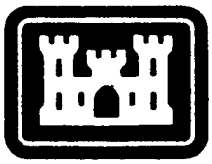
Executive Summary
Book I
EEAP
Nuernberg Military Community



US Army Corps of Engineers
Europe Division

April, 1984
Final Submission

Dalton • Dalton • Newport — Cleveland, Ohio
Dorsch Consult — Wiesbaden / W. Germany

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SECTION 1. EXECUTIVE SUMMARY

SYNOPSIS

This report explores potential energy conservation measures at the Nuernberg Military Community. A total of 26 E.C.I.P projects have been identified with an estimated total annual savings potential of 22 percent of the 1982 energy usage at the Milcom. Another 27 measures are recommended for Milcom funding and implementation, which have a combined potential savings of 7 percent of 1982 usage.

A. INTRODUCTION

1. Definition of Program

This report is the major product of the subject contract, DACA-90-82-C-0198, to perform a systematic energy study of the Nuernberg Military Community. The work is part of the Energy Engineering Analysis Program (EEAP) for the Europe Division, Corps of Engineers.

The objectives of the program are the following:

1. Develop a systematic plan for reduction of energy consumption.

2. Use and incorporate applicable portions of related past and present studies.

3. Develop a coordinated community-wide Energy Report.

4. Prepare programming and planning documents for feasible energy conservation projects.

5. Determine the economic feasibility of all practical projects in accordance with guidance given.

6. List and prioritize all recommended energy conservation projects.

The subject of the study is the Nuernberg Military Community in Bavaria, West Germany. The community is made up of some 23 installations, referred to as GYs. A listing of each GY and its salient features is given in Table 1A1.1.

A copy of the Schedule of Services for the program, along with the "Energy Conservation Investment Program (ECIP) Guidance" revised on February 18, 1983, is presented in Appendix A of the Energy Report (Book II) for reference.

2. Facility Types

The study has been subdivided into three areas of study: buildings, heating plants, and electrical services. These have been analyzed in different manners as follows:

1. The buildings have been studied through the analysis of 41 selected model buildings, each of which represents from 1 to 111 of the 604 different buildings in the community that are included in the total study. A list of the model buildings and their salient features is given in Table 1A2.1.

2. Heating plants were treated as individual items and all heating plants were studied.

3. The electrical analysis was based in some cases on representative buildings and areas of buildings, from which the results were extrapolated to the entire community. Other studies were based on overall community data

3. Subjective Division of Assignment; Increments

The project was also divided into Increments A, E, F, and G, which have the following significance:

Increment A denotes ECIP projects which deal with building components, both the shell of the building and the electrical and mechanical appliances and services within the building itself. Projects must exceed $200,000 in cost, except for family housing projects, and have both S.I.R. (savings-to-investment ratio) and E.S.I.R. (energy savings to investment ratio) of 1.00 or more.

Increment B denotes ECIP projects which deal with utility services to the buildings and other installations, including both the electrical and heating generation and distribution systems. As with Increment A, projects must exceed $200,000, except for family housing projects, and have S.I.R. and E.S.I.R. values of 1.00 or more.

Increment F includes those projects and conservation measures which are of relatively small expense but produce significant results and are within the funding capabilities of the local community.

Increment G covers those projects and conservation measures which have economic advantages less than those required for participation in ECIP programs, but are still deemed advisable.

The report discusses all measures that were studied, regardless of whether the final decision was favorable or unfavorable to their recommendation.

4. Phases of the Project

The development of the program, from data collection through analysis and final report form, was split into phases and submittals as follows:

The product of Phase 1, the field study portion, was published as Book IV, a nine-volume Data Report, in December of 1982, and amended in February of 1983. The Energy Report, Book II, was the major product

of Phase 2, the analysis phase of the project. In addition to the Energy Report, Phase 2 produced a preliminary portion of Book III, Planning and Development Documentation. This included page 1 of DD form 1391 for all recommended Increment A and B projects.

In Phase 3 of the project, Book III was updated, with complete planning documents as prescribed in the Schedule of Services; and Section 1 of the Energy Report, the Executive Summary, was revised and issued as a separate document, labeled Book I. These materials, along with Addenda for Book II, were submitted in prefinal form in December of 1983; and in final form in April of 1984.

In addition to the above-described four books that constitute the text and data output of the total project, a representative portion of the computer output was assembled and presented for reference in Book V. A single copy of other significant computer output has been submitted to EUDED for documentation purposes as instructed. These documents accompanied the Phase II submittal.

All of the material presented in Book I, the Data Report, is an intrinsic part of the Energy Report and stands as a basic reference material, unless amended elsewhere.

B. ENERGY HISTORY

1. Past Performance

A summary of the historical energy usage of the Nuernberg community, with particular emphasis on base year 1975, the test reference year 1979, and the most recent year 1982, is presented in the accompanying graphs and tables. Table 1B1.1 gives the historic record of energy consumption for various sources of energy in 1975, 1979, and 1982. The graphs in Figure 1B1.2 provide a comparison and historical usage of each type of energy, along with the total energy, for the years from 1975 to 1982. They show that oil, gas, and total consumption declined significantly, while electricity and coal consumption increased slightly.

It will be seen from this data that energy usage declined between 1978 and 1982 by approximately 6 percent. This reduction in consumption is attributed to energy conservation measures and practices that have been developed by the community during this period.

The comparison charts in Figures 1B1.3 through 1B1.7 show the relative consumption of energy by the different GY installations that make up the community.

C. TABULATION OF E.C.O.s (ENERGY CONSERVATION OPPORTUNITIES)

A master list of E.C.O.s developed during Phase 1 is shown in Table 1C1.1. This table lists all of the E.C.O.s that were considered

throughout this investigation, in the somewhat random sequence in which they were initially presented.

Included in the listing are the E.C.O. number, an abbreviated description, the approximate investment cost, the approximate annual energy savings in dollars, the composite savings-to-investment ratio (SIR), and the designated increment to which the E.C.O. is assigned, based upon its SIR ratio and subject matter.

A second Table, 1C1.2, presents the projects by increment, and within each increment lists them and their significant data in the sequential order of their SIR ratios.

It will be seen that 23 E.C.O.s have been rated acceptable for Increment A, 16 for Increment B, 27 for Increment F, and 5 for Increment G.

Those E.C.O.s whose functions duplicate another more favorable or more comprehensive E.C.O., and which are therefore not included in the summation of total savings and costs, are so noted in Table 1C1.2 by the words "Yield to _____", and their data is enclosed in parentheses.

Certain E.C.O.s have been included in the A and B lists even though their estimated investment cost is less than the $200,000 benchmark. In the preparation of final project documents for Book III, these E.C.O.s have been combined with others, as noted in Table 1C1.2, to form projects of sufficient size for ECIP qualification.

The disposition of the 103 suggested E.C.O.s in the original list 1C1.1 is as follows:

		Projects
Increment A	23	13
Increment B	16	13
Increment F	27	0
Increment G	5	0
Non-productive measures	18	0
Duplications	14	0
Total	103	26

A list of final projects is given in Table 1C1.3. Planning and development documents for these projects are given in Book III.

Finally, two lists are presented which rank the projects in the order of their priority. Table 1C1.4 prioritizes the projects which apply to Family Housing and Table 1C1.5 applies to the projects for Non-Family Housing. These tables are prioritized from highest to lowest S.I.R. value, which places those projects with the quickest return first and those with the longest return on investment last.

D. ENERGY AND COST SAVINGS

1. Projected Savings

The projected total savings for the recommended E.C.O.s are presented in Table 1D1.1. As noted above, adjustments have been made in the various subtotals to eliminate duplication of subject matter in two or more E.C.O.s, so that a realistic picture of maximum possible savings is presented.

The values of these savings have been shown by a dashed line on Figure 1D1.2, which is a graph of the historic community-wide energy consumption, similar to Figure 1B1.2B, but with the projection of potential savings added thereto for the years 1983 to 1990. The projection for future years is based upon immediate implementation of Increment F E.C.O.s through community funding to be effective by 1987, and the gradual implementation of the Increment A and B E.C.I.P projects between 1987 and 1990.

The projected annual savings for combined Increments A, B, and F are 762,900 MBtu and $4,260,650. This is approximately 29 percent of the 1982 usage of energy by the Nuernberg community. The breakdown of these savings by increment and by subject group is presented in Table 1D1.1. This table will give a better understanding of the relative values of the different types of conservation measures. Backup calculations for these summaries are given in Appendix C.

The two greatest fuel saving ECOs are District Heating (ECO B-7) and Consolidation of Heating Plants (ECO B-6).

Conversion to District Heating would eliminate the existing old and inefficient boiler plants at three GYs (Pastoriusstrasse, GY-224; Merrell Barracks, GY-410; and the Hospital, GY-342). Heating would then be obtained from the local heating district at a much higher efficiency, saving 97,000 MBtu per year in energy consumption. In addition where district heating is not available, the old, small and inefficient heating plants are eliminated by consolidating the production of the heating medium into one single source. This is the case for three GYs (Dambach, GY-190; Herzogenaurach, GY-203; Schwabach, GY-230). Each GY will have existing heating plants eliminated and a central heating plant will be constructed at each GY. The new heating plants will utilize a combination of coal and oil-fired boilers and will save an estimated 35,700 MBtu annually.

These two ECOs combined with other boiler and heating plant improvement ECOs comprise approximately 47 percent of the total projected energy savings to the community. These boiler and heating plant improvements consist of such ECOs as conversion of steam heating to hot water to allow the use of outside temperature compensated control and night set-back (B-2), installation of night set-back on existing hot water heated buildings (B-30), cleaning of boilers and installation of new more efficient controls (B-18, B-11, A-25, and A-1), and

such simple items as the insulation of existing un-insulated hot surfaces (B-17 and B-21).

Improvements to building shells will save an estimated 93,500 MBtu annually representing 12 percent of the projected savings and 4 percent of the 1982 energy consumption for the entire community. Building shell ECOs include such items as the addition of insulation to the existing buildings (ECO A-7), the addition of storm windows to existing leaky windows (A-3), the installation of vestibules on commissary doors (A-18), or merely the elimination of cold air infiltration by sealing wall openings or weatherstripping doors (A-4, A-5, and A-11).

The installation of Computerized Energy Management and Control Systems (ECO D-20) to automatically control energy consumption at 18 various sites will produce 16 percent of the projected energy savings or 4.6 percent of the 1982 energy consumption of the entire community. These Energy Management Systems will save energy with such routines as peak electrical shaving, demand limiting, power factor monitoring and night setback and outside air temperature reset of heating systems.

