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Coal Conversion Strategies for DOD

2

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Development of the Central Heating Plant Status Quo Program

by
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In accordance with the Defense Appropriation Act (fiscal year 1986), the Department of Defense (DOD) was directed to rehabilitate and convert central energy plants to coal firing where a cost benefit could be realized. To satisfy this requirement, the life cycle costs of potential fuel/technology alternatives must be compared. The Status Quo program is one component of a series of programs being developed by the U.S. Army Construction Engineering Research Laboratories to evaluate coal conversion alternatives. Status Quo is a microcomputer program that estimates the life cycle costs of maintaining an existing energy plant in its present condition, thereby providing a baseline for comparing the life cycle costs of alternatives to the status quo: modernization, retrofit, or construction of a new plant.

This program works in conjunction with (and requires) the Life Cycle Cost in Design (LCCID) computer program, and is designed to run on any IBM PC or compatible with at least 640K of random access memory and about 1.4 megabytes of free hard drive space.

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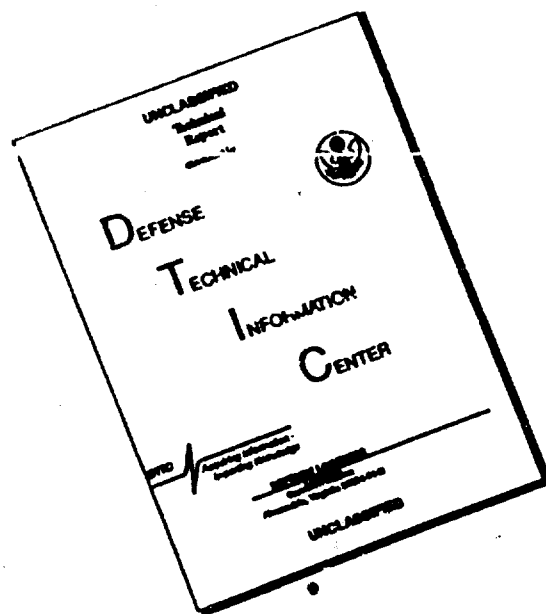
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FOREWORD

This study was conducted for the U.S. Army Engineering and Housing Support Center (USAEHSC) under the Coal Conversion Studies Program, which is administered by the Energy Policy Directorate, of the Office of the Assistant Secretary of Defense, Production & Logistics, OASD(P&L/EP). Mr. Millard Carr is the Program Manager. Funding was provided under Military Interdepartmental Purchase Request (MIPR) W56HZV-89-AC-01, dated 20 November 1989; Work Unit WPO, "Coal Conversion Strategies for DOD." The USAEHSC technical monitor was James Donnelly, CEHSC-FU-P.

The research was done by the Energy and Utility Systems Division (FE) of the Infrastructure Laboratory (FL), U.S. Army Construction Engineering Research Laboratories (USACERL). Martin J. Savoie and Ralph E. Moshage were the USACERL principal investigators. Dr. David M. Joncich is Chief, CECER-FE, and Dr. Michael J. O'Connor is Chief, CECER-FL. The USACERL technical editor was William J. Wolfe, Information Management Office.

COL Daniel Waldo, Jr., is Commander and Director of USACERL, and Dr. L.R. Shaffer is Technical Director.

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DEVELOPMENT OF THE CENTRAL HEATING PLANT STATUS QUO PROGRAM

1 INTRODUCTION

Background

The fiscal year 1986 (FY86) Defense Appropriation Act (PL-99-190), Section 8110, directed the Department of Defense (DOD) to begin to rehabilitate and convert central energy plants (CEPs) to coal firing where a cost benefit could be realized. Section 8110 formed the basis for the Army's Coal Conversion Program, and set a target level of coal consumption, to be achieved by 1994, of 1.6 million short tons per year over the 1985 DOD coal consumption level for the continental United States (1.3 million tons).^{*} The law further stipulates that 300,000 tons of the coal burned should be anthracite coal. (This condition was intended to offset the decreasing use of anthracite coal in Germany resulting from the connection of U.S. Army Europe [USAREUR] installations to district heating systems.) To help the DOD comply with this law, the U.S. Army Engineering and Housing Support Center (USAEHSC) requested the U.S. Army Construction Engineering Research Laboratories (USACERL) to provide technical studies and support for the Army's Coal Conversion Program.

To satisfy the Section 8110 directive, the DOD must select fuel/technology alternatives that will operate most economically through the life cycle of its heating plants. The DOD already uses the Life Cycle Cost in Design (LCCID) economic analysis computer program to evaluate and rank design alternatives for new facilities.^{**} LCCID calculates the present-worth life-cycle cost, payback period, and savings-investment ratio for Army facilities. LCCID also compares and ranks energy supply alternatives according to these cost methods, providing a consistent method to evaluate central heating system energy supply alternatives.

This study developed "Status Quo," a computer program that collects data on an existing central heating plant, evaluates the plant's condition, and estimates its life-cycle cost. The output of the Status Quo program is an LCCID input file containing information of all plant components, including their replacement year and cost, and the costs of plant labor, maintenance, spare parts, and utilities. This information forms the baseline for comparing different fuel/technology alternatives, and can be integrated with other coal conversion analysis procedures that have already been tested. In its present stage of development, Status Quo can identify major capital equipment components and systems typical of Army oil and natural gas-fired heating plants. Status Quo is currently being developed to include coal-fired technologies.

The Status Quo program is designed to run on an IBM PC or compatible with 640K of random access memory (RAM), and about 1.4 megabytes of free hard drive space.

* 1 ton = 907.185 kg.

** For more information on LCCID, refer to: L.K. Lawrie, *Development and Use of the Life Cycle Cost in Design Computer Program (LCCID)*, Technical Report [TR] E-85/07/ADA162522 [U.S. Army Construction Engineering Research Laboratories (USACERL), November 1985].

Objective

The objective of this initial research effort was to develop an automated procedure to evaluate the condition and estimate the life-cycle costs of an existing oil- or gas-fired central heating plant, to provide a baseline or "status quo" alternative to compare with modernization, retrofit, and construction of new energy plants.

A later stage of this study will expand the Status Quo program to evaluate coal-fired heating plants similarly to the way it evaluates oil and natural gas-fired plants.

Approach

Development of the Status Quo program was divided into two phases, the investigation of oil and natural gas-fired combustion technologies, and the investigation of coal-fired technologies. The first step in developing the Status Quo program for oil and natural gas-fired heating plants was to identify major capital equipment components and systems typical of Army plants, which range from 20 to 200 MBtu/hr per boiler, up to 600 MBtu/hr total plant capacity (1 Btu/hr = 0.2931 W). Principal systems considered in this study included water treatment plants, feedwater systems, fuel handling and storage facilities, combustion controls, boilers, air pollution control devices, and heat recovery and physical plants.

The next step was to determine replacement cost factors for each component or system. These factors were developed from recent industrial heating plant replacement projects and Army Corps of Engineers cost guidelines.

Next, the remaining useful life was estimated based on industry experience. A procedure was also developed to determine the expected operation and maintenance (O&M) costs for a central heating plant, also based on typical operating conditions. O&M costs were broken into categories for labor, spare parts and consumables, services, utilities, and fuel.

The information on oil and natural gas-fired central heating plant status quo was developed into a menu-driven microcomputer program that allows the user to enter plant information. A similar module is currently being developed to gather information on coal-fired heating plants similar to the way it evaluates oil and natural gas-fired plants. Table 1 lists the major coal-fired CEP components that will be added to Status Quo. The coal upgrade is scheduled for completion by September 1992.

Scope

The primary purpose of this work is to investigate the feasibility of converting Army central heating plants to coal firing. However, the Status Quo program may also be applied at the installation level to evaluate energy supply alternatives for industrial-size facilities that burn natural gas, oil, or coal. The program may also help establish a phased O&M plan and annual O&M budgets.

Note that the Status Quo program was designed to provide only an estimate of the equipment condition; detailed evaluation procedures considering maintenance and operating history were not developed. There are, however, techniques available to more closely determine life expectancy for many components, such as vibration analysis, thermography, and ultrasonic metal thickness detection.

Table 1

Coal-Fired Plant Components

Boilers	Fire Protection
Underfeed stoker	Water systems
Overfeed stoker	• wet
Spreader stoker	• dry
Stoker variations	CO ₂ systems
• chain grate	
• traveling grate	Heat Recovery Systems
• fixed/dump grate	Economizers
Overfire air systems	Air heaters
Ash reinjection systems	
	Combustion Controls
Coal Handling Systems	Sootblowers
Screw conveyors	
Belt conveyors	Auxiliary Fuel Firing
Densephase transport	Oil
Mechanical feeders	Gas
Belt feeders	
Metal detectors	Ash Handling and Storage
Metering bins	Vacuum systems
	Pressure systems
Coal Storage and Receiving	Bottom ash handling
Outside	Ash ponds/separation
Inside	Fly ash handling
• silos	
• bunkers	Stacks
Truck dumpers	Steel
Rail unloading	Concrete (incl. multiple)

Mode of Technology Transfer

It is anticipated that the algorithms developed in this study will be used in a microcomputer program that will eventually be incorporated into an existing cost-estimating program LCCID, or Central Heating Plant Economics (CHPECON). LCCID is distributed and supported through the Blast Support Office (BSO), 30 Mechanical Engineering Bldg., 1206 W. Green Street, Urbana, IL, 61801. CHPECON is another computer program currently being developed by USACERL under the Army's Coal Conversion Program. Support and distribution channels for CHPECON will be determined as the software is completed.

2 OIL AND NATURAL GAS TECHNOLOGY STATUS QUO

Program Operation

The Status Quo program is part of an overall strategy to determine the most cost effective alternative for meeting an installation's thermal and electrical energy requirements throughout the life cycle of its energy plants. To make that determination, many possible energy supply alternatives must be compared to the installation's current energy supply method (the status quo) to determine the best alternative. Also, the status quo must be established to evaluate other modernization opportunities such as retrofit with high-efficiency burners or cogeneration equipment, which can improve the plant operating condition and life-cycle cost without major construction.

Currently, the Status Quo program can estimate the life expectancy and life-cycle cost of oil and natural gas-fired equipment for boilers in the 20 to 200 MBtu/hr range, with a maximum plant capacity of 600 MBtu/hr. The program data input is quite simple, consisting primarily of the size and year of installation for major CEP components. Table 2 lists the components for oil and natural gas-fired CEPs. Component size may be defined by physical dimensions, capacity, power requirement, or some other measure the program needs to determine component cost. The year of installation is needed to calculate the remaining life of the component. Appendixes A, B, and C show the data structure, default values, and component size parameters for the Status Quo database.

