#### DESIGN CONCEPTS

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

Project Title: <u>UNACCOMPANIED ENLISTED PERSONNEL</u>

HOUSING (UEPH), (P-624)

# USE OF DEFINITIVES AND PREVIOUS DESIGNS

Standard Marine Corps definitive designs have been revised for the 3-story reinforced concrete buildings in this project to conform to the UEPH criteria of 1 APR 83 which provides for two-man rooms with a two room module sharing a connecting bath.

## SPECIAL DESIGN CHARACTERISTICS

No special design characteristics are included.

## ENERGY CONSERVATION

a. MBTB was directed to site adapt the multi-use definitive (MUD) drawings including the use of terminal air blenders, by-pass air handling units, fan coil units and unit heaters for the building mechanical systems. The total energy savings over 1975 energy consumption is less than 15%, and well below the required 45% due in part to the similarity in barracks styles, with large areas of exposed walls and glass with medium to high heat transfer valves and small areas of exposed roof with low heat transfer valves.

## b. Interim DOD Design Energy Budget

Building Categroy Code No. - 721 Climatic Zone - 4

Energy Budget Figure Required - 60,000 BTU/Ft<sup>2</sup>
Energy Budget Figure Achieved - 34,655 BTU/Ft<sup>2</sup>

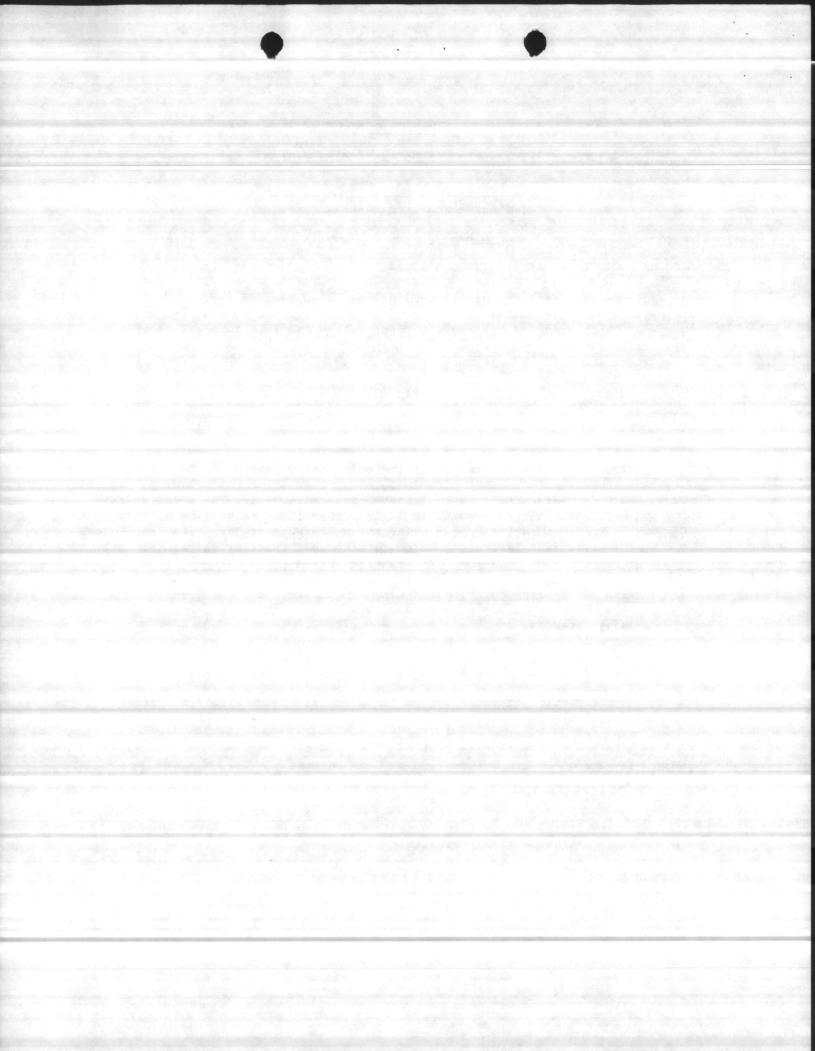
- c. A solar domestic hot water system is not considered feasible for this project based on a life cycle cost analysis.
- d. This design will interface with the Energy Monitoring and Control Systems (EMCS) soon to be under construction at Camp Lejeune.

## POLLUTION ABATEMENT ASPECTS OF DESIGN

Erosion control will be required during construction of this facility. No other air or water pollution is anticipated.

#### SITE APPROVAL

The site has been approved by the Commandant (LFFI), Marine Corps by letter of 16 NOV 81 and in accordance with the requirements of NAVFAC INST 11010.57 of 20 MAR 72.