The contribution of energy savings by such lighting ECOs as replacement of incandescent lights with fluorescent (D-18), lighting controls (D-11 and D-7) and replacement of inefficient light fixtures (D-5) and miscellaneous electrical ECOs is approximately 15 percent of the projected savings.

Lastly, certain miscellaneous mechanical ECOs represent 8 percent of the total projected energy savings to the community.

This breakdown helps to illustrate the fact that even the smallest item which presents energy savings adds to the whole and increases the overall benefit and savings to the community.

E. FUTURE DESIGN CONSIDERATIONS

A number of energy conservation opportunities do not have an economic advantage if implemented immediately but gain advantage if implemented during normal work routines.

If the replacement or revision of some item is required as a normal maintenance item, then the cost for implementation in an energy-efficient manner is often not greatly different than if the change were done without energy considerations.

The following ECOs fit into this category, and should be considered when existing equipment becomes defective or modification is required.

1. ECO A-14, Makeup Air Heating Units

The implementation of this ECO involves the replacement of existing kitchen exhaust hoods and exhaust fans with a new energy efficient makeup air type exhaust system.

The implementation of this ECO requires high initial cost and major modification work. In addition, the operation of the kitchen would be greatly disrupted during the construction work.

This ECO should therefore be kept in mind whenever kitchen modification work is planned. The relative installation costs of these modifications would be reduced if they can be scheduled into the normal renovation work. (See ECO Discussion page 4.B - A-14 - 3 of the Energy Report Book II.)

2. ECO B-16, High-Efficiency Motors

The implementation of the ECO involves the replacement of standard duty electric motors with high-efficiency motors. Since the cost of these motors is fairly high and the quantity required great, a program to replace motors would not be economically advantageous.

If, however, a motor becomes defective or otherwise requires replacement, the relative cost difference between the two motor types is relatively insignificant.

The implementation of this ECO should therefore be kept in mind in the future whenever a motor must be replaced. (See ECO Discussion page 4.B - B-16 - 2 of the Energy Report Book II.)

3. ECO D-16 Transformer Sequencing, ECO D-21 Low-Loss Transformers, and ECO D-23 Smaller Transformers

The installation of new transformers or transformer modifications, as indicated for previously discussed ECOs, is relatively expensive compared to the anticipated energy savings. Because of this fact, the implementation of these ECOs at the present time is not considered.

When transformers require replacement, however, these ECOs should be kept in mind when designing the required modifications. (See ECO Discussions pages 4.B - D-16 - 1, D-21 - 1 and D-23 - 1 of the Energy Report Book II.)

Table 1A1.1

LIST OF INSTALLATIONS

AT NUERNBERG COMMUNITY

GY No.	Name	No. of Buildings	Area (Sq Ft)	Building No. Range
64	Nuernberg Athletic Facility	1	7,065	819
180	Erlangen Housing	20	521,840	2091-2110
190	Dambach Housing	45	212,408	5701-5745
191	Kalb Housing	107	3,049,678	1401-1523
203	Herzo Family Housing	8	253,956	1651-1658
224	Pastorius Housing	18	431,901	603-606 2071-2085
230	Schwabach Housing	8	232,972	1051-1058
276	Ferris Barracks	79	1,472,582	4000-4324
330	Herzo Base	41	841,856	1552-1623
342	Nuernberg Hospital	18	635,700	453-476
373	Johnson Barracks	38	976,685	901-986
410	Merrell Barracks	18	1,059,893	551-564
413	Monteith Barracks	41	957,391	251-348
436	O'Brien Barracks	29	572,891	1001-1043
467	Pinder Barracks	25	750,526	351-389
488	Feucht P.O.L. Storage	3	21,805	1961-1965
531	Reinwarzhofen RRF	1	2,601	2021
576	Furth Shopping Center	17	285,836	100-129
631	Feucht ASA	2	8,522	1942, 1974
668	Nuernberg Hotel	1	113,924	851
699	W.O. Darby Kaserne	81	1,737,374	1-92
940	Feucht Army Airfield	2	45,149	1981, 1982
978	Nuernberg Coal Yard	1	982	1C
	Total	604	14,193,526	
	Total Family Housing		4,702,755	
	Total Non-Family Housing		9,570,782	
	Without new barracks building		9,490,782	

TABLE 1A2.1 MODEL BUILDINGS

.DATE 13 JUN 83 12:49:22 RID 2 13 JUN 83 IANNETTA
.MODEL NO REPORT BY: C0244

BY	BLDG NO	USE	AREA SQ FT	CONST. YEAR	NO FLRS	TOTAL AREA	TOTAL BLDGS
699	1	ADMINISTRATION	41791	1936	4	292588	8
699	39	ADMINISTRATION	15560	1936	4	211524	19
699	43	ADMIN/CHAPEL/GEN	26110	1916	4	107545	11
699	53	STORAGE	8026	1936	2	93391	25
699	67	COMMUNITY CENTER	15789	1936	4	150061	11
699	69	WAREHOUSE	19711	1936	1	103653	11
699	77	SHOP/OFFICE	45600	1915	2	488969	15
699	82A	MOTOR REPAIR	24071	1915	1	338145	18
699	88	BARRACKS/ADMIN	51652	1945	5	259980	2
576	100	COMMISSIONARY	182171	1936	5	413465	13
413	253	MOTOR POOL	12950	1936	1	659509	48
413	254	ADMINISTR/HQ/NCO	52195	1926	3	314789	16
413	285	BILLETS/HQS	102353	1935	3	154036	4
413	302	BARRACKS/HQS	35490	1936	4	304407	11
467	356	BARRACKS HQ	82679	1936	4	432961	9
467	384	GYM	15876	1955	1	138231	9
342	457	HOSPITAL	425275	1936	5	425275	1
410	551	BILLETS	129084	1935	6	662196	3
410	564	PX	33275	1935	3	263504	13
668	851	GUEST HOUSE HOTEL	113924	1936	7	123077	2
373	906	BARRACKS/HQ	55298	1935	5	464230	8
373	926	QM REPAIR	13708	1935	1	360836	17
373	940	GEN PURPOSE WHSE	69298	1936	7	557402	17
436	1029	BARRACKS/HQ	49992	1936	5	315276	7
191	1415	ADMIN/SVC STORE	21667	1951	1	74052	9
191	1442	SCHOOL	7811	1951	1	65192	10
191	1443	DORMITORY	24312	1952	2	24312	1
191	1444	HIGH SCHOOL	81179	1952	4	81179	1
191	1448	FAMILY HOUSING	20470	1954	5	368935	21
191	1469	SCHOOL	30880	1955	3	153402	7
191	1477	FAMILY HOUSING	34667	1955	5	3624347	111
330	1556	FAMILY HOUSING	9512	1936	3	95786	9
330	1582	BARRACKS/HQ	33205	1936	4	583545	15
330	1605	COMMISSARY	69991	1945	2	188965	7
330	1612	EM-CLUB	8460	1950	1	130979	14
276	4004	BARRACKS/HQ	41272	1936	5	204646	6
276	4019	ADM/GEN	21177	1936	4	62744	5
276	4051	THEATER	9519	1938	1	103032	11
276	4057	MESS	30179	1935	3	385211	15
276	4311	SCHOOL	32111	1953	1	167320	12
190	5726	DUPLEX HOUSING	5050	1957	2	244840	51
.GRAND-TOTAL -						14193537	603

..... END REPORT .....

HISTORICAL COMMUNITY ENERGY CONSUMPTION

Fuel	Amount			Cost			Approximate Area*	
Type	Units	MBtu	Percent of Total	$	Percent	$/MBtu	Sq Ft	Percent of Total
FY 1975								
Electricity	50,735,390 kWh	588,531	21.2					
Coal	37,073 M ton	1,035,800	37.4					
Oil	7,653,319 gal	1,083,360	39.1					
Gas	1,450,065 cu m	52,759	1.9					
Steam	4,106 M ton	12,104	0.4					
Labor contract	--	--	--					
Total		2,772,554	100.0					
FY 1979								
Electricity	56,262,373 kWh	652,640	23.6					
Coal	38,496 M ton	1,075,589	38.9					
Oil	7,105,935 gal	999,170	36.1					
Gas	710,827 cu m	25,863	0.9					
Steam	4,468 M ton	13,172	0.5					
Labor contract	--	--	--					
Total		2,776,434	100.0					
FY 1982								
Electricity	55,007,798 kWh	638,090	24.0	3,883,460	22.34	6.09	--	--
Coal	40,455 M ton	1,130,313	42.6	6,119,223	35.22	5.41	7,407,133	54.4
Oil	5,625,636 gal	801,330	30.2	4,820,097	27.73	6.02	6,089,031	44.7
Gas	1,988,196 cu m	72,338	2.7	644,837	3.71	8.91	--	--
Steam	4,379 M ton	12,909	0.5	94,520	0.54	7.32	113,924	0.9
Labor contract	--	--	--	1,818,035	10.46		--	--
Total		2,654,980	100.0	17,380,172	100.00		13,610,088	100.0

*Heating area does not include GYs 631, 845, and 940.