Once the data is entered, the program will display (for each component) the equipment cost in 1991 dollars and the year the equipment should be replaced. Costs are based on average industry prices and the replacement year is based on industry experience.* Program default values may be changed when better information becomes available.

For instance, a good method to establish water tube boiler life is to measure the steam drum thickness and compare it to the original thickness and pressure rating. Boiler codes limit allowable pressures based on drum thickness, so the current pressure rating and the installed design pressure can be plotted against time. The remaining life is estimated by the intersection of the allowable pressure and the operating pressure required to supply steam to the users (Figure 1). Other components may require different methods to determine their condition and life expectancy, including: vibration analysis, motor testing, ultrasonic listening, thickness testing, oil analysis or ferrography, infrared thermal surveys, eddy current testing, equipment performance tracking, equipment run time, and age.

After component data is entered, the user enters annual costs for labor, maintenance, spare parts, and utilities. The program contains defaults for these, but actual costs should be used whenever possible for a more accurate economic analysis. Appendix D contains a draft users manual, which details the data input for the Status Quo program.

The Status Quo program uses LCCID to perform the life cycle cost analysis. The LCCID program is an economic analysis computer program designed to evaluate and rank design alternatives for new and existing DOD facilities. LCCID incorporates Army, Navy, and Air Force economic criteria for design studies, and operates in a manner that does not require the user to know this criteria. LCCID provides the present worth life cycle cost, payback period, and savings-investment ratio. Each energy supply alternative can be compared and ranked according to each of these cost methods, thereby providing a consistent method to evaluate any central heating system energy supply alternative.

* This information was compiled for USACERL by Stanley Consultants, Stanley Building, Muscatine, IA 52761.

Table 2

Oil/Gas-Fired Plants Components

Boilers	Air Pollution Control	Condensate Polishing
Oil or natural gas	Mechanical collectors	Oil removal equipment
Boiler information	Baghouses	Diatomaceous filters
Relief valves	ESPs	Sodium cycle polishers
Feedwater regulators	Breechings	
Burners	Stacks	Compressed Air System
Forced draft fans	Opacity monitors	Air compressors
Induced draft fans	Sulfur dioxide scrubbers	Air dryers
Economizer	Ash conveyors	Air receivers
Air heater	Ash storage	
Air preheater		Electrical System
Drum level control	Combustion Controls	Transformers
	Plant master controllers	Switchgear/breakers
Feedwater System	Boiler controllers	Motor control center
Deaerating heaters	Oxygen trim systems	Breakers
Feedwater heaters	Flame safeguard systems	Starters
Treated water storage	Furnace draft controls	Emergency generators
Treated water pumps	Pressure sensors	
Condensate pumps	Pressure controllers	Physical Plant
Condensate receivers	Damper actuators	Concrete
Boiler feed pumps	Flow meters	Steel
Make-up pumps	Temperature recorders	Roofing
Boiler circ. water pumps		Siding
Sediment tanks	Chemical Feed System	Windows
Expansion tanks	Chemical feed tanks	Doors
Feedwater piping system	Chemical feed pumps	Sump pumps
Cooling water pumps		Lighting
HTW distr. system pumps	Make-up Water System	
	Chlorinators	
Fuel Handling System	Flocc./settling basins	
Unloading pumps	Clarifiers	
Tanks - aboveground	Gravity filters	
Tanks - belowground	Pressure filters	
Pumps	Carbon filters	
Heaters	Sludge contact softeners	
Piping system	Hot process softeners	
Natural gas	Sodium zeolite softeners	
Piping system	Dealkalizers	
	Hydrogen zeolite/sodium	
Heat Recovery System	Zeolite split stream	
Blowdown flash tanks	Reverse osmosis units	
Blowdown heat exchgrs.	Forced draft degasifiers	
	Vacuum degasifiers	
	Demineralizers	
	Evaporators	

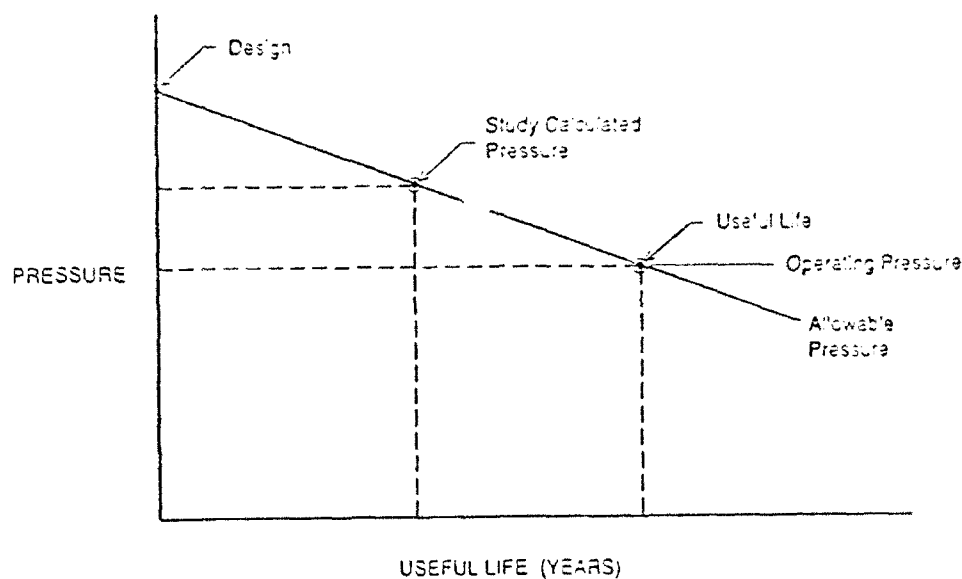


Figure 1. Steam Drum Useful Life Chart

The Status Quo program produces an LCCID input file containing all the plant components with their replacement year and cost, and the plant labor, maintenance, spare parts, and utility costs. The program then runs the LCCID program automatically. All data is saved in a user-defined file that can be modified later, if required.

Test Run for Fort Campbell

The Status Quo program is currently being tested at Fort Campbell, KY, Fort Gordon, GA, Fort Bragg, NC, and Picatinny Arsenal, NJ to identify any system or technical problems. At Fort Campbell, the central plant at building 650 supplies steam to a hospital, which was completed in 1982. The plant contains three 15,000 lb/hr steam boilers that were installed in 1978 (1 lb/hr = 1000 Btu/hr). In 1990, the boilers were converted from burning No. 5 oil to natural gas, with No. 2 oil used as the reserve fuel. The boilers underwent a major overhaul in 1990 to repair damage that occurred while burning No. 5 oil. In addition to providing steam for heating, the steam from the plant also supplies a 640 ton/hr steam absorption chiller that provides part of the hospital's cooling.

The data needed for the Status Quo program was obtained by a site survey and entered into the program. Table 3 lists the basic input data summary from the LCCID portion of the program. The first column lists the expenditure type, the second column lists the cost, the third column lists the escalation rate (used only for energy costs), and the last column shows the dates when the cost is scheduled. No initial investments were required in the first year of the study. The study used a discount factor of 4.6 percent and a project life of 25 years, starting January 1994. This discount rate is required by the Army for FY92 energy projects, and is taken from: *Energy Prices and Discount Factors for the Life-Cycle Cost Analysis*, NISTIR 85-3273 (National Institute of Standards and Technology [NIST], updated annually).

Table 4 shows the net PW or the life cycle cost of the Status Quo program. Table 5 shows a year-by-year expenditure profile for fuel, recurring maintenance and repair, and major repair and replacement costs. The expenditure profile will provide installation engineers with a good way to estimate O&M requirements and costs for planning the installation's O&M budget.

Table 3

Basic Input Data Summary

Cost/Benefit Description	Cost in DOS \$ (\$ X 10**0)	Equivalent Uniform Differential Escalation Rate (% Per Year)	Time(s) Cost Incurred
INVESTMENT COSTS	0.0	0.00	JAN 94
DISTILLATE OIL	60600.0	1.58	JUL95-JUL19
RESIDUAL OIL	8396.9	2.11	JUL95-JUL19
NATURAL GAS	729332.8	3.64	JUL95-JUL19
MAINT LABOR	122500.0	0.00	JUL95-JUL19
MAINT SERV	12162.0	0.00	JUL95-JUL19
MAINT SUPPLY	90000.0	0.00	JUL95-JUL19
MAINT UTIL	60811.0	0.00	JUL95-JUL19
STACK	18000.0	0.00	JAN 18
DRUMCTL	15000.0	0.00	JAN 98
ECONOMIZER	105000.0	0.00	JAN 98
F_FAN	21000.0	0.00	JAN 18
RELVALVE	6800.0	0.00	JAN 98
RELVALVE	3400.0	0.00	JAN 11
WTBURNER	150000.0	0.00	JAN 18
PUMPSIMPLEX	3000.0	0.00	JAN 98
TANKPOLY	200.0	0.00	JAN 98
BOILMASTER	15000.0	0.00	JAN 08
DAMPACT	3000.0	0.00	JAN 08
FLAMESAFE	30000.0	0.00	JAN 08
PLANTMASTER	5000.0	0.00	JAN 08
AIRCOMPRECIP	20000.0	0.00	JAN 98
AIRDRYERREFR	12000.0	0.00	JAN 93
EMERGENCYGEN	276000.0	0.00	JAN 08
SWITCH	20000.0	0.00	JAN 18
CONDPUMP	8000.0	0.00	JAN 98
CONDREC	22000.0	0.00	JAN 08
FEEDPUMP	45750.0	0.00	JAN 08
NAGPIPEBELOW	13.0	0.00	JAN 15
OILPIPEBELOW	25.0	0.00	JAN 03
PUMP	3250.0	0.00	JAN 03
TANKBELOW	42000.0	0.00	JAN 08
SZSOFT	231000.0	0.00	JAN 12
SUMPPUMPVERT	5000.0	0.00	JAN 93

Table 4
Life Cycle Cost Summary

Initial Investment Breakdown	Costs (\$)	
Energy costs:		
Distillate oil	984,832.00	
Residual oil	148,059.00	
Natural gas	15,506,270.00	
Total energy costs	16,639,160.00	16,639,160.00
Recurring M&R/custodial costs		3,786,598.00
Major repair/replacement costs		502,230.00
Other O&M costs & monetary benefits		0.00
Disposal costs/retention value		0.00
LCC of all costs/benefits (net present worth)		20,927,990.00