#### ECONOMIC ANALYSIS

The secondary systems were directed to be terminal air blenders with six (6) central air handling units for each barracks. The design criteria required steam to be the primary source of energy. With the above criteria being set, the remaining decision was the type of central chilled water facility to be considered.

Economic analyses were prepared and are included for the following:

Two air cooled reciprocating chillers vs. one centrifugal chiller with cooling tower. (Two air cooled chillers selected).

1500 SF of solar collectors vs. steam fired hot water system. (Solar not feasible).

1000 SF of solar collectors vs. 2000 SF of solar collectors (Solar not feasible).

## SPECIAL ENGINEERING SERVICES

A topographic survey has been prepared for the site. Sub-surface soil investigation has been carried out throughout the site.

The soil borings indicate that shallow spread concrete foundations may be used for four of the buildings. Two buildings will be supported on pile foundations.

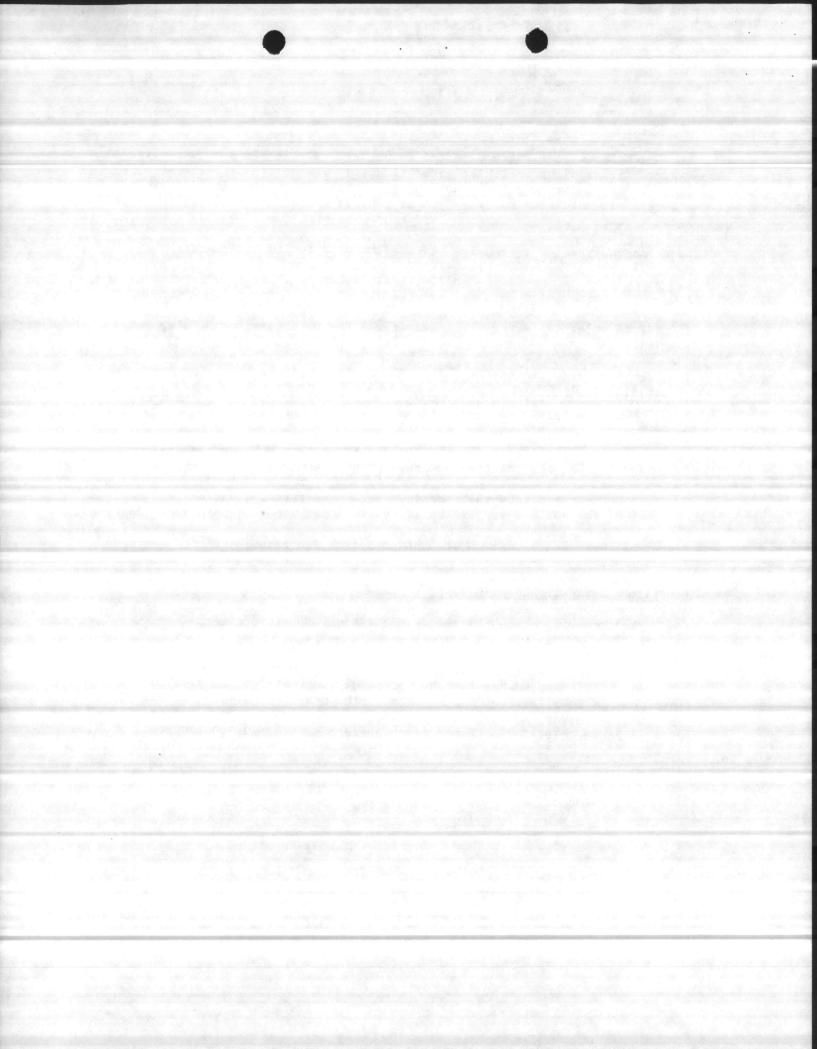
Timber pilings with a maximum of 50-foot length are recommended for the deep foundations.

## OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

OSHA Standards will be considered in the design of this project.