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Figure 1B1.2A

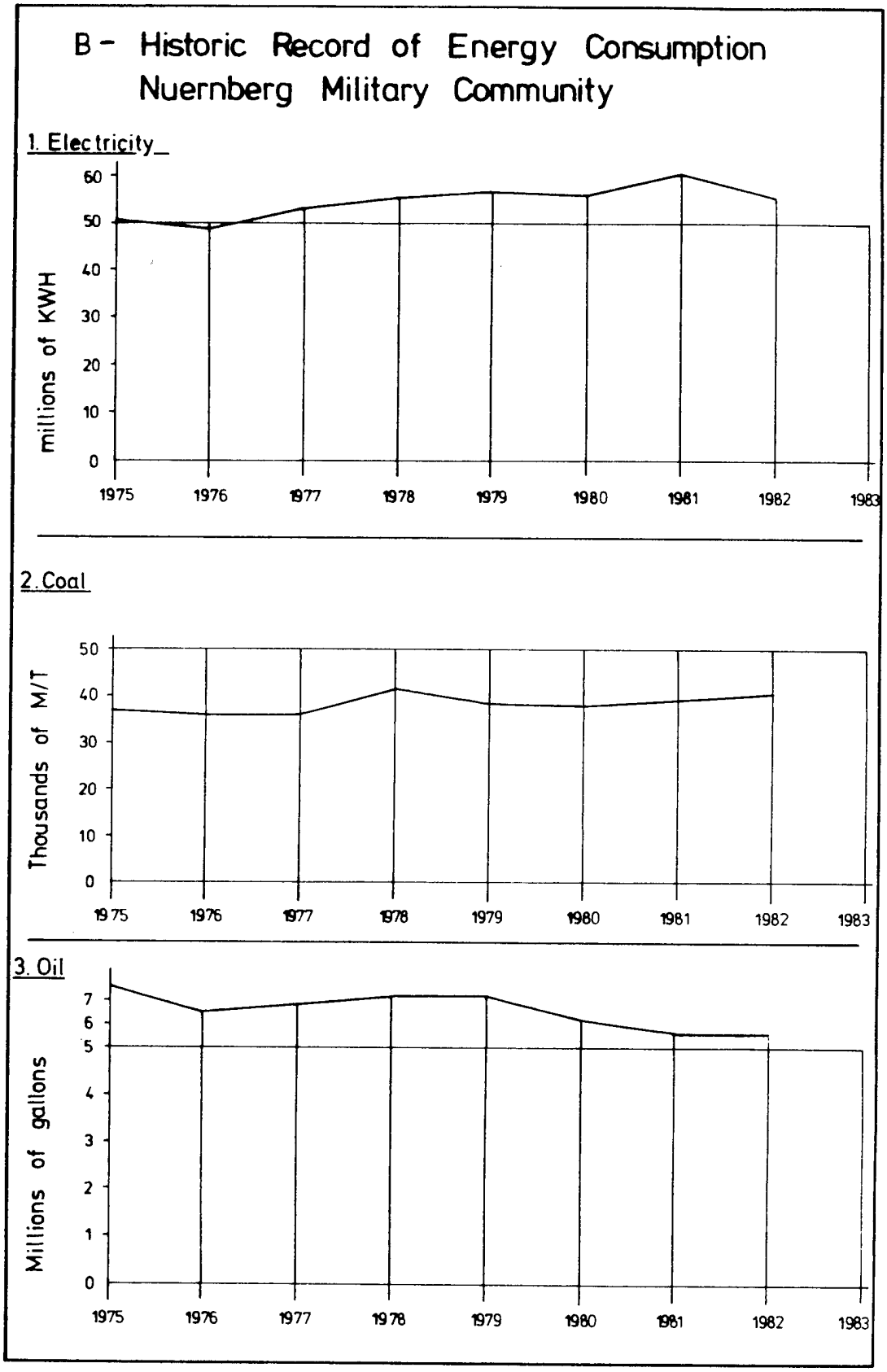


Figure 1B1.2B

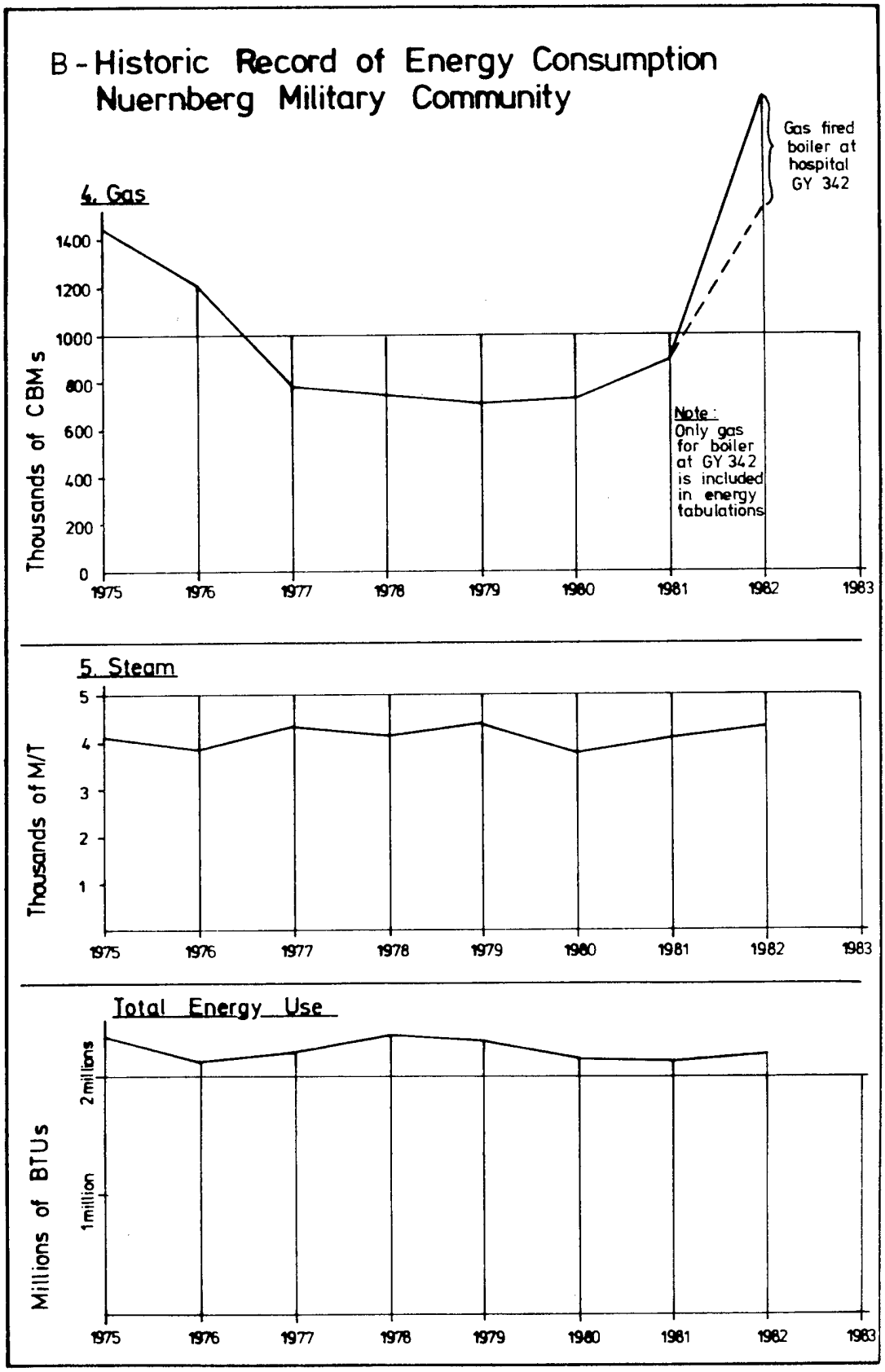


Figure 1B1.3

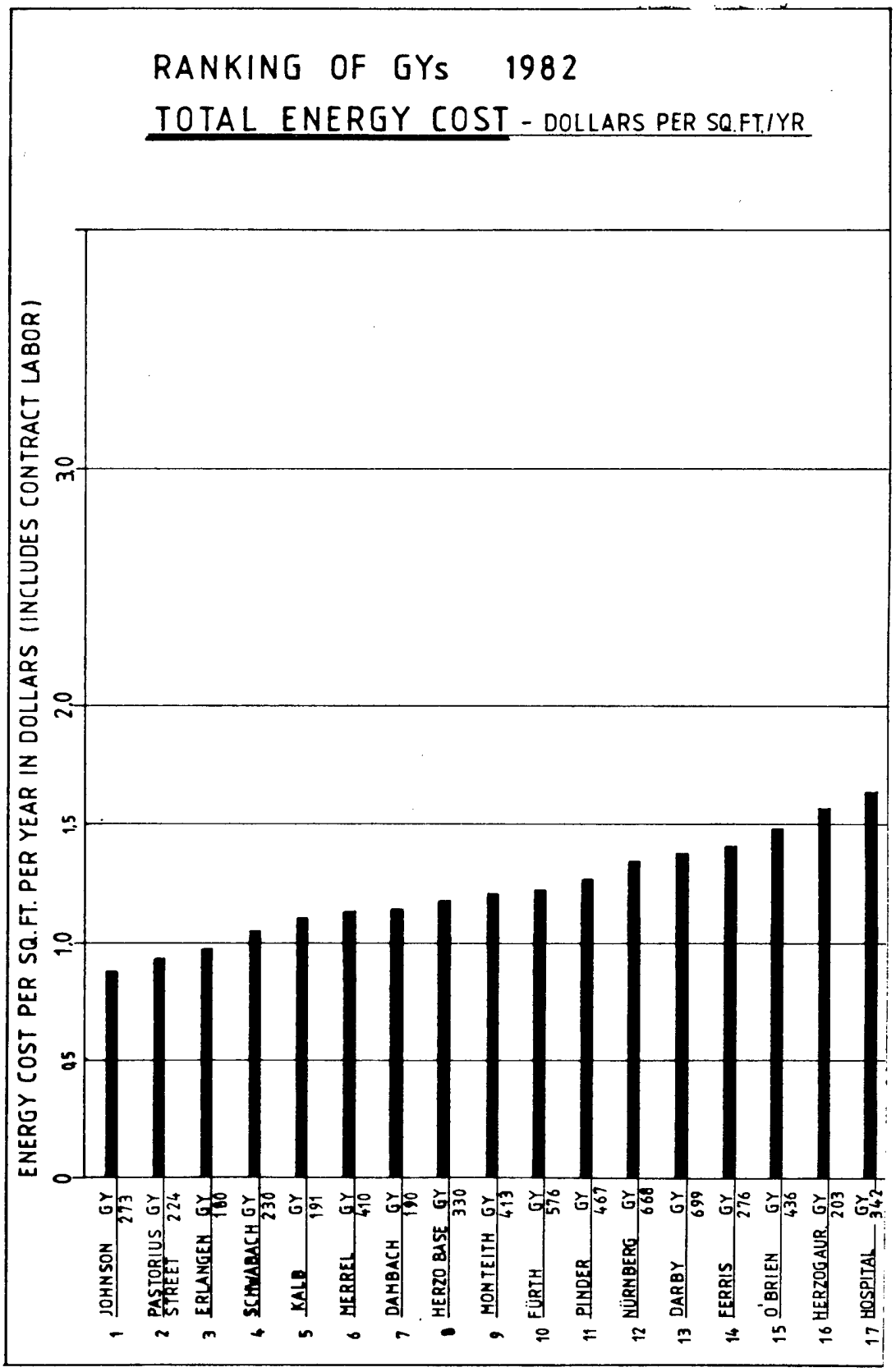

RANKING OF GYs 1982
TOTAL ENERGY COST - DOLLARS PER SQ.FT/YR
ENERGY COST PER SQ.FT. PER YEAR IN DOLLARS (INCLUDES CONTRACT LABOR)
0
.5
1.0
1.5
2.0
3.0
1 JOHNSON GY 273
2 PASTORIUS STREET GY 224
3 ERLANGEN GY 180
4 SCHWABACH GY 230
5 KALB GY 191
6 MERREL GY 410
7 DAMBACH GY 190
8 HERZO BASE GY 330
9 MONTEITH GY 413
10 FÜRTH GY 576
11 PINDER GY 467
12 NÜRNBERG GY 668
13 DARBY GY 699
14 FERRIS GY 276
15 O'BRIEN GY 436
16 HERZOGAUR GY 203
17 HOSPITAL GY 342

