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DATE : 1 SEPT , 1980

DEPARTMENT OF THE NAVY

PROJECT ENGINEERING DOCUMENTATION

DINING FACILITIES MODERNIZATION

(P-697)

FY 1982 MCON

MARINE CORPS BASE
CAMP LEJEUNE
NORTH CAROLINA

ADMINISTERED BY:

ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
NORFOLK, VA. 23511

PREPARED BY:

ODELL ASSOCIATES, INC.
222 S. CHURCH ST.
CHARLOTTE, N.C. 28202

1. COMPONENT	FY 1982 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
NAVY		1 SEPT 80

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA	DINING FACILITIES MODERNIZATION

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	722-10	P-697	$5,600

9. COST ESTIMATES

Escalation 12% ITEM Bid opening date 1 JANUARY 82	U/M	QUANTITY	UNIT COST	COST ($000)
Dining Facility Modernization	SF	102,975	$ 44.14	$4,482
Buildings	SF	102,975	38.55	(3,909)
Built in equipment	LS			(512)
Solar Systems	LS			(61)
Supporting Facilities				353
Utilities	LS			(323)
Site Improvements	LS			(30)
Subtotal				$4,835
Contingency (10%)				484
Total Contract Cost				$5,319
Supervision Inspection and Overhead (5.5%)				292
Total Request				$5,611
Total Request (Rounded)				$5,600
Equipment provided from other appropriations				(63)

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Interior renovations consisting of new wall coverings, new doors, installation of decorative partitions, omit alternate windows in dining wings, providing new lowered ceilings, air conditioning, insulation, fluorescent fixtures; installation of terrazzo and quarry tile on floor, miscellaneous carpentry, plumbing, masonry, mechanical work, painting, site improvements, and related work. (Air conditioning -285 tons)

11. REQUIREMENTS: 25,946 PN. ADEQUATE: 17,230 PN. SUBSTANDARD: 10,118 PN.
PROJECT: Renovate the existing enlisted dining facilities, Buildings 1209, M424, 508, RR3, BA103.
REQUIREMENT: The alterations and renovations are considered essential to solve the major problems of poor atmosphere, personnel traffic flow, efficiency of layout, maintenance and cleanliness, durability and flexibility of facilities used.

CURRENT SITUATION: The facilities are in a general run-down condition with little modernization since their construction over 37 years ago. The overall condition and configuration of the existing facilities does not present an environment for efficient or maximum utilization.
IMPACT IF NOT PROVIDED: Continued use of inefficient and outdated dining facilities.

1. COMPONENT	FY 19 82 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
NAVY		1 SEPT 80

3. INSTALLATION AND LOCATION

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

4. PROJECT TITLE	5. PROJECT NUMBER
DINING FACILITIES MODERNIZATION	P 697

ENVIRONMENTAL IMPACT

The Environmental Impact Assessment has been reviewed, and where required, the design concepts give consideration to eliminating adverse environmental effects consistent with applicable directives.

PRESERVATION OF HISTORICAL SITES AND STRUCTURES

The project facilities do not directly or indirectly affect a district, site, building, structure, object or setting which is listed in the National Register or otherwise possesses a significant quality of American history.

FALLOUT SHELTER CONSTRUCTION

Fallout shelter excluded - - Shelter not economically feasible as part of this project.

FLOOD HAZARDS EVALUATION

Requirements of Executive Order No. 11988 (Flood plain Management) and Executive Order No. 11990 (Protection of Wetlands) are not applicable.

POLLUTION, PREVENTION, ABATEMENT AND CONTROL

This project will not cause additional air or water pollution.

DESIGN FOR ACCESSIBILITY OF PHYSICALLY HANDICAPPED PERSONNEL

Provisions for physically handicapped personnel not required in preparation and service areas of the facilities, since its use is specifically restricted to able-bodied military personnel. However, a dining area in each building will be made accessible to the handicapped and public toilets will be outfitted for the handicapped.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

		$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
	BUILDINGS 1209, M424, 508, RR-3, BA-103			102,975 SF			
1	Foundation	.379	N/A	N/A	39,000	39,000	0
2	Slab on Grade	.447	N/A	N/A	46,000	46,000	0
3	Structural Frame	.767	N/A	N/A	79,000	79,000	0
4	Supported Floor	0	N/A	N/A	0	0	0
5	Roof	.767	N/A	N/A	79,000	79,000	0
6	Exterior Walls	1.729	N/A	N/A	178,000	178,000	0
7	Interior Walls	.719	N/A	N/A	74,000	74,000	0
8	Interior Finishes	8.886	N/A	N/A	915,000	915,000	0
9	Doors and Windows	2.593	N/A	N/A	267,000	267,000	0
10	Specialties	.923	N/A	N/A	95,000	95,000	0
11	Plumbing	4.758	N/A	N/A	490,000	490,000	0
12	Mechanical	9.002	N/A	N/A	927,000	927,000	0
13	Electrical	7.000	N/A	N/A	720,000	720,000	0
14	Equipment	4.972	N/A	N/A	512,000	0	512,000
	SUBTOTAL						
15	Solar Systems	.60	50.80	1210 Coll.SF	61,000	61,000	0
	Sub-Total Building	43.53			$4,482,000	$*3,970,000	$*512,000
1	Piling						*
2	Elec. Substation & Dist.	2.93	N/A	N/A	302,000	302,000	
3	Not Used						*
4	Telephone & Fire Alarm						
5	Water Distribution						
6	Sanitary Sewers	.204	N/A	N/A	21,000	21,000	
7	Roads, Parking, Sidewalks						*
8	Storm Sewers						*
9	Site Improvements	.291	N/A	N/A	30,000	30,000	
10	Demolition (In ea. sys.						*
11	above)						
12							
13							
14							
15							
	Sub-Total Supporting Facilities				* $ 353,000		

Total Estimated Contract Cost: 1 Jan 82	$ 4,835,000
Contingency 10 %	$ 483,500
SIOH 5.5%	$ 292,517
Total Budget Cost	$ 5,611,017
Rounded	$ 5,600,000

*Asteric indicates these totals on 1391.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

		$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
	BUILDING 1209			22,530 SF			
1	Foundation	.400	N/A	N/A	9,023	9,023	0
2	Slab on Grade	.616	N/A	N/A	13,883	13,883	0
3	Structural Frame	.836	N/A	N/A	18,825	18,825	0
4	Supported Floor	0	N/A	N/A	0	0	0
5	Roof	.768	N/A	N/A	17,298	17,298	0
6	Exterior Walls	1.953	N/A	N/A	43,995	43,995	0
7	Interior Walls	.881	N/A	N/A	19,855	19,855	0
8	Interior Finishes	9.742	N/A	N/A	219,488	219,488	0
9	Doors and Windows	2.562	N/A	N/A	57,731	57,731	0
0	Specialties	1.102	N/A	N/A	24,829	24,829	0
1	Plumbing	6.320	N/A	N/A	142,393	142,393	0
2	Mechanical	10.013	N/A	N/A	225,585	225,585	0
3	Electrical	7.54	N/A	N/A	169,971	169,971	0
4	Equipment	4.701	N/A	N/A	105,928	0	105,928
	SUBTOTAL						
5	Solar Systems	.80	47.69	380 Coll.SF	18,123	18,123	0
	Sub-Total Building	48.24			$1,086,927	$*980,999	$*105,928
1	Piling			0	0	0	* 0
2	Elec. Substation & Dist.	2.75	N/A	N/A	62,000	62,000	0
3	Not Used			0	0	0	* 0
4	Telephone & Fire Alarm			0	0	0	0
5	Water Distribution			0	0	0	0
6	Sanitary Sewers	.106	N/A	N/A	2,381	2,381	0
7	Roads, Parking, Sidewalks			0	0	0	* 0
8	Storm Sewers			0	0	0	* 0
9	Site Improvements	.150	N/A	N/A	3,371	3,371	0
0	Demolition (In ea. sys.			0	0	0	* 0
1	above)						
2							
3							
4							
5							
	Sub-Total Supporting Facilities				* $ 67,752		

Total Estimated Contract Cost: 1 Jan 82		$ 1,154,679
Contingency 10 %		$ 115,468
SIOH 5.5%		$ 69,858
Total Budget Cost		$ 1,340,005
Rounded		$ 1,300,000

1209

*Asteric indicates these totals on 1391.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

		$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
	BUILDING M424			22,530 SF			
1	Foundation	.534	N/A	N/A	12,036	12,036	0
2	Slab on Grade	.616	N/A	N/A	13,883	13,883	0
3	Structural Frame	.989	N/A	N/A	22,275	22,275	0
4	Supported Floor	0	N/A	N/A	0	0	0
5	Roof	.910	N/A	N/A	20,496	20,496	0
6	Exterior Walls	2.121	N/A	N/A	47,787	47,787	0
7	Interior Walls	.924	N/A	N/A	20,814	20,814	0
8	Interior Finishes	9.690	N/A	N/A	218,320	218,320	0
9	Doors and Windows	3.240	N/A	N/A	73,007	73,007	0
0	Specialties	1.243	N/A	N/A	28,016	28,016	0
1	Plumbing	6.466	N/A	N/A	145,682	145,682	0
2	Mechanical	10.013	N/A	N/A	225,585	225,585	0
3	Electrical	8.90	N/A	N/A	200,564	200,564	0
4	Equipment	6.599	N/A	N/A	148,680	0	148,680
	SUBTOTAL						
5	Solar Systems	.80	47.69	380 Coll. SF	18,123	18,123	0
	Sub-Total Building	53.05			$1,195,268	$*1,046,588	$*148,680
1	Piling			0	0	0	* 0
2	Elec. Substation & Dist.	2.80	N/A	N/A	63,000	63,000	0
3	Not Used			0	0	0	* 0
4	Telephone & Fire Alarm			0	0	0	0
5	Water Distribution			0	0	0	0
6	Sanitary Sewers	.106	N/A	N/A	2,381	2,381	0
7	Roads, Parking, Sidewalks			0	0	0	* 0
8	Storm Sewers			0	0	0	* 0
9	Site Improvements	.431	N/A	N/A	9,712	9,712	0
0	Demolition (In ea. sys.			0	0	0	* 0
1	above)						
2							
3							
4							
5							
	Sub-Total Supporting Facilities				* $ 75,093		

Total Estimated Contract Cost: 1 Jan 82		$ 1,270,361
Contingency 10 %		$ 127,036
SIOH 5.5%		$ 76,857
Total Budget Cost		$ 1,474,254
Rounded		$ 1,450,000

M424

*Asteric indicates these totals on 1391.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

		$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
	BUILDING 508			22,475 SF			
1	Foundation	.378	N/A	N/A	8,499	8,499	0
2	Slab on Grade	.381	N/A	N/A	8,562	8,562	0
3	Structural Frame	.609	N/A	N/A	13,681	13,681	0
4	Supported Floor	0	N/A	N/A	0	0	0
5	Roof	.760	N/A	N/A	17,073	17,073	0
6	Exterior Walls	1.483	N/A	N/A	33,336	33,336	0
7	Interior Walls	.633	N/A	N/A	14,225	14,225	0
8	Interior Finishes	10.074	N/A	N/A	226,411	226,411	0
9	Doors and Windows	2.014	N/A	N/A	45,262	45,262	0
0	Specialties	.744	N/A	N/A	16,720	16,720	0
1	Plumbing	5.247	N/A	N/A	117,934	117,934	0
2	Mechanical	7.761	N/A	N/A	174,428	174,428	0
3	Electrical	5.70	N/A	N/A	128,087	128,087	0
4	Equipment	3.744	N/A	N/A	84,152	0	84,152
	SUBTOTAL						
5	Solar Systems	.45	56.03	180 SF	10,086	10,086	0
	Sub-Total Building	39.98			$898,456	$*814,304	$*84,152
1	Piling			0	0	0	* 0
2	Elec. Substation & Dist.	2.80	N/A	N/A	63,000	63,000	0
3	Not Used			0	0	0	* 0
4	Telephone & Fire Alarm			0	0	0	0
5	Water Distribution			0	0	0	0
6	Sanitary Sewers	.530	N/A	N/A	11,905	11,905	0
7	Roads, Parking, Sidewalks			0	0	0	* 0
8	Storm Sewers			0	0	0	* 0
9	Site Improvements	.513	N/A	N/A	11,533	11,533	0
0	Demolition (In ea. sys.			0	0	0	* 0
1	above)						
2							
3							
4							
5							
	Sub-Total Supporting Facilities				* $ 86,438		

Total Estimated Contract Cost: 1 Jan 82	$ 984,894
Contingency 10 %	$ 98,489
SIOH 5.5%	$ 59,586
Total Budget Cost	$1,142,969
Rounded	$1,150,000

508

*Asteric indicates these totals on 1391.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

		$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
	BUILDING RR-3			22,475 SF			
1	Foundation	.250	N/A	N/A	5,636	5,636	0
2	Slab on Grade	.140	N/A	N/A	3,155	3,155	0
3	Structural Frame	.747	N/A	N/A	16,785	16,785	0
4	Supported Floor	0	N/A	N/A	0	0	0
5	Roof	.762	N/A	N/A	17,134	17,134	0
6	Exterior Walls	1.473	N/A	N/A	33,113	33,113	0
7	Interior Walls	.457	N/A	N/A	10,272	10,272	0
8	Interior Finishes	5.439	N/A	N/A	122,237	122,237	0
9	Doors and Windows	1.806	N/A	N/A	40,590	40,590	0
0	Specialties	.588	N/A	N/A	13,210	13,210	0
1	Plumbing	1.960	N/A	N/A	44,042	44,042	0
2	Mechanical	7.761	N/A	N/A	174,428	174,428	0
3	Electrical	5.70	N/A	N/A	128,087	128,087	0
4	Equipment	3.603	N/A	N/A	80,971	0	80,971
	SUBTOTAL						
5	Solar Systems	.45	56.03	180 Coll.SF	10,086	10,086	0
	Sub-Total Building	31.13			$699,746	$* 618,775	$* 80,971
1	Piling			0	0	0	* 0
2	Elec. Substation & Dist.	2.80		N/A	63,000	63,000	0
3	Not Used			0	0	0	* 0
4	Telephone & Fire Alarm			0	0	0	0
5	Water Distribution			0	0	0	0
6	Sanitary Sewers	.106		N/A	2,381	2,381	0
7	Roads, Parking, Sidewalks			0	0	0	* 0
8	Storm Sewers			0	0	0	* 0
9	Site Improvements	.124		N/A	2,792	2,792	0
0	Demolition (In ea. sys.			0	0	0	* 0
1	above)						
2							
3							
4							
5							
	Sub-Total Supporting Facilities				* $ 68,173		

Total Estimated Contract Cost: 1 Jan 82	$	767,919
Contingency 10 %	$	76,792
SIOH 5.5%	$	46,459
Total Budget Cost	$	891,170
Rounded	$	890,000

RR-3

*Asteric indicates these totals on 1391.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

		$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
	BUILDING BA-103			12,965 SF			
1	Foundation	.299	N/A	N/A	3,880	3,880	0
2	Slab on Grade	.527	N/A	N/A	6,837	6,837	0
3	Structural Frame	.603	N/A	N/A	7,816	7,816	0
4	Supported Floor	0	N/A	N/A	0	0	0
5	Roof	.563	N/A	N/A	7,299	7,299	0
6	Exterior Walls	1.507	N/A	N/A	19,533	19,533	0
7	Interior Walls	.668	N/A	N/A	8,659	8,659	0
8	Interior Finishes	9.927	N/A	N/A	128,709	128,709	0
9	Doors and Windows	3.860	N/A	N/A	50,047	50,047	0
0	Specialties	.933	N/A	N/A	12,098	12,098	0
1	Plumbing	3.095	N/A	N/A	40,125	40,125	0
2	Mechanical	9.812	N/A	N/A	127,210	127,210	0
3	Electrical	7.15	N/A	N/A	92,755	92,755	0
4	Equipment	6.780	N/A	N/A	87,904	0	87,904
	SUBTOTAL						
5	Solar Systems	.39	56.03	90 Coll.SF	5,045	5,045	0
	Sub-Total Building	46.12			$597,917	$* 510,013	$* 87,904
1	Piling			0	0	0	* 0
2	Elec. Substation & Dist.	3.93	N/A	N/A	51,000	51,000	0
3	Not Used			0	0	0	* 0
4	Telephone & Fire Alarm			0	0	0	0
5	Water Distribution			0	0	0	0
6	Sanitary Sewers	.184	N/A	N/A	2,381	2,381	0
7	Roads, Parking, Sidewalks			0	0	0	* 0
8	Storm Sewers			0	0	0	* 0
9	Site Improvements	.215	N/A	N/A	2,792	2,792	0
0	Demolition (In ea. sys.			0	0	0	* 0
1	above)						
2							
3							
4							
5							
	Sub-Total Supporting Facilities				* $ 56,173		

Total Estimated Contract Cost: 1 Jan 82	$	654,090
Contingency 10 %	$	65,409
SIOH 5.5%	$	39,572
Total Budget Cost	$	759,071
Rounded	$	760,000

BA 103

*Asteric indicates these totals on 1391.

DESIGN CONCEPTS

Activity and Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

Project Title: DINING FACILITIES MODERNIZATION (P-697)

Date: 1 JULY 1980

USE OF DEFINITIVES AND PREVIOUS DESIGNS

Although definitives for Dining Facilities have been superseded, Definitives 1286674, 75, 76, and 77 were used for reference during design of interior functions and equipment layout. The scope of the modernization of the facilities does not warrant use of existing definitives.

SPECIAL DESIGN CHARACTERISTICS

Floor Plan: Existing building layout limited modernization approach. However, new locations for entries, toilets, serving line equipment and sculleries are proposed in order to relieve present internal cross traffic patterns of inefficiency.

Ventilation: Heat, humidity and odors produced during facility use require new ventilation in following areas: Bakery, Pot Wash, Scullery, Food Service, Garbage Rooms, Toilets and Attics above air conditioned spaces.

Air Conditioning is provided for all dining areas, salad prep areas, and offices.

Finishes: Terrazzo floors and quarry tile floor and wainscots are planned for all major spaces not presently finished as such in order to create sanitary and easily maintainable surfaces.

ENERGY CONSERVATION AND SOLAR ENERGY

1. Energy Conservation: The following energy conservation measures were considered and analyzed for the design of this building:

    a. Insulation in wall: The benefit/cost was computed for two (2) representative buildings, M424 and 508, using Trace computer program to determine the reduction in building heating and cooling loads due to installation of additional insulation in the wall. Results are tabulated in "Summary of Energy Conservation Analysis."

b. Insulation in Attic: The benefit/cost was computed for two (2) representative buildings, M424 and 508, using Trace computer program to determine the reduction in building heating and cooling loads due to installation of additional insulation in the attic. Results are tabulated in "Summary of Energy Conservation Analysis."

c. Exhaust Heat Recovery: A run around coil was considered for computing exhaust heat recovery from scullery to preheat outside air makeup for buildings M424 and 508. System CFM not of feasible capacity. Kitchen hoods use untempered makeup air with only 20 percent tempered air from dining.

d. Hot Water Recovery: Heat recovery from pot sink and dish machines was considered for preheating make-up water for the hot water heater for building M424 and 508. The locations of the various hot water using equipment makes it impractical to collect waste hot water for reclaiming heat. Very long pipe runs, intermediate sumps and pumping to a central location close to the domestic hot water heater will have to be provided so that make-up water can be preheated. This conservation feature is, therefore, not considered feasible.

e. Condensate Heat Recovery: Since condensate is returned back to central system, heat recovery at this use terminal would not be feasible. Condensate recovery would be considered more feasible at the central energy plant.

f. Storm Windows for Existing Windows: Approximately 45 percent of the windows in the dining areas are removed and blocked up for other than energy savings reasons. The balance of the windows in occupied spaces were considered for adding storm windows and were determined to be feasible.

g. Vestibules: Vestibules are proposed for all major entrances and exits by simply adding doors to 10 existing vestibule areas, adding two complete vestibules and maintaining six existing vestibules. No detail analysis was made, since the construction cost was so small.

2. Solar Energy: The feasibility of Solar Energy Systems for the five buildings was determined by the "Solcost" computer program. Two of the five buildings (508, M424), were run on the computer. Two buildings (RR-3, 1209) were nearly identical to the two run. Solar systems to BA-103 (similar shape to 508) were scaled down from building 508 sizes. Domestic hot water is based on people served while space heating is based on area of building.

   Two alternatives were considered: (1) domestic hot water and (2) domestic hot water combined with space heating. The combined system was considered since the design will integrate both aspects into one system.

Each building was determined to be feasible within the limits of Government criteria for solar assisted Domestic Hot Water heating only. See charts indicating Solar Collector Sizing. Listed below is statistical information (totals for all buildings).

a.	Type system included:	DOMESTIC HOT WATER HEATING
b.	Type collector:	Single glazed flat plate
c.	Area collector, all buildings:	1,210 square feet
d.	Systems cost, all buildings:	$61,463
e.	Annual energy savings:	Barrels of oil equivalent = 44.5
f.	Percent energy contribution from solar system to DHW Heat:	83%
g.	Payback:	9 years
h.	System design cost:	$30,000

The combined domestic hot water and space heating system is not economically feasible.

3. An economic study was made to provide a basis for selection of an HVAC system. A Variable Temperature Constant Volume System was compared with a Variable Air Volume System with Reheat serving Dining Areas, Packaged Terminal Air Conditioning Units serving certain support areas and Perimeter Radiation serving total building except for areas served by Variable Air Volume System with Reheat.

   Analysis proved that the Variable Temperature Constant Volume Systems will provide a lower present worth.

4. Energy Monitoring and Control System (EMCS):

   a. Camp Lejeune's present EMCS is set up to operate or monitor the following:

      1) Stop and start of each air conditioning unit.
      2) Room supply air flow status.
      3) Room temperature of each area.

   b. Telephone lines are used for transmission of signal from each building to the master monitoring unit (CPU).

   c. Each building will require a field panel to be installed.

   d. The electric power, steam and fire alarm system are not to be monitored at this time.