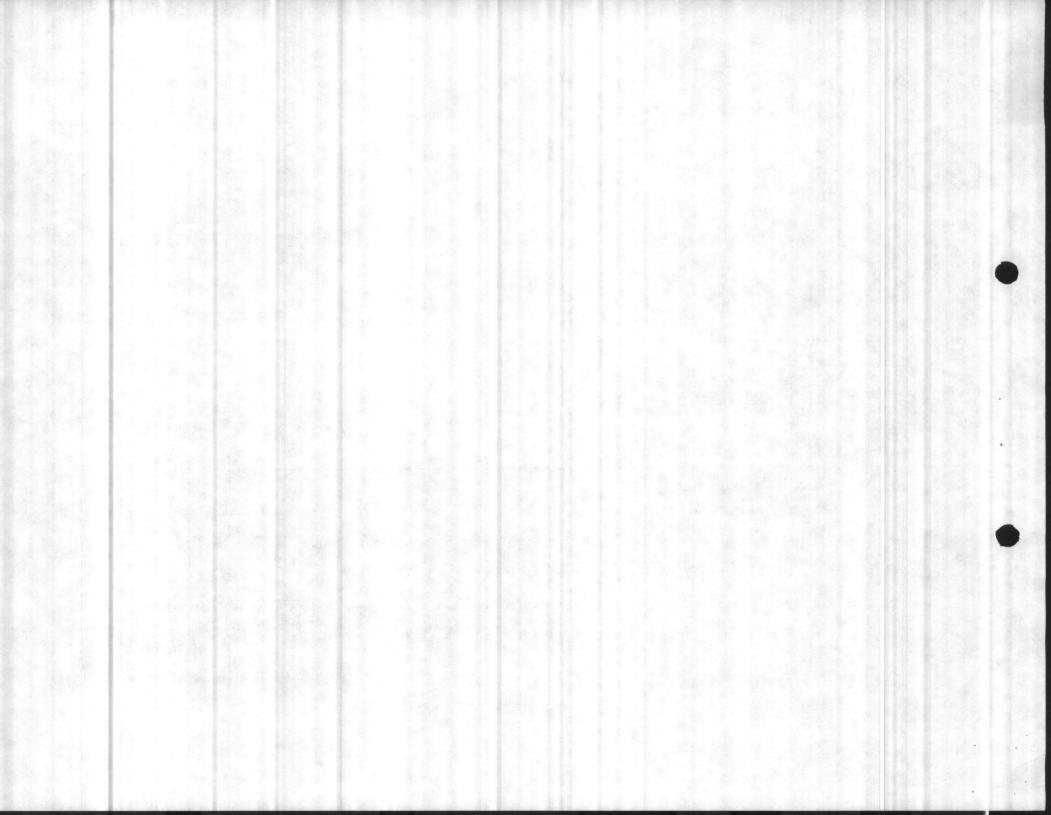
#### DEMOLITION -

Two existing squad-bay type barracks buildings will be demolished under this project to allow for construction of the new UEPH buildings. The existing buildings, No. 426 and No. 477, are two-story masonry construction with approximately 13,350 SF per floor and are considered substandard.

