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CONCEPT-5 User's Manual

C. R. Hudson II

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C. R. Hudson II

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ABSTRACT

The CONCEPT computer code package was developed to provide conceptual capital cost estimates for nuclear-fueled and fossil-fired power plants. Cost estimates can be made as a function of plant type, size, location, and date of initial operation. The output includes a detailed breakdown of the estimate into direct and indirect costs similar to the accounting system described in document NUS-531.

Cost models are currently provided in CONCEPT 5 for single- and multiunit pressurized-water reactors, boiling-water reactors, and coal-fired plants with and without flue gas desulfurization equipment.

Keywords: capital costs, power costs, power plant economics.

1. INTRODUCTION

Three computer programs, which are referred to as the CONCEPT package, have been developed by the Engineering Technology Division of the Oak Ridge National Laboratory (ORNL). This computer package is designed to provide a rapid means of estimating future capital costs of different types of plants under various sets of economic and technical ground rules. The use of the CONCEPT code requires an understanding of trends in contributing costs factors, such as labor rates, labor productivity, and materials and equipment prices, as a function of location and time. For application in project evaluation studies, these cost factors should be based on the specific location and design and construction dates being considered. Cost estimates produced by the CONCEPT code are not intended as substitutes for detailed cost estimates for specific projects; however, the CONCEPT estimates should be useful as a rough check of the detailed estimates or for preliminary studies prior to completion of detailed estimates.

This report describes the fifth generation in the development of the CONCEPT package,^{*} which consists of three separate computer programs as

^{*}Previous work is documented in Refs. 1 to 5.

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illustrated in Fig. 1.1. At the preoperational level the CONTAC auxiliary program, described in Appendix A, is used to read cost-model data (i.e., detailed cost breakdowns for reference plants for the various types of plants from punched cards and to generate the cost-model data file, CONO, on a magnetic storage device. The CONLAM auxiliary program, described in Appendix B, is used to read historical cost data for factory equipment, labor, and site-related materials at various locations from punched cards and to generate the data file, LAMA, on a second magnetic storage device. The two auxiliary programs, CONTAC and CONLAM, are important parts of the

Fig. 1.1. CONCEPT-5 package.

total CONCEPT package and must be used to generate, update, and modify the data files. The main body of this report is devoted to the operational level CONCEPT-5 program, which retrieves cost-model data and historical cost data from the two previously prepared data files and uses them to generate cost estimates based on the ground rules specified by the user at program execution time. The major features in the evolution of the CONCEPT code are summarized in Table 1.1.

Table 1.1. Evolution of the CONCEPT code

Version	Major features
Phase 1	Experimental version, which included only a preliminary cost model for a single-unit pressurized-water reactor (PWR) plant
Phase 2	Added cost models for the first unit of PWR, boiling-water reactor (BWR), coal, and oil plants based on WASH-1230 (vols. I-IV) Added historical craft labor and materials cost data for the generation of cost indices and escalation rates
Phase 3	Updated the first-unit cost models for PWR, BWR, coal, and oil plants to account for more stringent environmental and safety regulations between 1971 and 1973 Added cost models for coal- and oil-fired plants with wet limestone scrubber SO ₂ removal systems Added cost models for gas-fired plants Added cost models for the second unit of two-unit plants
Phase 4	Added cost models for high-temperature gas-cooled reactor (HTGR) plants Modified all second-unit cost models Modified code to simplify data input for optional calculations, to accept time-dependent escalation rates, and to calculate allowances for interest during construction and escalation during construction based on cash flow curves modified for a specified receipt-of-construction-permit date
Phase 5	Updated cost models for PWR, BWR, and coal plants with and without flue gas desulfurization (FGD) and expanded cost models to include coal-fired plants with cross-compound (as well as tandem-compound) turbine generators Added historical factory equipment cost data for the generation of cost indices and escalation rates Modified indirect costs to be calculated as a function of unit size in the same manner as direct costs, rather than calculated as a function of direct costs Established an indirect cost account for owner's costs Improved time-dependent escalation feature

The three programs are written for batch processing in FORTRAN IV for the IBM 360 and 370 class of machines. Instructions for executing the programs on an IBM machine, as well as sample job control language (JCL) statements, are presented in Appendix E. Previous versions of the programs have been implemented on other computers by various users. Less than 270K (bytes) of computer core are required for any one of the three programs. Computer time required for a single cost calculation is dependent on the complexity of the case but averages only a few seconds.

The CONCEPT-5 package, including auxiliary programs and cost-model and historical cost data sets, will be available from the Argonne Code Center, Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439.

2. GENERAL DESCRIPTION OF THE CONCEPT-5 CODE

The procedures used in the CONCEPT code are based on the assumption that any central station power plant of the same type involves approximately the same major cost components, regardless of location or date of initial operation. Therefore, if the trends of these major cost components can be established as a function of time, location, and plant size, a cost estimate for a reference case can be adjusted to fit any case of interest.

The application of this approach requires a detailed cost model for each plant type at a reference condition and the determination of the cost trend relationships. The generation and updating of these data sets comprise a large effort in the continuing development of the code.

The cost model for each type of plant is based on a detailed cost estimate for a reference plant at a designated time and location. Each estimate includes a detailed breakdown of each cost account into costs for equipment, labor, and site-related materials. The cost models are stored on a magnetic storage device (the COMO data file) by the auxiliary program, CONTAC, which is described in Appendix A.

Data that reflect historical trends in equipment costs, labor rates, and prices of site-related materials for 23 locations are stored on a second magnetic storage device (the LAMA data file) by the auxiliary program, CONLAM, which is described in Appendix B. CONCEPT uses the historical equipment, labor, and materials cost data to calculate cost indices for translating the cost-model data from the base (or reference) time and location to the specified time and location.

The input to CONCEPT consists of the plant net electrical capacity, plant type, plant location, date of purchase of nuclear steam supply system (NSSS) or fossil-fired steam generator, date of receipt of construction permit, date of initial commercial operation, and interest rate. Specific constants, variables, and cost arrays, which are listed in Chap. 7 of this report, can be altered by input option. In addition, the escalation rates calculated by the code from data stored in the historical cost data file (LAMA file) can be overridden by input option. Contingency cases can be examined with a minimum of effort, and the cost-model data

can be altered temporarily at execution time to take into account known costs or factors that affect the design of the plant.

As an example of the procedures described above, suppose a cost estimate for the year 1977 is available for a 1100-MWe PWR plant located on a site near Middletown,^{*} and a cost estimate for 1986 is desired for a corresponding plant located on a similar site but near another city. The new estimate is obtained by adjusting factory and site-related costs for the Middletown plant by the ratios of the projected 1986 cost indices for the new city to the 1977 cost indices for Middletown.

The technique of separating the plant cost into individual components, applying appropriate cost indices, and summing the adjusted components is the basic tool used in CONCEPT. A schematic illustration of this technique is presented in Fig. 2.1. Three sets of cost indices as functions of

Fig. 2.1. Method used to adjust base costs in CONCEPT.

time and location are required. These indices are used to adjust the costs of equipment, labor, and site-related materials. The equipment cost indices are calculated from Bureau of Labor Statistics data, and the labor cost indices are calculated from basic parameters, which include wage

^{*} Middletown represents the standard hypothetical site described in the Commercial Electric Power Cost Studies.⁶⁻¹¹

rates for the various crafts, labor productivity, and overtime considerations. The materials cost indices are calculated from unit costs for site-related materials, which include structural steel, reinforcing steel, concrete, and lumber. A detailed breakdown of the equipment, labor, and materials categories is included in Appendix B.

Figure 2.2 indicates the general flow of calculations in CONCEPT 5. The computer code follows this procedure closely; however, the illustration is not a detailed computer program flowchart. An important feature of this arrangement is that the second block of the diagram utilizes the cost-model data stored in the CORIO file for different types of power

Fig. 2.2. General flow of calculations in CONCEPT 5.

plants, and the fourth block utilizes the historical equipment, labor, and materials cost data stored in the LAMA file for different locations. Therefore, when other types of plants or other cities are studied, only the cost-model data set for the reference plant or the historical cost data set for the new location need be provided.

Block 1 refers to the input data stream. This input is read from punched cards and, for each case, must include the net electrical capacity, plant type, plant location (one of 23 cities), and design and construction period. The code will make the following assumptions if they are not overridden by input data: (1) costs are referenced to the date of purchase of the steam supply system, (2) 40-hr workweek with no overtime, and (3) constant 8% per year simple interest for calculating interest during construction. Cases of interest may differ from these hypothetical cases, and input options have been included to allow modifications to plant cost-model data, to escalation data, and to calculated costs at the time of program execution (blocks 3, 5, and 7).

In block 2, the cost-model data for the type of plant specified by the input data are retrieved from the COMO data file. If a cost-model data set for the type of plant specified is not found, a diagnostic message will be printed, and the code will select the last plant type on the COMO file as a default.

In block 3, the user has the option to read in, at program execution time, values that replace most of the constants or factors in the cost-model data set and in the MAIN program. The unadjusted reference costs stored in the cost model data set may be modified at this point, if desired. This option is also used to specify the time period from which historical equipment, labor, and materials cost data are to be used in calculating escalation rates for cost indices. A list of the variables capable of adjustment is given in Chap. 7.

In block 4, the historical equipment, labor, and materials cost data for the specified city are retrieved from the LAMA data file, and escalation rates are calculated for use in adjusting costs to the specified location and for projecting costs to the specified dates. This calculation of escalation rates utilizes the historical data previously generated by the CONLAM auxiliary program, data from the reference plant cost model,

and data stored by the MAIN program. If the specified city is not found, a diagnostic message will be printed, and the code will select the last city on the LAMA file as a default.

In block 5, the user has the option to read in, at program execution time, values that override the equipment, labor, and materials escalation rates previously calculated in block 4. It is also possible to specify time-dependent equipment, labor, and materials escalation rates at this point. Data read in at this point continue in effect only for the current case unless retrieved as described in Chap. 7.

In block 6, the three components of each account in the plant cost model (equipment, labor, and materials at the three-, four-, or five-digit account level) are scaled to the specified plant size, escalated and adjusted to the date of purchase of the NSSS (or fossil-fired steam generator), adjusted to the specified city, and adjusted for craft-labor overtime and productivity. Component costs are scaled by using mathematical models that define each two-digit account cost in the plant cost model as a function of size. Component costs are escalated and adjusted to the specified city by cost indices calculated from the data developed in block 4 and specified in block 5. If overtime is specified, labor costs are adjusted for premium pay and for changes in productivity; the labor costs are also adjusted for changes in straight-time productivity, if specified.

In block 7, the user has the option to read in, at program execution time, values that override the adjusted equipment, labor, and materials costs at the most detailed three-, four-, or five-digit account levels which have been calculated in block 6 for the specified plant. These data changes continue in effect only for the current case.

In block 8, the adjusted three-, four-, and five-digit account costs from blocks 6 and 7 are summed to the two-digit account level.

In block 9, allowances for contingencies are calculated for each two-digit cost account as percentages of corresponding two-digit account costs.

In block 10, an allowance for escalation during construction is calculated. This step utilizes the cost indices generated in blocks 4 and 5 as well as the two-digit-level cash flow curves provided in each plant cost model.

In block 11, an allowance for interest during construction is calculated. This step utilizes a total cumulative cash flow curve and includes the effect of interest on escalation during construction.

In block 12, all costs are summed to give the total capital cost of the specified plant.

In block 13, additional cumulative cash flow information is developed for use in block 14.

In block 14, the final cost report is printed. The amount of detail is optional with the user, allowing either a one-page summary at the two-digit account level, a one page summary and a total cumulative cash flow curve and table, or a multipage detailed listing at the three-, four-, and five-digit subaccount levels and a total cumulative cash flow curve and table.

3. COST MODELS FOR REFERENCE PLANTS

Cost-model data sets are provided in CONCEPT 5 for single- and multiunit PWR and BWR nuclear plants and coal-fired plants with and without FGD equipment. Following the practice that the first unit of a multiunit plant bears the cost of shared facilities, a cost model is provided for a single-unit station, while a separate cost model describes the first of a multiunit plant. A distinction has also been made for coal-fired plants with respect to size. Large coal-fired plants (generally above 1000 MWe) may use cross-compound turbine generators, whereas the smaller plants would operate with tandem-compound turbine generators. Models for either possibility are provided. First- and second-unit models exist for all plant types, and, for the smaller reference-size coal plants, a third-unit model is provided to reflect further facility sharing. As an illustrative example, the complete data set for the first-unit PWR plant cost model is listed in Appendix A. In the previous version of the CONCEPT code, a distinction among cooling systems was made resulting in separate plant models for different cooling systems. It has been shown by United Engineers and Constructors Inc. (UE&C) that the direct and indirect capital costs of plants utilizing either once-through, natural-draft tower, or mechanical-draft tower cooling differ by less than 4%.¹¹ As this is well within the variance that should be attributed to conceptual estimates, such as made by this code, cost models depicting various cooling systems have not been included. The models herein describe plants with mechanical-draft tower cooling but may be used for any conventional cooling system. The cost-model data sets available in CONCEPT 5 are defined in Table 3.1.

The present cost models were developed using data presented in a series of investment cost studies for hypothetical plants by UE&C.⁶⁻¹¹ The hypothetical plants are assumed to be located at the Middletown site, which is described in considerable detail in the UE&C studies. This site is favorable in all respects, including an adequate supply of cooling water, low population density, satisfactory transportation facilities,

Table 3.1. Cost-model data sets available in CONCEPT-5

Cost-model name	Definition
PR1MET	Pressurized-water reactor; single unit (stand-alone plant)
PR1MET	Pressurized-water reactor; first unit of multiunit plants
PR2MET	Pressurized-water reactor; second unit
BR1MET	Boiling-water reactor; single unit (stand-alone plant)
BR1MET	Boiling-water reactor; first unit of multiunit plant
BR2MET	Boiling-water reactor; second unit
COAL1MET	Coal-fired without SO ₂ removal system; using tandem-compound turbine; single unit (stand-alone plant)
COAL1MET	Coal-fired without SO ₂ removal system; using tandem-compound turbine; first unit of multiunit plant
COAL2MET	Coal-fired without SO ₂ removal system; using tandem-compound turbine; second unit
COAL3MET	Coal-fired without SO ₂ removal system; using tandem-compound turbine; third unit
COAL1SMT	Coal-fired with SO ₂ removal system; using tandem-compound turbine; single unit (stand-alone plant)
COAL1SMT	Coal-fired with SO ₂ removal system; using tandem-compound turbine; first unit of multiunit plant
COAL2SMT	Coal-fired with SO ₂ removal system; using tandem-compound turbine; second unit
COAL3SMT	Coal-fired with SO ₂ removal system; using tandem-compound turbine; third unit
CB1G1MET	Coal-fired without SO ₂ removal system; using cross-compound turbine; single unit (stand-alone plant)
CB1G1MET	Coal-fired without SO ₂ removal system; using cross-compound turbine; first unit of multiunit plant
CB1G2MET	Coal-fired without SO ₂ removal system; using cross-compound turbine; second unit
CB1G3MET	Coal-fired with SO ₂ removal system; using cross-compound turbine; single unit (stand-alone plant)
CB1G1SMT	Coal-fired with SO ₂ removal system; using cross-compound turbine; first unit of multiunit plant
CB1G2SMT	Coal-fired with SO ₂ removal system; using cross-compound turbine; second unit

and sufficient labor supply for a 40-hr workweek. The cost estimates exclude costs for the main transformer, switchyard and transmission facility, waste disposal, and initial fuel supply.

The actual costs stored in the cost-model data sets are subdivided into equipment, labor, and site-related materials at the detailed sub-account level (three-, four-, or five-digit level) and are identified by account numbers to facilitate making modifications through the optional input data stream.

In addition to detailed reference cost data, each cost model contains scaling coefficients for each two-digit account to adjust the costs from the reference size to the size of the specific case. This is done through a classical exponential scaling relation of the form

$$\text{Factor} = a + b \left(\frac{\% \text{ new}}{\% \text{ base}} \right)^c.$$

These scaling coefficients, rounded to one significant digit, are shown in Table 3.2. It is estimated that the scaling equations are representative of capital cost trends for unit sizes in the range from 500 to

Table 3.2. Scaling coefficients for unit-size adjustments

Account	a	b	c (nuclear)	c (coal)
20	1.0	0.0	0.0	0.0
21	0.0	1.0	0.5	0.5
22	0.0	1.0	0.6	0.8
23	0.0	1.0	0.8	0.8
24	0.0	1.0	0.4	0.3
25	0.0	1.0	0.3	0.3
26	0.0	1.0	0.8	0.6
91	0.0	1.0	0.4	0.7
92	0.0	1.0	0.2	0.7
93	0.0	1.0	0.4	0.6
94	0.0	1.0	0.4	0.4

1500 MWe and may be used outside this range at the risk of greater uncertainty. As there are differences of opinion regarding appropriate values for these scaling exponents, the user can readily make changes, either permanently by modifying the cost-model data or temporarily through the optional input data stream.

The calculation of allowances for interest and escalation during construction requires a cash flow curve for each two-digit direct and indirect cost account. A set of cash flow curves is provided with each cost-model data set. Typical cash flow curves for nuclear-fueled and fossil-fired plants are illustrated in Figs. 3.1 and 3.2. These cash flow curves are assumed to be approximately the same for all similar types of power plants. The curves are normalized so that the range for both axes is from zero to one. The time zero corresponds to the date of placing the order for the steam supply system. The times 0.25 and 0.12 correspond to the date of issuance of the construction permit and start of actual construction for nuclear plants and fossil plants, respectively, and the time 1.0 corresponds to the date of initial commercial operation. These three dates -- purchase of steam supply system, issuance of construction permit (or start of onsite construction), and commercial operation -- are part of the standard input data specified by the program user. The CONCEPT-5 code remaps the cash flow curves over the specified time periods, as discussed in Chap. 5.

The cost model for each type of plant includes relative distributions of equipment, labor, and materials, which are used as weighting factors in calculating weighted-average cost indices for adjusting reference plant costs to other locations and for projecting future costs. Each cost model also includes equipment, labor, and materials rates for the reference-plant cost estimate; arrays defining the number of accounts; and tables of account headings.

Specific data in the cost-model data sets can be altered temporarily at program execution time through the optional input feature. This important feature is discussed in greater detail later in Chap. 7 and is illustrated in Chap. 8. Permanent modification of cost-model data is accomplished through use of the CONTACT auxiliary program described in Appendix A.