Table 5
Year-by-Year Breakdown of Life Cycle Costs

Pay	Dist	Resid	Nat G	M&R	R/R	Other
1	52,772.00	7,847.00	647,997.00	246,653.00	0.00	0.00
2	50,440.00	7,521.00	619,500.00	235,806.00	0.00	0.00
3	48,267.00	7,172.00	597,166.00	225,436.00	0.00	0.00
4	46,434.00	6,887.00	579,511.00	215,522.00	121,997.00	0.00
5	45,343.00	6,739.00	583,025.00	206,044.00	0.00	0.00
6	44,565.00	6,646.00	595,981.00	196,983.00	0.00	0.00
7	43,925.00	6,573.00	614,158.00	188,320.00	0.00	0.00
8	43,475.00	6,527.00	643,188.00	180,038.00	0.00	0.00
9	43,020.00	6,482.00	663,287.00	172,121.00	2,020.00	0.00
10	42,505.00	6,420.00	670,113.00	164,552.00	0.00	0.00
11	41,962.00	6,353.00	684,487.00	157,315.00	0.00	0.00
12	41,212.00	6,249.00	692,231.00	150,397.00	0.00	0.00
13	40,309.00	6,112.00	695,234.00	143,783.00	0.00	0.00
14	39,226.00	5,940.00	687,726.00	137,460.00	216,069.00	0.00
15	38,040.00	5,746.00	670,886.00	131,415.00	0.00	0.00
16	36,731.00	5,548.00	661,863.00	125,635.00	0.00	0.00
17	35,578.00	5,375.00	645,496.00	120,110.00	1,463.00	0.00
18	34,652.00	5,235.00	628,700.00	114,828.00	95,030.00	0.00
19	34,787.00	5,104.00	612,997.00	109,778.00	0.00	0.00
20	32,863.00	4,965.00	596,240.00	104,951.00	0.00	0.00
21	31,934.00	4,824.00	579,376.00	100,335.00	5.00	0.00
22	30,900.00	4,668.00	560,614.00	95,923.00	0.00	0.00
23	29,914.00	4,519.00	542,727.00	91,704.00	0.00	0.00
24	28,974.00	4,377.00	525,674.00	87,671.00	65,646.00	0.00
25	28,005.00	4,231.00	508,096.00	83,816.00	0.00	0.00
(Totals)	984,832.00	148,059.00	15,506,273.00	3,786,598.00	502,230.00	0.00

3 SUMMARY

The Status Quo program, which is one of the economic analysis tools under development for the Army Coal Conversion Program, will apply to most installations considering changes in their thermal or electrical supply. Status Quo will help develop annual O&M budgets; estimate the replacement cost of individual plant components such as feedwater pumps, deaerator systems, or air pollution control devices; and evaluate third party financing and contract activity studies.

In addition to evaluating coal technology upgrades currently under development, the Status Quo program may also be used to evaluate thermal distribution systems, to help compare and evaluate centralized and decentralized energy supply alternatives.

Plans are to upgrade Status Quo to include weighting factors such as reliability, hazardous materials, safety, and compliance with applicable codes and governmental regulations. Such weighting factors will be used to accelerate a component's replacement time. Initial efforts have developed Status Quo for oil- and gas-fired technologies. Research continues to develop Status Quo for coal-fired energy plants.

APPENDIX A: Database File Structures

Structure for database: <basecode>DATA.DBF

Field	Field Name	Type	Width	Dec
1	SYSTEM	Character	10	
2	ITEM	Character	12	
3	SPEC1	Numeric	8	1
4	SPEC2	Numeric	8	1
5	SPEC3	Numeric	8	1
6	NUMUNITS	Numeric	6	
7	YRINSTAL	Numeric	4	
8	YRREPLACE	Numeric	4	
9	COSTREPL	Numeric	10	
10	CONDITION	Numeric	1	
11	YRDOLLARS	Numeric	4	
12	EXPLINDEX	Character	6	

** Total Bytes 82

Structure for database: <basecode>EXPL.DBF

Field	Field Name	Type	Width	Dec
1	INDEX	Character	6	
2	YREXPL	Character	70	
3	COSTEXPL	Character	70	

** Total Bytes ** 147

Structure for database: VALID.DBF

Field	Field Name	Type	Width
1	SYSTEM	Character	10
2	ITEM	Character	12
3	UNIT1	Character	12
4	UNIT2	Character	12
5	UNIT3	Character	12
6	VAL_MSPEC1	Character	40
7	VAL_MSPEC2	Character	40
8	VAL_MSPEC3	Character	40

** Total ** 179

Structure for database: DEFAULT.DBF

Field	Field Name	Type	Width	Dec
1	SYSTEM	Character	10	
2	ITEM	Character	12	
3	SPEC1	Numeric	8	1
4	SPEC2	Numeric	8	1
5	SPEC3	Numeric	8	1
6	COST	Numeric	7	
7	COSTYR	Numeric	4	
8	LIFESPAN	Numeric	2	

** Total Bytes 60

APPENDIX B: Data for DEFAULT.DBF

SYSTEM *****	ITEM *****	SPEC1 *****	SPEC2 *****	COST *****	COSTYR *****	LIFESPAN *****
APC	ASHCONV	1.0	0.0	50000	1991	25
APC	ASHCONV	5.0	0.0	85000	1991	25
APC	ASHSTOR	5.0	0.0	7000	1991	25
APC	ASHSTOR	10.0	0.0	13000	1991	25
APC	BAGHOUSE	25000.0	0.0	300000	1991	40
APC	BAGHOUSE	50000.0	0.0	500000	1991	40
APC	BAGHOUSE	75000.0	0.0	550000	1991	40
APC	BAGHOUSE	100000.0	0.0	800000	1991	40
APC	BAGHOUSE	150000.0	0.0	1000000	1991	40
APC	BREECH	3.0	0.0	550	1991	40
APC	BREECH	4.0	0.0	740	1991	40
APC	BREECH	5.0	0.0	925	1991	40
APC	BREECH	7.5	0.0	1400	1991	40
APC	BREECH	10.0	0.0	1900	1991	40
APC	COLLECTOR	25000.0	0.0	28000	1991	40
APC	COLLECTOR	50000.0	0.0	43000	1991	40
APC	COLLECTOR	75000.0	0.0	55000	1991	40
APC	COLLECTOR	100000.0	0.0	69000	1991	40
APC	COLLECTOR	150000.0	0.0	83000	1991	40
APC	OPACMONITOR	0.0	0.0	25000	1991	30
APC	PRECIP	25000.0	0.0	700000	1991	40
APC	PRECIP	50000.0	0.0	1100000	1991	40
APC	PRECIP	75000.0	0.0	1400000	1991	40
APC	PRECIP	100000.0	0.0	1600000	1991	40
APC	PRECIP	150000.0	0.0	2000000	1991	40
APC	SCRUBBER	25000.0	0.0	6800000	1991	40
APC	SCRUBBER	50000.0	0.0	10300000	1991	40
APC	SCRUBBER	75000.0	0.0	13200000	1991	40
APC	SCRUBBER	100000.0	0.0	15700000	1991	40
APC	SCRUBBER	150000.0	0.0	20000000	1991	40
APC	STACK	3.0	50.0	10000	1991	40
APC	STACK	4.0	50.0	15000	1991	40
APC	STACK	5.0	75.0	25000	1991	40
APC	STACK	6.0	100.0	40000	1991	40
APC	STACK	8.0	100.0	80000	1991	40
BOILER	AIRHEAT	20.0	0.0	25000	1991	20
BOILER	AIRHEAT	60.0	0.0	50000	1991	20
BOILER	AIRHEAT	120.0	0.0	70000	1991	20
BOILER	AIRHEAT	160.0	0.0	90000	1991	20
BOILER	AIRHEAT	200.0	0.0	100000	1991	20
BOILER	AIRPHEAT	20.0	0.0	4000	1991	20
BOILER	AIRPHEAT	60.0	0.0	7000	1991	20
BOILER	AIRPHEAT	120.0	0.0	11000	1991	20
BOILER	AIRPHEAT	160.0	0.0	13000	1991	20
BOILER	AIRPHEAT	200.0	0.0	15000	1991	20
BOILER	DRUMCTL	0.0	0.0	5000	1991	20
BOILER	ECONOMIZER	20.0	0.0	35000	1991	20
BOILER	ECONOMIZER	60.0	0.0	70000	1991	20
BOILER	ECONOMIZER	120.0	0.0	100000	1991	20
BOILER	ECONOMIZER	160.0	0.0	120000	1991	20
BOILER	ECONOMIZER	200.0	0.0	140000	1991	20
BOILER	FTBOILER	20.0	0.0	600000	1991	25
BOILER	FTBOILER	60.0	0.0	1100000	1991	25
BOILER	FTBOILER	120.0	0.0	1700000	1991	25
BOILER	FTBOILER	160.0	0.0	2000000	1991	25
BOILER	FTBOILER	200.0	0.0	2300000	1991	25

SYSTEM	ITEM	SPEC1	SPEC2	COST	COSTYR	LIFESPAN
=====	=====	=====	=====	=====	=====	=====
BOILER	FTBURNER	25.0	0.0	50000	1991	25
BOILER	FTBURNER	75.0	0.0	100000	1991	25
BOILER	FTBURNER	150.0	0.0	150000	1991	25
BOILER	FTBURNER	200.0	0.0	175000	1991	25
BOILER	FTBURNER	250.0	0.0	200000	1991	25
BOILER	FW_REG	1.5	150.0	600	1991	40
BOILER	FW_REG	1.5	300.0	800	1991	40
BOILER	FW_REG	1.5	600.0	1200	1991	40
BOILER	FW_REG	2.0	150.0	600	1991	40
BOILER	FW_REG	2.0	300.0	900	1991	40
BOILER	FW_REG	2.0	600.0	1400	1991	40
BOILER	FW_REG	2.5	150.0	800	1991	40
BOILER	FW_REG	2.5	300.0	1200	1991	40
BOILER	FW_REG	2.5	600.0	1800	1991	40
BOILER	FW_REG	3.0	150.0	900	1991	40
BOILER	FW_REG	3.0	300.0	1300	1991	40
BOILER	FW_REG	3.0	600.0	2000	1991	40
BOILER	FW_REG	4.0	150.0	1000	1991	40
BOILER	FW_REG	4.0	300.0	1500	1991	40
BOILER	FW_REG	4.0	600.0	2300	1991	40
BOILER	F_FAN	10.0	0.0	7000	1991	40
BOILER	F_FAN	50.0	0.0	20000	1991	40
BOILER	F_FAN	100.0	0.0	30000	1991	40
BOILER	F_FAN	150.0	0.0	40000	1991	40
BOILER	F_FAN	200.0	0.0	50000	1991	40
BOILER	I_FAN	10.0	0.0	7000	1991	40
BOILER	I_FAN	50.0	0.0	20000	1991	40
BOILER	I_FAN	100.0	0.0	30000	1991	40
BOILER	I_FAN	150.0	0.0	40000	1991	40
BOILER	I_FAN	200.0	0.0	50000	1991	40
BOILER	RELVALVE	1.0	600.0	1900	1991	20
BOILER	RELVALVE	1.5	150.0	1700	1991	20
BOILER	RELVALVE	1.5	300.0	1800	1991	20
BOILER	RELVALVE	1.5	600.0	2000	1991	20
BOILER	RELVALVE	2.0	100.0	1900	1991	20
BOILER	RELVALVE	2.0	150.0	2400	1991	20
BOILER	RELVALVE	2.0	300.0	2600	1991	20
BOILER	RELVALVE	2.0	600.0	2700	1991	20
BOILER	RELVALVE	2.5	150.0	2600	1991	20
BOILER	RELVALVE	2.5	300.0	2800	1991	20
BOILER	RELVALVE	2.5	600.0	3400	1991	20
BOILER	RELVALVE	3.0	150.0	3400	1991	20
BOILER	RELVALVE	3.0	300.0	3700	1991	20
BOILER	WTBOILER	60.0	0.0	1100000	1991	40
BOILER	WTBOILER	120.0	0.0	1700000	1991	40
BOILER	WTBOILER	120.0	0.0	1700000	1991	40
BOILER	WTBOILER	160.0	0.0	2000000	1991	40
BOILER	WTBOILER	200.0	0.0	2300000	1990	40
BOILER	WTBURNER	25.0	0.0	50000	1991	40
BOILER	WTBURNER	75.0	0.0	100000	1991	40
BOILER	WTBURNER	150.0	0.0	150000	1991	40
BOILER	WTBURNER	200.0	0.0	175000	1991	40
BOILER	WTBURNER	250.0	0.0	200000	1991	40
CALCULATE	APC	10.0	10.0	0	0	0
CALCULATE	BOILER	30.0	30.0	0	0	0
CALCULATE	CHEMFEED	1.0	1.0	0	0	0
CALCULATE	COMBCTRL	11.0	11.0	0	0	0
CALCULATE	COMPAIR	5.0	5.0	0	0	0
CALCULATE	CONDENSATE	2.0	2.0	0	0	0