Figure 1B1.4

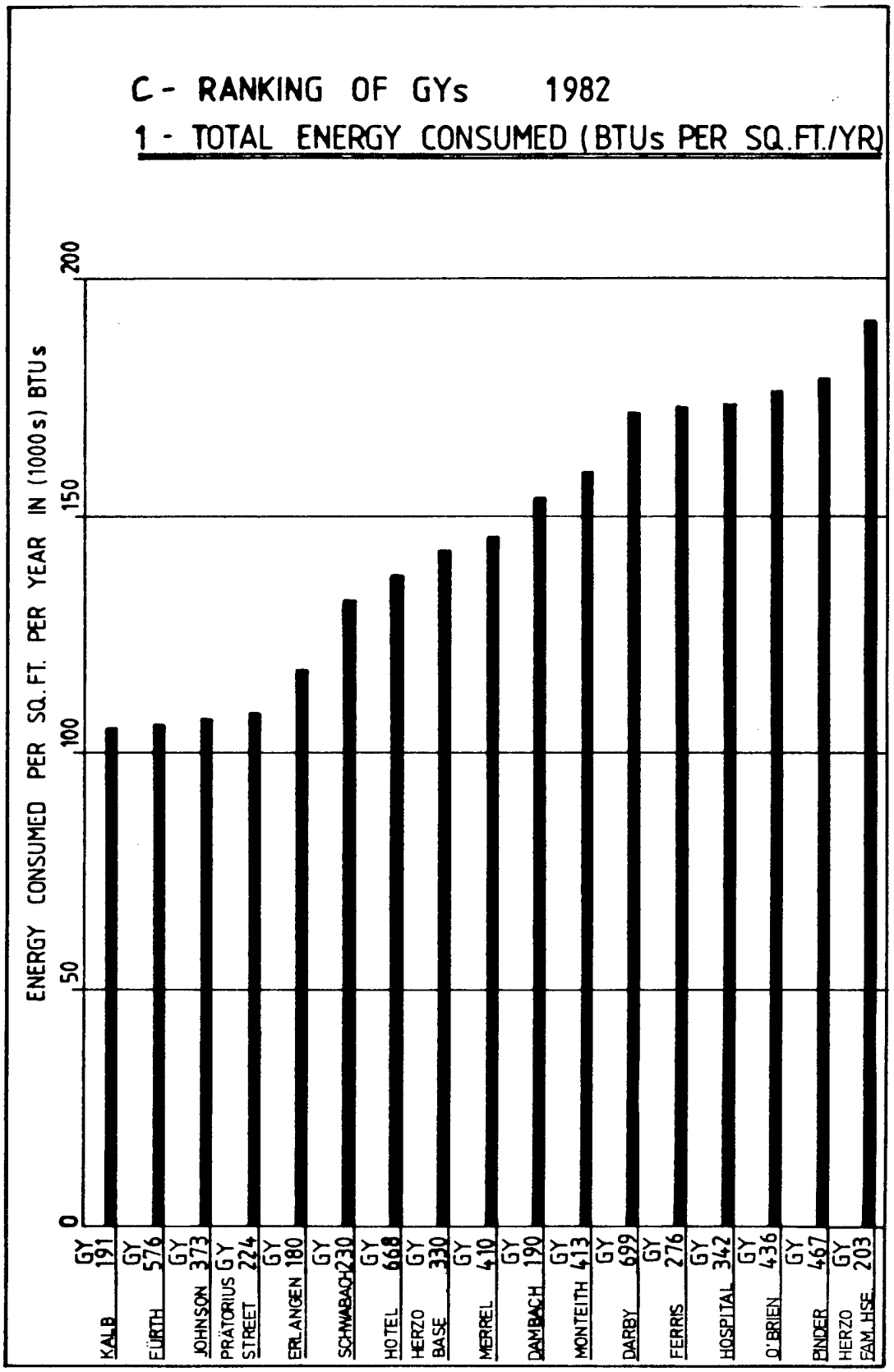

C - RANKING OF GYs 1982
1 - TOTAL ENERGY CONSUMED (BTUs PER SQ.FT/YR)
ENERGY CONSUMED PER SQ.FT. PER YEAR IN (1000s) BTUs
0
50
100
150
200
GY 191 KALB
GY 576 FÜRTH
GY 373 JOHNSON
GY 224 PRÄTORIUS STREET
GY 180 ERLANGEN
GY 230 SCHWABACH
GY 668 HOTEL
GY 330 HERZO BASE
GY 410 MERREL
GY 190 DAMBACH
GY 413 MONTEITH
GY 699 DARBY
GY 276 FERRIS
GY 342 HOSPITAL
GY 436 O'BRIEN
GY 467 BINDER
GY 203 HERZO FAM.HSE

Figure 1B1.5

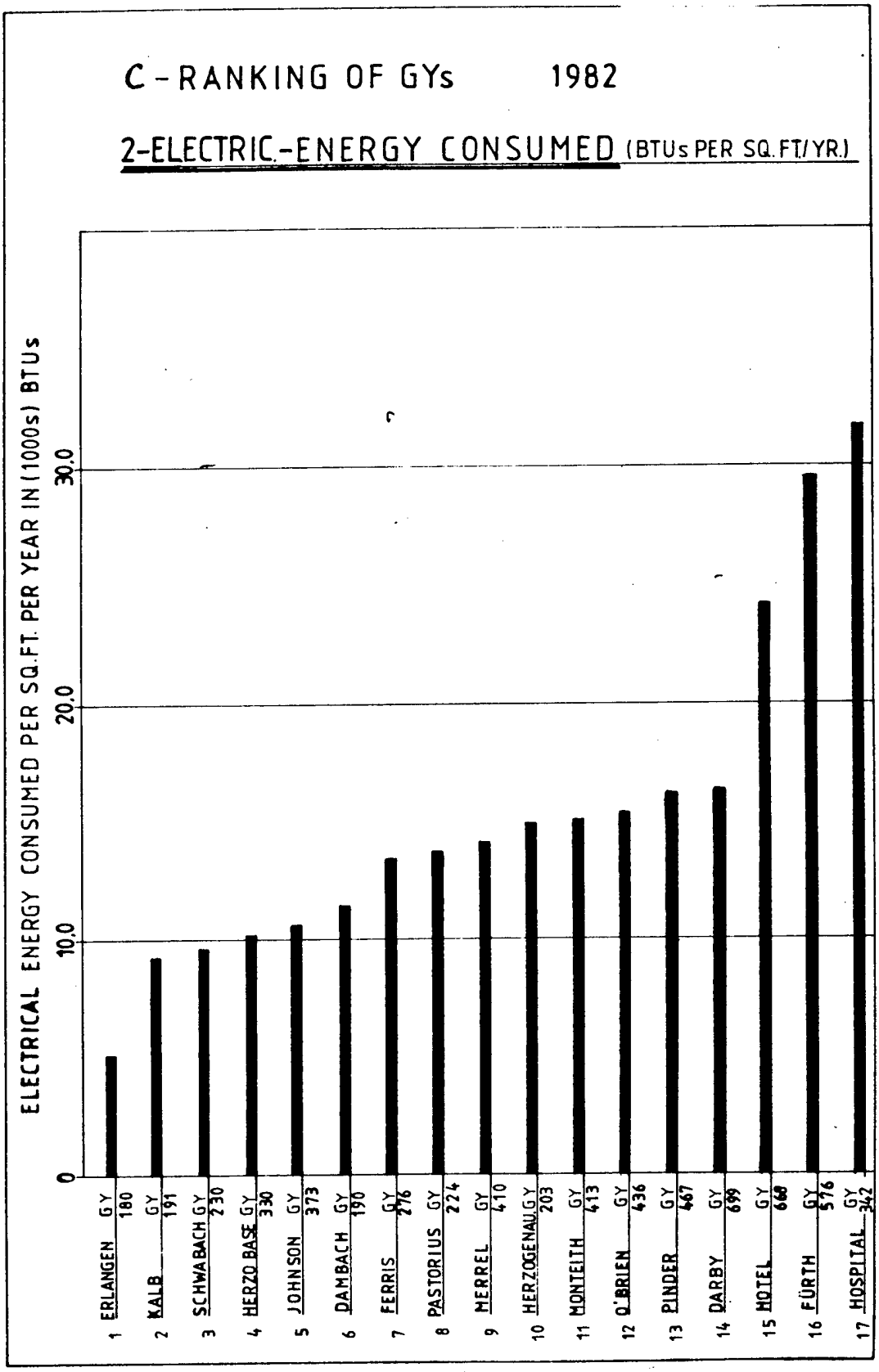

C - RANKING OF GYs 1982
2-ELECTRIC-ENERGY CONSUMED (BTUs PER SQ.FT/YR.)
ELECTRICAL ENERGY CONSUMED PER SQ.FT. PER YEAR IN (1000s) BTUs
0
10.0
20.0
30.0
1 ERLANGEN GY 180
2 KALB GY 191
3 SCHWABACH GY 230
4 HERZO BASE GY 330
5 JOHNSON GY 373
6 DAMBACH GY 190
7 FERRIS GY 276
8 PASTORIUS GY 224
9 MERREL GY 410
10 HERZOGENAU GY 203
11 MONTEITH GY 413
12 O'BRIEN GY 436
13 PINDER GY 467
14 DARBY GY 699
15 HOTEL GY 660
16 FÜRTH GY 576
17 HOSPITAL GY 342