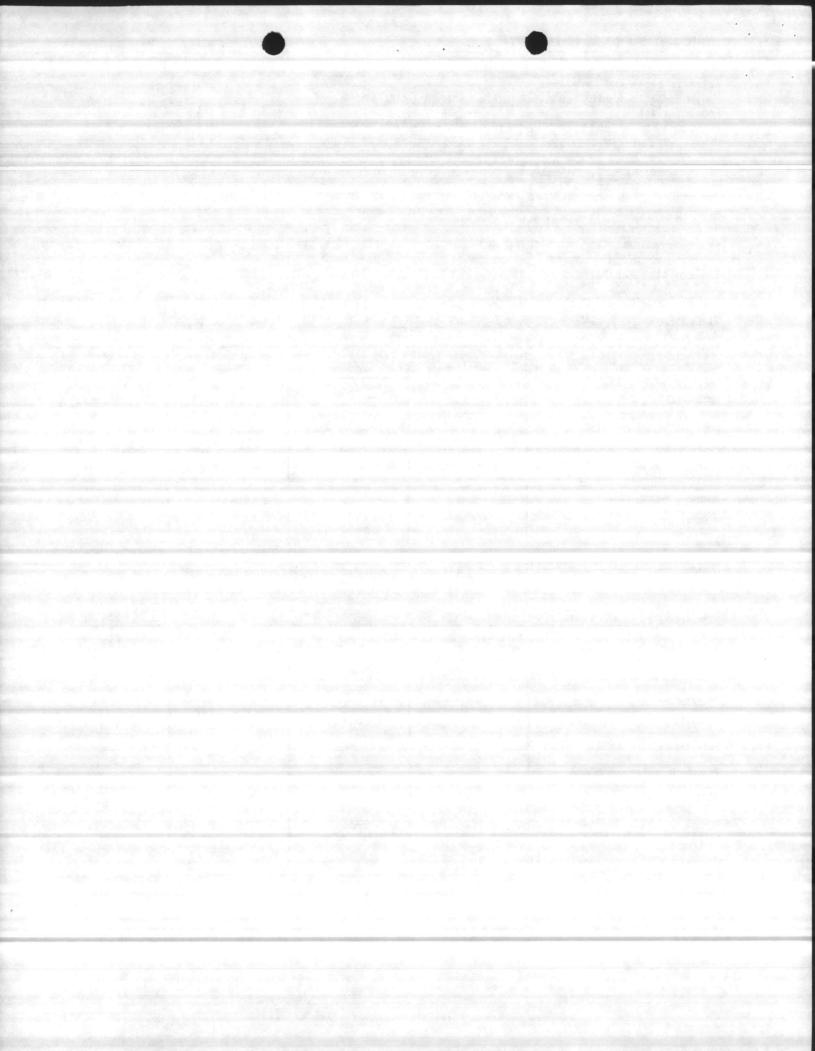


# SUMMARY OF ENERGY CONSERVATION ANALYSIS

Activity	and Location	n: MCB, CA	MP LEJEUNE,	NC Proje	ect Title: <u>UEF</u>	н	(P-624)	Date:	10 NOV 83	
	E Current = R = (1 - (	9,390,500,0 E Current/E	0003TUs per 1	year (Tota	l annual energy l annual energy Percent reducti	consumptio	n incorporation	ng curre	nt criteria)	75)
Bar	rels of Oil				*(Barrels of 5,825,40		Saved, Curren	t Design	vs 1975)	
(1) Priority	(2) Description of Measure			0)	(6) 10 <sup>6</sup> BTUs Consumption/ Yr E	(7) % Energy Reduction of Measure R	(8) (6) Annual Consumption Bldg. Square Footage BTU/SF/yr	ative	(10) First Cost of Measure (\$1000)	(11) Total Construction Cos (10) + 1 (\$1000)
Current R.	Design (Incl	uding Manda X	atory Measur	es) X	9,390	14.4	34,655	14.7	. X	14,169
Other Co R1. R2.	st Effective	Measures	Included							
	Effective M	leasures Eva	aluated							9
R1. Cent	. Chiller	486.1	-20.2	-24.5	8,894	5.3	32,824	X	180.7	Х
R3. Sola	r Domestic F	1.W. 528.0	106.1	4.97	X	X	X	· X	131.9	Х



DESCRIPTION AND YEAR	COSTS	(5)	DISCOUNT	PRESENT	
DESCRIPTION AND TEAR	ONE TIME	RECURRING	FACTOR	VALUE (\$)	
INVESTMENT					
DPERATIONS STEAM 30/70		16,112	22.28	358,975	
HA I NTENANCE				14 14	
PERSONNEL					
TERMINAL VALUE					
OTHER:					
TOTAL PRESENT VALUE ALTERNATIV		, DI	SCOUNT FACTOR	UNIFORM ANNUAL	



ECONOMIC ANALYSIS OF SHORE FA	r <b>y</b>		DATE 10 NO	DV 1983
Marine Corps Base, Camp Le	jeune, North Ca	rolina		
PROJECT TITLE Unaccompanied Enlisted Persons OF ALTERNATIVES	sonnel Housing	(UEPH)	PN	524
ALT. C - 1000 SQ. FT. of f for dom. hot water	lat plate colle	ectors with 2000	gal. storage	tank
ALT. D - 2000 SQ. FT. of f	lat plate colle	ectors with 4000	gal. storage	tank for dom.
PROJECT COST PROJECTIONS BY ALT	ERNATIVES			
ALTERNATIVE C 1000 SQ. FT. o	f Solar Collec	tors	ECONOL LIFE	41C 25 YRS.
DESCRIPTION AND YEAR	COST:	S (\$)	DISCOUNT	PRESENT VALUE (\$)
INVESTMENT OPERATIONS STEAM 30/70 MAINTENANCE PERSONNEL	91,100	14,017 24.67	22.28 12.06	91,100 312,308 29,763
TERMINAL VALUE OTHER:				
			COOLINE FACTOR	HINTEDDA ANNHAL COST