SYSTEM *****	ITEM ****	SPEC1 *****	SPEC2 *****	COST *****	COSTYR *****	LIFESPAN *****
CALCULATE	ELECTRIC	15.0	15.0	0	0	0
CALCULATE	FEEDWATER	4.0	4.0	0	0	0
CALCULATE	FUEL	9.0	9.0	0	0	0
CALCULATE	HEATRECOV	1.0	1.0	0	0	0
CALCULATE	INDEXEQUIP	318.4	0.0	0	1986	0
CALCULATE	INDEXEQUIP	323.8	0.0	0	1987	0
CALCULATE	INDEXEQUIP	325.3	0.0	0	1985	0
CALCULATE	INDEXEQUIP	342.5	0.0	0	1988	0
CALCULATE	INDEXEQUIP	355.4	0.0	0	1989	0
CALCULATE	INDEXEQUIP	357.6	0.0	0	1990	0
CALCULATE	INDEXEQUIP	370.0	0.0	0	1991	0
CALCULATE	INDEXOM	789.6	0.0	0	1985	0
CALCULATE	INDEXOM	797.6	0.0	0	1986	0
CALCULATE	INDEXOM	813.6	0.0	0	1987	0
CALCULATE	INDEXOM	852.0	0.0	0	1988	0
CALCULATE	INDEXOM	895.1	0.0	0	1989	0
CALCULATE	INDEXOM	915.1	0.0	0	1990	0
CALCULATE	MAKEUP	2.0	2.0	0	0	0
CALCULATE	PLANT	10.0	10.0	0	0	0
CALCULATE	RATEDISC	4.7	0.0	0	0	0
CHEMFEED	PUMPDUPLEX	0.0	0.0	4000	1991	20
CHEMFEED	PUMPSIMPLEX	0.0	0.0	3000	1991	20
CHEMFEED	TANKMIXER	0.0	0.0	1000	1991	20
CHEMFEED	TANKPOLY	0.0	0.0	200	1991	20
CHEMFEED	TANKSTEEL	0.0	0.0	500	1991	20
COMBCTRL	BOILMASTER	0.0	0.0	5000	1991	30
COMBCTRL	DAMPACT	0.0	0.0	1000	1991	30
COMBCTRL	FLAMESAFE	0.0	0.0	10000	1991	30
COMBCTRL	FLOWMETER	0.0	0.0	3000	1991	30
COMBCTRL	O2TRIM	0.0	0.0	10000	1991	30
COMBCTRL	PLANTMASTER	0.0	0.0	5000	1991	30
COMBCTRL	PSIGCTRL	0.0	0.0	2500	1991	30
COMBCTRL	PSIGSENSOR	0.0	0.0	1000	1991	30
COMBCTRL	TEMPREC	0.0	0.0	3000	1991	30
COMPAIR	AIRCOMPCESTR	50.0	0.0	20000	1991	30
COMPAIR	AIRCOMPCESTR	100.0	0.0	26000	1991	30
COMPAIR	AIRCOMPCESTR	150.0	0.0	32000	1991	30
COMPAIR	AIRCOMPCESTR	200.0	0.0	39000	1991	30
COMPAIR	AIRCOMPCESTR	350.0	0.0	48000	1991	30
COMPAIR	AIRCOMPCESTR	750.0	0.0	96000	1991	30
COMPAIR	AIRCOMPCESTR	50.0	0.0	20000	1991	20
COMPAIR	AIRCOMPCESTR	100.0	0.0	26000	1991	20
COMPAIR	AIRCOMPCESTR	150.0	0.0	32000	1991	20
COMPAIR	AIRCOMPCESTR	200.0	0.0	39000	1991	20
COMPAIR	AIRCOMPCESTR	350.0	0.0	48000	1991	20
COMPAIR	AIRCOMPCESTR	750.0	0.0	96000	1991	20
COMPAIR	AIRCOMPCESTR	50.0	0.0	12000	1991	20
COMPAIR	AIRCOMPCESTR	100.0	0.0	13000	1991	20
COMPAIR	AIRCOMPCESTR	150.0	0.0	16000	1991	20
COMPAIR	AIRCOMPCESTR	200.0	0.0	18000	1991	20
COMPAIR	AIRCOMPCESTR	250.0	0.0	20000	1991	20
COMPAIR	AIRCOMPCESTR	50.0	0.0	12000	1991	15
COMPAIR	AIRCOMPCESTR	100.0	0.0	13000	1991	15
COMPAIR	AIRCOMPCESTR	150.0	0.0	16000	1991	15
COMPAIR	AIRCOMPCESTR	200.0	0.0	18000	1991	15
COMPAIR	AIRCOMPCESTR	250.0	0.0	20000	1991	15
COMPAIR	AIRREC	100.0	0.0	600	1991	30
COMPAIR	AIRREC	200.0	0.0	1100	1991	30
COMPAIR	AIRREC	400.0	0.0	1900	1991	30

SYSTEM *****	ITEM *****	SPEC1 *****	SPEC2 *****	COST *****	COSTYR *****	LIFESPAN *****
COMPAIR	AIRREC	600.0	0.0	2500	1991	30
COMPAIR	AIRREC	1000.0	0.0	3000	1991	30
CONDENSATE	DEARTHFILTER	100.0	0.0	40000	1991	20
CONDENSATE	DEARTHFILTER	400.0	0.0	90000	1991	20
CONDENSATE	DEARTHFILTER	700.0	0.0	130000	1991	20
CONDENSATE	DEARTHFILTER	1000.0	0.0	160000	1991	20
CONDENSATE	DEARTHFILTER	1200.0	0.0	175000	1991	20
CONDENSATE	NAPOLISHERS	100.0	0.0	280000	1991	20
CONDENSATE	NAPOLISHERS	400.0	0.0	650000	1991	20
CONDENSATE	NAPOLISHERS	700.0	0.0	900000	1991	20
CONDENSATE	NAPOLISHERS	1000.0	0.0	1120000	1991	20
CONDENSATE	NAPOLISHERS	1200.0	0.0	1250000	1991	20
CONDENSATE	OILREMOVAL	100.0	0.0	40000	1991	25
CONDENSATE	OILREMOVAL	400.0	0.0	90000	1991	25
CONDENSATE	OILREMOVAL	700.0	0.0	130000	1991	25
CONDENSATE	OILREMOVAL	1000.0	0.0	160000	1991	25
CONDENSATE	OILREMOVAL	1200.0	0.0	175000	1991	25
ELECTRIC	EMERGENCYGEN	100.0	0.0	35000	1991	30
ELECTRIC	EMERGENCYGEN	150.0	0.0	176000	1991	30
ELECTRIC	EMERGENCYGEN	500.0	0.0	87000	1991	30
ELECTRIC	EMERGENCYGEN	1000.0	0.0	138000	1991	30
ELECTRIC	EMERGENCYGEN	2000.0	0.0	210000	1991	30
ELECTRIC	MOTORCTRL	100.0	0.0	800	1991	40
ELECTRIC	MOTORCTRL	200.0	0.0	1400	1991	40
ELECTRIC	MOTORCTRL	500.0	0.0	2900	1991	40
ELECTRIC	MOTORCTRL	1000.0	0.0	5400	1991	40
ELECTRIC	MOTORCTRL	2000.0	0.0	12000	1991	40
ELECTRIC	MOTORSTARTER	10.0	0.0	1200	1991	40
ELECTRIC	MOTORSTARTER	25.0	0.0	1400	1991	40
ELECTRIC	MOTORSTARTER	50.0	0.0	2100	1991	40
ELECTRIC	MOTORSTARTER	100.0	0.0	3700	1991	40
ELECTRIC	MOTORSTARTER	200.0	0.0	7500	1991	40
ELECTRIC	SWITCH	10000.0	0.0	66000	1991	40
ELECTRIC	SWITCH	400.0	0.0	12000	1991	40
ELECTRIC	SWITCH	1000.0	0.0	20000	1991	40
ELECTRIC	SWITCH	2000.0	0.0	25000	1991	40
ELECTRIC	SWITCH	4000.0	0.0	38000	1991	40
ELECTRIC	TRANSFORMER	200.0	0.0	19000	1991	40
ELECTRIC	TRANSFORMER	500.0	0.0	25000	1991	40
ELECTRIC	TRANSFORMER	1000.0	0.0	32000	1991	40
ELECTRIC	TRANSFORMER	2000.0	0.0	44000	1991	40
ELECTRIC	TRANSFORMER	5000.0	0.0	80000	1991	40
ELECTRIC	TRANSPCB	200.0	0.0	25000	1991	40
ELECTRIC	TRANSPCB	500.0	0.0	30000	1991	40
ELECTRIC	TRANSPCB	1000.0	0.0	35000	1991	40
ELECTRIC	TRANSPCB	2000.0	0.0	42000	1991	40
ELECTRIC	TRANSPCB	5000.0	0.0	60000	1991	40
FEEDWATER	CIRCPUMP	10.0	0.0	14000	1991	30
FEEDWATER	CIRCPUMP	25.0	0.0	15000	1991	30
FEEDWATER	CIRCPUMP	50.0	0.0	19000	1991	30
FEEDWATER	CIRCPUMP	75.0	0.0	23000	1991	30
FEEDWATER	CIRCPUMP	100.0	0.0	24000	1991	30
FEEDWATER	CONDPUMP	1.0	0.0	3500	1991	20
FEEDWATER	CONDPUMP	3.0	0.0	4000	1991	20
FEEDWATER	CONDPUMP	5.0	0.0	4500	1991	20
FEEDWATER	CONDPUMP	10.0	0.0	5500	1991	20
FEEDWATER	CONDPUMP	20.0	0.0	7000	1991	20
FEEDWATER	CONDREC	100.0	0.0	6000	1991	30
FEEDWATER	CONDREC	500.0	0.0	14000	1991	30

