max.	
III. Electrical Characteristics						
25 KHz Instant Start						
Lamp						
Rated Power	13 watts		20 watts		27 watts	
Lumens per Watt	97 LPW		102 LPW		104 LPW	
Lamp Current	210 ma.		210 ma.		210 ma.	
Lamp Voltage	61 v.		96 v.		131 v.	
Lamp Life (3 hrs./start)	15,000 hrs.		15,000 hrs.		15,000 hrs.	
Ballast Requirements						
Open Circuit Voltage	425 v. min. ⁴		500 v. min. ⁴		575 v. min. ⁴	
Starting Time	50 ms. max.		50 ms. max.		50 ms. max.	
Current Crest Factor	1.7 max.		1.7 max.		1.7 max.	
IV. Photometric Characteristics						
Ordering Abbreviation	FB016/31K FB016/41K		FB024/31K FB024/41K		FB031/31K FB031/41K	
Sylvania Item Number	21801 21802		21803 21804		21805 21806	
Correlated Color Temp.	3100K 4100K		3100K 4100K		3100K 4100K	
Color Rendering Index	75 75		75 75		75 75	
Initial Lumens	1250 1250		2050 2050		2800 2800	
Mean Lumens (8000 Hrs) ²	1125 1125		1845 1845		2520 2520	
Mean Lumens (6000 Hrs) ³						

1. For Starting at 50° F and above

2. Mean Lumens at 40% of 20,000 Hr rated Life—Rapid Start Operation

3. Mean Lumens at 40% of 15,000 Hr rated Life—Instant Start Operation—High Frequency

4. Single lamp requirement

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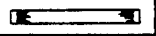
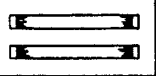
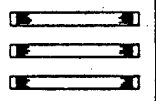
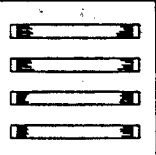
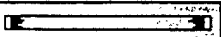
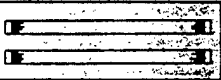
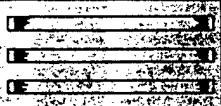
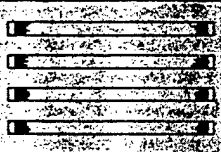
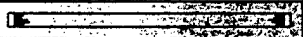
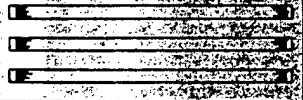
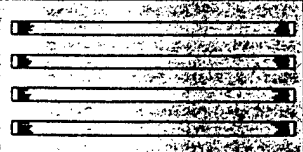
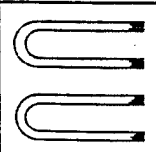
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SYLVANIA LIGHTING SERVICES FIXTURE CONVERSION DATA