Figure 1B1.6

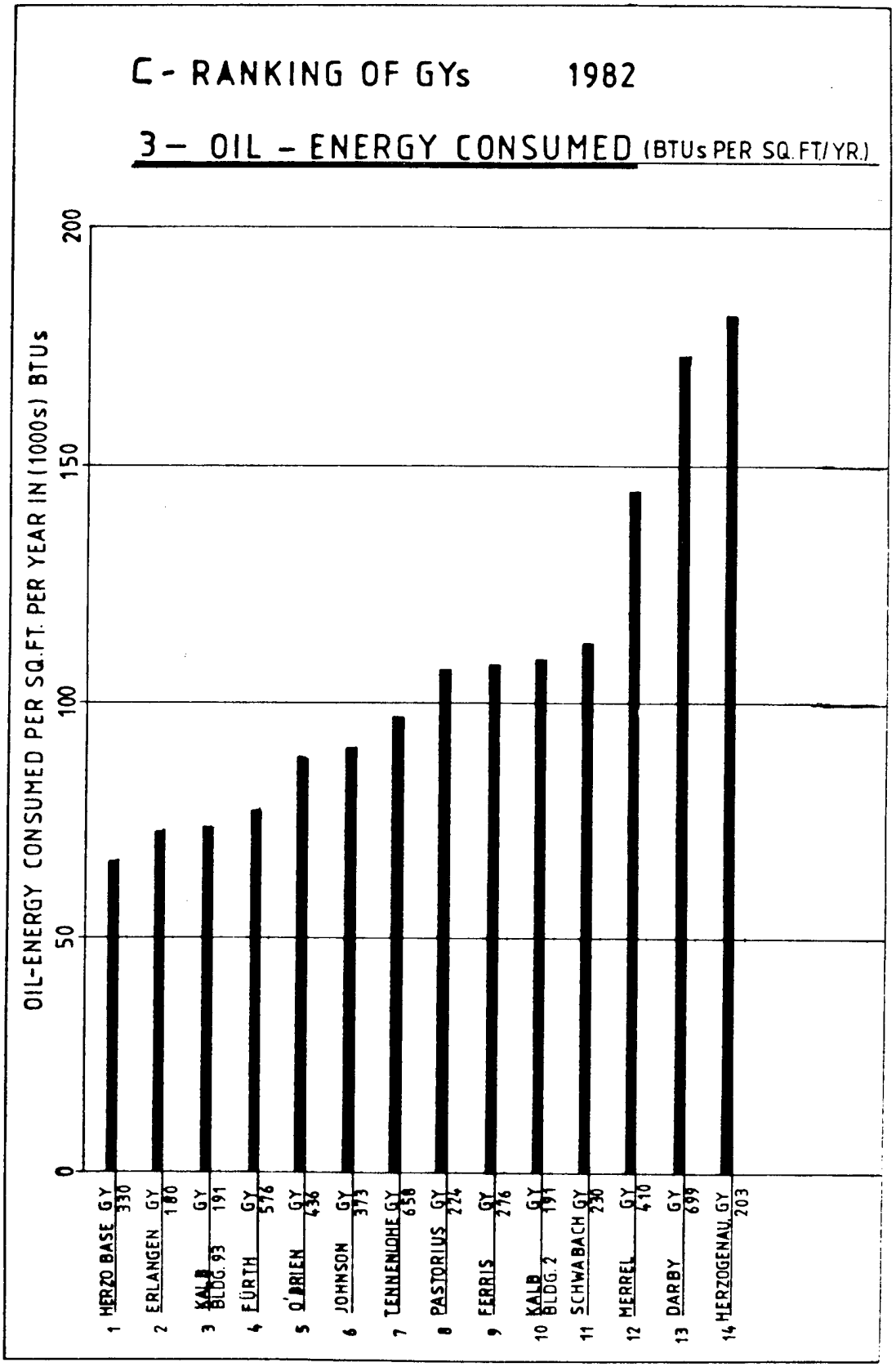

C - RANKING OF GYs 1982
3 - OIL - ENERGY CONSUMED (BTUs PER SQ.FT/YR.)
OIL-ENERGY CONSUMED PER SQ.FT. PER YEAR IN (1000s) BTUs
0
50
100
150
200
1 HERZO BASE GY 330
2 ERLANGEN GY 180
3 KALB BLDG. 93 GY 191
4 FÜRTH GY 576
5 O'BRIEN GY 436
6 JOHNSON GY 373
7 TENNENLOHE GY 658
8 PASTORIUS GY 224
9 FERRIS GY 276
10 KALB BLDG. 2 GY 191
11 SCHWABACH GY 230
12 MERREL GY 410
13 DARBY GY 699
14 HERZOGENAU GY 203

Figure 1B1.7

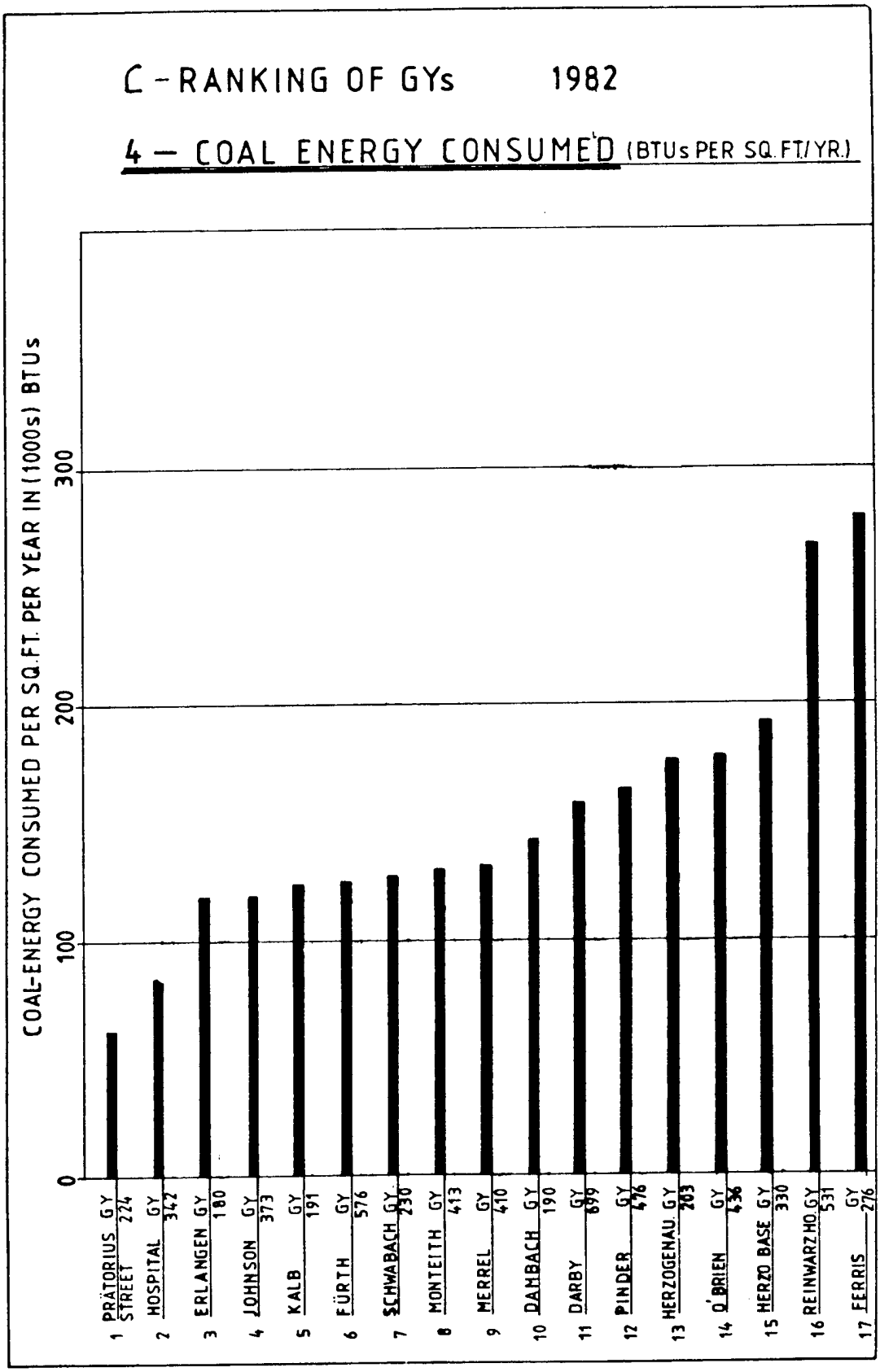

C - RANKING OF GYs 1982
4 — COAL ENERGY CONSUMED (BTUs PER SQ.FT/YR.)
COAL-ENERGY CONSUMED PER SQ.FT. PER YEAR IN (1000s) BTUs
0
100
200
300
1 PRÄTORIUS GY STREET 224
2 HOSPITAL GY 342
3 ERLANGEN GY 180
4 JOHNSON GY 373
5 KALB GY 191
6 FÜRTH GY 576
7 SCHWABACH GY 230
8 MONTEITH GY 413
9 MERREL GY 410
10 DAMBACH GY 190
11 DARBY GY 699
12 PINDER GY 476
13 HERZOGENAU GY 203
14 O'BRIEN GY 436
15 HERZO BASE GY 330
16 REINWARZHO GY 531
17 FERRIS GY 276

Table 1C1.1

MASTER LIST OF E.C.O.s

*Note: The number in parentheses, with an asterisk, denotes the related item in Table 2A2.1 which is a copy of the USAEUR-supplied list of suggested E.C.O.s from Annex B of the Schedule of Services.