Fig. 3.1. Typical cumulative cash flow curves for major direct cost accounts - nuclear power plants.

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Fig. 3.2. Typical cumulative cash flow curves for major direct cost accounts - coal-fired plants.

4. COST INDEX DATA

Historical cost data for equipment, labor, and site-related materials for 20 U.S. cities, two Canadian cities, and the hypothetical Middletown site are stored in the LAMA data file by the CONLAM auxiliary program described in Appendix B. These locations are identified and illustrated on the map in Fig. 4.1. The file contains cost data for the past 15 years in six-month intervals.

The data used to generate factory equipment cost indices consist of the wholesale price index for steel mill products, SIC Code 10-13; the hourly earnings index in the electrical equipment and supplies industry, SIC Code 36; and the hourly earnings index in the steam engine and

Fig. 4.1. Cities for which historical equipment, labor, and materials cost data are stored in CONCEPT.

turbine industry, SIC Code 3511. This data is obtained from U.S. Department of Labor, Bureau of Labor Statistics publications.¹²⁻¹⁴ Unlike the labor and site-related materials data, the equipment data is the same for all cities. This is done in recognition of the limited number of possible equipment suppliers.

A white-collar wage index is also stored in the LAMA data file. It is obtained from white-collar wage escalation data presented in the Bureau of Labor Statistics publication "National Survey of Professional, Administrative, Technical, and Clerical Pay."¹⁵ Like factory equipment data, it is the same for all cities and is used to adjust all noncraft labor costs.

The craft labor cost data consist of hourly rates (including union-negotiated fringe benefits, but not including employers' contributions for social security and workmen's compensation insurance) for 16 classifications of craft labor listed in Appendix B. The materials cost data consist of market quotations for seven classifications of site-materials. The craft labor and materials data for all locations except Middletown are obtained from *Engineering News-Record*.¹⁶ The Middletown location represents a composite of Boston, New York, and Philadelphia data in equal proportions.

The cost data in the LAMA file are retrieved by the CONCEPT program and are used with data on the relative distribution of equipment, labor, and materials included in the cost model for each plant type to calculate indices for adjusting capital costs at the reference (Middletown) site to costs at any of the other 22 cities and to calculate escalation rates.

5. CONCEPT METHODOLOGY

This section is devoted to the description of the analytical methods used in the CONCEPT-5 code. The treatment is presented for the program user who wishes to modify internal and calculated coefficients using the special input options and who therefore must understand the implications of each change.

5.1 Cash Flow Curve Modifications

The shape of the cash flow curves used in the CONCEPT program is dependent upon the construction permit date. This is due to the assumption that only after the construction permit is received does the majority of work and, therefore, expenditures begin. The DELOF subroutine adjusts the reference cash flow curves to reflect the construction schedule of the specific case. To do so, the fraction of the total design and construction period that is prior to the receipt of the construction permit is determined to be

$$P = \frac{YRPER - YRSSS}{YRCOP - YRSSS}, \quad (1)$$

where YRPER is the date of the construction permit, YRSSS is the date of the steam supply order, and YRCOP is the date of commercial operation.

A reference fraction, defined by the variable PO, is either 0.25 or 0.12 for nuclear-fueled or coal-fired plants, respectively. Should P be different from PO, subroutine DELOF compresses or expands the cash flow data such that, at the construction permit date of the specific case, the fraction of total expenditures will be the same as the reference model.

Further, the cash flow curve for each two-digit-level cost account is modeled by 50 data points with equal temporal variation. The program, in adjusting for the specific design and construction schedule, maintains the level of expenditures at the steam supply order date, the construction permit date, and the commercial operation date the same. The other data points are mapped linearly to achieve a modified curve as shown in Fig. 5.1.

Fig. 5.1. Alteration of project's cash flow.

The procedure for mapping divides the reference array into two sections, one containing data before the construction permit date and the other after that date. Two straight lines with different slopes define the transformation as shown in Fig. 5.2. The units on the ordinate (L) and abscissa (I) are the subscript or index numbers of the reference cash flow array and the cash flow array for the particular case, respectively. There are $50 \times P$ elements of the array prior to and including the construction permit. The reference model assumes $50 \times P_0$ elements prior to and including the construction permit. (All of these values are rounded to an integer format.) By taking the ratio of the number of elements in the reference case to the number of elements in the specific case in each of the two sections described above and requiring the $P \times 50$ element in the new array be equated to the $P_0 \times 50$ element in the reference array, a linear equation of the form

$$L = a + bI \quad (2)$$

is generated. From this, the I th element of the adjusted array is defined by the L th element of the reference array.

Fig. 5.2. Transformation of cash flow data.

5.2 Cost Index Generation and Alteration

The ability to adjust the reference cost data to various points in time comes from an analysis of historical equipment, labor, and materials unit costs and cost indices. The LAMA file contains 15 years of cost data on which a regression analysis provides escalation rates for each two-digit account. A separate escalation rate is developed for equipment, labor, and materials within each two-digit account.

As there are several equipment items, labor types, and types of materials in the LAMA file, the CONIV subroutine establishes a weighted average unit cost for each point in time in the LAMA file for equipment, labor, and materials. For each of the three categories, a weighted average unit cost can be represented by

$$C_n = \frac{\sum_{k=1}^{k_{\max}} f_k C_{kn}}{\sum_{k=1}^{k_{\max}} f_k}, \quad (3)$$

where f_k is the weighting factor for item k of the mix and C_{kn} is the historical cost data for item k at time n . The weighting factors are stored in the cost models and represent the relative amount of item k used in construction. The weighted average data can be expressed as a function of time according to

$$C_n = C_o (1 + \epsilon)^t \quad (4)$$

Taking the logarithm of both sides, the linear equation

$$\ln C_n = \ln C_o + t \ln (1 + \epsilon) \quad (5)$$

results which is of the form $Y = a + Xb$. The values for C_n and the corresponding t are known such that a linear regression can be performed on the data to find $\ln C_o$ and $\ln (1 + \epsilon)$. The average unit cost at the cost-model reference date and the rate of escalation ($1 + \epsilon$) are obtained by taking the exponent of $\ln C_o$ and $\ln (1 + \epsilon)$, respectively.

An additional feature of CONCEPT allows a combination of cities to be used in establishing a composite site. The above regression procedure is then performed for each city selected. The resulting escalation and the average unit cost at the reference date are combinations of data from each city weighted by proportions (summing to one) specified by the user.

Once the rates of escalation are determined for the categories of equipment, labor, and materials in the various two-digit accounts, the design and construction period is divided into 50 elements, each representing a particular point in time. Using Eq. (4), cost indices for equipment, labor, and materials in each two-digit account are assigned to the 50 elements. The cost indices are used by the code to adjust the reference costs to the steam supply order date and to determine escalation during construction, as described later.

Many times it is useful to modify the cost indices and/or rate of escalation at various points during or before the design and construction period. This is accomplished through the use of time-dependent escalation input data. The INDUSE subroutine reads this data and manipulates the

cost indices. As will be further explained in Chap. 7, should the cost index at a particular point in time (A) and the rate of escalation at a particular point in time (B) both be zero for a portion of the time-dependent escalation data input, then no changes will be made to that portion of the cost index array.

Changes in the cost indices representing a given design and construction period can be made using input data corresponding to dates prior to the steam supply order date. This is useful when the design and construction period is well into the future and cost index input data on hand is current. When time-dependent escalation data are input with an effective date prior to the steam supply order date, the INDUSE subroutine adjusts the input data to represent data at the steam supply order date. For example, if A and B are both nonzero, the adjustment is of the form

$$A_{sss} = A_{IN} \times B_{IN}^{YR_{SSS}-YR_{IN}} \quad (6)$$

where sss and IN represent the steam supply date and the input values, respectively. An initial set of cost indices is present when the program enters INDUSE, and, if A or B should be zero, the initial A and B values will be used. If the input for A is nonzero and the input for B is zero, then the equation is

$$A_{sss} = A_{IN} \times B_{OLD}^{YR_{SSS}-YR_{IN}} \quad (7)$$

where OLD represents the initial A and B values. If the input for A is zero and B is nonzero, the expression

$$A_{sss} = A_{OLD} \times (B_{IN}/B_{OLD})^{YR_{SSS}-YR_{IN}} \quad (8)$$

discounts back in time at the old rate of escalation and escalates forward in time at the new rate. Once all the input data are for dates during the design and construction period, a substitution process is used to construct a modified array of cost indices.

The escalation rate (B) will be the same for all 50 time periods unless specifically changed with time-dependent escalation input data. Likewise, a change in B holds until additional data, if any, are entered to change it again.

As part of the output produced by the program, the adjusted cost indices and escalation rates are listed. In view of the characteristics of B as explained in the previous paragraph, only the data at the steam supply order date are printed when there are no time-dependent escalation input data or when the effective date of such data is on or before the steam supply order date. If the effective date is after the steam supply order date, then the entire array is printed.

5.3 Adjustments to the Reference Costs

At the heart of the CONCEPT method are the adjustments to the base or reference costs to reflect a specific plant estimate. The goal is to take a reference plant cost estimate at reference conditions, to modify the estimate to reflect the specific characteristics of a particular case, and to express the estimate in dollars current to the steam supply order date. The cost data for the particular plant type selected from the COMO file are adjusted for size, time, location, overtime, productivity, and overhead burden, as shown in Eq. (9). These adjustments will be discussed in the order in which the COST subroutine considers them.

$$\text{Adjusted cost} = \frac{\text{reference cost}}{f_1 f_2} f_3 f_4 f_5 f_6 \quad (9)$$

The CONCEPT code uses 40 hr as a reference workweek. Should overtime be utilized, two factors influence the costs. First is an overtime efficiency relationship shown in Fig. 5.3. This represents the effects of sustained overtime on the efficiency or productivity of craft labor and can be expressed mathematically as

$$f_1 = 1 - \eta(\text{HRS} - 40) \quad (10)$$

Fig. 5.3. Effects of sustained overtime on productivity of site labor.

where f_1 is an overtime efficiency factor, ϵ is the incremental efficiency loss, and HRS is the number of hours in the workweek. The second cost influence is that of the overtime wage premium, which is assumed to be double time for craft labor and time and one-half for white collar workers. These assumptions can be altered temporarily through the NAMELIST feature or permanently by modification of the MAIN program if desired. The wage premium can be expressed mathematically as a weighted average wage rate factor or

$$f_2 = [40 + \text{OTP}(\text{HRS} - 40)]/\text{HRS} , \quad (11)$$

where OTP is the overtime wage premium.

The productivity of craft labor is difficult to define and, in practice, varies significantly, not only country-wide, but within a single

locale, depending on factors such as the general economy, project management, labor relations, job conditions, availability of equipment, and weather conditions. No attempt was made to include productivity factors for the normal 40-hr workweek, either as a function of location or as a function of time. However, an equation of the form

$$f_3 = a + b(YRSSS - YBC) \quad (12)$$

is included in the program, where YRSSS is the steam supply order date and YBC is the year of the reference costs. Coefficients a and b have default values of 1 and 0, respectively, in the program but can be modified by the user through the NAMELIST feature.

In many instances a contractor will apply a percentage to the direct labor costs to cover overhead burden such as insurance, taxes, and other labor-related costs of a general nature. Although the current cost models stored in the COMO file explicitly account for such overhead, provisions are in the CONCEPT program to adjust the reference labor costs by a factor expressed as

$$f_4 = (1 + COS)/(1 + COB) \quad (13)$$

where COS is the decimal amount of overhead burden in the specific case and COB is the decimal amount of overhead burden in the reference model. Because overhead burden is explicitly considered in the CONCEPT-5 cost models, COS and COB have zero as their default values.

Adjusting the reference costs for time and location utilizes the function subprogram CLAB. Essentially, CLAB returns the ratio of the cost index for a specific location and time (as developed by the CONIV subroutine discussed in Sect. 5.2) to the reference cost index stored in the cost model (representing a reference time and location). To adjust for a specific site at the steam supply order date, the reference costs are multiplied by

$$f_5 = \frac{A_{LOC,NSSS}}{A_{BASE,YBC}} \quad (14)$$

where $A_{LOC,NSSS}$ represents the cost index at the specific location and at the steam supply order date and $A_{BASE,YBC}$ represents the cost index at the reference location (Middletown) and at the reference date (1976.5).

The reference model must also be adjusted for size. This is done through a classical exponential scaling relation of the form

$$f_s = a + b \left(\frac{MWe_{new}}{MWe_{base}} \right)^c \quad (15)$$

Each two-digit account has its own scaling coefficients (a, b, and c) stored in the cost models.

All of the factors discussed above are developed and applied to the reference costs in the COST subroutine.

5.4 Escalation During Construction

Escalation during construction is calculated in the COST subroutine utilizing the cost indices for the design and construction period generated earlier. Taking the ratio of the cost index at a certain point in time to the index at the steam supply order date produces the change in cost over that interval. By use of the altered cash flow data discussed in Sect. 5.1, an escalation factor can be generated as

$$\text{factor} = \sum_{t=2}^{50} \frac{A_t}{A_{SSS}} (CF_t - CF_{t-1}) \quad (16)$$

where A_t represents the cost index at time t, A_{SSS} represents the cost index at the steam supply order date, and CF_t represents the normalized cumulative cash expenditure up to and including time t.

The utility of this procedure can better be seen by observing that this factor is multiplied by total costs that are expressed in dollars current to the steam supply order date, or

$$\text{escalated costs} = D \sum_{t=2}^{50} \frac{A_t}{A_{SSS}} (CF_t - CF_{t-1}) \quad (17)$$

where D is the total unescalated cost in the year of the steam supply order date.

As explained in Chap. 7, the CONCEPT code produces a cost estimate with escalation during construction either broken out as a separate line item or included implicitly in the direct and indirect costs. Either way, the escalation is calculated in the manner described above.

5.5 Interest During Construction

As mentioned earlier, the design and construction period is divided into 50 elements. Associated with each element is a point in time and a cumulative expenditure to date. This cumulative expenditure is developed in the MAIN program using the total costs from the SUM subroutine, the cash flow data from the cost models, and, when escalation is present, the cost indices from the COST subroutine. When escalation is present, the cumulative costs to date during the design and construction period are derived from the equation

$$\text{escalated cumulative costs to date} = D \sum_{t=2}^T \frac{A_t}{A_{SSS}} (CF_t - CF_{t-1}), \quad (18)$$

which is very similar to Eq. (17) except that the summation goes to T where T varies from 2 to 50. The cumulative cash flow in the first element ($T = 1$) is zero corresponding to time zero. When escalation is not considered, cumulative costs are derived from the more simple equation,

$$\text{unescalated cumulative costs to date} = D \sum_{t=2}^T (CF_t - CF_{t-1}), \quad (19)$$

where D is the total unescalated cost.

When escalation is broken out as a separate line item, interest due solely to escalation is calculated separately from interest on direct and indirect costs. To do so requires a cumulative cost of escalation to date which is obtained by subtracting each element of Eq. (19) from the corresponding element of Eq. (18).

Regardless of whether the interest is being calculated on the escalated costs [Eq. (18)], the unescalated costs [Eq. (19)], or the escalation itself [Eq. (18) - Eq. (19)], subroutine DELIN uses whichever cumulative cash flow array is provided to calculate the interest during construction. In addition to the cumulative expenditure to date, the subroutine is given the interest rate, the date associated with each expenditure element, and an indication whether the interest is to be simple or compound.

Subroutine DELIN first ensures that if compound interest has been specified the interest rate is on an annual basis. This must be done because the frequency of compounding for the 50-element cost array is generally more than once per year. Interest during construction is then calculated using either a simple or compound method as follows:

$$\text{Interest} = \sum_{i=1}^{50} \left\{ \begin{array}{l} \text{cash expended up to and including period } i \\ + \text{ interest charges to date (if compounding)} \\ \cdot (\text{interest rate}) \cdot (\text{length of period } i) \end{array} \right\} \quad (20)$$

5.6 Multunit Cost Summation

As multiunit plants may have different design and construction schedules, the dates associated with each 50-element cash flow array will differ, as will the time interval between elements. To obtain the total plant cash flow, a means for summing cash flows having dissimilar schedules must be provided. The ADYR subroutine does this by establishing an all-inclusive time line starting with the earliest steam supply order date and ending with the latest commercial operation date. Such a time line is shown as the lower line in Fig. 5.4. The upper line reflects the schedule of a specific unit. At each element (date) of the overall time line, subroutine ADYR checks the unit line in an effort to have two elements of the unit line straddle a single element of the overall line. As shown in Fig. 5.4, elements 24 and 25 of the unit line straddle element 17 of the overall time line. When this occurs, a linear interpolation of the unit cash expenditures for those two elements provides the

Fig. 5.4. Time lines for cash flow additions.

cash expenditure at the time associated with the element on the overall time line.

Any previous overall time line and cash flow (resulting from previous units already calculated) must also be scanned in the same manner as the unit line to fit it to the new overall line. Summing the costs of the new unit and the previous total at each element (date) of the new total cash flow array provides the total plant cash flow.

6. DESCRIPTION OF CONCEPT-5 MAIN PROGRAM AND SUBPROGRAMS

A brief description of the functions of the CONCEPT-5 MAIN program and subprograms is presented here. The auxiliary programs, CONTAC and CONLAM, are described in Appendices A and B, respectively.

All programs and subprograms that make up the CONCEPT-5 package are written in FORTRAN IV for the IBM 360 and 370 class of computers. The CONCEPT-5 program consists of a MAIN program and 15 subprograms and requires about 240K of computer core for execution. Primary input data are read from punched cards, support data are read from direct access devices (COMO and LAMA), and the output report is listed by the system printer. Listings of the CONCEPT-5 MAIN program and subprograms are included in Appendix C, and several examples of output listings are included in Appendix D. A first-call sequence of the subprograms is illustrated in Fig. 6.1. This figure is intended only to indicate subprogram interactions and should not be considered a program flowchart. For simplicity, some of the calls to minor subprograms are not shown in the following individual flowcharts. The MAIN program and all subprograms are described in the following paragraphs.

6.1 MAIN Program

The MAIN program exercises control over all logical flows and decisions concerning the input data, calculations, and output. The first step in executing a case is concerned with data input; the MAIN program utilizes three on-line direct access devices to manipulate, pass, and save input data used throughout the calculations. The flowchart for MAIN is shown in Fig. 6.2. The upper portion of the diagram is concerned with manipulating standard and nonstandard input data, and the lower portion indicates the logic required for escalation options, multiple-unit plants, and output control.