5. Energy Summary: The analysis of energy conserving measures (listed on Energy Analysis Summary) indicates feasibility of several features:

   a. The following features are feasible and have been incorporated into the project, and the cost is included in the building costs:

1) Insulation of walls of AC space
2) Insulation of ceiling of AC space
3) Solar assisted domestic hot water heating
4) Storm windows

b. The following features are not feasible and have not been incorporated into the project:

1) Hot water recovery
2) Exhaust air heat recovery
3) Condensate heat recovery
4) Solar space heating

POLLUTION ABATEMENT ASPECTS OF DESIGN

No pollution of air, water, noise, erosion, etc., is anticipated resulting from the work proposed in this project; therefore, no need for permits from authorities in this regard is anticipated.

Additional toilet fixtures added to each building will be tied into the existing building sewer, therefore negating the need to tie into sanitary sewer at additional connection points. The additional quantity of discharge for each building is anticipated as identified below:

Building 1209	3240 GPD
Building M424	3240 GPD
Building 508	1620 GPD
Building RR3	1620 GPD
Building BA103	810 GPD

The additional discharge is anticipated to be absorbed within the existing sanitary sewers and the effluent is anticipated to be handled by existing treatment plant.

SITE APPROVAL

The five separate sites involved with this project have been approved as described in letter CMC, LFF-1-AJR:bab of January 11, 1980.

ECONOMIC ANALYSIS

Economic analyses were done on two Base Buildings M424 and 508 for the considerations mentioned in the ENERGY SUMMARY. Since Building 1209 is similar to M424, it is deduced that all energy conservation measures applicable to M424 can be used for Building 1209. Similarly, Building 508 measures are applicable to RR3. Since Building BA103 is also similar to 508 and half as large in area as 508, energy conservation measures are applied to this building, providing half the credit that can be obtained

from conservation and solar contributions. The building loads for the base buildings are calculated on a Trace program, and economic analyses of system type and equipment to be used for the heating, ventilating, and air conditioning for these base buildings are selected based on a TRACE computer program.

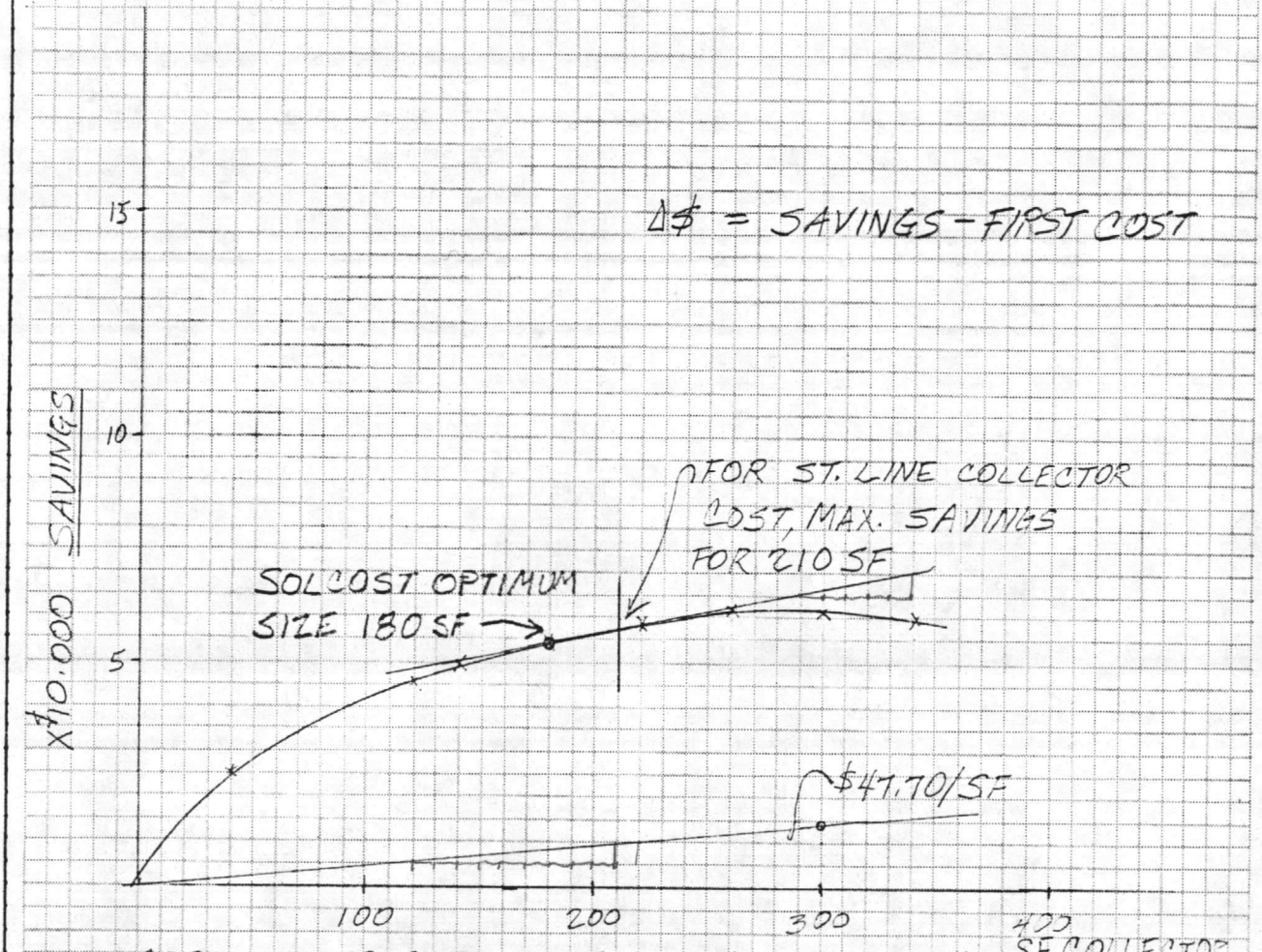
SPECIAL ENGINEERING SERVICES

None Required.

CONTINGENCY ALLOWANCE

A 10% contingency allowance is considered as necessary at this phase of design since the project involves remodeling of (5) individual buildings over 30 years old.

LCS = ENERGY REQD X ENERGY COST X PRESENT VALUE FACTOR
= 78.84 X 10^6 BTU/YR X 12.53 $/10^6$ BTU X 80.23
= 79,256.



AREA	FIRST COST	f	SAVINGS	Δ$
40	1908	.284	22509	20601
80	3816	.495	39232	35416
120	5724	.656	51992	46268
140	6678	.722	57223	50545
180	8586	.828	65624	57038
220	10494	.903	71568	61074
260	12402	.950	75293	62891
300	14310	.970	76879	62569
340	16218	.983	77900	61691

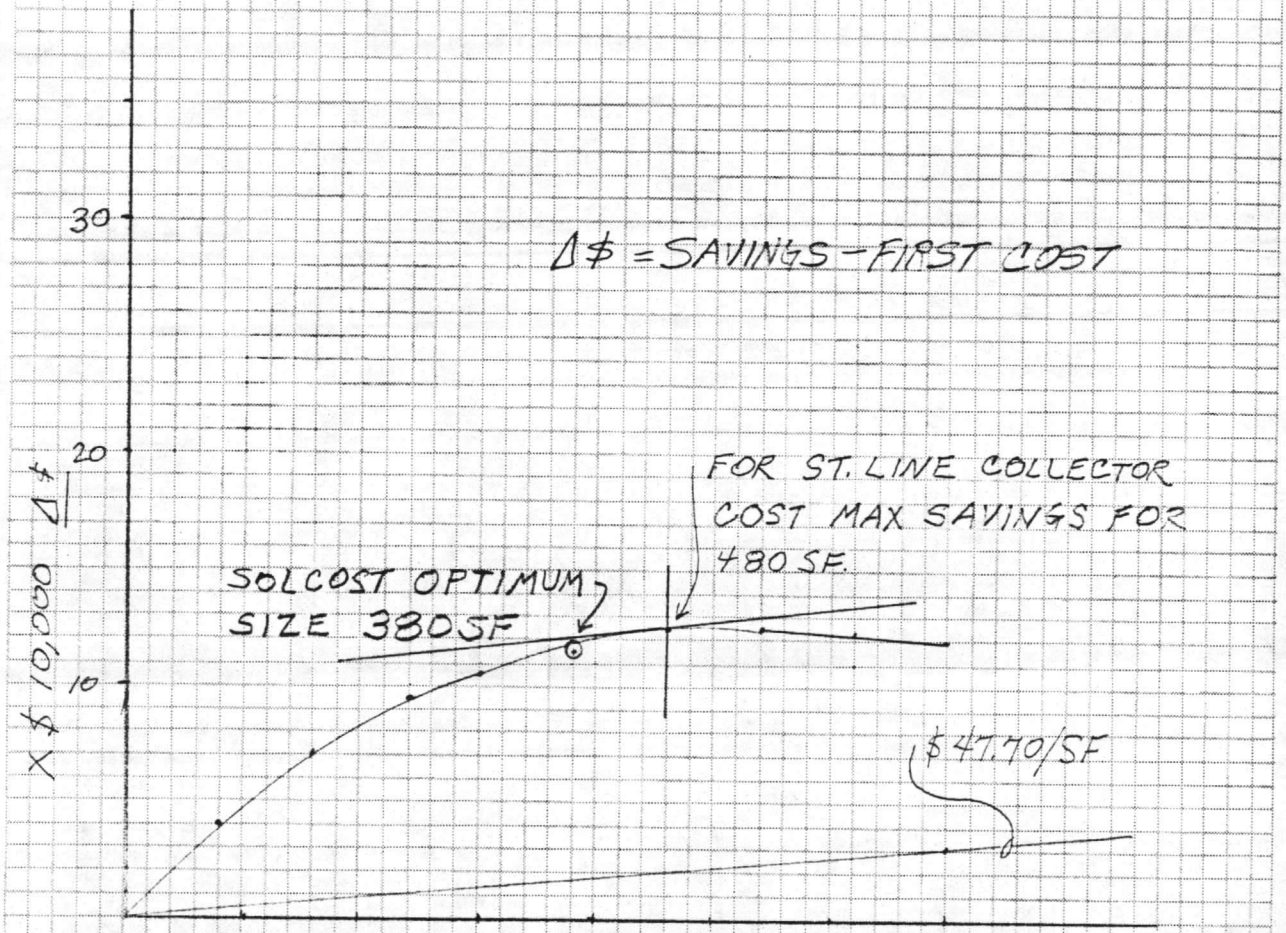
SOLAR COLLECTOR SIZING

ODELL ASSOCIATES, INC.
ARCHITECTS CHARLOTTE, N. C.

CAMP LEJEUNE DIVING FAC
BUILDING 503 & RES

DATE _____ JOB NO. 1412
BY TM SHEET ____ OF ____

LCS = ENERGY REQD. X ENERGY COST X PRESENT VALUE FACTOR
= 157.68 X BTU/YR X $12.53 MIL BTU X 80.23
= $158,513



AREA	FIRST COST	f	SAVINGS	Δ$.
80	3822	.283	44859	41037
160	7643	.496	78623	70980
240	11465	.662	104936	93471
300	14331	.760	120470	106139
380	18152	.859	136163	118011
460	21974	.931	147576	125602
540	25796	.960	152173	126377
620	29617	.979	155184	125567
700	33439	.989	156770	123331

SOLAR COLLECTOR SIZING

ODELL ASSOCIATES, INC.
ARCHITECTS CHARLOTTE, N. C.

CAMP LE JEUNE DINING FAC. BUILDING M424 & 1209

DATE _____ JOB NO. 1412
BY TN SHEET ____ OF ____

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDING BA 103

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 2054 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current = 1157 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 43.8 (Percent reduction in energy consumption current year vs. existing situation)

ECC=634,400 (Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 153 *(Barrels of Fuel Oil Saved, Current Design vs. 1975)
5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000)
1.	Insulate Walls	129	-24.	5.38	1,925	6.3	148,476	6.3	7.2	641.6
2.	Insulate Ceiling	692	-154.	4.49	1,233	33.7	95,102	40.0	6.0	647.6
3.	Storm Windows	57	-23.	2.47	1,176	2.8	90,706	42.8	1.4	649
4.	Solar Domestic HW	19	-28.	0.67	1,157	1.0	89,240	43.8	5.0	654

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDINGS 1209, M424, 508, RR-3 AND BA103

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 17,200 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current = 9467 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 44.9 (Percent reduction in energy consumption current year vs. existing situation)

ECC=4,604,900(Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 1360 *(Barrels of Fuel Oil Saved, Current Design vs. 1975)
5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000)
1.	Insulate Walls	1,189	-204.	5.82	16011	6.9	155,484	6.9	82.1	4,687
2.	Insulate Ceiling	5,694	-1262.	4.51	10317	33.1	100,189	40.0	69.2	4,757
3.	Storm Windows	591	-139.	4.25	9726	3.4	94,450	43.4	15.5	4,773.5
4.	Solar Domestic HW	259	-384.	.67	9467	1.5	91,934	44.9	61.5	4,835

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDING 1209

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 3708 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current = 2179 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 41.2 (Percent reduction in energy consumption current year vs. existing situation)

ECC = 1,094,700 (Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 295 *(Barrels of Fuel Oil Saved, Current Design vs. 1975)
5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000)
1.	Insulate Walls	272	-42.	6.47	3,436	7.3	152,507	7.3	23.2	1,117.9
2.	Storm Windows	154	-33.	4.66	3,282	4.1	145,672	11.4	4.3	1,122.2
3.	Insulate Ceiling	1,022	-224.	4.56	2,260	27.5	100,310	38.9	14.7	1,136.9
4.	Solar Domestic HW	81	-121.	.67	2,179	2.2	96,715	41.2	18.1	1,155

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDING M424

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 3900 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current = 2179 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 44.1 (Percent reduction in energy consumption current year vs. existing situation)

ECC=1,207,000(Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 295 *(Barrels of Fuel Oil Saved, Current Design vs. 1975) 5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000)
1.	Insulate Walls	272	-42.	6.47	3,628	7.0	161,030	7.0	23.2	1,230.2
2.	Storm Windows	154	-33.	4.66	3,474	3.9	154,194	10.9	4.3	1,234.5
3.	Insulate Ceiling	1,214	-266.	4.56	2,260	31.1	100,311	42.0	17.4	1,251.9
4.	Solar Domestic HW	81	-121.	.67	2,179	2.1	96,715	44.1	18.1	1,270

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDING 508

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 3769 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current =1976 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 47.5 (Percent reduction in energy consumption current year vs. existing situation)

ECC=942,400 (Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) =307 *(Barrels of Fuel Oil Saved, Current Design vs. 1975) 5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000)
1.	Insulate Walls	258	-48.	5.38	3,511	6.8	156,218	6.8	14.2	956.6
2.	Storm Windows	113	-25.	4.52	3,398	3.0	151,190	9.8	2.8	959.4
3.	Insulate Ceiling	1,383	-309.	4.47	2,015	36.7	89,655	46.5	15.5	974.9
4.	Solar Domestic HW	39	-57.	.68	1,976	1.0	87,920	47.5	10.1	985

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDING RR-3

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 3769 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current = 1976 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 47.5 (Percent reduction in energy consumption current year vs. existing situation)

ECC=725,400(Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 307 *(Barrels of Fuel Oil Saved, Current Design vs. 1975)
5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption / Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000)
1.	Insulate Walls	258	-48.0	5.38	3,511	6.8	156,218	6.8	14.2	739.6
2.	Storm Windows	113	-25.	4.52	3,398	3.0	151,190	9.8	2.8	742.4
3.	Insulate Ceiling	1,383	-309.	4.47	2,015	36.7	89,655	46.5	15.5	757.9
4.	Solar Domestic HW	39	-57.0	.68	1,976	1.0	87,920	47.5	10.1	768

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 1209; BUILDING M424

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Variable temp. constant volume split system, packaged terminal A/C and Fin. Rad.

ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$101,181			$101,181
OPERATIONS Elec.		$51,794	18.049	934,830
OPERATIONS Steam (oil)		25,502	20.050	511,315
MAINTENANCE		2,321	9.524	22,105
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $1,569,431 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $164,787

ALTERNATIVE B Variable air volume with reheat, packaged terminal A/C and Fin. Rad.

ECONOMIC LIFE _____ YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$163,601			$163,601
OPERATIONS Elec.		$52,183	18.049	941,851
OPERATIONS Steam (oil)		25,372	20.050	508,709
MAINTENANCE		2,453	9.524	23,362
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $1,637,523 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $171,936

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - 1,569,431
Alt. B - 1,637,523
L.C.C. - 68,092
- 68×10^3

$$S.I.R. = \frac{1,637,523}{1,569,431} = 1.04$$

Encl 7

BUILDING 1209 and BUILDING M424 - VTCV/VAV
DESIGN ANALYSIS

1. Investment Costs: From back-up estimates (PED level).

2. Energy Cost:

	FY 80		FY 81	FY 82	
Steam (Oil) -	$9.27/MIL BTU	x 1.04 x	1.14 x	1.14 =	$12.53/MIL BTU
Elec. -	$0.0296	x 1.04 x	1.13 x	1.13 =	$0.04/KWH

3. Operating Expenses: From Energy Analysis

Alternate A (Page 18)
Elec. - 1,294,853 KWH x $0.04/KWH = $51,794
Steam - 20,353 x 0.1 MIL BTUS/THERM x $12.53/MIL BTU = $25,502

Alternate B (Page 19)
Elec. - 1,304,568 KWH x $0.04/KWH = $52,183
Steam - 20,249 THERMS x 0.1 MIL BTUS/THERM x 12.53/MIL BTU = $25,372

4. Maintenance:

Alternate A - $2,321
Alternate B - $2,453

5. Uniform Annual Cost = $\frac{\text{TOTAL PRESENT VALUE}}{\text{0\% INFL. @ 10\% DISC. FACTOR}}$

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 1209; BUILDING M424

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Storm Windows — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$4,293			$4,293
OPERATIONS Steam		0		
Elec.		0		
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 4,293 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $451

ALTERNATIVE B No Storm Windows — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	0			0
OPERATIONS Steam Savings		$1,442	20.05	$28,912
Elec. Savings		453	18.049	8,176
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 37,088 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $3,894

REMARKS

Alternative "A" is feasible due to lower total present value than "B".

Life Cycle Cost
Alt. A - 4,293
Alt. B - 37,088
L.C.C. - 32,795
$= 33 \times 10^3$

$$S.I.R. = \frac{37,088}{4,293} = 8.64$$

Encl 7

BUILDING 1209 and BUILDING M424 - STORMS

Total Window Area (Heating) = 1,596 SF
(Cooling) = 1,281 SF
Savings from Storm Windows

1. Winter Savings
Reduction in Infiltration x ΔT x 1.08 x SF Window
+ Reduction in Transmission x ΔT x SF Window
= 0.5(1.6 - 0.8) CFM/SF x (68 - 23) x 1.08 x 1,596 SF
+ (1.04 - 0.54) x (68 - 23) x 1,596 SF
= 66,936 BTUH
Annual Savings in BTU's

$$\frac{2901 \text{ HDD} \times 24 \times 66{,}936}{(68 - 23) \times .90(\text{Effy.})} = 115.07 \text{ MIL BTU/YR.}$$

Annual Dollar Savings
$12.53/MIL BTUS x 115.07 MIL BTU/YR. = $1,442

2. Summer Savings
Reduction in Infiltration x ΔH x 4.45 x SF Window
+ Reduction in Transmission x ΔT x SF Window
= 0.5(0.8 - 0.4) CFM/SF x 12. x 4.45 x 1,281 SF
+ (1.04 - 0.54) x (90 - 78) x 1,281 SF
= 21,367 BTUH
Annual Savings in BTU's

$$\frac{1810 \text{ CDD} \times 21{,}367 \text{ BTUH}}{3{,}413 \text{ KWH/BTU}} = 11{,}331 \text{ KWH}$$
or 38.67 MIL BTU/YR

Annual Dollar Savings
$0.04/KWH x 11,331 KWH = $453

3. Total Annual Savings from Storm Windows
$1,442 + $453 = $1,895

4. Cost of Storm Windows
Jan 80 Jun 80 Jan 82
$2.27/SF x 1.036 x 1.143 = $2.69 represents cost to add storms to proposed cost for screens under equipment section.
Installation Cost of Storm Windows
1,596 SF x $2.69/SF = $4,293

5. Discount Factor - Use 20.050 for 25 years for oil, 8%; and use 18.049 for 25 years for electricity, 7%.

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING M424

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Add insulation above ceiling — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$17,437			$17,437
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 17,437 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $1,831

ALTERNATIVE B Continue to operate with current losses — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	0			0
OPERATIONS Steam		$8,305	20.05	$166,515
OPERATIONS Elec.		6,457	18.049	116,542
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 283,057 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $29,720

REMARKS

Alternative "A" is feasible due to lower total present value.

Life Cycle Cost
Alt. A - $ 17,437
Alt. B - 283,057
L.C.C. - 265,620
- 266×10^3

$$S.I.R. = \frac{283,057}{17,437} = 16.23$$

Encl 7

BUILDING M424

1. Additional insulation above ceiling
Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Roof Area SF over heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Roof Area SF over A/C space

$U_{Exist.}$ = 0.44 BTU/HR^{o}F.SF U_{New} = 0.05 BTU/HR^{o}F.SF

From Trace
Heat Loss with U_{New} (.05) = 49,427 BTUH
Heat Loss with $U_{Exist.}$ (.44)
$\frac{49,427 \times .44}{.05}$ = 434,958 BTUH
Winter Energy Saved = 385,531 BTUH

Annual Savings in BTU's
$\frac{2901 \text{ HDD} \times 24 \times 385,531 \text{ BTUH}}{(68 - 23) \times .90 \text{ (Effy.)}}$ = 662.77 MIL BTU/YR.