E.C.O. No.	Title	Invest. Cost	Annual Energy Savings	S.I.R. Range	Increment
Buildings					
A-1	Thermostatic Radiator Valves at Individual Radiators (*29)	$189,000	$72,500	4.97	A
A-2	Time Clock Control on Radiator System	See B-30			
A-3.0	Storm Windows, Addition (*32)	$221,000	$30,600	1.82	A
A-3.1	Thermopane Windows (*32)	$387,600	$31,300	1.22	A
A-3.2	Replace Windows with Masonry (*32)	Not productive			None
A-3.3	Replace Windows with Glass Block (*32)	Not productive			None
A-4	Seal Wall Openings (*31)	Minor	Minor	100	F
A-5.1	Weatherstrip Doors Family Housing (*31)	$95,100	$68,400	9.45	A
A-5.2	Weatherstrip Doors Non-Family Housing (*31)	$29,400	$10,500	4.72	A
A-6	Thermo Valves in System	See B-30			
A-7.1	Insulation Over Ceiling (*30)	$435,300	$152,000	4.5	A
A-7.2	Add Insulation to Top of Roof (*30)	Not productive			None
A-7.3	Add Insulation to Roof of Used Attic (*30)	$171,700	$40,600	3.54	A
A-7.4	Add Insulation to Underside of 1-Story Roof (*30)	$913,800	$93,000	1.42	A
A-7.5	Add Insulation to Underside of Steep Roof Between Rafters (*30)	$10,000	$750	1.15	A

Table 1C1.1 (Continued)

E.C.O. No.	Title	Invest. Cost	Annual Energy Savings	S.I.R. Range	Increment
A-7.6	Add Insulation Over Attic Floor (*30)	$5,300	$1,810	3.9	A
A-8	Heating Pipe Insulation (*9)	?	?	13	F
A-9.1	Shower Flow Restrictors Non-Family Housing (*18)	$16,300	$115,900	107	A
A-9.2	Shower Flow Restrictors Family Housing (*18)	$44,700	$107,700	33.1	A
A-10	Temperature Regulator for Shower Water	$65,000	$12,250	2.9	F
A-11.1	Dampers on Wall Fans - Non-Family Housing	$289,600	$40,400	1.82	A
A-11.2	Dampers on Wall Fans - Family Housing	$154,600	$21,600	1.82	A
A-12	Individual Water Heaters	See B - 8			
A-13	Exterior Doors, Replace (*33)	$786,000	$37,300	0.62	G
A-14	Make-up Air Heating Units	$158,000	$12,600	1.2	F
		Use in Future Construction			
A-14.1	Heat Recovery with Make-up Air Unit	Use A - 14			None
A-15	Plastic Strips at Commissary Coolers	$7,300	$9,900	14.7	A
A-16	Reduce O.S. Air Intake	$800	$2,500	46	F
A-17	Reduce Lighting at Off-peak	See D - 8			
A-18	Add Heated Vestibules at Commissaries	$2,700	$1,126	4.6	A
A-19	Carbon Exhaust at Motor Repair	$73,000	$4,100	0.69	F
A-20	Circulating System for Domestic Hot Water	See B - 8			
A-21	Insulate Exterior Walls	$14,400,000	$270,000	0.25	None

Table 1C1.1 (Continued)

E.C.O. No.	Title	Invest. Cost	Annual Energy Savings	S.I.R. Range	Increment
A-22	Add Vestibules (*33)	$341,000	$39,500	1.5	A
A-23	Reschedule Building Use Time (*2)	Not applicable			None
A-24	Don't Use Temporary Buildings (*3)	Not applicable			None
A-25	Heating Coil Control Valve	$6,500	$3,200	5.5	A
A-26	Night Setback on Fan System	$31,900	$8,500	3.96	F
	Heating				
B-1	Convert Hand-fired Boilers to Stokers	Not Recommended			None
B-2	Convert Steam Heat to Hot Water (*11) and Add Night Setback	$1,408,600	$371,000	3.58	B
B-3	Replace Pipe Insulation	See A - 8			
B-4	Repair Underground System	?	?	?	F
B-5	Control Boiler Sequence	$13,400	$275,000	284	F
B-6	Consolidate Heat Plants (*5, 6)	$1,347,700	$198,500	2.7	B
B-7	District Heating (*4)	$377,000	$543,300	26	B
B-8	Separate Domestic Water Heaters (*14)				
A	Family - Housing	$81,000	$ 9,900	2.78	B
B	Other	$85,000	18,500	4.17	A
B-9	Add Pump to Gravity Hot Water System, and Add Therm. Radiator Valves	$31,500	$6,900	2.93	B
B-10	Variable Speed Pumping	$15,200	$1,280	0.92	None
B-11	Electronic Boiler System Controls	$15,800	$9,800	9.4	B
B-12	Reduce Hot Water Temperature (*16)	$9,350	$250,000	350	F

Table 1C1.1 (Continued)

E.C.O. No.	Title	Invest. Cost	Annual Energy Savings	S.I.R. Range	Increment
B-13	Pumps for Domestic Hot Water		Not Recommended		None
B-14	Check Valve at Hot Water Coil		See also B-8		F
B-15	Heat Recovery (Stack Economizer) (*12)	$117,200	$12,016	0.7	G
B-16	High Efficiency Motors (*28)		Maintenance	15	F
B-17	Insulate Top of Boilers	$ 28,500	$ 8,300	4.4	B
B-18	Clean Boilers	$204,000	$185,700	12.4	B
B-19	Convert 3-Way Valves to 2-Way Valves	$460	$250	5.9	F
B-20	Check Efficiency of Controls (*29)	$52,300	$208,500	53	F
B-21.1	Insulate Valves, Fittings, Tanks Non-Family Housing (*12)	$344,100	$56,100	2.25	B
B-21.2	Insulate Valves, Fittings, Tanks Family Housing (*12)	$75,900	$12,000	2.47	B
B-22	Chemically Treat Make-up Water		See also B-18		F
B-23	Combustion Efficiency Tests		Maintenance Item		F
B-24	Zone Multiple Use Facilities (*1)		No Applications		None
B-25	Energy-Efficient Fuels (*7)		No Applications		None
B-26	Flue Gas Dampers, Turbulators, Oxygen Trim Control (*8)		Not Recommended		None
B-27	Return Condensate (*10)		Already Exists		
B-28	Add Heat Pump for Domestic Hot Water (*12, 13)	$11,000	$700	0.71	F
B-29	Curtail Energy to Domestic Water Heaters (*15)	$1,350	$28,000	280	F
B-30	Install Night Setback (*29) (See also B-2)				
A	Family - Housing	$47,000	$ 5,200	1.25	F
B	Other (Add to A-1)	$24,450	19,100	10.00	B

Table 1C1.1 (Continued)

E.C.O. No.	Title	Invest. Cost	Annual Energy Savings	S.I.R. Range	Increment
B-31	Replace Boilers	$24,800	$620	0.12	None
B-32	Preheat Domestic Hot Water	$14,800	$3,350	3.4	B
B-33	Cooling Tower Repairs	Not Recommended			None
	Operational				
C-1	Training Program for Occupants	--	--	N.A.	F
C-2	Coal Firing and Ash Removal	$200,000	$241,600	N.A.	F
C-3	Boiler Operation Contract	--	--	N.A.	F
	Electrical				
D-1	Capacitor for Power Factor	$15,300	0	3.5	G
D-2	Revise Exterior Lighting (*19)	$248,200	$44,900	2.4	B
D-3	Fluorescent Interior Lighting	See D-5			
D-4	Sodium Interior Lighting	See D-5			
D-5	Revise Interior Lighting at Non-Housing Buildings, New Luminaires and Lamps (*20, 23, 24)	$1,080,000	$143,100	1.6	A
D-6	Revise Interior Lighting at Non-Housing Buildings, New Lamps in Existing Luminaires (*20, 23, 24)	$ 26,800	$104,600	45	F
D-7	Photo-Cell Lighting Control, Interior (*21, 22)	$231,400	$37,200	2.6	A
D-8	Programmed Time Control (*21)	See D-7	$7,900	N.A.	A
D-9	Interlock Ovens, etc.	$125,000	$132,000	21	A
D-10	Sequence-Start for Ovens, etc.	See D-9			
D-11	Time-delay Lighting Control (*21)	$86,000	$16,000	3.1	A

Table 1C1.1 (Continued)

E.C.O. No.	Title	Invest. Cost	Annual Energy Savings	S.I.R. Range	Increment
D-12	Group Replacement of Lamps	0	$63,000	N.A.	F
D-13	Electric Spot Heating (*26)	$170,400	-$71,700	-4.5	None
D-14	On-Site Power Generation for Peak Shaving	$92,400	$43,600	2.9	G
D-15	Reduce Lighting Levels	0	$4,800	N.A.	F
D-16	Transformer Sequencing	$1,875	38	0.2	None
		Use in Future Construction			
D-17	Occupant Incentives	--	--	--	F
D-18	Round Fluorescent Lamps at Housing (*20, 23)	$220,000	$222,000	17.0	A
D-19	Individual Housing Metering (*27)	See D-22			F
D-20	EMCS (*34)	$2,510,700	$723,100	3.96	B
D-21	Use of Low-Loss Transformers	$10,500	$340	0.35	F
		Use in Future Construction			
D-22	Eliminate Contract Meter Fees	0	0	N.A.	G
D-23	Smaller Transformers	Maintenance			F
D-24	Photo-Cell Exterior Lighting	See D-2			
D-25	Utilize High-Efficiency Ballasts (*25)	Not Recommended			None

Table 1C1.2

NUERNBERG ENERGY PROJECT
RANKING OF E.C.O.s

E.C.O. No. S.I.R.	E.S.I.R.	Title	Cost	Annual Savings MBtu	Energy	Non-Energy
Increment A - Building Components						
A-9.1		Showerhead with Flow Restrictor - Non-Family Housing				
107	107		$16,300	21,400	$115,900	-0-
A-9.2		Showerhead with Flow Restrictor - Family Housing				
33.1	33.1		$44,700	21,200	$107,700	-0-
D-9		Interlock Ovens at Messhalls				
20.6	15.3		$124,800	34,400	$132,000	$126,000
D-18		Round Fluorescent Lamps at Housing				
17.0	13.4		$220,000	35,800	$222,000	$169,000
A-15		Plastic Strips at Commissary Coolers				
14.7	14.7		$7,300	1,626	$9,900	-0-
A-5.1		Weatherstrip Doors at Family Housing				
9.45	9.45		$95,100	11,960	$68,400	-0-
A-5.2		Weatherstrip Doors at Non-Family Housing				
4.72	4.72		$29,400	1,978	$10,400	-0-
A-18		Heated Vestibules at Commissary				
4.60	4.60		$2,700	200	$1,100	-0-
A-7.1		Insulation over Ceiling				
4.5	4.5		$435,300	26,000	$152,000	-0-
B-8B		Separate Domestic Water Heaters (Non-Family Housing)				
4.17	4.17		$85,000	4,000	$18,500	-0-

Table 1C1.2 (Continued)

E.C.O. No. S.I.R.	Title E.S.I.R.	Cost	Annual Savings MBtu	Energy	Non-Energy
A-7.6	Add Insulation over Attic Floor (Add to A-7.1)				
3.9	3.9	$5,300	280	$1,800	-0-
A-7.3	Add Insulation to Roof of Used Attic (Add to A-7.1)				
3.5	3.5	$171,700	7,500	$40,600	-0-
D-11	Time Delay Lighting Control				
3.07	1.98	$85,900	2,500	$16,000	$9,100
D-7	Photocell Lighting Control, Interior				
2.6	2.0	$231,400	9,900	$36,900	$27,400
A-3.0	Storm Windows				
1.82	1.82	$221,000	5,200	$30,600	-0-
A-11.1	Backdraft Dampers on Wall Fans - Non-Family Housing				
1.82	1.82	$289,600	6,820	$40,400	-0-
A-11.2	Backdraft Dampers on Wall Fans - Family Housing				
1.82	1.82	$154,600	3,640	$21,600	-0-
D-5	Revise Interior Lighting @ Non-Housing Buildings, New Luminaires				
1.62	1.62	$1,080,000	23,100	$143,100	$36,200
A-22	Add Vestibules				
1.49	1.49	$341,000	6,500	$39,500	-0-
A-7.4	Add Insulation to Underside of 1-Story Roof (Add to A-7.1)				
1.42	1.42	$913,800	16,400	$93,000	-0-
A-3.1	Thermopane Windows (Combine with A-3.0)				
1.22	1.22	$387,600	5,800	$31,300	-0-