Fig. 6.1. First-call sequence of CONCEPT-5 subprograms.

6.2 Subprograms

The CONCEPT approach is extremely general and easily extends to include other types of power plants or any large construction project. The result of this philosophy is that all subprograms are applicable to the most generalized calculations. Estimates for any type of project can be produced by adding a new cost-model data set to the COMO file, and any city can be studied by adding historical equipment, labor, and materials cost data to the LAMA file.

6.2.1 SCAN

The subprogram SCAN scans the COMO and LAMA data files at the start of a job and provides the user with a listing of the available cost models and site locations. This listing is included in Appendix D. The flow diagram for SCAN is shown in Fig. 6.3.

Fig. 6.3. Subprogram SCAN.

6.2.2 COST

The subprogram COST alters the reference plant costs as described in Sects. 5.3 and 5.4, controls logic associated with nonstandard input, and keeps track of the cost accounting structure. This subprogram exercises control over all cost index projections, escalation calculations, and cost summations. The flow diagram for COST is shown in Fig. 6.4.

6.2.3 MODLAM

The subprogram MODLAM is called by subprogram COST and retrieves the cost-model data set for the specified plant type from the COMO file. It initiates adjustments to the reference cash flow data to reflect the specific design and construction schedule. It also checks for the specified location in the LAMA file and determines the date of the latest entry in that file. The flow diagram for MODLAM is shown in Fig. 6.5.

6.2.4 DELOF

The subprogram DELOF is called by subprogram MODLAM and maps the specified plant type reference cash flow curves (shown previously in Fig. 3.1) into those specified by the user's design and construction dates.

6.2.5 CONIV

The subprogram CONIV calculates the escalation coefficients. CONIV is called by subprogram COST when regression analysis of historical equipment, labor, and materials cost data is required. The regression analysis can be specified to calculate weighted-average escalation rates for a multilocal environment. Up to 20 locations can be combined with independent weighting factors for each location. The selection and weighting of locations is accomplished by reading in data through the NAMELIST option. Weighting coefficients for the individual equipment, labor, and materials types are stored as part of each cost model. The raw cost data are selected from the LAMA file for the time period, YFIRST to YLAST, as specified by the user. The CONIV subprogram generates a separate escalation rate for equipment, labor, and material for each two-digit-level cost account. The time-dependent escalation arrays are

Fig. 6.5. Subprogram MODLAM.

developed after returning to the calling subprogram COST. The flow diagram for CONIV is shown in Fig. 6.6.

6.2.6 FITS

The subprogram FITS is called by subprogram CONIV and performs a linear least-squares fit on the logarithmic data set generated by CONIV. The A and B coefficients are returned for each two-digit account and specified location.

6.2.7 INDUSE

The subprogram INDUSE is called by subprogram COST and is a data input routine designed to read the coefficients and dates specified by the user for changes to the time-dependent escalation arrays. This routine reads data card input and stores it on an on-line direct access device for subsequent cases. The flow diagram for INDUSE is shown in Fig. 6.7.

6.2.8 CLAB

The function subprogram CLAB is called by subprogram COST and is used to calculate cost indices for adjusting base plant costs to the specified site and time and for escalating costs to the year of commercial operation. The coefficients necessary to evaluate the cost indices are either calculated in CONIV or are input via INDUSE.

6.2.9 SUM

The subprogram SUM is called by subprogram COST and sums all the detailed direct and indirect costs, which have been calculated in COST, to the two-digit level. These costs are in terms of the specified plant type, size, location, and date. SUM also calculates direct labor manhours and allowances for contingencies.

6.2.10 DELIN

The subprogram DELIN evaluates the cost of interest during construction.

Fig. 6.6. Subprogram CONIV.

Fig. 6.7. Subprogram INDUSE.

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6.2.11 OUTPUT

The subprogram OUTPUT always gives a one-page summary of the cost estimate for the specified plant. Two-digit-account direct and indirect costs are listed, along with contingency, escalation (when applicable), interest, and the total plant capital investment. The two-digit-account direct costs are also broken down into equipment, labor, and materials components.

If a full report is requested, the three-, four-, and five-digit account costs are printed on subsequent pages, following a format similar to that presented in NUS-531.¹⁷ These costs are also broken down into equipment, labor, and materials components. The flow diagram for OUTPUT is shown in Fig. 6.8. Examples of output listings are included in Appendix D.

6.2.12 HEADS

The subprogram HEADS is called by subprogram OUTPUT to generate headings for the summary page of the output listing.

6.2.13 TAILS

The subprogram TAILS is called by subprogram OUTPUT to generate headings for the detailed output listings.

6.2.14 PLOT

The subprogram PLOT uses the system printer to plot the cumulative expenditures from date of purchase of steam supply system to date of commercial operation. The output consists of a one-page graphical representation of cash flow during this period. The original PLOT subprogram was obtained from the IBM Corporation¹⁸ and was modified to meet the needs of CONCEPT.

6.2.15 ADYR

The subprogram ADYR sums the individual-unit cumulative cash flow curves for a multiple-unit plant. The cash flow curves are adjusted to the earliest date of purchase of steam supply system and to the latest date of commercial operation.

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Fig. 6.8. Subprogram OUTPUT.

7. DATA INPUT

Preceding the first data card of any case, any number of comment cards can be included by placing a "C" in column 1 of each card. The program will print these comments at the top of the first output page if space is available or on a separate page if more than a few lines of comments are read in.

Coding forms are illustrated on example problems in Chap. 8.

7.1 Standard Input Data

The first card contains the standard input data for a case and the optional output and nonstandard input flags. Any number of cases can be processed in one run, subject to time and output limitations. The entries on this card are the following:

Column	Variable name	Description
1-4	MWE	The net capacity of the desired unit in MWe, right justified in the field. Format I4
6-13	TYPE	Type of power plant (see Table 3.1), left justified in the field. Format A8
15-30	CITY	The city where the plant is to be located (see Fig. 4.1), left justified in the field. Characters are stored in LOC(1) and LOC(2). Format 2A8
32-39	IDENT	Any alphanumeric data. Characters are stored in LOC(3). Format A8
41-47	YRSSS	Date steam supply system is purchased. Format F7.3
48-54	YRPER	Date construction permit is issued. Format F7.3
55-61	YRCOP	Date of initial commercial operation. Format F7.3
62-66	RIB	Average annual interest rate for interest during construction (in percent). If not input, 8%/year will be used. Format F5.3
68	ILAZ	Flag for saving and retrieving optional NAMELIST input data for use in subsequent cases (IFLAG>0): 0 - NAMELIST input data are neither saved nor retrieved 1 - Save NAMELIST input data for use in subsequent cases

Column	Variable name	Description
		2 - Retrieve NAMELIST input data that have been saved in a previous case
		3 - Retrieve NAMELIST input data that have been saved in a previous case and read additional NAMELIST input data
70	IFLAG	Flag for reading optional NAMELIST input data: 0 - No NAMELIST input 1 - Permits changing YFIRST and YLAST prior to the analysis of historical equipment, labor, and materials cost data and permits overriding certain data stored in the cost models and in the MAIN program prior to the detailed cost calculations 2 - Permits overriding calculated direct and indirect costs after adjustment for size, time, location, and escalation to date of purchase of steam supply system 3 - Two NAMELIST calls. The first is identical to IFLAG=1, and the second is identical to IFLAG=2
72	IOF	Flag for optional output: 0 - Two-digit-level summary output only 1 - Two-digit-level summary output with cumulative cash flow plot and table 2 - Complete cost breakdown with cumulative cash flow plot and table
74	IESC	Flag for escalation during construction: 0 - All cost accounts are escalated from date of reference case to date of purchase of steam supply system, and escalation during construction is shown as a separate lump-sum item 1 - All cost accounts include implicitly both escalation from date of reference case to date of purchase of steam supply system and escalation during construction 2 - All cost accounts are escalated from date of reference case to date of purchase of steam supply system, with no allowance for escalation during construction
76	IBS	Flag to specify time-dependent escalation data: 0 - No input data are expected

Column	Variable name	Description
		1 - Input data are expected and will be saved for subsequent cases
		2 - Retrieve data used when IBS was 1
78	IAC	Flag to specify type of interest: 0 - Simple interest 1 - Compound interest
80	ISTACK	Flag to specify total number of units for a multiple-unit plant: 1 - Single-unit plant >1 - Total number of units for a multiple-unit plant. The total number of units must be entered on the standard input data card for the first unit only blank - Entry for second, third, fourth units, etc., for a multiple-unit plant

Each subsequent unit for a multiple-unit plant must be provided with a standard input data card similar to the card for the first unit, except that column 80 must be blank. The standard input data for a second unit, or subsequent units, can be identical to the data for the first unit, or it can be different in size, construction dates, interest rate, and even location. Multiunit plants should be of the same type (e.g., COAL1SMT, COAL2SMT, COAL3SMT) to prevent incorrect addition of costs for the total plant.

7.2 Nonstandard Input Data

Specific data stored in the cost-model data sets and the MAIN program and certain calculated costs can be changed at program execution time for one case or for a series of cases by setting the flags, IFLAG and ILAZ, on the standard input data card. These changes are effective for the current case only unless indicated by the ILAZ variable. The NAMELIST cards have

the following form:

Card	Column	Description
2	2-8	&CONOPT- This identifies the following as a NAMELIST named CONOPT that contains optional data
2	10-80	Data changes start with this card in column 10; data items are separated by commas. The form of the data may be (1) variable name = constant, where the variable name may be a subscripted array name or a single variable name; (2) array name = set of constants (separated by commas). The array name is not subscripted. The number of constants must be less than or equal to the number of elements in the array. Successive occurrences of the same constant can be represented in the form k*constant. The last data entry is followed by a comma
3 or more	2-80	If required, columns 2-80 of additional cards can be used with each data item separated by commas
Last	2-5	&END must be the last card for each set of NAMELIST data

Lists and descriptions of the variables and arrays that can be changed by the NAMELIST input option for the various values of IFLAG follow. Examples of the use of this option and the save-and-retrieve option (ILAZ>0) are presented in Chap. 8 on example problems. The following variables may be changed when IFLAG=1 and in the first NAMELIST call when IFLAG=3:

Variable name	Description
AA(I,J)	Scaling coefficients for adjusting the direct and indirect costs as a function of size according to the relation $a + b (MW_1/MW_0)^c$ for each two-digit account. The first dimension, I, varies from 1 to 3 representing a, b, and c, respectively. The second dimension, J, defines the two-digit account such that J=1,11 for accounts 20 through 94
AMAN	The direct labor manhours per kilowatt for the specific case being run
APC(I)	Initial productivity of labor at input location at the reference year of the cost model [coefficient a in Eq. (12)], for each two-digit direct and indirect cost account such that I=1,11 for accounts 20-94

Variable name	Description
BPC(I)	Change in productivity of site labor at input location per unit of time [coefficient b in Eq. (12)], for each two-digit direct and indirect cost account such that I=1,11 for accounts 20-94
CFCA(I,J)	Cash flow data for each two-digit direct and indirect cost account (I=2,12) in each of the 50 time periods between the steam supply date and commercial operation date (J=1,50). The values when I=1 are the fraction of the design and construction period
COB(I)	Contractor's overhead burden factor for each two-digit direct and indirect cost account in the base model (COB) and the specific case (COS). I=1,11 for accounts 20-94.
COS(I)	
CONTL(I)	Contingency percentage for labor, materials, and equipment, respectively, for each two-digit direct and indirect cost account. I=1,11 for accounts 20-94
CONTM(I)	
CONTE(I)	
D(I,J)	Array containing lowest-digit-account direct and indirect costs divided into equipment, labor, and materials components (I=1,3) for a given account (J=1,380) in the base plant cost model
DEOT(I)	Coefficient γ in Eq. (10) for calculating the overall efficiency of an overtime workweek for each two-digit direct and indirect cost account. I=1,11 for accounts 20-94
FACS1(I,J)	Weighting factors for labor, materials, and equipment, respectively, for each two-digit direct and indirect cost account. I=1,11 for accounts 20-94. The second dimension, J, correlates a weighting factor to a specific labor, materials, or equipment index in the CONIAM file
FACS2(I,J)	
FACS3(I,J)	
FILS(J)	Weighting factors for combining up to 20 specified locations in a composite site (J=1,20) $\sum_{J=1}^{20} \text{FILS}(J) \text{ must equal } 1$
HWI(J)	The number of hours worked per week for each two-digit direct and indirect cost account (J=1,11) for accounts 20-94, or, alternatively, the number of hours worked per week in all the accounts
HW	
ISITE(J)	Array for site combinations up to J=20. If nonzero, the ISITE value indicates site (or city) number (see Fig. 4.1) used in conjunction with weighting factor, FILS. For example, sites 12 and 16 might be combined by setting ISITE=12,16 and FILS=0.4,0.6 for 40 and 60% weighting of the respective sites

Variable name	Description
OTP(I)	Overtime premium paid to labor (multiplier of straight-time rate) for time worked in excess of 40-hr workweek for each two-digit direct and indirect cost account (I=1,11) for accounts 20-94
OVERS(I)	Overall efficiency of a nonstandard workweek for each two-digit direct and indirect cost account (I=1,11) for accounts 20-94. Use of this variable overrides the calculations in Eq. (10)
RINT(J)	Interest rate expressed as a decimal number for each of the fifty time periods between the steam supply date and commercial operation date (J=1,50)
YFIRST	The first date to be considered in performing a linear regression on the historical equipment, labor, and materials file
YLAST	The last date to be considered in performing a linear regression on the historical equipment, labor, and materials file

The following variables may be changed when IFLAG=1,2, or 3 (either NAMELIST call)

Variable name	Description
CONTL(I)	Contingency percentage for labor, materials, and factory equipment, respectively, for each two-digit direct and indirect cost account (I=1,11) for accounts 20-94
CONTM(I)	
CONTE(I)	
D(I,J)	Lowest-digit account direct and indirect costs divided into equipment, labor, and materials (I=1,3) for a given account (J=1,350). When IFLAG=1 and in the first NAMELIST call when IFLAG=3, the costs in the D array represent the reference cost model. When IFLAG=2 or in the second NAMELIST call when IFLAG=3, the costs in the D array are the costs adjusted for size and location and expressed in dollars current to the steam supply date
RINT(J)	Interest rate expressed as a decimal number for each of the 50 time periods between the steam supply date and commercial operation date (J=1,50)

7.3 Time-dependent Escalation Data

Time-dependent escalation input can be used to alter the escalation rates and cost indices for equipment, labor, and materials. To do so requires a set of six input cards which follows after the standard input and NAMELIST cards (when used). Figure 7.1 shows the form of the six cards. The first two are for factory equipment direct and indirect cost accounts, respectively. Labor and materials are treated in the same fashion. The "A" field in each of the two-digit accounts represents a cost index at a given point in time. The "B" field represents the escalation rate in the $(1 + \cdot)$ form at a given point in time. If fields are left blank on the data cards, the current escalation coefficients in these fields will not be altered. The last field on the sixth card is for a date written in decimal notation. This is the "effective" date for the data being input. These data may be during or before the design and construction period.

Additional sets of six cards may be used in a sequential fashion with different dates in chronological order to change escalation parameters with time. However, following the last set a card with -1. in the last field must be input. This is true even if there is only one set of six cards being input.

As described in Sect. 7.1, the time-dependent escalation data input may be saved for subsequent cases.

Examples of this feature are given in Chap. 8.

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8. EXAMPLE PROBLEMS

This section illustrates the preparation of input data for the CONCEPT-5 program. Eight examples are presented which are designed to help clarify previous discussion concerning the various options, the use of the NAMELIST input feature, and the input of time-dependent escalation data. Input data for all examples are shown in Fig. 8.1, and complete output listings for problems 3, 6, and 7 are included in Appendix D.

Example problems 1 and 2 are simple cases of single- and multiunit plants. The IOF output variable is set to produce a two-digit-level summary only.

Example problem 3 illustrates the use of the NAMELIST feature for a single-unit plant. As determined by the value of IFLAG, the direct labor manhours per kilowatt and the cost of the site land will be set to the values in the NAMELIST prior to the detailed cost calculations. The output option has been set to produce a two-digit-level summary and a cash flow plot and table.

Example problem 4 is a three-unit coal plant using NAMELIST to modify the starting date for the LAMA file linear regression analysis. For the second and third units, ILAZ=2 to retrieve NAMELIST data used for the first unit, ISTACK is left blank signifying the multiunit case.

Example problem 5 is a single-unit illustration of the time-dependent escalation data input option. Variable IBS is set to 1, which causes the escalation data cards to be read and saved internally, should a subsequent case need the same escalation input. The "effective" date for data input is allowed to be earlier than the steam supply order date. The effect of the time-dependent escalation data is to cause escalation of equipment and materials to occur at a rate of 6% per year and escalation of labor at 8% per year starting in 1977.

Example problem 6 demonstrates the time-dependent escalation data input feature for multiunit plants. By setting IBS=2 for the second unit, the data input for the first unit is retrieved and applied to the second unit. The escalation option variable, IESC, has been set such that the escalation during construction is expressed implicitly within the direct

DATA SHEET[illegible]

Fig. 8.1. Data input for example problems.

[illegible][illegible]

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ZONE		PLANT TYPE	CITY	EXTRA IDENTIFICATION	YEAR \$15 PURCHASED	YEAR CONSTRUCTION PERMIT	YEAR COMMERCIAL OPERATION	% INTEREST RATE	FLAG OPTIONS											
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
C	EXAMPLE	PROBLEM	ATLANTA	EXAMPLE	1978.50	1982.50	1988.50	9.50%												
1/00	PWRIMET	ATLANTA		EXAMPLE	1978.50	1982.50	1988.50	9.50%												
1/00	PWRZMET	ATLANTA		EXAMPLE	1978.50	1982.50	1988.50	9.50%												

TIME-DEPENDENT ESCALATION COEFFICIENTS															YEAR	
ACCT. 20 01		ACCT. 21 02		ACCT. 22 03		ACCT. 23 04		ACCT. 24		ACCT. 25		ACCT. 26				
A	B	A	B	A	B	A	B	A	B	A	B	A	B			
EQUIPMENT																
LABOR	0.85	0.85	1.085	1.085	1.085	1.085	1.085	1.085	1.085	1.085	1.085	1.085	1.085			
MAINTENANCE																1978.5
EQUIPMENT																
LABOR																
MAINTENANCE																

Fig. 8.1. (continued)

and indirect costs. Only the labor component is to be adjusted through the escalation data input. However, the number of cards in the input sequence must remain the same. Also, the time-dependent escalation input cards must follow the standard input data card for the first unit (i.e., the standard input data card for the second unit will be the final card in the input stream).

