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FINAL SUBMITTAL

ENERGY SURVEYS OF
ARMY INDUSTRIAL FACILITIES
ENERGY ENGINEERING ANALYSIS PROGRAM
LETTERKENNY ARMY DEPOT
CHAMBERSBURG, PENNSYLVANIA

VOLUME IV
PROGRAMMING DOCUMENTS

CONTRACT NO. DACA65-91-C-0071

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS
NORFOLK, VIRGINIA

DTIC QUALITY INSPECTED 2

PREPARED BY:

ENERGY AND ENVIRONMENTAL SERVICES DEPARTMENT
REYNOLDS, SMITH AND HILLS, INC.
P.O. BOX 4850
JACKSONVILLE, FLORIDA 32201
904/279-2277

RS&H PROJECT NO. 2900379001

JANUARY 1992

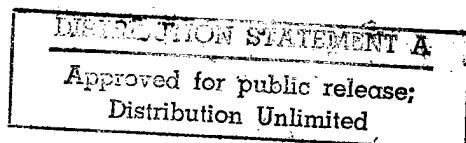


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3		9	Paint Booth Exhaust Fan Controls
4		11	Blast Booth Fan Cut-Off
5		15	Modular Offices
6	OSD PIF	3	Dip Tank Covers with Exhaust Fan Controls
7		10	Drive-In Paint Booth Air Flow Controls

QRIP

1 August 1982

C 1, AR 5-4

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS				1. PROJECT NO.		REQUIREMENT CONTROL SYMBOL	
For use of this form, see AR 5-4; the proponent agency is OCA.				AMC QRIP		DD-M(R) 1681	
2. TO: HQ DA Attn: DACS-DME Pentagon Washington, DC 20310-2070		3. THRU: US AMC Attn: AMCM-M 5001 Eisenhower Ave Alexandria, VA 22303-0001		4. FROM: Commander US DESCOM Attn: AMSDS-RM-P Chambersburg, PA 17201-4170		5. DOD COMP NAME Army	
6. PROJECT TITLE Compressed Air Shut-Off Valves		10. TYPE OF PROJECT (Check one) ☒ QRIP ☐ OSD PIF ☐ PECIP		7. COMMAND CODE W730KK		8. DOD COMP CODE A	
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE		9. AMORTIZATION YEARS/MONTHS 8,108 ÷ 4,004 X 12 (Project Cost) (Average Annual Savings) (No. Mo)		11. AMORTIZATION YEARS/MONTHS - 2.0 (year) or (month) (amortization)	
15. SUBMITTING UNIT(S) Commander Letterkenny Army Depot Attn: SDSLE-EM (T. Hagie) Bldg. 663 Chambersburg, PA 17201-4150		16. UNIT ID CODE		17. PROJECT DESCRIPTION Replace existing compressed gate-type shut-off valves with ball valve type.			
18. DETAILED JUSTIFICATION Unlike gate valves, ball valves shut off quickly with a single motion through a 90° angle. It requires little access, on-off position is easily identified and is less susceptible to leaking.							
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).

1 August 1982

C 1, AR 5-4

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	\$4,004	\$0	\$0	\$0	\$0	\$0	\$4,004	\$4,004	\$4,004	\$4,004
CONTRACT COSTS										
OTHER (Identify)										
TOTALS	\$4,004	\$0	\$0	\$0	\$0	\$0	\$4,004	\$4,004	\$4,004	\$4,004

(1) INTERNAL RATE OF RETURN (IRR)
 Divide estimated project cost 8,108 by average annual savings 4,004 = 2.0 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 = .66 % IRR.

(2) SAVINGS TO INVESTMENT RATIO (S/I)
 Multiply annual savings 4,004 X discount factor 9.524 = 38,134 and divide by present value of investment (undiscounted) 8,108 = 4.70 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) N/A
 Divide estimated project cost by number of manpower space savings = RIMS.
 (Manpower requirements cannot be used in this computation.)

1 August 1982

C 1, AR 5-4

COST FOR PROJECT TO BECOME OPERATIONAL						APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT	FY FUNDS REQUIRED
EQUIPMENT TYPE	PROPOSED SOURCE OF PROCUREMENT	UNIT PRICE	QUANTITY	TOTAL COST			
(1) Compressed air ball valves		\$35.56	228	\$8,108			
(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				\$8,108			
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$8,108			
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵							
(16) TOTAL (Sum of (14) + (15) above)				\$8,108			

¹Not to exceed 10% of equipment cost for QRIP projects.

²Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.

³Normally not OPA funded.

⁴Used to compute amortization in Item 11.

⁵Specify source to include certification that funds are available, if financed from the regular budget.

1 August 1982

C 1, AR 5-4

SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)									
ITEMS a	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR b	TYPE PERC 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 ⁷									
(7) OTHER DOLLAR SAVINGS (Excluding Manpower), e.g., CONTRACT COSTS & UTILITIES									
(8) Electricity			\$4,004						
(9)									
(10)									
(11) TOTAL DOLLAR SAVINGS			\$4,004						
⁶ (1) US Graded (2) US Wage Board (3) DHFN (4) IHFN (5) Officer (6) WO (7) Enlisted ⁷ Reflect specific duties being performed with additional manhours available (equivalent manyears)									

1 August 1982

C 1, AR 5-4

24. 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.) _____ _____ _____			
25. OTHER COORDINATION (Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)			
_____ _____ _____			
26. 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
29. OTHER REMARKS (Cont'd)			

ECO Number: 1

COMPRESSED AIR VALVE REPLACEMENT IN BUILDING 350

Discussion

Building 350 is constructed with a one-inch diameter compressed air supply on each of the 228 columns. Typically, these air stations are arranged with a shut-off gate valve followed by one or more quick disconnect compressed air hose fittings. The problem is that many of the air stations are leaking compressed air continuously.

All the leaks are in valve stem packings or hose connections downstream of the manual, gate-type, shut-off valve located on the column. Typically, these valves are left open all the time, allowing the compressed air to leak out. The background noise is too high to hear the leaks, and the workmen often wear gloves so they cannot feel them either. It is cumbersome to shut off a gate valve which requires multiple turns, particularly if access to it is blocked by surrounding equipment. A ball valve shuts off quickly (requiring on a single motion through 90° angle), requires little excess, and is less susceptible to leaking.

Based on the results of a leak survey (see Appendix B), it is estimated that about half of the 228 columns in Building 350, have a detectable leak. These leaks total 85 cfm and cost approximately \$4,000 annually.

Recommendations

It is recommended that the compressed air shut-off valve on each column in Building 350 be changed from the existing gate valve to a ball valve; and that this new valve be closed at all times when compressed air is not in use. Typically, this would be at the end of a workman's shift.

Construction Cost	\$7,271
Annual Energy Savings (MBtu/yr)	
Electricity	366
Annual Energy Cost Savings (\$/yr)	\$4,004
SIR	7.5
Simple Payback (years)	2.0

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: ECO1

LCCID 1.062

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: LETTERKENNY ARREGION NOS. 3 CENSUS: 1

PROJECT NO. & TITLE: ECO #1 COMPRESSED AIR VALVE REPLACEMENT

FISCAL YEAR 1991 DISCRETE PORTION NAME: TOTAL PROJECT

ANALYSIS DATE: 09-11-91 ECONOMIC LIFE 25 YEARS PREPARED BY: G. FALLON

1. INVESTMENT

A. CONSTRUCTION COST	\$	7271.
B. SIOH	\$	400.
C. DESIGN COST	\$	437.
D. SALVAGE VALUE COST	-\$	0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	\$	8108.

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

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 10.94	366.	\$ 4004.	15.11	60501.
B. DIST	\$ 7.43	0.	\$ 0.	21.31	0.
C. RESID	\$ 6.61	0.	\$ 0.	25.22	0.
D. NAT G	\$.00	0.	\$ 0.	20.70	0.
E. COAL	\$.00	0.	\$ 0.	15.93	0.
F. TOTAL		366.	\$ 4004.		\$ 60501.

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

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)		14.53
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-) (3A2+3Bd4)	\$	0.

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33) \$ 19965.

 A IF 3D1 IS = OR > 3C GO TO ITEM 4

 B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F) _____

 C IF 3D1B IS = > 1 GO TO ITEM 4

 D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE))\$ 4004.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) \$ 60501.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 7.46
(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 2.02



SUBJECT LETTERKENNY A.D.
ECO #1
DESIGNER G. FALLON
CHECKER P. Hutchins

AEP NO 290-0379-001
SHEET 1 OF 1
DATE _____
DATE _____

ECO #1 Compressed Air Valve Replacement in Bldg 350

EACH COLUMN CONTAINS AT LEAST ONE COMPRESSED AIR ROOT VALVE. DRAWINGS SHOW 4 ROWS OF 57 COLUMNS EACH, TOTAL 228 COLUMNS $\Rightarrow$ 228 AIR STATIONS. 40 COL'S HAD LEAKS.

COLUMNS SURVEYED

B19 THRU B57 AND C11 THRU C57 $\Rightarrow$ 84 COL'S

PERCENT W/LEAKS

$$\frac{40}{84} \times 100 = 47.62\%$$

ESTIMATED COL'S W/LEAKS

$$228 \text{ COL'S} \times .4762 = 109 \text{ COL'S.}$$

TOTAL ESTIMATED LEAKAGE

$$\Sigma \text{LEAKS} = 31 \text{ CFM}$$

$$\frac{31 \text{ CFM}}{40 \text{ COL'S}} \times 109 \text{ COL'S} = 84.5 \text{ CFM.}$$

TOTAL VALUE OF LEAKS

$$\frac{84.5 \text{ CFM}}{1} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{3760 \text{ hr}}{1 \text{ yr}} \times \frac{0.009 \text{ MBTU}}{1000 \text{ cf}}$$

$$\times \frac{\$10.94}{\text{MBTU}} \approx \$4000/\text{yr}$$

TOTAL ENERGY SAVED

$$\frac{\$4000}{\text{yr}} \times \frac{\text{MBTU}}{\$10.94} = \underline{\underline{366 \text{ MBTU/yr.}}}$$

Project No. 290-0379-001

Local _____ L.D. ☒ Placed ☒ Rec'd. _____ Date _____

Gr. Fallon _____ Conversed With Tom Knowland _____

Of Ingersoll-Rand _____ Regarding Compressor Energy Use _____

TK gave the following energy use values:

				kwh/kcf	MBtu/kcf
CFM	Bhp	PSIG	Btu/CFM	~~kwh/kcf~~	~~MBtu/kcf~~
1595	319	110	509	~~2.70~~	0.0092
1560	330	125	538	2.86	0.0098
1603	306	100	485	2.57	0.0088

CALC ENERGY USE PER ~~100~~ CFM OF AIR

MOTOR EFF = 0.92

Distribution:



SUBJECT LEAD ECO #1
DESIGNER G. Fallon
CHECKER P. Hutchins

AEP NO. _____
SHEET 2 OF _____
DATE _____
DATE _____

COST OF BALL VALVE

FROM MEANS, ITEM 151-955-1470
AND FROM CONSTRUCTION COST CALCULATION (ATTACHED)

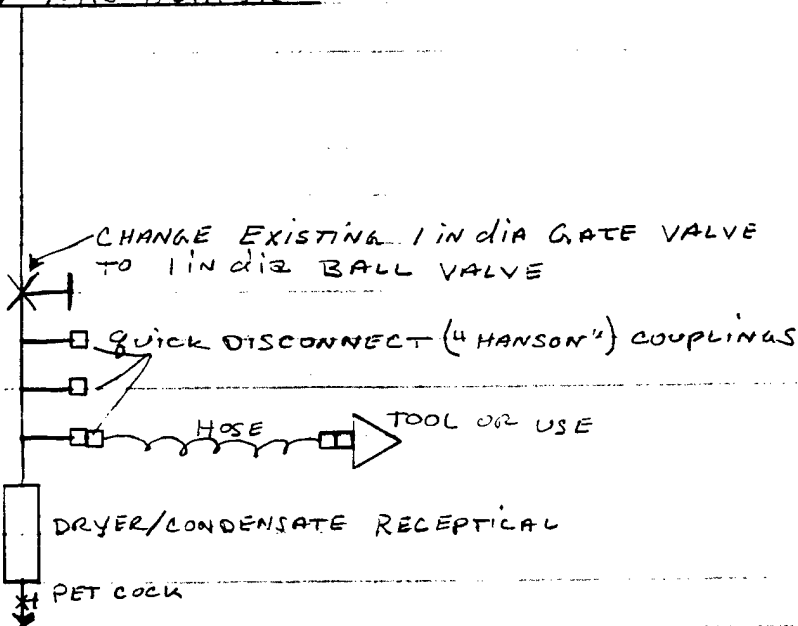
228 VALVES = \$8131

PAYBACK

$$\frac{\$8131}{\$4000/\text{yr}} = 2.0 \text{ years}$$

SKETCH

SUPPLY AIR HEADER



NOTE: EXISTING GATE VALVE OFTEN HAS LEAKY VALVE STEM AND ARE RARELY CLOSED. THIS ALLOWS DOWNSTREAM LEAKS TO CONTINUE. VALVE IS "DIFFICULT" TO SHUT OFF. BALL VALVE IS QUICK SHUT OFF TYPE. THEREFORE MORE LIKELY TO BE SHUT OFF BY WORKERS WHEN ASKED TO DO SO.

05/09/91

ECO Construction Cost Estimate
Calculations

ECO Name: Air Valves Replacement in Building 350

ECO #: 1

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$2,109
Labor		\$2,440
	Subtotal bare costs	\$4,549
FICA Insurance (20% of Labor)		\$488
Sales Tax (6.5% of Material)		\$137
	Subtotal	\$5,174
Overhead (15%)		\$776
	Subtotal	\$5,950
Profit (10%)		\$595
	Subtotal	\$6,545
Bond (1%)		\$65
	Subtotal	\$6,610
Contingency (10%)		\$661
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$7,271
		+-----+
SIOH (5.5% of Construction Cost)		\$400
	Subtotal	\$7,671
Design (6% of Construction Cost)		\$436

Total Project Cost		\$8,107

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET OF

PROJECT

ENERGY ENGINEERING ANALYSIS

LOCATION

Letterkenny Army Depot

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

G. Fallon

CHECKED BY

ECD #1

SUMMARY

QUANTITY

LABOR

MATERIAL

TOTAL COST

NO. UNITS

UNIT MEAS.

PER UNIT

TOTAL

PER UNIT

TOTAL

1 IN Ø BALL VALVE

228

EA

10.70

2440

9.25

2109

4549

EC071

LETTERKENNY ARMY DEPOT
COMPRESSED AIR SURVEY
BUILDING 350

COLUMN/ LOCATION	LEAK* DETECTION	FLOW** (CFM)	COMMENT
ID	TECHNIQUE		
B26	A	0.659	VALVE PACKING (MEASURED)
B54	A	1	VALVE PACKING
C24	A	1.5	1 HOSE COUPLING
C28	A	1.5	DRYER DRAIN
C32	A	1.5	VALVE PACKING
C47	A	1	VALVE PACKING
PB60	A	4.1	DRYER DRAIN PAINT BOOTH 60 (MEASURED)
B19	D	<0.5	VALVE PACKING (MEASURED)
B23	D	<0.5	VALVE PACKING
B27	D	<0.5	HOSE COUPLING
B30	D	<0.5	HOSE COUPLING
B31	D	<0.5	HOSE COUPLING
B35	D	<1.5	3 HOSE COUPLING
B36	D	<0.5	1 HOSE COUPLING
B37	D	<0.5	1 HOSE COUPLING (BREATHABLE AIR)
B38	D	>0.5	1 HOSE COUPLING
B50	D	<0.5	VALVE PACKING
C21	D	<0.5	1 HOSE COUPLING
C36	D	<0.5	1 HOSE COUPLING
C38	D	<0.5	VALVE PACKING (BREATHABLE AIR)
C39	D	<0.5	VALVE PACKING (BREATHABLE AIR)
C42	D	<0.5	VALVE PACKING
C46	D	<0.5	1 HOSE COUPLING
C51	D	<0.5	1 HOSE COUPLING
C52	D	<0.5	1 HOSE COUPLING
C54	D	<0.5	1 HOSE COUPLING
C55	D	<0.5	DRAIN COCK
B39	F	1	1 HOSE COUPLING
B46	F	1	VALVE PACKING (MEASURED)
B48	F	1	VALVE PACKING
B51	F	1	VALVE PACKING
B55	F	1	DRAIN COCK
C11	F	<1	1 HOSE COUPLING
C13	F	<1	1 HOSE COUPLING
C14	F	1	DRYER DRAIN
C17	F	<1	1 HOSE COUPLING
C18	F	<1	1 HOSE COUPLING
C23	F	1	1 HOSE COUPLING
C25	F	1	1 HOSE COUPLING
C31	F	1	1 HOSE COUPLING
C45	F	1	VALVE PACKING

31

* A = AUDIBLE TO HUMAN EAR WITH "AT WORK" BACKGROUND NOISE
D = DETECTOR ONLY. LEAK COULD NOT BE HEARD OR FELT
F = CAN BE FELT WITH HAND

** FLOW WAS MEASURED IN EACH OF THE MAJOR CATAGORIES (A,D,F).
FLOW WAS ESTIMATED BASED ON CATAGORY OF DETECTION SENSITIVITY

1 August 1982

C 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. AMC QRIP		REQUIREMENT CONTROL SYMBOL DD-M(R) 1661	
2. TO: HQ DA Attn: DACS-DME Pentagon Washington, DC 20310-2070		3. THRU: US AMC Attn: AMCM-M 5001 Eisenhower Ave Alexandria, VA 22303-0001		4. FROM: Commander US DESCOM Attn: AMSDS-RM-P Chambersburg, PA 17201-4170		5. DOD COMP NAME Army	
8. PROJECT TITLE Condensate Heat Recovery		10. TYPE OF PROJECT (Check one) ☒ QRIP ☐ OSD PIF ☐ PECIP		7. COMMAND CODE W730KK		6. DOD COMP CODE A	
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE 25		11. AMORTIZATION YEARS/MONTHS \$ 2,703 ÷ 4,100 X 12 (Project Cost) (Average Annual Savings) (No. Mo)		9. DATE 10/9/91	
16. SUBMITTING UNIT(S) Commander Letterkenny Army Depot Attn: SDSLE-EM (T. Hagie) Bldg. 663 Chambersburg, PA 17201-4150		18. UNIT ID CODE		14. EXPECTED OPERATIONAL DATE		11. AMORTIZATION YEARS/MONTHS - 0.7 (years) or (months) (amortization)	
15. DETAILED JUSTIFICATION Because dip tanks contain chemicals that are harmful to boiler water, condensate is not returned. This project recovers the heat from the waste condensate to be used to heat the building interior.		17. PROJECT DESCRIPTION Recover heat from dip tanks condensate which is otherwise disposed as industrial waste water.					
19. SAVINGS DISPOSITION Savings are used to reduce energy expenditures							
20. OTHER REMARKS (Continue on page 5, if more space is needed)							

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

1 August 1982

C 1, AR 5-1

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

21a.

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 Fuel Oil	33,800	29,700	29,700	29,700	29,700	4,100	4,100	4,100	4,100
CONTRACT COSTS									
OTHER (Identify)									
TOTALS	33,800	29,700	29,700	29,700	29,700	4,100	4,100	4,100	4,100

PRIORITIZATION

(1) INTERNAL RATE OF RETURN (IRR)
Divide estimated project cost 2,703 by average annual savings 4,100 = 0.66 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 4,100 X discount factor 9,524 = 39,000 and divide by present value of investment
(undiscounted) 2,703 = 14.4 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) N/A

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

1 August 1982

C 1, AR 5-4

COST FOR PROJECT TO BECOME OPERATIONAL						APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT	FY FUNDS REQUIRED
EQUIPMENT TYPE	PROPOSED SOURCE OF PROCUREMENT	UNIT PRICE	QUANTITY	TOTAL COST			
(1) Hydronic heaters	-	\$901	3	\$2,703			
(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				\$2,703			
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$2,703			
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵				-			
(16) TOTAL (Sum of (14) + (15) above)				\$2,703			

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

1 August 1982

C 1, AR 5-4

SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)										
ITEMS a	SAVINGS			REAPPLICATION OF SAVINGS						
	NO. MPR OR MHR b	TYPE PERSS 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) OVERHINES 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										
(8) #6 Fuel Oil			\$4,100							
(9)										
(10)										
(11) TOTAL DOLLAR SAVINGS			\$4,100							
6 (1) US Graded (2) US Wage Board (3) DHFN (4) IHFN (5) Officer (6) WO (7) Enlisted										

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

1 August 1982

C 1, AR 5-4

24. 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.) 25. OTHER COORDINATION (Functional Coordination at local level, e.g., Pac Eng, Log, Para, etc.)	
26. 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 PIP PROJECTS ONLY	
27. APPROVED BY	SIGNATURE DATE (YYMMDD) AUTOVON
28. OTHER REMARKS (Cont'd)	

ECO Number: 6

CONDENSATE HEAT RECOVERY FOR BOILERS IN BUILDING 349

Discussion

This ECO identifies known steam and condensate losses, assesses their recoverability and evaluates their economic impact.

Steam losses for deaerator heating, atomizing steam, soot blowing and steam cleaning are all vented directly or indirectly to the atmosphere. Condensate losses from dip tank heating may be contaminated by chemicals used in various processes and water losses from boiler blowdown are "dirty" and unsuitable for return. One energy savings option is to recover the heat from the various streams.

The heat in the boiler blowdown can be recovered for boiler makeup. The heat in the dip tank condensate can be used to heat building air during the heating season. Both of these options are evaluated in this ECO.

Recommendations

Based on the Life Cycle Cost Analysis, heat recovery from the boiler blowdown is not recommended. However, heat recovery from dip tank condensate in Buildings 350N, 350S and 370 are recommended.

Construction Cost	\$2,423
Annual Energy Savings (MBtu/yr)	
No. 6 Fuel Oil	938
Annual Energy Cost Savings (\$/yr)	\$4,100
SIR	38.6
Simple Payback (years)	0.7

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: EC06

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) LCCID 1.062

INSTALLATION & LOCATION: LETTERKENNY ADREGION NOS. 3 CENSUS: 1

PROJECT NO. & TITLE: ECO #6 HEAT RECOVERY FROM CONDENSATE

FISCAL YEAR 1992 DISCRETE PORTION NAME: TOTAL PROJECT

ANALYSIS DATE: 10-14-91 ECONOMIC LIFE 25 YEARS PREPARED BY: G. FALLON

1. INVESTMENT

A. CONSTRUCTION COST	\$	2423.
B. SIOH	\$	134.
C. DESIGN COST	\$	146.
D. SALVAGE VALUE COST	-\$	0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	\$	2703.

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

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 10.94	0.	\$ 0.	15.11	0.
B. DIST	\$ 4.98	0.	\$ 0.	21.31	0.
C. RESID	\$ 4.41	938.	\$ 4137.	25.22	104325.
D. NAT G	\$.00	0.	\$ 0.	20.70	0.
E. COAL	\$.00	0.	\$ 0.	15.93	0.
F. TOTAL		938.	\$ 4137.		\$ 104325.

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

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)		14.53
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-) (3A2+3Bd4)	\$	0.

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33) \$ 34427.

 A IF 3D1 IS = OR > 3C GO TO ITEM 4

 B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F) _____

 C IF 3D1B IS = > 1 GO TO ITEM 4

 D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE))	\$	4137.
5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)	\$	104325.
6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)=		38.60
(IF < 1 PROJECT DOES NOT QUALIFY)		
7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4		.65

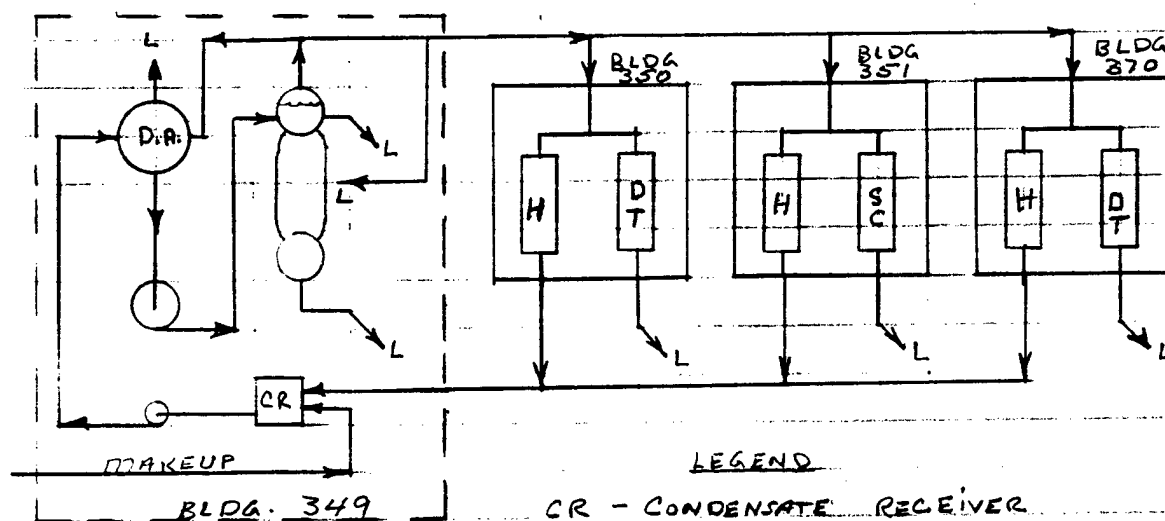


SUBJECT LETTERKENNY A.D.
ECO #6
 DESIGNER G.F.
 CHECKER PA

AEP NO 290-0379-001
 SHEET _____ OF _____
 DATE _____
 DATE _____

ECO#6 - REDUCE MAKEUP WATER REQUIREMENTS AT BLDG. 349

PROCESS FLOW DIAGRAM - MAIN BOILER (#349)



LEGEND

CR - CONDENSATE RECEIVER
 D.A. - DEAERATING FEEDWATER HEATER
 DT - DIP TANK HEATING
 H - COMFORT HEATING
 L - LOSS
 SC - STEAM CLEANING

STEAM LOSSES

HEAT RECOVERABLE

CONDENSATE RECOVERABLE

1. D.A. VENT	NO	NO
2. CONTINUOUS BLOWDOWN	YES	NO
3. BOTTOM BLOWDOWN	YES	NO
4. SOOT BLOWER	NO	NO
5. ATOM. STEAM	NO	NO
6. BLDG 350 DIP TANKS	YES	NO
7. BLDG 351 STEAM CLEAN	NO	NO
8. BLDG 370 DIP TANKS	YES	NO



SUBJECT LETTER KENNY A.D.