SYSTEM *****	ITEM *****	SPEC1 *****	SPEC2 *****	COST *****	COSTYR *****	LIFESPAN *****
FEEDWATER	CONDREC	1000.0	0.0	22000	1991	30
FEEDWATER	CONDREC	2500.0	0.0	37000	1991	30
FEEDWATER	CONDREC	5000.0	0.0	56000	1991	30
FEEDWATER	COOLPUMP	5.0	0.0	4500	1991	20
FEEDWATER	COOLPUMP	10.0	0.0	5500	1991	20
FEEDWATER	COOLPUMP	20.0	0.0	7000	1991	20
FEEDWATER	COOLPUMP	30.0	0.0	8200	1991	20
FEEDWATER	COOLPUMP	50.0	0.0	11400	1991	20
FEEDWATER	DAIRHEATER	50000.0	0.0	25000	1991	40
FEEDWATER	DAIRHEATER	100000.0	0.0	35000	1991	40
FEEDWATER	DAIRHEATER	200000.0	0.0	55000	1991	40
FEEDWATER	DAIRHEATER	400000.0	0.0	80000	1991	40
FEEDWATER	DAIRHEATER	600000.0	0.0	100000	1991	40
FEEDWATER	EXPTANK	36.0	10.0	7000	1991	40
FEEDWATER	EXPTANK	48.0	16.0	13000	1991	40
FEEDWATER	EXPTANK	60.0	20.0	19000	1991	40
FEEDWATER	EXPTANK	72.0	30.0	30000	1991	40
FEEDWATER	EXPTANK	96.0	40.0	50000	1991	40
FEEDWATER	FEEDPUMP	10.0	0.0	14000	1991	30
FEEDWATER	FEEDPUMP	50.0	0.0	19000	1991	30
FEEDWATER	FEEDPUMP	100.0	0.0	24000	1991	30
FEEDWATER	FEEDPUMP	150.0	0.0	35000	1991	30
FEEDWATER	FEEDPUMP	200.0	0.0	37000	1991	30
FEEDWATER	FWHEATER	100.0	0.0	17000	1991	40
FEEDWATER	FWHEATER	200.0	0.0	30000	1991	40
FEEDWATER	FWHEATER	30000.0	0.0	40000	1991	25
FEEDWATER	FWHEATER	500.0	0.0	50000	1991	40
FEEDWATER	FWHEATER	500.0	0.0	50000	1991	40
FEEDWATER	FWHEATER	1000.0	0.0	79000	1991	40
FEEDWATER	FWHEATER	1200.0	0.0	85000	1991	40
FEEDWATER	FWPIPINGVAL	4.0	150.0	1100	1991	20
FEEDWATER	FWPIPINGVAL	4.0	300.0	1500	1991	20
FEEDWATER	FWPIPINGVAL	4.0	600.0	2900	1991	20
FEEDWATER	FWPIPINGVAL	6.0	150.0	1700	1991	20
FEEDWATER	FWPIPINGVAL	6.0	300.0	2500	1991	20
FEEDWATER	FWPIPINGVAL	6.0	600.0	2900	1991	20
FEEDWATER	FWPIPINGVAL	8.0	150.0	2600	1991	20
FEEDWATER	FWPIPINGVAL	8.0	300.0	3700	1991	20
FEEDWATER	FWPIPINGVAL	8.0	600.0	8200	1991	20
FEEDWATER	FWPIPINGVAL	10.0	150.0	3700	1991	20
FEEDWATER	FWPIPINGVAL	10.0	300.0	5600	1991	20
FEEDWATER	FWPIPINGVAL	10.0	600.0	12000	1991	20
FEEDWATER	FWPIPINGVAL	12.0	150.0	4800	1991	20
FEEDWATER	FWPIPINGVAL	12.0	300.0	7100	1991	20
FEEDWATER	FWPIPINGVAL	12.0	600.0	15200	1991	20
FEEDWATER	HTWPUMP	50.0	0.0	19000	1991	30
FEEDWATER	HTWPUMP	75.0	0.0	23000	1991	30
FEEDWATER	HTWPUMP	100.0	0.0	24000	1991	30
FEEDWATER	HTWPUMP	150.0	0.0	35000	1991	30
FEEDWATER	HTWPUMP	200.0	0.0	37000	1991	30
FEEDWATER	MUPUMP	1.0	0.0	3500	1991	20
FEEDWATER	MUPUMP	3.0	0.0	4000	1991	20
FEEDWATER	MUPUMP	5.0	0.0	4500	1991	20
FEEDWATER	MUPUMP	10.0	0.0	5500	1991	20
FEEDWATER	MUPUMP	20.0	0.0	7000	1991	20
FEEDWATER	SEDTANK	24.0	5.0	3000	1991	40
FEEDWATER	SEDTANK	36.0	6.0	5200	1991	40
FEEDWATER	SEDTANK	36.0	8.0	6200	1991	40
FEEDWATER	SEDTANK	42.0	10.0	8500	1991	40

SYSTEM *****	ITEM *****	SPEC1 *****	SPEC2 *****	COST *****	COSTYR *****	LIFESPAN *****
FEEDWATER	SED TANK	48.0	10.0	10000	1991	40
FEEDWATER	TREATPUMP	1.0	0.0	3500	1991	20
FEEDWATER	TREATPUMP	3.0	0.0	4000	1991	20
FEEDWATER	TREATPUMP	5.0	0.0	4500	1991	20
FEEDWATER	TREATPUMP	10.0	0.0	5500	1991	20
FEEDWATER	TREATPUMP	20.0	0.0	7000	1991	20
FEEDWATER	WATERSTOR	10000.0	0.0	25000	1991	25
FEEDWATER	WATERSTOR	20000.0	0.0	38000	1991	25
FEEDWATER	WATERSTOR	50000.0	0.0	66000	1991	25
FEEDWATER	WATERSTOR	75000.0	0.0	84000	1991	25
FEEDWATER	WATERSTOR	100000.0	0.0	100000	1991	25
FUEL	HEATER	3.0	0.0	1300	1991	30
FUEL	HEATER	6.0	0.0	1500	1991	30
FUEL	HEATER	10.0	0.0	2500	1991	30
FUEL	HEATER	20.0	0.0	4000	1991	30
FUEL	HEATER	60.0	0.0	8000	1991	30
FUEL	NAGPIPEABOVE	2.0	0.0	13	1991	50
FUEL	NAGPIPEABOVE	3.0	0.0	18	1991	50
FUEL	NAGPIPEABOVE	4.0	0.0	23	1991	50
FUEL	NAGPIPEABOVE	6.0	0.0	40	1991	50
FUEL	NAGPIPEABOVE	8.0	0.0	54	1991	50
FUEL	NAGPIPEBELOW	2.0	0.0	13	1991	25
FUEL	NAGPIPEBELOW	3.0	0.0	18	1991	25
FUEL	NAGPIPEBELOW	4.0	0.0	23	1991	25
FUEL	NAGPIPEBELOW	6.0	0.0	40	1991	25
FUEL	NAGPIPEBELOW	8.0	0.0	54	1991	25
FUEL	OILPIPEABOVE	2.0	0.0	13	1991	25
FUEL	OILPIPEABOVE	3.0	0.0	20	1991	25
FUEL	OILPIPEABOVE	4.0	0.0	23	1991	25
FUEL	OILPIPEABOVE	6.0	0.0	39	1991	25
FUEL	OILPIPEABOVE	8.0	0.0	50	1991	25
FUEL	OILPIPEBELOW	2.0	0.0	25	1991	50
FUEL	OILPIPEBELOW	3.0	0.0	36	1991	50
FUEL	OILPIPEBELOW	4.0	0.0	49	1991	50
FUEL	OILPIPEBELOW	6.0	0.0	86	1991	50
FUEL	OILPIPEBELOW	8.0	0.0	209	1991	50
FUEL	PUMP	3.0	0.0	1300	1991	25
FUEL	PUMP	6.0	0.0	1500	1991	25
FUEL	PUMP	10.0	0.0	2500	1991	25
FUEL	PUMP	20.0	0.0	4000	1991	25
FUEL	PUMP	60.0	0.0	8000	1991	25
FUEL	TANKABOVE	1000000.0	0.0	320000	1991	40
FUEL	TANKABOVE	100000.0	0.0	80000	1991	40
FUEL	TANKABOVE	200000.0	0.0	120000	1991	40
FUEL	TANKABOVE	500000.0	0.0	210000	1991	40
FUEL	TANKABOVE	800000.0	0.0	280000	1991	40
FUEL	TANKBELOW	10000.0	0.0	15000	1991	30
FUEL	TANKBELOW	20000.0	0.0	26000	1991	30
FUEL	TANKBELOW	30000.0	0.0	42000	1991	30
FUEL	TANKBELOW	40000.0	0.0	50000	1991	30
FUEL	TANKBELOW	50000.0	0.0	57000	1991	30
FUEL	UNLOADPUMP	1.0	0.0	3500	1991	20
FUEL	UNLOADPUMP	5.0	0.0	4000	1991	20
FUEL	UNLOADPUMP	20.0	0.0	7000	1991	20
FUEL	UNLOADPUMP	50.0	0.0	9400	1991	20
FUEL	UNLOADPUMP	100.0	0.0	16000	1991	20
HEATRECOV	FLASHTANK	1.0	2.0	300	1991	25
HEATRECOV	FLASHTANK	2.0	3.0	500	1991	25
HEATRECOV	FLASHTANK	3.0	4.0	1100	1991	25