Annual Dollar Savings
$12.53/MIL BTUS x 662.77 MIL BTUS/YR. = $8,305

From Trace
Heat Gain with U_{New} (.05) = 39,027 BTUH
Heat Gain with $U_{Exist.}$ (.44)
$\frac{39,027 \times .44}{.05}$ = 343,438 BTUH
Summer Energy Saved = 304,411 BTUH

Annual Savings in BTU's
$\frac{1810 \text{ CDD} \times 304,411 \text{ BTUH}}{3,413 \text{ KWH/BTU}}$ = 161,437 KWH/YR.
or 551 MIL BTU/YR.

Annual Dollar Savings
$0.04/KWH x 161,437 KWH = $6,457

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 1209

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Add insulation above ceiling — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$14,670			$14,670
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 14,670 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $1,540

ALTERNATIVE B Continue to operate with current losses — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	0			0
OPERATIONS Steam		$6,988	20.05	$140,109
OPERATIONS Elec.		5,434	18.049	98,078
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 238,187 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $25,009

REMARKS

Alternative "A" is feasible due to lower total present value.

Life Cycle Cost
Alt. A - $ 14,670
Alt. B - 238,187
L.C.C. - 223,517
- 224×10^3

$$S.I.R. = \frac{238,187}{14,670} = 16.24$$

Encl 7

BUILDING 1209

1. Additional insulation above ceiling
Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Roof Area SF over heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Roof Area SF over A/C space

$U_{Exist.}$ = 0.44 BTU/HR^{o}F.SF U_{New} = 0.05 BTU/HR^{o}F.SF

From Trace (for Bldg. M424)
Heat Loss with U_{New} (.05) = 49,427 BTUH
Heat Loss with $U_{Exist.}$ (.44)
$\frac{49,427 \times .44}{.05}$ = 434,958 BTUH
Winter Energy Saved = 385,531 BTUH

Annual Savings in BTU's
$\frac{2901 \text{ HDD} \times 24 \times 385,531 \text{ BTUH}}{(68 - 23) \times .90 \text{ (Effy.)}}$ = 662.77 MIL BTU/YR.

or

$\frac{12,736SF}{15,136SF} \times 662.77$ = 557.78 MIL BTU/YR. for Bldg. 1209

Annual Dollar Savings
$12.53/MIL BTUS x 557.68 MIL BTUS/YR. = $6,988

From Trace
Heat Gain with U_{New} (.05) = 39,027 BTUH
Heat Gain with $U_{Exist.}$ (.44)
$\frac{39,027 \times .44}{.05}$ = 343,438 BTUH
Summer Energy Saved = 304,411 BTUH

Annual Savings in BTU's
$\frac{1810 \text{ CDD} \times 304,411 \text{ BTUH}}{3,413 \text{ KWH/BTU}}$ = 161,437 KWH/YR.

or

$\frac{12,736SF}{15,136SF} \times 161,437$ = 135,839 KWH/YR. or 464 MIL BTU/YR.

Annual Dollar Savings
$0.04/KWH x 135,839 KWH = $5,434

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 1209; BUILDING M424

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Insulate exterior walls — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$23,232			$23,232
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 23,232 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $2,439

ALTERNATIVE B Continue to operate with current losses — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam		$2,468	20.05	$49,483
OPERATIONS Elec.		882	18.049	15,919
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 65,402 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $6,867

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $23,232
Alt. B - 65,402
L.C.C. - 42,170
- $ 42 x 10^3

$$S.I.R. = \frac{65,402}{23,232} = 2.82$$

Encl 7

BUILDING 1209 and BUILDING M424

2. Additional insulation in walls
Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Wall Area SF across heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Wall Area SF across A/C space

$U_{Exist.}$ = 0.35 BTU/HR^{o}F.SF U_{New} = 0.15 BTU/HR^{o}F.SF

From Trace
Heat Loss with U_{New} (.15) = 85,932 BTUH
Heat Loss with $U_{Exist.}$ (.35)
$\frac{85,932 \times .35}{.15}$ = 200,508 BTUH
Energy Saved for Heating = 114,575 BTUH

Annual Energy Savings
$\frac{2901 \text{ HDD} \times 24 \times 114,575 \text{ BTUH}}{(68 - 23) \times .90 \text{(Effy.)}}$ = 196.97 MIL.BTU/YR.

Annual Dollar Savings
$12.53/MIL BTUS x 196.97 MIL BTUS/YR. = $2,468

From Trace
Heat Gain with U_{New} (.15) = 31,166 BTUH
Heat Gain with $U_{Exist.}$ (.35)
$\frac{31,166 \times .35}{.15}$ = 72,721 BTUH
Energy Saved for Cooling = 41,555 BTUH

Annual Energy Savings
$\frac{1810 \text{ CDD} \times 41,555 \text{ BTUH}}{3,413}$ = 22,038 KWH/YR
or 75.22 MIL BTU/YR.

Annual Dollar Savings
$0.04/KWH x 22,038 KWH = $882

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 1209 and BUILDING M424

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A: Solar Domestic Hot Water — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	18,125			18,125
OPERATIONS Oil (Steam)		244	80.23	19,581
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 37,706 ÷ DISCOUNT FACTOR = UNIFORM ANNUAL COST

ALTERNATIVE B: Conventional Steam — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Oil (Steam)		1,976	80.23	158,534
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 158,534 ÷ DISCOUNT FACTOR = UNIFORM ANNUAL COST

REMARKS

Alternate A is feasible.

Life Cycle Cost
Alt. A - $ 37,706
Alt. B - 158,534
L.C.C. - 120,828
- $121 x 10^3

$$\text{S.I.R.} = \frac{158,534}{37,706} = 4.2$$

$$\text{Payback} = \frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{18,125}{1,732} = 10.5$$

From Enclosure 14 = Less than 8 years.

Encl 7

BUILDING 1209 AND BUILDING M424 - SOLAR DHW
SOLAR ANALYSIS

1. Investment Cost: Back-up estimate esc. to 1 January 82.

2. Energy Cost: FY 80 FY 81 FY 82
Steam (Oil) $9.27/Mil BTU x 1.04 x 1.14 x 1.14 = 12.53/Mil BTU

3. Energy Consumption
Alternate A
Auxiliary Energy Required = 19.44 MBTU/YR*
Cost of Aux. Energy 19.44 x 12.53 = $244

Alternate B
Conventional Energy Required = 157.68 MBTU/YR*
Cost of Conventional Energy = 157.68 x 12.53 = $1,976

4. Discount Factor - Use 80.23 for 25 years for oil from enclosure 14 (FY 82)

5. Payback = $\frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{18,125}{1,732} = 10.5$

From Enclosure 14 = Less Than 8 years.

* Refer to SOLCOST analysis

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 508 and BUILDING RR3

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES
See Below

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Variable temperature constant volume split system, packaged terminal A/C and Fin. Rad.

ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$87,249			$ 87,249
OPERATIONS Elec.		$51,836	18.049	935,588
OPERATIONS Steam (oil)		21,914	20.050	439,376
MAINTENANCE		2,213	9.524	21,077
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 1,483,290 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $155,742

ALTERNATIVE B Variable air volume with reheat air cooled chiller, packaged terminal A/C and Fin. Rad.

ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$145,487			$145,487
OPERATIONS Elec.		$52,801	18.049	953,005
OPERATIONS Steam (oil)		21,891	20.050	438,915
MAINTENANCE		2,397	9.524	22,829
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 1,560,236 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $163,822

REMARKS

Alternative "A" is feasible.

Life Cycle Cost
Alt. A - $1,483,290
Alt. B - 1,560,236
L.C.C. - $ 76,946
- 77 x 10^3

$$S.I.R. = \frac{1,560,236}{1,483,290} = 1.05$$

Encl 7

BUILDING 508; BUILDING RR-3 - VTCV/VAV
DESIGN ANALYSIS

1. Investment Costs: From back-up estimates (PED Level).

2. Energy Cost:

	FY 80		FY 81	FY 82	
Steam (Oil)	$9.27/MIL BTU	X 1.04	X 1.14	X 1.14	= $12.53/MIL BTU
Elec.	$0.0296	X 1.04	X 1.13	X 1.13	= $0.04/KWH

3. Operating Expenses: From Energy Analysis

Alternate A:
Elec. - 1,295,902 KWH X $0.04/KWH = $51,836
Steam - 17,489 Therms X 0.1 MIL BTU/THERM X $12.53/MIL BTU = $21,914

Alternate B:
Elec. - 1,320,024 KWH X $0.04/KWH = $52,801
Steam - 17,471 THERMS X 0.1 MIL BTU/THERM X 12.53/MIL BTU = $21,891

4. Maintenance:

Alternate A - $2,213

Alternate B - $2,397

5. Uniform Annual Cost = $\frac{\text{TOTAL PRESENT VALUE}}{\text{0\% INFL. @ 10\% DISC. FACTOR}}$

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 508; BUILDING RR-3

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Storm Windows — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$2,763			$2,763
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 2,763 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST 290

ALTERNATIVE B No Storm Windows — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS		$1,143	20.05	$22,917
MAINTENANCE		254	18.049	4,584
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 27,501 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST 2,886

REMARKS Alternative A is feasible due to lower present value than B.

Life Cycle Cost
Alt. A - $ 2,763
Alt. B - 27,501
L.C.C. - $24,738
- $25 x 10^3

$$S.I.R. = \frac{27,501}{2,763} = 9.95$$

Encl 7

BUILDING 508 and BUILDING RR-3 - Storms

TOTAL WINDOW AREA (Heating) = 1,027 SF
(Cooling) = 759 SF

SAVINGS FROM STORM WINDOWS

1. Winter Savings:

Reduction in Infiltration x ΔT x 1.08 x SF Window
+ Reduction in Transmission x ΔT x SF Window
= 0.5(2.4 - 1.2) CFM/SF x (68 - 23) x 1.08 x 1,027
+ (1.04 - 0.54) x (68 - 23) x 1,027 SF
= 53,055 BTUH

ANNUAL SAVINGS IN BTU's

$$\frac{2901 \text{ HDD} \times 24 \times 53{,}055}{(68 - 23) \times .90(\text{Effy.})} = 91.21 \text{ MIL BTU/YR.}$$

ANNUAL DOLLAR SAVINGS
$12.53/MIL BTU's x 91.21 MIL BTU/YR. = $1,143

2. Summer Savings:

Reduction in Infiltration x ΔH x 4.45 x SF Window
+ Reduction in Transmission x ΔT x SF Window
= 0.5(1.2 - 0.6) CFM/SF x 12 x 4.45 x 759 SF
+ (1.04 - 0.54) x (68 - 23) x 759 SF
= 11,958 BTUH

ANNUAL SAVINGS IN BTU's

$$\frac{1810 \text{ CDD} \times 11{,}958 \text{ BTUH}}{3{,}413 \text{ KWH/BTU}} = 6{,}342.\text{KWH} \text{ or } 21.6 \text{ MIL BTU/YR.}$$

ANNUAL DOLLAR SAVINGS
$0.04/KWH x 6,342 KWH = $254

3. Total Annual Savings from Storm Windows
$1,143 + $254 = $1,397

4. Cost of Storm Windows

Jan 80	Jun 80	Jan 82	
$2.27/SF x	1.036 x	1.142 =	$2.69

represents cost to add storms to proposed cost for screens under equipment section.

INSTALLATION COST OF STORM WINDOWS
1,027 SF x $2.69/SF = $2,763

5. Discount Factor - Use 20.050 for 25 years for oil, 8%; and use 18.049 for 25 years for electricity, 7%.

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 508; BUILDING RR-3

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Add insulation in ceiling — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$15,538			$15,538
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 15,538 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $1,631

ALTERNATIVE B Continue to operate with current losses — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam (oil)		$8,915	20.05	$182,758
OPERATIONS Elec.		7,874	18.049	142,118
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 324,876 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $34,111

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $ 15,538
Alt. B - 324,876
L.C.C. - $309,338
- $309 x 10^3

$$S.I.R. = \frac{324,876}{15,538} = 20.91$$

Encl 7

BUILDING 508 and BUILDING RR-3

1. Additional insulation above ceiling
Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Roof Area SF over heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Roof Area SF over A/C space

$U_{Exist.}$ = 0.44 BTU/HR^{o}F. SF U_{New} = 0.05 BTU/HR^{o}F. SF

From Trace
Heat Loss with U_{New} (.05) = 53,060 BTUH
Heat Loss with $U_{Exist.}$ (.44)

$$\frac{53,060 \times .44}{.05} = 466,928 \text{ BTUH}$$

Winter Energy Saved = 413,868 BTUH

Annual Savings in BTU's

$$\frac{2901 \text{ HDD} \times 24 \times 413,868 \text{ BTUH}}{(68 - 23) \times .90(\text{Effy.})} = 711.48 \text{ MIL BTU/YR.}$$

Annual Dollar Savings
$12.53/MIL BTUS x 711.48 MIL BTUS/YR. = $8,915

From Trace
Heat Gain with U_{New} (.05) = 47,588 BTUH
Heat Gain with $U_{Exist.}$ (.44)

$$\frac{47,588 \times .44}{.05} = 418,774 \text{ BTUH}$$

Summer Energy Saved = 371,186 BTUH

Annual Savings in BTU's

$$\frac{1810 \text{ CDD} \times 371,186 \text{ BTUH}}{3,413 \text{ KWH/BTU}} = 196,850 \text{ KWH/YR.}$$

or 671.85 MIL BTU/YR.

Annual Dollar Savings
$0.04/KWH x 196,850 KWH = $7,874

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 508; BUILDING RR-3

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Add insulation in walls — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$14,206			$14,206
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 14,206 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $1,492

ALTERNATIVE B Continue to operate with current losses — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam (oil)		$2,252	20.05	$45,153
OPERATIONS Elec.		922	18.049	16,641
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 61,794 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $6,488

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $14,206
Alt. B - 61,794
L.C.C. - $47,588
- $48 x 10^3

S.I.R. = $\frac{61,794}{14,206} = 4.35$

Encl 7

BUILDING 508 and BUILDING RR-3

2. Additional insulation in walls

Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Wall Area SF across heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Wall Area SF across A/C space

$U_{Exist.}$ = 0.35 BTU/HR^{o}F.SF. U_{New} = 0.15 BTU/HR^{o}F.SF.

From Trace

Heat Loss with U_{New} (.15) = 78,402 BTUH

Heat Loss with $U_{Exist.}$ (.35)

$$\frac{78,402 \times .35}{.15} = 182,938 \text{ BTUH}$$

Energy Saved for Heating = 104,536 BTUH

Annual Energy Savings

$$\frac{2901 \text{ HDD} \times 24 \times 104,586 \text{ BTUH}}{(68 - 23) \times .90(\text{Effy.})} = 179.71 \text{ MIL BTU/YR.}$$

Annual Dollar Savings

\$12.53/MIL BTUS x 179.71 MIL BTU/YR. = \$2,252

From Trace

Heat Gain with U_{New} (.15) = 32,586 BTUH

Heat Gain with $U_{Exist.}$ (.35)

$$\frac{32,586 \times .35}{.15} = 76,034 \text{ BTUH}$$

Energy Saved for Cooling = 43,448 BTUH

Annual Energy Savings

$$\frac{1810 \text{ CDD} \times 43,448 \text{ BTU}}{3,413} = 23,042 \text{ KWH/YR.}$$

78.64 MIL BTU/YR.

Annual Dollar Savings

\$0.04/KWH x 23,042 KWH = \$922

ECONOMIC ANALYSIS OF SHORE FACILITY

Building 508 and Building RR3

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Solar Domestic Hot Water Heating — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	10,087			10,087
OPERATIONS		149	80.23	11,954
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 22,041 ÷ DISCOUNT FACTOR _____ = UNIFORM ANNUAL COST _____

ALTERNATIVE B Operate Domestic Hot Water System with Hot Water Generator Using Steam — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS		988	80.23	79,267
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 79,267 ÷ DISCOUNT FACTOR _____ = UNIFORM ANNUAL COST _____

REMARKS

Alternate "A" is feasible.
Life Cycle Cost
Alt. A - $22,041
Alt. B - 79,269
L.C.C. - 57,228
- $57 x 10^3

$$S.I.R. = \frac{79,267}{22,041} = 3.60$$

$$Payback = \frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{5043}{419} = 12.02$$

From Enclosure 14 = Less than 9 years.

Encl 7

BUILDING 508 AND BUILDING RR3 - SOLAR DHW
SOLAR ANALYSIS

1. Investment cost: Back-up estimate esc. to 1 January 82.

2. Energy Cost: FY 80 FY 81 FY 82
Steam (oil) $9.27/MIL BTU x 1.04 x 1.14 x 1.14 = 12.53/MIL BTU.

3. Energy Consumption
Alternate A
Auxiliary Energy Required = 11.93 MBTU/YR*
Cost of Aux. Energy = 11.93 x 12.53 = $149

Alternate B
Conventional Energy Required = 78.84 MBTU/YR*
Cost of Conventional Energy = 78.84 x 12.53 = $988

4. Discount Factor - use 80.23 for 25 years for oil from enclosure 14 (FY 82).

5. Payback = $\frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{10,087}{839} = 12.02$

From Enclosure 14 = Less than 9 years.

* Refer to SOLCOST analysis.

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING BA-103

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Add Storm Windows — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT		$1,383		$1,383
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 1,383 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $145

ALTERNATIVE B _____ ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam (oil)		$572	20.05	$11,526
OPERATIONS Elec.		703	18.049	12,688
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 24,214 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $2,542

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $ 1,383
Alt. B - 24,214
L.C.C. - 22,831
- 23×10^3

$$S.I.R. = \frac{24,214}{1,383} = 17.51$$

Encl 7

BUILDING BA-103 - STORMS
(Glazed Area Considered 1/2 of Building 508)

Total Window Area (Heating) = 514 SF
(Cooling) = 380 SF

Savings From Storm Windows

1. Winter Savings
   Reduction in Infiltration x ΔT x 1.08 x SF Window
   + Reduction in Transmission x ΔT x SF Window
   = 0.5(2.4 - 1.2) CFM/SF x (68 - 23) x 1.08 x 514 SF
   + (1.04 - 0.54) x (68 - 23) x 514 SF
   = 26,553 BTUH
   Annual Savings in BTU's

$$\frac{2901 \text{ HDD} \times 24 \times 26{,}553}{(68 - 23) \times .90 \text{ (Effy.)}} = 45.65 \text{ MIL BTU/YR.}$$

   Annual Dollar Savings
   $12.53/MIL BTUS x 45.65 MIL BTU/YR. = $572

2. Summer Savings
   Reduction in Infiltration x ΔH x 4.45 x SF Window
   + Reduction in Transmission x ΔT x SF Window
   = 0.5(1.2 - 0.6) CFM/SF x 12 x 4.45 x 380 SF
   + (1.04 - 0.54) x (68 - 23) x 380 SF
   = 6,174 BTUH
   Annual Savings in BTU's

$$\frac{1810 \text{ CDD} \times 6{,}174 \text{ BTUH}}{3{,}413 \text{ KWH/BTU}} = 3{,}274 \text{ KWH}$$
   or 11.17 MIL BTU/YR.

   Annual Dollar Savings
   $0.04/KWH x 3,274 KWH = $131

3. Total Annual Savings from Storm Windows
   $572 + $131 = $703

4. Cost of Storm Windows
   Jan 80 Jun 80 Jan 82
   $2.27/SF x 1.036 x 1.142 = $2.69 represents cost to add storms to proposed cost for screens under equipment section.

   Installation Cost of Storm Windows
   514 SF x $2.69/SF = $1,383

5. Discount Factor - Use 20.050 for 25 years for oil, 8%; and use 18.049 for 25 years for electricity, 7%.

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING BA-103

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A: Add insulation above ceiling — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$6,027			$6,027
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 6,027 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST 633

ALTERNATIVE B: Operate with existing losses — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam (oil)		$4,457	20.05	$89,363
OPERATIONS Elec.		3,937	18.049	71,059
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 160,422 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $16,844

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $ 6,027
Alt. B - 160,422
L.C.C. - 154,395
- $154 x 10^3

$$S.I.R. = \frac{160,422}{6,027} = 26.62$$

Encl 7

BUILDING BA-103

1. Additional insulation above ceiling
Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Roof Area SF over heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Roof Area SF over A/C space

$U_{Exist.}$ = 0.44 BTU/HR^{o}F.SF U_{New} = 0.05 BTU/HR^{o}F.SF

From Trace
Heat Loss with U_{New} (.05) = 26,530 BTUH
Heat Loss with $U_{Exist.}$ (.44)
$\frac{26,530 \times .44}{.05}$ = 233,464 BTUH
Winter Energy Saved = 206,934 BTUH

Annual Savings in BTU's
$\frac{2901 \text{ HDD} \times 24 \times 206,934 \text{ BTUH}}{(68 - 23) \times .90(\text{Effy.})}$ = 355.74 MIL BTU/YR.

Annual Dollar Savings
$12.53/MIL BTUS x 355.74 MIL BTUS/YR. = $4,457

From Trace
Heat Gain with U_{New} (.05) = 23,794 BTUH
Heat Gain with $U_{Exist.}$ (.44)
$\frac{23,794 \times .44}{.05}$ = 209,387 BTUH
Summer Energy Saved = 185,593 BTUH

Annual Savings in BTU's
$\frac{1810 \text{ CDD} \times 185,593 \text{ BTUH}}{3,413 \text{ KWH/BTU}}$ = 98,425 KWH/YR.
or 335.92 MIL BTU/YR.