DISCOUNT FACTOR

UNIFORM ANNUAL COST

TOTAL PRESENT VALUE ALTERNATIVE A - \$ 433,171

ALTERNATIVE D 2000 SQ. FT. of Solar Collectors

ECONOMIC LIFE

25 YRS.

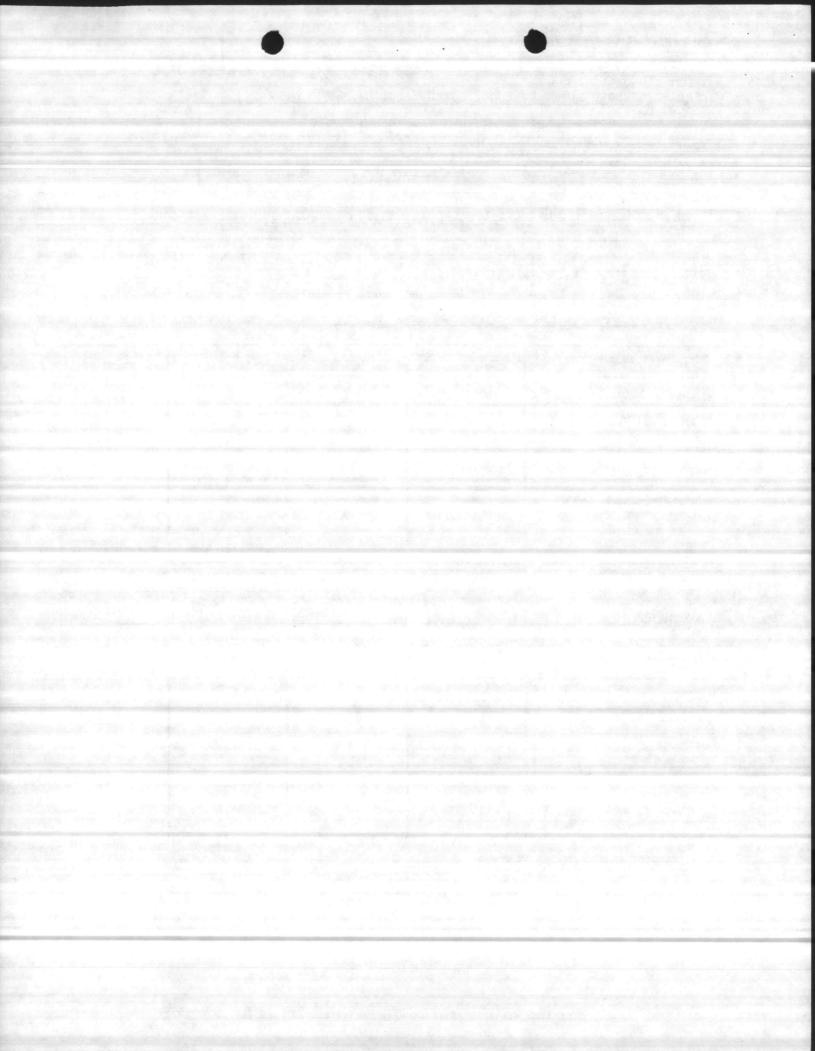
DESCRIPTION AND YEAR	COSTS	(5)	DISCOUNT	PRESENT	
DESCRIPTION AND TEAR	ONE TIME	RECURRING	FACTOR	VALUE (\$)	
INVESTMENT	168,192			168,192	
PERATIONS STEAM 30/70		12,245	22.28	272,821	
HAINTENANCE		4,556	12.06	54,947	
PERSONNEL					
TERMINAL VALUE					
OTHER:					
		DIS	COUNT FACTOR	UNIFORM ANNUAL COS	

TOTAL PRESENT VALUE ALTERNATIVE B - \$ 495,960

DISCOUNT FACTOR

UNIFORM ANNUAL COST

REMARKS



ACTIVITY (Name and Location)

Marine Corps Base, Camp Lejeune, North Carolina

PROJECT TITLE

Unaccompanied Enlisted Personnel Housing (UEPH)

P NO. 624

DESCRIPTION OF ALTERNATIVES

ALT. E - Investment and Maintenance of SO. FT. of Flat Plate Solar Collectors with Gal. Storage Tank for Dom. Hot Water.

ALT. F - Energy Cost Saving of SQ. FT. of Flat Plate Solar Collectors with Gal. Storage Tank for Dom. Hot Water.

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE E - INVESTMENT AND MAINTENANCE

ECONONIC

25 YRS.

DESCRIPTION AND YEAR	COSTS	(\$)	DISCOUNT	PRESENT VALUE (\$)	
DESCRIPTION AND TEAR	ONE TIME	RECURRING	FACTOR		
INVESTMENT	131,400			131,400	
OPERATIONS					
HA INTENANCE		3,559	12.06	42,927	
PERSONNEL					
TERMINAL VALUE					
OTHER:					

DISCOUNT FACTOR

UNIFORM ANNUAL COST

TOTAL PRESENT VALUE ALTERNATIVE A - \$ 174,327

ALTERNATIVE F \_ ENERGY COST SAVINGS

ECONOMIC LIFE · 25 YRS.