SYSTEM *****	ITEM *****	SPEC1 *****	SPEC2 *****	COST *****	COSTYR *****	LIFESPAN *****
HEATRECOV	FLASHTANK	4.0	6.0	2000	1991	25
HEATRECOV	HEATEXCH	5.0	0.0	1000	1991	30
HEATRECOV	HEATEXCH	20.0	0.0	1600	1991	30
HEATRECOV	HEATEXCH	50.0	0.0	2500	1991	30
HEATRECOV	HEATEXCH	100.0	0.0	4500	1991	30
HEATRECOV	HEATEXCH	200.0	0.0	8500	1991	30
MAKEUP	CHLORINATOR	50.0	0.0	6000	1991	20
MAKEUP	CHLORINATOR	250.0	0.0	15000	1991	20
MAKEUP	CHLORINATOR	500.0	0.0	23000	1991	20
MAKEUP	CHLORINATOR	750.0	0.0	30000	1991	20
MAKEUP	CHLORINATOR	1000.0	0.0	35000	1991	20
MAKEUP	CLARIFIER	50.0	0.0	72000	1991	30
MAKEUP	CLARIFIER	250.0	0.0	150000	1991	30
MAKEUP	CLARIFIER	500.0	0.0	190000	1991	30
MAKEUP	CLARIFIER	750.0	0.0	245000	1991	30
MAKEUP	CLARIFIER	1000.0	0.0	297000	1991	30
MAKEUP	DEALKALK	50.0	0.0	70000	1991	20
MAKEUP	DEALKALK	150.0	0.0	135000	1991	20
MAKEUP	DEALKALK	300.0	0.0	205000	1991	20
MAKEUP	DEALKALK	450.0	0.0	260000	1991	20
MAKEUP	DEALKALK	600.0	0.0	310000	1991	20
MAKEUP	DEMINERAL	50.0	0.0	450000	1991	20
MAKEUP	DEMINERAL	250.0	0.0	1200000	1991	20
MAKEUP	DEMINERAL	500.0	0.0	1800000	1991	20
MAKEUP	DEMINERAL	750.0	0.0	2300000	1991	20
MAKEUP	DEMINERAL	1000.0	0.0	2700000	1991	20
MAKEUP	EVAPORATOR	50.0	0.0	10000	1991	30
MAKEUP	EVAPORATOR	250.0	0.0	30000	1991	30
MAKEUP	EVAPORATOR	500.0	0.0	55000	1991	30
MAKEUP	EVAPORATOR	750.0	0.0	70000	1991	30
MAKEUP	EVAPORATOR	1000.0	0.0	80000	1991	30
MAKEUP	FILTERCARB	50.0	0.0	10000	1991	20
MAKEUP	FILTERCARB	150.0	0.0	15000	1991	20
MAKEUP	FILTERCARB	250.0	0.0	21000	1991	20
MAKEUP	FILTERCARB	350.0	0.0	25000	1991	20
MAKEUP	FILTERCARB	500.0	0.0	31000	1991	20
MAKEUP	FILTERGRAV	50.0	0.0	25000	1991	30
MAKEUP	FILTERGRAV	500.0	0.0	60000	1991	30
MAKEUP	FILTERGRAV	1000.0	0.0	79000	1991	30
MAKEUP	FILTERGRAV	1500.0	0.0	95000	1991	30
MAKEUP	FILTERGRAV	2000.0	0.0	128000	1991	30
MAKEUP	FILTERPRESS	50.0	0.0	10000	1991	20
MAKEUP	FILTERPRESS	150.0	0.0	15000	1991	20
MAKEUP	FILTERPRESS	250.0	0.0	21000	1991	20
MAKEUP	FILTERPRESS	350.0	0.0	25000	1991	20
MAKEUP	FILTERPRESS	500.0	0.0	31000	1991	20
MAKEUP	FLOCCULATOR	50.0	0.0	7000	1991	30
MAKEUP	FLOCCULATOR	250.0	0.0	17000	1991	30
MAKEUP	FLOCCULATOR	500.0	0.0	25000	1991	30
MAKEUP	FLOCCULATOR	750.0	0.0	32000	1991	30
MAKEUP	FLOCCULATOR	1000.0	0.0	37000	1991	30
MAKEUP	FORCDEGASS	50.0	0.0	10000	1991	25
MAKEUP	FORCDEGASS	250.0	0.0	15000	1991	25
MAKEUP	FORCDEGASS	500.0	0.0	20000	1991	25
MAKEUP	FORCDEGASS	750.0	0.0	25000	1991	25
MAKEUP	FORCDEGASS	1000.0	0.0	30000	1991	25
MAKEUP	HOTPROCSOFT	50.0	0.0	190000	1991	35
MAKEUP	HOTPROCSOFT	150.0	0.0	370000	1991	35
MAKEUP	HOTPROCSOFT	300.0	0.0	560000	1991	35

SYSTEM =====	ITEM =====	SPEC1 =====	SPEC2 =====	COST =====	COSTYR =====	LIFESPAN =====
MAKEUP	HOTPROCST	450.0	0.0	810000	1991	35
MAKEUP	HOTPROCST	600.0	0.0	1030000	1991	35
MAKEUP	REVOSMOSIS	50.0	0.0	250000	1991	25
MAKEUP	REVOSMOSIS	100.0	0.0	321000	1991	25
MAKEUP	REVOSMOSIS	150.0	0.0	610000	1991	25
MAKEUP	REVOSMOSIS	200.0	0.0	725000	1991	25
MAKEUP	REVOSMOSIS	250.0	0.0	830000	1991	25
MAKEUP	SLUDGESOFT	50.0	0.0	190000	1991	30
MAKEUP	SLUDGESOFT	150.0	0.0	370000	1991	30
MAKEUP	SLUDGESOFT	300.0	0.0	560000	1991	30
MAKEUP	SLUDGESOFT	450.0	0.0	810000	1991	30
MAKEUP	SLUDGESOFT	600.0	0.0	1030000	1991	30
MAKEUP	SPLITSOFT	50.0	0.0	190000	1991	20
MAKEUP	SPLITSOFT	250.0	0.0	505000	1991	20
MAKEUP	SPLITSOFT	500.0	0.0	865000	1991	20
MAKEUP	SPLITSOFT	750.0	0.0	1180000	1991	20
MAKEUP	SPLITSOFT	1000.0	0.0	1455000	1991	20
MAKEUP	SZSOFT	50.0	0.0	70000	1991	20
MAKEUP	SZSOFT	150.0	0.0	135000	1991	20
MAKEUP	SZSOFT	300.0	0.0	205000	1991	20
MAKEUP	SZSOFT	450.0	0.0	260000	1991	20
MAKEUP	SZSOFT	600.0	0.0	310000	1991	20
MAKEUP	VACUDEGASS	50.0	0.0	30000	1991	25
MAKEUP	VACUDEGASS	250.0	0.0	45000	1991	25
MAKEUP	VACUDEGASS	500.0	0.0	60000	1991	25
MAKEUP	VACUDEGASS	750.0	0.0	60000	1991	25
MAKEUP	VACUDEGASS	750.0	0.0	75000	1991	25
MAKEUP	VACUDEGASS	1000.0	0.0	90000	1991	25
PLANT	CONCRETE	0.0	0.0	400	1991	75
PLANT	DOORS	0.0	0.0	800	1991	20
PLANT	LIGHTS	0.0	0.0	20	1991	40
PLANT	ROOF	0.0	0.0	7	1991	20
PLANT	SIDING	0.0	0.0	20	1991	20
PLANT	STEEL	0.0	0.0	3000	1991	75
PLANT	SUMPPUMPSUB	5.0	0.0	5400	1991	15
PLANT	SUMPPUMPSUB	10.0	0.0	5500	1991	15
PLANT	SUMPPUMPSUB	50.0	0.0	5600	1991	15
PLANT	SUMPPUMPVERT	5.0	0.0	4900	1991	15
PLANT	SUMPPUMPVERT	10.0	0.0	5000	1991	15
PLANT	SUMPPUMPVERT	50.0	0.0	5100	1991	15
PLANT	WINDOWS	0.0	0.0	41	1991	20

APPENDIX C: Data in VALID.DBF

SYSTEM	ITEM	UNIT1	UNIT2	VAL_MSPEC1	VAL_MSPEC2
-----	-----	-----	-----	-----	-----
APC	ASHCONV	tons/hr		mspec1 > 0	empty(mspec2)
APC	ASHSTOR	tons		mspec1 > 0	empty(mspec2)
APC	BAGHOUSE	cap(ACFM)		mspec1 > 0	empty(mspec2)
APC	BREECH	size(sq ft)		mspec1 > 0	empty(mspec2)
APC	COLLECTOR	cap(ACFM)		mspec1 > 0	empty(mspec2)
APC	OPACMONITOR			empty(mspec1)	empty(mspec2)
APC	PRECIP	cap(ACFM)		mspec1 > 0	empty(mspec2)
APC	SCRUBBER	cap(ACFM)		mspec1 > 0	empty(mspec2)
APC	STACK	diameter(ft)	height(ft)	mspec1 > 0	mspec2 > 0
BOILER	AIRHEAT	MBtu		mspec1 > 0	empty(mspec2)
BOILER	AIRPHEAT	MBtu		mspec1 > 0	empty(mspec2)
BOILER	DRUMCTL			empty(mspec1)	empty(mspec2)
BOILER	ECONOMIZER	MBtu		mspec1 > 0	empty(mspec2)
BOILER	FTBOILER	MBtu		mspec1 > 0	empty(mspec2)
BOILER	FTBURNER	MBtu		mspec1 > 0	empty(mspec2)
BOILER	FW_REG	psi		mspec1 > 0	empty(mspec2)
BOILER	F_FAN	HP		mspec1 > 0	empty(mspec2)
BOILER	I_FAN	HP		mspec1 > 0	empty(mspec2)
BOILER	RELVALVE	psi		mspec1 > 0	empty(mspec2)
BOILER	WTBOILER	MBtu		mspec1 > 0	empty(mspec2)
BOILER	WTBURNER	MBtu		mspec1 > 0	empty(mspec2)
CALCULATE	APC	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	BOILER	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	CHEMFEED	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	COMBCTRL	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	COMPAIR	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	CONDENSATE	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	ELECTRIC	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	FEEDWATER	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	FUEL	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	HEATRECOV	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	INDEXEQUIP	index		mspec1 > 0	empty(mspec2)
CALCULATE	INDEXOM	index		mspec1 > 0	empty(mspec2)
CALCULATE	MAKEUP	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	PLANT	scalars	% weight	mspec1 > 0	mspec2 > 0
CALCULATE	RATEDISC	%		mspec1 > 0	empty(mspec2)
CHEMFEED	PUMPDUPLEX			empty(mspec1)	empty(mspec2)
CHEMFEED	PUMPSIMPLEX			empty(mspec1)	empty(mspec2)
CHEMFEED	TANKMIXER			empty(mspec1)	empty(mspec2)
CHEMFEED	TANKPOLY			empty(mspec1)	empty(mspec2)
CHEMFEED	TANKSTEEL			empty(mspec1)	empty(mspec2)
COMBCTRL	BOILMASTER			empty(mspec1)	empty(mspec2)
COMBCTRL	DAMPACT			empty(mspec1)	empty(mspec2)
COMBCTRL	FLAMESAFE			empty(mspec1)	empty(mspec2)
COMBCTRL	FLOWMETER			empty(mspec1)	empty(mspec2)
COMBCTRL	O2TRIM			empty(mspec1)	empty(mspec2)
COMBCTRL	PLANTMASTER			empty(mspec1)	empty(mspec2)
COMBCTRL	PSIGCTRL			empty(mspec1)	empty(mspec2)
COMBCTRL	PSIGSENSOR			empty(mspec1)	empty(mspec2)
COMBCTRL	TEMPREC			empty(mspec1)	empty(mspec2)
COMPAIR	AIRCOMPCESTR	SCFM		mspec1 > 0	empty(mspec2)
COMPAIR	AIRCOMPRECIP	SCFM		mspec1 > 0	empty(mspec2)
COMPAIR	AIRDRYERDESC	SCFM		mspec1 > 0	empty(mspec2)
COMPAIR	AIRDRYERREFR	SCFM		mspec1 > 0	empty(mspec2)
COMPAIR	AIRREC	gal		mspec1 > 0	empty(mspec2)
CONDENSATE	DEARTHFILTER	gpm		mspec1 > 0	empty(mspec2)