Example problem 7 makes use of both the NAMELIST and time-dependent escalation input features. The NAMELIST option variables have been set to call the NAMELIST input only after the costs have undergone size, time, and location adjustment (IFLAG=2). As contingency factors represent the NAMELIST input, this is perfectly acceptable. Again the effective date for escalation input data is before the steam supply order date.

Example problem 8 combines the NAMELIST and time-dependent escalation data input features in determining the capital cost of a three-unit coal-fired plant. The IFLAG variable is set to 3 so that there will be two NAMELIST calls; one before the detailed cost adjustments and one after. Because the interest is not calculated until the reference costs have been adjusted for size, time, and location, modifying RINT at the second NAMELIST call is acceptable. The time-dependent escalation data consist of two sets, one effective at 1978.5 and the second at 1982.5. This causes the escalation rates to change in 1982.5. The -1. card occurs only after all the sets are input. The NAMELIST and escalation data are used in the second and third units through the retrieval features of the IIAZ and IBS variables.

Appendix A
CONTAC AUXILIARY PROGRAM

CONTAC AUXILIARY PROGRAM

Auxiliary program CONTAC is used to maintain the reference plant cost-model data file, COMO, by converting a card image cost-model data set to a single unformatted binary record. Each record is 50,148 bytes in length and contains all data relating to the cost model for a power plant type at some base location and base time. The CONTAC program can be used to create new records, update existing records, delete unwanted records, and list records that are on the updated file. Written in FORTRAN IV, CONTAC has approximately the same machine requirements as the CONCEPT program. CONTACT consists of only a main program, which exercises control over the option list. The data are entered on punched cards and are listed on the system printer.

Each set of data consists of about 800 cards, depending on the model. These cost-model data sets are defined as logical unit 4 (FT04F001) in the program and are read in sequentially. Each cost model has a control card which specifies the numerical position of the record on the file and a command instruction for the program. This control card is such that a new record may be added by specifying the number of the record preceding the one to be added and the letter A. A record may be changed, deleted, or listed by specifying the desired record number and C, D, or L, respectively, on the control card.

In addition to the control card for each model, there is an overall control card read from logical unit 5 (FT05F001) that instructs the program whether a completely new file is being built or whether an unformatted binary file already exists which is to be modified. A value of zero indicates the absence of an existing binary cost model file. A nonzero value indicates the existence of such a file. A new unformatted cost-model file is created on logical unit 9 (FT09F001) for each computer run regardless of the operations performed during that run.

After all records have been read in and an unformatted binary file created, an output table is listed showing the new cost-model file record sequence with the appropriate plant type.

A description of the input cards is tabulated below, followed by a FORTRAN listing of the program and a listing of the cost model for a PWR

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plant. The CONTAC program uses a local subroutine to obtain the date of the run in A8 format. CALL JDAY(DATE) is found at CONT1210 and initializes the variable DATE to the current date. A modification to reflect the specific local computer environment may have to be made to assign DATE the date-of-run.

CONTAC program input card description

No. of cards in each type	Column	Variable name	Description
CONTAC control card read from unit FT05F001			
1	1	ITAPE	Input file control. Format I1 0 -- No existing binary file 1 -- Existing unformatted binary file
Each CONTAC cost model card deck read from unit FT04F001 is assembled as follows:			
1	1-2	IREC	Cost model record number on binary file. Format I2
	3	DOREC	Record control. Format A1 'A' Add (Use IREC number of plant preceding one to be added) 'C' Change } Use IREC number of specific model 'D' Delete } of interest 'L' List }
1	1-16	TYPE1(I)	Plant type and date of origin (I=1,2). Format 2A8
	17-23	BWE	Plant capacity, MWe. Format F7.0
	24-30	YBC	Year of reference case costs. Format F7.2
	31-34	PO	Fraction of time expended up to date of construc- tion permit. Format F4.2
1	1-80	TITLE	Comment card. Format 20A4
1	1-4	NAA	Number of cards to read for AA array. Format I4
	5-8	NIAR4	Number of cards to read for IAR4 array. Format I4
	9-12	NIAR5	Number of cards to read for IAR5 array. Format I4
	13-16	NCCD	Number of cards to read for D array. Format I4

CONTAC program input card description (continued)

No. of cards in each type	Column	Variable name	Description
	17-20	IAC2	Number of cards to read for AC2 array. Format I4
	21-24	IAC3	Number of cards to read for AC3 array. Format I4
	25-28	IAC4	Number of cards to read for AC4 array. Format I4
	29-32	IAC5	Number of cards to read for AC5 array. Format I4
1	1-3	IAR1	Number of one-digit accounts. Format I3
1	1-3 4-6 7-9 10-12 13-15	IAR2(I2)	Number of two-digit accounts in each one-digit account (I2=1,5). Format 5I3
1	1-3 . . . 43-45	IAR3(I3)	Number of three-digit accounts in each two-digit account (I3=1,15). Format 15I3
NIAR4	1-3 . . . 58-60	IAR4(I4)	Number of four-digit accounts in each three-digit account (I4=1,20*NIAR4). Format 20I3
	73-80	IA4D(I)	Identification field. Format A8. (I=1, NIAR4)
NIAR5	1-3 . . . 58-60	IAR5(I5)	Number of five-digit accounts in each four-digit account (I5=1,20*NIAR5). Format 20I4

CONTAC program input card description (continued)

No. of cards in each type	Column	Variable name	Description
1	73-80	IA5D(I)	Identification field. Format A8. (I=1,NIAR5)
	1-8	Plant Type	Used only for plant identification on this card
	12-16	NHT	Total craft labor in thousands of man-hours for direct cost accounts for reference plant. Format 15
	17-20	MHP(I)	Craft labor in thousands of man-hours for each direct cost account (I=1,7). Format 714
	. . . 41-44		
1	1-7	COB(I)	Contractor's overhead burden factor for craft labor in each two-digit account (I=1,11) for accounts 20-94. Format 11F7.3
	. . . 71-77		
	1-7	AEB(I)	Coefficient used for reference factory equipment rate in each two-digit account (I=1,11). Format 11F7.3
1	. . . 71-77		
	1-7	ALB(I)	Coefficient used for base craft wage rate in each two-digit account (I=1,11). Format 11F7.3
	. . . 71-77		

CONTAC program input card description (continued)

No. of cards in each type	Column	Variable name	Description
1	1-7 . . . 71-77	AMB(I)	Coefficient used for reference site-related materials rate for each two-digit account (I=1,11). Format 11F7.3
11	1-15 16-30 31-45 65-66 73-80	AA(J,I) NAC(I) AAD(I)	Size-scaling coefficients for two-digit accounts (J=1,3, and I=1,NAA). Format 3F15.0 Two-digit account number (I=1,11). Format 12 Identification field (I=1,11). Format A8
NCCD	1-15 16-30 31-45 64-71 73-80	D(J,I) IDD(I) IDN(I)	Array containing costs at lowest-level accounts (J=1,3 and I=1,NCCD). Format 3F15.4 Account number (I=1,NCCD). Format A8 Card identification field (I=1,NCCD). Format A8
50	1-6 7-12 . . 67-72	CFCA(J,I)	Array containing cash flow curves for each two-digit cost account (J=1,12 and I=1,50). Format 12F6.3
16	1-6 . . . 61-66	FACSl(J,I)	Weighting factors for site labor (J=1,11 and I=1,16). Format 11F6.2

CONTAC program input card description (continued)

No. of cards in each type	Column	Variable name	Description
16	1-6 . . 61-66	FACS2(J,I)	Weighting factors for site material (J=1,11 and I=1,16). Format 11F6.2
8	1-6 . . 61-66	FACS3(J,I)	Weighting factors for factory equipment (J=1,11 and I=1,8). Format 11F6.2
IAC2	1-64	AC2(J,I)	Alphabetic description of two-digit accounts (J=1,8 and I=1,IAC2). Format 8A8
IAC3	1-64	AC3(J,I)	Alphabetic description of three-digit accounts (J=1,8 and I=1,IAC3). Format 8A8
IAC4	1-64	AC4(J,I)	Alphabetic description of four-digit accounts (J=1,8 and I=1,IAC4). Format 8A8
IAC5	1-64	AC5(J,I)	Alphabetic description of five-digit accounts (J=1,8 and I=1,IAC5). Format 8A8


```

1'X,11', 'WCAB', 'D WU', 'WDER', '1H', '122', '(1H,') /
DATA P213 /
1' (1H', 'P10', '5,2', 'X, 7', 'P0.3', '10', '5,AB', '1)
DATA P222 /
1' (3X', '7', 'P6.1', '3X', '2AB', '7X', 'AB)
DATA P73/
1' (9H', 'TOTA', 'L', '6X', '6(I2', '8X', '1)
DATA P73/
1'1(I2', '2(I2', '3(I2', '4(I2', '5(I2', '6(I2', '7(I2' /
DATA PACLAB /
1'BUILDING', 'LABOR'
1'HEAVY LA', 'BOR
1'BRICKLAY', 'ERS
1'CARPENTE', 'RS
1'STRUCT.', 'IRON
1'PLASTER', 'RS
1'ELECT. W', 'ORKERS
1'STEAM PI', 'TTERS
1'OPER. EN', 'GERS.
1'SH. TRAC', 'OP.
1'LG. TRAC', 'OP.
1'CRANE OP', 'ERS.
1'AIR COMP', 'OPERS.
1'TRUCK CR', 'IVERS
1'BOILER W', 'AKERS
1'OTHER CR', 'APTS
DATA PACMAT /
1'CHANNELS',
1'I BEARS',
1'W PLARGE', 'S
1'RE-BARS',
1'REDIRIX', 'CONCPETE'
1'PLYFORM',
1'LUMBER',
1'LAND',
1'UNASSIGN', 'ED
1'UNASSIGN', 'ED
1'UNASSIGN', 'ED
1'UNASSIGN', 'ED
1'UNASSIGN', 'ED
1'UNASSIGN', 'ED
1'UNASSIGN', 'ED
1'UNASSIGN', 'ED /
DATA PACQOP /
1'NOT ASSI', 'GNABLE
1'STEEL RI', 'LL PROD
1'ELEC EQP', 'T & SUP
1'STH ENG', '6 TORS
1'WHITE-CO', 'LLAR
1'UNASSIGN', 'ED
1'UNASSIGN', 'ED
1'UNASSIGN', 'ED /
C      INPT = 5
C      IF READING COST MODELS FROM CARDS BEHIND DECK OR STEPLIB, USE INPT
C      OTHERWISE READ INPUT FROM INPT = 4 FOR INDIRECT DATA SOURCES.
C      INPT = 4
C      IOUT = 6
C      CALL IDAY (DATE)
C      USE LOCAL ROUTINE OR READ DATE IN ON NEXT CARD
C      READ(5,500) ITAPE,DATE
C
C      ITAPE=0 - NO EXISTING INPUT FILE
C      1 - EXISTING INPUT FILE
C
C      READ(5,500) ITAPE
C      IF (ITAPE.NE.0) REWIND 8

```

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CONT 640
CONT 650
CONT 660
CONT 670
CONT 680
CONT 690
CONT 700
CONT 710
CONT 720
CONT 730
CONT 740
CONT 750
CONT 760
CONT 770
CONT 780
CONT 790
CONT 800
CONT 810
CONT 820
CONT 830
CONT 840
CONT 850
CONT 860
CONT 870
CONT 880
CONT 890
CONT 900
CONT 910
CONT 920
CONT 930
CONT 940
CONT 950
CONT 960
CONT 970
CONT 980
CONT 990
CONT1000
CONT1010
CONT1020
CONT1030
CONT1040
CONT1050
CONT1060
CONT1070
CONT1080
CONT1090
CONT1100
CONT1110
CONT1120
CONT1130
CONT1140
CONT1150
CONT1160
CONT1170
CONT1180
CONT1190
CONT1200
CONT1210
CONT1220
CONT1230
CONT1240
CONT1250
CONT1260
CONT1270
CONT1280
CONT1290

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```

      REWIND 9
      DOREC = 0
      IPLAG = 0
      8 READ(INPT,501,END=100) IREC,DOREC
      IF (ITAPE.EQ.0) GO TO 10
      10 IF (IPLAG.EQ.1) GO TO 12
      READ(8,END=110)
      1 TYPE1, IDB, TITLE, YBC, DUE, AA, IAR1, IAR2, IAR3,
      1 IAR4, IAR5, CPCA, PACS1, PACS2, PACS3, AEB,
      1 AEB, ALB, D, AC2, AC3, AC4, AC5, PO, COB,
      1 HNT, HNP, NAA, NIAR4, NIAR5, WCCD, WAC, IAC2,
      1 IAC3, IAC4, IAC5
      DOREC = DOREC + 1
      IPLAG = 1
      12 IF (IREC.NE.DOREC) GO TO 10
      IF (DOREC.EQ.ALIST) GO TO 60
      IF (DOREC.EQ.ADD) GO TO 67
      IF (DOREC.NE.CHANGE.AND.DOREC.NE.DELETE) GO TO 10
      DOREC = DOREC - 1
      IPLAG = 0
      IF (DOREC.EQ.CHANGE) GO TO 10
      GO TO 8
      14 RECTAB(DOREC) = TYPE1(1)
      IPLAG = 3
      WRITE(9)
      1 TYPE1, IDB, TITLE, YBC, DUE, AA, IAR1, IAR2, IAR3,
      1 IAR4, IAR5, CPCA, PACS1, PACS2, PACS3, AEB,
      1 AEB, ALB, D, AC2, AC3, AC4, AC5, PO, COB,
      1 HNT, HNP, NAA, NIAR4, NIAR5, WCCD, WAC, IAC2,
      1 IAC3, IAC4, IAC5
      GO TO 10
      17 IPLAG=0
      18 CONTINUE
      IAP1 = 0
      DO 2 I = 1, 180
      IF (I.LE.5) IAR2(I) = 0
      IF (I.LE.15) IAR3(I) = 0
      IF (I.LE.60) IAR4(I) = 0
      2 IAR5(I) = 0
      DO 4 I = 1,50
      DO 4 J=,12
      4 CPCA(J,I) = 0.0
      READ(INPT,502) TYPE1,DUE,YBC,PO,TITLE
      WRITE(ICUT,504) TYPE1,DATE,TITLE
      WRITE(IOUT,506) TYPE1,DUE,YBC,IREC,DOREC
      C NAA = NUMBER OF CARDS IN THE AA ARRAY
      C NIAR4 = NUMBER OF CARDS IN THE IAR4 ARRAY
      C NIAR5 = NUMBER OF CARDS IN THE IAR5 ARRAY
      C WCCD = NUMBER OF CARDS IN THE D ARRAY
      C IAC2 = NUMBER OF CARDS IN AC2 ARRAY
      C IAC3 = NUMBER OF CARDS IN AC3 ARRAY
      C IAC4 = NUMBER OF CARDS IN AC4 ARRAY
      C IAC5 = NUMBER OF CARDS IN AC5 ARRAY
      READ(INPT,512) NAA,NIAR4,NIAR5,WCCD,IAC2,IAC3,IAC4,IAC5
      READ(INPT,518) IAR1
      READ(INPT,518) (IAR2(I), I=1,5)
      NUN = IAR2(1)
      NUN1 = NAA + 1
      READ(INPT,518) (IAR3(I), I=1,15)
      L = 0
      DO 20 I = 1,NIAR4
      K = L + 1
      L = K + 19
      READ(INPT,520) (IAR4(J),J=K,L), IAR4(I)
      20 CONTINUE
      L = 0

```

```

CONT1300
CONT1310
CONT1320
CONT1330
CONT1340
CONT1350
CONT1360
CONT1370
CONT1380
CONT1390
CONT1400
CONT1410
CONT1420
CONT1430
CONT1440
CONT1450
CONT1460
CONT1470
CONT1480
CONT1490
CONT1500
CONT1510
CONT1520
CONT1530
CONT1540
CONT1550
CONT1560
CONT1570
CONT1580
CONT1590
CONT1600
CONT1610
CONT1620
CONT1630
CONT1640
CONT1650
CONT1660
CONT1670
CONT1680
CONT1690
CONT1700
CONT1710
CONT1720
CONT1730
CONT1740
CONT1750
CONT1760
CONT1770
CONT1780
CONT1790
CONT1800
CONT1810
CONT1820
CONT1830
CONT1840
CONT1850
CONT1860
CONT1870
CONT1880
CONT1890
CONT1900
CONT1910
CONT1920
CONT1930
CONT1940
CONT1950

```

```

DO 22 I = 1, NIAPS
K = L + 1
L = K + 19
PEAD(IPT,520) (IAR5(J), J=K,L), IASD(I)
22 CONTINUE
READ(IPT,500) HNT, (HNP(I), I=1, NUM)
READ(IPT,510) (COB(I), I=1, NAA)
READ(IPT,510) (ARB(I), I=1, NAA)
READ(IPT,510) (ALB(I), I=1, NAA)
READ(IPT,510) (ANB(I), I=1, NAA)
DO 26 I = 1, NAA
READ(IPT,520) (AA(J,I), J=1,3), WAC(I), AAB(I)
26 CONTINUE
WRITE(IOUT,526) NAA, NIAR4, NIAPS, WCCD, IAC2, IAC3, IAC4, IAC5
WRITE(IOUT,532) BWE
DO 30 I = 1, NAA
WRITE(IOUT,534) (AA(J,I), J=1,3), WAC(I), AAB(I)
30 CONTINUE
P73(5) = N73(NUM)
WRITE(IOUT,536)
WRITE(IOUT,538)
WRITE(IOUT,538) (WAC(I), I=1, NUM)
WRITE(IOUT,540) HNT, (HNP(I), I=1, NUM)
WRITE(IOUT,542)
WRITE(IOUT,538)
P760(3) = N760(NAA)
WRITE(IOUT,5760) (WAC(I), I=1, NAA)
WRITE(IOUT,544) (ARB(I), I=1, NAA), AR
WRITE(IOUT,544) (ALB(I), I=1, NAA), AL
WRITE(IOUT,544) (ANB(I), I=1, NAA), AN
WRITE(IOUT,543)
WRITE(IOUT,538)
WRITE(IOUT,5760) (WAC(I), I=1, NAA)
WRITE(IOUT,545) (COB(I), I=1, NAA)
WRITE(IOUT,504) TYPE1, DATE, TITLE
WRITE(IOUT,546) IAR1, IAD1
WRITE(IOUT,548) (IAR2(I), I=1,5), IAD2
WRITE(IOUT,550) (IAR3(I), I=1,15), IAD3
WRITE(IOUT,552)
L = 0
DO 32 I = 1, NIAR4
K = L + 1
L = K + 19
WRITE(IOUT,554) (IAR4(J), J=K,L), IARD(I)
32 CONTINUE
WRITE(IOUT,556)
L = 0
DO 34 I = 1, NIAR5
K = L + 1
L = K + 19
WRITE(IOUT,554) (IAR5(J), J=K,L), IASD(I)
34 CONTINUE
N22 = 0
N32 = 0
N42 = 0
WRITE(IOUT,558) IAR1
WRITE(IOUT,568)
DO 40 I1 = 1, IAR1
WRITE(IOUT,560) IAR2(I1)
WRITE(IOUT,568)
N2 = IAR2(I1)
IF (N2.EQ.0) GO TO 40
N21 = N22 + 1
N22 = N21 + N2 - 1
DO 38 I2 = N21, N22
WRITE(IOUT,562) IAR3(I2)

```