AEP NO _____

ECO #6

SHEET 2 OF _____

DESIGNER _____

DATE _____

CHECKER _____

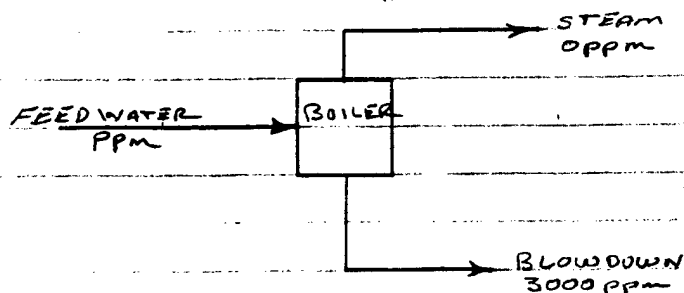
DATE _____

HEAT RECOVERY FROM BOILER BLOWDOWN (Items 2 & 3)

DETERMINE BLOW DOWN FLOW

ASSUME: 3000 ppm TDS BOILER WATER (AGMA STD)

: 30 ppm IN FEEDWATER



$$\sum \text{WATER} = 0 = \text{FEEDWATER} - \text{STEAM FLOW} - \text{BLOW DOWN} = m_f - m_s - m_B$$

$$\sum \text{SOLIDS} = 0 = \text{FEEDWATER} \times \text{CONC.} - \text{STEAM FLOW} \times \text{CONC.} - \text{BLOW DOWN} \times \text{CONC.}$$

$$0 = m_f \times C_f - m_s C_s - m_B C_B$$

$$0 = m_f C_f - (m_f - m_B) C_s - m_B C_B$$

$$0 = m_f C_f - m_B C_B$$

$$m_B = m_f \frac{C_f}{C_B} = m_f \frac{30}{3000} = .001 m_f$$

SO BLOW DOWN $\approx$.1% OF STEAM FLOW

TOTAL STEAM PRODUCTION

$$\text{TOTAL STEAM PRODUCTION} = \frac{\text{TOTAL FUEL CONSUMPTION}}{\text{Boiler EPA} \times \Delta H}$$

$$= \frac{188578 \text{ MBTU/yr}}{.8 \times (11881 - (.8 \times 148 + .2 \times 28))}$$

$$= 221.5 \text{ million LBS STEAM / yr.}$$

TOTAL BLOW DOWN

$$221.5 \times 10^6 \times .001 = 221.5 \times 10^3 \text{ LBS / yr.}$$



SUBJECT LEAD
ECO #6
DESIGNER _____
CHECKER _____

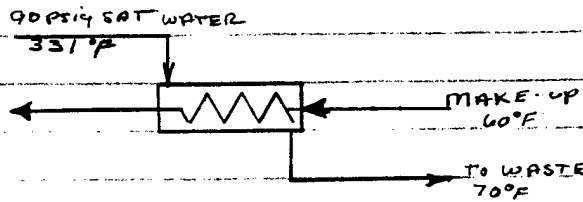
AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

RECOVERABLE ENERGY IN BLOW DOWN

ASSUME: 10° AT COLD END APPROACH

90 PSIG BOILER PRESSURE

MAKE-UP WATER TEMP = 60°F



$$\dot{Q} = \dot{W} C_p \Delta T = \frac{221.5 \times 10^3 \text{ LBS/yr} \times (331 - 70)}{0.8 \times 10^6} = 72.3 \text{ MBTU/yr}$$

#601C

VALUE OF RECOVERED ENERGY

$$72.3 \text{ MBTU/yr} \times \$0.61/\text{MBTU} = \$478/\text{yr}$$

$$\text{CONSTRUCTION COST} = \$9297$$

$$\text{PAYBACK} = \frac{\$9297}{\$478/\text{yr}} = 19.4 \text{ YEARS} \Rightarrow \text{NOT RECOMMENDED}$$



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

HEAT RECOVERY FROM DIP TANK CONDENSATE.

DIP TANK STEAM CONSUMPTION

DURING NON-WORK SUMMERTIME WEEKENDS THE ONLY STEAM CONSUMERS ARE THE DIP TANKS IN BUILDINGS 350 & 370. SINCE THESE ARE THE ONLY CONSUMERS AND THE CONDENSATE IS DUMPED, THE MAKEUP FLOW IS EQUAL TO THE STEAM FLOW AND THE CONDENSATE FLOW.

1990 AUGUST WEEKEND MAKEUP FLOW DATA

<u>DATE</u>	<u>MAK-UP FLOW</u> <u>(GPD)</u>
4	2891
5	2800
11	2800
12	2800
18	3200
19	3300
25	4000
26	3300
TOTAL	25100
AVERAGE (GPD)	3140
AVERAGE (#/HR)	1090

THERE ARE 11 HEATED TANKS TOTALING 19,200 gpl. THE TANKS OPERATE AT APPROXIMATELY THE SAME TEMPERATURE. THE STEAM CAN BE ASSUMED TO BE CONSUMED AS A FUNCTION OF TANK CAPACITY. THE CONDENSATE TEMPERATURE IS EQUAL TO THE TANK TEMPERATURE

$$\frac{1090 \text{ \#/HR}}{19200 \text{ gpl}} = 0.0568 \text{ \# STEAM / HR / gpl}$$

RS&H

SUBJECT HEAD
ECO #6
DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

350 N

4 TANKS @ 3000 gal ea = 12,000 gal
2 TANKS @ 500 gal ea = 1,000 gal
13,000 gal

TOTAL STEAM CONSUMPTION

$$13,000 \text{ gal} \times 0.0568 \text{ \#STEAM/HR/gal} = 738 \text{ LBS STM/HR.}$$

RECOVERABLE ENERGY IN CONDENSATE

ASSUME: 68°F INDOOR TEMP., 10° H/X APPROACH.

$$738 \text{ LBS. STM/HR} \times (180 - 78) = 75,300 \text{ BTU/HR}$$

ANNUAL HEAT RECOVERY

$$\frac{75,300 \text{ BTU/HR}}{10^6 \text{ BTU/MBTU} \times 0.8} \times 6687 \text{ HR/YR} = 629 \text{ MBTU/YR} \quad \text{\#6 OIL}$$

RS-H

SUBJECT

LEAD

AEP NO

FCD #6

SHEET

OF

DESIGNER

DATE

CHECKER

DATE

350 S

2 TANKS @ 1600 gal @ = 3200 gal

TOTAL STEAM CONSUMPTION

3200 gal x 0.0568 #STM/HR/gal = 182 LBS STM/HR

RECOVERABLE ENERGY IN CONDENSATE

182 LBS STM/HR x (180-78) = 18500 BTU/HR

ANNUAL HEAT SAVER

$\frac{18500 \text{ BTU/HR}}{10^6 \text{ BTU/MATL} \times 0.8} \times 6687 \text{ HRS/YR} = 155 \text{ MBTU/YR}$
#6 OIL



SUBJECT LEAD
ECO #6
DESIGNER _____
CHECKER _____

AEP NO _____
SHEET _____ OF _____
DATE _____
DATE _____

370

$$3 \text{ TANKS @ } 1000 \text{ gal @ } = 3000 \text{ gal}$$

TOTAL STEAM CONSUMPTION

$$3000 \text{ gal} \times 0.0568 \text{ \#s/hr.gal} = 170 \text{ LBS STM/HR}$$

RECOVERABLE ENERGY IN CONDENSATE

$$170 \text{ LBS STM/HR} \times (180 - 72) = 18400 \text{ BTU/HR}$$

ANNUAL ENERGY RECOVERY

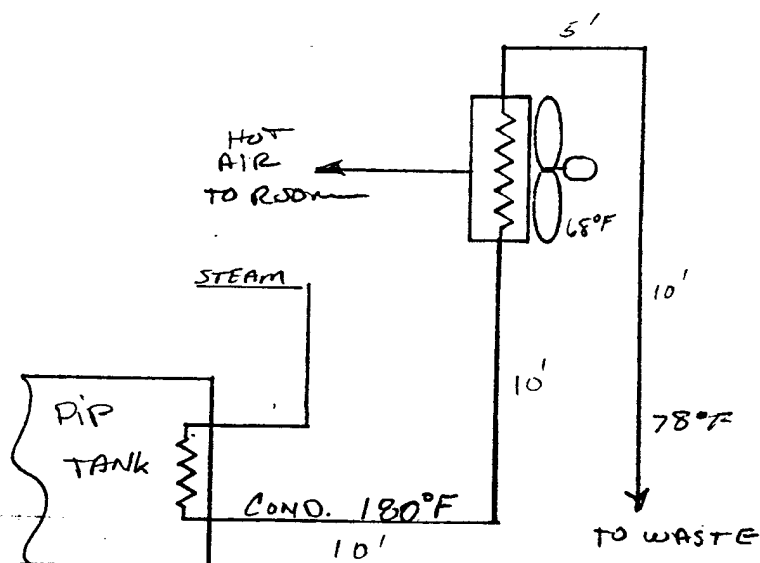
$$\frac{18400 \text{ BTU/HR}}{10^6 \text{ BTU/MTU} \times 0.8} \times 6687 \text{ HRS/YR} = 154 \text{ MBTU \#601/YR}$$



SUBJECT LEAD
ECO #6
 DESIGNER _____
 CHECKER _____

AEP NO _____
 SHEET _____ OF _____
 DATE _____
 DATE _____

DIP TANK CONDENSATE HEAT RECOVERY



1 HYDRONIC HEATER
 35 ft - 1" ϕ SCH 40 PIPE,
 3 1" ϕ ... ELS.
 NO INSULATION

ONE UNIT REQUIRED @
 EACH GROUP OF DIP TANKS,
 3 TOTAL.

$$\text{TOTAL ENERGY SAVED} = .629 + 155 + 154 = 938 \text{ MBTU/yr}$$

TOTAL CONSTRUCTION COST \$2701

QRIP Calculations

$$\begin{aligned} \text{Present energy use} &= \{(738 + 182 + 170) \#/\text{hr}\} \times 6687 \text{ hr/yr} \times 1050 \frac{\text{Btu}}{\text{lb}} \\ &= \underline{7653 \text{ MBtu/yr}} \times 4.41 \text{ \$/MBtu} = \underline{\underline{\$33,800/\text{yr}}} \end{aligned}$$

LETTERKENNY ARMY DEPOT ENERGY AUDIT OF INDUSTRIAL FACILITIES

Operation Hrs/Day = 24

Room or Supply Air Conditions - Winter 68
Air Quantity (cfm) 1

Hour Fractions 1 AM - 9 AM 1
9 AM - 5 PM 1
5 PM - 1 AM 1

Operation Days Per Week 5

Temp. Range	Hours of Occurrence			Total Hours	Delta H or T	Const.	CFM	BTU/HR	Total BTU	
	2-9	10-17	18-1							
70	74	247	237	301	785	-4	1.08	1	0	0
65	69	296	217	278	791	1	1.08	1	1	854
60	64	269	196	236	701	6	1.08	1	6	4,542
55	59	249	191	209	649	11	1.08	1	12	7,710
50	54	221	193	202	616	16	1.08	1	17	10,644
45	49	218	193	206	617	21	1.08	1	23	13,994
40	44	237	236	239	712	26	1.08	1	28	19,993
35	39	289	246	286	821	31	1.08	1	33	27,487
30	34	304	194	258	756	36	1.08	1	39	29,393
25	29	184	106	152	442	41	1.08	1	44	19,572
20	24	124	65	90	279	46	1.08	1	50	13,861
15	19	75	32	57	164	51	1.08	1	55	9,033
10	14	54	13	26	93	56	1.08	1	60	5,625
5	9	18	3	9	30	61	1.08	1	66	1,976
0	4	9	0	2	11	66	1.08	1	71	784
-5	-1	3	0	1	4	71	1.08	1	77	307
-10	-6	1	0	0	1	76	1.08	1	82	82
-15	-11	0	0	0	0	81	1.08	1	87	0
Totals		2798	2122	2552	7472					165,858

Total Operation Hours While Heating
(and corrected for working days/week) 4776 118,470

Avg outdoor temp while heating (F) 45.0

7472
- 785

6687 HRS OF HEATING

05/16/91

ECO Construction Cost Estimate Calculations

ECO Name: Condensate heat recovery - dip tank heat exchanger

ECO #: 6

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$1,310
Labor		\$274
	Subtotal bare costs	\$1,584
FICA Insurance (20% of Labor)		\$55
Sales Tax (6.5% of Material)		\$85
	Subtotal	\$1,724
Overhead (15%)		\$259
	Subtotal	\$1,983
Profit (10%)		\$198
	Subtotal	\$2,181
Bond (1%)		\$22
	Subtotal	\$2,203
Contingency (10%)		\$220
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$2,423
		+-----+
SIOH (5.5% of Construction Cost)		\$133
	Subtotal	\$2,556
Design (6% of Construction Cost)		\$145

Total Project Cost		\$2,701

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

05/16/91

ECO Construction Cost Estimate Calculations

ECO Name: Condensate heat recovery - blow down heat exchanger

ECO #: 6

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$3,340
Labor		\$1,980
	Subtotal bare costs	\$5,320
FICA Insurance (20% of Labor)		\$396
Sales Tax (6.5% of Material)		\$217
	Subtotal	\$5,933
Overhead (15%)		\$890
	Subtotal	\$6,823
Profit (10%)		\$682
	Subtotal	\$7,505
Bond (1%)		\$75
	Subtotal	\$7,580
Contingency (10%)		\$758
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$8,338
		+-----+
SIOH (5.5% of Construction Cost)		\$459
	Subtotal	\$8,797
Design (6% of Construction Cost)		\$500

Total Project Cost		\$9,297

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET OF

PROJECT

ENERGY ENGINEERING ANALYSIS

LOCATION

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

G. Fallon

CHECKED BY

P. Hutchins

~~BLOW DOWN HEAT~~
 RECOVERY - ECO 6

QUANTITY

LABOR

MATERIAL

TOTAL
COSTNO.
UNITSUNIT
MEAS.PER
UNIT

TOTAL

PER
UNIT

TOTAL

BLOW DOWN HEAT HX

MEANS ITEM NO

155601180

1

ea

185

185

2160

2160

2350

2" SCH 40 PIPE

200

LF

5.75

1150

2.91

582

1730

2" CAL. SIL INSULATION

200

LF

2.22

444

2.22

444

890

2" STEEL ELS.

10

EA

20

200

15.7

157

360

1980

3340

5330

1 August 1982

C 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. AMC QRIP		REQUIREMENT CONTROL SYMBOL DD-M(R) 1561	
2. TO: HQ DA Attn: DACS-DME Pentagon Washington, DC 20310-2070		3. THRU: US AMC Attn: AMCM-M 5001 Eisenhower Ave Alexandria, VA 22303-0001		4. FROM: Commander US DESCOM Attn: AMSDS-RM-P Chambersburg, PA 17201-4170		5. DOD COMP NAME Army	6. DOD COMP CODE A
9. PROJECT TITLE Paint Booth Exhaust Fan Controls		10. TYPE OF PROJECT (Check one) ☒ QRIP ☐ OSD PIF ☐ PECIP		11. AMORTIZATION YEARS/MONTHS 5,135 ÷ \$23,000 X 12 (Project Cost) (Average Annual Savings) (No. Mo)		7. COMMAND CODE W730KK	8. DATE 10/9/91
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE 15		14. EXPECTED OPERATIONAL DATE		15. AMORTIZATION 0.2 (years) or (month)	
15. SUBMITTING UNIT(S) Commander Letterkenny Army Depot Attn: SDSLE-EM (T. Hagie) Bldg. 663 Chambersburg, PA 17201-4150		16. UNIT ID CODE		17. PROJECT DESCRIPTION This project provides controls for nine paint booths that will allow exhaust air use only when occupied.			
18. DETAILED JUSTIFICATION For convenience, paint booth exhaust fans are left on continuously during work shifts. This project shuts off the exhaust fan when unoccupied and saves energy.							
19. SAVINGS DISPOSITION Savings are used to reduce energy expenditures							
20. OTHER REMARKS (Continue on page 5, if more space is needed)							

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

1 August 1982

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

214

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. & #6	45,800	24,200	24,200	24,200	24,200	21,600	21,600	21,600	21,600
OTHER (Identify) CONTRACT COSTS									
TOTALS	45,800	24,200	24,200	24,200	24,200	21,600	21,600	21,600	21,600

PRIORITIZATION

(1) INTERNAL RATE OF RETURN (IRR)
Divide estimated project cost 5,135 by average annual savings 23,000 = 0.2 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 23,000 X discount factor 7.98 = \$183,500 and divide by present value of investment
(undiscounted) 5,135 = 33.6 S/I.
(Based on economic life 15 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

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

1 August 1982

C 1, AR 5-4

COST FOR PROJECT TO BECOME OPERATIONAL						FY FUNDS REQUIRED
EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	
(1) Occupancy Sensor		\$571	9	\$5,135		
(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				\$5,135		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$5,135		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵				-		
(16) TOTAL (Sum of (14) + (15) above)				\$5,135		

¹Not to exceed 10% of equipment cost for QRIP projects.

²Applicable to OPA QRIP provided cost is included in packaged deal involving one bill for the equipment and initial maintenance.

³Normally not OPA funded.

⁴Used to compute amortization in Item 11.

⁵Specify source to include certification that funds are available, if financed from the regular budget.

1 August 1982

C 1, AR 5-4

23. SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)										
ITEMS	SAVINGS			REAPPLICATION OF SAVINGS						
	NO. MPR OR MHR	TYPE PER	DOLLARS	PROGRAM ELEMENT			TDA PARA AND LINE			FUNCTION CODE
				e.	f.	g.	h.	i.	j.	
(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) OTHER DOLLAR SAVINGS (Excluding Manpower), e.g., CONTRACT COSTS & UTILITIES										
(8) Electricity			\$1,400							
(9) #6 Fuel Oil			\$21,600							
(10)										
(11) TOTAL DOLLAR SAVINGS			\$23,000							
6 (1) US Graded (2) US Wage Board (3) DHFN (4) JHFN (5) Officer (6) WO (7) Enlisted										

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

1 August 1982

C 1, AR 5-4

24. 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.) 25. OTHER COORDINATION (Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)	
26. 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
27. APPROVED BY	
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY	
SIGNATURE	
DATE (YYMMDD)	
AUTOVON	
28. OTHER REMARKS (Cont'd)	

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: EC09

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) LCCID 1.062

INSTALLATION & LOCATION: LETTERKENNY ADREGION NOS. 3 CENSUS: 1

PROJECT NO. & TITLE: ECO #9 PAINT BOOTH FAN CONTROLS

FISCAL YEAR 1992 DISCRETE PORTION NAME: TOTAL PROJECT

ANALYSIS DATE: 10-14-91 ECONOMIC LIFE 15 YEARS PREPARED BY: G. FALLON

1. INVESTMENT

A. CONSTRUCTION COST	\$	4604.
B. SIOH	\$	254.
C. DESIGN COST	\$	277.
D. SALVAGE VALUE COST	-\$	0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	\$	5135.

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

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 10.94	124.	\$ 1357.	10.75	14583.
B. DIST	\$ 4.98	0.	\$ 0.	14.08	0.
C. RESID	\$ 4.41	4895.	\$ 21587.	16.21	349924.
D. NAT G	\$.00	0.	\$ 0.	13.25	0.
E. COAL	\$.00	0.	\$ 0.	11.13	0.
F. TOTAL		5019.	\$ 22944.		\$ 364507.

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

A. ANNUAL RECURRING (+/-) \$ 0.

(1) DISCOUNT FACTOR (TABLE A) 10.59

(2) DISCOUNTED SAVING/COST (3A X 3A1) \$ 0.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)\$ 0.

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33) \$ 120287.

A IF 3D1 IS = OR > 3C GO TO ITEM 4

B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F) _____

C IF 3D1B IS = > 1 GO TO ITEM 4

D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE))\$ 22944.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) \$ 364507.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 70.98

(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 .22

ECO Number: 9

PAINT BOOTH FAN CONTROL

Discussion

Paint booth exhaust fans operate continuously during the shift when painting is to be done. However, the fan is required to operate only when paint is being applied.

This ECO provides controls for nine paint booths that will turn the fan off if no one has been in the paint booth for three minutes, and will turn it on whenever any one enters the booth.

Recommendations

Based on the Life Cycle Cost Analysis, this project is recommended.

Construction Cost	\$4,604
Annual Energy Savings (MBtu/yr)	
No. 6 Oil	4,895
Electricity	124
Annual Energy Cost Savings (\$/yr)	\$22,900
SIR	71.0
Simple Payback (years)	0.2



SUBJECT LETTERKENNY A.D.
ECO 9
DESIGNER G.F.
CHECKER _____

AEP NO 290-0379-001
SHEET 1 OF _____
DATE _____
DATE _____

ECO # 9 Paint Booth Fan Control : Bldg 350, Booth # 61
CURRENT ENERGY COSTS

NO. 6 OIL

ASSUME: 68°F EXHAUST AIR, 2 SHIFT OPERATION
74,233 BTU / CFM / YR.
12141 CFM EXHAUST FLOW

BOILER EFFICIENCY = 0.8

HEAT LOSS F491 Fuel prices except for Q

$$HL = \frac{74,233 \text{ B/CFM/YR} \times 12141 \text{ CFM}}{0.8 \times 10^6} = 1127 \text{ MBTU/YR}$$

HEAT LOSS COST

$$1130 \text{ MBTU/YR} \times \$4.41/\text{MBTU} = \$4983/\text{YR}$$

ELECTRICITY

ASSUME: 2 HP MOTOR (BKA, INC. REPORT)

ENERGY CONSUMED

$$2 \text{ HP} \times .746 \text{ kW/HP} \times 16 \text{ H/d} \times 5 \text{ d/w} \times 52 \text{ w/YR} = 6210 \text{ kWh}$$

COST

$$= 21. \frac{\text{MBTU}}{\text{YR}}$$

$$6210 \text{ kWh} \times \$0.0373/\text{kWh} = \$230/\text{YR}$$

TOTAL COST

$$\$4983/\text{YR} + \$230/\text{YR} = \$5213/\text{YR}$$

SAVINGS

ASSUME: FAN IS OFF FOR 1/2 TIME



SUBJECT LEAD ECD #9
DESIGNER _____
CHECKER _____

AEP NO _____
SHEET 2 OF _____
DATE _____
DATE _____

SAVINGS CONT.