Annual Dollar Savings
$0.04/KWH x 161,437 KWH = $3,937

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING BA-103

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Insulate exterior walls — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$7,225			$7,225
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 7,225 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $759

ALTERNATIVE B Operate with existing losses. — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam (oil)		$1,126	20.05	$22,576
OPERATIONS Elec.		461	18.049	8,321
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 30,897 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $3,244

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $ 7,225
Alt. B - 30,897
L.C.C. - 23,672
- $24 x 10^3

$$S.I.R. = \frac{30,897}{7,225} = 4.28$$

Encl 7

BUILDING BA-103

2. Additional insulation in walls

Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Wall Area SF across heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Wall Area SF across A/C space

$U_{Exist.}$ = 0.35 BTU/HR^{o}F.SF U_{New} = 0.15 BTU/HR^{o}F.SF

From Trace

Heat Loss with U_{New} (.15) = 39,201 BTUH

Heat Loss with $U_{Exist.}$ (.35)

$$\frac{39,201 \times .35}{.15} = 91,469 \text{ BTUH}$$

Energy Saved for Heating = 52,268 BTUH

Annual Energy Savings

$$\frac{2901 \text{ HDD} \times 24 \times 52,268 \text{ BTUH}}{(68 - 23) \times .90(\text{Effy.})} = 89.86 \text{ MIL BTU/YR.}$$

Annual Dollar Savings

$12.53/MIL BTUS x 89.86 MIL BTUS/YR. = $1,126

From Trace

Heat Gain with U_{New} (.15) = 16,293 BTUH

Heat Gain with $U_{Exist.}$ (.35)

$$\frac{16,293 \times .35}{.15} = 38,017 \text{ BTUH}$$

Energy Saved for Cooling = 21,724 BTUH

Annual Energy Savings

$$\frac{1810 \text{ CDD} \times 21,724 \text{ BTUH}}{3413} = 11,521 \text{ KWH/YR.}$$

or 39.32 MIL BTU/YR.

Annual Dollar Savings

$0.04/KWH x 22,038 KWH = $461

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING BA-103

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Solar Domestic Hot Water

ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$5,043			$5,043
OPERATIONS		$75	80.23	6,017
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 11,060 ÷ DISCOUNT FACTOR _____ = UNIFORM ANNUAL COST _____

ALTERNATIVE B Operate domestic hot water system with hot water generator using steam

ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS		$489	80.23	$39,232
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 39,232 ÷ DISCOUNT FACTOR _____ = UNIFORM ANNUAL COST _____

REMARKS Alternative "A" is feasible.

Life Cycle Cost
Alt. A - $11,060
Alt. B - 39,232
L.C.C. - 28,172
- $28 x 10^3

S.I.R. = $\frac{39,232}{11,060} = 3.55$

Payback = $\frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{10,087}{839} = 12.02$

From Enclosure 14 = Less than 9 years.

Encl 7

BUILDING BA-103 - SOLAR DHW

1. Investment Cost: Back-up estimate escalates to 1 JAN 82.

2. Energy Cost:

		FY 80	FY 81	FY 82	
Steam (oil)	R9.27/MIL BTU	x 1.04	x 1.14	x 1.14	= 12.53/MIL BTU

3. Energy Consumption:

Alternate A:
Auxiliary Energy Required = 5.97 MIL BTU/YR*
Cost of Auxiliary Energy = 5.97 x 12.53 = $75

Alternate B:
Conventional Energy Required = 39.42 MIL BUT/YR*
Cost of Conventional Energy = 39.42 x 12.53 = $494

4. Discount Factor - Use 80.23 for 25 years for oil from enclosure 14(FY 82).

5. Payback = $\frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{5,043}{419} = 12.02$

From Enclosure 14 = Less Than 9 years.

*Refer to Solcost Analysis.

COLLATERAL EQUIPMENT REQUIREMENTS (Initial Outfitting)
5ND LANTDIV 4-11010/6 (NEW 2-79)

DATE: 1 JULY 80

1. ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

2. PROJECT TITLE
DINING FACILITIES MODERNIZATION

P. NO. P-697

COG. SYMBOL AND FED. STOCK NO. OR OTHER SOURCE	ITEM/EQUIPMENT DESCRIPTION	QUAN-TITY	UNIT OF ISSUE	M + L + MV UNIT PRICE	TOTAL COST
1. BUILT-IN EQUIPMENT TO BE MCON FUNDED	*Intercom system amplifiers	5	EA	876	4,380
	*Drinking water coolers	16	EA	804	12,864
	*Venetian blinds	340	EA	138	46,920
	*Window screens	340	EA	37	12,580
	*Serving line vent hood	2	EA	19,106	38,212
	*Soiled ware handling system 1 - ea. Bldg. BA-103 1 - ea. Bldg. 1209 1 - ea. Bldg. RR-3 2 - ea. Bldg. M-424 1 - ea. Bldg. 508	6	EA	56,268	337,608
	*Convection oven 2 - ea. Bldg. BA-103 2 - ea. Bldg. RR-3 2 - ea. Bldg. M-424	6	EA	4,495	26,972
	*Ice machine 1 - ea. Bldg. RR-3 2 - ea. Bldg. M-424	3	EA	3,439	10,318
	*Walk-in cooler doors	8	EA	2,768	22,144
	SUBTOTAL (To 1391)				511,998
	*Equipment with associated installation cost and mark ups and escalation to JAN 82				
2. EXPENSE ITEMS	Building BA-103				
Wasserstorm	Refrigerated display case	1	EA	3,355	3,355
Keating	Grill, electric, 6 ft.	1	EA	2,508	2,508
American Warehouse	Hot food table, mobile	2	EA	1,425	2,850
Keating	Deep fat fryer	1	EA	1,164	1,164
Hobart	Vertical cutter, mixer	1	EA	2,778	2,778

COLLATERAL EQUIPMENT REQUIREMENTS (Initial Outfitting)
5ND LANTDIV 4-11010/6 (NEW 2-79)

DATE: 1 JULY 80

1. ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

2. PROJECT TITLE
DINING FACILITIES MODERNIZATION

P. NO. 697

COG. SYMBOL AND FED. STOCK NO. OR OTHER SOURCE	ITEM/EQUIPMENT DESCRIPTION	QUAN-TITY	UNIT OF ISSUE	UNIT PRICE	TOTAL COST
	SUBTOTAL				12,655
	Building 1209				
Hobart	Vertical cutter, mixer	1	EA	2,777	2,777
	SUBTOTAL				2,777
	Building RR-3				
Hobart	Vertical cutter, mixer	1	EA	2,778	2,778
Wasserstorm	Cold food counters w/sneeze guards	4	EA	1,837	7,348
Keating	Grill, electric, 6 ft.	2	EA	2,508	5,016
	SUBTOTAL				15,142
	Building M-424				
Wasserstorm	Cold food counter w/sneeze guards	4	EA	1,837	7,348
Keating	Grill, electric, 6 ft.	4	EA	2,508	10,032
	SUBTOTAL				17,380
	Building 508				
Keating	Griddle, electric, 6 ft.	2	EA	2,508	5,016
Victory	Reefer, reach in	1	EA	2,310	2,310
	SUBTOTAL				7,326
	Fire Extinguishers for all blds.	24	EA	75	1,800
	TOTAL EXPENSE ITEMS				57,080
	Shipping, packing, handling, installation charges and contingencies - 10%				5,700
3. INVESTMENT ITEMS	NONE				
4. APA EQUIPMENT	NONE				
5. TRAINING EQUIPMENT	NONE				
6. OTHER EXPENSES	NONE				
7. EQUIPMENT ON HAND	NONE				
8. SUMMARY	Expense Cost				62,780

ENERGY ANALYSIS SUMMARY

ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

Const. Contr. No. _____

DATE 1 JULY 80

PROJECT DINING FACILITIES MODERNIZATION

LOCATION MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

☐ PRELIM. ☒ FINAL

DESCRIPTION	REMARKS	BENEFIT/ COST	E/C	YEAR PAYBACK	CURRENT WORKING ESTIMATE	ANNUAL SAVINGS	TOTAL MBTU/YR	( ) MBTU/YR	( ) MBTU/YR	(MBTU/
BUILDING 1209										
1. Storm Windows				3	4,293	1,895	153.74			
2. Ceiling Insulation				2	14,670	12,422	1,021.68			
3. Wall Insulation				7	23,232	3,350	272.19			
4. Solar Dom. HW.				8	18,123	1732	81.29			
5. Solar Htg. & DHW	Solcost calculations proved not feasible.									
6. HW. Recovery	Not practical.									
7. Exhaust Air Heat Recovery	Not practical (analysis not made).									
8. Condensate	Condensate is recovered and is pumped to Central Energy plant (analysis not made).									

ENCLOSURE 6

ENERGY ANALYSIS SUMMARY

ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

Const. Contr. No. _____

DATE 1 JULY 80

PROJECT DINING FACILITIES MODERNIZATION

LOCATION MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

☐ PRELIM. ☒ FINAL

DESCRIPTION	REMARKS	BENEFIT/ COST	E/C	YEAR PAYBACK	CURRENT WORKING ESTIMATE	ANNUAL SAVINGS	TOTAL MBTU/YR	( ) MBTU/YR	( ) MBTU/YR	(MBTU/
BUILDING M424										
1. Storm Windows				3	4,293	1,895	153.74			
2. Ceiling Insulation				1	17,437	14,762	1213.77			
3. Wall Insulation				7	23,232	3,350	272.19			
4. Solar Dom. HW.				8	18,123	1,732	81.29			
5. Solar Htg. & DHW	Solcost Calculation proved not feasible									
6. HW. Recovery	Not practical									
7. Exhaust Air Heat Recovery	Not practical (analysis not made)									
8. Condensate	Condensate is recovered and is pumped to Central Energy plant (analysis not made)									

ENCLOSURE 6

ENERGY ANALYSIS SUMMARY

ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

Const. Contr. No. _____

DATE 1 JULY 80

PROJECT DINING FACILITIES MODERNIZATION | LOCATION MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA | ☐ PRELIM. ☒ FINAL

DESCRIPTION	REMARKS	BENEFIT/ COST	E/C	YEAR PAYBACK	CURRENT WORKING ESTIMATE	ANNUAL SAVINGS	TOTAL MBTU/YR	( ) MBTU/YR	( ) MBTU/YR	(MBTU/
BUILDING 508										
1. Storm Windows				3	2,763	1,397	112.85			
2. Ceiling Insulation				1	15,538	16,789	1383.			
3. Wall Insulation				5	14,206	3,174	258.			
4. Solar Dom. HW.				9	10,086	839	39.15			
5. Solar Htg. & DHW	Solcost calculations proved not practical.									
6. HW. Recovery	Not practical.									
7. Exhaust Air Heat Recovery	Not practical (analysis not made).									
8. Condensate	Condensate is recovered and is pumped to Central Energy plant (analysis not made).									

ENCLOSURE 6

ENERGY ANALYSIS SUMMARY

ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

Const. Contr. No. _____

DATE 1 JULY 80

PROJECT DINING FACILITIES MODERNIZATION

LOCATION MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

☐ PRELIM. ☒ FINAL

DESCRIPTION	REMARKS	BENEFIT/ COST	E/C	YEAR PAYBACK	CURRENT WORKING ESTIMATE	ANNUAL SAVINGS	TOTAL MBTU/YR	( ) MBTU/YR	( ) MBTU/YR	(MBTU/
BUILDING RR-3										
1. Storm Windows				3	2,763	1,397	112.85			
2. Ceiling Insulation				1	15,538	16,789	1383.			
3. Wall Insulation				5	14,206	3,174	258.			
4. Solar Dom. HW.				9	10,086	839	39.15			
5. Solar Htg. & DHW	SolCost calculations proved not practical									
6. HW. Recovery	Not practical									
7. Exhaust Air Heat Recovery	Not practical (analysis not made)									
8. Condensate	Condensate is recovered and is pumped to Central Energy plant (analysis not made)									

ENCLOSURE 6

ENERGY ANALYSIS SUMMARY

ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

Const. Contr. No. _____

DATE 1 JULY 80

PROJECT DINING FACILITIES MODERNIZATION

LOCATION MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

☐ PRELIM. ☒ FINAL

DESCRIPTION	REMARKS	BENEFIT/ COST	E/C	YEAR PAYBACK	CURRENT WORKING ESTIMATE	ANNUAL SAVINGS	TOTAL MBTU/YR	( ) MBTU/YR	( ) MBTU/YR	(MBTU/
BUILDING BA 103										
1. Storm Windows				3	1,383	699	56			
2. Ceiling Insulation				1	6,007	8,395	692			
3. Wall Insulation				5	7,225	1,587	129			
4. Solar Dom. HW.				9	5,045	420	20			
5. Solar Htg. & DHW	Solcost calculations proved not practical									
6. HW. Recovery	Not practical									
7. Exhaust Air Heat Recovery	Not practical (analysis not made)									
8. Condensate	Condensate is recovered and is pumped to Central Energy plant (analysis not made)									

ENCLOSURE 6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DATE : 1 JULY , 1980

DEPARTMENT OF THE NAVY

PROJECT ENGINEERING DOCUMENTATION

DINING FACILITIES MODERNIZATION

(P-697)

FY 1982 MCON

MARINE CORPS BASE
CAMP LEJEUNE
NORTH CAROLINA

ADMINISTERED BY:

ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
NORFOLK, VA. 23511

PREPARED BY:

ODELL ASSOCIATES, INC.
222 S. CHURCH ST.
CHARLOTTE, N.C. 28202

1. COMPONENT	FY 19 82 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
NAVY		1 JULY 80

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA	DINING FACILITIES MODERNIZATION

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
	722-10	P-697	5600 ~~$5,700~~

9. COST ESTIMATES

Escalation 14% ITEM Bid opening date 1 JANUARY 82	U/M	QUANTITY	UNIT COST	COST ($000)
Dining Facility Modernization	SF	102,975	$ 44.14	$4,482
Buildings	SF	102,975	38.55	(3,909)
Built in equipment	LS			(512)
Solar Systems	LS			(61)
Supporting Facilities				353
Utilities	LS			(323)
Site Improvements	LS			(30)
Subtotal				$4,835
Contingency (10%)				484
Total Contract Cost				$5,319
Supervision Inspection and Overhead (5.5%)				292
Total Request				$5,611
Total Request (Rounded)				$5,600
Equipment provided from other appropriations				(63)

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Interior renovations consisting of new wall coverings, new doors, installation of decorative partitions, omit alternate windows in dining wings, providing new lowered ceilings, air conditioning, insulation, fluorescent fixtures; installation of terrazzo and quarry tile on floor, miscellaneous carpentry, plumbing, masonry, mechanical work, painting, site improvements, and related work. (Air conditioning; 285 tons)

11. REQUIREMENTS: 25,946 PN. ADEQUATE: 17,230 PN. SUBSTANDARD: 10,118 PN.
PROJECT: Renovate the existing enlisted dining facilities, Buildings 1209, M424, 508, RR3, BA103.
REQUIREMENT: The alterations and renovations are considered essential to solve the major problems of poor atmosphere, personnel traffic flow, efficiency of layout, maintenance and cleanliness, durability and flexibility of facilities used.

CURRENT SITUATION: The facilities are in a general run-down condition with little modernization since their construction over 37 years ago. The overall condition and configuration of the existing facilities does not present an environment for efficient or maximum utilization.
IMPACT IF NOT PROVIDED: Continued use of inefficient and outdated dining facilities.

1. COMPONENT	FY 19 82 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
NAVY		1 JULY 80

3. INSTALLATION AND LOCATION

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

4. PROJECT TITLE	5. PROJECT NUMBER
DINING FACILITIES MODERNIZATION	P 697

ENVIRONMENTAL IMPACT

The Environmental Impact Assessment has been reviewed, and where required, the design concepts give consideration to eliminating adverse environmental effects consistent with applicable directives.

PRESERVATION OF HISTORICAL SITES AND STRUCTURES

The project facilities do not directly or indirectly affect a district, site, building, structure, object or setting which is listed in the National Register or otherwise possesses a significant quality of American history.

FALLOUT SHELTER CONSTRUCTION

Fallout shelter excluded - - Shelter not economically feasible as part of this project.

FLOOD HAZARDS EVALUATION

Requirements of Executive Order No. 11988 (Flood plain Management) and Executive Order No. 11990 (Protection of Wetlands) are not applicable.

POLLUTION, PREVENTION, ABATEMENT AND CONTROL

This project will not cause additional air or water pollution.

DESIGN FOR ACCESSIBILITY OF PHYSICALLY HANDICAPPED PERSONNEL

Provisions for physically handicapped personnel not required in preparation and service areas of the facilities, since its use is specifically restricted to able-bodied military personnel. However, a dining area in each building will be made accessible to the handicapped and public toilets will be outfitted for the handicapped.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

	$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
BUILDINGS 1209, M424, 508, RR-3, BA-103			102,975 SF			
Foundation	.379	N/A	N/A	39,000	39,000	0
Slab on Grade	.447	N/A	N/A	46,000	46,000	0
Structural Frame	.767	N/A	N/A	79,000	79,000	0
Supported Floor	0	N/A	N/A	0	0	0
Roof	.767	N/A	N/A	79,000	79,000	0
Exterior Walls	1.729	N/A	N/A	178,000	178,000	0
Interior Walls	.719	N/A	N/A	74,000	74,000	0
Interior Finishes	8.886	N/A	N/A	915,000	915,000	0
Doors and Windows	2.593	N/A	N/A	267,000	267,000	0
Specialties	.923	N/A	N/A	95,000	95,000	0
Plumbing	4.758	N/A	N/A	490,000	490,000	0
Mechanical	9.002	N/A	N/A	927,000	927,000	0
Electrical	7.000	N/A	N/A	720,000	720,000	0
Equipment	4.972	N/A	N/A	512,000	0	512,000
SUBTOTAL						
Solar Systems	.60	50.80	1210 Coll.SF	61,000	61,000	0
Sub-Total Building	43.53			$4,482,000	$*3,970,000	$*512,000
Piling						*
Elec. Substation & Dist.	2.93	N/A	N/A	302,000	302,000	
Not Used						*
Telephone & Fire Alarm						
Water Distribution						
Sanitary Sewers	.204	N/A	N/A	21,000	21,000	
Roads, Parking, Sidewalks						*
Storm Sewers						*
Site Improvements	.291	N/A	N/A	30,000	30,000	
Demolition (In ea. sys. above)						*
Sub-Total Supporting Facilities				* $ 353,000		

Total Estimated Contract Cost: 1 Jan 82		$ 4,835,000
Contingency 10 %		$ 483,500
SIOH 5.5%		$ 292,517
Total Budget Cost		$ 5,611,017
Rounded		$ 5,600,000

*Asteric indicates these totals on 1391.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

	$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
BUILDING 1209			22,530 SF			
Foundation	.400	N/A	N/A	9,023	9,023	0
Slab on Grade	.616	N/A	N/A	13,883	13,883	0
Structural Frame	.836	N/A	N/A	18,825	18,825	0
Supported Floor	0	N/A	N/A	0	0	0
Roof	.768	N/A	N/A	17,298	17,298	0
Exterior Walls	1.953	N/A	N/A	43,995	43,995	0
Interior Walls	.881	N/A	N/A	19,855	19,855	0
Interior Finishes	9.742	N/A	N/A	219,488	219,488	0
Doors and Windows	2.562	N/A	N/A	57,731	57,731	0
Specialties	1.102	N/A	N/A	24,829	24,829	0
Plumbing	6.320	N/A	N/A	142,393	142,393	0
Mechanical	10.013	N/A	N/A	225,585	225,585	0
Electrical	7.54	N/A	N/A	169,971	169,971	0
Equipment	4.701	N/A	N/A	105,928	0	105,928
SUBTOTAL						
Solar Systems	.80	47.69	380 Coll.SF	18,123	18,123	0
Sub-Total Building	48.24			$1,086,927	$*980,999	$*105,928
Piling			0	0	0	* 0
Elec. Substation & Dist.	2.75	N/A	N/A	62,000	62,000	0
Not Used			0	0	0	* 0
Telephone & Fire Alarm			0	0	0	0
Water Distribution			0	0	0	0
Sanitary Sewers	.106	N/A	N/A	2,381	2,381	0
Roads, Parking, Sidewalks			0	0	0	* 0
Storm Sewers			0	0	0	* 0
Site Improvements	.150	N/A	N/A	3,371	3,371	0
Demolition (In ea. sys. above)			0	0	0	* 0
Sub-Total Supporting Facilities				* $ 67,752		

Total Estimated Contract Cost: 1 Jan 82		$ 1,154,679
Contingency 10 %		$ 115,468
SIOH 5.5%		$ 69,858
Total Budget Cost		$ 1,340,005
Rounded		$ 1,300,000

*Asteric indicates these totals on 1391.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

	$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
BUILDING M424			22,530 SF			
Foundation	.534	N/A	N/A	12,036	12,036	0
Slab on Grade	.616	N/A	N/A	13,883	13,883	0
Structural Frame	.989	N/A	N/A	22,275	22,275	0
Supported Floor	0	N/A	N/A	0	0	0
Roof	.910	N/A	N/A	20,496	20,496	0
Exterior Walls	2.121	N/A	N/A	47,787	47,787	0
Interior Walls	.924	N/A	N/A	20,814	20,814	0
Interior Finishes	9.690	N/A	N/A	218,320	218,320	0
Doors and Windows	3.240	N/A	N/A	73,007	73,007	0
Specialties	1.243	N/A	N/A	28,016	28,016	0
Plumbing	6.466	N/A	N/A	145,682	145,682	0
Mechanical	10.013	N/A	N/A	225,585	225,585	0
Electrical	8.90	N/A	N/A	200,564	200,564	0
Equipment	6.599	N/A	N/A	148,680	0	148,680
SUBTOTAL						
Solar Systems	.80	47.69	380 Coll. SF	18,123	18,123	0
Sub-Total Building	53.05			$1,195,268	$*1,046,588	$*148,680
Piling			0	0	0	* 0
Elec. Substation & Dist.	2.80	N/A	N/A	63,000	63,000	0
Not Used			0	0	0	* 0
Telephone & Fire Alarm			0	0	0	0
Water Distribution			0	0	0	0
Sanitary Sewers	.106	N/A	N/A	2,381	2,381	0
Roads, Parking, Sidewalks			0	0	0	* 0
Storm Sewers			0	0	0	* 0
Site Improvements	.431	N/A	N/A	9,712	9,712	0
Demolition (In ea. sys. above)			0	0	0	* 0
Sub-Total Supporting Facilities				* $ 75,093		