DESCRIPTION AND YEAR	COST	S (S)	DISCOUNT	PRESENT VALUE (\$)	
DESCRIPTION AND TEAR	ONE TIME	RECURRING	FACTOR		
INVESTMENT	19 19				
OPERATIONS STEAM 30/70		3.061	22.28	68,205	
HA I NTENANCE					
PERSONNEL					
TERMINAL VALUE					
OTHER:					
	er e Service de la composition della composition		SCOUNT FACTOR	UNIFORM ANNUAL C	

TOTAL PRESENT VALUE ALTERNATIVE B - \$ 68,205

DISCOUNT FACTOR

UNIFORM ANNUAL COST

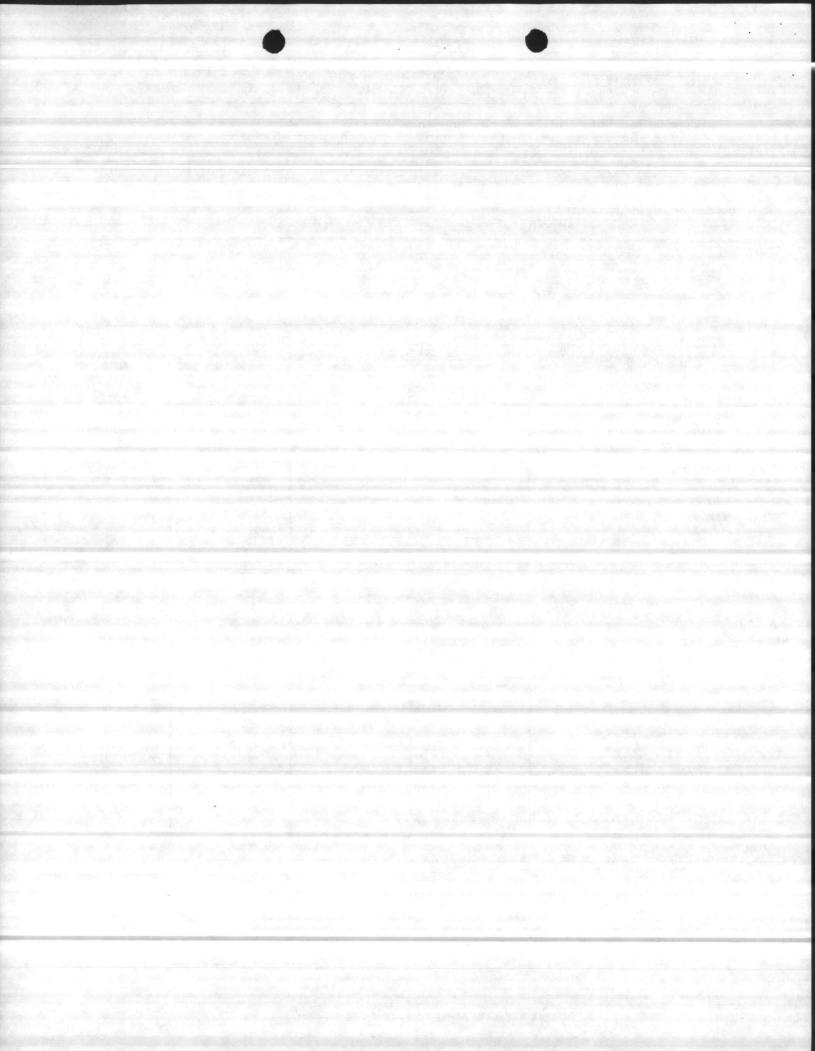
REMARKS DO NOT INCULDE SOLAR HEATED DOMESTIC H.W. IN PROJECT, DUE TO (HIGHER) LIFE CYCLE COST.