No. 6 OIL

ENERGY

$$\frac{1127 \text{ MBTU/yr}}{2} = \underline{\underline{564 \text{ MBTU/yr}}}$$

COST

$$564 \text{ MBTU/yr} \times \$4.41/\text{mbtu} = \$2487/\text{yr}$$

ELECTRICITY

ENERGY

$$\frac{6210 \text{ kWh/yr}}{2} = 3110 \cdot \text{kWh/yr} = \underline{\underline{11 \text{ MBTU/yr}}}$$

COST

$$3110 \text{ kWh/yr} \times \$0.0373/\text{kWh} = \$120/\text{yr}$$

TOTAL SAVINGS

$$\text{COST SAVINGS} = \text{OIL SAVINGS} + \text{ELEC. SAVINGS}$$

$$= \$2487/\text{yr} + \$120/\text{yr}$$

$$= \underline{\underline{\$2607/\text{yr}}}$$

$$\text{ENERGY SAVINGS} = 564 \frac{\text{MBTU}}{\text{yr}} + 11 \frac{\text{MBTU}}{\text{yr}}$$

$$= \underline{\underline{575 \text{ MBTU/yr}}}$$

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number: 350
Paint Booth No.: 2527

Heating Fuel Type: #6 Fuel Oil
Heating Fuel Cost: \$4.41 /MBtu
Boiler Efficiency: 80%
Electricity Cost: \$10.94 /MBtu
Exhaust Fan Motor: 5 HP
Exhaust Air Flow: 25,959 CFM
Makeup Percentage: 100%
Exhaust Air Temp.: 68 °F
O A Heating Load: 74,233 Btu/cfm-Yr
Operating Shifts: 2 /Day
Operating Days: 5 /Week

Current Energy Use:

Current Heating Energy =	2409 MBtu/Yr
Heating Energy Cost =	\$10,624 /Yr
Current Electric Use =	53 MBtu/Yr
Electricity Cost =	\$580 /Yr
Current Energy Use =	2462 MBtu/Yr
Current Energy Cost =	\$11,204 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	1205 MBtu/Yr
Heating Cost Savings =	\$5,314 /Yr
Electric Energy Savings =	27 MBtu/Yr
Electric Cost Savings =	\$295 /Yr
Total Energy Savings =	1232 MBtu/Yr
Total Energy Cost Savings =	\$5,609 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number: 37
Paint Booth No.: 280

Heating Fuel Type: #6 Fuel Oil
Heating Fuel Cost: \$4.41 /MBtu
Boiler Efficiency: 80%
Electricity Cost: \$10.94 /MBtu
Exhaust Fan Motor: 3 HP
Exhaust Air Flow: 18,318 CFM
Makeup Percentage: 100%
Exhaust Air Temp.: 68 °F
D A Heating Load: 74,233 Btu/cfm-Yr
Operating Shifts: 2 /Day
Operating Days: 5 /Week

Current Energy Use:

Current Heating Energy =	1700 MBtu/Yr
Heating Energy Cost =	\$7,497 /Yr
Current Electric Use =	32 MBtu/Yr
Electricity Cost =	\$350 /Yr
Current Energy Use =	1732 MBtu/Yr
Current Energy Cost =	\$7,847 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	850 MBtu/Yr
Heating Cost Savings =	\$3,749 /Yr
Electric Energy Savings =	16 MBtu/Yr
Electric Cost Savings =	\$175 /Yr
Total Energy Savings =	866 MBtu/Yr
Total Energy Cost Savings =	\$3,924 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number: 37
Paint Booth No.: 468

Heating Fuel Type: #6 Fuel Oil
Heating Fuel Cost: \$4.41 /MBtu
Boiler Efficiency: 80%
Electricity Cost: \$10.94 /MBtu
Exhaust Fan Motor: 2 HP
Exhaust Air Flow: 11,152 CFM
Makeup Percentage: 100%
Exhaust Air Temp.: 68 °F
O A Heating Load: 74,233 Btu/cfm-Yr
Operating Shifts: 2 /Day
Operating Days: 5 /Week

Current Energy Use:

Current Heating Energy =	1035 MBtu/Yr
Heating Energy Cost =	\$4,564 /Yr
Current Electric Use =	21 MBtu/Yr
Electricity Cost =	\$230 /Yr
Current Energy Use =	1056 MBtu/Yr
Current Energy Cost =	\$4,794 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	518 MBtu/Yr
Heating Cost Savings =	\$2,284 /Yr
Electric Energy Savings =	11 MBtu/Yr
Electric Cost Savings =	\$120 /Yr
Total Energy Savings =	529 MBtu/Yr
Total Energy Cost Savings =	\$2,404 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number: 37
Paint Booth No.: 470

Heating Fuel Type: #6 Fuel Oil
Heating Fuel Cost: \$4.41 /MBtu
Boiler Efficiency: 80%
Electricity Cost: \$10.94 /MBtu
Exhaust Fan Motor: 3 HP
Exhaust Air Flow: 12,069 CFM
Makeup Percentage: 100%
Exhaust Air Temp.: 68 °F
O A Heating Load: 74,233 Btu/cfm-Yr
Operating Shifts: 2 /Day
Operating Days: 5 /Week

Current Energy Use:

Current Heating Energy =	1120 MBtu/Yr
Heating Energy Cost =	\$4,939 /Yr
Current Electric Use =	32 MBtu/Yr
Electricity Cost =	\$350 /Yr
Current Energy Use =	1152 MBtu/Yr
Current Energy Cost =	\$5,289 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	560 MBtu/Yr
Heating Cost Savings =	\$2,470 /Yr
Electric Energy Savings =	16 MBtu/Yr
Electric Cost Savings =	\$175 /Yr
Total Energy Savings =	576 MBtu/Yr
Total Energy Cost Savings =	\$2,645 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number: 370
Paint Booth No.: 200

Heating Fuel Type: #6 Fuel Oil
Heating Fuel Cost: \$4.41 /MBtu
Boiler Efficiency: 80%
Electricity Cost: \$10.94 /MBtu
Exhaust Fan Motor: 5 HP
Exhaust Air Flow: 17,100 CFM
Makeup Percentage: 100%
Exhaust Air Temp.: 68 °F
O A Heating Load: 35,618 Btu/cfm-Yr
Operating Shifts: 1 /Day
Operating Days: 5 /Week

Current Energy Use:

Current Heating Energy =	761 MBtu/Yr
Heating Energy Cost =	\$3,356 /Yr
Current Electric Use =	26 MBtu/Yr
Electricity Cost =	\$284 /Yr
Current Energy Use =	787 MBtu/Yr
Current Energy Cost =	\$3,640 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	381 MBtu/Yr
Heating Cost Savings =	\$1,680 /Yr
Electric Energy Savings =	13 MBtu/Yr
Electric Cost Savings =	\$142 /Yr
Total Energy Savings =	394 MBtu/Yr
Total Energy Cost Savings =	\$1,822 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number: 370
Paint Booth No.: 412

Heating Fuel Type: #6 Fuel Oil
Heating Fuel Cost: \$4.41 /MBtu
Boiler Efficiency: 80%
Electricity Cost: \$10.94 /MBtu
Exhaust Fan Motor: 1.5 HP
Exhaust Air Flow: 6,147 CFM
Makeup Percentage: 100%
Exhaust Air Temp.: 68 °F
O A Heating Load: 35,618 Btu/cfm-Yr
Operating Shifts: 1 /Day
Operating Days: 5 /Week

Current Energy Use:

Current Heating Energy =	274 MBtu/Yr
Heating Energy Cost =	\$1,208 /Yr
Current Electric Use =	8 MBtu/Yr
Electricity Cost =	\$88 /Yr
Current Energy Use =	282 MBtu/Yr
Current Energy Cost =	\$1,296 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	137 MBtu/Yr
Heating Cost Savings =	\$604 /Yr
Electric Energy Savings =	4 MBtu/Yr
Electric Cost Savings =	\$44 /Yr
Total Energy Savings =	141 MBtu/Yr
Total Energy Cost Savings =	\$648 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number: 370
Paint Booth No.: 3877

Heating Fuel Type: #6 Fuel Oil
Heating Fuel Cost: \$4.41 /MBtu
Boiler Efficiency: 80%
Electricity Cost: \$10.94 /MBtu
Exhaust Fan Motor: 2 HP
Exhaust Air Flow: 11,956 CFM
Makeup Percentage: 100%
Exhaust Air Temp.: 68 °F
O A Heating Load: 35,618 Btu/cfm-Yr
Operating Shifts: 1 /Day
Operating Days: 5 /Week

Current Energy Use:

Current Heating Energy =	532 MBtu/Yr
Heating Energy Cost =	\$2,346 /Yr
Current Electric Use =	11 MBtu/Yr
Electricity Cost =	\$120 /Yr
Current Energy Use =	543 MBtu/Yr
Current Energy Cost =	\$2,466 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	266 MBtu/Yr
Heating Cost Savings =	\$1,173 /Yr
Electric Energy Savings =	6 MBtu/Yr
Electric Cost Savings =	\$66 /Yr
Total Energy Savings =	272 MBtu/Yr
Total Energy Cost Savings =	\$1,239 /Yr

ECO #9
Fan Controls For Open Paint Booths
Letterkenny Army Depot
10/14/91

Building Number: 370
Paint Booth No.: 4298

Heating Fuel Type: #6 Fuel Oil
Heating Fuel Cost: \$4.41 /MBtu
Boiler Efficiency: 80%
Electricity Cost: \$10.94 /MBtu
Exhaust Fan Motor: 7.5 HP
Exhaust Air Flow: 18,592 CFM
Makeup Percentage: 100%
Exhaust Air Temp.: 68 °F
O A Heating Load: 35,618 Btu/cfm-Yr
Operating Shifts: 1 /Day
Operating Days: 5 /Week

Current Energy Use:

Current Heating Energy =	828 MBtu/Yr
Heating Energy Cost =	\$3,651 /Yr
Current Electric Use =	40 MBtu/Yr
Electricity Cost =	\$438 /Yr
Current Energy Use =	868 MBtu/Yr
Current Energy Cost =	\$4,089 /Yr

Savings if fan is turned off 50% of the time:

Heating Energy Savings =	414 MBtu/Yr
Heating Cost Savings =	\$1,826 /Yr
Electric Energy Savings =	20 MBtu/Yr
Electric Cost Savings =	\$219 /Yr
Total Energy Savings =	434 MBtu/Yr
Total Energy Cost Savings =	\$2,045 /Yr

ECO #9 Project Summary
 Fan Controls For Open Paint Booths
 Letterkenny Army Depot
 10/21/91

4.41 4.41 10.94

Building Number	Booth Number	Energy Savings (MBtu/Yr)				Energy Cost Savings (\$/Yr)				CURRENT COSTS		
		#5 Oil	#6 Oil	Elect	Total	#5 Oil	#6 Oil	Elect	Total	FUEL OIL	ELEC.	TOTAL
350	61		564	11	575	\$0	\$2,487	\$120	\$2,608	\$4,983	\$230	\$5,213
350	2527		1205	27	1232	\$0	\$5,314	\$295	\$5,609	\$10,624	\$580	\$11,204
37	280	850		16	866	\$3,749	\$0	\$175	\$3,924	\$7,497	\$350	\$7,847
37	468	518		11	529	\$2,284	\$0	\$120	\$2,405	\$4,564	\$230	\$4,794
37	470	560		16	576	\$2,470	\$0	\$175	\$2,645	\$4,939	\$350	\$5,289
370	200		381	13	394	\$0	\$1,680	\$142	\$1,822	\$3,356	\$284	\$3,640
370	412		137	4	141	\$0	\$604	\$44	\$648	\$1,208	\$88	\$1,296
370	3877		266	6	272	\$0	\$1,173	\$66	\$1,239	\$2,346	\$120	\$2,466
370	4298		414	20	434	\$0	\$1,826	\$219	\$2,045	\$3,651	\$438	\$4,089
Total Project		1928	2967	124	5019	\$8,502	\$13,084	\$1,357	\$22,944	\$43,168	\$2,670	\$45,838

21,600

LETTERKENNY ARMY DEPOT ENERGY AUDIT OF INDUSTRIAL FACILITIES

Operation Hrs/Day = 8

Room or Supply Air Conditions - Winter 68
Air Quantity (cfm) 1

Hour Fractions 1 AM - 9 AM 0.25
9 AM - 5 PM 0.75
5 PM - 1 AM 0

Operation Days Per Week 5

Temp. Range	Hours of Occurrence 2-9 10-17 18-1	Total Hours	Delta H or I	Const.	CFM	BTU/HR	Total BTU
70 74	247 237 301	240	-4	1.08	1	0	0
65 69	236 217 278	237	1	1.08	1	1	256
60 64	269 196 236	214	6	1.08	1	6	1,388
55 59	249 191 209	206	11	1.08	1	12	2,441
50 54	221 193 202	200	16	1.08	1	17	3,456
45 49	218 193 206	199	21	1.08	1	23	4,519
40 44	237 236 239	236	26	1.08	1	28	6,634
35 39	289 246 286	257	31	1.08	1	33	8,596
30 34	304 194 258	222	36	1.08	1	39	8,612
25 29	184 106 152	126	41	1.08	1	44	5,557
20 24	124 65 90	80	46	1.08	1	50	3,962
15 19	75 32 57	43	51	1.08	1	55	2,355
10 14	54 13 26	23	56	1.08	1	60	1,406
5 9	18 3 9	7	61	1.08	1	66	445
0 4	9 0 2	2	66	1.08	1	71	160
-5 -1	3 0 1	1	71	1.08	1	77	58
-10 -6	1 0 0	0	76	1.08	1	82	21
-15 -11	0 0 0	0	81	1.08	1	87	0
-----							=====
Totals	2798 2122 2552	2291					49,865

Total Operation Hours While Heating
(and corrected for working days/week) 1465 35,618

Avg outdoor temp while heating (F) 45.0

ECO 9

LETTERKENNY ARMY DEPOT ENERGY AUDIT OF INDUSTRIAL FACILITIES

Operation Hrs/Day = 16

Room or Supply Air Conditions - Winter 68
 Air Quantity (cfm) 1

Hour Fractions 1 AM - 9 AM 0.375
 9 AM - 5 PM 1
 5 PM - 1 AM 0.625

Operation Days Per Week 5

Temp. Range	Hours of Occurrence			Total Hours	Delta H or T	Const.	CFM	BTU/HR	Total BTU
	2-9	10-17	18-1						
70	74	247	237	301	518	-4	1.08	1	0
65	69	296	217	278	502	1	1.08	1	542
60	64	269	196	236	444	6	1.08	1	6,880
55	59	249	191	209	415	11	1.08	1	4,930
50	54	221	193	202	402	16	1.08	1	6,949
45	49	218	193	206	404	21	1.08	1	9,151
40	44	237	236	239	474	26	1.08	1	13,317
35	39	289	246	286	533	31	1.08	1	17,849
30	34	304	194	258	469	36	1.08	1	18,244
25	29	184	106	152	270	41	1.08	1	11,956
20	24	124	65	90	168	46	1.08	1	8,334
15	19	75	32	57	96	51	1.08	1	5,274
10	14	54	13	26	50	56	1.08	1	2,994
5	9	18	3	9	15	61	1.08	1	1,013
0	4	9	0	2	5	66	1.08	1	330
-5	-1	3	0	1	2	71	1.08	1	134
-10	-6	1	0	0	0	76	1.08	1	31
-15	-11	0	0	0	0	81	1.08	1	0
Totals									103,927

Total Operation Hours While Heating
 (and corrected for working days/week) 3035 74,233

Avg outdoor temp while heating (F) 45.0

09/25/91

ECO Construction Cost Estimate
Calculations

ECO Name: Walk-in Spray Booth Fan Control

ECO #: 9

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

Material	\$1,179
Labor	\$1,683

Subtotal bare costs	\$2,862
---------------------	---------

FICA Insurance (20% of Labor)	\$337
-------------------------------	-------

Sales Tax (6.5% of Material)	\$77
------------------------------	------

Subtotal	\$3,276
----------	---------

Overhead (15%)	\$491
----------------	-------

Subtotal	\$3,767
----------	---------

Profit (10%)	\$377
--------------	-------

Subtotal	\$4,144
----------	---------

Bond (1%)	\$41
-----------	------

Subtotal	\$4,185
----------	---------

Contingency (10%)	\$419
-------------------	-------

Subtotal (Construction Cost Input For LCCID *)	\$4,604
--	---------

SIOH (5.5% of Construction Cost)	\$253
----------------------------------	-------

Subtotal	\$4,857
----------	---------

Design (6% of Construction Cost)	\$276
----------------------------------	-------

Total Project Cost	\$5,133
--------------------	---------

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET OF

PROJECT

ENERGY ENGINEERING ANALYSIS

LOCATION

Letterkenny Army Depot

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

G.F.

CHECKED BY

P. Hutchins

WALK-IN SPRAY BOOTH
FAN CONTROL SUMMARY

QUANTITY

NO.
UNITS

UNIT
MEAS.

PER
UNIT

LABOR

TOTAL

MATERIAL

PER
UNIT

TOTAL

TOTAL
COST

OCCUPANCY SENSOR

1

EA

25

25

80

80

105

CONDUIT 1/2" Ø

50

LF

2.97

149

.96

48

197

WIRE 2-14

0.5

CLF

2678

13

6.22

3

16

Subtotal For 1 Booth

187

131

318

x No. of Booths

x 9

x 9

Total Bare Costs

\$1,683

\$1,179

\$2,862

1 August 1982

C 1, AR 5-4

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS				1. PROJECT NO.		REQUIREMENT CONTROL SYMBOL	
For use of this form, see AR 5-4; the proponent agency is OCA.				AMC QRIP		DD-M(R) 1561	
2. TO: HQ DA Attn: DACS-DME Pentagon Washington, DC 20310-2070		3. THRU: US AMC Attn: AMCM-M 5001 Eisenhower Ave Alexandria, VA 22303-0001		4. FROM: Commander US DESCOM Attn: AMSDS-RM-P Chambersburg, PA 17201-4170		5. DOD COMP NAME Army	
8. PROJECT TITLE Blast Booth Exhaust Fan Controls		10. TYPE OF PROJECT (Check one) ☒ ORIP ☐ OSD PIF ☐ PECIP		7. COMMAND CODE W730KK		6. DOD COMP CODE A	
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE 15		8. DATE 10/9/91		11. AMORTIZATION YEARS/MONTHS 7,280 ÷ 17,613 X 12 (Project Cost) (Average Annual Savings) (No. Mo.) 0.4 (year) or (month) (amortization)	
15. SUBMITTING UNIT(S) Commander Letterkenny Army Depot Attn: SDSLE-EM (T. Hagie) Bldg. 663 Chambersburg, PA 17201-4150		16. UNIT ID CODE		17. PROJECT DESCRIPTION Limit switches are used to allow blast booth exhaust fans to operate only when doors are closed.			
18. DETAILED JUSTIFICATION Currently, blast booth exhaust fans remain on continuously throughout the work shifts. This project will save energy by shutting down exhaust fans when booths are not in use.							
19. SAVINGS DISPOSITION Savings are used to reduce energy expenditures							
20. OTHER REMARKS (Continue on page 5, if more space is needed)							

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

1 August 1982

C 1, AR 5-1

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	\$37,919	\$20,306	\$20,306	\$20,306	\$20,306	\$20,306	\$17,613	\$17,613	\$17,613
CONTRACT COSTS									
OTHER (Identify)									
TOTALS	\$37,919	\$20,306	\$20,306	\$20,306	\$20,306	\$20,306	\$17,613	\$17,613	\$17,613

PRIORITIZATION

(1) INTERNAL RATE OF RETURN (IRR)
Divide estimated project cost 7,280 by average annual savings 17,613 = 0.4 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 17,613 X discount factor 7.98 = 140,552 and divide by present value of investment (undiscounted) 7,280 = 19.3 S/I.
(Based on economic life 15 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

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

1 August 1982

COST FOR PROJECT TO BECOME OPERATIONAL					
EQUIPMENT TYPE a	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f
(1) Limit Switches	-	\$1,820	4	\$7,280	
(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				\$7,280	
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$7,280	
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵				-	
(16) TOTAL (Sum of (14) + (15) above)				\$7,280	

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

1 August 1982

C 1, AR 5-4

SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)										
ITEMS	SAVINGS		REAPPLICATION OF SAVINGS							
	NO. MPR OR MHR	TYPE PERS ⁶	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE		FUNCTION CODE		
				f.	TO	g.	FROM	h.	TO	i.
(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										
(8) Electricity			\$17,613							
(9)										
(10)										
(11) TOTAL DOLLAR SAVINGS			\$17,613							
⁶ (1) US Graded (2) US Wage Board (3) DHFN (4) IHFN (5) Officer (6) WO (7) Enlisted										

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

1 August 1982

C 1, AR 5-4

24. 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.)			
25. OTHER COORDINATION (Functional Coordination at local level, e.g., Fac Eng, Log, Pers, etc.)			
_____ _____ _____			
26. 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
27. APPROVED BY			
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		SIGNATURE	DATE (YYMMDD)
			AUTOVON
28. OTHER REMARKS (Cont'd)			

ECO Number: 11

BLAST BOOT FAN SHUT-OFF (BUILDINGS 350 AND 37)

Discussion

The blast booth exhaust fan draws air from the building interior, circulates it through the booth and a bag house, and discharges it back into the building. This fan must be operated whenever blasting is under way. However, there is no reason for the fan to operate when the blast booth is not being utilized and the doors are open.

This ECO provides electrical equipment that will automatically stop the exhaust fan when the large booth doors are not fully closed. One limit switch mounted on each pair of doors will indicate the doors are closed and the fan may be started. The fan will operate until one of the large doors opens, or until the stop button is depressed.

Recommendations

Based on the Life Cycle Cost Analysis, this project is recommended.

Construction Cost	\$6,529
Annual Energy Savings (MBtu/yr)	
Electricity	1,610
Annual Energy Cost Savings (\$/yr)	\$17,613
SIR	26.0
Simple Payback (years)	0.4

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: EC011

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) LCCID 1.062

INSTALLATION & LOCATION: LETTERKENNY ARREGION NOS. 3 CENSUS: 1

PROJECT NO. & TITLE: ECO #11 BLAST BOOTH FAN CONTROL (B350)

FISCAL YEAR 1991 DISCRETE PORTION NAME: TOTAL PROJECT

ANALYSIS DATE: 09-11-91 ECONOMIC LIFE 15 YEARS PREPARED BY: G. FALLON

1. INVESTMENT

A. CONSTRUCTION COST	\$	6529.
B. SIOH	\$	359.
C. DESIGN COST	\$	392.
D. SALVAGE VALUE COST	-\$	0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	\$	7280.

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

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 10.94	1610.	\$ 17613.	10.75	189344.
B. DIST	\$ 7.43	0.	\$ 0.	14.08	0.
C. RESID	\$ 6.61	0.	\$ 0.	16.21	0.
D. NAT G	\$.00	0.	\$ 0.	13.25	0.
E. COAL	\$.00	0.	\$ 0.	11.13	0.
F. TOTAL		1610.	\$ 17613.		\$ 189344.

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

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)	10.59	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)\$ 0.

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33) \$ 62484.

A IF 3D1 IS = OR > 3C GO TO ITEM 4

B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F) _____

C IF 3D1B IS = > 1 GO TO ITEM 4

D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YRS ECONOMIC LIFE))\$ 17613.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) \$ 189344.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 26.01
(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 .41



SUBJECT LETTER KENNEDY A D.
ECO # 11
DESIGNER G.F.
CHECKER P. Hutchins

AEP NO 290-0379-001
SHEET 1 OF 5
DATE _____
DATE _____

ECO # 11

BLAST BOOTH FAN SHUT-OFF (BOOTH 49)

REF 1. LEAD, EEAR, RSH, 1981, VOL 2, PROJ-H, CALC. pg V-6

CURRENT ENERGY CONSUMPTION

ELECTRICITY

ASSUME: FLOW = 44,000 CFM (REF. 1)

AP DUCT WORK & BAGS = 5 IN. W.G.

η FAN & MOTOR = .6

$$\text{FAN HP} = \frac{\text{ACFM} \times \text{S.P.}}{6356 \times \eta} = \frac{44000 \times 5.0}{6356 \times .6} = 58 \text{ HP}$$

$$\text{KW} = .746 \times \text{HP} = 43 \text{ KW}$$

ENERGY CONSUMED

ASSUME: 3 SHIFT/day, 5d/wk

$$43 \text{ KW} \times 24 \text{ hr/d} \times 5 \text{ d/wk} \times 52 \text{ wk/yr} = 268,000 \text{ kWhr/yr}$$
$$916 \text{ MBTU/yr}$$

COST OF ENERGY

$$916 \text{ MBTU/yr} \times \$10.94/\text{MBTU} = \$10,000/\text{yr.}$$

SAVINGS

ASSUME: BLASTING OCCURS ONLY ON 1/2 TIME

ENERGY

$$916 \text{ MBTU/yr} \times .5 = 458 \text{ MBTU/yr (elec.)}$$

COSTS

$$458 \text{ MBTU/yr} \times \$10.94/\text{MBTU} = \$5010/\text{yr}$$



SUBJECT LEAD ECO #11
DESIGNER _____
CHECKER _____

AEP NO _____
SHEET 2 OF 5
DATE _____
DATE _____

ECO - 11 (CONT)

BLAST BOOTH FAN SHUT-OFF (BOOTH 50)

REF 2: LEAD, EEAP, RSH, 1981, Vol 2, PROJ-H, CALC. pg VI-1

CURRENT ENERGY CONSUMPTION

ASSUME: FLOW = 56,000 CFM (REF 2)

ΔP DUCT & BAGS = 5 in. w.c.