Total Estimated Contract Cost: 1 Jan 82	$ 1,270,361
Contingency 10 %	$ 127,036
SIOH 5.5%	$ 76,857
Total Budget Cost	$ 1,474,254
Rounded	$ 1,450,000

*Asteric indicates these totals on 1391.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION — Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA — Escalation: 14%

Prepared by: Odell Associates Inc. — Date: 1 July 80 — Contingency: 10%

	$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
BUILDING 508			22,475 SF			
Foundation	.378	N/A	N/A	8,499	8,499	0
Slab on Grade	.381	N/A	N/A	8,562	8,562	0
Structural Frame	.609	N/A	N/A	13,681	13,681	0
Supported Floor	0	N/A	N/A	0	0	0
Roof	.760	N/A	N/A	17,073	17,073	0
Exterior Walls	1.483	N/A	N/A	33,336	33,336	0
Interior Walls	.633	N/A	N/A	14,225	14,225	0
Interior Finishes	10.074	N/A	N/A	226,411	226,411	0
Doors and Windows	2.014	N/A	N/A	45,262	45,262	0
Specialties	.744	N/A	N/A	16,720	16,720	0
Plumbing	5.247	N/A	N/A	117,934	117,934	0
Mechanical	7.761	N/A	N/A	174,428	174,428	0
Electrical	5.70	N/A	N/A	128,087	128,087	0
Equipment	3.744	N/A	N/A	84,152	0	84,152
SUBTOTAL						
Solar Systems	.45	56.03	180 SF	10,086	10,086	0
Sub-Total Building	39.98			$898,456	$* 814,304	$* 84,152
Piling			0	0	0	* 0
Elec. Substation & Dist.	2.80	N/A	N/A	63,000	63,000	0
Not Used			0	0	0	* 0
Telephone & Fire Alarm			0	0	0	0
Water Distribution			0	0	0	0
Sanitary Sewers	.530	N/A	N/A	11,905	11,905	0
Roads, Parking, Sidewalks			0	0	0	* 0
Storm Sewers			0	0	0	* 0
Site Improvements	.513	N/A	N/A	11,533	11,533	0
Demolition (In ea. sys. above)			0	0	0	* 0
Sub-Total Supporting Facilities				* $ 86,438		

Total Estimated Contract Cost: 1 Jan 82		$ 984,894
Contingency 10 %		$ 98,489
SIOH 5.5%		$ 59,586
Total Budget Cost		$1,142,969
Rounded		$1,150,000

*Asteric indicates these totals on 1391.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

	$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
BUILDING RR-3			22,475 SF			
Foundation	.250	N/A	N/A	5,636	5,636	0
Slab on Grade	.140	N/A	N/A	3,155	3,155	0
Structural Frame	.747	N/A	N/A	16,785	16,785	0
Supported Floor	0	N/A	N/A	0	0	0
Roof	.762	N/A	N/A	17,134	17,134	0
Exterior Walls	1.473	N/A	N/A	33,113	33,113	0
Interior Walls	.457	N/A	N/A	10,272	10,272	0
Interior Finishes	5.439	N/A	N/A	122,237	122,237	0
Doors and Windows	1.806	N/A	N/A	40,590	40,590	0
Specialties	.588	N/A	N/A	13,210	13,210	0
Plumbing	1.960	N/A	N/A	44,042	44,042	0
Mechanical	7.761	N/A	N/A	174,428	174,428	0
Electrical	5.70	N/A	N/A	128,087	128,087	0
Equipment	3.603	N/A	N/A	80,971	0	80,971
SUBTOTAL						
Solar Systems	.45	56.03	180 Coll.SF	10,086	10,086	0
Sub-Total Building	31.13			$699,746	$* 618,775	$* 80,971
Piling			0	0	0	* 0
Elec. Substation & Dist.	2.80		N/A	63,000	63,000	0
Not Used			0	0	0	* 0
Telephone & Fire Alarm			0	0	0	0
Water Distribution			0	0	0	0
Sanitary Sewers	.106		N/A	2,381	2,381	0
Roads, Parking, Sidewalks			0	0	0	* 0
Storm Sewers			0	0	0	* 0
Site Improvements	.124		N/A	2,792	2,792	0
Demolition (In ea. sys. above)			0	0	0	* 0
Sub-Total Supporting Facilities				* $ 68,173		

Total Estimated Contract Cost: 1 Jan 82	$	767,919
Contingency 10 %	$	76,792
SIOH 5.5%	$	46,459
Total Budget Cost	$	891,170
Rounded	$	890,000

*Asteric indicates these totals on 1391.

BUDGET ESTIMATE SUMMARY SHEET FOR P-697

Title: DINING FACILITIES MODERNIZATION Costs Escalated to: 1 JAN 82

Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA Escalation: 14%

Prepared by: Odell Associates Inc. Date: 1 July 80 Contingency: 10%

	$/SF	S/SYS	SYS QUAN	TOTAL	BUILDING	BUILT-IN EQUIPMENT
BUILDING BA-103			12,965 SF			
Foundation	.299	N/A	N/A	3,880	3,880	0
Slab on Grade	.527	N/A	N/A	6,837	6,837	0
Structural Frame	.603	N/A	N/A	7,816	7,816	0
Supported Floor	0	N/A	N/A	0	0	0
Roof	.563	N/A	N/A	7,299	7,299	0
Exterior Walls	1.507	N/A	N/A	19,533	19,533	0
Interior Walls	.668	N/A	N/A	8,659	8,659	0
Interior Finishes	9.927	N/A	N/A	128,709	128,709	0
Doors and Windows	3.860	N/A	N/A	50,047	50,047	0
Specialties	.933	N/A	N/A	12,098	12,098	0
Plumbing	3.095	N/A	N/A	40,125	40,125	0
Mechanical	9.812	N/A	N/A	127,210	127,210	0
Electrical	7.15	N/A	N/A	92,755	92,755	0
Equipment	6.780	N/A	N/A	87,904	0	87,904
SUBTOTAL						
Solar Systems	.39	56.03	90 Coll.SF	5,045	5,045	0
Sub-Total Building	46.12			$597,917	$* 510,013	$* 87,904
Piling			0	0	0	* 0
Elec. Substation & Dist.	3.93	N/A	N/A	51,000	51,000	0
Not Used			0	0	0	* 0
Telephone & Fire Alarm			0	0	0	0
Water Distribution			0	0	0	0
Sanitary Sewers	.184	N/A	N/A	2,381	2,381	0
Roads, Parking, Sidewalks			0	0	0	* 0
Storm Sewers			0	0	0	* 0
Site Improvements	.215	N/A	N/A	2,792	2,792	0
Demolition (In ea. sys. above)			0	0	0	* 0
Sub-Total Supporting Facilities				* $ 56,173		

Total Estimated Contract Cost: 1 Jan 82	$	654,090
Contingency 10 %	$	65,409
SIOH 5.5%	$	39,572
Total Budget Cost	$	759,071
Rounded	$	760,000

*Asteric indicates these totals on 1391.

DESIGN CONCEPTS

Activity and Location: MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

Project Title: DINING FACILITIES MODERNIZATION (P-697)

Date: 1 JULY 1980

USE OF DEFINITIVES AND PREVIOUS DESIGNS

Although definitives for Dining Facilities have been superseded, Definitives 1286674, 75, 76, and 77 were used for reference during design of interior functions and equipment layout. The scope of the modernization of the facilities does not warrant use of existing definitives.

SPECIAL DESIGN CHARACTERISTICS

Floor Plan: Existing building layout limited modernization approach. However, new locations for entries, toilets, serving line equipment and sculleries are proposed in order to relieve present internal cross traffic patterns of inefficiency.

Ventilation: Heat, humidity and odors produced during facility use require new ventilation in following areas: Bakery, Pot Wash, Scullery, Food Service, Garbage Rooms, Toilets and Attics above air conditioned spaces.

Air Conditioning is provided for all dining areas, salad prep areas, and offices.

Finishes: Terrazzo floors and quarry tile floor and wainscots are planned for all major spaces not presently finished as such in order to create sanitary and easily maintainable surfaces.

ENERGY CONSERVATION AND SOLAR ENERGY

1. Energy Conservation: The following energy conservation measures were considered and analyzed for the design of this building:

    a. Insulation in wall: The benefit/cost was computed for two (2) representative buildings, M424 and 508, using Trace computer program to determine the reduction in building heating and cooling loads due to installation of additional insulation in the wall. Results are tabulated in "Summary of Energy Conservation Analysis."

b. Insulation in Attic: The benefit/cost was computed for two (2) representative buildings, M424 and 508, using Trace computer program to determine the reduction in building heating and cooling loads due to installation of additional insulation in the attic. Results are tabulated in "Summary of Energy Conservation Analysis."

c. Exhaust Heat Recovery: A run around coil was considered for computing exhaust heat recovery from scullery to preheat outside air makeup for buildings M424 and 508. System CFM not of feasible capacity. Kitchen hoods use untempered makeup air with only 20 percent tempered air from dining.

d. Hot Water Recovery: Heat recovery from pot sink and dish machines was considered for preheating make-up water for the hot water heater for building M424 and 508. The locations of the various hot water using equipment makes it impractical to collect waste hot water for reclaiming heat. Very long pipe runs, intermediate sumps and pumping to a central location close to the domestic hot water heater will have to be provided so that make-up water can be preheated. This conservation feature is, therefore, not considered feasible.

e. Condensate Heat Recovery: Since condensate is returned back to central system, heat recovery at this use terminal would not be feasible. Condensate recovery would be considered more feasible at the central energy plant.

f. Storm Windows for Existing Windows: Approximately 45 percent of the windows in the dining areas are removed and blocked up for other than energy savings reasons. The balance of the windows in occupied spaces were considered for adding storm windows and were determined to be feasible.

g. Vestibules: Vestibules are proposed for all major entrances and exits by simply adding doors to 10 existing vestibule areas, adding two complete vestibules and maintaining six existing vestibules. No detail analysis was made, since the construction cost was so small.

2. Solar Energy: The feasibility of Solar Energy Systems for the five buildings was determined by the "Solcost" computer program. Two of the five buildings (508, M424), were run on the computer. Two buildings (RR-3, 1209) were nearly identical to the two run. Solar systems to BA-103 (similar shape to 508) were scaled down from building 508 sizes. Domestic hot water is based on people served while space heating is based on area of building.

   Two alternatives were considered: (1) domestic hot water and (2) domestic hot water combined with space heating. The combined system was considered since the design will integrate both aspects into one system.

Each building was determined to be feasible within the limits of Government criteria for solar assisted Domestic Hot Water heating only. See charts indicating Solar Collector Sizing. Listed below is statistical information (totals for all buildings).

a.	Type system included:	DOMESTIC HOT WATER HEATING
b.	Type collector:	Single glazed flat plate
c.	Area collector, all buildings:	1,210 square feet
d.	Systems cost, all buildings:	$61,463
e.	Annual energy savings:	Barrels of oil equivalent = 44.5
f.	Percent energy contribution from solar system to DHW Heat:	83%
g.	Payback:	9 years
h.	System design cost:	$30,000

The combined domestic hot water and space heating system is not economically feasible.

3. An economic study was made to provide a basis for selection of an HVAC system. A Variable Temperature Constant Volume System was compared with a Variable Air Volume System with Reheat serving Dining Areas, Packaged Terminal Air Conditioning Units serving certain support areas and Perimeter Radiation serving total building except for areas served by Variable Air Volume System with Reheat.

   Analysis proved that the Variable Temperature Constant Volume Systems will provide a lower present worth.

4. Energy Monitoring and Control System (EMCS):

   a. Camp Lejeune's present EMCS is set up to operate or monitor the following:

      1) Stop and start of each air conditioning unit.
      2) Room supply air flow status.
      3) Room temperature of each area.

   b. Telephone lines are used for transmission of signal from each building to the master monitoring unit (CPU).

   c. Each building will require a field panel to be installed.

   d. The electric power, steam and fire alarm system are not to be monitored at this time.

5. Energy Summary: The analysis of energy conserving measures (listed on Energy Analysis Summary) indicates feasibility of several features:

   a. The following features are feasible and have been incorporated into the project, and the cost is included in the building costs:

1) Insulation of walls of AC space
2) Insulation of ceiling of AC space
3) Solar assisted domestic hot water heating
4) Storm windows

b. The following features are not feasible and have not been incorporated into the project:

1) Hot water recovery
2) Exhaust air heat recovery
3) Condensate heat recovery
4) Solar space heating

POLLUTION ABATEMENT ASPECTS OF DESIGN

No pollution of air, water, noise, erosion, etc., is anticipated resulting from the work proposed in this project; therefore, no need for permits from authorities in this regard is anticipated.

Additional toilet fixtures added to each building will be tied into the existing building sewer, therefore negating the need to tie into sanitary sewer at additional connection points. The additional quantity of discharge for each building is anticipated as identified below:

Building 1209	3240 GPD
Building M424	3240 GPD
Building 508	1620 GPD
Building RR3	1620 GPD
Building BA103	810 GPD

The additional discharge is anticipated to be absorbed within the existing sanitary sewers and the effluent is anticipated to be handled by existing treatment plant.

SITE APPROVAL

The five separate sites involved with this project have been approved as described in letter CMC, LFF-1-AJR:bab of January 11, 1980.

ECONOMIC ANALYSIS

Economic analyses were done on two Base Buildings M424 and 508 for the considerations mentioned in the ENERGY SUMMARY. Since Building 1209 is similar to M424, it is deduced that all energy conservation measures applicable to M424 can be used for Building 1209. Similarly, Building 508 measures are applicable to RR3. Since Building BA103 is also similar to 508 and half as large in area as 508, energy conservation measures are applied to this building, providing half the credit that can be obtained

from conservation and solar contributions. The building loads for the base buildings are calculated on a Trace program, and economic analyses of system type and equipment to be used for the heating, ventilating, and air conditioning for these base buildings are selected based on a TRACE computer program.

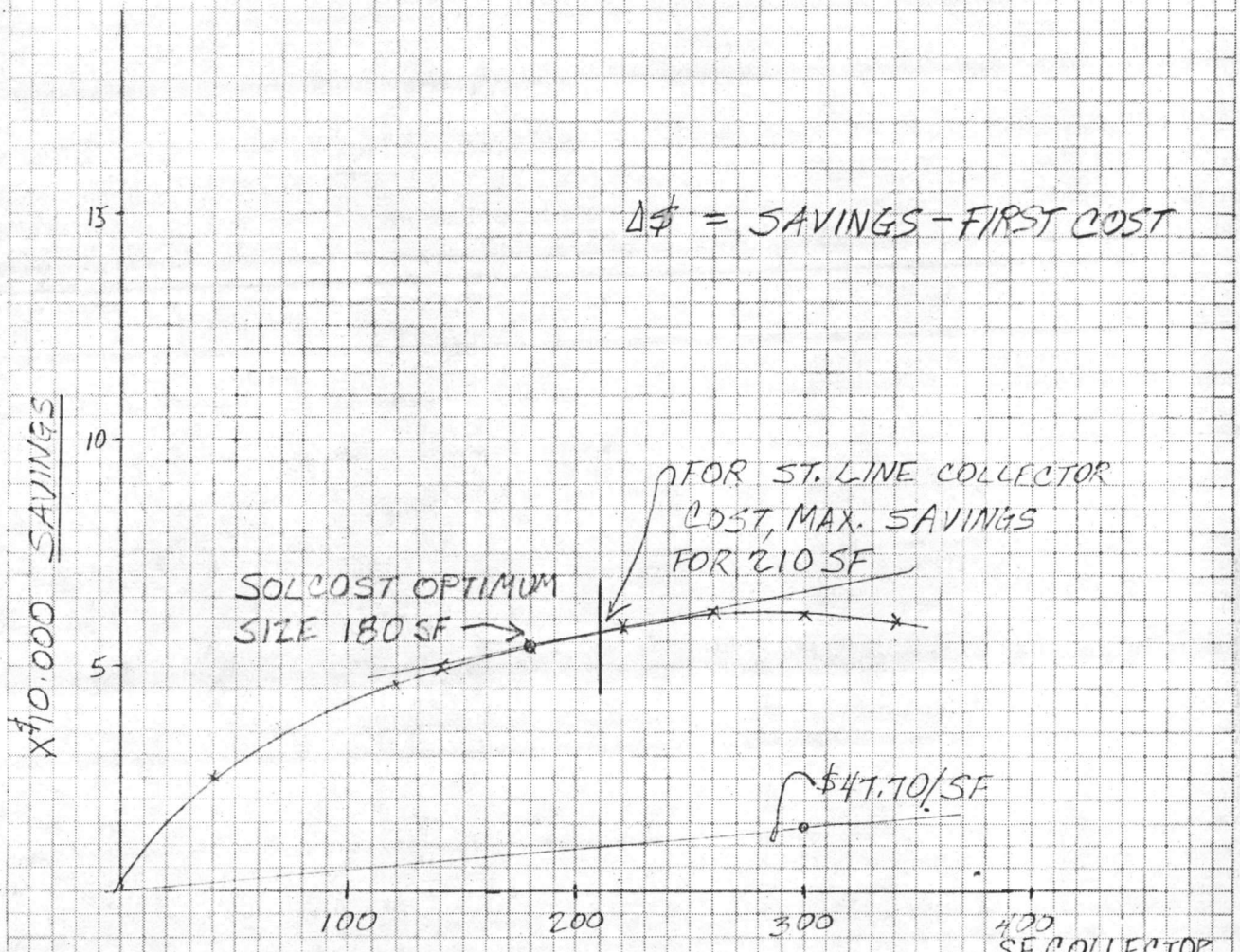
SPECIAL ENGINEERING SERVICES

None Required.

CONTINGENCY ALLOWANCE

A 10% contingency allowance is considered as necessary at this phase of design since the project involves remodeling of (5) individual buildings over 30 years old.

LCS = ENERGY REQD X ENERGY COST X PRESENT VALUE FACTOR
= 78.34 X 10^6 BTU/YR X 12.53 $/10^6$ BTU X 80.23
= 79,256.



AREA	FIRST COST	f	SAVINGS	Δ$
40	1908	.284	22509	20601
80	3816	.495	39232	35416
120	5724	.656	51992	46268
140	6678	.722	57223	50545
180	8586	.828	65624	57038
220	10494	.903	71568	61074
260	12402	.950	75293	62891
300	14310	.970	76879	62569
340	16218	.983	77909	61691

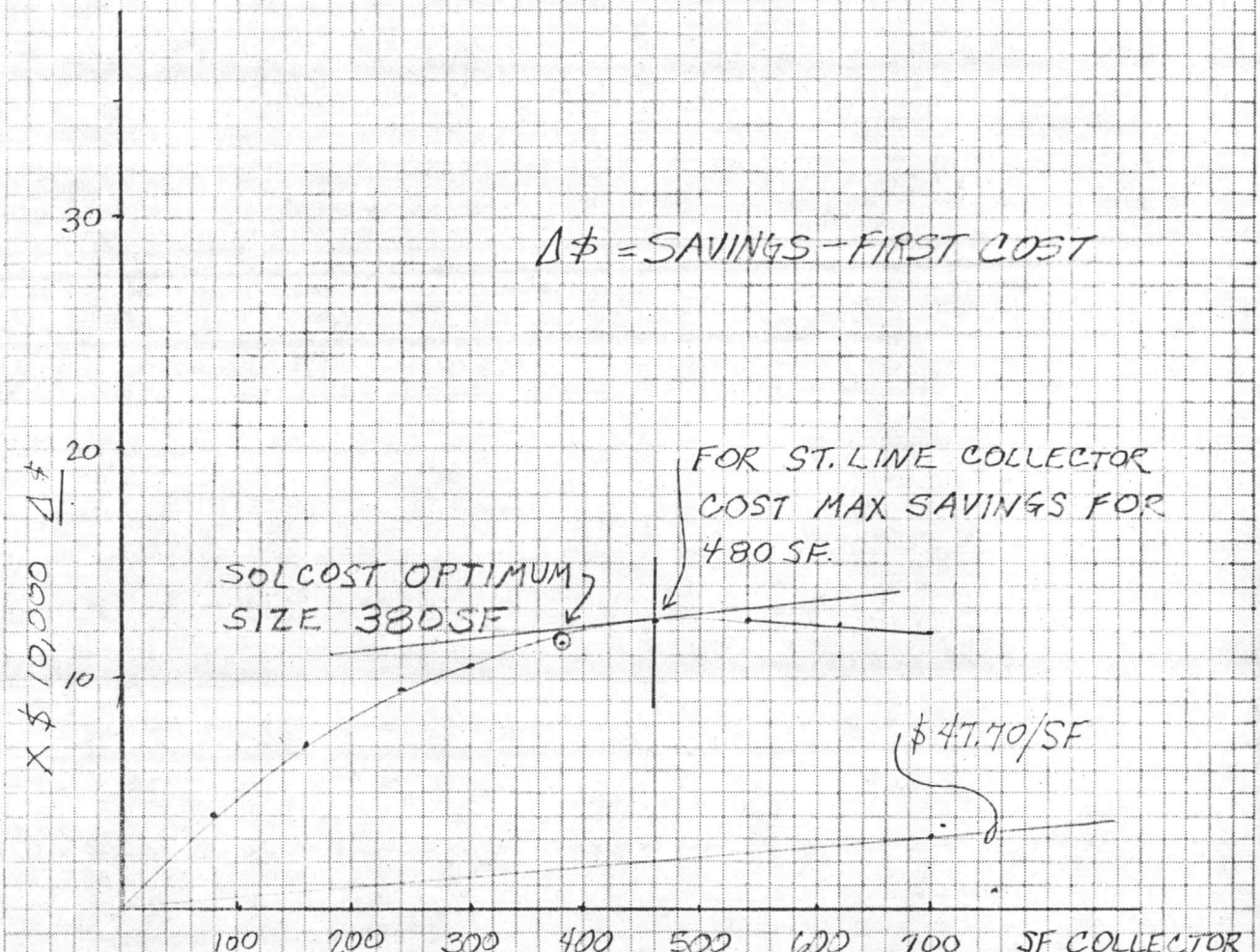
SOLAR COLLECTOR SIZING

ODELL ASSOCIATES, INC.
ARCHITECTS CHARLOTTE, N. C.