SYSTEM	ITEM	UNIT1	UNIT2	VAL_MSPEC1	VAL_MSPEC2
-----	-----	-----	-----	-----	-----
CONDENSATE	NAPOLISHERS	gpm		mspec1 > 0	empty (mspec2)
CONDENSATE	OILREMOVAL	gpm		mspec1 > 0	empty (mspec2)
ELECTRIC	EMERGENCYGEN	KVA		mspec1 > 0	empty (mspec2)
ELECTRIC	MOTORCTRL	amps		mspec1 > 0	empty (mspec2)
ELECTRIC	MOTORSTARTER	HP		mspec1 > 0	empty (mspec2)
ELECTRIC	SWITCH	amps		mspec1 > 0	empty (mspec2)
ELECTRIC	TRANSFORMER	KVA		mspec1 > 0	empty (mspec2)
ELECTRIC	TRANSPCB	KVA		mspec1 > 0	empty (mspec2)
FEEDWATER	CIRCPUMP	HP		mspec1 > 0	empty (mspec2)
FEEDWATER	CONDPUMP	HP		mspec1 > 0	empty (mspec2)
FEEDWATER	CONDREC	gallons		mspec1 > 0	empty (mspec2)
FEEDWATER	COOLPUMP	HP		mspec1 > 0	empty (mspec2)
FEEDWATER	DAIRHEATER	lb/hr		mspec1 > 0	empty (mspec2)
FEEDWATER	EXPTANK	diameter(in)	length(ft)	mspec1 > 0	mspec2 >9 and mspec2 < 41
FEEDWATER	FEEDPUMP	HP		mspec1 > 0	empty (mspec2)
FEEDWATER	FWHEATER	gpm		mspec1 > 0	empty (mspec2)
FEEDWATER	FWPIPINGVAL	diameter(in)	psi	mspec1 > 0	mspec2 > 0
FEEDWATER	HTWPUMP	HP		mspec1 > 0	empty (mspec2)
FEEDWATER	MUPUMP	HP		mspec1 > 0	empty (mspec2)
FEEDWATER	SEDTANK	diameter(in)	length(ft)	mspec1 > 0	mspec2 >4 and mspec2 < 11
FEEDWATER	TREATPUMP	HP		mspec1 > 0	empty (mspec2)
FEEDWATER	WATERSTOR	gallons		mspec1 > 0	empty (mspec2)
FUEL	HEATER	gpm		mspec1 > 0	empty (mspec2)
FUEL	NAGPIPEABOVE	diameter(in)		mspec1 > 0	empty (mspec2)
FUEL	NAGPIPEBELOW	diameter(in)		mspec1 > 0	empty (mspec2)
FUEL	OILPIPEABOVE	diameter(in)		mspec1 > 0	empty (mspec2)
FUEL	OILPIPEBELOW	diameter(in)		mspec1 > 0	empty (mspec2)
FUEL	PUMP	gpm		mspec1 > 0	empty (mspec2)
FUEL	TANKABOVE	gallons		mspec1 > 0	empty (mspec2)
FUEL	TANKBELOW	gallons		mspec1 > 0	empty (mspec2)
FUEL	UNLOADPUMP	HP		mspec1 > 0	empty (mspec2)
HEATRECOV	FLASHTANK	diameter(ft)	height(ft)	mspec1 > 0	mspec2 > 0
HEATRECOV	HEATEXCH	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	CHLORINATOR	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	CLARIFIER	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	DEALKALK	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	DEMINERAL	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	EVAPORATOR	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	FILTERCARB	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	FILTERGRAV	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	FILTERPRESS	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	FLOCCULATOR	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	FORCDEGASS	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	HOTPROCSOFT	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	REVOSMOSIS	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	SLUDGESOFT	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	SPLITSOFT	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	SZSOFT	gpm		mspec1 > 0	empty (mspec2)
MAKEUP	VACUDEGASS	gpm		mspec1 > 0	empty (mspec2)
PLANT	CONCRETE			empty (mspec1)	empty (mspec2)
PLANT	DOORS			empty (mspec1)	empty (mspec2)
PLANT	LIGHTS			empty (mspec1)	empty (mspec2)
PLANT	ROOF			empty (mspec1)	empty (mspec2)
PLANT	SIDING			empty (mspec1)	empty (mspec2)
PLANT	STEEL			empty (mspec1)	empty (mspec2)
PLANT	SUMPPUMPSUB	gpm		mspec1 > 0	empty (mspec2)
PLANT	SUMPPUMPVERT	gpm		mspec1 > 0	empty (mspec2)

SYSTEM -----	ITEM -----	UNIT1 -----	UNIT2 -----	VAL_MSPEC1 -----	VAL_MSPEC2 -----
PLANT	WINDOWS			empty (mspec1)	empty (mspec2)
SYSTEM	APC				
SYSTEM	BOILER				
SYSTEM	CALCULATE				
SYSTEM	CHEMFEED				
SYSTEM	COMBCTRL				
SYSTEM	COMPAIR				
SYSTEM	CONDENSATE				
SYSTEM	ELECTRIC				
SYSTEM	FEEDWATER				
SYSTEM	FUEL				
SYSTEM	HEATRECOV				
SYSTEM	MAKEUP				
SYSTEM	PLANT				

APPENDIX D: Status Quo Program Draft User's Manual

Introduction

The Status Quo database maintains an inventory of individual parts in a central heating plant (CHP) along with their installation years, costs (in a specified year), and lifespan. The database also keeps a record of the typical annual costs for operating and maintenance. This data is used to calculate the projected cost of operating the CHP in future years (i.e., maintaining its "Status Quo"). The Status Quo program displays a main menu which enables the user to enter data about a particular base, to maintain files containing default costs and life expectancy of parts, to browse the raw data files, and to run prepared reports.

Installation

The Status Quo program is designed to run on an IBM PC or compatible with 640K of memory. The total hard drive space required is about 1.4 megabytes. For specific help with installation, see the README file on the installation disk. The programs are supplied on the disk in compressed form. Running the INSTALL program will create the necessary subdirectories on your hard disk drive and uncompress the programs. The programs are placed in two directories:

1. A user-supplied directory name that contains the Status Quo database files and programs. For example: C:\SQ. This directory may be renamed as desired.
2. A subdirectory of the above directory named SQLCCID, which contains the LCCID (pronounced "el-cid") program for life cycle costing. This subdirectory must not be renamed, or the programs will not be able to move from one directory to another.

To install the programs: Put the install disk in a floppy disk drive and select that drive. Then run the INSTALL program, for example:

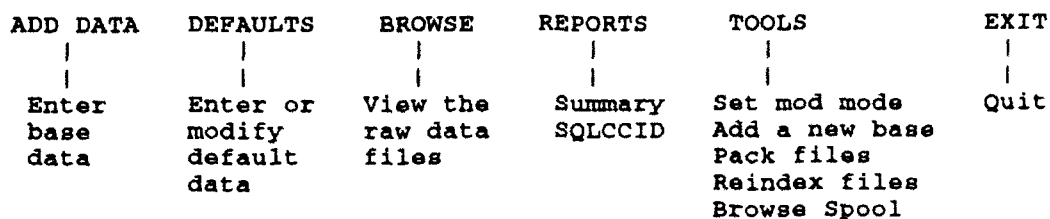
```
A:      <Enter>
INSTALL <Enter>
```

The program will prompt you to enter a drive and directory location for the files. It is not necessary to create the directory in advance because the program will do this if it does not exist. The program will also check for adequate disk space and adequate memory before starting the installation. As the program runs, it will uncompress the various files. When done, it will look for a CONFIG.SYS file on your C: drive. If the file does not exist, or if it does not contain the proper "Files=30" and "Buffers=30" statements, the program will display a message explaining what statements are necessary.

Starting the Program

Select the appropriate directory and type SQ, then <Enter>. The first screen displays the MAIN MENU at the top. Menus feature a choice of actions to be performed. Actions may be selected by pressing <ENTER> when a menu item is selected or by clicking the left mouse button once. Use the arrow keys, page up & down, or the mouse to move through the menu selections. Use the <ESC> key

to move back to the previous menu. On the first menu (the bar menu at the top of the screen), <ESC> will terminate the program. The diagram below shows the actions available from the MAIN MENU:



Adding or Modifying Records

The first time you attempt to enter the Modify Mode, you will be prompted to enter the password. (The default system password is in the README file on the Installation Disk.) Modify Mode can also be turned on or off from the TOOLS MENU. In Modify Mode, a blinking cursor appears that can be moved from field to field on the screen with the following keys: <ENTER>, <TAB>, <SHIFT-TAB>, <HOME>, and <END>. Other available keys are shown at the bottom of the screen:

- <F1> - Specific help for a data entry field. Placing the cursor on a field and pressing <F1> brings up a help screen for that field. (If no specific help has been defined for a field, general help will be displayed.) On some fields, <F1> will pop-up a menu of choices. Selecting an item and pressing <ENTER>, will place the selected value in the field.
- <F3> - Used to save the newly entered or modified data. Any changes made on the screen will not be changed in the data file until this key is pressed. (Pressing <CTRL+END> simultaneously also saves the data.) When <F3> is pressed, the program checks for the validity of the entered data.
- <F5> - Clears field entries on the screen. May be used to clear out a number of entries when you discover that you have made an error.
- <ESC> - Exits the screen and returns to the previous screen without modifying the data. Use <ESC> to exit after making errors in data entry.