```

CONT1960
CONT1970
CONT1980
CONT1990
CONT2000
CONT2010
CONT2020
CONT2030
CONT2040
CONT2050
CONT2060
CONT2070
CONT2080
CONT2090
CONT2100
CONT2110
CONT2120
CONT2130
CONT2140
CONT2150
CONT2160
CONT2170
CONT2180
CONT2190
CONT2200
CONT2210
CONT2220
CONT2230
CONT2240
CONT2250
CONT2260
CONT2270
CONT2280
CONT2290
CONT2300
CONT2310
CONT2320
CONT2330
CONT2340
CONT2350
CONT2360
CONT2370
CONT2380
CONT2390
CONT2400
CONT2410
CONT2420
CONT2430
CONT2440
CONT2450
CONT2460
CONT2470
CONT2480
CONT2490
CONT2500
CONT2510
CONT2520
CONT2530
CONT2540
CONT2550
CONT2560
CONT2570
CONT2580
CONT2590
CONT2600
CONT2610

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WRITE(IOUT,564)
N1 = IAP3(I2)
IF (N1.EQ.0) GO TO 32
N31 = N32 + 1
N32 = N31 + N3 - 1
DO 34 I3 = N31, N32
WRITE(IOUT,564; IAP3(I3))
WRITE(IOUT,564)
N4 = IAP4(I3)
IF (N4.EQ.0) GO TO 36
N41 = N42 + 1
N42 = N41 + N4 - 1
WRITE(IOUT,566) (IAP5(I4), I4=N41, N42)
WRITE(IOUT,568)
WRITE(IOUT,570)
36 CONTINUE
38 CONTINUE
40 CONTINUE
WRITE(IOUT,572)
N = 51
DO 46 I = 1, NCCD
READ(INPT,574) (D(J,I), J=1,3), IDD(I), IDN(I)
IF (N.LE.50) GO TO 48
WRITE(IOUT,584) TYPE1, DATE, TITLE
WRITE(IOUT,576)
N = 1
44 WRITE(IOUT,578) (D(J,I), J=1,3), IDD(I), IDN(I)
N = N + 1
46 CONTINUE
WRITE(IOUT,580) TYPE1, DATE, TITLE
WRITE(IOUT,580) DO
PMT3(6) = N760(NAA)
WRITE(IOUT, PMT3) (NAC(I), I=1, NAA)
P213(4) = MULT3(NAA)
DO 48 I = 1, 50
READ(INPT,582) (CPCA(J,I), J=1, NUN1), DUM2
WRITE(IOUT, P213) (CPCA(J,I), J=1, NUN1), DUM2
48 CONTINUE
WRITE(IOUT,584) TYPE1, DATE, TITLE
PMT2(13) = MULT2(NAA)
WRITE(IOUT, PMT2) (NAC(I), I=1, NAA)
P222(2) = MULT2(NAA)
DO 50 I = 1, 16
READ(INPT,586) (PACS1(J,I), J=1, NAA), DUM3
WRITE(IOUT, P222) (PACS1(J,I), J=1, NAA), (PAC1AP(J,I), J=1, 2), DUM3
50 CONTINUE
PMT3(13) = MULT3(NAA)
WRITE(IOUT, PMT3) (NAC(I), I=1, NAA)
DO 52 I = 1, 16
READ(INPT,588) (PACS2(J,I), J=1, NAA), DUM3
WRITE(IOUT, P222) (PACS2(J,I), J=1, NAA), (PAC2AT(J,I), J=1, 2), DUM3
52 CONTINUE
PMT4(12) = MULT3(NAA)
WRITE(IOUT, PMT4) (NAC(I), I=1, NAA)
DO 53 I = 1, 8
READ(INPT,584) (PACS3(J,I), J=1, NAA), DUM3
WRITE(IOUT, P222) (PACS3(J,I), J=1, NAA), (PAC3QP(J,I), J=1, 2), DUM3
53 CONTINUE
WRITE(IOUT,584) TYPE1, DATE, TITLE
WRITE(IOUT,586)
DO 54 I = 1, IAC2
READ(INPT,588) (AC2(J,I), J=1, 8), DUM1, DUM2
WRITE(IOUT,590) (AC2(J,I), J=1, 8), DUM1, DUM2
54 CONTINUE
N = 51
DO 58 I = 1, IAC3

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CONT2620
CONT2630
CONT2640
CONT2650
CONT2660
CONT2670
CONT2680
CONT2690
CONT2700
CONT2710
CONT2720
CONT2730
CONT2740
CONT2750
CONT2760
CONT2770
CONT2780
CONT2790
CONT2800
CONT2810
CONT2820
CONT2830
CONT2840
CONT2850
CONT2860
CONT2870
CONT2880
CONT2890
CONT2900
CONT2910
CONT2920
CONT2930
CONT2940
CONT2950
CONT2960
CONT2970
CONT2980
CONT2990
CONT3000
CONT3010
CONT3020
CONT3030
CONT3040
CONT3050
CONT3060
CONT3070
CONT3080
CONT3090
CONT3100
CONT3110
CONT3120
CONT3130
CONT3140
CONT3150
CONT3160
CONT3170
CONT3180
CONT3190
CONT3200
CONT3210
CONT3220
CONT3230
CONT3240
CONT3250
CONT3260
CONT3270

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IF (N.LE.50) GO TO 56
WRITE(ICUT,504) TYPE1, DATE, TITLE
WRITE(ICUT,592)
N = 1
56 READ(INPT,588) (AC3(J,I),J=1,8), DUM1, DUM2
WRITE(IOUT,590) (AC3(J,I),J=1,9), DUM1, DUM2
N = N + 1
58 CONTINUE
N = 51
DO 62 I = 1,IAC4
IF (N.LE.50) GO TO 60
WRITE(ICUT,504) TYPE1, DATE, TITLE
WRITE(ICUT,594)
N = 1
50 READ(INPT,588) (AC4(J,I),J=1,8), DUM1, DUM2
WRITE(IOUT,590) (AC4(J,I),J=1,9), DUM1, DUM2
N = N + 1
62 CONTINUE
N = 51
DO 66 I = 1,IAC5
IF (N.LE.50) GO TO 64
WRITE(IOUT,504) TYPE1, DATE, TITLE
WRITE(ICUT,596)
N = 1
64 READ(INPT,588) (AC5(J,I),J=1,8), DUM1, DUM2
WRITE(IOUT,590) (AC5(J,I),J=1,9), DUM1, DUM2
N = N + 1
66 CONTINUE
67 CONTINUE
IF (IPLAG.EQ.1) RECTAB(NOREC) = TYPE1(1)
WRITE(9)
1 TYPE1, IDO, TITLE, YBC, BWE, AA, IAR1, IAR2, IAR3,
IAR4, IAR5, CPCA, PACS1, PACS2, PACS3, ZEB,
AMB, ALB, D, AC2, AC3, AC4, AC5, PO, COB,
HHT, HHP, NAA, NIAR4, NIAR5, MCCD, NAC, IAC2,
IAC3, IAC4, IAC5
IF (DOREC.EQ.ADD.AND.IPLAG.EQ.1) GO TO 17
NOREC = NOREC + 1
IF (IPLAG.EQ.0) RECTAB(NOREC) = TYPE1(1)
GO TO 8
68 CONTINUE
WRITE(IOUT,504) TYPE1,DATE,TITLE
WRITE(ICUT,506) TYPE1,BWE,YBC,IREC,DOREC
WRITE(IOUT,526) NAA,NIAR4,NIAR5,MCCD,IAC2,IAC3,IAC4,IAC5
NUM = IAR2(1)
NUM1 = NAA + 1
WRITE(ICUT,532) BWE
DO 72 I= 1,NAA
WRITE(IOUT,535) (AA(J,I),J=1,3), NAC(I), I
72 CONTINUE
P73(5) = M73(NUM)
WRITE(IOUT,536)
WRITE(ICUT,538)
WRITE(IOUT,P73) (NAC(I),I=1,NUM)
WRITE(IOUT,540) HHT, (HHP(I),I=1,NUM)
WRITE(IOUT,542)
WRITE(IOUT,538)
P760(3) = M760(NAA)
WRITE(IOUT,P760) (NAC(I),I=1,NAA)
WRITE(IOUT,544) (ZEB(I),I=1,NAA), AZ
WRITE(IOUT,544) (ALB(I),I=1,NAA), AL
WRITE(IOUT,544) (AMB(I),I=1,NAA), AM
WRITE(IOUT,543)
WRITE(IOUT,538)
WRITE(IOUT,P760) (NAC(I),I=1,NAA)
WRITE(IOUT,545) (COB(I),I=1,NAA)

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WRITE(ICUT,504) TYPE1,DATE,TITLE
WRITE(ICUT,546) IAR1,IAD1
WRITE(IOUT,548) (IAR2(I), I=1,5),IAD1
WRITE(IOUT,550) (IAR3(I), I=1,15),IAD3
WRITE(IOUT,552)
L = 0
DO 72 I = 1,NIAR4
K = L + 1
L = K + 19
WRITE(IOUT,555) (IAR4(J),J=K,L), I
74 CONTINUE
WRITE(ICUT,556)
L = 0
DO 76 I = 1,NIAR5
K = L + 1
L = K + 19
WRITE(IOUT,555) (IAR5(J),J=K,L), I
76 CONTINUE
W22 = 0
W32 = 0
W42 = 0
WRITE(IOUT,558) IAR1
WRITE(IOUT,560)
DO 82 I1 = 1,IAR1
WRITE(ICUT,560) IAR2(I1)
WRITE(IOUT,564)
W2 = IAR2(I1)
IF (W2.EQ.0) GO TO 82
W21 = W22 + 1
W22 = W21 + W2 - 1
DO 80 I2 = W21,W22
WRITE(IOUT,562) IAR3(I2)
WRITE(IOUT,563)
W3 = IAR3(I2)
IF (W3.EQ.0) GO TO 80
W31 = W32 + 1
W32 = W31 + W3 - 1
DO 78 I3 = W31,W32
WRITE(ICUT,564) IAR4(I3)
WRITE(IOUT,568)
W4 = IAR4(I3)
IF (W4.EQ.0) GO TO 78
W41 = W42 + 1
W42 = W41 + W4 - 1
WRITE(ICUT,566) (IAR5(I4), I4=W41,W42)
WRITE(IOUT,568)
WRITE(IOUT,570)
78 CONTINUE
80 CONTINUE
82 CONTINUE
WRITE(IOUT,572)
N=51
DO 84 I = 1,NCCD
IF (N.LE.50) GO TO 83
WRITE(IOUT,504) TYPE1,DATE,TITLE
WRITE(IOUT,576)
N=1
83 WRITE(ICUT,598) (D(J,I),J=1,3),IDD(I),I
N= N + 1
84 CONTINUE
WRITE(IOUT,504) TYPE1, DATE, TITLE
WRITE(ICUT,580) PO
PNT1(6) = N760(NAA)
WRITE(ICUT,PNT1) (NAC(I),I=1,NAA)
P213(4) = MULT3(NAA)
DO 86 I = 1,50

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CONT3940
CONT3950
CONT3960
CONT3970
CONT3980
CONT3990
CONT4000
CONT4010
CONT4020
CONT4030
CONT4040
CONT4050
CONT4060
CONT4070
CONT4080
CONT4090
CONT4100
CONT4110
CONT4120
CONT4130
CONT4140
CONT4150
CONT4160
CONT4170
CONT4180
CONT4190
CONT4200
CONT4210
CONT4220
CONT4230
CONT4240
CONT4250
CONT4260
CONT4270
CONT4280
CONT4290
CONT4300
CONT4310
CONT4320
CONT4330
CONT4340
CONT4350
CONT4360
CONT4370
CONT4380
CONT4390
CONT4400
CONT4410
CONT4420
CONT4430
CONT4440
CONT4450
CONT4460
CONT4470
CONT4480
CONT4490
CONT4500
CONT4510
CONT4520
CONT4530
CONT4540
CONT4550
CONT4560
CONT4570
CONT4580
CONT4590

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      WRITE(IOUT,F213) (CPCA(J,I),J=1,NH1)
86 CONTINUE
      WRITE(IOUT,504) TYPE1, DATE, TITLE
      PHT2(13) = EULT2(NAA)
      WRITE(IOUT,PHT2) (NAC(I),I=1,NAA)
      F222(2) = EULT2(NAA)
      DO 88 I = 1,16
      WRITE(IOUT,F222) (FACS1(J,I),J=1,NAA),(FACLAB(J,I),J=1,2)
88 CONTINUE
      PHT3(13) = EULT3(NAA)
      WRITE(IOUT,PHT3) (NAC(I),I=1,NAA)
      DO 90 I = 1,16
      WRITE(IOUT,F222) (FACS2(J,I),J=1,NAA),(FACHAT(J,I),J=1,2)
90 CONTINUE
      PHT4(12) = EULT3(NAA)
      WRITE(IOUT,PHT4) (NAC(I),I=1,NAA)
      DO 91 I=1,8
      WRITE(IOUT,F222) (FACS3(J,I),J=1,NAA),(FACEQP(J,I),J=1,2)
91 CONTINUE
      WRITE(IOUT,504) TYPE1, DATE, TITLE
      WRITE(IOUT,586)
      DO 92 I = 1,IAC2
      WRITE(IOUT,600) (AC2(J,I),J=1,8), I
92 CONTINUE
      N = 51
      DO 96 I = 1,IAC3
      IF (N.LE.50) GO TO 94
      WRITE(IOUT,504) TYPE1, DATE, TITLE
      WRITE(IOUT,592)
      N = 1
94 WRITE(IOUT,602) (AC3(J,I),J=1,8), I
      N = N + 1
96 CONTINUE
      N = 51
      DO 100 I = 1,IAC4
      IF (N.LE.50) GO TO 98
      WRITE(IOUT,504) TYPE1, DATE, TITLE
      WRITE(IOUT,594)
      N = 1
98 WRITE(IOUT,604) (AC4(J,I),J=1,8), I
      N = N + 1
100 CONTINUE
      N=51
      DO 102 I=1,IAC5
      IF (N.LE.50) GO TO 101
      WRITE(IOUT,504) TYPE1, DATE, TITLE
      WRITE(IOUT,596)
      N=1
101 WRITE(IOUT,606) (AC5(J,I),J=1,8), I
      N = N + 1
102 CONTINUE
      RECTAB(NOREC) = TYPE1(1)
      IFLAG=0
      WRITE(9)
      1 TYPE1, IDD, TITLE, YBC, BWE, AA, IAR1, IAR2, IAR3,
      1 IAR4, IAR5, CPCA, FACS1, FACS2, FACS3, AEB,
      1 ANB, ALB, D, AC2, AC3, AC4, AC5, PO, COB,
      1 NHT, NHP, NAA, NIAR4, NIAR5, MCCD, NAC, IAC2,
      1 IAC3, IAC4, IAC5
      GO TO 8
104 IF (ITAFZ.EQ.0) GO TO 110
      IF (IFLAG.EQ.1) GO TO 108
106 READ(8,END=110)
      1 TYPE1, IDD, TITLE, YBC, BWE, AA, IAR1, IAR2, IAR3,
      1 IAR4, IAR5, CPCA, FACS1, FACS2, FACS3, AEB,
      1 ANB, ALB, D, AC2, AC3, AC4, AC5, PO, COB,
      CONT4600
      CONT4610
      CONT4620
      CONT4630
      CONT4640
      CONT4650
      CONT4660
      CONT4670
      CONT4680
      CONT4690
      CONT4700
      CONT4710
      CONT4720
      CONT4730
      CONT4740
      CONT4750
      CONT4760
      CONT4770
      CONT4780
      CONT4790
      CONT4800
      CONT4810
      CONT4820
      CONT4830
      CONT4840
      CONT4850
      CONT4860
      CONT4870
      CONT4880
      CONT4890
      CONT4900
      CONT4910
      CONT4920
      CONT4930
      CONT4940
      CONT4950
      CONT4960
      CONT4970
      CONT4980
      CONT4990
      CONT5000
      CONT5010
      CONT5020
      CONT5030
      CONT5040
      CONT5050
      CONT5060
      CONT5070
      CONT5080
      CONT5090
      CONT5100
      CONT5110
      CONT5120
      CONT5130
      CONT5140
      CONT5150
      CONT5160
      CONT5170
      CONT5180
      CONT5190
      CONT5200
      CONT5210
      CONT5220
      CONT5230
      CONT5240
      CONT5250