CAMP LEJEUNE DINING FAC. BUILDING 508 & RR3

DATE _____ JOB NO. 1412
BY TN SHEET _____ OF _____

LCS = ENERGY REQD. X ENERGY COST X PRESENT VALUE FACTOR
= 157.68 X BTU/YR X $12.53 MIL BTU X 80.23
= $158,513



AREA	FIRST COST	f	SAVINGS	Δ$
80	3822	.283	44859	41037
160	7643	.496	78623	70980
240	11465	.662	104936	93471
300	14331	.760	120770	106139
380	18152	.859	136163	118011
460	21974	.931	147576	125602
540	25796	.960	152173	126377
620	29617	.979	155184	125567
700	33439	.989	156770	123331

SOLAR COLLECTOR SIZING

ODELL ASSOCIATES, INC. ARCHITECTS CHARLOTTE, N. C.
CAMP LE JEUNE DINING FAC. BUILDING M424 & 1209
DATE _____ JOB NO. 1412
BY TN SHEET ____ OF ____

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDINGS 1209, M424, 508, RR-3 AND BA103

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 17,2002x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current = 9467 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 44,9 (Percent reduction in energy consumption current year vs. existing situation)

ECC=4,253,700 (Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 1360 *(Barrels of Fuel Oil Saved, Current Design vs. 1975)
5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption / Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000)
1.	Insulate Walls	1,189	204.	5.82	16011	6.9	155,484	6.9	82.1	4,687
2.	Insulate Ceiling	5,694	1262.	4.51	10317	33.1	100,189	40.0	69.2	4,757
3.	Storm Windows	591	139.	4.25	9726	3.4	94,450	43.4	15.5	4,773.5
4.	Solar Domestic HW	259	384.	.67	9467	1.5	91,934	44.9	61.5	4,835

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDING 1209

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 3708 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current = 2179 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 41.2 (Percent reduction in energy consumption current year vs. existing situation)

ECC = 1,026,700 (Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 295 *(Barrels of Fuel Oil Saved, Current Design vs. 1975)
5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000)
1.	Insulate Walls	272	42.	6.47	3,436	7.3	152,507	7.3	23.2	1,117.9
2.	Storm Windows	154	33.	4.66	3,282	4.1	145,672	11.4	4.3	1,122.2
3.	Insulate Ceiling	1,022	224.	4.56	2,260	27.5	100,310	38.9	14.7	1,136.9
4.	Solar Domestic HW	81	121.	.67	2,179	2.2	96,715	41.2	18.1	1,155

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDING M424

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 3900 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current = 2179 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 44.1 (Percent reduction in energy consumption current year vs. existing situation)

ECC=1,132,000 (Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 295 *(Barrels of Fuel Oil Saved, Current Design vs. 1975)
5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000)
1.	Insulate Walls	272	42.	6.47	3,628	7.0	161,030	7.0	23.2	1,230.2
2.	Storm Windows	154	33.	4.66	3,474	3.9	154,194	10.9	4.3	1,234.5
3.	Insulate Ceiling	1,214	266.	4.56	2,260	31.1	100,311	42.0	17.4	1,251.9
4.	Solar Domestic HW	81	121.	.67	2,179	2.1	96,715	44.1	18.1	1,270

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDING 508

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 3769 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current =1976 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 47.5 (Percent reduction in energy consumption current year vs. existing situation)

ECC=855,400 (Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) =307 *(Barrels of Fuel Oil Saved, Current Design vs. 1975)
5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000)
1.	Insulate Walls	258	48.	5.38	3,511	6.8	156,218	6.8	14.2	956.6
2.	Storm Windows	113	25.	4.52	3,398	3.0	151,190	9.8	2.8	959.4
3.	Insulate Ceiling	1,383	309.	4.47	2,015	36.7	89,655	46.5	15.5	974.9
4.	Solar Domestic HW	39	57.	.68	1,976	1.0	87,920	47.5	10.1	985

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDING RR-3

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 3769 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current = 1976 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 47.5 (Percent reduction in energy consumption current year vs. existing situation)

ECC=657,400(Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 307 *(Barrels of Fuel Oil Saved, Current Design vs. 1975)
5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000).
1.	Insulate Walls	258	48.0	5.38	3,511	6.8	156,218	6.8	14.2	739.6
2.	Storm Windows	113	25.	4.52	3,398	3.0	151,190	9.8	2.8	742.4
3.	Insulate Ceiling	1,383	309.	4.47	2,015	36.7	89,655	46.5	15.5	757.9
4.	Solar Domestic HW	39	57.0	.68	1,976	1.0	87,920	47.5	10.1	768

SUMMARY OF ENERGY CONSERVATION ANALYSIS

BUILDING BA 103

MARINE CORPS BASE DINING FACILITY MODERNIZATION (P-697) 1 JULY 80

E75 = 2054 x 10^6 BTU/Yr (Total annual energy consumption, 75)

E Current = 1157 x 10^6 BTU/Yr (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 43.8 (Percent reduction in energy consumption current year vs. existing situation)

ECC=578,400(Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 153 *(Barrels of Fuel Oil Saved, Current Design vs. 1975) 5,825,400 BTU/B.O.E.

(1) Priority	(2) Description Of Measure	(3) 10^6 BTUs Saved/Yr	(4) Life Cycle Cost ($1000) Expressed as present worth	(5) (3)/(4)	(6) 10^6 BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/Yr	(9) Cumula- tive % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc- tion Cost (10) + ECC ($1000).
1.	Insulate Walls	129	24.	5.38	1,925	6.3	148,476	6.3	7.2	641.6
2.	Insulate Ceiling	692	154.	4.49	1,233	33.7	95,102	40.0	6.0	647.6
3.	Storm Windows	57	23.	2.47	1,176	2.8	90,706	42.8	1.4	649
4.	Solar Domestic HW	19	28.	0.67	1,157	1.0	89,240	43.8	5.0	654

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 1209; BUILDING M424

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Variable temp. constant volume split system, packaged terminal A/C and Fin. Rad.

ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$101,181			$101,181
OPERATIONS Elec.		$51,794	18.049	934,830
OPERATIONS Steam (oil)		25,502	20.050	511,315
MAINTENANCE		2,321	9.524	22,105
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $1,569,431 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $164,787

ALTERNATIVE B Variable air volume with reheat, packaged terminal A/C and Fin. Rad.

ECONOMIC LIFE _____ YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$163,601			$163,601
OPERATIONS Elec.		$52,183	18.049	941,851
OPERATIONS Steam (oil)		25,372	20.050	508,709
MAINTENANCE		2,453	9.524	23,362
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $1,637,523 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $171,936

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - 1,569,431
Alt. B - 1,637,523
L.C.C. - 68,092
- 68 x 10^3

$$S.I.R. = \frac{1,637,523}{1,569,431} = 1.04$$

Encl 7

BUILDING 1209 and BUILDING M424 - VTCV/VAV
DESIGN ANALYSIS

1. Investment Costs: From back-up estimates (PED level).

2. Energy Cost:

	FY 80		FY 81		FY 82		
Steam (Oil) -	$9.27/MIL BTU	x	1.04	x	1.14	=	$12.53/MIL BTU
Elec. -	$0.0296	x	1.04	x	1.13	=	$0.04/KWH

3. Operating Expenses: From Energy Analysis

Alternate A (Page 18)
Elec. - 1,294,853 KWH x $0.04/KWH = $51,794
Steam - 20,353 x 0.1 MIL BTUS/THERM x $12.53/MIL BTU = $25,502

Alternate B (Page 19)
Elec. - 1,304,568 KWH x $0.04/KWH = $52,183
Steam - 20,249 THERMS x 0.1 MIL BTUS/THERM x 12.53/MIL BTU = $25,372

4. Maintenance:

Alternate A - $2,321
Alternate B - $2,453

5. Uniform Annual Cost = $\frac{\text{TOTAL PRESENT VALUE}}{\text{0\% INFL. @ 10\% DISC. FACTOR}}$

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 1209; BUILDING M424

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A: Storm Windows — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$4,293			$4,293
OPERATIONS Steam		0		
OPERATIONS Elec.		0		
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 4,293 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $451

ALTERNATIVE B: No Storm Windows — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	0			0
OPERATIONS Steam Savings		$1,442	20.05	$28,912
OPERATIONS Elec. Savings		453	18.049	8,176
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 37,088 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $3,894

REMARKS: Alternative "A" is feasible due to lower total present value than "B".

Life Cycle Cost
Alt. A - 4,293
Alt. B - 37,088
L.C.C. - 32,795
$= 33 \times 10^3$

$$S.I.R. = \frac{37,088}{4,293} = 8.64$$

Encl 7

BUILDING 1209 and BUILDING M424 - STORMS

Total Window Area (Heating) = 1,596 SF
(Cooling) = 1,281 SF

Savings from Storm Windows

1. Winter Savings
   Reduction in Infiltration x ΔT x 1.08 x SF Window
   + Reduction in Transmission x ΔT x SF Window
   = 0.5(1.6 - 0.8) CFM/SF x (68 - 23) x 1.08 x 1,596 SF
   + (1.04 - 0.54) x (68 - 23) x 1,596 SF
   = 66,936 BTUH
   Annual Savings in BTU's

$$\frac{2901 \text{ HDD} \times 24 \times 66{,}936}{(68 - 23) \times .90(\text{Effy.})} = 115.07 \text{ MIL BTU/YR.}$$

   Annual Dollar Savings
   $12.53/MIL BTUS x 115.07 MIL BTU/YR. = $1,442

2. Summer Savings
   Reduction in Infiltration x ΔH x 4.45 x SF Window
   + Reduction in Transmission x ΔT x SF Window
   = 0.5(0.8 - 0.4) CFM/SF x 12. x 4.45 x 1,281 SF
   + (1.04 - 0.54) x (90 - 78) x 1,281 SF
   = 21,367 BTUH
   Annual Savings in BTU's

$$\frac{1810 \text{ CDD} \times 21{,}367 \text{ BTUH}}{3{,}413 \text{ KWH/BTU}} = 11{,}331 \text{ KWH}$$
   or 38.67 MIL BTU/YR

   Annual Dollar Savings
   $0.04/KWH x 11,331 KWH = $453

3. Total Annual Savings from Storm Windows
   $1,442 + $453 = $1,895

4. Cost of Storm Windows
   Jan 80 Jun 80 Jan 82
   $2.27/SF x 1.036 x 1.143 = $2.69 represents cost to add storms to proposed cost for screens under equipment section.
   Installation Cost of Storm Windows
   1,596 SF x $2.69/SF = $4,293

5. Discount Factor - Use 20.050 for 25 years for oil, 8%; and use 18.049 for 25 years for electricity, 7%.

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING M424

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Add insulation above ceiling — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$17,437			$17,437
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 17,437 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $1,831

ALTERNATIVE B Continue to operate with current losses — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	0			0
OPERATIONS Steam		$8,305	20.05	$166,515
OPERATIONS Elec.		6,457	18.049	116,542
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 283,057 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $29,720

REMARKS

Alternative "A" is feasible due to lower total present value.

Life Cycle Cost
Alt. A - $ 17,437
Alt. B - 283,057
L.C.C. - 265,620
- 266×10^3

$$S.I.R. = \frac{283,057}{17,437} = 16.23$$

Encl 7

BUILDING M424

1. Additional insulation above ceiling

Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Roof Area SF over heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Roof Area SF over A/C space

$U_{Exist.}$ = 0.44 BTU/HR^{o}F.SF U_{New} = 0.05 BTU/HR^{o}F.SF

From Trace

Heat Loss with U_{New} (.05) = 49,427 BTUH

Heat Loss with $U_{Exist.}$ (.44)

$\frac{49,427 \times .44}{.05}$ = 434,958 BTUH

Winter Energy Saved = 385,531 BTUH

Annual Savings in BTU's

$\frac{2901 \text{ HDD} \times 24 \times 385,531 \text{ BTUH}}{(68 - 23) \times .90 \text{ (Effy.)}}$ = 662.77 MIL BTU/YR.

Annual Dollar Savings

\$12.53/MIL BTUS x 662.77 MIL BTUS/YR. = \$8,305

From Trace

Heat Gain with U_{New} (.05) = 39,027 BTUH

Heat Gain with $U_{Exist.}$ (.44)

$\frac{39,027 \times .44}{.05}$ = 343,438 BTUH

Summer Energy Saved = 304,411 BTUH

Annual Savings in BTU's

$\frac{1810 \text{ CDD} \times 304,411 \text{ BTUH}}{3,413 \text{ KWH/BTU}}$ = 161,437 KWH/YR. or 551 MIL BTU/YR.

Annual Dollar Savings

\$0.04/KWH x 161,437 KWH = \$6,457

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 1209

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Add insulation above ceiling — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$14,670			$14,670
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 14,670 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $1,540

ALTERNATIVE B Continue to operate with current losses — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	0			0
OPERATIONS Steam		$6,988	20.05	$140,109
OPERATIONS Elec.		5,434	18.049	98,078
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 238,187 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $25,009

REMARKS Alternative "A" is feasible due to lower total present value.

Life Cycle Cost
Alt. A - $ 14,670
Alt. B - 238,187
L.C.C. - 223,517
- 224×10^3

$$S.I.R. = \frac{238,187}{14,670} = 16.24$$

Encl 7

BUILDING 1209

1. Additional insulation above ceiling
Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Roof Area SF over heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Roof Area SF over A/C space

$U_{Exist.}$ = 0.44 BTU/HR^{o}F.SF U_{New} = 0.05 BTU/HR^{o}F.SF

From Trace (for Bldg. M424)
Heat Loss with U_{New} (.05) = 49,427 BTUH
Heat Loss with $U_{Exist.}$ (.44)
$\frac{49,427 \times .44}{.05}$ = 434,958 BTUH
Winter Energy Saved = 385,531 BTUH

Annual Savings in BTU's
$\frac{2901 \text{ HDD} \times 24 \times 385,531 \text{ BTUH}}{(68 - 23) \times .90 \text{ (Effy.)}}$ = 662.77 MIL BTU/YR.

or

$\frac{12,736SF}{15,136SF} \times 662.77$ = 557.78 MIL BTU/YR. for Bldg. 1209

Annual Dollar Savings
$12.53/MIL BTUS x 557.68 MIL BTUS/YR. = $6,988

From Trace
Heat Gain with U_{New} (.05) = 39,027 BTUH
Heat Gain with $U_{Exist.}$ (.44)
$\frac{39,027 \times .44}{.05}$ = 343,438 BTUH
Summer Energy Saved = 304,411 BTUH

Annual Savings in BTU's
$\frac{1810 \text{ CDD} \times 304,411 \text{ BTUH}}{3,413 \text{ KWH/BTU}}$ = 161,437 KWH/YR.

or

$\frac{12,736SF}{15,136SF} \times 161,437$ = 135,839 KWH/YR. or 464 MIL BTU/YR.

Annual Dollar Savings
$0.04/KWH x 135,839 KWH = $5,434

ECONOMIC ANALYSIS OF SHORE FACILITY

DATE: 1 JULY 80

BUILDING 1209; BUILDING M424

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A: Insulate exterior walls — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$23,232			$23,232
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 23,232 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $2,439

ALTERNATIVE B: Continue to operate with current losses — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam		$2,468	20.05	$49,483
OPERATIONS Elec.		882	18.049	15,919
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 65,402 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $6,867

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $23,232
Alt. B - 65,402
L.C.C. - 42,170
- $ 42 x 10^3

$$S.I.R. = \frac{65,402}{23,232} = 2.82$$

Encl 7

2. Additional insulation in walls
Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Wall Area SF across heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Wall Area SF across A/C space

$U_{Exist.}$ = 0.35 BTU/HR^{o}F.SF U_{New} = 0.15 BTU/HR^{o}F.SF

From Trace
Heat Loss with U_{New} (.15) = 85,932 BTUH
Heat Loss with $U_{Exist.}$ (.35)
$\frac{85,932 \times .35}{.15}$ = 200,508 BTUH
Energy Saved for Heating = 114,575 BTUH

Annual Energy Savings
$\frac{2901 \text{ HDD} \times 24 \times 114,575 \text{ BTUH}}{(68 - 23) \times .90(\text{Effy.})}$ = 196.97 MIL.BTU/YR.

Annual Dollar Savings
$12.53/MIL BTUS x 196.97 MIL BTUS/YR. = $2,468

From Trace
Heat Gain with U_{New} (.15) = 31,166 BTUH
Heat Gain with $U_{Exist.}$ (.35)
$\frac{31,166 \times .35}{.15}$ = 72,721 BTUH
Energy Saved for Cooling = 41,555 BTUH

Annual Energy Savings
$\frac{1810 \text{ CDD} \times 41,555 \text{ BTUH}}{3,413}$ = 22,038 KWH/YR
or 75.22 MIL BTU/YR.

Annual Dollar Savings
$0.04/KWH x 22,038 KWH = $882

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 1209 and BUILDING M424

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A: Solar Domestic Hot Water — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	18,125			18,125
OPERATIONS Oil (Steam)		244	80.23	19,581
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 37,706 ÷ DISCOUNT FACTOR = UNIFORM ANNUAL COST

ALTERNATIVE B: Conventional Steam — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Oil (Steam)		1,976	80.23	158,534
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 158,534 ÷ DISCOUNT FACTOR = UNIFORM ANNUAL COST

REMARKS

Alternate A is feasible.

Life Cycle Cost
Alt. A - $ 37,706
Alt. B - 158,534
L.C.C. - 120,828
- $121 x 10^3

$$\text{S.I.R.} = \frac{158,534}{37,706} = 4.2$$

$$\text{Payback} = \frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{18,125}{1,732} = 10.5$$

From Enclosure 14 = Less than 8 years.

Encl 7

BUILDING 1209 AND BUILDING M424 - SOLAR DHW
SOLAR ANALYSIS

1. Investment Cost: Back-up estimate esc. to 1 January 82.

2. Energy Cost: FY 80 FY 81 FY 82
Steam (Oil) $9.27/Mil BTU x 1.04 x 1.14 x 1.14 = 12.53/Mil BTU

3. Energy Consumption
Alternate A
Auxiliary Energy Required = 19.44 MBTU/YR*
Cost of Aux. Energy 19.44 x 12.53 = $244

Alternate B
Conventional Energy Required = 157.68 MBTU/YR*
Cost of Conventional Energy = 157.68 x 12.53 = $1,976

4. Discount Factor - Use 80.23 for 25 years for oil from enclosure 14 (FY 82)

5. Payback = $\frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{18,125}{1,732} = 10.5$

From Enclosure 14 = Less Than 8 years.

* Refer to SOLCOST analysis

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 508 and BUILDING RR3

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES See Below

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Variable temperature constant volume split system, packaged terminal A/C and Fin. Rad.

ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$87,249			$ 87,249
OPERATIONS Elec.		$51,836	18.049	935,588
OPERATIONS Steam (oil)		21,914	20.050	439,376
MAINTENANCE		2,213	9.524	21,077
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 1,483,290 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $155,742

ALTERNATIVE B Variable air volume with reheat air cooled chiller, packaged terminal A/C and Fin. Rad.

ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$145,487			$145,487
OPERATIONS Elec.		$52,801	18.049	953,005
OPERATIONS Steam (oil)		21,891	20.050	438,915
MAINTENANCE		2,397	9.524	22,829
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 1,560,236 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $163,822

REMARKS

Alternative "A" is feasible.

Life Cycle Cost
Alt. A - $1,483,290
Alt. B - 1,560,236
L.C.C. - $ 76,946
- 77×10^3

$$S.I.R. = \frac{1,560,236}{1,483,290} = 1.05$$

Encl 7

BUILDING 508; BUILDING RR-3 - VTCV/VAV
DESIGN ANALYSIS

1. Investment Costs: From back-up estimates (PED Level).

2. Energy Cost:

	FY 80		FY 81	FY 82	
Steam (Oil)	$9.27/MIL BTU	X 1.04 X	1.14 X	1.14 =	$12.53/MIL BTU
Elec.	$0.0296	X 1.04 X	1.13 X	1.13 =	$0.04/KWH

3. Operating Expenses: From Energy Analysis

Alternate A:
Elec. - 1,295,902 KWH X $0.04/KWH = $51,836
Steam - 17,489 Therms X 0.1 MIL BTU/THERM X $12.53/MIL BTU = $21,914

Alternate B:
Elec. - 1,320,024 KWH X $0.04/KWH = $52,801
Steam - 17,471 THERMS X 0.1 MIL BTU/THERM X 12.53/MIL BTU = $21,891

4. Maintenance:

Alternate A - $2,213

Alternate B - $2,397

5. Uniform Annual Cost = $\frac{\text{TOTAL PRESENT VALUE}}{\text{0\% INFL. @ 10\% DISC. FACTOR}}$

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 508; BUILDING RR-3

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Storm Windows — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$2,763			$2,763
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 2,763 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST 290

ALTERNATIVE B No Storm Windows — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS		$1,143	20.05	$22,917
MAINTENANCE		254	18.049	4,584
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 27,501 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST 2,886

REMARKS Alternative A is feasible due to lower present value than B.