Automatic Data Validation in Modify Mode

Some fields have been programmed in advance to accept only certain values. This ensures that key-stroke errors or incorrect values will not be entered at all. If a field is programmed for this feature and you make an entry error, a beep will sound and a message box will appear in the upper right corner as soon as you attempt to move out of the field. You cannot exit the field until it is corrected. (You may, however, press <ESC> to break out of Modify Mode or <F1> for help.)

Browse Menu

This feature enables you to view the actual raw data in any file. This may be useful should a question arise as to whether the data exists or is in the proper form. This feature allows you to view the raw data—not to modify it.

Reports Menu

Selecting **REPORTS** on the top bar menu will pop-up a menu of currently available reports. Each report begins with a screen that describes the purpose of the report and asks you to fill in some information such as the name of the desired data. Follow the instructions on screen to begin the report. Most reports will display on-screen messages as processing continues. (You may cancel a report in progress by pressing <ESC>.) When the report is complete, you will be prompted as to whether you wish to browse the results on the screen and/or print it. Output may be directed either to a dot matrix printer or to a laser printer with Postscript option. See **Running SQLCCID Reports** below for a discussion of how to run SQLCCID reports (p 32).

Tools Menu

This menu contains a number of utilities and useful features:

Add a Base - Used to add a set of files for a new base.
See the descriptions of datafiles below.

Pack the Datafiles - As records are deleted from the files, open spaces occur, which may slow down the general performance. Packing the files reorganizes the data and deletes unused space. Packing will not harm the data and is rarely necessary.

Reindex the Datafiles - All the files have indexes, which keep the data in order. It is possible for an index to become damaged, in which case you may not be able to locate data. Reindexing rebuilds the indexes. It will not harm the data and is rarely necessary.

Browse Print Spool - Output from most reports is placed in a file named PRINT.SPL. You can view the output from the most recent report by selecting this option. This is useful if you have run a report and exited the **REPORTS** menu, but still want to review the output.

Types of Data Files

1. Base CHP data files

There are four files for each database. Each filename begins with a "basecode" consisting of 1 to 4 characters an identifying word such as "DATA" or "EXPL" followed by a file extension such as "DBF" or "IDX". The basecode is created by the user from the Tools Menu when a new CHP is added. The basecode will usually be an abbreviation for the base name or the CHP name. In the following, the basecode is "PIC" for Picatinnny Arsenal

PICDATA.DBF	-	the main datafile
PICDATA.IDX	-	the index for the main datafile
PICEXPL.DBF	-	the explanations datafile
PICEXPL.IDX	-	the index for the explanations datafile

2. System data files

These files contain default values such as the replacement cost of inventory items and life expectancy. They also contain code to check for validity of entries made with the ADD DATA program to ensure that the user does not enter any values that are incorrect or out of the range of the default data.

DEFAULT.DBF - default data
DEFAULT.IDX - the index for the default datafile
VALID.DBF - validity checking data
VALID.IDX - the index for the valid datafile

Sample Screens

STATUS QUO DATA FILE - ADD MODE:

Enter Data for New Record:

System BOILER__

Item FTBOILER__

Spec1

000000.0 MBtu

Cost of Replacement in Year 0000 Is \$ 0000000

Default: Year 0000 Is \$ 0000000

Year Installed 0000 Year of Replacement 0000

Condition _ (G-Good, F-Fair, P-Poor)

For year of replacement other than expected, please explain:

If cost of replacement differs from default, please explain:

<F1>Help <F3>Save <F5>Clear Fields <ESC>Cancel

DEFAULT FILE - ADD MODE:

STATQUO DATABASE: DEFAULT VALUES							
System	Item	Spec1	Spec2	Spec3	Cost	Costyr	Lifespan
BOILER	FTBOILER	20.0			600000	1991	25
BOILER	FTBOILER	60.0			1100000	1991	25
BOILER	FTBOILER	120.0			1700000	1991	25
BOILER	FTBOILER	139.0			1390000	1994	25
BOILER	FTBOILER	160.0			2000000	1991	25
BOILER	FTBOILER	200.0			2300000	1991	25
BOILER	RELVALVE	1.0	600.0		1900	1991	10
BOILER	RELVALVE	1.5	150.0		1700	1991	10
BOILER	RELVALVE	1.5	300.0		1800	1991	10
BOILER	RELVALVE	1.5	600.0		2000	1991	10
BOILER	RELVALVE	2.0	150.0		2400	1991	10
BOILER	RELVALVE	2.0	100.0		1900	1991	10
BOILER	RELVALVE	2.0			2000	1991	10
BOILER	RELVALVE	3.0			2000	1991	10
BOILER	WTBOILER	60.0			1100000	1991	40
BOILER	WTBOILER	160.0			2000000	1991	40
Enter Data for New Record:							
BOILER	FTBOILER	000000.0	000000.0	000000.0	0000000	1991	25
		<F1>Help		<F3>Save		<ESC>Cancel	

Running SQLCCID Reports

This program is intended to aid the user in determining the life cycle cost of an existing U.S. Army central heating plant. It runs the Life Cycle Cost in Design (LCCID) program to determine these costs based on input entered via prompt screens and data contained in the Status Quo database. LCCID is an economic analysis computer program furnished by the U.S. Government and developed by USACERL. LCCID may be run in three ways:

1. As a standalone program by selecting the SQLCCID sub-directory and typing LCCID <Enter>.

Consult the separate LCCID User's Manual¹ for information about this usage.

2. From within Status Quo Database programs by selecting the option "Run SQLCCID" on the REPORTS MENU. Proceed with the first part of the program to create the necessary datafile then select "Run LCCID Manually" from the pop-up menu that will appear after the study data is prepared. Consult the LCCID Users Manual.

3. From within the SQLCCID program, which produces a complete report automatically. Select "Run SQLCCID" from the REPORTS MENU. Proceed with the program to create the study datafile, and select "Life Cycle Report" from the pop-up menu. When the report is complete, you will be prompted to browse and/or print the output.

Before running this program, data must first be entered into the Status Quo database. This includes the annual maintenance expenses and all one-time-cost items for the 25-year period to be examined. These Status Quo datafiles do not need to be on the same directory as the SQLCCID programs. To add data to the Status Quo database, select "ADD DATA" from the Status Quo MAIN MENU.

Instructions for SQLCCID

1. To save the data entered on any screen, press or click <F3>. To cancel the program and exit from any screen, press or click <ESC>. From any screen in the program, you can view a help screen by pressing <F1>. (While the Status Quo program is running LCCID, you may have to press <CTRL-BREAK> to terminate processing.)

2. The first screen asks for the studycode name and the name of the Status Quo database. Any name up to eight characters can be used as a studycode. The program will produce an input data file with the same name plus the extension ".LC," which contains the necessary data for LCCID to run. It will also produce a report with the studycode name and the extension ".RPT". If the studyfile already exists, the program will prompt you to reuse the existing file, or overwrite it with a new file.

¹ L.K. Lawrie, *Development and Use of the Life Cycle Cost in Design Computer Program (LCCID)*, TR E-85/07/ADA162522 (USACERL, November 1985).

```

STATUS QUO Life Cycle Costing

Enter LCC Study Code: TEST

Enter name of STATUS QUO Database: E:\SQ\SQDATA.DBF

File TEST.LC already exists

Please select an option
|Use the existing file
|Overwrite the file
|Cancel this program

```

3. The Study Dates allows input of the essential dates for the study. The exact day is not critical for LCCID since all dates are assumed to be the first of the month. The program will check for the basic validity of the dates entered. Press <F3> to continue.

```

Study Dates

Date of Study          1 /01/91
Midpoint of Construction  0 /01/92
Beneficial Date of Occupancy  0 /01/93
Economic Life (Years)    2

<F1>Help      <F3>Save      <ESC>Cancel

```

4. The Study Identification screen inputs information that will appear at the beginning of the report. These items are optional except for location and fiscal year. The location must be a valid state name or a valid two-letter abbreviation. The fiscal year must be entered as four digits, from 1990-2000. Press <F3> to continue.

```

Study Identification

Study location (state)  NEW JERSEY
Installation name       PICATINNY ARSENAL
Project number         WV9
Project title          CHP STATUS QUO
Design feature         A TEST PLANT
Name of study preparer JOHN Q. SMITH
Fiscal year            1992

<F1>Help      <F3>Save      <ESC>Cancel

```

5. The Fuel Screen prompts for the cost of fuel and usage. At least one fuel and its corresponding usage must be entered. This screen completes the data entry. When you press <F3>, the program will begin creating the .LC file using your answers and the data from the Status Quo database.

Fuel Costs and Annual Usage		
	COST	ANNUAL USAGE
Electricity	0.0000 \$/MBtu	0 MBtu
Distillate Oil	0.0000 \$/MBtu	0 MBtu
Residual Oil	3.0100 \$/MBtu	928373 MBtu
Natural Gas	0.0000 \$/MBtu	0 MBtu
Coal	0.0000 \$/MBtu	0 MBtu
Propane	0.0000 \$/MBtu	0 MBtu
<F1>Help	<F3>Save	<ESC>Cancel

6. A menu will appear allowing you to select the standard report, run LCCID manually, or cancel the program. For most purposes, the user will select the LCCID Report option. The program will run automatically. When the report is finished, you will be prompted whether you wish to browse the report. Answer Y or N. (While browsing, you can also use the mouse to move from screen to screen.) The next prompt asks if you wish to print the report followed by a menu of printer choices. (To use the laser printer, the file PS.EXE must be on the SQLCCID subdirectory or somewhere in the DOS path.)

```

- Please select an option -
Life Cycle Report
Run LCCID Manually
Cancel this program

```

You may be unable to print the report due to memory shortage. In this event, just exit the program normally. The report is now in the file <studycode>.RPT. It may be printed with one of the following commands:

Print on dot matrix printer on LPT1:

```
TYPE (studycode).RPT > LPT1 (Enter)
```

Print on laser printer on LPT3:

```
PS (studycode).RPT -s10 -dLPT3 (Enter)
```

In some instances the user may desire to run LCCID manually. This allows more adjustment and fine tuning of the additional options available through manual operation. This program will already have created the input file. After beginning LCCID, select the option to use an existing file and enter the studycode name without the .LC extension. If memory problems occur, just exit from SQLCCID and run LCCID as a separate program by typing:

```
LCCID <Enter> - Run LCCID alone
```

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