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550 FORMAT('0IAR3 DESCRIBES THE NUMBER OF 3 DIGIT ACCOUNTS', 15X, CONT65920
1 'CARD NUMBER'/'+',73(' ')/'0',15X,17X,A8) CONT65930
552 FORMAT('0IAR4 DESCRIBES THE NUMBER OF 4 DIGIT ACCOUNTS', 15X, CONT65940
1 'CARD NUMBER'/'+',73(' ')) CONT65950
554 FORMAT(' ',20I3,2X,A8) CONT65960
556 FORMAT(' ',20I3,7X,I2) CONT65970
558 FORMAT('0IAR5 DESCRIBES THE NUMBER OF 5 DIGIT ACCOUNTS', 15X, CONT65980
1 'CARD NUMBER'/'+',73(' ')) CONT65990
560 FORMAT('0',30X,'ACCOUNT INDICES'/'+',123(' ')/' IAR1 I IAR2 I CONT66000
IAR3 I IAR4 I IAR5',79X,'1'/'+',123(' ')/' ',13/'+',7(' ')) CONT66010
562 FORMAT(10X,I3/'+',6X,10(' ')) CONT66020
564 FORMAT(19X,I3/'+',15X,10(' ')) CONT66030
566 FORMAT(28X,I3/'+',24X,10(' ')) CONT66040
568 FORMAT(27X,40I2) CONT66050
569 FORMAT('+',5X,'1',9X,'1',9X,'1',9X,'1',95X,'1') CONT66060
570 FORMAT('+',33X,87(' ')) CONT66070
572 FORMAT('+',126(' ')) CONT66080
574 FORMAT(2P15.4,T64,A8,1X,A8) CONT66090
576 FORMAT('0D-ARRAY SPLITS BASE COST INTO LOWEST LEVEL COST COMPONENTS CONT66100
'5 (THOUSANDS OF DOLLARS)'/ '0', 59,'1 FACTORY',T24,'1 SITE',T40, CONT66110
'1'S SITE',T75,'CARD'/1X,T11,'COST',T25,'LABOR',T10,'MATERIAL', CONT66120
'T63,'ACCOUNT',T74,'NUMBER'/'+',86(' ')// CONT66130
578 FORMAT(' ',3P15.4,T64,2A8) CONT66140
580 FORMAT('0',T30,'CUMULATIVE CONSTANT DOLLAR CASH FLOW'/' ',T20, CONT66150
'1'FRACTION OF TOTAL CONSTRUCTION PERIOD EXPENDED UP TO RECEIPT OF CONT66160
CONSTRUCTION PERMIT = ',P5.2/'0'FRACTION OF ',T60,'ACCOUNT') CONT66170
582 FORMAT(12P6.3,A8) CONT66180
584 FORMAT(11(P6.2),6X,A8) CONT66190
586 FORMAT('0AC2 DESCRIBES THE 2-DIGIT ACCOUNT NUMBERS AND ALPHABETIC CONT66200
1ACCOUNT INFORMATION'/'0ACC NO ALPHABETIC INFORMATION',39X, CONT66210
1'CARD NUMBER'/'+',80(' ')// CONT66220
588 FORMAT(10A8) CONT66230
590 FORMAT(' ',10A8) CONT66240
592 FORMAT('0AC3 DESCRIBES THE 3-DIGIT ACCOUNT NUMBERS AND ALPHABETIC CONT66250
1ACCOUNT INFORMATION'/'0ACC NO ALPHABETIC INFORMATION',39X, CONT66260
1'CARD NUMBER'/'+',80(' ')// CONT66270
594 FORMAT('0AC4 DESCRIBES THE 4-DIGIT ACCOUNT NUMBERS AND ALPHABETIC CONT66280
1ACCOUNT INFORMATION'/'0ACC NO ALPHABETIC INFORMATION',39X, CONT66290
1'CARD NUMBER'/'+',80(' ')// CONT66300
596 FORMAT('0AC5 DESCRIBES THE 5-DIGIT ACCOUNT NUMBERS AND ALPHABETIC CONT66310
1ACCOUNT INFORMATION'/'0ACC NO ALPHABETIC INFORMATION',39X, CONT66320
1'CARD NUMBER'/'+',80(' ')// CONT66330
598 FORMAT(' ',3P15.4,15X,A8,5X,'D ',1X,I3) CONT66340
600 FORMAT(' ',8A8,6X,'AC2',2X,I3) CONT66350
602 FORMAT(' ',8A8,6X,'AC3',2X,I3) CONT66360
604 FORMAT(' ',8A8,6X,'AC4',2X,I3) CONT66370
606 FORMAT(' ',8A8,6X,'AC5',2X,I3) CONT66380
608 FORMAT('1NEW MASTER LIST') CONT66390
610 FORMAT('0RECORD NO ',I2,' IS PLANT TYPE ',2A8,2X,20A4) CONT66400
END CONT66410

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PURPOSE MODEL FOR CONTACT S / CONCEPT S

11	3	2	369	11	52	161	306
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2																		IAB1	1	
7	8																	IAP2	1	
0	7	9	6	6	8	2	8	3	8	5								IAP3	1	
0	0	3	2	2	2	2	2	18	2	2	1	8	3	3	7	5	3	5	IAR4	1
4	6	3	2	2	3	2	5	3	5	1	8	2	6	8	1	2	3	8	IAR4	2
5	8	8	8	6	8	8												IAR4	3	
7	5	1	2	3	2	5	2	8	2	8	2	3	2	2	2	2	1	2	IAR5	1
2	2	2	1	1	2	1	1	C	8	1	5	6	6	7	5	8	1	2	IAR5	2
1	4	1	6	2	1	2	3	8	6	0	7	3	0	3	0	3	2	1	IAR5	3
2	5	1	7	1	1	0	0	5	8	6	2	1	7	0	0	5	1	0	IAR5	8
3	2	3	2	3	3	3	2	2	2	0	0	0	0	2	0	0	1	2	IAR5	5
0	0	8	2	3	P	2	2	2	1	2	1	1	5	1	2	2	2	1	IAR5	6
3	5	3	0	0	0	0	0	0	0	0	0	C	0	0	0	0	0	0	IAR5	7
6	0	0	0	0	C	C	C	0	0	0	0	0	2						IAR5	8

PWRBT 10019 0 47162146 18271450 308 372

[illegible]

1.00000	0.0	0.0	20	AA	1
0.0	1.00000	0.50000	21	AA	2
0.0	1.00000	0.60000	22	AA	3
0.0	1.00000	0.80000	23	AA	4
0.0	1.00000	0.40000	24	AA	5
0.0	1.00000	0.30000	25	AA	6
0.0	1.00000	0.80000	26	AA	7
0.0	1.0	0.428	91	AA	8
0.0	1.0	0.708	92	AA	9
0.0	1.0	0.556	93	AA	10
0.0	1.0	0.4	94	AA	11

0.	0.	2000.	201.	D	1
0.	0.	0.	202.	D	2
0.	155.	211.	211.11	D	3
0.	170.	509.	211.12	D	4
0.	54.	59.	211.14	D	5
169.	94.	67.	211.15	D	6
0.	178.	487.	211.16	D	7
0.	258.	210.	211.17	D	8
0.	63.	104.	211.19	D	9
0.	10.	12.	211.41	D	10
0.	5.	12.	211.42	D	11
0.	775.	817.	211.43	D	12
0.	14.	22.	211.45	D	13
0.	4.	3.	211.46	D	14
0.	2730.	2084.	211.71	D	15
0.	1250.	1029.	212.13	D	16
1300.	17305.	12308.	212.14	D	17
1452.	648.	151.	212.22	D	18
0.	72.	74.	212.24	D	19
50.	29.	7.	212.25	D	20
0.	1169.	721.	213.13	D	21
0.	2824.	5582.	213.14	D	22
122.	216.	51.	213.21	D	23
253.	183.	27.	213.22	D	24
74.	146.	20.	213.23	D	25
0.	258.	126.	213.24	D	26
50.	23.	2.	213.25	D	27
0.	338.	197.	215.13	D	28
0.	3808.	2301.	215.14	D	29

28.	61.	11.	215.21	D	30
554.	688.	205.	215.22	D	31
3.	19.	5.	215.23	D	32
0.	166.	81.	215.24	D	33
0.	206.	179.	216.13	D	34
0.	391.	2367.	216.14	D	35
23.	45.	8.	216.21	C	36
94.	251.	94.	216.22	D	37
0.	184.	100.	216.24	D	38
50.	23.	2.	216.25	D	39
0.	957.	666.	217.13	D	40
0.	1455.	832.	217.14	D	41
22.	43.	8.	217.21	D	42
306.	46.	30.	217.22	D	43
0.	52.	25.	217.24	D	44
0.	4454.	2567.	218A.1	D	45
755.	1112.	311.	218A.2	F	46
0.	1170.	1444.	218B.1	D	47
517.	1152.	341.	218B.2	D	48
0.	101.	72.	218D.1	D	49
17.	24.	6.	218D.2	D	50
0.	1435.	532.	218E.1	D	51
22.	44.	14.	218E.2	D	52
0.	339.	142.	218F.1	D	53
2.	17.	9.	218F.2	D	54
0.	5.	3.	218G.2	D	55
0.	145.	112.	218H.1	D	56
10.	23.	10.	218H.2	D	57
0.	1472.	1010.	218J.1	D	58
7.	29.	13.	218J.2	D	59
0.	177.	76.	218K.1	D	60
0.	20.	11.	218K.2	D	61
0.	57.	44.	218M.1	D	62
0.	3.	3.	218M.2	D	63
0.	102.	32.	218P.1	D	64
0.	78.	33.	218S.1	D	65
0.	2213.	1091.	218T.1	D	66
25.	8.	1.	218T.2	D	67
0.	102.	43.	218V.1	D	68
65000.	0.	0.	220A.1	D	69
0.	0.	0.	220B.	D	70
475.	33.	3.	221.11	D	71
0.	763.	86.	221.12	D	72
0.	183.	19.	221.13	D	73
0.	0.	1800.	221.14	D	74
0.	168.	38.	221.21	D	75
775.	379.	34.	222.11	D	76
735.	3634.	397.	222.12	D	77
1850.	777.	82.	222.13	D	78
100.	81.	4.	222.14	D	79
490.	44.	4.	222.15	D	80
0.	26.	2.	223.11	D	81
0.	13.	1.	223.12	D	82
625.	1707.	189.	223.15	D	83
8.	0.	0.	223.16	C	84
20.	0.	0.	223.17	D	85
26.	2.	0.	223.18	D	86
15.	30.	3.	223.31	D	87
0.	161.	231.	223.33	D	88
569.	1803.	248.	223.35	D	89
178.	0.	0.	223.36	D	90
22.	0.	0.	223.37	D	91
54.	5.	0.	223.38	D	92
150.	33.	3.	223.41	D	93
151.	13.	1.	223.42	D	94
86.	3.	0.	223.43	D	95

799.	2092.	216.	223.45	D	96
563.	3.	0.	223.46	D	97
27.	0.	0.	223.47	D	98
36.	4.	0.	223.48	D	99
20.	39.	4.	223.55	D	100
1.	0.	0.	223.56	D	101
2.	0.	0.	223.57	D	102
10.	1.	0.	223.58	D	103
750.	52.	5.	223.59	D	104
798.	543.	118.	224.11	D	105
705.	40.	4.	224.12	D	106
342.	20.	2.	224.13	D	107
6.	1.	0.	224.14	D	108
204.	312.	93.	224.15	D	109
1076.	310.	110.	224.16	D	110
45.	12.	1.	224.17	D	111
64.	6.	1.	224.18	D	112
905.	509.	129.	224.21	D	113
793.	1114.	245.	224.31	D	114
900.	327.	33.	224.32	D	115
482.	63.	6.	225.11	D	116
900.	5.	0.	225.12	D	117
120.	100.	10.	225.13	D	118
65.	13.	1.	225.32	D	119
143.	67.	7.	225.41	D	120
183.	67.	7.	225.42	D	121
495.	413.	69.	225.43	D	122
15.	2.	0.	225.48	D	123
57.	79.	4.	226.11	D	124
6.	3.	0.	226.31	D	125
0.	71.	154.	226.33	D	126
76.	200.	26.	226.35	D	127
40.	0.	0.	226.36	D	128
4.	0.	0.	226.37	D	129
5.	1.	0.	226.38	D	130
1553.	1428.	267.	226.41	D	131
1358.	2405.	920.	226.42	D	132
95.	2.	0.	226.68	D	133
1365.	1995.	949.	226.71	D	134
2653.	2810.	241.	226.72	D	135
0.	0.	200.	226.86	D	136
0.	0.	60.	226.87	D	137
0.	0.	5.	226.88	D	138
0.	47.	15.	226.95	D	139
17.	0.	0.	226.96	D	140
1.	0.	0.	226.97	D	141
200.	18.	1.	226.98	D	142
615.	52.	3.	227.11	D	143
100.	10.	1.	227.14	D	144
50.	5.	0.	227.15	D	145
209.	21.	1.	227.16	D	146
200.	20.	1.	227.17	D	147
264.	36.	2.	227.18	D	148
1722.	508.	51.	227.2	D	149
550.	56.	3.	227.31	D	150
662.	34.	2.	227.32	D	151
80.	0.	0.	227.33	D	152
263.	27.	1.	227.34	D	153
120.	12.	1.	227.35	D	154
60.	6.	1.	227.36	D	155
54.	6.	1.	227.37	D	156
500.	25.	3.	227.41	D	157
600.	31.	3.	227.42	D	158
350.	20.	2.	227.43	D	159
117.	38.	4.	227.5	D	160
0.	864.	55.	228.11	D	161

0.	239.	105.	228.12	D	162
0.	98.	45.	228.13	D	163
1500.	0.	0.	228.2	D	164
0.	358.	743.	228.31	D	165
0.	66.	230.	228.32	D	166
0.	209.	746.	228.33	D	167
53217.	0.	0.	231.11	D	168
0.	2566.	245.	231.12	D	169
0.	1237.	834.	231.21	D	170
0.	4.	23.	231.43	D	171
3.	21.	4.	231.45	D	172
24.	0.	0.	231.46	D	173
1.	0.	0.	231.47	D	174
10.	1.	0.	231.48	D	175
109.	54.	60.	231.49	D	176
97.	81.	8.	231.51	D	177
63.	55.	5.	231.52	D	178
91.	16.	2.	231.63	D	179
507.	1058.	106.	231.65	D	180
624.	0.	0.	231.66	D	181
102.	0.	0.	231.67	D	182
27.	2.	0.	231.68	D	183
5939.	1325.	133.	233.12	D	184
829.	88.	9.	233.21	D	185
234.	120.	12.	233.23	D	186
725.	1505.	151.	233.25	D	187
506.	0.	0.	233.26	D	188
145.	0.	0.	233.27	D	189
49.	5.	0.	233.28	D	190
0.	287.	234.	233.29	D	191
324.	114.	12.	233.31	D	192
150.	0.	0.	233.41	D	193
1504.	544.	54.	233.5	D	194
2023.	628.	63.	234.1	D	195
1739.	221.	22.	234.21	D	196
1601.	3541.	355.	234.25	D	197
1508.	0.	0.	234.26	D	198
310.	0.	0.	234.27	D	199
59.	6.	0.	234.28	D	200
294.	611.	61.	234.35	D	201
398.	0.	0.	234.36	D	202
59.	0.	0.	234.37	D	203
34.	3.	0.	234.38	D	204
199.	24.	2.	234.41	D	205
0.	16.	79.	234.43	D	206
239.	495.	50.	234.45	D	207
211.	0.	0.	234.46	D	208
48.	0.	0.	234.47	D	209
47.	4.	0.	234.48	D	210
4283.	6244.	624.	235.11	D	211
1000.	81.	8.	235.14	D	212
4.	20.	4.	235.21	D	213
32.	16.	2.	235.31	D	214
296.	10.	1.	235.32	D	215
1.	1.	0.	235.33	D	216
210.	442.	45.	235.35	D	217
376.	0.	0.	235.36	D	218
42.	0.	0.	235.37	D	219
18.	2.	0.	235.38	D	220
1053.	157.	22.	235.4	D	221
35.	8.	2.	235.5	D	222
15.	5.	1.	235.61	D	223
40.	3.	0.	235.63	D	224
2.	4.	0.	235.65	D	225
0.	0.	0.	235.66	D	226
0.	0.	0.	235.67	D	227

996.	136.	12.	236.11	D	228
0.	0.	0.	236.2	D	229
139.	35.	3.	236.3	D	230
0.	99.	88.	237.11	D	231
0.	399.	180.	237.12	D	232
0.	98.	30.	237.13	D	233
0.	638.	1329.	237.31	D	234
0.	209.	880.	237.32	D	235
735.	56.	6.	241.11	D	236
0.	42.	4.	241.12	D	237
0.	7.	1.	241.13	D	238
2070.	437.	88.	241.21	D	239
856.	256.	26.	241.22	D	240
508.	70.	7.	242.11	D	241
968.	83.	8.	242.12	D	242
0.	154.	88.	242.13	D	243
1288.	271.	27.	242.21	D	244
882.	197.	20.	242.22	D	245
15.	11.	1.	242.23	D	246
196.	58.	6.	242.31	D	247
3693.	881.	70.	242.32	D	248
130.	22.	2.	242.38	D	249
200.	46.	5.	243.11	D	250
150.	35.	3.	243.14	D	251
22.	7.	1.	243.21	D	252
88.	40.	52.	243.22	D	253
0.	288.	126.	244.11	D	254
0.	273.	65.	244.12	D	255
0.	102.	52.	244.2	D	256
0.	25.	40.	244.3	D	257
0.	129.	150.	244.4	D	258
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0.	416.	195.	245.11	D	260
0.	185.	87.	245.12	D	261
0.	2766.	1112.	245.2	D	262
0.	3443.	788.	245.3	D	263
435.	189.	19.	246.11	D	264
0.	211.	759.	246.21	D	265
0.	763.	338.	246.22	D	266
0.	3305.	2799.	246.3	D	267
0.	2984.	1520.	246.4	D	268
506.	300.	30.	246.5	D	269
713.	100.	10.	251.11	D	270
1183.	220.	22.	251.12	D	271
0.	39.	88.	251.16	D	272
43.	8.	1.	251.17	D	273
146.	253.	47.	252.11	D	274
577.	54.	7.	252.12	D	275
834.	896.	90.	252.21	D	276
1046.	1688.	171.	252.22	D	277
69.	76.	10.	252.24	D	278
541.	95.	10.	252.31	D	279
29.	13.	1.	252.32	D	280
6.	9.	2.	252.33	D	281
28.	15.	1.	252.34	D	282
11.	7.	2.	252.35	D	283
14.	19.	2.	252.36	D	284
9.	3.	0.	252.38	D	285
85.	8.	0.	252.39	D	286
40.	47.	5.	252.43	D	287
0.	33.	11.	252.49	D	288
0.	37.	35.	253.11	D	289
0.	154.	108.	253.15	D	290
242.	24.	2.	253.21	D	291
726.	73.	7.	253.22	D	292
0.	2.	9.	254.11	D	293