η FAN & MOTOR = 0.6

$$\text{FAN HP} = \frac{\text{ACFM} \times \text{S.P.}}{6356 \times \eta} = \frac{56,000 \times 5}{6356 \times 0.6} = 73.4 \text{ HP}$$

$$\text{KW} = .746 \text{ kW/HP} \times \text{HP} = .746 \times 73.4 = 54.8 \text{ kW}$$

ENERGY CONSUMED

ASSUME 3 SHIFT/day, 5d/wk, 52wk/yr

$$54.8 \text{ kW} \times 24 \text{ H/d} \times 5 \text{ d/wk} \times 52 \text{ wk/yr} = 342,000 \text{ kWh/yr.}$$

$$342,000 \text{ kWh/yr} \times \frac{3413 \text{ BTU/kWh}}{10^6 \text{ BTU/MBTU}} = 1170 \text{ MBTU/yr}$$

$$1170 \times 10.94 = \underline{\$12,800/\text{yr}}$$

SAVINGS

ASSUME BLASTING OCCURS FOR $\frac{1}{2}$ TIME

ENERGY

$$1170 \text{ MBTU/yr} \times 0.5 = \underline{583 \text{ MBTU/yr (elec.)}}$$

COST

$$583 \text{ MBTU/yr} \times \$10.94/\text{MBTU} = \underline{\$6380/\text{yr}}$$



SUBJECT LEAD ECO #11

DESIGNER _____
CHECKER _____

AEP NO _____
SHEET 3 OF 5
DATE _____
DATE _____

ECO -11 (CONT)

BLAST BOOTH FAN SHUT-OFF (BOOTH 2544)

REF 3 : LEAD, FEAP, RSH, 1981, VOL. 2, PROJ- H, CALC. pg VII-1

CURRENT ENERGY CONSUMPTION

ASSUME: FLOW = 44,000 CFM (REF 3)

DP DUCT & BAGS = 5 IN. W.C.

η FAN & MOTOR = 0.6

VALUES ARE SAME AS BOOTH 49 (pg. 11-1) SO
SAVINGS WILL BE THE SAME.

Energy savings = 458 MWh/yr (elec.)



SUBJECT LEAD ECO #11
DESIGNER _____
CHECKER _____

AEP NO _____
SHEET 4 OF 5
DATE _____
DATE _____

ECO (CONT.)

BLAST BOOTH FAN SHUT OFF BLOG 37

REF 4: LEAD, EEP, RSH, 1981, VOL. 2, PROJ H, CALC. pg X-1

FAN MOTOR HP = 20 (REF 4)

CURRENT ENERGY CONSUMED

ASSUME: 2 SHIFT OPERATION

$$20 \text{ HP} \times .746 \text{ kW/HP} \times 16 \text{ H/d} \times 5 \text{ d/w} \times 52 \text{ w/yr} = 62100 \text{ kWh}$$

$$62100 \text{ kWh/yr} \times \frac{3413 \text{ BTU/kWh}}{106 \text{ BTU/MBTU}} = 212 \text{ MBTU/yr}$$

$$212 \times 10.94 = \$2319$$

SAVINGS

ASSUME: BLASTING OCCURS $\frac{1}{2}$ TIME,

ENERGY

$$212 \text{ MBTU/yr} \times 0.5 = \underline{106 \text{ MBTU/yr}} \quad \text{ELEC}$$

COST

$$106 \text{ MBTU/yr} \times \$10.94/\text{MBTU} = \$1160/\text{yr}$$



SUBJECT LEAD ECO #11
DESIGNER _____
CHECKER _____

AEP NO _____
SHEET 5 OF 5
DATE _____
DATE _____

SUMMARY
SAVINGS

<u>BLOG</u>	<u>BOOTH</u>	<u>ENERGY</u> <u>(MBTU ELEC/412)</u>	<u>ENERGY</u> <u>COST SAVINGS</u> <u>(\$)</u>
350	49	458	5010
350	50	583	6380
350	2544	458	5010
37	-	106	1160
TOTAL		1,610	17,600

CONSTRUCTION COST

FOR ALL 4 BOOTHS = \$6530

PAYBACK

$$\frac{\$7280}{\$17600/\text{yr}} = 0.41 \text{ YRS.}$$

QRTP Calc's

$$\begin{aligned} \text{Current energy use: } & \$10,000 + \$12,300 + \$17,800 + \$2319 \\ & = \$37,919 \end{aligned}$$

05/09/91

ECO Construction Cost Estimate
Calculations

ECO Name: Building 350 & 37 blast booth fan control

ECO #: 11

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

Material	\$1,150
Labor	\$2,850

Subtotal bare costs	\$4,000
---------------------	---------

FICA Insurance (20% of Labor)	\$570
-------------------------------	-------

Sales Tax (6.5% of Material)	\$75
------------------------------	------

Subtotal	\$4,645
----------	---------

Overhead (15%)	\$697
----------------	-------

Subtotal	\$5,342
----------	---------

Profit (10%)	\$534
--------------	-------

Subtotal	\$5,876
----------	---------

Bond (1%)	\$59
-----------	------

Subtotal	\$5,935
----------	---------

Contingency (10%)	\$594
-------------------	-------

Subtotal (Construction Cost Input For LCCID *)	\$6,529
--	---------

SIOH (5.5% of Construction Cost)	\$359
----------------------------------	-------

Subtotal	\$6,888
----------	---------

Design (6% of Construction Cost)	\$392
----------------------------------	-------

Total Project Cost	\$7,280
--------------------	---------

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

CONSTRUCTION COST ESTIMATE

DATE PREPARED

SHEET OF

PROJECT

ENERGY ENGINEERING ANALYSIS

LOCATION

Letterkenny Army Depot

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

G. F.

CHECKED BY

P. H. H. H. H.

AUTO SHUT DOWN
BLAST BOOTH
FANS. SUMMARY

QUANTITY

LABOR

MATERIAL

TOTAL COST

NO.
UNITSUNIT
MEAS.PER
UNIT

TOTAL

PER
UNIT

TOTAL

Limit Switches

2

ea

32

64

42

84

148

WIRE 2-14

2

CLF

26.75

54

6.22

12

66

CONDUIT 1/2" Ø

200

LF

2.97

594

0.96

192

786

COST PER BOOTH

712

288

1000

4 BOOTHS.

X 4

X 4

X 4

2850

1150

4000

1 August 1982

C 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. AMC QRIIP		REQUIREMENT CONTROL SYMBOL DD-M(R) 1861	
2. TO: HQ DA Attn: DACS-DME Pentagon Washington, DC 20310-2070		3. FROM: US AMC Attn: AMCM-M 5001 Eisenhower Ave. Alexandria, VA 22303-0001		4. FROM: Commander US DESCOM Attn: AMSDS-RM-P Chambersburg, PA 17201-4170		5. DOD COMP NAME Army	
6. PROJECT TITLE Modular Personnel Offices		10. TYPE OF PROJECT (Check one) ☒ QRIIP ☐ OSD PIF ☐ PECIP		7. COMMAND CODE W73QKK		8. DOD COMP CODE A	
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE 25 yrs		9. 26,039 + 13,600 X 12 (Project Cost) (Average Annual Savings) (No. Mo)		10/9/91	
15. SUBMITTING UNIT(S) Commander Letterkenny Army Depot Attn: SDSLE-EM (T. Hagie) Bldg. 663 Chambersburg, PA 17201-4150		16. UNIT ID CODE		11. AMORTIZATION YEARS/MONTHS 1.9 (year) or (month)		12. DATE 10/9/91	
17. PROJECT DESCRIPTION Install modular offices with self-contained heating and cooling systems in three warehouses (#63, 8 and 9). Reset open area thermostats from 68°F to 55°F.				18. DETAILED JUSTIFICATION Installing modular offices in storage warehouses will allow the occupants to decrease the space heating temperatures in open storage areas while maintaining higher comfort levels in the modular offices. This action will save heating fuel oil.			
19. SAVINGS DISPOSITION Savings are used to reduce energy expenditures.				20. OTHER REMARKS (Continue on page 2, if more space is needed)			

1 August 1982

C 1, AR 5-1

214.

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

Attach compilation 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	\$36,100	\$22,500	\$22,500	\$22,500	\$22,500	\$13,600	\$13,600	\$13,600	\$13,600
and #2 fuel oil									
CONTRACT COSTS									
OTHER (Identify)									
TOTALS	\$36,100	\$22,500	\$22,500	\$22,500	\$22,500	\$13,600	\$13,600	\$13,600	\$13,600

PRIORITIZATION

(1) INTERNAL RATE OF RETURN (IRR)
Divide estimated project cost 26,039 by average annual savings \$13,600 = 1.9 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 = 65 % IRR.

(2) SAVINGS TO INVESTMENT RATIO (S/I)
Multiply annual savings 13,600 X discount factor 9,524 = 129,500 and divide by present value of investment
(undiscounted) 26,039 = 5.0 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) N/A
Divide estimated project cost _____ by number of manpower space savings _____ = _____ RIMS.
(Manpower requirements cannot be used in this computation.)

1 August 1982

C 1, AR 5-4

COST FOR PROJECT TO BECOME OPERATIONAL					
EQUIPMENT TYPE ^a	PROPOSED SOURCE OF PROCUREMENT ^b	UNIT PRICE ^c	QUANTITY ^d	TOTAL COST ^e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT ^f
(1) Modular Offices		\$8,680	3	\$26,039	
(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				\$26,039	
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$26,039	
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵				-	
(16) TOTAL (Sum of (14) + (15) above)				\$26,039	

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

1 August 1982

C 1, AR 5-4

SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)										
ITEMS a	SAVINGS		REAPPLICATION OF SAVINGS				FUNCTION CODE			
	NO. MPR OR MHR b	TYPE PERSS c	DOLLARS d	PROGRAM ELEMENT		TDA PARA AND LINE		L FROM		J TO
				e	f	g	h	i	j	k
(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										
(8) #2 Fuel Oil			\$13,800							
(9) Electricity			-200							
(10)										
(11) TOTAL DOLLAR SAVINGS			\$13,800							
6 (1) US Graded (2) US Wage Board (3) DHFN (4) IHFN (5) Officer (6) WO (7) Enlisted										

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

1 August 1982

C 1, AR 5-4

24. 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.) A. OTHER COORDINATION (Functional Coordination of 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
27. APPROVED BY	
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY	
SIGNATURE	DATE (YYMMDD) AUTOVON
28. OTHER REMARKS (Cont'd)	

ECO Number: 15

MODULAR OFFICES IN BUILDINGS 6 SOUTH, 8 AND 9

Discussion

The temperature in these warehouses is maintained at 68°F (and higher) primarily for operator comfort. A tremendous amount of energy is required to heat the entire warehouse to 68°F. This project consists of installing modular 10 X 12 foot offices inside these warehouses, maintaining 68°F in the offices and reducing the temperature of the warehouse to 55°F. The results are shown below.

Recommendations

Based on the Life Cycle Cost Analysis, this project is recommended.

Construction Cost	\$23,352
Annual Energy Savings (MBtu/yr)	
No. 2 Fuel Oil	2,775
Electricity	(20)
Annual Energy Cost Savings (\$/yr)	\$13,600
SIR	11.2
Simple Payback (years)	1.9

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: EC015

LCCID 1.062

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: LETTERKENNY ADREGION NOS. 3 CENSUS: 1

PROJECT NO. & TITLE: ECO #15 MODULAR OFFICES IN WAREHOUSING

FISCAL YEAR 1992 DISCRETE PORTION NAME: TOTAL PROJECT

ANALYSIS DATE: 10-14-91 ECONOMIC LIFE 25 YEARS PREPARED BY: W. TODD

1. INVESTMENT

A. CONSTRUCTION COST	\$	23352.
B. SIOH	\$	1285.
C. DESIGN COST	\$	1402.
D. SALVAGE VALUE COST	-\$	0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	\$	26039.

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

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 10.94	-20.	\$ -219.	15.11	-3306.
B. DIST	\$ 4.98	2775.	\$ 13820.	21.31	294494.
C. RESID	\$ 4.41	0.	\$ 0.	25.22	0.
D. NAT G	\$.00	0.	\$ 0.	20.70	0.
E. COAL	\$.00	0.	\$ 0.	15.93	0.
F. TOTAL		2755.	\$ 13601.		\$ 291187.

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

A. ANNUAL RECURRING (+/-)	\$	0.
(1) DISCOUNT FACTOR (TABLE A)	14.53	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)	\$	0.
D. PROJECT NON ENERGY QUALIFICATION TEST		
(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$	96092.
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)		
C IF 3D1B IS = > 1 GO TO ITEM 4		
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS $2F3+3A+(3B1D/(YRS \text{ ECONOMIC LIFE}))$ \$ 13601.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) \$ 291187.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 11.18
(IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) $SPB=1F/4$ 1.91

SUBJECT Modular Offices
LEAD
DESIGNER W.T. Todd
CHECKER P. Hutchins

AEP NO. 290-0379-001
SHEET 1 OF
DATE 4/13/91
DATE Rev. 9-25-91

ECO # 15

Modular offices for personnel in Buildings 65, 8 & 9

Assumptions:

1. The indoor temperature for these warehouses is currently maintained at 68°F.
2. The heating for these buildings is provided by the boilers in building 8, which burn Fuel oil #2.
3. The operation hours for these buildings are 8 hours per day, 5 days per week (2080 hrs/yr.)
4. The warehouse temperature can be reduced to 55°F while maintaining 68°F in the modular offices.
5. The modular offices will also be cooled to 75°F during the summer months.
6. The average indoor temperature during the summer months is currently about 80°F.
7. Since the wall and roof U-values and the infiltration rate do not change, the heat losses from the buildings is determined by the indoor-outdoor temperature difference and the amount of time heating is required.

SUBJECT Modular Offices

LEAD

DESIGNER

WTT

CHECKER

AEP NO.

SHEET

2

OF

DATE

DATE

Current energy consumption:

Annual Fuel oil deliveries*:
FY 87 = 71,478 gal/yr
FY 88 = 63,607
FY 89 = 27,283
FY 90 = 46,446

Total 208,814 gal/4 years

* From Letterkenny Army Depot, Fuel Consumption Report,
Building 8 boilers.

$$\text{Average fuel oil consumption} = \frac{208,814 \text{ gal}}{4 \text{ years}} = 52,203 \text{ gal/yr}$$

Buildings 6, 8 and 9 are approximately the same size so the energy use for each building is about:

$$52,203 \text{ gal/yr} \div 3 = 17,401 \text{ gal/yr per building}$$

$$17,401 \text{ gal/yr} \times 0.13869 \frac{\text{MBtu}}{\text{gal}} = 2,413 \text{ MBtu/yr per bldg.}$$

$$\text{TOTAL USE FOR ALL BLDGS} = 2,413 \times 3 = 7,239 \text{ MBtu/yr}$$

Energy Savings:

Bin temperature data were used to calculate the potential energy savings when the indoor temperature is reduced from 68°F to 55°F.

From the spreadsheet calculations the sum of the (indoor temperature - average outdoor temperature) x hours of occurrence for 68°F is: 153,752 degree hours per year

This value corresponds to the total current energy use.

The degree hours for 55°F indoor temperature is:

82,338 degree hours

$$\text{Energy savings} = \frac{153,572 \text{ deg hrs} - 82,338 \text{ deg hrs}}{153,572 \text{ deg hrs}} = 0.46$$

$$\text{Energy Savings} = 2413 \frac{\text{MBtu}}{\text{yr}} \times 0.46 = 1110 \frac{\text{MBtu}}{\text{yr}} \text{ ea. for bldgs. 8 \& 9}$$

Additional Energy Use: Savings for bldg. 6's will be 50% of the above value since half the bldg. is offices.

To maintain office temperature an electric a/c and heating unit will be utilized. It's energy use is:

$$Q = UA\Delta T$$

$U_{\text{wall}}:$	air film	$R = 0.68$	} From 1989 ASHRAE Fund.
	1/8" hardboard	$R = 0.125 \div 1.2 = 0.10$	
	3" air space	$R = 0.90$	
	1/8" hardboard	$R = 0.10$	
	air film	$R = 0.68$	

$$R_T = 2.46$$

$$U_w = \frac{1}{R_T} = 0.41 \text{ Btu/hr.ft}^2.\text{°F}$$

$$U_{\text{window}} = 1.10 \text{ Btu/hr.ft}^2.\text{°F} \quad (1989 \text{ ASHRAE Fundamentals})$$

$U_{\text{ceiling}}:$	air film	$R = 0.76$	} From 1989 ASHRAE Fund.
	1/2" Acc. Tile	$R = 1.25$	
	air film	$R = 0.76$	
		$R_T = 2.77$	

$$U_{\text{ceiling}} = \frac{1}{R_T} = 0.36 \text{ Btu/hr.ft}^2.\text{°F}$$

$$\text{Wall area} = A_w = (10' \times 8' + 12' \times 8') \times 2 = 352 \text{ ft}^2 - A_{w_i}$$

$$\text{Window area} = A_{w_i} = 3' \times 3' \times 6 = 54 \text{ ft}^2$$

$$\text{Ceiling area} = A_c = 10' \times 12' = 120 \text{ ft}^2$$

$$Q = U_w \times A_w \times \Delta T + U_{w_i} \times A_{w_i} \times \Delta T + U_c \times A_c \times \Delta T$$

$$\Delta T_w = 68^\circ\text{F} - 55^\circ\text{F} = 13^\circ\text{F} \quad \text{winter}$$

$$\Delta T_s = 80^\circ\text{F} - 75^\circ\text{F} = 5^\circ\text{F} \quad \text{summer}$$

$$Q = (0.41 \times 298 + 1.10 \times 54 + 0.36 \times 120) \frac{\text{Btu}}{\text{hr} \cdot ^\circ\text{F}} \times \Delta T$$

$$Q_s = 224.8 \frac{\text{Btu}}{\text{hr} \cdot ^\circ\text{F}} \times 5^\circ\text{F} = 1124 \text{ Btu/hr}$$

$$Q_w = 224.8 \frac{\text{Btu}}{\text{hr} \cdot ^\circ\text{F}} \times 13^\circ\text{F} = 2922 \text{ Btu/hr}$$

$$\text{Heating hours} = 1,465 \text{ hours/year (from bin data)}$$

$$\text{Heating energy} = 1465 \frac{\text{hr}}{\text{yr}} \times 2922 \frac{\text{Btu}}{\text{hr}} = 4.3 \frac{\text{mbtu}}{\text{yr}}$$

$$4.3 \frac{\text{mbtu}}{\text{yr}} \times 10.94 \frac{\$}{\text{mbtu}} = \$47/\text{year}$$

$$\text{Cooling hours} = 9 \frac{\text{hr}}{\text{day}} \times 260 \frac{\text{day}}{\text{yr}} - 1465 \frac{\text{hr}}{\text{yr}} = 875 \text{ hr/yr}$$

$$\text{Cooling efficiency: assume an EER of } 8 \frac{\text{Btu}}{\text{watt}}$$

$$\text{Cooling energy} = 1124 \frac{\text{Btu}}{\text{hr}} + 1500 \text{ w} \times \frac{3.413 \text{ Btu/hr}}{\text{w}} \left(\frac{\text{appliances}}{\text{people load}} \right) = 6224 \frac{\text{Btu}}{\text{hr} \cdot \text{Bldg}}$$

$$\text{Cooling energy} = 6224 \frac{\text{Btu}}{\text{hr}} \div 8 \frac{\text{Btu}}{\text{w}} \times \frac{1 \text{ kw}}{1000 \text{ w}} \times 875 \frac{\text{hr}}{\text{yr}} = 683 \frac{\text{kwh}}{\text{yr} \cdot \text{Bldg}}$$

$$\text{Cooling energy} = 683 \frac{\text{kwh}}{\text{yr}} \times \frac{3413 \text{ Btu}}{\text{kwh}} \times \frac{\text{MBtu}}{10^6 \text{ Btu}} = 2.3 \frac{\text{MBtu}}{\text{yr. Bldg.}}$$

$$2.3 \frac{\text{MBtu}}{\text{yr}} \times 10.94 \frac{\$}{\text{MBtu}} = \underline{\$25 / \text{yr. Bldg.}}$$

$$\text{Total additional energy use} = (4.3 \frac{\text{MBtu}}{\text{yr. B.}} + 2.3 \frac{\text{MBtu}}{\text{yr. B.}}) \times 3 \text{ Bld.} = \underline{20 \frac{\text{MBtu}}{\text{yr}}}$$

$$\text{Total additional energy cost} = (47 \frac{\$}{\text{yr. B.}} + 25 \frac{\$}{\text{yr. B.}}) \times 3 \text{ Bld.} = \underline{\$216 / \text{yr}}$$

Energy Cost Savings:

$$1110 \frac{\text{MBtu}}{\text{yr}} \times 4.98 \frac{\$}{\text{MBtu}} = \underline{\$5528 / \text{yr for bldgs. 8 \& 9}}$$

$$1110 \frac{\text{MBtu}}{\text{yr}} \times 4.98 \frac{\$}{\text{MBtu}} \times 0.5 = \underline{\$2764 / \text{yr for bldg 6 S}}$$

Net Energy Savings:	#2 Fuel oil	: $1110 \frac{\text{MBtu}}{\text{yr. Bld.}} \times 2.5 \text{ Bld.} =$	<u>2775 MBtu/yr</u>
	Elec	: $(4.3 + 2.3) \times 3 =$	<u>(20) MBtu/yr</u>

$$\text{Net Energy Savings} = \text{Energy Savings} - \text{Add. energy use}$$

$$= 2775 \text{ MBtu/yr} - 20 \text{ MBtu/yr}$$

$$= \underline{2755 \text{ MBtu/yr}}$$

Net Energy Cost Savings:

$$\text{Net energy cost savings} = \$5528 / \text{yr} \times 2.5 \text{ Bldgs.} - \$216 / \text{yr}$$

$$= \underline{\$13,600 / \text{yr}}$$

Project Cost :

Total Project Cost = \$26,037

See cost estimate sheets for details

Simple Payback :

Payback = Cost ÷ Savings

= $\$26,037 \div \$13,600/\text{yr}$

Payback = 1.9 years

QRIP Calc's

Present energy use = 7239 MBtu/yr #2 fuel oil
cost = $7239 \times 4.98 = \$36,100/\text{yr}$

Proposed method = 4464 MBtu/yr #2 fuel oil
20 MBtu/yr electricity
cost = $4464 \times 4.98 + 20 \times 10.94$
= \$22,500

**ENERGY AUDIT OF INDUSTRIAL FACILITIES
LETTERKENNY ARMY DEPOT**

Operation hours per day = 24
Operation days per week = 7

Indoor Air Temperature (F) = 55

Hour Fractions: 1 AM - 9 AM 1
 9 AM - 5 PM 1
 5 PM - 1 AM 1

Temperature Range		Hours of Occurrence			Net Hours	Delta T	Total Deg Hrs	Net Deg Hrs
		2-9	10-17	18-1				
70	74	247	237	301	785	-17	0	0
65	69	296	217	278	791	-12	0	0
60	64	269	196	236	701	-7	0	0
55	59	249	191	209	649	-2	0	0
50	54	221	193	202	616	3	1,848	1,848
45	49	218	193	206	617	8	4,936	4,936
40	44	237	236	239	712	13	9,256	9,256
35	39	289	246	286	821	18	14,778	14,778
30	34	304	194	258	756	23	17,388	17,388
25	29	184	106	152	442	28	12,376	12,376
20	24	124	65	90	279	33	9,207	9,207
15	19	75	32	57	164	38	6,232	6,232
10	14	54	13	26	93	43	3,999	3,999
5	9	18	3	9	30	48	1,440	1,440
0	4	9	0	2	11	53	583	583
-5	-1	3	0	1	4	58	232	232
-10	-6	1	0	0	1	63	63	63
-15	-11	0	0	0	0	68	0	0
Totals		2798	2122	2552	7472		82338	82338

Total operation hours while heating
corrected for working days/week = 4546 Hours/Yr

Total degree hours per year corrected for
working days per week = 82338 Degree hours

Average outdoor temperature while heating = 36.9 F

05/14/91

ECO Construction Cost Estimate
Calculations

ECO Name: Modular Offices For Buildings 6-South, 8 and 9

ECO #: 15

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$14,385
Labor		\$1,080
	Subtotal bare costs	\$15,465
FICA Insurance (20% of Labor)		\$216
Sales Tax (6.5% of Material)		\$935
	Subtotal	\$16,616
Overhead (15%)		\$2,492
	Subtotal	\$19,108
Profit (10%)		\$1,911
	Subtotal	\$21,019
Bond (1%)		\$210
	Subtotal	\$21,229
Contingency (10%)		\$2,123
Subtotal (Construction Cost Input For LCCID *)		\$23,352
SIOH (5.5% of Construction Cost)		\$1,284
	Subtotal	\$24,636
Design (6% of Construction Cost)		\$1,401
Total Project Cost		\$26,037

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

GETCO, Inc.
P.O. Box 10432
Jacksonville, FL 32247-0432
(904) 791-9042 Fax: (904) 358-3906

Ship To:

Bill To:

REYNOLDS, SMITH & HILL

6737 Southpoint Drive

JAX, FL 32216

ATTN: BILL TODD

Salesman:

DAN

Cust Contact:

BILL

Phone Number:

279-2281

Fax Number:

279-2491

Customer PO:

Inv #

Date

4-12-91

Quote #

Order #

Qty.	Unit	Stock #	Description	W	Cap.	Unit Total Wgt. Weight	Unit List	Total List	Disc.	Unit Cost	Total Cost	Unit Sell	Total Sell
1	EA		ET-120 10'x12' W-PLANT										
			OFFICE BUILDING COMPLETE										
			WITH THE FOLLOWING:										
			1-STD. DOOR, 6-WINDOWS,										
			1-HVAC UNIT, 4-110V OUTLETS,										
			1-220V OUTLETS, 1-LIGHT SWITCH										
			2-4 TUBE FLUORESCENT FIXTURES,										
			1-4 CIRCUIT BREAKER 1500					4169.00					4385.00
			ABOVE PRICE F.O.B. JACKSONVILLE, FL										
			ALLOW 3 WKS A.R.O. DELIVERY										
			Delivery Charges										
			T.A.										
			T.L.										

