DESIGN CONCEPTS

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

Project Title: UNACCOMPANIED ENLISTED PERSONNEL HOUSING (UEPH), (P-624)

Date: 10 NOV 83

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^2
Energy Budget Figure Achieved	-	34,655 BTU/Ft^2

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: MCB, CAMP LEJEUNE, NC Project Title: UEPH (P-624) Date: 10 NOV 83

E75 = 10,975,000,000 BTUs per year (Total annual energy consumption if constructed in 1975)

E Current = 9,390,500,000 BTUs per year (Total annual energy consumption incorporating current criteria)

R = (1 - (E Current/E75)) 100 = 14.4 % (Percent reduction in energy consumption current year vs. 1975)

ECC = $14,169,000 (Estimated construction cost for current criteria)

Barrels of Oil Equivalent (B.O.E.) = 268 *(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) Cumul- ative % Reduc- tion	(10) First Cost of Measure ($1000)	(11) Total Construc tion Cos (10) + E ($1000)
Current Design (Including Mandatory Measures)										
R.		X	X	X	9,390	14.4	34,655	14.7	X	14,169
Other Cost Effective Measures Included										
R1.										
R2.										
R3.										
Non-Cost Effective Measures Evaluated										
R1.	Cent. Chiller	486.1	-20.2	-24.5	8,894	5.3	32,824	X	180.7	X
R3.	Solar Domestic H.W.	528.0	106.1	4.97	X	X	X	X	131.9	X

ECONOMIC ANALYSIS OF SHORE FACILITY

DATE: 10 NOV 1983

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. A - 1500 SQ. FT. of flat plate collectors with 3000 gal. storage tank for dom. hot water.

ALT. B - Existing system unaltered

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A 1500 SQ. FT. of Solar Collector — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	131,400			131,400
OPERATIONS STEAM 30/70		13,050	22.28	290,700
MAINTENANCE		3,559	12.06	42,927
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 465.077 ÷ DISCOUNT FACTOR = UNIFORM ANNUAL COST

ALTERNATIVE B Existing System — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS STEAM 30/70		16,112	22.28	358,975
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 358,975 ÷ DISCOUNT FACTOR = UNIFORM ANNUAL COST

REMARKS

(Attach separate sheet showing derivation of cost entries)

ECONOMIC ANALYSIS OF SHORE FACILITY

DATE: 10 NOV 1983

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. C - 1000 SQ. FT. of flat plate collectors with 2000 gal. storage tank for dom. hot water.

ALT. D - 2000 SQ. FT. of flat plate collectors with 4000 gal. storage tank for dom. hot water.

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE C 1000 SQ. FT. of Solar Collectors — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	91,100			91,100
OPERATIONS STEAM 30/70		14,017	22.28	312,308
MAINTENANCE		24.67	12.06	29,763
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 433,171 ÷ DISCOUNT FACTOR = UNIFORM ANNUAL COST

ALTERNATIVE D 2000 SQ. FT. of Solar Collectors — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	168,192			168,192
OPERATIONS STEAM 30/70		12,245	22.28	272,821
MAINTENANCE		4,556	12.06	54,947
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 495,960 ÷ DISCOUNT FACTOR = UNIFORM ANNUAL COST

REMARKS

(Attach separate sheet showing derivation of cost entries)

ECONOMIC ANALYSIS OF SHORE FACILITY

DATE: 10 NOV 1983

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 SQ. 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 — ECONOMIC LIFE 25 YRS.

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

TOTAL PRESENT VALUE ALTERNATIVE A - $ 174,327 ÷ DISCOUNT FACTOR = UNIFORM ANNUAL COST

ALTERNATIVE F - ENERGY COST SAVINGS — ECONOMIC LIFE 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT				
OPERATIONS STEAM 30/70		3.061	22.28	68,205
MAINTENANCE				
PERSONNEL				
TERMINAL VALUE				
OTHER:				

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

(Attach separate sheet showing derivation of cost entries)

CONOMIC ANALYSIS OF SHORE FACILITY

DATE: 10 NOV 83

ACTIVITY (Name and Location)
MCB, CAMP LEJEUNE, NORTH CAROLINA

PROJECT TITLE
UNACCOMPANIED ENLISTED PERSONNEL HOUSING (UEPH)

P NO. P-624

DESCRIPTION OF ALTERNATIVES

Alternative A - Two air cooled reciprocating chillers

Alternative B - One centrifugal chiller with cooling tower

PROJECT COST PROJECTIONS BY ALTERNATIVES

ALTERNATIVE A: Two reciprocating chillers — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	1,878,000			1,878,000
OPERATIONS Elec.		177,626	16.303	2,886,054
MAINTENANCE Steam		38,424	18.049	693,515
		5,367	9.524	51,115
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE A - $ 5,508,684 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST 578,400

ALTERNATIVE B: Centrifugal chiller w/tower — ECONOMIC LIFE: 25 YRS.

DESCRIPTION AND YEAR	COSTS ($) ONE TIME	COSTS ($) RECURRING	DISCOUNT FACTOR	PRESENT VALUE ($)
INVESTMENT	2,116,700			2,116,700
OPERATIONS Elec.		166,990	16.303	2,722,428
MAINTENANCE Steam		38,424	18.049	693,515
Water		302	9.524	2,876
		6,054	9.524	57,658
PERSONNEL				
TERMINAL VALUE				
OTHER:				

TOTAL PRESENT VALUE ALTERNATIVE B - $ 5,593,177 ÷ DISCOUNT FACTOR 9.524 = UNIFORM ANNUAL COST 587,272

REMARKS

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)

B. ENERGY RATES: From LANTDIV Code 403

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

$$\text{For FY-86} = \underset{\text{1-1-83}}{\$0.02927\ [1 + .13\ (9/12)]} = \underset{\text{FY-83}}{0.05408} \times 1.13$$

$$= \underset{\text{FY-84}}{0.06110} \times 1.13 = \underset{\text{FY-85}}{0.06905}$$

Steam Cost MCB, Camp Lejeune = $3.03/$10^6$BTU (3-1-84)

(Based on 10/90 oil and coal)

$$\text{For FY-86} = \$3.08\ [1 + 1.11\ (7/12)] = \underset{\text{FY-83}}{4.88} \times 1.11 = \underset{\text{FY-84}}{5.41} \times 1.11$$

$$= \underset{\text{FY-85}}{6.00}$$

C. OPERATING EXPENSES: From Computer Analysis

Alternative "A":

Electric = 2,563,747 x $0.06905/kwh = $177,026.00

Steam = 6404 MBTU x $6.00/$10^6$BTU = $38,424.00

Alternative "B":

Electric = 2,418,391 x $0.06905/kwh = $166,990.00

Steam = 6404 MBTU x $6.00/$10^6$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 x 1 + 0.56 = 5429 x 1.056 = 5733 x 1.056

FY-85

= 6054.00