50.-	2.-	1.-	25a.22	D	29a
100.-	9.-	1.-	25a.23	E	295
111.-	0.-	0.-	25a.31	D	296
1a.-	1.-	0.-	25a.41	D	297
170.-	9.-	1.-	25a.51	D	298
97.-	10.-	1.-	25a.52	D	299
50.-	5.-	1.-	25a.53	D	300
30.-	3.-	0.-	25a.5a	D	301
40.-	4.-	0.-	25a.55	D	302
18a.-	45.-	5.-	25a.61	D	303
5.-	251.-	167.-	261.11	D	30a
0.-	8.-	8.-	261.12	D	305
0.-	591.-	276.-	261.21	D	306
56.-	53.-	16.-	261.22	D	307
C.-	238.-	296.-	261.31	D	308
36.-	6a.-	17.-	261.32	D	309
0.-	5.-	4.-	261.41	D	310
165.-	68.-	8.-	262.11	D	311
4228.-	1115.-	229.-	262.12	D	312
9729.-	1623.-	162.-	262.13	D	313
1a4a.-	570.-	118.-	262.15	D	31a
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0.-	1309.-	150.-	911.12	D	316
0.-	2065.-	150.-	911.13	D	317
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0.-	660.-	600.-	911.24	D	321
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0.-	3075.-	1700.-	912.13	D	324
0.-	0.-	400.-	912.14	D	325
0.-	0.-	2750.-	912.3	D	326
0.-	8588.-	0.-	912.4	D	327
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0.-	781.-	0.-	913.3	D	330
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20050.-	0.-	0.-	914.1	D	332
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5010.-	0.-	0.-	921.2	D	334
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150.-	0.-	0.-	923.1	D	342
410.-	0.-	0.-	923.2	D	343
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0.-	0.-	650.-	931.2	D	347
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0.-	0.-	150.-	931.4	D	349
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5501.-	0.-	0.-	932.2	D	351
2750.-	0.-	0.-	932.3	D	352
2063.-	0.-	0.-	932.4	D	353
800.-	0.-	0.-	932.5	D	354
120.-	0.-	0.-	932.61	D	355
1661.-	0.-	0.-	932.62	D	356
3020.-	0.-	0.-	933.1	D	357
755.-	0.-	0.-	933.2	D	358
565.-	0.-	0.-	933.3	D	359

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FACS1	8
FACS1	9

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40187	40184	12549	9364	123	5026	8512	40184	0	0	0
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0.0	72813	72813	72813	72813	72813	72813	72813	72813	72813	72813
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0.0	165914	165914	165914	165914	165914	165914	165914	165914	165914	165914
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0.0	2888	2888	2888	2888	2888	2888	2888	2888	2888	2888
1.0										

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FACS1	11
FACS1	12
FACS1	13
FACS1	14
FACS1	15
FACS1	16
FACS2	1
FACS2	2
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FACS2	11
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FACS2	13
FACS2	14
FACS2	15
FACS2	16

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250	250	250	250	250	250	250	250	0.	0.	0.
								1.0	1.0	1.0

FACS3	1
FACS3	2
FACS3	3
FACS3	4
FACS3	5
FACS3	6
FACS3	7
FACS3	8

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21 .	STRUCTURES + IMPROVEMENTS
22 .	REACTOR PLANT EQUIPMENT
23 .	TURBINE PLANT EQUIPMENT
24 .	ELECTRIC PLANT EQUIPMENT
25 .	MISCELLANEOUS PLANT EQUIPT
26 .	MAIN COND HEAT REJECT SYS
91 .	CONSTRUCTION SERVICES
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93 .	FIELD OFFICE ENGP.G.SERVICE
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202.	RELOCATION OF BUILDINGS, UTILITIES, ETC.
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212.	REACTOR CONTAINMENT BLDG
213.	TURBINE ROOM + HEATER BAY
215.	PRIM AUX BLDG + TUNNELS
216.	WASTE PROCESS BUILDING
217.	FUEL STORAGE BLDG
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223.	SAFEGUARDS SYSTEM
224.	RADWASTE PROCESSING
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AC3	1
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227.3	MONITORING SYSTEMS	AC4	52
227.4	PLANT CONTROL SYSTEMS	AC4	53
227.5	RX PLANT I+C TUBING + FITTING	AC4	54
228.1	HYSC SUSPENSE ITEMS	AC4	55
228.2	STANDARD MSSS VALVE PKG	AC4	56
229.3	REACTOR PLANT INSULATION	AC4	57
231.1	TURBINE GENERATOR + ACCESSRY	AC4	58
231.2	FOUNDATIONS	AC4	59
231.4	LUBRICATING OIL SYSTEM	AC4	60
231.5	GAS SYSTEMS	AC4	61
231.6	WTR SEPTIC/RETR DRAIN SYS	AC4	62
233.1	CONDENSER EQUIPMENT	AC4	63
233.2	CONDENSATE SYSTEM	AC4	64
233.3	GAS REMOVAL SYSTEM	AC4	65
233.4	TURBINE BYPASS SYSTEM	AC4	66
233.5	CONDENSATE POLISHING	AC4	67
234.1	FEEDWATER HEATERS	AC4	68
234.2	FEEDWATER SYSTEM	AC4	69
234.3	EXTRACTION STEAM SYSTEM	AC4	70
234.4	PWR VENT + DRAIN SYSTEM	AC4	71
235.1	MAIN VAPOR PIPING SYSTEM	AC4	72
235.2	TURBINE AUXILIARIES	AC4	73
235.3	TB CLOSED CLG WATER SYS	AC4	74
235.4	DEMIN. WATER MAKE-UP SYSTEM	AC4	75
235.5	CHEMICAL TREATMENT SYSTEM	AC4	76
235.6	NEUTRALIZATION SYSTEM	AC4	77
236.1	PROCESS I+C EQUIPMENT	AC4	78
236.2	PROCESS COMPUTER	AC4	79
236.3	TURB FLT I+C TUBING	AC4	80
237.1	HYSC SUSPENSE ITEMS	AC4	81
237.3	TURBINE PLANT INSULATION	AC4	82
241.1	GEN EQPT SWITCHGEAR	AC4	83
241.2	STATION SERVICE SWITCHGEAR	AC4	84
242.1	STATION SERVICE STARTUP XFMR	AC4	85
242.2	UNIT SUBSTATIONS	AC4	86
242.3	AUXILIARY POWER SOURCES	AC4	87
243.1	CONTROL PANELS	AC4	88
243.2	AUX. POWER & SIGNAL BOARDS	AC4	89
244.1	GENRL STATION GROUND SYS	AC4	90
244.2	FIRE DETECTION + SUPPRESSION	AC4	91
244.3	LIGHTNING PROTECTION	AC4	92
244.4	CATHODIC PROTECTION	AC4	93
244.5	HEAT TRACING + FREEZE PROT	AC4	94
245.1	UNDERGROUND DUCT RUNS	AC4	95
245.2	CABLE TRAY	AC4	96
245.3	CONDUIT	AC4	97
246.1	GENERATOR CIRCUITS WIRING	AC4	98
246.2	STATION SERVICE PWR WIRING	AC4	99
246.3	CONTROL CABLE	AC4	100
246.4	INSTRUMENT WIRE	AC4	101

246.5	CONTAINMENT PENETRATIONS	AC4	102
251.1	CRANES & HOISTS	AC4	103
252.1	AIR SYSTEMS	AC4	104
252.2	WATER SYSTEMS	AC4	105
252.3	AUXILIARY STEAM SYSTEM	AC4	106
252.4	PLANT FUEL OIL SYSTEM	AC4	107
253.1	LOCAL COMMUNICATIONS SYS	AC4	108
253.2	SIGNAL SYSTEMS	AC4	109
254.1	SAFETY EQUIPMENT	AC4	110
254.2	CHEMICAL LAB + INSTR SHOP	AC4	111
254.3	OFFICE EQUIP+FURNISHINGS	AC4	112
254.4	CHANGE ROOM EQUIPMENT	AC4	113
254.5	ENVIRONMENT MONIT EQUIP	AC4	114
254.6	DIVING FACILITIES	AC4	115
261.1	MAKEUP WTR INT + DISCH STR	AC4	116
261.2	CIRC WATER PUMP HOUSE	AC4	117
261.3	MAKEUP WTR PRETREATMENT BLDG	AC4	118
261.4	CHLORINATION BUILDING	AC4	119
262.1	HEAT REJECTION SYSTEM	AC4	120
911.1	TEMPORARY BUILDINGS	AC4	121
911.2	TEMPORARY FACILITIES	AC4	122
912.1	MAJOR EQUIPMENT	AC4	123
912.3	PURCHASE OF SMALL TOOLS	AC4	124
912.4	EXPENDABLE SUPPLIES	AC4	125
913.1	SOCIAL SECUR. TAX .055 X L	AC4	126
913.2	STATE+PED.UNEMPLOY.035 X L	AC4	127
913.3	WORKMENS COMP.INS .040 X L	AC4	128
913.4	P.L.+F.D. INS. .005 X L	AC4	129
914.1	BUILDERS ALL RISK INS	AC4	130
921.1	SALARIES	AC4	131
921.2	EXPENSES - 15% OF SALARIES	AC4	132
921.3	DIRECT PAYROLL COST 25%	AC4	133
921.4	OVERHEAD LOADING 55%	AC4	134
921.6	FEE FOR H/O SERVICES 10%	AC4	135
922.1	SALARIES	AC4	136
922.2	DIRECT PAYROLL COST 25%	AC4	137
922.3	OVERHEAD LOADING 55%	AC4	138
922.4	EXPENSES	AC4	139
923.1	SALARIES	AC4	140
923.2	DIRECT PAYROLL COST 25%	AC4	141
923.3	OVERHEAD LOADING 55%	AC4	142
923.4	EXPENSES - 15% OF SALARIES	AC4	143
931.1	OFFICE FURNITURE & EQUIP.	AC4	144
931.2	TELEPHONE & COMMUNICATIONS	AC4	145
931.3	OFFICE SUPPLIES	AC4	146
931.4	FIRST AID & MEDICAL EXP.	AC4	147
932.1	SALARIES	AC4	148
932.2	SALARIES	AC4	149
932.3	DIRECT PAYROLL COST 25%	AC4	150
932.4	OVERHEAD LOADING 15%	AC4	151
932.5	RELOCATION EXPENSE-ALLOWANCE	AC4	152
932.6	FEE FOR CONSTR SVCS 10%	AC4	153
933.1	SALARIES	AC4	154
933.2	DIRECT PAYROLL COST 25%	AC4	155
933.3	OVERHEAD LOADING 15%	AC4	156
933.4	EXPENSES 5%	AC4	157
934.1	SALARIES	AC4	158
934.2	DIRECT PAYROLL COST 25%	AC4	159
934.3	OVERHEAD LOADING 55%	AC4	160
934.4	EXPENSES - 15% OF SALARIES	AC4	161
211.11	GENERAL CUT + FILL	AC5	1
211.12	ROADS, WALKS + PARKING ARE	AC5	2
211.14	FENCING + GATES	AC5	3
211.15	SANITARY SEWER FACILITY	AC5	4
211.16	YARD DRAINAGE STORM SEWERS	AC5	5
211.17	ROADWAY + YARD LIGHTING	AC5	6

211.19	SETTLING BASINS	ACS	7
211.41	CUT + FILL	ACS	8
211.42	GRADING	ACS	9
211.43	TRACK (BALLAST, TIES, RAIL	ACS	10
211.45	SWITCHES+BUMPERS	ACS	11
211.46	RIP RAP (24 IN. THICK)	ACS	12
211.71	CUT + FILL	ACS	13
212.13	SUBSTRUCTURE CONCRETE	ACS	14
212.14	SUPERSTRUCTURE	ACS	15
212.22	HEATING, VENT + AIR COND	ACS	16
212.24	LIGHTING+SERVICE POWER	ACS	17
212.25	ELEVATOR	ACS	18
213.13	SUBSTRUCTURE CONCRETE	ACS	19
213.14	SUPERSTRUCTURE	ACS	20
213.21	PLUMBING + DRAINS	ACS	21
213.22	HEATING, VENT, + AIR COND.	ACS	22
213.23	FIRE PROTECTION	ACS	23
213.24	LIGHTING+SERVICE POWER	ACS	24
213.25	ELEVATOR	ACS	25
215.13	SUBSTRUCTURE CONCRETE	ACS	26
215.14	SUPERSTRUCTURE	ACS	27
215.21	PLUMBING + DRAINS	ACS	28
215.22	HEATING, VENT, + AIR COND	ACS	29
215.23	FIRE PROTECTION	ACS	30
215.24	LIGHTING & SERVICE POWER	ACS	31
216.13	SUBSTRUCTURE CONCRETE	ACS	32
216.14	SUPERSTRUCTURE	ACS	33
216.21	PLUMBING + DRAINS	ACS	34
216.22	HEATING, VENT + AIR COND	ACS	35
216.24	LIGHTING & SERVICE POWER	ACS	36
216.25	ELEVATOR	ACS	37
217.13	SUBSTRUCTURE CONCRETE	ACS	38
217.14	SUPERSTRUCTURE	ACS	39
217.21	PLUMBING + DRAINS	ACS	40
217.22	HEATING, VENT, + AIR COND	ACS	41
217.24	LIGHTING & SERVICE POWER	ACS	42
218A.1	BUILDING STRUCTURE	ACS	43
218A.2	BUILDING SERVICES	ACS	44
218B.1	BUILDING STRUC.	ACS	45
218B.2	BLDG. SERVICES	ACS	46
218C.1	BLDG. STRUC.	ACS	47
218D.2	BUILDING SERVICES	ACS	48
218E.1	BLDG. STRUCTURE	ACS	49
218E.2	BUILDING SERVICES	ACS	50
218F.1	BUILDING STRUCTURE	ACS	51
218F.2	BUILDING SERVICES	ACS	52
218G.2	BUILDING SERVICES	ACS	53
218H.1	BLDG. STRUCT.	ACS	54
218H.2	BUILDING SERVICES	ACS	55
218J.1	BLDG. STRUCT.	ACS	56
218J.2	BLDG. SERV.	ACS	57
218K.1	BLDG. STRUCT	ACS	58
218K.2	BLDG. SERV.	ACS	59
218N.1	BLDG. STRUCTURES	ACS	60
218N.2	BUILDING SERVICES	ACS	61
218P.1	SHIELD STRUCTURE	ACS	62
218S.1	POND STRUCTURE	ACS	63
218T.1	BLDG. STRUCT	ACS	64
218T.2	BUILDING SERVICES	ACS	65
218V.1	BLDG. STRUCTURE	ACS	66
220A.1	QUOTED WBS PRICE	ACS	67
221.11	REACTOR SUPPORT	ACS	68
221.12	VESSEL STRUCTURE	ACS	69
221.13	VESSEL INTERVALS	ACS	70
221.14	TRANSPORT TO SITE	ACS	71
221.21	CONTROL ROD SYSTEM	ACS	72

222.11	FLUID CIRCULATION DR. SYS.	ACS	73
222.12	REACT.COOLANT PIPING SYS.	ACS	74
222.13	STEAM GENERATOR EQUIPMENT	ACS	75
222.14	PRESSURIZING SYSTEM	ACS	76
222.15	PRI COOL PIPE WHIP RESTRAINT	ACS	77
223.11	ROTATING MACHINERY	ACS	78
223.12	HEAT TRANSFER EQUIPMENT	ACS	79
223.15	PIPING	ACS	80
223.16	RNR VALVES	ACS	81
223.17	PIPING - MISC. ITEMS	ACS	82
223.18	INSTRUMENTATION + CONTROL	ACS	83
223.31	ROTATING MACHINERY	ACS	84
223.33	TANKS AND PRESSURE VESSELS	ACS	85
223.35	PIPING	ACS	86
223.36	VALVES	ACS	87
223.37	PIPING - MISC. ITEMS	ACS	88
223.38	INSTRUMENTATION + CONTROL	ACS	89
223.41	ROTATING MACHINERY	ACS	90
223.42	HEAT TRANSFER EQUIPMENT	ACS	91
223.43	TANKS AND PRESSURE VESSELS	ACS	92
223.45	PIPING	ACS	93
223.46	VALVES + FITTINGS	ACS	94
223.47	PIPING - MISC. ITEMS	ACS	95
223.48	INSTRUMENTATION + CONTROL	ACS	96
223.55	PIPING	ACS	97
223.56	VALVES	ACS	98
223.57	PIPING - MISC ITEMS	ACS	99
223.58	INSTRUMENTATION + CONTROL	ACS	100
223.59	FOUNDATIONS / SKIDS	ACS	101
224.11	EQUIPMENT DRAIN TRAIN	ACS	102
224.12	MISC WASTE TRAIN	ACS	103
224.13	DETERGENT WASTE TRAIN	ACS	104
224.14	CHEMICAL WASTE TRAIN	ACS	105
224.15	STEAM GEN BLOWDOWN	ACS	106
224.16	REFGEN CHEM WASTE TRAIN	ACS	107
224.17	MISC RADWASTE EQUIP	ACS	108
224.18	INSTRUMENTATION + CONTROL	ACS	109
224.21	RAD GAS WASTE PROCESS SYS	ACS	110
224.31	SOLID WASTE PROCESSING SYS	ACS	111
224.32	VOLUME REDUCTION	ACS	112
225.11	CRANES + HOISTS	ACS	113
225.12	FUEL HANDLING TOOLS	ACS	114
225.13	"RAW" FER SYSTEMS	ACS	115
225.32	FUEL STOR POOL SERV PLATPH	ACS	116
225.41	NEW FUEL STORAGE RACKS	ACS	117
225.42	SPENT FUEL STORAGE RACKS	ACS	118
225.43	SPENT FUEL POOL CLG+PURIF	ACS	119
225.48	INSTRUMENTATION + CONTROL	ACS	120
226.11	H2/W2 GAS SUPPLY SYS	ACS	121
226.31	ROTATING MACHINERY	ACS	122
226.33	TANKS AND PRESSURE VESSELS	ACS	123
226.35	PIPING	ACS	124
226.36	VALVES	ACS	125
226.37	PIPING-MISC ITEMS	ACS	126
226.40	INSTRUMENTATION + CONTROL	ACS	127
226.41	CHEN & VOLUME CONTROL	ACS	128
226.42	BORON RECYCLE SYSTEM	ACS	129
226.68	INSTRUMENTATION+CONTROL	ACS	130
226.71	WUC SERV WTR SYS	ACS	131
226.72	PRI CHFM COOLING WTR	ACS	132
226.86	DECONTAMINATION EQUIPMENT	ACS	133
226.87	LAUNCH EQUIPMENT	ACS	134
226.88	HOT CHANGE AREA	ACS	135
226.95	PIPING	ACS	136
226.96	SAMPLE SYSTEM VALVES	ACS	137
226.97	PIPING-MISC ITEMS	ACS	138