New and Used Warehouse Equipment
Sales and Service

GETCO, INC.

Dan Caswell

P.O. Box 10432
Jacksonville, Florida 32247-0432
(904) 791-9042

1780 W. Beaver St.
Jacksonville, Florida 32209

ENERGY AUDIT OF INDUSTRIAL FACILITIES
LETTERKENNY ARMY DEPOT

Operation hours per day = 24
Operation days per week = 7

Indoor Air Temperature (F) = 60

Hour Fractions: 1 AM - 9 AM 1
 9 AM - 5 PM 1
 5 PM - 1 AM 1

Temperature Range		Hours of Occurrence			Net Hours	Delta T	Total Deg Hrs	Net Deg Hrs
		2-9	10-17	18-1				
70	74	247	237	301	785	-12	0	0
65	69	296	217	278	791	-7	0	0
60	64	269	196	236	701	-2	0	0
55	59	249	191	209	649	3	1,947	1,947
50	54	221	193	202	616	8	4,928	4,928
45	49	218	193	206	617	13	8,021	8,021
40	44	237	236	239	712	18	12,816	12,816
35	39	289	246	286	821	23	18,883	18,883
30	34	304	194	258	756	28	21,168	21,168
25	29	184	106	152	442	33	14,586	14,586
20	24	124	65	90	279	38	10,602	10,602
15	19	75	32	57	164	43	7,052	7,052
10	14	54	13	26	93	48	4,464	4,464
5	9	18	3	9	30	53	1,590	1,590
0	4	9	0	2	11	58	638	638
-5	-1	3	0	1	4	63	252	252
-10	-6	1	0	0	1	68	68	68
-15	-11	0	0	0	0	73	0	0
Totals		2798	2122	2552	7472		107015	107015

Total operation hours while heating
corrected for working days/week = 5195 Hours/Yr

Total degree hours per year corrected for
working days per week = 107015 Degree hours

Average outdoor temperature while heating = 39.4 F

ENERGY AUDIT OF INDUSTRIAL FACILITIES
LETTERKENNY ARMY DEPOT

Operation hours per day = 24
Operation days per week = 7

Indoor Air Temperature (F) = 68

Hour Fractions: 1 AM - 9 AM 1
 9 AM - 5 PM 1
 5 PM - 1 AM 1

Temperature Range		Hours of Occurrence			Net Hours	Delta T	Total Deg Hrs	Net Deg Hrs
		2-9	10-17	18-1				
70	74	247	237	301	785	-4	0	0
65	69	296	217	278	791	1	791	791
60	64	269	196	236	701	6	4,206	4,206
55	59	249	191	209	649	11	7,139	7,139
50	54	221	193	202	616	16	9,856	9,856
45	49	218	193	206	617	21	12,957	12,957
40	44	237	236	239	712	26	18,512	18,512
35	39	289	246	286	821	31	25,451	25,451
30	34	304	194	258	756	36	27,216	27,216
25	29	184	106	152	442	41	18,122	18,122
20	24	124	65	90	279	46	12,834	12,834
15	19	75	32	57	164	51	8,364	8,364
10	14	54	13	26	93	56	5,208	5,208
5	9	18	3	9	30	61	1,830	1,830
0	4	9	0	2	11	66	726	726
-5	-1	3	0	1	4	71	284	284
-10	-6	1	0	0	1	76	76	76
-15	-11	0	0	0	0	81	0	0
Totals		2798	2122	2552	7472		153572	153572

Total operation hours while heating
corrected for working days/week = 6687 Hours/Yr

Total degree hours per year corrected for
working days per week = 153572 Degree hours

Average outdoor temperature while heating = 45.0 F

ENERGY AUDIT OF INDUSTRIAL FACILITIES
LETTERKENNY ARMY DEPOT

Operation hours per day = 8
Operation days per week = 5

Indoor Air Temperature (F) = 68

Hour Fractions: 1 AM - 9 AM 0.25
 9 AM - 5 PM 0.75
 5 PM - 1 AM 0

Temperature Range		Hours of Occurrence			Net Hours	Delta T	Total Deg Hrs	Net Deg Hrs
		2-9	10-17	18-1				
70	74	247	237	301	240	-4	0	0
65	69	296	217	278	237	1	791	237
60	64	269	196	236	214	6	4,206	1,286
55	59	249	191	209	206	11	7,139	2,261
50	54	221	193	202	200	16	9,856	3,200
45	49	218	193	206	199	21	12,957	4,184
40	44	237	236	239	236	26	18,512	6,143
35	39	289	246	286	257	31	25,451	7,959
30	34	304	194	258	222	36	27,216	7,974
25	29	184	106	152	126	41	18,122	5,146
20	24	124	65	90	80	46	12,834	3,669
15	19	75	32	57	43	51	8,364	2,180
10	14	54	13	26	23	56	5,208	1,302
5	9	18	3	9	7	61	1,830	412
0	4	9	0	2	2	66	726	149
-5	-1	3	0	1	1	71	284	53
-10	-6	1	0	0	0	76	76	19
-15	-11	0	0	0	0	81	0	0
Totals		2798	2122	2552	2291		153572	46172

Total operation hours while heating
corrected for working days/week = 1465 Hours/Yr

Total degree hours per year corrected for
working days per week = 32980 Degree hours

Average outdoor temperature while heating = 45.0 F

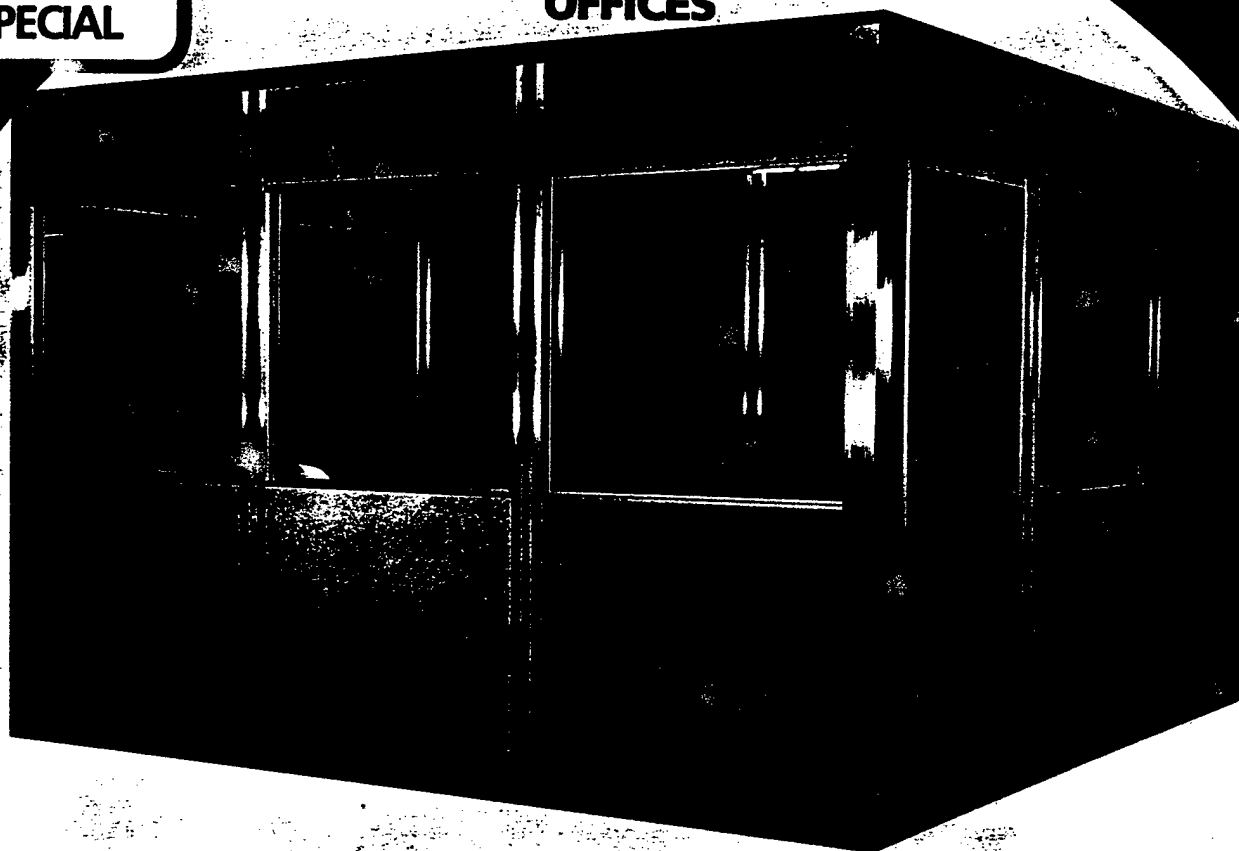
LETTERKENNY ARMY DEPOT
FUEL CONSUMPTION REPORT
IN GALLONS

BLDG	YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YEARLY TOTAL
** BOILER LOCATION: BUILDING 1		SERVES BUILDINGS: 1, 2												FUEL TYPE: 5
1	FY87	4545	2640	728	2810	3401	6278	10899	6000	17985	2112	3989	8052	69439
1	FY88	0	21786	9197	4575	16052	4647	10351	225	2472	0	0	0	69305
1	FY89	294	5623	9885	2697	16802	3138	10534	706	91	1321	1027	4165	56283
1	FY90	6864	10838	851	8832	15574	2377	-1	4007	0	1386	378	0	51106
** BOILER LOCATION: BUILDING 2		SERVES BUILDINGS: 4, 7												FUEL TYPE: 2
2	FY87	896	732	4206	9777	9384	8246	2710	2636	3836	3636	2916	190	49165
2	FY88	8018	943	10711	12793	27167	15963	12033	8226	4936	21796	4113	1233	127932
2	FY89	2112	6053	602	2783	11941	1044	10607	1107	0	0	0	0	36249
2	FY90	5131	14811	17118	20647	4276	4882	2137	0	0	1220	4410	0	74632
** BOILER LOCATION: BUILDING 3		SERVES BUILDINGS: 3, 5												FUEL TYPE: 5
3	FY87	756	6275	908	6695	15	1361	1931	2617	4275	8198	15139	5951	54121
3	FY88	3368	6455	13284	11511	3649	7043	4445	6164	392	0	0	0	56311
3	FY89	0	12449	4999	4672	17211	5886	2140	1230	0	179	228	1266	50260
3	FY90	3787	1852	2154	7188	11293	4493	-1	0	0	0	0	0	30766
** BOILER LOCATION: BUILDING 8		SERVES BUILDINGS: 6, 8, 9												FUEL TYPE: 2
8	FY87	1088	7035	13054	16931	13780	9278	9475	163	0	0	123	551	71478
8	FY88	0	8435	10865	1249	24192	0	4246	77	0	3544	3534	7465	63607
8	FY89	9612	4042	2798	4808	446	4719	336	522	0	0	0	0	27283
8	FY90	3614	8846	9613	11906	7665	1679	3123	0	0	0	0	0	46446
** BOILER LOCATION: BUILDING 10		SERVES BUILDINGS: 10												FUEL TYPE: 2
10	FY87	254	66	77	96	129	65	106	83	0	356	250	0	1482
10	FY88	530	1177	4509	3631	2993	3240	637	619	0	206	121	58	17721
10	FY89	103	1982	3918	4290	2413	2534	910	215	0	300	2703	500	19868
10	FY90	0	1315	4433	4942	2225	789	0	0	0	0	0	0	13704
** BOILER LOCATION: BUILDING 12		SERVES BUILDINGS: 12, 13, 14												FUEL TYPE: 5
12	FY87	1794	1732	833	2938	4103	2987	961	31	62	4	92	184	15721
12	FY88	369	2414	3949	4405	3537	2370	1547	131	0	0	0	0	18722
12	FY89	800	2507	4263	2818	3824	2596	789	269	0	0	0	0	17866
12	FY90	675	3428	2929	1432	2430	3067	521	0	0	0	0	0	14482
** BOILER LOCATION: BUILDING 37HP		SERVES BUILDINGS: 37												FUEL TYPE: 2
37HP	FY87	3506	3583	2147	6008	4366	3582	3763	4823	1153	5113	3037	5424	46505
37HP	FY88	4633	4840	5453	6893	6583	7643	2435	5611	6266	7803	2280	6856	67296
37HP	FY89	2625	5712	6551	6816	8100	5837	5824	1110	1108	3660	6957	3379	57679
37HP	FY90	5486	9712	5367	4934	5666	9263	8553	1012	0	0	0	0	49993
** BOILER LOCATION: BUILDING 37N		SERVES BUILDINGS: 37												FUEL TYPE: 5
37N	FY87	101	1477	4097	4079	4300	3586	1307	155	0	0	40	40	19182
37N	FY88	731	3099	1571	2750	10474	4706	4820	156	312	624	1248	960	31451
37N	FY89	1920	1951	266	3412	4256	3531	1084	123	0	0	0	0	16543
37N	FY90	1553	5008	7038	1798	2996	5695	1079	0	0	0	0	0	25167

EN
P-2



ECONO-THREE OFFICES



National ECONO-THREE modular in-plant offices are designed for applications where cost is a major consideration.

Although low in price, these attractive enclosures offer full 3" thick, 3-ply wall panels constructed of 1/4" 4 mil vinyl-clad hardboard (each side) over a kraft honeycomb core. All panels are completely interchangeable and reuseable.

Features include pre-hung, pre-finished oak woodgrain doors, pre-painted steel-ribbed roof deck

and one-piece mill-finished extruded aluminum connection and corner posts allowing fast on-site assembly.

System incorporates all of National's quality features including exclusive "Wire-Pak" modular snap-together, six-wire wiring system. Offices are also available in vision tower and two-story versions.

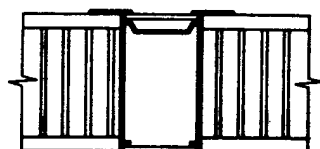
SEE PAGES 16 THROUGH 19 FOR CONSTRUCTION DETAILS.

SEE PAGE 26
FOR ARCHITECTURAL
SPECIFICATIONS.

MODEL SELECTION CHART

ET64	8x8	958	ET320	16x20	2734
ET80	8x10	1012	ET336	12x28	2966
ET96	8x12	1246	ET384	12x32	3310
ET100	10x10	1260	ET388	16x24	3148
ET120	10x12	1418	ET400	20x20	3190
ET144	12x12	1590	ET448	16x28	3534
ET160	10x16	1734	ET480	20x24	3646
ET192	12x16	1934	ET512	16x32	3934
ET200	10x20	2050	ET560	20x28	4102
ET240	12x20	2278	ET640	20x32	4558
ET256	16x16	2334	ET720	20x36	5014
ET288	12x24	2622	ET800	20x40	5470

15-14



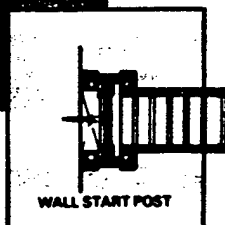


NATIONAL'S VERSATILE

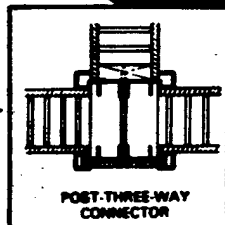
V10™
POST SYSTEM

IS A UNIQUE STRUCTURAL CONCEPT THAT SERVES AS THE KEY ELEMENT OF NATIONAL'S MODULAR BUILDING SYSTEMS.

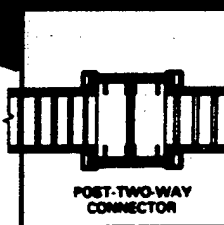
The V10 Post System was specially designed to be used in ten different ways: 1) as a wall start; 2) as a finished end; 3) as an in-line post; 4) as a 3-way post; 5) as a 4-way post; 6) as a corner post; 7) as an electrical raceway; 8) as a housing for steel inserts; 9) as a battan strip; 10) as a shelf standard when pierced.



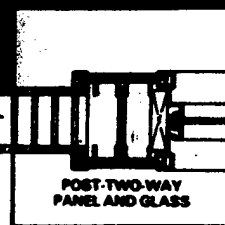
WALL START POST



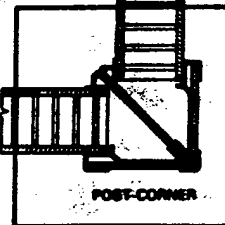
POST-THREE-WAY CONNECTOR



POST-TWO-WAY CONNECTOR



POST-TWO-WAY PANEL AND GLASS



POST-CORNER



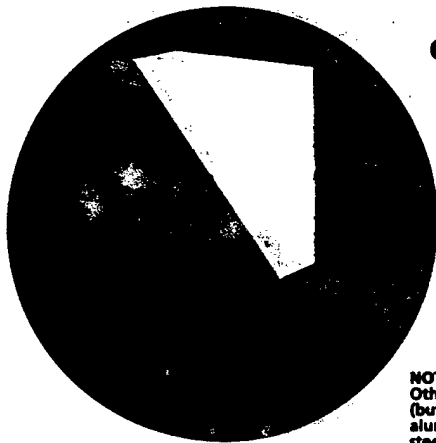
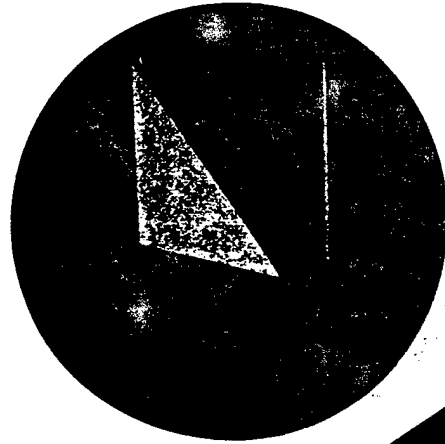
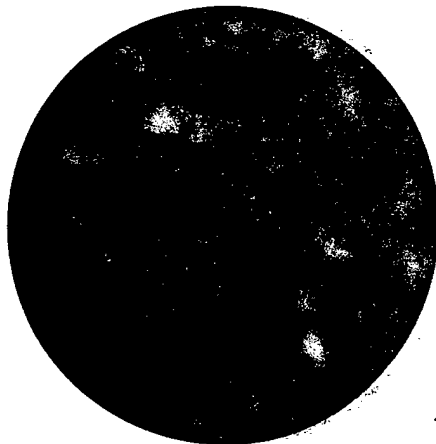
1. **POSTS:** Extruded anodized aluminum with spring-held vinyl-clad feature strips to match interior/exterior panel facings (see V10™ information above).
2. **CORNER POSTS:** Massive two-piece anodized aluminum with matching vinyl-clad feature strips assure fastest possible assembly of corners.
3. **CEILING:** Attractive, white, random fissured, vinyl-faced fiberglass tile, easily cleaned to retain permanent beauty.
4. **INDIRECT LIGHTING:** Luminous fixture panels, as required, provide efficient, soft overall lighting without dark areas.
5. **CONCEALED LIGHTS:** Fluorescent, four-tube, lay-in troffer-type fixtures. Average 100 foot candles of illumination.
6. **TIE WIRES:** Fasten to roof deck with self-tapping screws and to ceiling grid main T's.
7. **ROOF DECK:** Designed to achieve optimum structural efficiency in 22 gauge steel (painted), provides clear spans up to 12 feet (20 feet with 6-inch joists).
8. **ROOF DECK END CLOSURES:** Rubber seals inserted in roof flutes contain heat and conditioned air. Insures dust-free interior.

9. **CEILING GRID:** White enameled "T" support system forms a rigid frame for light fixtures and ceiling tiles.
10. **PANEL CAPS:** Anodized aluminum panel caps incorporating fascia provide finishing touch to panels as seen from exterior.
11. **WALLS:** A full 3-inch thick with honeycomb core affords structural rigidity and effective "Sound Conditioning." $\frac{3}{16}$ " tempered hardboard facings, clad in choice of "DIAMOND-COAT" vinyl colors and finishes, retain beauty with minimum maintenance.
12. **CONTINUOUS BASE CHANNEL:** Heavy anodized aluminum base channel (fastened to floor) supports and secures wall panels. Trims bottom on interior and exterior.
13. **REMOVABLE PANELS:** Special design feature of panels allows easy removal providing access for large equipment, or replacement of damaged panels, without dismantling enclosure.
14. **WINDOWS:** Optional choice of picture, sliding or pass-thru (with or without shelf). All provided with tempered safety glass.
15. **DOORS:** Attractively faced in harmonizing vinyl. Pre-hung in aluminum jamb, complete

- with hardware, solid 20-inch by 30-inch door lite, and/or with 18-inch by 12-inch anodized aluminum grille are optional.
16. **WALL SWITCH:** Light switches are conveniently placed and attractive, conforming to National Code.
17. **WALL OUTLETS:** Conduit run with junction box, outlet or switch, cover plate offset fitting, conduit to reach ceiling plenum and connectors. All pre-assembled in interior posts to create vertical electric raceway.
18. **COMFORT CONTROL OPTIONS:** Include air conditioners (from 5,000 BTU to 12,000 BTU); 8-inch exhaust fan (wall-mounted), 180 CFM; heater up to 5,600 watts (Heat, off or fan) wall-mounted; anodized aluminum louver 12-inch by 18-inch.
19. **AIR CONDITIONER OUTLET:** 110 or 220 volt. (Breaker panel provided with the office kit allows separate circuit for air conditioner operation.)
20. **ENERGY-SAVER CONSTRUCTION (Optional):** Includes wall panels constructed of $\frac{3}{8}$ -inch vinyl-clad facings (each side) with an insulating polystyrene foam core (1 lb. density) and a 6-inch thick fiberglass blanket of insulation layed into the plenum area. Provides R-12 wall and R-19 roof rating.

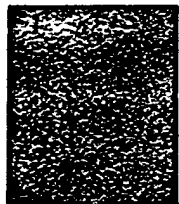
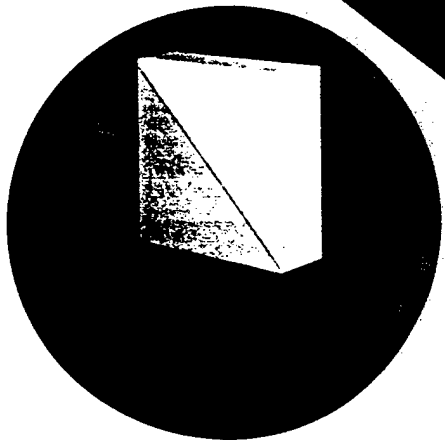
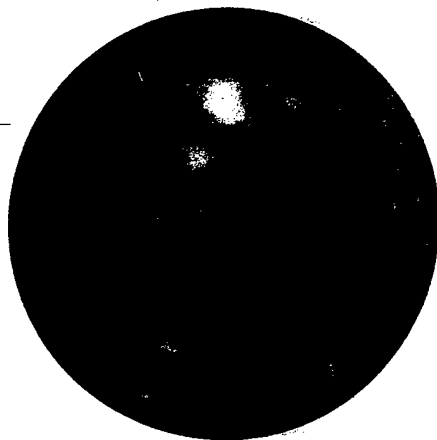
SEE PAGE 26 FOR ENGINEERING AND ARCHITECTURAL SPECIFICATIONS

CONSTRUCTION DETAILS



PANEL CONSTRUCTION DETAILS

NOTE:
Other facings such as (but not limited to) .032-inch aluminum, and panel cores utilizing steel studs and urethane are also available.



409-SAND



NC-251-HICKORY

STANDARD INTERIOR PANEL FINISHES – National offices are available in the standard vinyl finishes as shown at left. These and all optional finishes (except 801, 803 and 812 textured films) incorporate National's exclusive **DIAMOND COAT™** described above.



401 SNOW WHITE



NC-159 PECAN



NC-150 WALNUT



NC-254 OAK



NC-156 ROSEWOOD



NC-157 NATURAL TEAK



801 TAN CALCUTTA



803 BEIGE CALCUTTA



812 GREY CALCUTTA

OPTIONAL INTERIOR PANEL FINISHES

National laminates their own vinyl-clad panels and can provide the widest selection of colors and woodgrains in the industry. Cork and chalk board facings are also available on request. Other finishes (not shown) can be supplied ... contact the factory. See actual swatch samples for exact color and finish.