Table 1C1.2 (Continued)

E.C.O. No. S.I.R.	E.S.I.R.	Title / Cost	Annual Savings MBtu	Energy	Non-Energy
A-7.5	Add Insulation to Steep Roof between Rafters (Add to A-7.1)				
1.15	1.15	$10,000	140	$750	-0-
D-8	Programmed Time Control (Add to D-7)				
---	---	-0-	2,100	$7,900	$5,400
Increment B - Utility Services					
B-7	District Heating (Forms 2 Projects)				
26	26	$377,000	96,700	$543,300	$-99,300
B-18	Clean Boilers				
12.43	12.43	$204,000	32,200	$185,700	-0-
B-30B	Install Night Setback and Outside-Air Water-Temperature Reset. (Combine with A-1.) YIELD TO D-20. (Non-Family Housing)				
10.00	10.00	($24,450)	(3,200)	($19,100)	-0-
B-11	Electronic Boiler System Controls				
9.40	9.40	$15,800	1,800	$9,800	-0-
A-25	Heating Coil Control Valve (Add to A-1)				
5.5	5.5	$6,500	600	$3,200	-0-
A-1	Thermostatic Radiator Valves at Individual Radiators				
5.0	5.0	$189,000	13,000	$72,500	-0-
B-17	Insulate Top of Boiler				
4.41	4.41	$28,500	1,500	$8,300	-0-
D-20	EMCS (Energy Management Control System) (Forms 3 Projects)				
3.96	3.96	$2,510,700	122,800	$723,100	$115,300

Table 1C1.2 (Continued)

E.C.O. No. S.I.R.	Title E.S.I.R.	Cost	Annual Savings MBtu	Energy	Non-Energy
B-2	Convert Steam Heat to Hot Water and Add Night Setback. YIELD TO D-20. (Add to A-1)				
3.58	3.58	($1,408,600)	(64,000)	($371,000)	-0-
B-32	Preheat Domestic Hot Water				
3.44	3.44	$14,800	600	$3,350	-0-
B-9	Add Pump to Gravity Hot Water System (Add to A-1)				
2.93	2.93	$31,500	1,250	$6,900	-0-
B-8A	Separate Domestic Water Heaters (Family Housing)				
2.78	2.78	$81,000	2,400	$9,900	-0-
B-6	Consolidate Heat Plants (Forms 3 Projects)				
2.72	2.72	$1,347,700	35,700	$198,500	$83,500
B-21.2	Insulate Valves and Fittings - Family Housing				
2.47	2.47	$75,900	2,162	$12,000	-0-
D-2	Revise Exterior Lighting				
2.35	2.35	$248,200	11,600	$44,900	$10,400
B-21.1	Insulate Valves and Fittings - Non-Family Housing				
2.25	2.25	$344,100	9,798	$56,100	-0-
Increment F - Milcom Projects					
C-2	Coal Firing and Ash Removal				
N.A.	N.A.	$200,000	44,700	$241,600	-0-
D-12	Group Replacement				
N.A.	N.A.	-0-	-0-	-0-	$62,700

Table 1C1.2 (Continued)

E.C.O. No. S.I.R.	E.S.I.R.	Title	Cost	Annual Savings MBtu	Energy	Non-Energy
D-15		Reduce Lighting Levels				
N.A.	N.A.		-0-	300	$4,800	$600
B-12		Reduce Domestic Hot Water Temperature				
351	351		$9,350	45,100	$250,000	-0-
B-5		Control Boiler Sequence				
284	284		$13,400	46,000	$275,000	-0-
B-29		Curtail Energy to Domestic Water Heaters				
280	280		$1,350	4,900	$28,000	-0-
A-4		Seal Wall Openings				
100	100		$20	30	$150	-0-
B-20		Check Efficiency of Controls				
53	53		$52,300	35,800	$208,500	-0-
A-16		Reduce Outside Air Intake				
46	46		$800	450	$2,500	-0-
D-6		Revise Interior Lighting at Non-housing Buildings New Lamps. YIELD TO D-5.				
45	45		($26,800)	(16,500)	($104,000)	($7,500)
B-16		High Efficiency Motors (Maintenance Item)				
15	-		-	-	-	-
A-8		Piping Insulation (Magnitude not Known)				
13.0	13.0		-	-	-	-
B-19		Convert 3-Way Valves to 2-Way Valves				
5.9	5.9		$500	40	$250	-0-
B-4		Repair Underground Heating Distribution System (Magnitude not Known)				
5.5	5.5		-	-	-	-

Table 1C1.2 (Continued)

E.C.O. No. S.I.R.	E.S.I.R.	Title	Cost	Annual Savings MBtu	Energy	Non-Energy
A-26		Night-Setback on Fan System. YIELD TO D-20.				
3.96	3.96		($31,900)	(1,550)	($8,500)	-0-
A-10		Temperature Regulator for Shower Water				
2.9	2.9		$64,600	2,000	$12,250	-0-
B-30A		Install Night Setback (Family Housing) YIELD TO D-20.				
1.25	1.25		($47,000)	(900)	($5,200)	-0-
A-14		Make-up Air Units				
1.18	1.18		$158,000	2,300	$12,600	-0-
B-28		Add Heat Pump for Preheating Domestic Hot Water				
0.71	0.71		$11,000	100	$700	-0-
A-19		Carbon Monoxide Exhaust at Motor Repair				
0.69	0.69		$72,600	700	$4,100	-0-
D-21		Use of Low-loss Transformers				
0.35	0.35		$10,500	50	$300	-0-
B-23		Combustion Efficiency Tests				
N.A.	N.A.		-	-	-	-
C-1		Training Program for Occupants				
N.A.	N.A.		-	-	-	-
C-3		Boiler Operation Contract				
N.A.	N.A.		-	-	-	-
D-17		Occupant Incentives				
N.A.	N.A.		-	-	-	-
D-23		Use of Smaller Transformers				
N.A.	N.A.		-	-	-	-

Table 1C1.2 (Continued)

E.C.O. No. S.I.R.	E.S.I.R.	Title	Cost	Annual Savings MBtu	Energy	Non-Energy
Increment G - NON-ECIP						
D-1		Capacitor for Power Factor				
3.5	-0-		$15,300	-0-	-0-	$5,900
D-14		On Site Power Generation for Peak Shaving. YIELD TO D-20.				
29	-1.8		($92,500)	(1,130)	($11,100)	($43,600)
B-15		Heat Recovery from Boiler Stack				
0.68	0.68		$117,200	1,205	$12,016	-0-
A-13		Replace Existing Doors				
0.62	0.62		$786,000	6,300	$37,300	-0-
D-22		Eliminate Contract Meter Fees				
N.A.	N.A.		-0-	-0-	-0-	$182,500
Non-Productive E.C.O.s						
A-3.2		Replace Windows with Masonry				
Not productive						
A-3.3		Replace Windows with Glass Block				
Not productive						
A-7.2		Add Insulation to Top of Roof				
Not productive						
A-14.1		Heat Recovery with Make-up Air Unit				
Alternate; less productive than A-14						
A-21		Insulate Exterior Walls				
0.25	0.25		$14,400,000	50,960	$270,000	-0-
A-23		Reschedule Building Use Time				
No Applications Found						

Table 1C1.2 (Continued)

E.C.O. No. S.I.R.	E.C.O. No. E.S.I.R.	Title	Cost	Annual Savings MBtu	Annual Savings Energy	Annual Savings Non-Energy
A-24		Don't Use Temporary Buildings				
No Applications Found						
B-1		Convert Hand-fired Boilers to Stokers				
Not Recommended						
B-13		Pumps for Domestic Hot Water				
Not Recommended						
B-24		Zone Multiple Use Facilities				
No Applications Found						
B-25		Energy Efficient Fuels				
No Applications Found						
B-26		Flue Gas Dampers, Turbulators, Oxygen Trim				
Not Recommended						
B-27		Return Condensate				
No Applications Found, Already in Effect						
B-31		Replace Boilers				
0.12	0.12		$24,800	36	$620	-0-
B-33		Cooling Tower Repairs				
Not Recommended						
D-13		Electric Spot Heating				
-4.5	-6.0		$170,400	-11,878	-$71,700	-0-
D-16		Transformer Sequencing				
0.22	0.22		$1,875	11.6	$38	-0-
D-25		Utilize High-Efficiency Ballasts				
Not Recommended						

Table 1C1.2 (Continued)

E.C.O. No. S.I.R.	E.S.I.R.	Title	Cost	Annual Savings MBtu	Energy	Non-Energy
Duplicates, Deleted						
A-2		Time Clock Control on Radiation System (See B-30)				
A-6		Thermo Valves in System (See B-30)				
A-12		Individual Water Heaters (See B-8)				
A-17		Reduce Lighting at Off-peak (See D-8)				
A-20		Circulating System for Domestic Hot Water (See B-8)				
B-3		Replace Pipe Insulation (See A-8)				
B-14		Check Valve at Hot Water Coil (See Also B-8)				
B-22		Chemically Treat Make-up Water (See Also B-18)				
D-3		Fluorescent Interior Lighting (See D-5)				
D-4		Sodium Interior Lighting (See D-5)				
D-8		Programmed Time Control (See D-7)				
	N.A.				$7,900	
D-10		Sequence-Start for Ovens, etc. (See D-9)				
D-19		Individual Housing Metering (See D-22)				
D-24		Photo-Cell Exterior Lighting (See D-2)				