Fixtures that are "Convertible" to the Optron System	Typical Wattages after Conversion to Optron System	Typical Pre- Conversion T12 System Wattages ¹	Estimated Change in Fixture Wattage with Conversion ²	Estimated Change in Light Output with Conversion ³
1-F20 (2' Fixture) 	24 Watts w/Mag Ballast	32 Watts w/Std lamp	Down 25%	Up 7 - 10%
2-F20 (2' Fixture) 	43 Watts w/Mag Ballast	50 Watts w/Std lamps	Down 14%	Up 7 - 10%
3-F20 (2' Fixture) 	51 Watts w/Elec Ballasts (67 Watts w/Mag Ballast)	82 Watts w/Std lamps	Down 38%	Up 7 - 10%
4-F20 (2' Fixture) 	57 Watts w/Elec Ballast (86 Watts w/Mag Ballasts)	100 Watts w/Std lamps	Down 43%	Up 7 - 10%
1-F30 (3' Fixture) 	29 Watts w/Mag Ballast	43 Watts w/Std lamp 36 Watts w/SS lamp	Down 33% Down 20%	No Change Up 7 - 10%
2-F30 (3' Fixture) 	48 Watts w/Elec Ballast (55 Watts w/Mag Ballast)	75 Watts w/Std lamps 61 Watts w/SS lamps	Down 36% Down 21%	No Change Up 7 - 10%
3-F30 (3' Fixture) 	64 Watts w/Elec Ballast (84 Watts w/Mag Ballasts)	118 Watts w/Std lamps 97 Watts w/SS lamps	Down 46% Down 34%	No Change Up 7 - 10%
4-F30 (3' Fixture) 	84 Watts w/Elec Ballast (110 Watts w/Mag Ballasts)	150 Watts w/Std lamps 122 Watts w/SS lamps	Down 44% Down 31%	No Change Up 7 - 10%
1-F40 (4' Fixture) 	35 Watts w/Mag Ballast	55 Watts w/Std lamp 48 Watts w/SS lamp	Down 36% Down 27%	No Change Up 10 - 14%
2-F40 (4' Fixture) 	62 Watts w/Elec Ballast (67 Watts w/Mag Ballast)	92 Watts w/Std lamps 78 Watts w/SS lamps	Down 33% Down 21%	No Change Up 10 - 14%
3-F40 (4' Fixture) 	84 Watts w/Elec Ballast (102 Watts w/Mag Ballasts)	147 Watts w/Std lamps 126 Watts w/SS lamps	Down 43% Down 33%	No Change Up 10 - 14%
4-F40 (4' Fixture) 	106 Watts w/Elec Ballast (133 Watts w/Mag Ballasts)	174 Watts w/Std lamps 156 Watts w/SS lamps	Down 39% Down 32%	No Change Up 10 - 14%
2-FB40 (2' x 2' Fixture) 	60 Watts w/Elec Ballast (65 Watts w/Mag Ballast)	92 Watts w/Std lamps 78 Watts w/SS lamps	Down 35% Down 23%	No Change Up 10 - 14%

NOTES:

1. Estimate is based on fixtures with Standard Magnetic Ballasts
2. Compared to lowest wattage Optron system
3. Assumes same age of both old & new systems (4100K vs. CW). Does not consider immediate light level improvement provided by relamping.

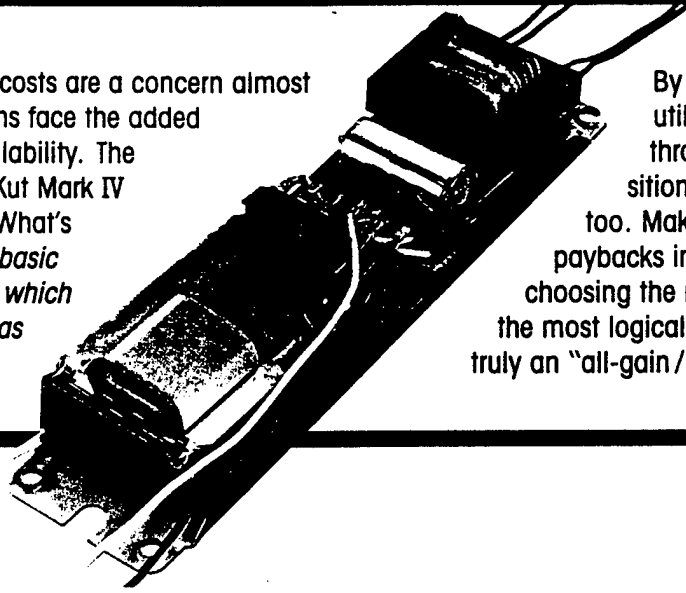
SYLVANIA

Lighting
Services

GTE

A Solid Choice for Many Applications

Rapidly rising electrical power costs are a concern almost everywhere. And some locations face the added problem of limited power availability. The energy-saving ADVANCE PowrKut Mark IV ballast is an answer for both. What's more, it lets you *maintain the basic lighting performance levels for which your present lighting system was originally designed.*



By taking advantage of the extensive utility rebate programs available throughout many areas, your acquisition cost may be greatly reduced, too. Making for one of the fastest overall paybacks in ballasting today. Indeed, choosing the new PowrKut Mark IV may be the most logical move you've ever made — it's truly an "all-gain / no-pain" proposition.