ALTERNATIVE - E 174,329 ALTERNATIVE - F - 68,205

LIFE CYCLE + 106,122

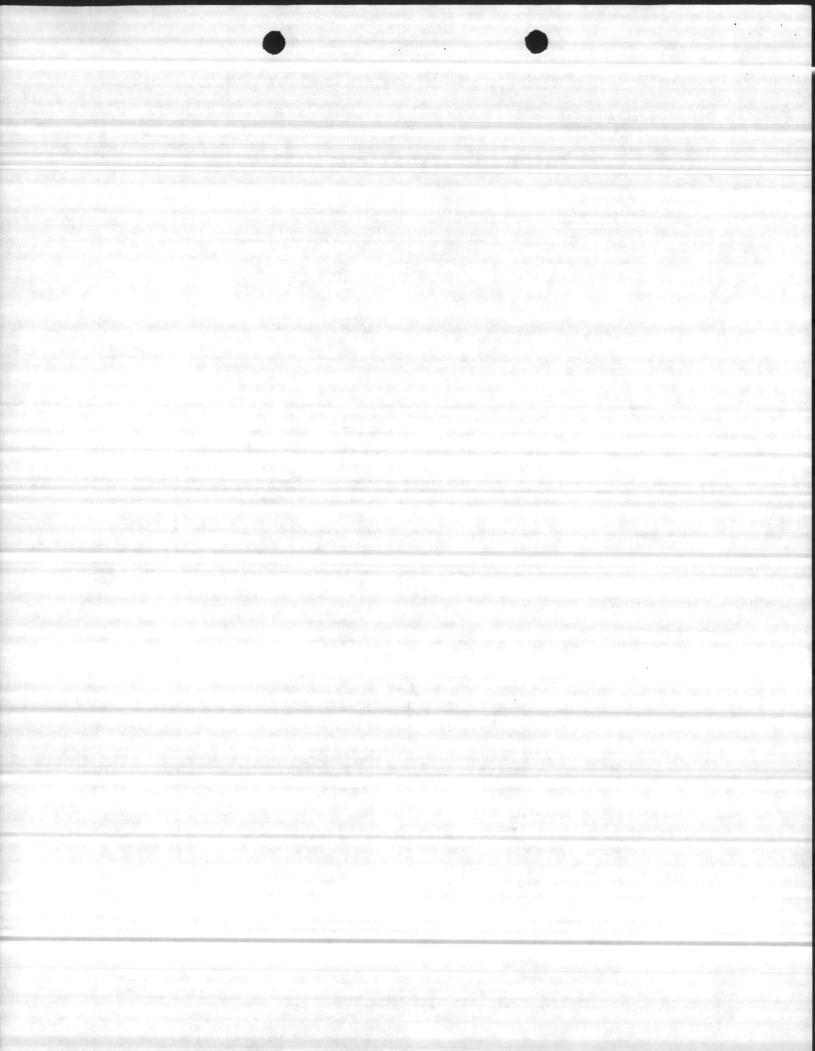
COST (LCC) + 106

S.I.R. =  $\frac{68,205 - 42,927}{131,400} = \frac{.1923}{131,400}$ 



ILITY		DATE	10 NOV 92	
AND			10 NOV 83	
TH CAROLINA		P	NO.	
PERSONNEL HOUSTN	AC (HEPH)	P-624		
T BROOMING TROOP 1	(CELTIT)	The Table Table 1		
r cooled reciproc	ating chillers			
ntrifugal chiller	with cooling	tower		
THE STATE OF THE STATE OF THE				
<del></del>				
ALTERNATICES				
	and the second	ECON	OHIC 25 YRS	
iprocating chille	rs	LIFE		
Caut	5 (3)	DISCOUNT	PRESENT	
ONE TIME	ECURRING	FACTOR	VALUE (\$)	
1 878 000	200 S 200 S		1,878,000	
1,070,000	177 (0)	16 202		
			2,886,054 693,515	
			51,115	
	5,307	9.324	) ),,,,,	
		1	5004 (100141) 60	
			UNIFORM ANNUAL CO	
11VE 4 - 3,508,6	<del>84</del> ÷	7.324	578,400	
		FCON	ONIC 25 YRS.	
l chiller w/tower	10.00 (2000) 10 (20, 10 to 10	LIFE	25 YRS.	
COSTS	(5)	DISCOUNT	PRESENT	
ONE TIME	RECURRING	FACTOR	VALUE (3)	
2,116,700			2,116,700	
	166,990	16.303	2,722,428	
	38,424	18.049	693,515	
	302		2,876	
	6,054	9.524	57,658	
		E-RESIDENTIAL C		
		SCOUNT FACTOR	UNIFORM ANNUAL CO	
	ntrifugal chiller  ALTERNATIONS  iprocating chille  ONE TIME  1.878,000  TIVE A - \$ 5,508,6	TH CAROLINA  PERSONNEL HOUSING (UEPH)  r cooled reciprocating chillers  ntrifugal chiller with cooling  ALTERNATIVES  iprocating chillers  Cools (s)  ONE TIME COURTING  1,878,000  177,626  38,424  5,367   TIVE A - \$ 5,508,684  COSTS (s)  ONE TIME RECURRING  2,116,700  166,990  38,424	TH CAROLINA  PERSONNEL HOUSING (UEPH)  r cooled reciprocating chillers  ntrifugal chiller with cooling tower  ALTERNATIONS  iprocating chillers  CONE TIME  1,878,000  177,626  1,878,000  177,626  38,424  5,367  DISCOUNT FACTOR  9.524  TIVE A - \$ 5,508,684  CONE TIME  COSTS (\$)  ONE TIME  RECURRING  166,990  16.303  38,424  18.049  302  9.524	

Recommend Alternative "A" because of lowest total present value.