Table 1C1.3

LIST OF PROPOSED PROJECTS

Preliminary Number	Title	Based on E.C.O.s
A-1	Heating System Modifications	A-1, B-2, B-9, B-30
A-3	Window Improvement	A-3.0, A-3.1
A-5.2	Weatherstrip Doors	A-5.0
A-7	Attic Insulation	A-7.1, A-7.3, A-7.4, A-7.5, A-7.6
A-9.2	Showerhead Flow Restrictors @ Family Housing	A-9.0
A-11.1	Dampers on Wall Exhaust Fans @ Non-Family Housing	A-11
A-11.2	Dampers on Wall Exhaust Fans @ Family Housing	A-11
A-22	Add Vestibules	A-22
B-6.1	Consolidation of Heat Plants, GY-190	B-6
B-6.2	Consolidation of Heat Plants, GY-203	B-6
B-6.3	Consolidation of Heat Plants, GY-230	B-6
B-7.1	Conversion to District Heating, GY-224	B-7
B-7.1	Conversion to District Heating, GY-342 and GY-410	B-7
B-8A	Separate Domestic Water Heaters	B-8
B-18	Cleaning of Boilers	B-18, B-22
B-21.2	Insulate Valves and Fittings @ Family Housing	B-21
D-2	Revise Exterior Lighting	D-2
D-5	Revise Interior Lighting @ Non-housing Buildings	D-5
D-7	Add Photocell and Time-Control to Interior Lighting	D-7, D-8
D-18	Use Round Fluorescent Lamps at Housing	D-18
D-20.1	EMCS @ GY-191	D-20

Table 1C1.3 (Continued)

Preliminary Number	Title	Based on E.C.O.s
D-20.3	EMCS @ 11 Nonfamily-Housing Sites	D-20
AA-1	Miscellaneous Building Measures	A-5.1, A-9.1, A-15, A-18, B-8B
BB-1	Miscellaneous Building Measures	B-11, B-17, B-21.1, B-32
DD-1	Kitchen Controls and Time Delay Lighting	D-9, D-11

Table 1C1.4

PRIORITY LIST - FAMILY HOUSING PROJECTS

Preliminary Number	S.I.R.	Title	Invest Cost $ x 1,000	Annual Savings MBtu	Annual Savings $ x 1,000	Annual Savings Non-Energy
A-9.2	33.1	Shower Flow Restrictors	44.8	21,227	107.7	
D-18	16.96	Round Fluorescent Lamps at Housing	219.9	35,768	221.9	168.9
B-7.1	15.6	Convert to District Heat; GY-224	61.7	14,850	121.4	-44.4
D-20.2	5.62	EMCS @ GY-224	41.4	2,640	15.6	6.9
B-8B	4.17	Separate Domestic Water Heaters (Non-Family Housing)	85.0	4,000	18.5	
B-6.2	3.77	Consolidate Heat Plants, GY-203	405.1	13,449	76.5	50.9
B-8A	2.78	Separate Domestic Water Heaters (Family Housing)	80.9	2,411	9.9	--
B-21.2	2.47	Insulate Valves	75.9	2,392	13.0	--
B-6.1	2.29	Consolidate Heat Plants, GY-190	535.0	13,290	71.8	14.9
B-6.3	2.14	Consolidate Heat Plants, GY-230	407.7	8,936	50.3	17.6
D-20.1	1.88	EMCS @ GY-191	198.0	6,237	38.0	--
A-11.2	1.82	Wall Exhaust Fans - Family Housing	154.6	3,640	21.6	--

Table 1C1.5

PRIORITY LIST - NON-FAMILY HOUSING PROJECTS

Preliminary Number	S.I.R.	Title	Invest Cost $ x 1,000	Annual Savings MBtu	Annual Savings $ x 1,000	Annual Savings Non-Energy
B-7.2	27.51	Convert to District Heat, GY-342 and GY-410	315.7	81,865	421.9	-54.9
AA-1	13.57	Misc. Building Measures	205.7	39,031	213.0	--
B-18	12.43	Cleaning of Boilers	204.0	32,211	185.7	--
DD-1	11.64	Kitchen Controls and Time Delay Lighting	210.7	36,888	141.4	133.1
A-5.2	4.72	Weatherstrip Doors	29.4	1,978	10.4	--
D-20.3	4.09	EMCS @ 11 Non-Family Housing Sites	2,271.4	113,800	669.5	108.4
A-1	3.96	Heating System Modifications	1,462.9	74,291	429.3	--
D-7	3.09	Photocell and Time Control - Interior Light	231.4	12,038	44.9	32.8
A-7	2.53	Attic Insulation	1,536.0	50,158	287.7	--
BB-1	2.50	Misc. Heating Measures	400.6	13,947	78.5	--
D-2	2.35	Revise Exterior Lighting	248.2	11,585	44.9	10.4
A-11.1	1.82	Wall Exhaust Fans	289.6	6,820	40.4	--
D-5	1.62	Revise Interior Lighting - Non-Family Housing	1,080.0	23,068	143.1	36.2
A-3	1.58	Window Improvements	172.3	3,612	21.8	--
A-22	1.48	Add Vestibules	341.3	6,546	38.7	--

Table 1D1.1

SUMMARY OF E.C.O. ACTION
NUERNBERG MILCOM

Item	No. of ECOs	Cost $	Annual Savings Energy MBtu	Energy $	Non-Energy $	% 1982 MBtu
Annual Usage						
1979			2,766,434			104%
1982			2,654,980	17,380,172		100%
Increments						
A, Buildings	23	$ 4,952,500	248,440	1,341,350	$373,100	9.4
B, Utilities	16	5,474,700	332,110	1,877,600	109,900	12.5
F, Milcom	26	594,400	182,500	1,040,800	$ 63,300	6.9
Total: A,B,F	65	11,021,600	763,050	4,259,750	546,300	28.7
G, Non-ECIP	5	918,500	7,500	49,300	182,500	0.0

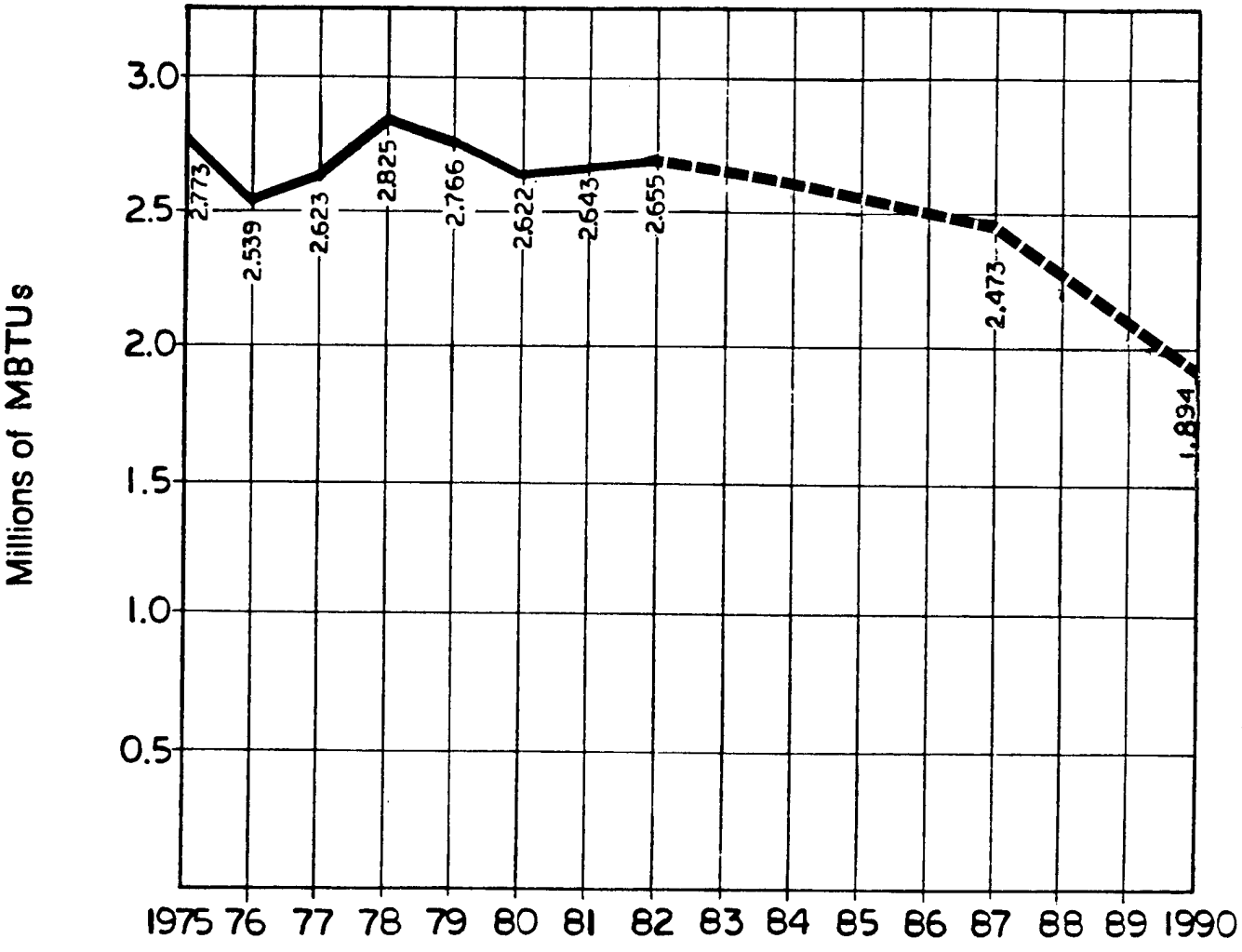
E.C.O. Types (Increments A, B, F)
See Appendix C for Detail Tabulations (Book II Pages 83 to 88)

						% Total
District Heat & Consol.	2	1,724,700	132,400	741,800	- 15,800	17.4
Heat System	13	1,125,500	231,000	1,306,650	-0-	30.4
Building Shell	16	3,065,200	94,500	544,200	-0-	12.3
Lighting	8	1,865,500	85,300	475,600	320,800	10.9
EMCS	1	2,510,700	122,800	723,100	115,300	16.2
Misc. Mech.	11	594,700	62,600	336,100	-0-	8.2
Misc. Elec.	2	135,300	34,450	132,300	126,000	4.6
Duplicates	4	-0-	-0-	-0-	-0-	-0-
No Values	8	-0-	-0-	-0-	-0-	-0-
Total	65	$11,021,600	763,050	4,259,750	546,300	99.9

Figure 1D1.2

Historic Record and Projection of Energy Consumption at Nuernberg Military Community

Total Gross Energy Use *
(Consumption of Natural Resources)



* Includes electrical energy at 11,600 Btu per kWh, which includes efficiency of power production and distribution.

"Total Energy Use" graph on page 8 is net consumption with electrical energy at 3,414 Btu per kWh.

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