OSD PIF

1 August 1982

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS For use of this form, see AR 5-4; the proponent agency is OCA.				1. PROJECT NO. AMC OSD PIF		REQUIREMENT CONTROL SYMBOL DD-M(R) 1561	
2. TO: HQ DA Attn: DACS-DME Pentagon Washington, DC 20310-2070		3. THRU: US AMC Attn: AMCM-M 5001 Eisenhower Ave Alexandria, VA 22303-0001		4. FROM: Commander US DESCOM Attn: AMSDS-RM-P Chambersburg, PA 17201-4170		5. DOD COMP NAME Army	6. DOD COMP CODE A
9. PROJECT TITLE Dip Tank Covers and Exhaust Fan Controls		10. TYPE OF PROJECT (Check one) ☐ ORIP ☒ OSD PIF ☐ PECIP		11. AMORTIZATION YEARS/MONTHS 8. \$210,257 ÷ 137,400 X 12 (Project Cost) (Average Annual Savings) (No. Moos) - 1.5 (year) or (month) (amortization)		7. COMMAND CODE W730KK	
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE 15		14. EXPECTED OPERATIONAL DATE		9. DATE 10/9/81	
15. SUBMITTING UNIT(S) Commander Letterkenny Army Depot Attn: SDSLE-EM (T. Hagie) Bldg. 663 Chambersburg, PA 17201-4150		16. UNIT ID CODE		17. PROJECT DESCRIPTION Covers for dip tanks that will allow the exhaust fan speed to be reduced to provide reduced air flow requirements.			
18. DETAILED JUSTIFICATION Covering the dip tanks will reduce the ventilation air flow requirements. The reduced air flow will save energy.							
19. SAVINGS DISPOSITION Savings are used to reduce energy expenditures							
20. OTHER REMARKS (Continue on page 5, if more space is needed)							

1 August 1982

C 1, AR 5-4

21a. 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 and #6 fuel oil	\$209,500	\$72,100	\$72,100	\$72,100	\$72,100	\$72,100	\$137,400	\$137,400	\$137,400
CONTRACT COSTS									
OTHER (Identify)									
TOTALS	\$209,500	\$72,100	\$72,100	\$72,100	\$72,100	\$72,100	\$137,400	\$137,400	\$137,400

PRIORITIZATION

(1) INTERNAL RATE OF RETURN (IRR)
 Divide estimated project cost \$209,500 by average annual savings 137,400 = 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 = 110. % IRR.

(2) SAVINGS TO INVESTMENT RATIO (S/I)
 Multiply annual savings 137,400 X discount factor 7.98 = 1,096,500 and divide by present value of investment (undiscounted) 210,257 = 5.2 S/I.
 (Based on economic life 15 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

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

1 August 1982

C 1, AR 5-4

COST FOR PROJECT TO BECOME OPERATIONAL						FY FUNDS REQUIRED
EQUIPMENT TYPE	PROPOSED SOURCE OF PROCUREMENT	UNIT PRICE	QUANTITY	TOTAL COST	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT	
(1) Dip Tank Covers	-	\$1,404	39	\$54,765		
(2) Exhaust Fan Controls		\$7,775	20	\$155,492		
(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				\$210,257		
(14) TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$210,257		
(15) TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵				-		
(16) TOTAL (Sum of (14) + (15) above)				\$210,257		

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

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SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)										
ITEMS	SAVINGS			REAPPLICATION OF SAVINGS						
	NO. MPR OR MHR	TYPE PERS ⁶	DOLLARS	PROGRAM ELEMENT		TDA PARA AND LINE			FUNCTION CODE	
				FROM	TO	FROM	TO	TO	FROM	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										
(8) Electricity			\$27,300							
(9) #6 Fuel Oil			\$114,800							
(10) Cover Replacements			(\$4,700)							
(11) TOTAL DOLLAR SAVINGS			\$137,400							
6 (1) US Graded (2) US Wage Board (3) DHFN (4) IHFN (5) Officer (6) WO (7) Enlisted										

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

1 August 1982

C 1, AR 5-4

24. 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.) _____ _____ _____			
25. OTHER COORDINATION (Functional Coordination at local level, e.g., Fed Eng. Log. Pers. etc.)			
26. 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
27. APPROVED BY			
FOR USE BY HQDA ON OSD PIF PROJECTS ONLY		SIGNATURE	DATE (YYMMDD)
			AUTOVON
29. OTHER REMARKS (Cont'd)			

ECO Number: 3

DIP TANK COVERS WITH EXHAUST FAN CONTROLS

Discussion

Noxious dip tank fumes are exhausted in accordance with OSHA guidelines to protect workers. Ventilation of the fumes is accomplished by drawing room air across the surface of the dip tank fluid, into an exhaust duct, through a ventilation fan and out through the roof to the atmosphere. The warm room air used to entrain the fumes must be replaced with outside air that must be heated. The exhausted air represents a significant heat loss.

The amount of exhausted air can be minimized by covering the dip tank and draft slot with a flexible, chemically resistant cover whenever the tank is not in use. With the cover in place, the fume evolution potential is sharply reduced, so the amount of exhaust air can also be reduced. The reduction in exhaust air represents substantial energy savings from both reduced warm air loss as well as from reduced exhaust fan power.

This ECO provides all vented dip tanks with a flexible, chemically resistant cover (like a tarpaulin) permanently fixed to each tank/vent-duct assembly. The cover can be extended or retracted by appropriate means ranging from manually rolling and unrolling to spring-assisted retraction, similar to the operation of a window shade (see Volume II for sketches). This ECO also provides for exhaust fan speed reduction whenever the covers are in place. The speed reduction will be accomplished by measuring and controlling a set pressure rise across the exhaust fan with a differential pressure sensor and controller which in turn will adjust the speed of the exhaust fan motor through a variable frequency drive. This fan speed control will be particularly effective in Buildings 1 and 370 where fans serve multiple tanks. With this control technique, the OSHA-mandated exhaust air flows can be maintained under all conditions of variable building pressure and variable tank use.

This approach to dip tank operation has been discussed with OSHA in Harrisburg, Pennsylvania, and determined to be acceptable.

Recommendation

Based on the Life Cycle Cost Analysis and a discussion with OSHA, it is recommended that flexible, chemically resistant dip tank covers be installed along with vent fan pressure differential controllers on the 29 vented dip tanks as noted in the Appendix.

Construction Cost	\$188,590
Annual Energy Savings (MBtu/yr)	
Nos. 5 & 6 Oil	26,034
Electricity	2,496
Annual Energy Cost Savings (\$/yr)	\$142,100
Additional Maintenance	\$4,700
SIR	10.0
Simple Payback (years)	1.5

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) STUDY: EC03
 INSTALLATION & LOCATION: LETTERKENNY ADREGION NOS. 3 CENSUS: 1 LCCID 1.062
 PROJECT NO. & TITLE: ECO #3 DIP TANK COVERS
 FISCAL YEAR 1992 DISCRETE PORTION NAME: TOTAL PROJECT
 ANALYSIS DATE: 10-21-91 ECONOMIC LIFE 15 YEARS PREPARED BY: W. TODD

1. INVESTMENT

A. CONSTRUCTION COST	\$	188570.
B. SIOH	\$	10372.
C. DESIGN COST	\$	11315.
D. SALVAGE VALUE COST	-\$	0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	\$	210257.

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

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 10.94	2496.	\$ 27306.	10.75	293542.
B. DIST	\$ 4.98	0.	\$ 0.	14.08	0.
C. RESID	\$ 4.41	26034.	\$ 114810.	16.21	1861069.
D. NAT G	\$.00	0.	\$ 0.	13.25	0.
E. COAL	\$.00	0.	\$ 0.	11.13	0.
F. TOTAL		28530.	\$ 142116.		\$ 2154611.

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

A. ANNUAL RECURRING (+/-)	\$	-4700.
(1) DISCOUNT FACTOR (TABLE A)	10.59	
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$	-49773.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-) (3A2+3Bd4) \$ -49773.

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33) \$ 711022.
 A IF 3D1 IS = OR > 3C GO TO ITEM 4
 B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F) _____
 C IF 3D1B IS = > 1 GO TO ITEM 4
 D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS $2F3+3A+(3B1D/(YRS \text{ ECONOMIC LIFE}))$ \$ 137416.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) \$ 2104838.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 10.01
 (IF < 1 PROJECT DOES NOT QUALIFY)

7. SIMPLE PAYBACK PERIOD (ESTIMATED) SPB=1F/4 1.53

SUBJECT LETTERKENNY ERAPAEP NO 290-0379-001ECO #3SHEET 1 OF 4DESIGNER G.F.DATE 3-21-91CHECKER [Signature]

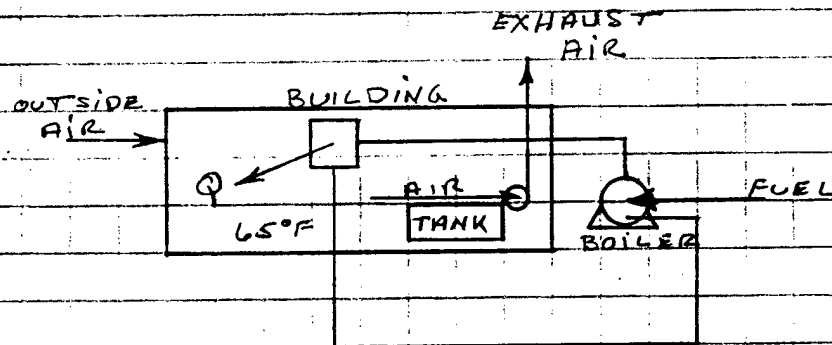
DATE _____

ECO # 3 Dip Tank Covers

ASSUMPTIONS:

1. ROOM TEMPERATURE = 68°F

2. HEAT LOAD FACTOR (HLF)

HLF₁ = 0.166 MBTU / yr. CFM (24 h/d, 7 d/w)HLF₂ = 0.0742 MBTU / yr. CFM (16 h/d, 5 d/w)3. FAN EFFICIENCY = 0.54. STEAM GENERATION EFFICIENCY = 0.85. FAN ΔP = 3 IN. WC6. LEAKAGE FLOW WITH COVER IN PLACE = 1% DESIGN FLOWCURRENT ENERGY USE (TANK 431B, BLDG 37)

$$Q = \frac{\text{CFM} \times \text{HEAT LOSS FACTOR (MBTU/CFM YR)}}{\text{STEAM GEN. EFF}}$$

$$= \frac{5200 \times 0.166}{0.8} = 1079 \text{ MBTU/yr} \quad \# 2 \text{ F.O.}$$

CURRENT FAN ENERGY USE

$$\text{FAN HP} \times \text{BTU/HPHR} \times 8760 \text{ HR/YR} \times \frac{\text{MBTU}}{10^6 \text{ BTU}} =$$

$$\frac{5200 \times 3}{6356 \times 0.5} \text{ HP} \times 2545 \text{ BTU/HPHR} \times 8760 \text{ HR/YR} \times \frac{1}{10^6} = 10.9 \text{ MBTU/YR}$$

ELECTRIC

SUBJECT LETTERKENNY E&AP

AEP NO _____

DESIGNER G. F.SHEET 2 OF 4

CHECKER _____

DATE 3-21-91

DATE _____

ENERGY CONSUMPTION (U) COVER

$$\begin{aligned} Q &= \text{HEAT LOSS IN OPERATION} + \text{HEAT LOSS COVERED} \\ &= \frac{\text{CFM} \times \text{HLF}}{\eta} + \frac{(\text{LEAKAGE CFM} \times (\text{HLF}_1 - \text{HLF}_2))}{\eta} \\ &= \frac{5200 \times 0.0742}{0.8} + \frac{52 \times (0.166 - 0.0742)}{0.8} = 488 \text{ MBTU/YR} \end{aligned}$$

FAN ENERGY CONSUMPTION (U) COVER

NOTE: FAN D.P. CONTROLS WILL REDUCE FAN SPEED VIA A VARIABLE FREQUENCY DRIVE TO MAINTAIN SET D.P. WHEN COVER IS IN PLACE.

CONSUMPTION = ENERGY USE WHILE COVERED & UNCOVERED.

UNCOVERED CONSUMPTION

$$\begin{aligned} &= \text{CURRENT FAN USE} \times \frac{\text{UNCOVERED TIME}}{\text{TOTAL TIME}} \\ &= 109 \times \frac{4160}{8760} = 51.76 \text{ MBTU ELEC/YR} \end{aligned}$$

COVERED CONSUMPTION

$$\frac{52 \times 3}{6356 \times 0.5} \text{ (HP)} \times \frac{2545 \text{ BTU}}{\text{HP-HR}} \times (8760 - 3035) \text{ HRS/YR} \times \frac{\text{MBTU}}{10^6 \text{ BTU}} = 0.715 \frac{\text{MBTU}}{\text{YR}}$$

TOTAL CONSUMPTION

$$\text{TOTAL} = \text{COVERED} + \text{UNCOVERED}$$

$$= 0.715 + 51.76 = 52.47 \frac{\text{MBTU elec}}{\text{YR}}$$

SUBJECT LETTERKENNY E&AP

AEP NO. _____

DESIGNER G. F.SHEET 3 OF 4

CHECKER _____

DATE 3/21/91

DATE _____

SAVINGSFUEL OIL

$$\text{SAVINGS} = (\text{CURRENT}) - (\text{COVER})$$

$$= 107.9 \frac{\text{MBTU}}{\text{YR}} - 48.8 \frac{\text{MBTU}}{\text{YR}}$$

$$= \underline{\underline{59.1 \text{ MBTU/YR}}} \quad \#2 \text{ FUEL OIL}$$

ELECTRICITY

$$\text{SAVINGS} = (\text{CURRENT}) - (\text{COVER})$$

$$= 10.9 - 52.47$$

$$= \underline{\underline{56.53 \text{ MBTU ELEC/YR}}}$$

TOTAL REPORT

ASSUMPTIONS:

- 1) ALL TANK FANS OPERATE CONTINUOUSLY AT DESIGN FLOW (PER OSHA REQUIREMENTS)
- 2) TANKS ARE "USED" 2 SHIFTS / DAY, 5 d/w, 52 w/yr

- APPROACH:
- 1) CALCULATE UNIT HEAT SAVING FACTOR FROM SINGLE TANK PROCEDURE ABOVE
 - 2) APPLY FACTORS TO ALL OTHER TANKS
 - 3) SUM RESULTS FOR TOTAL FACILITY.

$$\text{UNIT HEAT SAVING FACTOR} = \frac{\text{HEAT SAVED}}{\text{CFM}}$$

$$\text{UHSF} = \frac{59.1 \text{ MBTU/YR}}{5200 \text{ CFM}} = 0.1137 \frac{\text{MBTU}}{\text{CFM YR}}$$

SUBJECT LETTERKENNY E&AP

AEP NO. _____

DESIGNER G. F.SHEET 4 OF 4

CHECKER _____

DATE 3-21-91

DATE _____

UNIT ELECTRICITY SAVING FACTOR = $\frac{\text{ELECTRIC ENERGY SAVED}}{\text{CFM}}$

$$UESIF = \frac{58.55 \text{ MBTU ELEC}}{5200 \text{ CFM}} = 0.0109 \frac{\text{MBTU ELEC}}{\text{CFM YR.}}$$

APPLYING THESE FACTORS TO EACH VENTED TANK
(SEE ENCLOSED SPREADSHEET CALCULATION) YIELDS:

TOTAL FACILITY HEAT SAVED = Σ INDIVIDUAL TANKS.

$$= \underline{26,034} \text{ MBTU FUEL/YR.}$$

TOTAL FACILITY ELEC ENERGY SAVED = Σ INDIVIDUAL TANKS

$$= \underline{2,496} \text{ MBTU ELEC YR.}$$

LETTERKENNY ARMY DEPOT
DIP TANK COVER
SUMMARY

Building Number	Tank ID	Design Ventil. (cfm)	Common or Dedicated Fan (D)-(C)	Annual FUEL(5% Saved) (Mbtu)	Value of Saved Energy (\$/yr)	Annual Electric Saved (Mbtu)	Value of Saved Ele Energy (\$/yr)	Total Cost Savings (\$/yr)	Const. Cost* (\$)	Payback (Yrs)	
+-----+											
1N	2861-1	10,000	D	1,137	\$5,014	109	\$1,192	\$6,207	\$9,148	1.5	
	2861-2	3,750	C	426	\$1,880	41	\$447	\$2,327	\$1,438	0.6	
	2861-3	7,500	C	853	\$3,761	82	\$894	\$4,655	\$1,438	0.3	
	2861-4	7,500	C	853	\$3,761	82	\$894	\$4,655	\$1,438	0.3	
	2861-5	7,500	C	853	\$3,761	82	\$894	\$4,655	\$1,438	0.3	
	+-----+										
	2861-6	7,500	D	853	\$3,761	82	\$894	\$4,655	\$9,148	2.0	
	2861-7	7,500	C	853	\$3,761	82	\$894	\$4,655	\$1,438	0.3	
	2861-8	7,500	C	853	\$3,761	82	\$894	\$4,655	\$1,438	0.3	
	+-----+										
	400	3,060	C	348	\$1,534	33	\$365	\$1,899	\$1,438	0.8	
	402	4,500	D	512	\$2,256	49	\$537	\$2,793	\$9,148	3.3	
	378	4,500	C	512	\$2,256	49	\$537	\$2,793	\$1,438	0.5	
	377	4,500	C	512	\$2,256	49	\$537	\$2,793	\$1,438	0.5	
4577	1,560	C	177	\$782	17	\$186	\$968	\$1,438	1.5		
4741	4,050	C	460	\$2,031	44	\$483	\$2,514	\$1,438	0.6		
+-----+											
Subtotal	1N	14	80,920	3	9,201	\$40,575	882	\$9,649	\$50,224	\$43,262	0.9
+-----+											
37	2568	6,800	D	773	\$3,410	74	\$811	\$4,221	\$9,148	2.2	
	4318	5,200	D	591	\$2,607	57	\$620	\$3,227	\$9,148	2.8	
	4319	9,600	D	1,092	\$4,814	105	\$1,145	\$5,958	\$9,148	1.5	
	4193	6,000	D	682	\$3,009	65	\$715	\$3,724	\$9,148	2.5	
+-----+											
Subtotal	37	4	27,600	4	3,138	\$13,839	301	\$3,291	\$17,130	\$36,592	2.1
+-----+											
350N	2514	9,360	D	1,064	\$4,693	102	\$1,116	\$5,809	\$9,148	1.6	
	2516	6,480	D	737	\$3,249	71	\$773	\$4,022	\$9,148	2.3	
	2518	9,360	D	1,064	\$4,693	102	\$1,116	\$5,809	\$9,148	1.6	
	2520	12,600	D	1,433	\$6,318	137	\$1,502	\$7,820	\$9,148	1.2	
	2744	5,500	D	625	\$2,758	60	\$656	\$3,414	\$9,148	2.7	
	1479	3,600	D	409	\$1,805	39	\$429	\$2,234	\$9,148	4.1	
	1480	6,860	D	780	\$3,440	75	\$818	\$4,258	\$9,148	2.1	
	2606	993	D	113	\$498	11	\$118	\$616	\$9,148	14.8	
	350S	2531	12,000	D	1,364	\$6,017	131	\$1,431	\$7,448	\$9,148	1.2
		2536	11,000	D	1,251	\$5,516	120	\$1,312	\$6,827	\$9,148	1.3
2539		2,500	D	284	\$1,254	27	\$298	\$1,552	\$9,148	5.9	
+-----+											
Subtotal	350	11	80,253	11	9,125	\$40,240	875	\$9,570	\$49,810	\$100,628	2.0

LETTERKENNY ARMY DEPOT
DIP TANK COVER
SUMMARY

Building Number	Tank ID	Design Ventil. (cfm)	Common or Dedicated Fan (D)-(C)	Annual FUEL(5% Saved) (Mbtu)	Value of Saved Energy (\$/yr)	Annual Electric Saved (Mbtu)	Value of Saved Ele Energy (\$/yr)	Total Cost Savings (\$/yr)	Const. Cost* (\$)	Payback (Yrs)	
370	T-1	3,800	C	432	\$1,905	41	\$453	\$2,359	\$1,438	0.6	
	T-2	2,700	C	307	\$1,354	29	\$322	\$1,676	\$1,438	0.9	
	T-3	5,700	D	648	\$2,858	62	\$680	\$3,538	\$9,148	2.6	
	T-4	5,700	C	648	\$2,858	62	\$680	\$3,538	\$1,438	0.4	
	T-5	3,600	C	409	\$1,805	39	\$429	\$2,234	\$1,438	0.6	
	T-6	2,700	C	307	\$1,354	29	\$322	\$1,676	\$1,438	0.9	
	T-7	5,700	D	648	\$2,858	62	\$680	\$3,538	\$9,148	2.6	
	T-8	3,800	C	432	\$1,905	41	\$453	\$2,359	\$1,438	0.6	
	T-9	2,700	C	307	\$1,354	29	\$322	\$1,676	\$1,438	0.9	
	T-10	3,800	C	432	\$1,905	41	\$453	\$2,359	\$1,438	0.6	
Subtotal	370	10	40,200	2	4,571	\$20,157	438	\$4,794	\$24,951	\$29,800	1.2
Total	4	39	228,973	20	26,034	\$114,811	2,496	\$27,304	\$142,115	\$210,282	1.5

* Costs for differential pressure controls and VF drives are not distributed over tanks sharing a common fan.

QRIP Calc using FY 92 Fuel Oil Prices

Current energy use:

$$E_{elec} = \text{Fan Hp} \times \text{Btu/Hp} \times 3760 \text{ hr/yr} \times \frac{1 \text{ MBtu}}{10^6 \text{ MBtu}} \times 10.94 \text{ \$/MBtu}$$

$$\begin{aligned} \text{Fan Hp} &= \frac{\text{cfm} \Delta P}{6356 \eta_{fan}} \\ &= \frac{(228,973)(0.5)}{(6356)(0.5)} \times \frac{2545 \text{ Btu}}{\text{Hp Hr}} \times \frac{3760}{10^6} \times 10.94 \text{ \$/MBtu} = \$52,700/\text{yr} \end{aligned}$$

$$\text{Fuel Oil} = \text{cfm} \times \text{HLF} \div \eta_{HV} = 228,973 \times 0.166 \div 0.8 = 47,512 \text{ MBtu/yr}$$

$$\begin{aligned} \text{TOTAL COSTS} &= \$47,512 \times 4.41 \text{ \$/MBtu} = \$209,500/\text{yr} \\ &= \$262,200/\text{yr} \end{aligned}$$

05/09/91

ECO Construction Cost Estimate Calculations

ECO Name: Dip Tank Cover

ECO #: 3

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$4,400
Labor		\$960
	Subtotal bare costs	\$5,360
FICA Insurance (20% of Labor)		\$192
Sales Tax (6.5% of Material)		\$286
	Subtotal	\$5,838
Overhead (15%)		\$876
	Subtotal	\$6,714
Profit (10%)		\$671
	Subtotal	\$7,385
Bond (1%)		\$74
	Subtotal	\$7,459
Contingency (10%)		\$746
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$8,205
		+-----+
SIOH (5.5% of Construction Cost)		\$451
	Subtotal	\$8,656
Design (6% of Construction Cost)		\$492

Total Project Cost		\$9,148

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

05/09/91

ECO Construction Cost Estimate
Calculations

ECO Name: Dip Tank Covers w/o Controls

ECO #: 3.