Life Cycle Cost
Alt. A - $ 2,763
Alt. B - 27,501
L.C.C. - $24,738
- $25 x 10^3

$$S.I.R. = \frac{27,501}{2,763} = 9.95$$

Encl 7

BUILDING 508 and BUILDING RR-3 - Storms

TOTAL WINDOW AREA (Heating) = 1,027 SF
(Cooling) = 759 SF

SAVINGS FROM STORM WINDOWS

1. Winter Savings:

Reduction in Infiltration x ΔT x 1.08 x SF Window
+ Reduction in Transmission x ΔT x SF Window
= 0.5(2.4 - 1.2) CFM/SF x (68 - 23) x 1.08 x 1,027
+ (1.04 - 0.54) x (68 - 23) x 1,027 SF
= 53,055 BTUH

ANNUAL SAVINGS IN BTU's

$$\frac{2901 \text{ HDD} \times 24 \times 53{,}055}{(68 - 23) \times .90(\text{Effy.})} = 91.21 \text{ MIL BTU/YR.}$$

ANNUAL DOLLAR SAVINGS
$12.53/MIL BTU's x 91.21 MIL BTU/YR. = $1,143

2. Summer Savings:

Reduction in Infiltration x ΔH x 4.45 x SF Window
+ Reduction in Transmission x ΔT x SF Window
= 0.5(1.2 - 0.6) CFM/SF x 12 x 4.45 x 759 SF
+ (1.04 - 0.54) x (68 - 23) x 759 SF
= 11,958 BTUH

ANNUAL SAVINGS IN BTU's

$$\frac{1810 \text{ CDD} \times 11{,}958 \text{ BTUH}}{3{,}413 \text{ KWH/BTU}} = \begin{array}{l} 6{,}342.\text{KWH} \\ \text{or } 21.6 \text{ MIL BTU/YR.} \end{array}$$

ANNUAL DOLLAR SAVINGS
$0.04/KWH x 6,342 KWH = $254

3. Total Annual Savings from Storm Windows
$1,143 + $254 = $1,397

4. Cost of Storm Windows

Jan 80	Jun 80	Jan 82	
$2.27/SF x	1.036 x	1.142 =	$2.69

represents cost to add storms to proposed cost for screens under equipment section.

INSTALLATION COST OF STORM WINDOWS
1,027 SF x $2.69/SF = $2,763

5. Discount Factor - Use 20.050 for 25 years for oil, 8%; and use 18.049 for 25 years for electricity, 7%.

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 508; BUILDING RR-3

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO.
P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Add insulation in ceiling — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$15,538			$15,538
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 15,538 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $1,631

ALTERNATIVE B Continue to operate with current losses — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam (oil)		$8,915	20.05	$182,758
OPERATIONS Elec.		7,874	18.049	142,118
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 324,876 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $34,111

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $ 15,538
Alt. B - 324,876
L.C.C. - $309,338
- $309 x 10^3

$$S.I.R. = \frac{324,876}{15,538} = 20.91$$

Encl 7

BUILDING 508 and BUILDING RR-3

1. Additional insulation above ceiling

Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Roof Area SF over heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Roof Area SF over A/C space

$U_{Exist.}$ = 0.44 BTU/HR^{o}F. SF U_{New} = 0.05 BTU/HR^{o}F. SF

From Trace

Heat Loss with U_{New} (.05) = 53,060 BTUH

Heat Loss with $U_{Exist.}$ (.44)

$\frac{53,060 \times .44}{.05}$ = 466,928 BTUH

Winter Energy Saved = 413,868 BTUH

Annual Savings in BTU's

$\frac{2901 \text{ HDD} \times 24 \times 413,868 \text{ BTUH}}{(68 - 23) \times .90 \text{(Effy.)}}$ = 711.48 MIL BTU/YR.

Annual Dollar Savings

\$12.53/MIL BTUS x 711.48 MIL BTUS/YR. = \$8,915

From Trace

Heat Gain with U_{New} (.05) = 47,588 BTUH

Heat Gain with $U_{Exist.}$ (.44)

$\frac{47,588 \times .44}{.05}$ = 418,774 BTUH

Summer Energy Saved = 371,186 BTUH

Annual Savings in BTU's

$\frac{1810 \text{ CDD} \times 371,186 \text{ BTUH}}{3,413 \text{ KWH/BTU}}$ = 196,850 KWH/YR. or 671.85 MIL BTU/YR.

Annual Dollar Savings

\$0.04/KWH x 196,850 KWH = \$7,874

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING 508; BUILDING RR-3

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Add insulation in walls — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$14,206			$14,206
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 14,206 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $1,492

ALTERNATIVE B Continue to operate with current losses — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam (oil)		$2,252	20.05	$45,153
OPERATIONS Elec.		922	18.049	16,641
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 61,794 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $6,488

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $14,206
Alt. B - 61,794
L.C.C. - $47,588
- $48 x 10^3

$$S.I.R. = \frac{61,794}{14,206} = 4.35$$

Encl 7

BUILDING 508 and BUILDING RR-3

2. Additional insulation in walls

Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Wall Area SF across heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Wall Area SF across A/C space

$U_{Exist.}$ = 0.35 BTU/HR^{o}F.SF. U_{New} = 0.15 BTU/HR^{o}F.SF.

From Trace

Heat Loss with U_{New} (.15) = 78,402 BTUH

Heat Loss with $U_{Exist.}$ (.35)

$\frac{78,402 \times .35}{.15}$ = 182,938 BTUH

Energy Saved for Heating = 104,536 BTUH

Annual Energy Savings

$\frac{2901 \text{ HDD} \times 24 \times 104,586 \text{ BTUH}}{(68 - 23) \times .90(\text{Effy.})}$ = 179.71 MIL BTU/YR.

Annual Dollar Savings

\$12.53/MIL BTUS x 179.71 MIL BTU/YR. = \$2,252

From Trace

Heat Gain with U_{New} (.15) = 32,586 BTUH

Heat Gain with $U_{Exist.}$ (.35)

$\frac{32,586 \times .35}{.15}$ = 76,034 BTUH

Energy Saved for Cooling = 43,448 BTUH

Annual Energy Savings

$\frac{1810 \text{ CDD} \times 43,448 \text{ BTU}}{3,413}$ = 23,042 KWH/YR.
78.64 MIL BTU/YR.

Annual Dollar Savings

\$0.04/KWH x 23,042 KWH = \$922

ECONOMIC ANALYSIS OF SHORE FACILITY

	DATE
Building 508 and Building RR3	1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE	P NO.
DINING FACILITIES MODERNIZATION	P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Solar Domestic Hot Water Heating — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	10,087			10,087
OPERATIONS		149	80.23	11,954
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 22,041 ÷ DISCOUNT FACTOR ____ = UNIFORM ANNUAL COST ____

ALTERNATIVE B Operate Domestic Hot Water System with Hot Water Generator Using Steam — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS		988	80.23	79,267
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 79,267 ÷ DISCOUNT FACTOR ____ = UNIFORM ANNUAL COST ____

REMARKS

Alternate "A" is feasible.
Life Cycle Cost
Alt. A - $22,041
Alt. B - 79,269
L.C.C. - 57,228
- $57 x 10^3

$$S.I.R. = \frac{79,267}{22,041} = 3.60$$

$$Payback = \frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{5043}{419} = 12.02$$

From Enclosure 14 = Less than 9 years.

Encl 7

BUILDING 508 AND BUILDING RR3 - SOLAR DHW
SOLAR ANALYSIS

1. Investment cost: Back-up estimate esc. to 1 January 82.

2. Energy Cost: FY 80 FY 81 FY 82
Steam (oil) $9.27/MIL BTU x 1.04 x 1.14 x 1.14 = 12.53/MIL BTU.

3. Energy Consumption
Alternate A
Auxiliary Energy Required = 11.93 MBTU/YR*
Cost of Aux. Energy = 11.93 x 12.53 = $149

Alternate B
Conventional Energy Required = 78.84 MBTU/YR*
Cost of Conventional Energy = 78.84 x 12.53 = $988

4. Discount Factor - use 80.23 for 25 years for oil from enclosure 14 (FY 82).

5. Payback = $\frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{10,087}{839} = 12.02$

From Enclosure 14 = Less than 9 years.

* Refer to SOLCOST analysis.

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING BA-103

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Add Storm Windows — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT		$1,383		$1,383
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 1,383 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $145

ALTERNATIVE B _____ ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam (oil)		$572	20.05	$11,526
OPERATIONS Elec.		703	18.049	12,688
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 24,214 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $2,542

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $ 1,383
Alt. B - 24,214
L.C.C. - 22,831
- 23×10^3

$$S.I.R. = \frac{24,214}{1,383} = 17.51$$

Encl 7

BUILDING BA-103 - STORMS
(Glazed Area Considered 1/2 of Building 508)

Total Window Area (Heating) = 514 SF
(Cooling) = 380 SF

Savings From Storm Windows

1. Winter Savings
   Reduction in Infiltration x ΔT x 1.08 x SF Window
   + Reduction in Transmission x ΔT x SF Window
   = 0.5(2.4 - 1.2) CFM/SF x (68 - 23) x 1.08 x 514 SF
   + (1.04 - 0.54) x (68 - 23) x 514 SF
   = 26,553 BTUH
   Annual Savings in BTU's

$$\frac{2901 \text{ HDD} \times 24 \times 26{,}553}{(68 - 23) \times .90 \text{ (Effy.)}} = 45.65 \text{ MIL BTU/YR.}$$

   Annual Dollar Savings
   $12.53/MIL BTUS x 45.65 MIL BTU/YR. = $572

2. Summer Savings
   Reduction in Infiltration x ΔH x 4.45 x SF Window
   + Reduction in Transmission x ΔT x SF Window
   = 0.5(1.2 - 0.6) CFM/SF x 12 x 4.45 x 380 SF
   + (1.04 - 0.54) x (68 - 23) x 380 SF
   = 6,174 BTUH
   Annual Savings in BTU's

$$\frac{1810 \text{ CDD} \times 6{,}174 \text{ BTUH}}{3{,}413 \text{ KWH/BTU}} = 3{,}274 \text{ KWH}$$
   or 11.17 MIL BTU/YR.

   Annual Dollar Savings
   $0.04/KWH x 3,274 KWH = $131

3. Total Annual Savings from Storm Windows
   $572 + $131 = $703

4. Cost of Storm Windows
   Jan 80 Jun 80 Jan 82
   $2.27/SF x 1.036 x 1.142 = $2.69 represents cost to add storms to proposed cost for screens under equipment section.

   Installation Cost of Storm Windows
   514 SF x $2.69/SF = $1,383

5. Discount Factor - Use 20.050 for 25 years for oil, 8%; and use 18.049 for 25 years for electricity, 7%.

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING BA-103

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A: Add insulation above ceiling — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$6,027			$6,027
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A = $ 6,027 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST 633

ALTERNATIVE B: Operate with existing losses — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam (oil)		$4,457	20.05	$89,363
OPERATIONS Elec.		3,937	18.049	71,059
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B = $ 160,422 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $16,844

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $ 6,027
Alt. B - 160,422
L.C.C. - 154,395
- $154 x 10^3

$$S.I.R. = \frac{160,422}{6,027} = 26.62$$

Encl 7

BUILDING BA-103

1. Additional insulation above ceiling
Energy Saved:

Winter = ($U_{Exist.} - U_{New}$) x ΔT x Roof Area SF over heated space

Summer = ($U_{Exist.} - U_{New}$) x Solar Gain Factor x Roof Area SF over A/C space

$U_{Exist.}$ = 0.44 BTU/HR^{o}F.SF U_{New} = 0.05 BTU/HR^{o}F.SF

From Trace
Heat Loss with U_{New} (.05) = 26,530 BTUH
Heat Loss with $U_{Exist.}$ (.44)
$\frac{26,530 \times .44}{.05}$ = 233,464 BTUH
Winter Energy Saved = 206,934 BTUH

Annual Savings in BTU's
$\frac{2901 \text{ HDD} \times 24 \times 206,934 \text{ BTUH}}{(68 - 23) \times .90(\text{Effy.})}$ = 355.74 MIL BTU/YR.

Annual Dollar Savings
$12.53/MIL BTUS x 355.74 MIL BTUS/YR. = $4,457

From Trace
Heat Gain with U_{New} (.05) = 23,794 BTUH
Heat Gain with $U_{Exist.}$ (.44)
$\frac{23,794 \times .44}{.05}$ = 209,387 BTUH
Summer Energy Saved = 185,593 BTUH

Annual Savings in BTU's
$\frac{1810 \text{ CDD} \times 185,593 \text{ BTUH}}{3,413 \text{ KWH/BTU}}$ = 98,425 KWH/YR.
or 335.92 MIL BTU/YR.

Annual Dollar Savings
$0.04/KWH x 161,437 KWH = $3,937

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING BA-103

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A Insulate exterior walls — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$7,225			$7,225
OPERATIONS				
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 7,225 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $759

ALTERNATIVE B Operate with existing losses. — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS Steam (oil)		$1,126	20.05	$22,576
OPERATIONS Elec.		461	18.049	8,321
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 30,897 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST $3,244

REMARKS

Alternative "A" is feasible.
Life Cycle Cost
Alt. A - $ 7,225
Alt. B - 30,897
L.C.C. - 23,672
- 24×10^3

$$S.I.R. = \frac{30,897}{7,225} = 4.28$$

Encl 7

BUILDING BA-103

2. Additional insulation in walls

Energy Saved:

Winter = ($U_{Exist.}$ - U_{New}) x ΔT x Wall Area SF across heated space

Summer = ($U_{Exist.}$ - U_{New}) x Solar Gain Factor x Wall Area SF across A/C space

$U_{Exist.}$ = 0.35 BTU/HR^{o}F.SF U_{New} = 0.15 BTU/HR^{o}F.SF

From Trace

Heat Loss with U_{New} (.15) = 39,201 BTUH

Heat Loss with $U_{Exist.}$ (.35)

$\frac{39,201 \times .35}{.15}$ = 91,469 BTUH

Energy Saved for Heating = 52,268 BTUH

Annual Energy Savings

$\frac{2901 \text{ HDD} \times 24 \times 52,268 \text{ BTUH}}{(68 - 23) \times .90(\text{Effy.})}$ = 89.86 MIL BTU/YR.

Annual Dollar Savings

$12.53/MIL BTUS x 89.86 MIL BTUS/YR. = $1,126

From Trace

Heat Gain with U_{New} (.15) = 16,293 BTUH

Heat Gain with $U_{Exist.}$ (.35)

$\frac{16,293 \times .35}{.15}$ = 38,017 BTUH

Energy Saved for Cooling = 21,724 BTUH

Annual Energy Savings

$\frac{1810 \text{ CDD} \times 21,724 \text{ BTUH}}{3413}$ = 11,521 KWH/YR. or 39.32 MIL BTU/YR.

Annual Dollar Savings

$0.04/KWH x 22,038 KWH = $461

ECONOMIC ANALYSIS OF SHORE FACILITY

BUILDING BA-103

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATTION

P NO. P-697

DESCRIPTION OF ALTERNATIVES

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A: Solar Domestic Hot Water — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	$5,043			$5,043
OPERATIONS		$75	80.23	6,017
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 11,060 ÷ DISCOUNT FACTOR _____ = UNIFORM ANNUAL COST _____

ALTERNATIVE B: Operate domestic hot water system with hot water generator using steam — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS		$489	80.23	$39,232
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 39,232 ÷ DISCOUNT FACTOR _____ = UNIFORM ANNUAL COST _____

REMARKS

Alternative "A" is feasible.

Life Cycle Cost
Alt. A - $11,060
Alt. B - 39,232
L.C.C. - 28,172
- $28 x 10^3

$$S.I.R. = \frac{39,232}{11,060} = 3.55$$

$$Payback = \frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{10,087}{839} = 12.02$$

From Enclosure 14 = Less than 9 years. Encl 7

BUILDING BA-103 - SOLAR DHW

1. Investment Cost: Back-up estimate escalates to 1 JAN 82.

2. Energy Cost:

		FY 80	FY 81	FY 82	
Steam (oil)	R9.27/MIL BTU	x 1.04	x 1.14	x 1.14	= 12.53/MIL BTU

3. Energy Consumption:

Alternate A:
Auxiliary Energy Required = 5.97 MIL BTU/YR*
Cost of Auxiliary Energy = 5.97x 12.53 = $75

Alternate B:
Conventional Energy Required = 39.42 MIL BUT/YR*
Cost of Conventional Energy = 39.42x 12.53 = $494

4. Discount Factor - Use 80.23 for 25 years for oil from enclosure 14(FY 82).

5. Payback = $\frac{\text{Investment Cost}}{\text{Annual Savings}} = \frac{5,043}{419} = 12.02$

From Enclosure 14 = Less Than 9 years.

*Refer to Solcost Analysis.

)LLATERAL EQUIPMENT REQUIREME[redacted]itial Outfitting)
D LANTDIV 4-1010/6 (NEW 2-79)

DATE
1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P. NO.
P-697

COG. SYMBOL AND FED. STOCK NO. OR OTHER SOURCE	ITEM/EQUIPMENT DESCRIPTION	QUAN-TITY	UNIT OF ISSUE	M + L + MV UNIT PRICE	TOTAL COST
. BUILT-IN EQUIPMENT O BE MCON FUNDED	*Intercom system amplifiers	5	EA	876	4,380
	*Drinking water coolers	16	EA	804	12,864
	*Venetian blinds	340	EA	138	46,920
	*Window screens	340	EA	37	12,580
	*Serving line vent hood	2	EA	19,106	38,212
	*Soiled ware handling system 1 - ea. Bldg. BA-103 1 - ea. Bldg. 1209 1 - ea. Bldg. RR-3 2 - ea. Bldg. M-424 1 - ea. Bldg. 508	6	EA	56,268	337,608
	*Convection oven 2 - ea. Bldg. BA-103 2 - ea. Bldg. RR-3 2 - ea. Bldg. M-424	6	EA	4,495	26,972
	*Ice machine 1 - ea. Bldg. RR-3 2 - ea. Bldg. M-424	3	EA	3,439	10,318
	*Walk-in cooler doors	8	EA	2,768	22,144
	SUBTOTAL (To 1391)				511,998
	*Equipment with associated installation cost and mark ups and escalation to JAN 82				
. EXPENSE ITEMS	Building BA-103				
asserstorm	Refrigerated display case	1	EA	3,355	3,355
eating	Grill, electric, 6 ft.	1	EA	2,508	2,508
merican Warehouse	Hot food table, mobile	2	EA	1,425	2,850
eating	Deep fat fryer	1	EA	1,164	1,164
obart	Vertical cutter, mixer	1	EA	2,778	2,778

)LLATERAL EQUIPMENT REQUIREMENTS (Initial Outfitting)
D LANTDIV 4-11010/8 (NEW 2-79)

DATE: 1 JULY 80

ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
DINING FACILITIES MODERNIZATION

P. NO. 697

COG. SYMBOL AND FED. STOCK NO. OR OTHER SOURCE	ITEM/EQUIPMENT DESCRIPTION	QUAN-TITY	UNIT OF ISSUE	UNIT PRICE	TOTAL COST
	SUBTOTAL				12,655
	Building 1209				
Hobart	Vertical cutter, mixer	1	EA	2,777	2,777
	SUBTOTAL				2,777
	Building RR-3				
Hobart	Vertical cutter, mixer	1	EA	2,778	2,778
Wasserstorm	Cold food counters w/sneeze guards	4	EA	1,837	7,348
Keating	Grill, electric, 6 ft.	2	EA	2,508	5,016
	SUBTOTAL				15,142
	Building M-424				
Wasserstorm	Cold food counter w/sneeze guards	4	EA	1,837	7,348
Keating	Grill, electric, 6 ft.	4	EA	2,508	10,032
	SUBTOTAL				17,380
	Building 508				
Keating	Griddle, electric, 6 ft.	2	EA	2,508	5,016
Victory	Reefer, reach in	1	EA	2,310	2,310
	SUBTOTAL				7,326
	Fire Extinguishers for all blds.	24	EA	75	1,800
	TOTAL EXPENSE ITEMS				57,080
	Shipping, packing, handling, installation charges and contingencies - 10%				5,700
3. INVESTMENT ITEMS	NONE				
4. APA EQUIPMENT	NONE				
5. TRAINING EQUIPMENT	NONE				
6. OTHER EXPENSES	NONE				
7. EQUIPMENT ON HAND	NONE				
8. SUMMARY	Expense Cost				62,780

ENERGY ANALYSIS SUMMARY

ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

Const. Contr. No. _____

DATE 1 JULY 80

PROJECT DINING FACILITIES MODERNIZATION | LOCATION MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA | ☐ PRELIM. ☒ FINAL

DESCRIPTION	REMARKS	BENEFIT/ COST	E/C	YEAR PAYBACK	CURRENT WORKING ESTIMATE	ANNUAL SAVINGS	TOTAL MBTU/YR	( ) MBTU/YR	( ) MBTU/YR	(MBTU/
BUILDING 1209										
1. Storm Windows				3	4,293	1,895	153.74			
2. Ceiling Insulation				1	14,670	12,422	1,021.68			
3. Wall Insulation				8	23,232	3,350	272.19			
4. Solar Dom. HW.				8	18,123	1732	81.29			
5. Solar Htg. & DHW	Solcost calculations proved not feasible.									
6. HW. Recovery	Not practical.									
7. Exhaust Air Heat Recovery	Not practical (analysis not made).									
8. Condensate	Condensate is recovered and is pumped to Central Energy plant (analysis not made).									