## A. INVESTMENT

Alternative "A": New Construction Cost of \$1,878,000 escalated to 1 APR 85. (See Project Estimate)

Alternative "B": New Construction Cost of \$2,116,700 escalated to 1 APR 85. (See Attached Estimate)

R ENERGY RATES: From LANTDIV Code 403

Elec. Cost MCB, Camp Lejeune = \$0.02927/kwh (1-1-83)

For FY-86 =  $\$0.02927 [1 + .13 (9/12)] = 0.05408 \times 1.13$ FY-84 FY-85 =  $0.06110 \times 1.13 = 0.06905$ 

Steam Cost MCB, Camp Lejeune = \$3.03/106BTU (3-1-84)

(Based on 10/90 oil and coal)
FY-83
FY-84

For FY-86 = \$3.08 [1 + 1.11 (7/12)] = 4.88 x 1.11 = 5.41 x 1.11

FY-85
= 6.00

C. OPERATING EXPENSES: From Computer Analysis

Alternative "A":

Electric =  $2,563,747 \times \$0.06905/\text{kwh} = \$177,026.00$ 

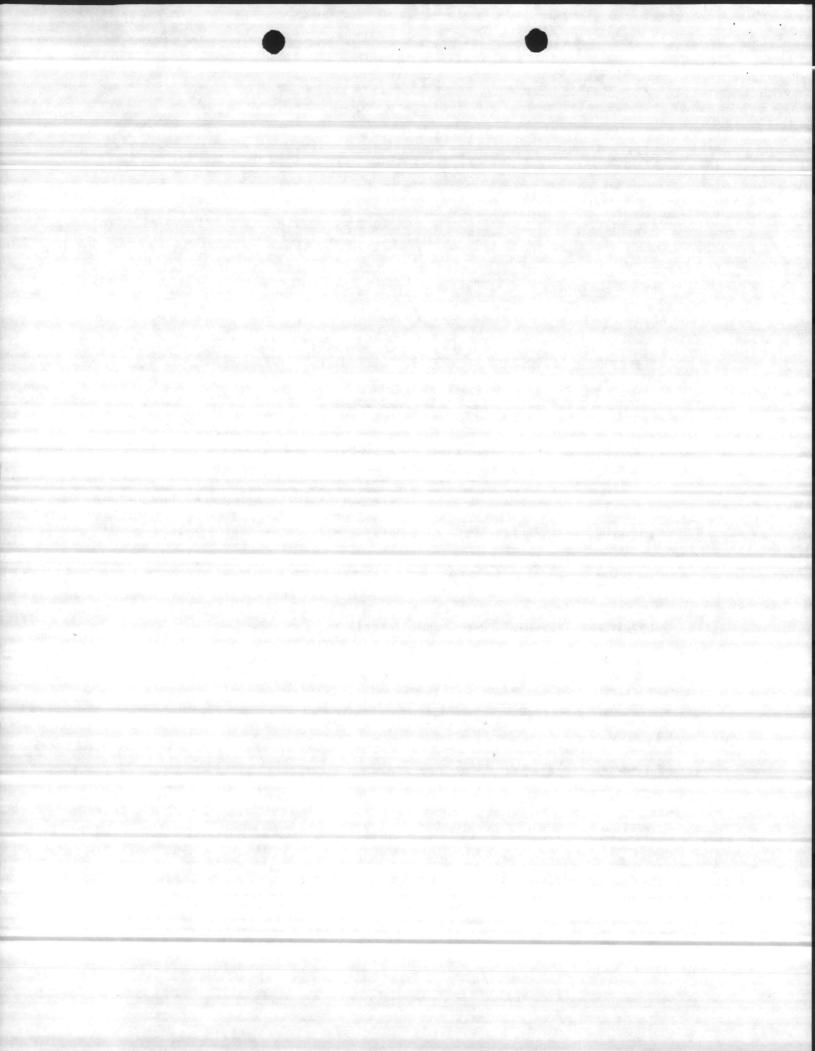
Steam =  $6404 \text{ MBTU x } \$6.00/10^6 \text{BTU} = \$38,424.00$ 

Alternative "B":

Electric =  $2,418,391 \times \$0.06905/\text{kwh} = \$166,990.00$ 

Steam =  $6404 \text{ MBTU } \times \$6.00/10^6 \text{BTU} = \$38,424.00$ 

Water = 151,200 x \$0.20/1000 gal. = \$302.40



# D. MAINTENANCE:

Alternative "A": (From Computer Analysis, first year = \$4558.00)

FY-83 FY-84

\$4588.00 x 1 + .056 = 4813 x 1.056 = 5083 x 1.056

FY-85

= 5367.00

Alternative "B": (From Computer Analysis, first year = \$5142.00)

FY-83 FY-84

 $$5141.00 \times 1 + 0.56 = 5429 \times 1.056 = 5733 \times 1.056$ 

FY-85

= 6054.00