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$500
Labor		\$320
	Subtotal bare costs	\$820
FICA Insurance (20% of Labor)		\$64
Sales Tax (6.5% of Material)		\$33
	Subtotal	\$917
Overhead (15%)		\$138
	Subtotal	\$1,055
Profit (10%)		\$106
	Subtotal	\$1,161
Bond (1%)		\$12
	Subtotal	\$1,173
Contingency (10%)		\$117
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$1,290
		+-----+
SIOH (5.5% of Construction Cost)		\$71
	Subtotal	\$1,361
Design (6% of Construction Cost)		\$77

Total Project Cost		\$1,438

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

09/26/91

ECO Construction Cost Estimate Calculations

ECO Name: Dip Tank Covers

ECO #: 3

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$97,500
Labor		\$25,280
	Subtotal bare costs	\$122,780
FICA Insurance (20% of Labor)		\$5,056
Sales Tax (6.5% of Material)		\$6,338
	Subtotal	\$134,174
Overhead (15%)		\$20,126
	Subtotal	\$154,300
Profit (10%)		\$15,430
	Subtotal	\$169,730
Bond (1%)		\$1,697
	Subtotal	\$171,427
Contingency (10%)		\$17,143
		+-----+
Subtotal (Construction Cost Input For LCCID *)		\$188,570
		+-----+
SIOH (5.5% of Construction Cost)		\$10,371
	Subtotal	\$198,941
Design (6% of Construction Cost)		\$11,314

Total Project Cost		\$210,255

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

For QRIP

(p. 3-9)

Covers represent 26% of project cost $\Rightarrow \frac{31980}{122,180} = 0.26$

Therefore $210,257 \times 0.26 = \underline{\underline{\$54,765}}$

3-8a



SUBJECT ECO#3
DESIGNER P. Hutchins
CHECKER _____

AEP NO 290-0379-001
SHEET _____ OF _____
DATE _____
DATE _____

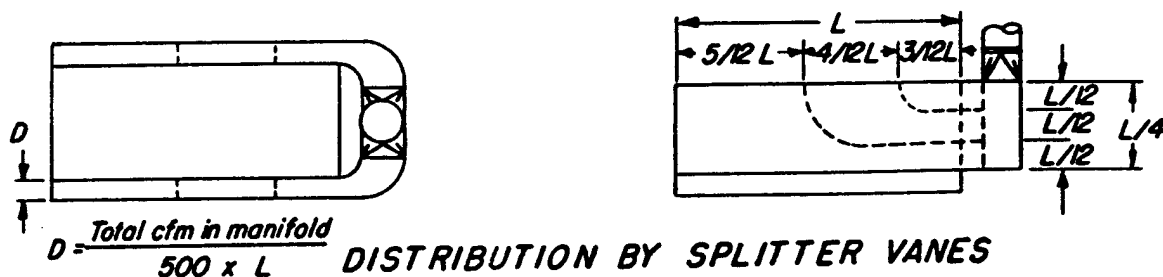
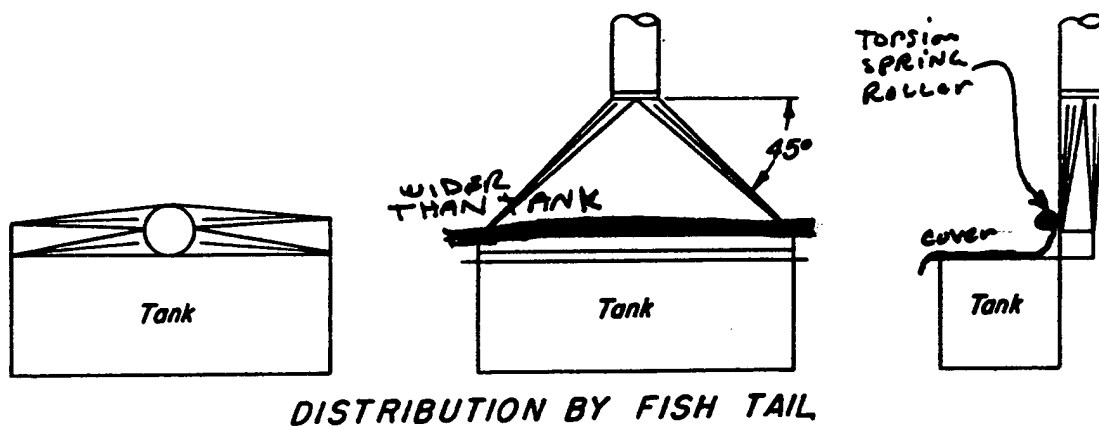
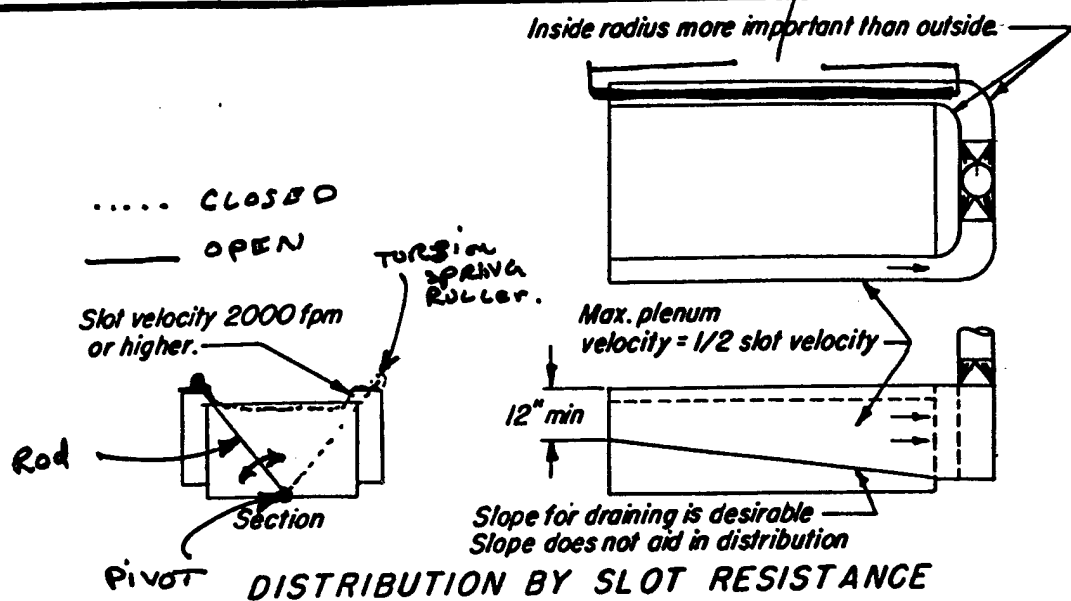
Additional maintenance costs

Covers will last about 5 years

Therefore, covers will be replaced 3 times
over the 15 year project life

For LCCID 1/5 of 39 covers will be replaced
annually

$$\frac{1}{5} \times \$600 \times 39 = \$4700$$

WIDER THAN TANK
TO ALLOW OVERHANG

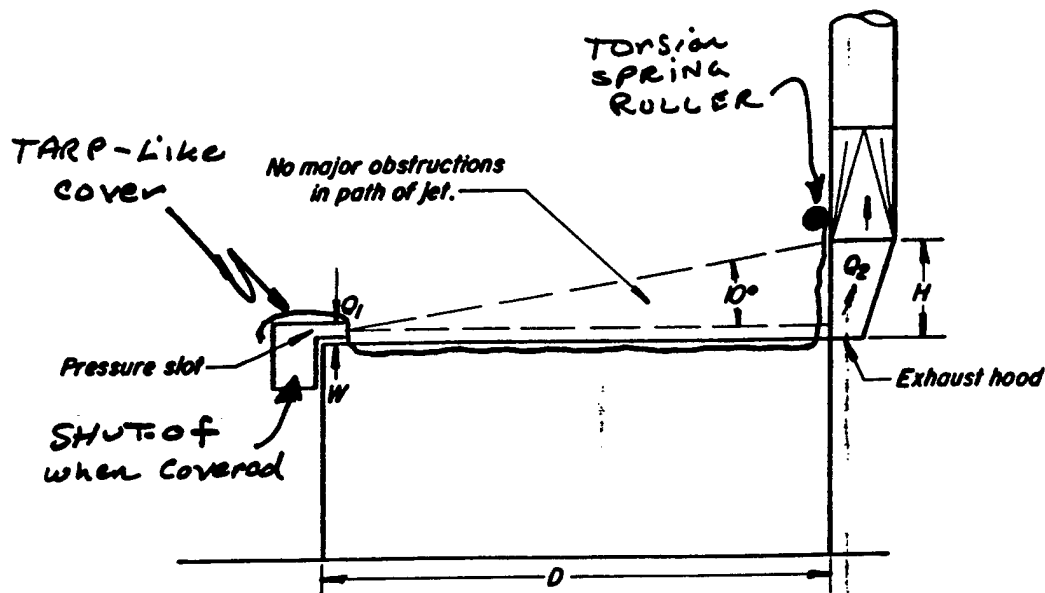
With low plenum velocities and high slot velocities, good distribution is obtained. If this design is not possible, splitter vanes should be used. Slots over 10 feet to 12 feet in length usually need multiple take-offs.

AMERICAN CONFERENCE OF
GOVERNMENTAL INDUSTRIAL HYGIENISTS

PRINCIPLES OF MANIFOLD DESIGN

DATE 1-70

Fig. 4-12

**PUSH PULL HOODS****Exhaust Hood**

Quantity of air exhausted,
 $Q_2 = 100$ to 150 cfm /sq.ft. of
 tank area, depending on temp-
 erature of liquid, cross drafts,
 agitation, etc.

Hood height should be,
 $H = D \times \tan. 10^\circ$
 $= 0.18D$

Pressure Slot

Quantity of air supplied,

$$Q_1 = \frac{1}{D \times E} \times Q_2$$

where; D = length of throw, feet
 E = entrainment factor.

Throw length, D , feet	Entrainment factor, E
0 - 8	2.0
8 - 16	1.4
16 - 24	1.0
over 24	0.7

Slot width W should be designed for
 a velocity of 1000 to 2000 fpm.

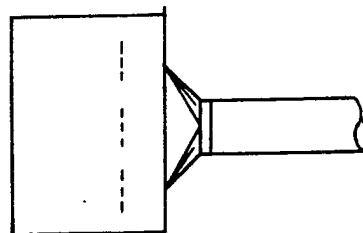
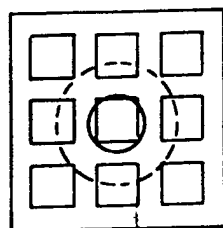
Design such systems so they can be easily modified or adjusted to obtain desired results.

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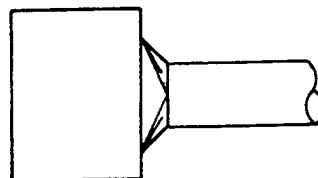
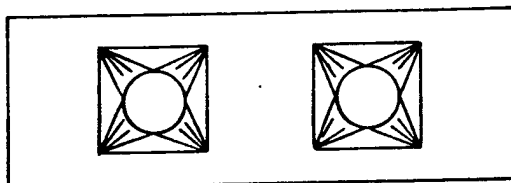
HOOD DESIGN DATA

DATE 1-64

Fig. 4-17

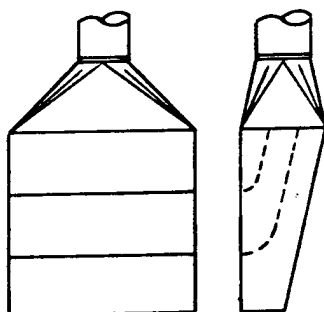


DISTRIBUTION BY BAFFLES
See Fig. 4-16



LONG BOOTHS - DISTRIBUTION BY MULTIPLE TAKE-OFFS and TAPERS

BOOTH-TYPE HOODS
(Same principle apply to canopy type)

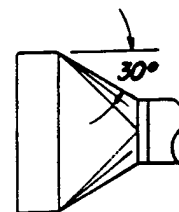
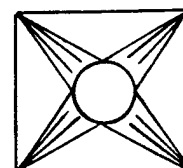


**DISTRIBUTION BY
SPLITTER VANES**



**DISTRIBUTION BY
SLOT (or baffles)**

Slot velocity 2000 fpm or higher.



DISTRIBUTION BY TAPER

SIDE-DRAFT & SUSPENDED HOODS

AMERICAN CONFERENCE OF
GOVERNMENTAL INDUSTRIAL HYGIENISTS

PRINCIPLES OF MANIFOLD DESIGN

DATE 1-64

Fig. 4-13



THE KING OF
TARPAULINS

GOSPORT MANUFACTURING COMPANY, INC.

DUNS: 04-588-0844
TELEPHONE: 812/879-4224
OUT OF STATE: 800/457-4406
FAX: 812/879-4227

11 LOUISIA STREET, P.O. BOX #26, GOSPORT, INDIANA 47433

March 15, 1991

REYNOLDS, SMITH & HILLS
4651 SALISBURY ROAD
JACKSONVILLE, FL 32256
ATTN: GEORGE FALLEN

Dear George:

Please find the information that I have enclosed for you per our recent phone conversation.

You can be assured that Gosport Manufacturing Company will provide you with the best in quality and excellent service in meeting your tarpaulin needs. Not only do we offer quality, 100% American made products, we stand behind everything we make.

If I can be of any service, or if you have any questions, please do not hesitate to call me at 800-457-4406. Thank you for your consideration!

Looking forward to doing business with you!

Sincerely,

David S. Daubenheyer
Account Executive

DSD/mg

Enclosures

TARPAULINS

COVERS

NAME	CATALOG PAGE	ORDER NUMBER	WEIGHT	DESCRIPTION	COLOR	PRICE (per sq. ft.)
CANVAS TARP*						
Noble	4	TCN00	8 oz.	1 1/2" hem	Dark Brown	248
Noble	4	TCN10	10 oz.	1 1/2" hem	Dark Brown	254
Noble	4	TCN12	12 oz.	1 1/2" hem	Dark Brown	278
Noble	4	TCN15	14.9 oz.	1 1/2" hem	Dark Brown	324
Reynol	3	TCR00	8 oz.	Reinforced patches, brass grommets	Dark Brown	248
Reynol	3	TCR10	10 oz.	Reinforced patches, brass grommets	Dark Brown	248
Reynol	3	TCR12	12 oz.	Reinforced patches, brass grommets	Dark Brown	248
Reynol	3	TCR15	14.9 oz.	Reinforced patches, brass grommets	Dark Brown	324
McIntosh	4	TCM00	8 oz.	Rope-in-hem, two rows of stitching	Dark Brown	248
McIntosh	4	TCM10	10 oz.	Rope-in-hem, two rows of stitching	Dark Brown	248
McIntosh	4	TCM12	12 oz.	Rope-in-hem, two rows of stitching	Dark Brown	248
McIntosh	4	TCM15	14.9 oz.	Rope-in-hem, two rows of stitching	Dark Brown	324
Reynol	3	TCR00	8 oz.	D-rings, reinforced patches, rope-in-hem	Dark Brown	248
Reynol	3	TCR10	10 oz.	D-rings, reinforced patches, rope-in-hem	Dark Brown	248
Reynol	3	TCR12	12 oz.	D-rings, reinforced patches, rope-in-hem	Dark Brown	278
Reynol	3	TCR15	14.9 oz.	D-rings, reinforced patches, rope-in-hem	Dark Brown	348

VINYL TARP*

Impervious	5	TVN10	10 oz.	Extra durable material	Black	378
Impervious	5	TVN12	12 oz.	Flame resistant, "W" hem	Black	348
Laminated	5	TVL14	14 oz.	Flame resistant treated	Gm, Red, Blu	408
Cooled	5	TVL18	18 oz.	Tear and puncture resistant	Large variety	478
Cooled	5	TVL22	22 oz.	Tear and puncture resistant	Large variety	528

POLYETHYLENE TARP*

Ultrastrong	5	TPU		D-rings, reinforced patches, rope-in-hem	Blue	184
AB-Anti-tear	5	TPA		Rope-in-hem, two rows of stitching (Orders less than \$100, \$4.00 per sq. ft.)	Blue	8.96
Poly Tarp	10	TPP0R		8 x 8, flame resistant	Opaque	148
Poly Tarp	10	TP1004		10 x 10	White/White	94
Poly Tarp	10	TP1212		12 x 12	Black/White	134
Poly Tarp	10	TP00LV		8 x 8, UV resistant	White/White	134
Poly Tarp	10	TP1018		10 x 10	Silver	134

Poly-Star Tarp in Poly-Star Section

INFLATION FIGHTER TARPS						
	5	TFP10	10 oz.	Made from piece goods, fabric varies	Varies	228
	5	TFP12	12 oz.	Made from piece goods, fabric varies	Varies	23.94
DRY FINISH TARPS						
	5	TFD10	10 oz.	No rub off or discoloration damage	Pearl B	248
	5	TFD100	10.3 oz.	Army Duct, no rub off damage	Pearl B	278

COVERS

NAME	CATALOG PAGE	ORDER NUMBER	WEIGHT	DESCRIPTION	COLOR	PRICE (per sq. ft.)
SWIMMING POOL COVERS						
Reynol	5	CYPR10	10 oz.	Vinyl laminated, reinforced patches & webbing	Gm, Red, Blu	278
Reynol	5	CYPR14	14 oz.	Vinyl laminated, reinforced patches & webbing	Gm, Red, Blu	448
Amesbury	5	CPPAL		Light weight poly, reinforced patches & webbing	Blue	134
Amesbury	5	CPPAH		Heavy weight poly, reinforced patches & webbing	Blue	248
Met	5	CHP		Reinforced patches & webbing	Multi-color	248

*Commercial Canvas Flame Resistant, add \$6 per square foot.

NAME	CATALOG PAGE	ORDER NUMBER	WEIGHT	DESCRIPTION	COLOR	PRICE (per sq. ft.)
------	--------------	--------------	--------	-------------	-------	---------------------

CAR COVERS

A	11	CDC-A		Poly-cotton blend, elastic & tie downs	Pearl Green	94.00 net
B	11	CDC-B		Poly-cotton blend, elastic & tie downs	Pearl Green	91.00 net
C	11	CDC-C		Poly-cotton blend, elastic & tie downs	Pearl Green	97.00 net
D	11	CDC-D		Poly-cotton blend, elastic & tie downs	Pearl Green	97.00 net
E	11	CDC-E		Poly-cotton blend, elastic & tie downs	Pearl Green	97.00 net
F	11	CDC-F		Poly-cotton blend, elastic & tie downs	Pearl Green	94.00 net
G	11	MCBB		Car cover storage bag	Pearl Green	12.00 net

TRUCK COVERS

Met	6	CHTT		Top grade PVC coated poly net, 2" hem	Gm, Blu, Rkt Multi-color	248
Met	6	CHTB		Economy grade, 1 1/2" hem	Varies	248
Steel Header	6	CHT13	12 oz.	Cotton Duct, D-rings and tie down bands	Dark Brown	248
Steel Header	6	CHT15	14.9 oz.	Cotton Duct, D-rings and tie down bands	Dark Brown	448
Steel Header	6	CVH18	18 oz.	Vinyl coated nylon, D-rings and tie down bands	Large variety	528

GYM COVERS

Canvas	12	CCG10	10 oz.	Flame resistant, meets state school fire codes	Tan	Quake
Vinyl	13	CVG10	10 oz.	Completely waterproof & flame resistant	Large variety	Quake
				Meets state school fire codes		

FIELD COVERS

Polyethylene	13	CPF		Completely waterproof, high UV treated	Blue	Quake
Vinyl	13	CYF10	10 oz.	Durable cover, completely waterproof	Large variety	Quake
Vinyl	13	CYF14	14 oz.	Durable cover, completely waterproof	Large variety	Quake

SALVAGE COVERS

Canvas	16	CCS12	12 oz.	Triple-thick hem		248
Canvas Duck	10	CCSD	412	Triple-thick hem		448
Dry Finish	10	CDR10	10.36 oz.	Triple-thick hem, no rub off damage	Pearl B	448
Dry Finish	10	CDR13	13 oz.	Triple-thick hem, no rub off damage	Pearl B	448
Vinyl	10	CVS10	10 oz.	Vinyl laminated nylon, triple-thick hem	Red, Green	448
Vinyl	10	CVS14	14 oz.	Vinyl laminated nylon, triple-thick hem	Red, Green	448

BOAT COVERS

NAME	CATALOG PAGE	ORDER NUMBER	WEIGHT	DESIGNED FOR	BOAT LENGTH (feet)	BEAM WIDTH (inches)	STOCK NUMBER	OUTBOARD STOCK NUMBER	NET PRICE
Standard	12	CDBS14	8 oz.	V-Hull	14	68	RF-14	RF-14	98.00
Standard	12	CDBS15	8 oz.	V-Hull	15	70	RF-15	RF-15	98.00
Standard	12	CDBS16	8 oz.	V-Hull	16	70	RF-16	RF-16	98.00
Standard	12	CDBS17	8 oz.	V-Hull	17	80	RF-17	RF-17	98.00
Standard	12	CDBS18	8 oz.	V-Hull	18	80	RF-18	RF-18	97.00
Deluxe	12	CDBD14	10.5 oz.	V-Hull	14	68	DRF-14	DRF-14	98.00
Deluxe	12	CDBD15	10.5 oz.	V-Hull	15	70	DRF-15	DRF-15	97.00
Deluxe	12	CDBD16	10.5 oz.	V-Hull	16	70	DRF-16	DRF-16	97.00
Deluxe	12	CDBD17	10.5 oz.	V-Hull	17	80	DRF-17	DRF-17	97.00
Deluxe	12	CDBD18	10.5 oz.	V-Hull	18	80	DRF-18	DRF-18	97.00
Tri-Hull	12	CDRT18	10.5 oz.	Cathedral Hulls	18	70	R/O-18	R/O-18	98.00
Tri-Hull	12	CDRT16	10.5 oz.	Cathedral Hulls	16	60	R/O-16	R/O-16	98.00
Tri-Hull	12	CDRT17	10.5 oz.	Cathedral Hulls	17	82	R/O-17	R/O-17	98.00
Tri-Hull	12	CDRT18	10.5 oz.	Cathedral Hulls	18	80	R/O-18	R/O-18	98.00

Telephone Call Confirmation

Project No. _____

reynolds, smith and hills

Local _____ L.D. X Placed _____ Rec'd X Date 3-21-91
G. FALLON S.M.F. Conversed with BOB FINK (717) 782-3902
Of OSHA HARRISBURG, PA. Regarding DIP TANK COVERS.

G.F. EXPLAINED FLEXIBLE DIP TANK COVERS WITH FAN
AP CONTROLS.

B.F. ADVISED THAT OSHA HAS VERY SPECIFIC REGULATIONS
RE: MINIMUM DIP TANK AIR FLOW REQUIREMENTS AIMED
AT PROTECTING WORKERS FROM ON THE JOB HAZARDS.

ALTHOUGH REDUCING THE AIR FLOW WOULD BE A
"TECHNICAL" VIOLATION, NO CITATION WOULD BE ISSUED
AS LONG AS THERE WAS NO HAZARD TO THE WORKER.

HE FELT THAT AS LONG AS THE FANS WERE
DRAWING AIR FROM THE CAVITY BETWEEN THE
COVER AND THE FLUID THAT ANY EVOLVED FUMES
WOULD STILL BE EXHAUSTED.

NOTE: MR FINK ADVISED THAT DIP TANK VENT FANS
SHOULD BE OPERATED AT ALL TIMES (24 HRS/day)
AS A GENERAL RULE. THIS WAS ECHOED BY
LEAD HYGIENISTS.

Distribution:

1 August 1982

DOCUMENTATION FOR PRODUCTIVITY CAPITAL INVESTMENT PROGRAMS For use of this form, see AR 5-4; the proponent agency is OCA.			1. PROJECT NO. AMC OSD PIF		REQUIREMENT CONTROL SYMBOL DD-M(R) 1561	
2. TO: HQ DA Attn: DACS-DME Pentagon Washington, DC 20310-2070		3. THRU: US AMC Attn: AMCM-M 5001 Eisenhower Ave Alexandria, VA 22303-0001		4. FROM: Commander US DESCOM Attn: AMSDS-RM-P Chambersburg, PA 17201-4170		5. DOD COMP NAME Army
9. PROJECT TITLE Drive-In Paint Booth Air Flow Control		10. TYPE OF PROJECT (Check one) ☐ QIP ☒ OSD PIF ☐ PECIP		6. DOD COMP CODE A		7. COMMAND CODE W73QKK
12. FUNCTIONAL AREA WHERE SAVINGS WILL OCCUR 024		13. ECONOMIC LIFE 15		8. DATE 10/9/91		11. AMORTIZATION YEARS/MONTHS $\$ 237,128 \div 64,100 = 3.7$ (years) or (months) (amortization)
15. SUBMITTING UNIT(S) Commander Letterkenny Army Depot Attn: SDSLE-EM (T. Hagie) Bldg. 663 Chambersburg, PA 17201-415D		16. UNIT ID CODE		14. EXPECTED OPERATIONAL DATE		12. (No. Mo)
18. DETAILED JUSTIFICATION Supply and exhaust fans operate continuously during work shifts for convenience and to keep back flow due to building negative pressure. This project would allow fans to throttle back and save energy when booths are unoccupied, but not allow back flow of outside air.		17. PROJECT DESCRIPTION Speed controllers are used on exhaust and supply fans to maintain correct ventilation rates under varying conditions and minimize flow during unoccupied times.				
19. SAVINGS DISPOSITION Savings are used to reduce energy expenditures						
20. OTHER REMARKS (Continue on page 5, if more space is needed)						

1 August 1982

C 1, QR 5-4

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

21a

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. & fuel	\$261,800	\$197,700	\$197,700	\$197,700	\$197,700	\$64,100	\$64,100	\$64,100	\$64,100
CONTRACT COSTS									
OTHER (Identify)									
TOTALS	\$261,800	\$197,700	\$197,400	\$197,700	\$197,700	\$64,100	\$64,100	\$64,100	\$64,100

PRIORITIZATION

(1) INTERNAL RATE OF RETURN (IRR)
Divide estimated project cost 237,128 by average annual savings 64,100 = 3.7 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 = 30 % IRR.

(2) SAVINGS TO INVESTMENT RATIO (S/I)
Multiply annual savings 64,100 X discount factor 7.98 = 511,500 and divide by present value of investment
(undiscounted) 237,128 = 2.2 S/I.
(Based on economic life 15 years, select discount factor from Table H-4, App H, Ch. 5, AR 5-4.