ENCLOSURE 6

ENERGY ANALYSIS SUMMARY

ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

Const. Contr. No. _____

DATE 1 JULY 80

PROJECT DINING FACILITIES MODERNIZATION

LOCATION MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

☐ PRELIM. ☒ FINAL

DESCRIPTION	REMARKS	BENEFIT/ COST	E/C	YEAR PAYBACK	CURRENT WORKING ESTIMATE	ANNUAL SAVINGS	TOTAL MBTU/YR	( ) MBTU/YR	( ) MBTU/YR	(MBTU
BUILDING M424										
1. Storm Windows				3	4,293	1,895	153.74			
2. Ceiling Insulation				1	17,437	14,762	1213.77			
3. Wall Insulation				8	23,232	3,350	272.19			
4. Solar Dom. HW.				8	18,123	1,732	81.29			
5. Solar Htg. & DHW	Solcost Calculation proved not feasible									
6. HW. Recovery	Not practical									
7. Exhaust Air Heat Recovery	Not practical (analysis not made)									
8. Condensate	Condensate is recovered and is pumped to Central Energy plant (analysis not made)									

ENCLOSURE 6

ENERGY ANALYSIS SUMMARY

ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND

NORFOLK, VIRGINIA

Const. Contr. No. _____

DATE 1 JULY 80

PROJECT DINING FACILITIES MODERNIZATION

LOCATION MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

☐ PRELIM. ☒ FINAL

DESCRIPTION	REMARKS	BENEFIT/ COST	E/C	YEAR PAYBACK	CURRENT WORKING ESTIMATE	ANNUAL SAVINGS	TOTAL MBTU/YR	( ) MBTU/YR	( ) MBTU/YR	(MBTU/
BUILDING 508										
1. Storm Windows				3	2,763	1,397	112.85			
2. Ceiling Insulation				1	15,538	16,789	1383.			
3. Wall Insulation				6	14,206	3,174	258.			
4. Solar Dom. HW.				9	10,086	839	39.15			
5. Solar Htg. & DHW	Solcost calculations proved not practical.									
6. HW. Recovery	Not practical.									
7. Exhaust Air Heat Recovery	Not practical (analysis not made).									
8. Condensate	Condensate is recovered and is pumped to Central Energy plant (analysis not made).									

ENCLOSURE 6

ENERGY ANALYSIS SUMMARY

ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

Const. Contr. No. _____

DATE 1 JULY 80

PROJECT DINING FACILITIES MODERNIZATION | LOCATION MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA | ☐ PRELIM. ☒ FINAL

DESCRIPTION	REMARKS	BENEFIT/ COST	E/C	YEAR PAYBACK	CURRENT WORKING ESTIMATE	ANNUAL SAVINGS	TOTAL MBTU/YR	( ) MBTU/YR	( ) MBTU/YR	(MBT
BUILDING RR-3										
1. Storm Windows				3	2,763	1,397	112.85			
2. Ceiling Insulation				1	15,538	16,789	1383.			
3. Wall Insulation				6	14,206	3,174	258.			
4. Solar Dom. HW.				9	10,086	839	39.15			
5. Solar Htg. & DHW	SolCost calculations proved not practical									
6. HW. Recovery	Not practical									
7. Exhaust Air Heat Recovery	Not practical (analysis not made)									
8. Condensate	Condensate is recovered and is pumped to Central Energy plant (analysis not made)									

ENCLOSURE 6

ENERGY ANALYSIS SUMMARY

ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

Const. Contr. No. _____

DATE 1 JULY 80

PROJECT DINING FACILITIES MODERNIZATION | LOCATION MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA | ☐ PRELIM. ☒ FINAL

DESCRIPTION	REMARKS	BENEFIT/ COST	E/C	YEAR PAYBACK	CURRENT WORKING ESTIMATE	ANNUAL SAVINGS	TOTAL MBTU/YR	( ) MBTU/YR	( ) MBTU/YR	(MBTU
BUILDING BA 103										
1. Storm Windows				3	1,383	699	56			
2. Ceiling Insulation				1	6,007	8,395	692			
3. Wall Insulation				6	7,225	1,587	129			
4. Solar Dom. HW.				9	5,045	420	20			
5. Solar Htg. & DHW	Solcost calculations proved not practical									
6. HW. Recovery	Not practical									
7. Exhaust Air Heat Recovery	Not practical (analysis not made)									
8. Condensate	Condensate is recovered and is pumped to Central Energy plant (analysis not made)									

ENCLOSURE 6

ODELL ASSOCIATES INC.
PLANNING
ARCHITECTURE
ENGINEERING
222 SOUTH CHURCH STREET · CHARLOTTE, NORTH CAROLINA 28202
704-377-5941

December 5, 1980

Public Works Department
Building 1005
Marine Corps Base
Camp Lejeune, North Carolina 28542

Attention: Commanding Officer

Re: Dining Facilities Modernization
Camp Lejeune North Carolina
Buildings 1209, M424, 508, RR3, BA103

Gentlemen:

According to the instructions of our Contract, we are transmitting herewith the thirty-five percent (35%) design submittal including sketch drawings, basis of design, outline specifications, tabulation of gross floor areas and cost estimate all dated December 3, 1980.

Please review the enclosed information and forward your comments to Department of the Navy, Atlantic Division, Attention: Mr. M. L. Bryant, by December 19, 1980, and forward a copy to our office.

We understand that this concludes our efforts in connection with the thirty-five percent (35%) design and will await your review, approval and notice to proceed from the Naval Facilities Engineering Command before proceeding with the final drawing phase.

Very truly yours,

ODELL ASSOCIATES INC.

Stephen D. Thomas

E-1412

Encl.: 35% design submittal (2 cys.)

cc: DON - Bryant

) DEC 8 A10: 30

ODELL ASSOCIATES INC.
PLANNING
ARCHITECTURE
ENGINEERING
222 SOUTH CHURCH STREET · CHARLOTTE, NORTH CAROLINA 28202
704-377-5941

December 5, 1980

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Attention: Commanding Officer

Re: Dining Facilities Modernization
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Buildings 1209, M424, 508, RR3, BA103

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Very truly yours,

ODELL ASSOCIATES INC.

Stephen D. Thomas

E-1412

Encl.: 35% design submittal (2 cys.)

cc: DON - Bryant

) DEC 8 A10 : 30

P-697

PWO:408:EGJ:bb
11000

7 NOV 1980

From: Commanding General
To: Commandant of the Marine Corps (LFF)

Subj: Supplemental Information Requested by Congress for FY-82 Military Construction Program; submittal of

Ref: (a) CMC ltr LFF-1-AN:apm of 16 Oct 1980

Encl: (1) DD Form 1390, Supplemental Data for FY-82 MCON Program
(2) DD Form 1391c, Supplemental Data for FY-82 MCON Project P-526, Combat Vehicle Maintenance Shop, w/work sheets
(3) DD Form 1391c, Supplemental Data for FY-82 MCON Project P-175, Communications/Electronics Maintenance Shop, w/work sheets
(4) DD Form 1391c, Supplemental Data for FY-82 MCON Project P-414, Unaccompanied Enlisted Personnel Housing, w/work sheets
(5) DD Form 1391c, Supplemental Data for FY-82 MCON Project P-697, Modernize Enlisted Dining Facilities BB-103, 1209, M-424, & 508, w/work sheets

1. Reference (a) provided guidance for submission of supplemental information for our FY-82 Military Construction Program, as requested by Congress. Accordingly, enclosures (1) through (5) are hereby forwarded for your continuing action.

R. P. MILLICE, Jr.
By direction

Blind copy to: (w/encls)
AC/S, Fac

Return Pwo Planning Branch

DD FORM 1390 SUPPLEMENTAL DATA
FY-82 MILITARY CONSTRUCTION PROGRAM

P-697

Navy COMPONENT	MCB Camp Lejeune NC INSTALLATION/LOCATION	Marine Corps COMMAND

($000)

A. ESTIMATED COST OF BACKLOG REAL PROPERTY MAINTENANCE (BMAR): *NOTE

Permanent Facilities:	( )
Temporary Facilities:	( )

B. SIMILAR UNUSED SPACE:

Real Property Categories:	Quantity/Unit of Measure
214-XX, COMBAT VEHICLE MAINTENANCE SHOP	**0 SF
217-XX, COMMUNICATIONS/ELECTRONICS MAINTENANCE SHOP	***0. SF
721-XX, UNACCOMPANIED ENLISTED PERSONNEL HOUSING	****52,291 SF
722-XX, DINING FACILITY	*****0 SF

C. OUTSTANDING POLLUTION AND SAFETY (OSHA) DEFICIENCIES ($000):

1. Air Pollution	*NOTE
2. Water Pollution	*NOTE
3. Safety and Occupational Health	*NOTE

NOTES:

*CMC (Code LFF) will complete.

**Combat Veh Maint Shops (reference P-526) located in substandard WW-II Butler-type metal buildings constructed in 1952 which do not meet the standards used today and cannot be economically rehabilitated.

***Comm/Elec Maint Shops (reference P-175) are located in makeshift temporary metal and semi-permanent wood/concrete block facilities that were constructed for warehousing.

****The vacant UEPH facilities were constructed in 1943 as emergency multi-use facilities (Admin, Storage, and UEPH). Construction consists of concrete foundation, concrete slab, masonry walls, wood trusses, and asphalt shingles; minimum electric power and detached toilet facilities.

*****The overall appearance, condition, and layout of the existing Dining Facilities being modernized (reference P-697) are inefficient, under-utilized, and do not permit a favorable environment while personnel are dining.

1. COMPONENT	FY 19 82 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
Navy		5 NOV 1980

3. INSTALLATION AND LOCATION

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA 28542

4. PROJECT TITLE	5. PROJECT NUMBER
MODERNIZE ENLISTED DINING FACILITIES BB-103, 1209, M-424, & 508	P-697

SUPPLEMENTAL DATA

A. ESTIMATED ANNUAL COST TO OPERATE THE PROPOSED FACILITY.... 486 ($000)

B. NUMBER OF ADDITIONAL PERSONNEL NECESSARY TO CARRY OUT THE FUNCTION OF THE PROPOSED FACILITY..... 0 (PEOPLE)

C. ESTIMATED LIFE-CYCLE COST TO OPERATE AND MAINTAIN THE PROPOSED FACILITY..... *NOTE ($000)

D. ESTIMATED LIFE-CYCLE COST TO OPERATE AND MAINTAIN THE EXISTING FACILITY IF NEW FACILITY IS A REPLACEMENT..... N/A ($000)

E. DESIGN DATA (Estimated): **NOTE

1. STATUS

a. Date Design Started.....
b. Percent Complete as of 1 Jan 19__.....
c. Percent Complete as of 1 Oct 19__.....
d. Date Design Complete.....

2. BASIS

a. Standard or Definitive Design: Yes___ No___
b. Where Design was Most Recently Used:_____

3. COST (Total) = c = a+b and d+e ($000)

a. Production of Plans and Specifications.....
b. All Other Design Costs.....
c. Total.....
d. Contract.....
e. In-House.....

4. CONSTRUCTION START..... (month and year)

F. EQUIPMENT ASSOCIATED WITH THIS PROJECT WHICH WILL BE PROVIDED FROM OTHER APPROPRIATIONS: *NOTE

Equipment Nomenclature	Procuring Appropriation	Fiscal Year Appropriated or Requested	Cost ($000)

(ALL NOTES ON PAGE 2)

1. COMPONENT	FY 19 82 MILITARY CONSTRUCTION PROJECT DATA	2. DATE
Navy		5 NOV 1980

3. INSTALLATION AND LOCATION

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA 28542

4. PROJECT TITLE	5. PROJECT NUMBER
MODERNIZE ENLISTED DINING FACILITIES BB-103, 1209, M-424, & 508	P-697

NOTES:

*These Dining Facilities are inadequate and are being modernized to bring them up to standards that are required to support today's all volunteer Marine Corps. A cost analysis has been made for feasibility and cost effectiveness, and it was found to be in the best interests of the Government to rehabilitate these facilities.

**CMC (Code LFF) will complete.

WORK SHEETS

P-697, MODERNIZE ENLISTED DINING FACILITIES

A. Annual Maintenance Cost:

Inventory of Like Facilities = 433,312 SF

Cost/Yr of Existing Facilities = $274,109

Cost/SF $\frac{\$274,109}{433,312\ SF}$ = $.63/SF

Proposed Facility = 95,433 SF

95,433 SF X $.63 = $60,123

SOURCE: Base Historical Data

B. Utility Costs:

1. Electricity: 1,200,000 KWH/YR X .0353/KWH = $42,360

2. Steam: 18,090,900 LBS/YR X .01007/LB = $182,175

3. Water & Sewage: 65 gal per pn per day:

(a) Annual Water Cost: 4,036 pn X 65 gal/day X $.6438/1000 gal X 365 days = $61,646

(b) Annual Sewage Cost: 4,036 pn X 65 gal/day X $.4673/1000 gal X 365 days = $44,746

4. Summary of Utility Costs (Annual):

Electricity:	$ 42,360
Steam:	$182,175
Water & Sewage:	$106,392
TOTAL:	$330,927

C. Other Engineering Support:

Trash Disposal:	$11,050
Pest Control:	$ 5,344
Misc. Services:	$10,000
TOTAL:	$26,394

WORK SHEETS, P-697, MODERNIZE ENLISTED DINING FACILITIES

D. Summary of Costs:

		(escalated to FY-82)
Maintenance & Repair:	$ 60,123	$ 69,983
Utilities:	$330,927	$385,199
Other Engr. Support:	$ 26,394	$ 30,723
TOTAL:	$417,444	$485,905

Escalation Factor for Above:

80-81 - 8.3%

81-82 = 7.5%

EF = 1.083 X 1.075 = 1.164

PWO:408:CWB:bb
P-697
7 Aug 1980

From: Base Commander
To: Commandant of the Marine Corps (LFS-3)

Subj: FY-82 MCON Project P-697, Dining Facilities Modernization; update of collateral equipment for

Ref: (a) MCO P11000.12

Encl: (1) LANTDIV 4-11010/6 Forms, Collateral Equipment Requirements for P-697, Dining Facilities Modernization, dtd 30 Jul 1980

1. Reference (a) provided detailed instruction for the preparation of Collateral Equipment Requirements lists. In accordance with reference (a), the collateral equipment requirements for the subject project have been updated and are hereby submitted as enclosure (1).

V. PODBIELSKI
By direction

Blind copy to: (w/encl)
AC/S, Fac
AC/S, Sup Serv
BFSO

Pls return to PW Planning Branch

7 Aug 18

PIS returns to Pm Planning Branch

COLLATERAL EQUIPMENT REQUIREMENTS (Initial Outfitting)
5ND LANTDIV 4-11010/6 (NEW 2-79)

DATE 30 JULY 1980

1. ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA 28542

2. PROJECT TITLE
DINING FACILITY MODERNIZATION, BLDG BA-103

P. NO. P-697

COG. SYMBOL AND FED. STOCK NO. OR OTHER SOURCE	ITEM/EQUIPMENT DESCRIPTION	QUANTITY	UNIT OF ISSUE	UNIT PRICE	TOTAL COST
1. Built-in Equipment to be MCON Funded					
	*Heating, ventilating, and air-conditioning installations		EA		
	*Fire alarm and intercom systems		EA		
	*Drinking water coolers		EA		
	*Venetian Blinds and Window Screens		EA		
	*Serving line vent hood		EA		
	*Soiled ware handling system		EA		
	*Deep fat fryer		EA		
	*Convection oven		EA		
	*Vertical cutter, mixer		EA		
*Equipment with associated installation cost.					
2. Expense Items					
Wasserstorm	Refrigerated display case	1	EA	3,355	3,355
Keating	Grill, electric, 6 ft.	1	EA	2,508	2,508
American Warehouse	Hot food table, mobile	2	EA	1,425	2,850
	Beverage island	1	EA	2,500	2,500
	Subtotal				11,213

COLLATERAL EQUIPMENT REQUIREMENTS (Initial Outfitting)
5ND LANTDIV 4-11010/6 (NEW 2-79)

DATE: 30 JULY 1980

1. ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA 28542

2. PROJECT TITLE
DINING FACILITY MODERNIZATION, BLDG 1209

P. NO. P-697

COG. SYMBOL AND FED. STOCK NO. OR OTHER SOURCE	ITEM/EQUIPMENT DESCRIPTION	QUAN-TITY	UNIT OF ISSUE	UNIT PRICE	TOTAL COST
1. Built-in Equipment to be MCON funded					
	*Heating, Ventilating, and air-conditioning installations		EA		
	*Fire alarm and intercom systems		EA		
	*Drinking water coolers		EA		
	*Venetian blinds and window screens		EA		
	*Dishwasher, flight type		EA		
	*Ventilation hood, serving line		EA		
	*Soiled ware handling system		EA		
	*Vertical cutter, mixer		EA		
*Equipment with associated installation cost.					
2. Expense Items					
	Beverage Island	3	EA	2,500	7,500
	Subtotal				7,500

COLLATERAL EQUIPMENT REQUIREMENTS (Initial Outfitting)
5ND LANTDIV 4-11010/6 (NEW 2-79)

DATE: 30 JULY 1980

1. ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA 28542

2. PROJECT TITLE
DINING FACILITY MODERNIZATION, BLDG. RR-3

P. NO. P-697

COG. SYMBOL AND FED. STOCK NO. OR OTHER SOURCE	ITEM/EQUIPMENT DESCRIPTION	QUANTITY	UNIT OF ISSUE	UNIT PRICE	TOTAL COST
1. Built-in Equipment to be MCON Funded					
	*Heating, ventilating, and air-conditioning installations		EA		
	*Fire alarm and intercom systems		EA		
	*Drinking water coolers		EA		
	*Venetian blinds and window screens		EA		
	*Pot washer		EA		
	*Vertical cutter, mixer		EA		
	*Convection oven		EA		
	*Soiled ware handling system		EA		
*Equipment with associated installation cost.					
2. Expense Items					
Wasserstorm	Cold food counters w/sneeze guards	4	EA	1,837	7,348
Keating	Grill, electric, 6 ft.	2	EA	2,508	5,016
Lern	Ice machine	1	EA	1,980	1,980
	Beverage island	2	EA	2,500	5,000
	Subtotal				19,344

COLLATERAL EQUIPMENT REQUIREMENTS (Initial Outfitting)
5ND LANTDIV 4-11010/6 (NEW 2-79)

DATE: 30 JULY 1980

1. ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA 28542

2. PROJECT TITLE
DINING FACILITY MODERNIZATION, BLDG M-424

P. NO. P-697

COG. SYMBOL AND FED. STOCK NO. OR OTHER SOURCE	ITEM/EQUIPMENT DESCRIPTION	QUANTITY	UNIT OF ISSUE	UNIT PRICE	TOTAL COST
1. Built-in Equipment to be MCON Funded					
	*Heating, ventilating, and air conditioning installation		EA		
	*Fire alarm and intercom system		EA		
	*Drinking water coolers		EA		
	*Venetian blinds and window screens		EA		
	*Pot washer		EA		
	*Soiled ware handling system		EA		
	*Ice dispenser		EA		
	*Convection oven		EA		
*Equipment with associated installation costs.					
2. Expense Items					
Keating	Cold food counter w/sneeze guard	4	EA	1,837	7,348
	Grill, electric, 6 ft.	4	EA	2,508	10,032
	Beverage island	4	EA	2,500	10,000
	Subtotal				27,380

COLLATERAL EQUIPMENT REQUIREMENTS (Initial Outfitting)
5ND LANTDIV 4-11010/6 (NEW 2-79)

DATE: 30 July 1980

1. ACTIVITY (Name and Location)
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA 28542

2. PROJECT TITLE
DINING FACILITY MODERNIZATION, BLDG 508

P. NO. P-697

COG. SYMBOL AND FED. STOCK NO. OR OTHER SOURCE	ITEM/EQUIPMENT DESCRIPTION	QUANTITY	UNIT OF ISSUE	UNIT PRICE	TOTAL COST
1. Built-in Equipment to be MCON Funded					
	*Heating, ventilating and air-conditioning installation		EA		
	*Fire alarm and intercom system		EA		
	*Drinking water coolers		EA		
	*Venetian blinds and window screens		EA		
	*Pot washer		EA		
	*Reefer, reach-in		EA		
	*Soiled ware handling system		EA		
	*Serving line vent hood		EA		
*Equipment with associated installation costs.					
2. Expense Items					
Keating	Griddle, electric, 6 ft.	2	EA	2,508	5,016
	Beverage island	2	EA	2,500	5,000
	Subtotal				10,016
	Bldg BA-103				11,213
	Bldg 1209				7,500
	Bldg RR-3				19,344
	Bldg M-424				27,380
	Bldg 508				10,016
	Total Expense Items				75,453
	Shipping, packing, handling, installation charges, contingencies (10%)				7,545
	Grand Total				82,998

1 AUG 1980

ARCHITECTURAL BRANCH
CONTRACT PRIORITY LIST

Contract No.	Title	Completion Date
2025	IMPROVE ENL CLUBS, BLDGS 62 & M-134	1 AUG 80
2092	REROOF PORTION BLDG. H-14	1 AUG 80
2040	ADDN TO ENL CLUB, FRENCH CREEK (1)	15 AUG 80
2090	STAINED GLASS WINDOWS	22 AUG 80
2111	ADDITION/ALTERATIONS TO NCO CLUB, COURTHOUSE BAY (2)	5 SEP 80
2099	CONSTRUCT DETENTION CELL, PMO, BLDG AS-122	5 SEP 80
2109	DISBURSING IMPROVEMENTS	19 SEP 80
2108	HELICOPTER INTERNAL STORES 3	3 OCT 80
2106	MOD TO COMM CENTER (4)	17 OCT 80
2107	BATTERY SHOP	31 OCT 80
2077	GYM FLOORS	14 NOV 80
2076	REROOF 1200 & 1500	28 NOV 80

BLDG 14. 1 Oct.