ADVANCE® PowrKut Mark IV™ Ballast for Two 4-ft. F-40 Rapid Start Lamps—60 Hz

Lamp Data		Min. Starting Temp. (°F)	Ballast Input Watts	Line Current (Amps)	Circuit (Volts)	Catalog Number (Class P)	Ballast Efficacy Factor	Sound Rating	Dimensions (Inches)				No. of Units Per Std. Ctn.	Wt. Std. Ctn. (Lbs.)
Description	Nom. Watts								Length	Width	Height	Mounting		
(2) F40 (2) F40/U Energy Savers	34	60°	66	.57 .26	120 277	RK-2S40-TP® VK-2S40-TP®	1.33						10	38
(2) F40T12, (2) F40T10, (2) FB40T12	40	50°	80	.69 .31	120 277	RK-2S40-TP® VK-2S40-TP®	1.16							

ETL verification of performance to specifications in ETL Procedure B30.0
with test methods per ANSI Standard C82.2.

ADVANCE® POWRKUT MARK IV™

"THE SAVINGS WITHOUT THE SACRIFICE"



ADVANCE POWRKUT MARK IV

	Ballast Factor	Watts Input
Standard Lamps	.95	80
Energy Savings Lamps	.88	66

ADVANCE POWRKUT™

	Ballast Factor	Watts Input
Standard Lamps	.85	71
Energy Savings Lamps	.81	58

ADVANCE MARK III

	Ballast Factor	Watts Input
Standard Lamps	.95	86
Energy Savings Lamps	.88	72

ADVANCE RQM/VQM

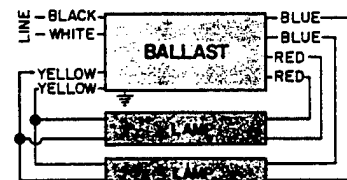
	Ballast Factor	Watts Input
Standard Lamps	.95	96
Energy Savings Lamps	.88	82

Specifications—ADVANCE PowrKut Mark IV Hybrid Electromagnetic Ballast

The ballast shall be ADVANCE PowrKut Mark IV hybrid electromagnetic design incorporating special circuitry to cut off cathode voltage to lamp filaments after the lamps are lit. It shall have an average input of 80 watts when operating 2, F40T12 (40W) rapid start lamps with ballast factor of .95 and average input of 66 watts when operating 2, F40T12 (34W) energy saving rapid start lamps with ballast factor of .88. Performance verified by ETL Laboratories to specifications in ETL Procedural Guide B30.0, using Test Methods of ANSI C82.2.

When operating 2, F40T12 (40W) rapid start lamps, Ballast Efficacy Factor (B.E.F.) shall meet or exceed 1.16; lamp current crest factor shall not exceed 1.6. Ballast shall have a 3-year warranty; design shall provide full rated 20,000 hour lamp life.

Wiring Diagram



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Specifications and data in this bulletin subject to change without notice.

EBT LOW HARMONIC BALLAST GUIDE

RAPID START BALLAST (SERIES CONNECTION)

LAMPS	LAMP TYPE	LAMP LENGTH	LAMP WATTS	INPUT VOLTAGE	LINE AMPS	INPUT WATTS	ORDERING CODE
1 ***	F40T12/RS	4'	34	120	0.27	31	SSB1-120-1/40 LH
			40		0.33	38	
			34	277	0.12	31	SSB1-277-1/40 LH
			40		0.14	38	
2 ***	F40T12/RS	4'	34	120	0.50	59	SSB1-120-2/40 LH
			40		0.60	71	
			34	277	0.22	59	SSB1-277-2/40 LH
			40		0.26	71	
3 ***	F40T12/RS	4'	34	120	0.77	90	SSB1-120-3/40 LH
			40		0.89	105	
			34	277	0.33	90	SSB1-277-3/40 LH
			40		0.39	105	
2 ****	F96T12/HO	8'	95	120	1.36	160	SSB1-120-2/96 HO LH
			110		1.62	190	
			95	277	0.59	160	SSB1-277-2/96 HO LH
			110		0.70	190	