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

1 August 1982

C 1, AR 5-4

COST FOR PROJECT TO BECOME OPERATIONAL

22.	EQUIPMENT TYPE e	PROPOSED SOURCE OF PROCUREMENT b	UNIT PRICE c	QUANTITY d	TOTAL COST e	APPROPRIATION, BUDGET ACTIVITY OR PROGRAM ELEMENT f	FY FUNDS REQUIRED g
(1)	Variable-Speed Controls and Devices	-	\$5,928	40	\$237,128		
(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				\$237,128		
(14)	TOTAL AMOUNT OF FUNDING REQUESTED IN THIS PROPOSAL				\$237,128		
(15)	TOTAL AMOUNT OF FUNDING REQUIRED FROM OTHER SOURCE ⁵				-		
(16)	TOTAL (Sum of (14) + (15) above)				\$237,128		

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

1 August 1982

C 1, AR 5-4

SUMMARY OF SAVINGS (MANPOWER AND DOLLARS)									
ITEMS	SAVINGS			REAPPLICATION OF SAVINGS					
	NO. MPR OR MHR	TYPE PERS ⁶	DOLLARS	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 ⁷									
(7) OTHER DOLLAR SAVINGS (Excluding Manpower), e.g. CONTRACT COSTS & UTILITIES									
(8) Electricity			\$16,400						
(9) #2 Fuel Oil			\$28,300						
(10) #6 Fuel Oil			\$19,400						
(11) TOTAL DOLLAR SAVINGS			\$64,100						
⁶ (1) US Graded (2) US Wage Board (3) DHFN (4) IHFN (5) Officer (6) WO (7) Enlisted									

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

1 August 1982

C 1, AR 5-4

24. 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.)			
25. OTHER COORDINATION (Functional Coordination at local level, e.g., Fac Eng, Log, Para, etc.)			
_____ _____ _____			
26. 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
27. APPROVED BY			
FOR USE BY HQDA ON OSD PIP PROJECTS ONLY		SIGNATURE	DATE (YYMMDD)
			AUTOVON
28. OTHER REMARKS (Cont'd)			

ECO Number: 10

DRIVE-IN PAINT BOOTH AIR FLOW CONTROL

Discussion

The two paint booths in Building 350 and the eight in Building 320 are large enough to enclose large tracked and wheeled vehicles. Supply air fans move outside air across a steam coil and into the paint booth. The exhaust fans draw air and fumes from the booth and discharge them to the atmosphere. Because of the variable pressure drops caused by the filters and the unsteady building negative pressure, the fans are hard to balance. This imbalance sometimes causes low air flows, a violation of OSHA regulations, and positive booth pressure which releases paint fumes into the building, a fire hazard. Additionally, the fans are allowed to operate at all times, even though no painting is being done because, while running, they prevent cold air from being drawn back into the booth by the negative pressure in the building. During the winter this back flow would allow cold air to blow on a freshly painted vehicle potentially ruining the paint job, and making the surroundings uncomfortably cold.

The recommended controls would solve all of these problems. Both supply and exhaust air fans are supplied with variable frequency (variable speed) drives and analog control loops. The supply air fans would supply the required flow, and the exhaust fans would maintain the required negative pressure. The supply air fan would supply the required air flow even if the filters get a little plugged, or if the building pressure were to change. Likewise, the exhaust fan would remove just enough air to keep the booth under a slightly negative pressure relative to the building interior. When painting is stopped, and the booth doors opened, the fans (supply and exhaust) would reduce speed to minimize backdraft air flow. Furthermore, in a manual mode, the controls will allow accelerated warm-up of cold vehicles inside the booth. This would liberate the valuable floor space in Building 350, now used for this purpose, for other, more productive activities.

The recommended fan controls optimize booth air flow and pressure while painting is under way and reduces air flow to a minimum when there are no

painting activities. These controls will save energy through reduced electrical consumption and reduced fuel consumption.

Recommendations

Based on the Life Cycle Cost Analysis, this project is recommended.

Construction Cost	\$212,670
Annual Energy Savings (MBtu/yr)	
Electricity	1,503
No. 6 Fuel Oil	4,397
No. 2 Fuel Oil	5,674
Annual Energy Cost Savings (\$/yr)	\$64,100
SIR	3.8
Simple Payback (years)	3.7

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: ECO10

LCCID 1.062

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: LETTERKENNY ADREGION NOS. 3 CENSUS: 1

PROJECT NO. & TITLE: ECO #10 PAINT BOOTH AIR FLOW CONTROL

FISCAL YEAR 1992 DISCRETE PORTION NAME: TOTAL PROJECT

ANALYSIS DATE: 10-14-91 ECONOMIC LIFE 15 YEARS PREPARED BY: G. FALLON

1. INVESTMENT

A. CONSTRUCTION COST	\$ 212670.
B. SIOH	\$ 11697.
C. DESIGN COST	\$ 12761.
D. SALVAGE VALUE COST	-\$ 0.
E. TOTAL INVESTMENT (1A + 1B + 1C - 1D)	\$ 237128.

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

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ 10.94	1503.	\$ 16443.	10.75	176760.
B. DIST	\$ 4.98	5674.	\$ 28257.	14.08	397852.
C. RESID	\$ 4.41	4397.	\$ 19391.	16.21	314324.
D. NAT G	\$.00	0.	\$ 0.	13.25	0.
E. COAL	\$.00	0.	\$ 0.	11.13	0.
F. TOTAL		11574.	\$ 64090.		\$ 888937.

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

A. ANNUAL RECURRING (+/-)	\$ 0.
(1) DISCOUNT FACTOR (TABLE A)	10.59
(2) DISCOUNTED SAVING/COST (3A X 3A1)	\$ 0.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)\$ 0.

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33) \$ 293349.

A IF 3D1 IS = OR > 3C GO TO ITEM 4

B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F) _____

C IF 3D1B IS = > 1 GO TO ITEM 4

D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS $2F3+3A+(3B1D/(YRS\ ECONOMIC\ LIFE))$ \$ 64090.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) \$ 888937.

6. DISCOUNTED SAVINGS RATIO (SIR)=(5 / 1F)= 3.75
(IF < 1 PROJECT DOES NOT QUALIFY)

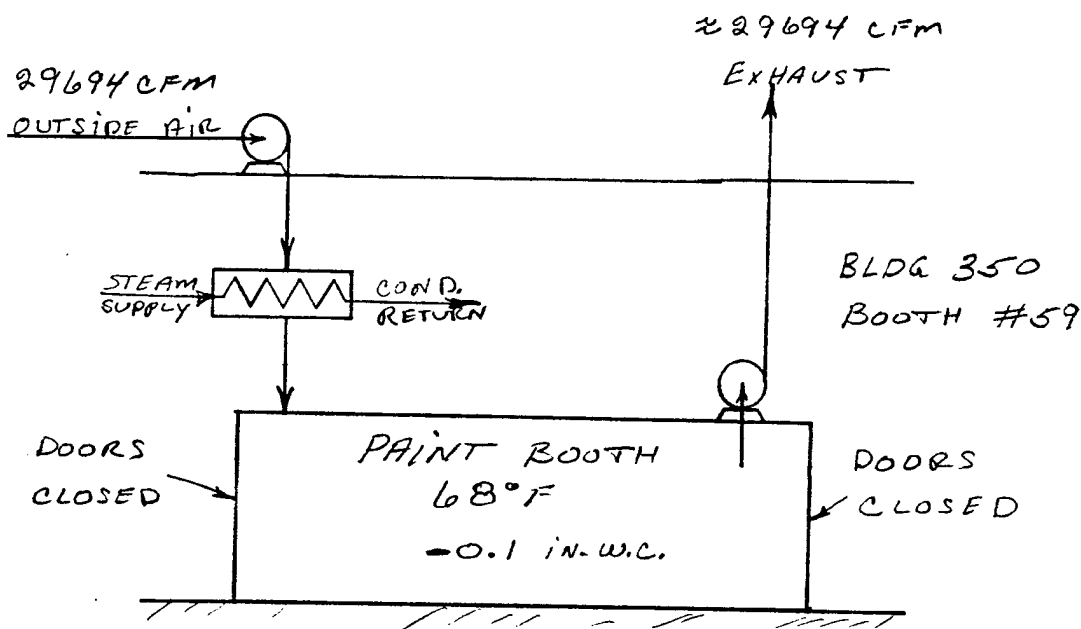
7. SIMPLE PAYBACK PERIOD (ESTIMATED) $SPB=1F/4$ 3.70



SUBJECT LEAD ECO #10
DESIGNER G. Fallon
CHECKER P. Hutchins

AEP NO 290-0379-001
SHEET 1 OF 1
DATE
DATE

ECO #10 PAINT BOOTH AIR FLOW CONTROL



CALCULATE CURRENT HEAT LOSS

ASSUME: 68°F EXHAUST TEMP

29,694 CFM (LEAD, PAINT BOOTH STUDY, BKA, 1987, Pg 94)
BOTH FANS CAN BE SHUT DOWN FOR 50%
OF THE TIME.

24 H/d, 5d /wk OPERATIONS

118,470 BTU/CFM/YR (HEAT LOSS CALC, ENCLOSED)

0.8 BOILER EFFICIENCY.

$$\text{Consumption} = \frac{118470 \text{ BTU/CFM.YR} \times 29694 \text{ CFM}}{0.8 \times 10^6 \text{ BTU/MBTU}} = 4,400 \text{ MBTU/YR}$$

SAVINGS #6 oil

$$\text{ENERGY} = 4,400 \text{ MBTU/YR} \times 0.5 = \underline{\underline{2,200 \text{ MBTU/YR}}} \quad \text{\#6 oil}$$



SUBJECT LEAD ECO #10
DESIGNER G.F.
CHECKER _____

AEP NO _____
SHEET 2 OF _____
DATE _____
DATE _____

ECO 10 (CONT.)

CALCULATE CURRENT ELECTRICAL CONSUMPTION

ASSUME: TOTAL $\Delta P = 5.0$ IN W.C. (2.5" IN & 2.5" OUT)

$$\text{FAN \& MOTOR Eff} = 0.6 \quad \frac{2545}{6356} = 0.4$$

$$\text{FAN ENERGY} = \frac{.4 \times \text{FLOW} \times \text{HEAD}}{0.6} = \frac{.4 \times 29694 \text{ CFM} \times 5}{0.6} = 99081 \frac{\text{BTU}}{\text{Hr}}$$

$$\text{ANNUAL ENERGY} = \frac{99081 \frac{\text{BTU}}{\text{Hr}} \times 24 \text{ H/d} \times 52 \text{ Wk/YR}}{10^6 \frac{\text{BTU}}{\text{MBTU}}} = \boxed{618 \frac{\text{MBTU}}{\text{YR}}}$$

SAVINGS

ENERGY ELEC

$$618 \text{ MBTU/YR} \times 0.5 = \boxed{309 \text{ MBTU/YR ELEC}}$$

COST ELEC

$$309 \text{ MBTU/YR} \times \$10.94/\text{MBTU} = \boxed{\$3382/\text{YR ELEC.}}$$

TOTAL SAVINGS

FROM pg 1: #6 OIL - 2200 MBTU/YR
ELEC - 309 MBTU/YR

NOTE: THE ABOVE TECHNIQUE WAS APPLIED TO LARGE PAINT SPRAY BOOTHS IN BLDGS 350 & 320 USING SPREAD SHEET SOFTWARE TO GENERATE A PAYBACK ON EACH BOOTH. THE RESULTS ARE SHOWN ON THE SUMMARY SHEET.

RS&H

SUBJECT LETTER KENNY A-D.

AEP NO _____

DESIGNER G F

SHEET 3 OF _____

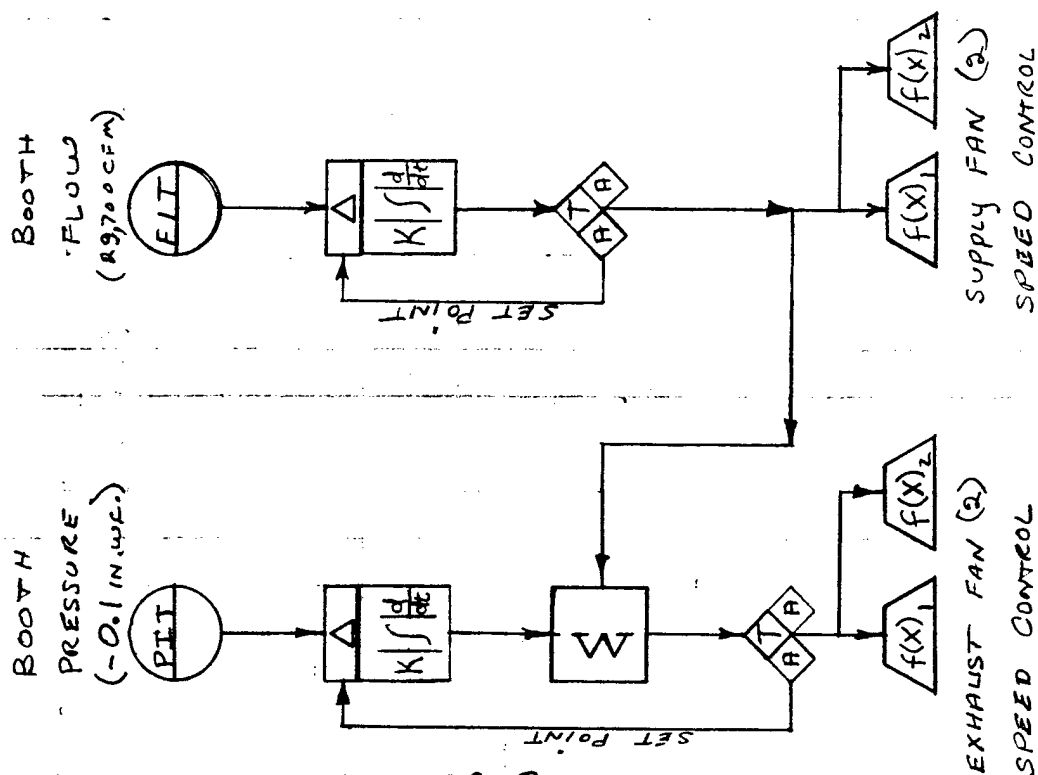
CHECKER _____

DATE _____

DATE _____

- 1) WHEN BOTH LARGE DOORS ARE CLOSED BOTH CONTROL LOOPS ARE OPERATING & CONTROLLING
- 2) WHEN EITHER LARGE DOOR IS OPEN, BOTH FAN SPEEDS ARE REDUCED TO A MINIMUM, AUTOMATICALLY
- 3) THIS CONTROL SCHEME ASSURES DESIGN FLOW THROUGH THE BOOTH AT A SLIGHTLY NEGATIVE PRESSURE.

Flow & Pressure will be maintained regardless of building negative pressure, season of year, or reasonable degree of system cleanliness.



LETTERKENNY ARMY DEPOT
LARGE PAINT BOOTH FAN CONTROL
SUMMARY

+-----+
: R E C O M M E N D E D :
+-----+

BUILDING NUMBER	BOOTH NUMBER	AIR FLOW (CFM)	OPERATION					
			HOURS PER WEEK	#6 FUEL SAVED (MBTU)	ELEC SAVED (MBTU)	COST SAVED (\$/YR)	CONST. COST (\$)	PAYBACK (YRS)
350	59	29694	120	2199	309.1	\$13,078	\$23,713	1.8
350	60	29694	120	2199	309.1	\$13,078	\$23,713	1.8
SUBTOTAL		59388	120	4397	618	\$26,156	\$47,426	1.8

BUILDING NUMBER	BOOTH NUMBER	AIR FLOW (CFM)	OPERATION					
			HOURS PER WEEK	#2 FUEL SAVED (MBTU)	ELEC SAVED (MBTU)	COST SAVED (\$/YR)	CONST. COST (\$)	PAYBACK (YRS)
320	3880	58876	40	1311	204.3	\$8,762	\$23,713	2.7
320	4378	29172	40	649	101.2	\$4,342	\$23,713	5.5
320	4379	27805	40	619	96.5	\$4,138	\$23,713	5.7
320	4380	27805	40	619	96.5	\$4,138	\$23,713	5.7
320	4381	27805	40	619	96.5	\$4,138	\$23,713	5.7
320	4382	27805	40	619	96.5	\$4,138	\$23,713	5.7
320	4383	27805	40	619	96.5	\$4,138	\$23,713	5.7
320	4384	27805	40	619	96.5	\$4,138	\$23,713	5.7
SUBTOTAL		254878	40	5674	884	\$37,932	\$189,704	5.0

+-----+			+-----+					
: GRAND TOTAL			#6 FUEL	4397	1503	\$64,088	\$237,130	3.7
:			#2 FEUL	5674				:
+-----+			+-----+					

+-----+
: N O T R E C O M M E N D E D :
+-----+

BUILDING NUMBER	BOOTH NUMBER	AIR FLOW (CFM)	OPERATION					
			HOURS PER WEEK	#2 FUEL SAVED (MBTU)	ELEC SAVED (MBTU)	COST SAVED (\$/YR)	CONST. COST (\$)	PAYBACK (YRS)
320	3930	2000	40	36	6.9	\$253	\$23,713	93.6
320	3931	2000	40	36	6.9	\$253	\$23,713	93.6

SUBJECT ECO # 10

AEP NO _____

DESIGNER

P. Hutchins

SHEET _____

OF _____

CHECKER _____

DATE _____

DATE _____

QRIP Calculations Using FY92 Fuel Oil Prices

Current energy use:

$$\#6 \text{ Fuel Oil} = \frac{HLF * CFM * 4.41 \text{ \$/MBtu}}{0.8 * 10^6}$$

$$= \frac{118,470 \text{ Btu} * 59,388 \text{ CFM} * 4.41}{0.8 * 10^6} = \$38,800$$

$$\#2 \text{ Fuel Oil} = \frac{118,470 * 254,878 * 4.98}{0.8 * 10^6} = \$188,000$$

$$\text{Electricity} = \frac{CFM * AP * 2545 \text{ Btu/kp-hr} * \text{hrs/yr}}{6356 * \eta_F}$$

$$= \frac{254,878 * 542545 * 24 \text{ h/d} * 52 \text{ w/yr}}{6356 * 0.6}$$

$$= 5307 \text{ MBtu}$$

$$\text{Cost} = 5307 * 10.94 \text{ \$/MBtu} = \$58,000$$

$$\text{TOTAL COST} =$$

$$\$261,800$$

LETTERKENNY ARMY DEPOT ENERGY AUDIT OF INDUSTRIAL FACILITIES

Operation Hrs/Day = 24

Room or Supply Air Conditions - Winter 68
Air Quantity (cfm) 1

Hour Fractions 1 AM - 9 AM 1
9 AM - 5 PM 1
5 PM - 1 AM 1

Operation Days Per Week 5

Temp. Range	Hours of Occurrence 2-9 10-17 18-1	Total Hours	Delta H or T	Const.	CFM	BTU/HR	Total BTU
70 74	247 237 301	785	-4	1.08	1	0	0
65 69	296 217 278	791	1	1.08	1	1	854
60 64	269 196 236	701	6	1.08	1	6	4,542
55 59	249 191 209	649	11	1.08	1	12	7,710
50 54	221 193 202	616	16	1.08	1	17	10,644
45 49	218 193 206	617	21	1.08	1	23	13,994
40 44	237 236 239	712	26	1.08	1	28	19,993
35 39	289 246 286	821	31	1.08	1	33	27,487
30 34	304 194 258	756	36	1.08	1	39	29,393
25 29	184 106 152	442	41	1.08	1	44	19,572
20 24	124 65 90	279	46	1.08	1	50	13,861
15 19	75 32 57	164	51	1.08	1	55	9,033
10 14	54 13 26	93	56	1.08	1	60	5,625
5 9	18 3 9	30	61	1.08	1	66	1,976
0 4	9 0 2	11	66	1.08	1	71	784
-5 -1	3 0 1	4	71	1.08	1	77	307
-10 -6	1 0 0	1	76	1.08	1	82	82
-15 -11	0 0 0	0	81	1.08	1	87	0

Totals 2798 2122 2552 7472 165,858

Total Operation Hours While Heating
(and corrected for working days/week) 4776

118,470

Avg outdoor temp while heating (F) 45.0

LETTERKENNY ARMY DEPOT ENERGY AUDIT OF INDUSTRIAL FACILITIES

Operation Hrs/Day = 8

Room or Supply Air Conditions - Winter 68
Air Quantity (cfm) 1

Hour Fractions 1 AM - 9 AM 0.25
9 AM - 5 PM 0.75
5 PM - 1 AM 0

Operation Days Per Week 5

Temp. Range	Hours of Occurrence			Total Hours	Delta H or T	Const.	CFM	BTU/HR	Total BTU
	2-9	10-17	18-1						
70	74	247	237	301	240	-4	1.08	1	0
65	69	296	217	278	237	1	1.08	1	256
60	64	269	196	236	214	6	1.08	1	1,388
55	59	249	191	209	206	11	1.08	1	2,441
50	54	221	193	202	200	16	1.08	1	3,456
45	49	218	193	206	199	21	1.08	1	4,519
40	44	237	236	239	236	26	1.08	1	6,634
35	39	289	246	286	257	31	1.08	1	8,596
30	34	304	194	258	222	36	1.08	1	8,612
25	29	184	106	152	126	41	1.08	1	5,557
20	24	124	65	90	80	46	1.08	1	3,962
15	19	75	32	57	43	51	1.08	1	2,355
10	14	54	13	26	23	56	1.08	1	1,406
5	9	18	3	9	7	61	1.08	1	445
0	4	9	0	2	2	66	1.08	1	160
-5	-1	3	0	1	1	71	1.08	1	58
-10	-6	1	0	0	0	76	1.08	1	21
-15	-11	0	0	0	0	81	1.08	1	0
Totals									49,865

Total Operation Hours While Heating
(and corrected for working days/week) 1465

Avg outdoor temp while heating (F) 45.0

35,618

10/01/91

ECO Construction Cost Estimate Calculations

ECO Name: Paint Booth Air Flow Control

ECO #: 10

1991 ECO "bare" costs (from cost estimate sheet)		
Material		\$113,210
Labor		\$25,630
	Subtotal bare costs	\$138,840
FICA Insurance (20% of Labor)		\$5,126
Sales Tax (6.5% of Material)		\$7,359
	Subtotal	\$151,325
Overhead (15%)		\$22,699
	Subtotal	\$174,024
Profit (10%)		\$17,402
	Subtotal	\$191,426
Bond (1%)		\$1,914
	Subtotal	\$193,340
Contingency (10%)		\$19,334
		+
Subtotal (Construction Cost Input For LCCID *)		\$212,674
		+
SIOH (5.5% of Construction Cost)		\$11,697
	Subtotal	\$224,371
Design (6% of Construction Cost)		\$12,760

Total Project Cost		\$237,131

* The SIOH costs (5.5%) and Design costs (6.0%) are automatically added in the Life Cycle Cost In Design (LCCID) analysis program.

NOTE: VENDOR ADVISES EQUIPMENT BELOW
CAN ACCOMMODATE 2 BOOTHS. THEREFOR
EACH BOOTH COSTS ~\$1000.00

Cameron & Barkley Company

Flexible Manufacturing Systems
10200 Alton Box Rd., Box 26879
Jacksonville, FL 32218
(904) 757-0211

CamBar

GEORGE FALLON
REYNOLD & SMITH & HILLS
1651 SALISBURY RD.
JACKSONVILLE FL, 32256

MODICON COMPACT 984 CONFIGURATION

		<u>CONTROLLER HARDWARE</u>		
1	1	PC-0984-120 1.5K Compact-984 CPU	400.00	400.00
		<u>MISC ITEMS</u>		
2	1	AS-MEEP-000 EEPROM Memory Card	~~200.00~~	~~200.00~~
		<u>I/O MODULES</u>		
3	1	AS-BADU-205 +/-10V, +/-20mA analog input module	375.00	375.00
4	1	AS-BDAP-209 115 VAC Output Module	160.00	160.00
5	1	AS-BDAU-202 4-20 mA Analog Input	435.00	435.00
6	1	AS-BDEP-209 115 VAC Input Module	115.00	115.00
7	1	AS-P120-000 120 VAC - 24 VDC Power Converter	200.00	200.00
		<u>HOUSINGS</u>		
8	1	AS-HDTA-200 primary subrack	165.00	165.00
9	1	AS-HDTA-201 secondary subrack - 5 module	165.00	165.00
		<u>CABLES</u>		
10	1	AS-WBXT-201 Bus Extension Cable	70.00	70.00

TOTAL AMOUNT:

~~2285.00~~

NOTE: ALL MODICON EQUIPMENT COMES WITH A THREE YEAR WARRANTY. ~~\$2085.00~~
PLEASE REFER TO THIS QUOTATION NUMBER. #99-910515-P004

MARK J. WALKER
SYSTEMS SPECIALIST

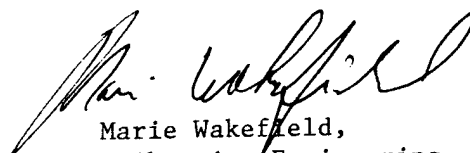


DEPARTMENT OF THE ARMY
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