INSTANT START BALLAST (PARALLEL CONNECTION)

1 ***	F032T8	4'	32	120	0.26	30	SSB2-120-1/32 IS LH
			40		0.31	36	SSB2-277-1/32 IS LH
2 ***	F032T8	4'	32	120	0.49	58	SSB2-120-2/32 IS LH
	F040T8	5'	40		0.59	70	
	F032T8	4'	32	277	0.21	58	SSB2-277-2/32 IS LH
	F040T8	5'	40		0.26	70	
3 **	F032T8	4'	32	120	0.75	88	SSB2-120-3/32 IS LH
	F032T8	4'	32	277	0.32	88	SSB2-277-3/32 IS LH
2 *****	F96T12/IS	8'	60	120	0.89	105	SSB2-120-2/96 IS LH
			75		1.11	130	
			60	277	0.39	105	SSB2-277-2/96 IS LH
			75		0.48	130	
2 ***	40W	22.5"	40	120	0.55	65	SSB2-120-2/40 IS LH
	(TWIN TUBE)	22.5"	40	277	0.24	65	SSB2-277-2/40 IS LH

- * ALSO COMPATIBLE WITH F025T8 LAMPS
- ** ALSO COMPATIBLE WITH F040T8 LAMPS
- *** ALSO COMPATIBLE WITH F30T12, OR F25T12 LAMPS
- **** ALSO COMPATIBLE WITH F72T12/HO OR F84T12/HO LAMPS
- ***** ALSO COMPATIBLE WITH F60T12, F70T12 OR F84T12 LAMPS



EBT SPECIAL PRODUCT GUIDE

LAMPS	LAMP TYPE	LAMP LENGTH	LAMP WATTS	INPUT VOLTAGE	LINE AMPS	INPUT WATTS	ORDERING CODE
2 *	F40T12/RS	4'	34	120	0.53	59	SSB1-120-2/40 MINI
			40		0.64	71	
			34	277	0.23	59	SSB1-277-2/40 MINI
			40		0.28	71	
2 **	F032T8/RS	4'	32	120	0.58	64	SSB1-120-2/32 MINI
			32	277	0.25	64	SSB1-277-2/32 MINI
2 **	F032T8/RS	4'	32	120	0.53	62	SSB1-120-2/32 LH
			32	277	0.23	62	SSB1-277-2/32 LH
3	F032T8/RS	4'	32	120	0.80	94	SSB1-120-3/32 LH
			32	277	0.35	94	SSB1-277-3/32 LH
2	F017T8/RS	2'	17	120	0.29	34	SSB2-120-2/17 IS
			17	277	0.12	34	SSB2-277-2/17 IS
2 *	F40T12/RS	4'	34	120	0.60	71	SSB1-120-2/40MPX LH
			40		0.73	86	
			34	277	0.26	71	SSB1-277-2/40MPX LH
			40		0.32	86	
2 *	F40T12/RS	4'	34	120	0.56	66	SSB1-120-2/40 LH 100%
			40		0.68	80	
			34	277	0.24	66	SSB1-277-2/40 LH 100%
			40		0.29	80	

- * ALSO COMPATIBLE WITH F40T12/32W, F30T12, F25T12, 3" AND 6" "U" TUBE LAMPS
** ALSO COMPATIBLE WITH F025T8, F032T8 LAMPS

The ballast total harmonic distortion level may not be less than 20% when used with the above compatible lamps.