226.98	INSTRUMENTATION+CONTROL	AC5	139
227.11	SSS CONTROL BOARD	AC5	140
227.14	REMOTE SHOWN PANELS	AC5	141
227.15	RVAC PANELS	AC5	142
227.16	RADWASTE PANELS + RACKS	AC5	143
227.17	LOCAL PANELS + CABINETS	AC5	144
227.18	INSTRUMENT RACKS	AC5	145
227.31	RADIOLOGICAL MON+DATA REC	AC5	146
227.32	NEUTRON MONITORING SYSTEM	AC5	147
227.33	POST ACCIDENT MONITOR	AC5	148
227.34	REACTOR DIAGNOSTIC SYSTEM	AC5	149
227.35	CONTAINMENT ATMOSPHERE MON	AC5	150
227.36	CONTAINMENT LEAK MONITOR	AC5	151
227.37	PAILED FUEL DETECTION	AC5	152
227.41	REACTOR POWER CONTROL	AC5	153
227.42	REACTOR PROTECTION SYSTEM	AC5	154
227.43	EMERGENCY SAFETY FEATURE ACTUAT	AC5	155
228.11	FINAL ALIGNMENT+CHECKING	AC5	156
228.12	FIELD PAINTING	AC5	157
228.13	QUALIFICATION OF WELDERS	AC5	158
228.31	PIPE INSULATION	AC5	159
228.32	EQUIPMENT INSULATION	AC5	160
228.33	SSS INSULATION	AC5	161
231.11	TURBINE FACTORY COST	AC5	162
231.12	OTHER TURBINE COSTS	AC5	1.3
231.21	T-G FEDESTAL	AC5	164
231.43	TANKS + PRESSURE VESSELS	AC5	165
231.45	PIPING	AC5	166
231.46	VALVES	AC5	167
231.47	PIPING-MISC. ITEMS	AC5	168
231.48	INSTRUMENTATION + CONTROL	AC5	169
231.49	SKIDS / FOUNDATIONS	AC5	170
231.51	HYDROGEN STORAGE SYSTEM	AC5	171
231.52	CARBON DIOXIDE STORAGE SYS	AC5	172
231.63	TANKS + PRESS. VESSELS	AC5	173
231.65	PIPING	AC5	174
231.66	VALVES	AC5	175
231.67	PIPING-MISC. ITEMS	AC5	176
231.68	INSTRUMENTATION + CONTROL	AC5	177
233.12	HEAT TRANSFER EQUIPMENT	AC5	179
233.21	ROTATING MACHINERY	AC5	179
233.23	TANKS & PRESSURE VESSELS	AC5	180
233.25	PIPING	AC5	181
233.26	VALVES	AC5	182
233.27	PIPING-MISC. ITEMS	AC5	183
233.28	INSTRUMENTATION + CONTROL	AC5	184
233.29	FOUNDATIONS	AC5	185
233.31	CONDENSER GAS REMOVAL SYS.	AC5	186
233.41	TURBINE BYPASS SYS. EQPT.	AC5	187
234.21	ROTATING MACHINERY	AC5	188
234.25	PIPING	AC5	189
234.26	VALVES	AC5	190
234.27	PIPING-MISC. ITEMS	AC5	191
234.28	INSTRUMENTATION + CONTROL	AC5	192
234.35	PIPING	AC5	193
234.36	VALVES	AC5	194
234.37	PIPING-MISCELLANEOUS	AC5	195
234.38	INSTRUMENTATION + CONTROL	AC5	196
234.41	ROTATING MACHINERY	AC5	197
234.43	TANKS + PRESSURE VESSELS	AC5	198
234.45	PIPING	AC5	199
234.46	VALVES	AC5	200
234.47	PIPING-MISC. ITEMS	AC5	201
234.48	INSTRUMENTATION + CONTROL	AC5	202
235.11	MAIN STEAM SYSTEM	AC5	203
235.14	MAIN VAPOR PIPE WHIP RES.	AC5	204

235.21	RM STR/REHEAT VENTS + DRES	205
235.31	ROTATING MACHINERY	A.5 206
235.32	HEAT TRANSFER EQUIPMENT	AC5 207
235.33	TANKS + PRESSURE VESSELS	AC5 208
235.35	PIPING	AC5 209
235.36	VALVES	AC5 210
235.37	PIPING-MISC. ITEMS	AC5 211
235.38	INSTRUMENTATION + CONTROL	AC5 212
235.61	ROTATING MACHINERY	AC5 213
235.63	TANKS AND PRESSURE VESSELS	AC5 214
235.65	PIPING	AC5 215
235.66	VALVES	AC5 216
235.67	PIPING - MISC ITEMS	AC5 217
236.11	BENCHBOARD, PANELS + PACKS	AC5 218
237.11	PIPE	AC5 219
237.12	FIELD PAINTING	AC5 220
237.13	QUALIFICATION OF WELDERS	AC5 221
237.31	PIPE INSULATION	AC5 222
237.32	EQUIPMENT INSULATION	AC5 223
241.11	GEN LOAD BREAK SWITCH	AC5 224
241.12	GEN NEUTRAL GROUNDING EQPT	AC5 225
241.13	GEN CURRENT+POTENTIAL XFRS	AC5 226
241.21	MEDIUM VOLTAGE METAL CLAD	AC5 227
241.22	STATION MOTOR CONTROL CNTR	AC5 228
242.11	UNIT AUXILIARY TRANSFORMER	AC5 229
242.12	RESERVE AUXILIARY XFR	AC5 230
242.13	FOUNDATIONS FOR XFRS	AC5 231
242.21	LOAD CENTER SWITCHGEAR	AC5 232
242.22	LOAD CENTER TRANSFORMERS	AC5 233
242.23	MISCELLANEOUS XFRS	AC5 234
242.31	BATTERY SYSTEMS	AC5 235
242.32	EMERGENCY DIESEL GEN SYS	AC5 236
242.38	INVERTERS	AC5 237
243.11	GEN+AUX POWER SYS CTRL PNL	AC5 238
243.14	GEN PROTECTIVE RELAY PANEL	AC5 239
243.21	POWER DISTRIBUTION PANEL	AC5 240
243.22	BATTERY CONTROL PC DIST PNL	AC5 241
244.11	EQUIPMENT GROUNDING SYSTEM	AC5 242
244.12	YARD + STRUCTURE GROUNDING	AC5 243
245.11	NON-CLASS 1E DUCT BANKS	AC5 244
245.12	CLASS 1E DUCT BANKS	AC5 245
246.11	MAIN GENERATOR BUS DUCT	AC5 246
246.21	HIGH VOLTAGE BUS+CABLE	AC5 247
246.22	LOW VOLTAGE BUS+CABLE	AC5 248
251.11	TURBINE BUILDING CRANE	AC5 249
251.12	REACTOR CONTNRT BLDG CRANE	AC5 250
251.16	MISC. CRANES, HOISTS+HOWLS	AC5 251
251.17	DIESEL BUILDING CRANES	AC5 252
252.11	COMPRESSED AIR SYSTEM	AC5 253
252.12	CONTAIN BLDG INST AIR SYS	AC5 254
252.21	SERVICE WATER SYSTEM	AC5 255
252.22	YARD FIRE PROTECTION	AC5 256
252.24	POTABLE WATER SYSTEM	AC5 257
252.31	AUXILIARY BOILER SYSTEM	AC5 258
252.32	AUX BOILER FEEDWATER SYS	AC5 259
252.33	AUX FUEL OIL SYSTEM	AC5 260
252.34	AUX DEAR + MAKEUP SYSTEM	AC5 261
252.35	AUX CHM FEED SYSTEM	AC5 262
252.36	AUX. STEAM+CONDENSATE RETRN	AC5 263
252.38	AUX BOILER BLOWDOWN	AC5 264
252.39	AUX STEAM SYS COMPLETE I+C	AC5 265
252.43	TANKS AND PRESSURE VESSELS	AC5 266
252.49	FOUNDATIONS/SKIDS	AC5 267
253.11	GEN. PURPOSE TELEPHONE SYS	AC5 268
253.15	PA + INTERCOM SYS.	AC5 269
253.21	FIRE DETECTION SYSTEM	AC5 270

253.22	SECURITY SYSTEM	ACS	271
254.11	PORTABLE FIRE EXTINGUISHERS	ACS	272
254.22	INSTRUMENT SHOP APPARATUS	ACS	273
254.23	SPEC LAB FURNITURE+FIXTURE	ACS	274
254.31	OFFICE FURNITURE	ACS	275
254.41	LOCKERS-BENCHES	ACS	276
254.51	OFF SITE RADIOLOGICAL MON?	ACS	277
254.52	WEATHEROLOGICAL MONIT.EQUIP	ACS	278
254.53	WATER QUALITY MONITORING	ACS	279
254.54	THERMAL EFFLUENT MONITOR	ACS	280
254.55	SEISMIC MONITORING	ACS	281
254.61	CAFETERIA EQUIPMENT	ACS	282
261.11	INTAKE STRUCTURE	ACS	283
261.12	DISCHARGE STRUCTURE	ACS	284
261.21	BUILDING STRUCTURE	ACS	285
261.22	BUILDING SERVICE	ACS	286
261.31	BUILDING STRUCTURE	ACS	287
261.32	BUILDING SERVICES	ACS	288
261.41	BUILDING STRUCTURE	ACS	289
262.11	WATER INTAKE EQUIPMENT	ACS	290
262.12	CIRCULATING WATER SYSTEM	ACS	291
262.13	COOLING TOWERS	ACS	292
262.15	MAIN CT.BAKEUP+BLowDN SYS.	ACS	293
911.11	FIELD OFFICE, SHOPS, WARE.	ACS	294
911.12	JANITOR SERVICES	ACS	295
911.13	GUARDS - SECURITY	ACS	296
911.21	ROADS, PARKING, LAYDOWN AREA	ACS	297
911.22	TEMPORARY ELECTRICAL SWGE	ACS	298
911.23	TEMPORARY MECH. & PIPING	ACS	299
911.24	TEMPORARY HEAT	ACS	300
911.26	GENERAL CLEANUP	ACS	301
912.11	PURCHASE MAJOR EQUIPMENT	ACS	302
912.13	EQUIPMENT MAINTENANCE	ACS	303
912.14	FUEL + LUBRICANTS	ACS	304
932.61	HOME OFFICE	ACS	305
932.62	FIELD	ACS	306

Appendix B

CONLAM AUXILIARY PROGRAM

CONLAM AUXILIARY PROGRAM

Auxiliary program CONLAM is used to generate the data file, LAMA, containing information on historical factory equipment, craft and white collar labor, and site-related materials costs for the 23 cities shown previously in Fig. 4.1. Data for other locations can also be entered through this program as they become available. However, normal application of CONLAM will be limited to updating cost data for the existing 23 cities at regular time intervals. Six-month intervals have been used; however, other time intervals are acceptable. The LAMA file currently contains 15 years of historical data.

Factory equipment data are obtained from the U.S. Department of Labor, Bureau of Labor Statistics, and are the same for all locations, reflecting the limited market. The items used are given on the following page. Craft labor and site materials data for the 22 actual cities are obtained from *Engineering News-Record*. The hypothetical Middletown site is a composite of Boston, New York, and Philadelphia weighted equally. The craft labor and materials items are listed on the following page.

Data can be read for a maximum of 30 time periods, as specified by the user, for each of the 22 actual locations. The hypothetical Middletown site is generated internally by the CONLAM program. At the user's option, data can be read either from cards alone when initially generating a file (variable IRMOLD=1) or from an existing file in card images with update cards when updating or modifying an existing file (IRMOLD=0). In either case, one new file is produced in card images and another file is written in unformatted binary records. It is the unformatted binary record file (LAMA) that is used by the CONCEPT program. Options also exist for punching card decks of the data stored on the file and for producing the following listings: (1) card image output and (2) tabular output for equipment, labor, and materials for each site in the file. The program is designed to eliminate automatically the oldest time period as each new period is introduced, or it will add a new period if there are less than 30 total periods.

The program uses two wage duplications, as follows, by option of the user: (1) boilermaker wages are duplicated from steamfitter wages, and

(2) other crafts' wages are duplicated from bricklayer wages. This is done since *Engineering News-Record*¹⁶ does not include boilermaker wages or a combination of other crafts' wages. An option flag for both labor categories permits using data punched into standard input cards.

The remainder of this Appendix consists of a description of the input data requirements and a FORTRAN listing of the CONLAM program. (When updating an existing file, Card 2 is not used; hence, the update card deck order must correspond to the city order of the old card image file.)

CONLAM input card description

Card	Column	Variable name	Description
1	1-5	NOPER	Number of actual data points stored on file, less than or equal to MAXREC. Format 15
	6-10	MAXREC	Maximum number of time periods on file for each location, not to exceed 30. Format 15
	11-15	NCITY	Number of locations on file, presently 23. Format 15.
	16-20	IRMOLD	Flag for type of input. Format 15 0 - Update existing master files 1 - Establish new master files from card input
	21-25	IPUNCH	Flag for card output. Format 15 0 - Omits card output 1 - Produces card deck
	26-30	NOLIST	Flag for listing card images. Format 15 0 - Produces list 1 - Omits list
	31-35	NOREF	Flag for table output. Format 15 0 - Produces table 1 - Omits table
	36-40	IBLMKR	Flag for boilermakers' wages. Format 15 0 - Uses steamfitters' wages 1 - Boilermakers' wages must be supplied in B(15)
	41-45	IOCRFT	Flag for other crafts' wages. Format 15 0 - Uses bricklayers' wages 1 - Other crafts' wages must be supplied, in B(16)
2	3-4	IC	City number (see Fig. 4.1). Format 12
	7-8	IS	Site number (not used by CONCEPT). Format 12
	11-12	IR	Region number (not used by CONCEPT). Format 12

CONLAM input card description (continued)

Card	Column	Variable name	Description
3	17-48	LOC	Location (alphabetic) (see Fig. 4.1). Format 8M
	1-10	A(1)	Date (e.g., 1978.5). Format F10.2
	11-20	A(2)	Wholesale price index for steel mill products, Code 10-13 Steel Mill Products, "Monthly Labor Review," Bureau of Labor Statistics. Format F10.2
	21-30	A(3)	Hourly earnings index in the electrical equipment and supplies industry. Data from "Employment and Earnings," Bureau of Labor Statistics, SIC Code 36 Electrical Equipment and Supplies. This number has been normalized so that the index for 1967 is 100. This was done by multiplying the BLS data by 100/2.70. Format F10.2
	31-40	A(4)	Hourly earnings index in the steam engine and turbine industry. Data from "Employment and Earnings," BLS, SIC Code 3511 Steam Engines and Turbines. This has also been normalized by multiplying the BLS number by 100/3.50 so that the index for 1967 is 100. Format F10.2
	41-50	A(5)	White collar wage index. Data from "National Survey of Professional, Administrative, Technical, and Clerical Pay," BLS. This data has been converted from a percent annual increase to an index based on 1967=100. Format F10.2

The following cards use a format of 8F10.2

4	1-10	B(1)	Hourly rate for building labor
	11-20	B(2)	Hourly rate for heavy construction labor

CONSUM input card description (continued)

Card	Column	Variable name	Description
5	21-30	B(3)	Hourly rate for bricklayers
	31-40	B(5)	Hourly rate for carpenters
	41-50	B(5)	Hourly rate for structural ironworkers
	51-60	B(6)	Hourly rate for plasterers
	61-70	B(7)	Hourly rate for electrical workers
	71-80	B(8)	Hourly rate for steamfitters
	1-10	B(9)	Hourly rate for operating engineers
	11-20	B(10)	Hourly rate for small tractor operators
	21-30	B(11)	Hourly rate for scraper operators
	31-40	B(12)	Hourly rate for crane operators
	41-50	B(13)	Hourly rate for air compressor operators
	51-60	B(14)	Hourly rate for truck drivers (load)
	61-70	B(15)	Hourly rate for boilermakers, Steamfitters' wages used
	71-80	B(16)	Hourly rate for all other crafts, Bricklayers' wages used
	1-10	C(1)	Material costs for channels, \$/100 lb
	11-20	C(2)	Material costs for I-beams, \$/100 lb
6	21-30	C(3)	Material costs for S-ranges, \$/100 lb
	31-40	C(4)	Material costs for re-bars, \$/100 lb
	41-50	C(5)	Material costs for 3000-psi Redmix concrete, yd

CONLAM input card description (continued)

Card	Column	Variable name	Description
	51-60	C(6)	Material costs for 3/4-in. B-A plyform, \$/1000 ft ²
	61-70	C(7)	Material costs for 2 x 4 fir or pine lumber, \$/1000 bd ft
	71-80	C(8)	Land coefficient, Input 1000.00
7	1-80	C(9-16)	Unassigned

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C
C -----CLAN 10
C |                                           ICLAN 20
C |                                           ICLAN 30
C |           C O N L A N   P R O G R A M      ICLAN 40
C |           P H A S E   5                    ICLAN 50
C |                                           ICLAN 60
C |           (CONSTRUCTION MODEL EQUIPMENT, LABOR, AND MATERIAL COSTS) ICLAN 70
C |   AUTHOR: B. J. BARWARD                     ICLAN 80
C |   JULY 1972 - REVISED SEPT. 1975           ICLAN 90
C |   MODIFIED BY : C. R. HUDSON                ICLAN 100
C |           OAK RIDGE NATIONAL LABORATORY    ICLAN 110
C |                                           ICLAN 120
C -----CLAN 130
C |                                           ICLAN 140
C |   COST DATA ARE TAKEN FROM THE MAGAZINE "ENGINEERING NEWS RECORD" ICLAN 150
C |   (ENR) EVERY JULY AND JANUARY FOR SELECTED LABOR AND MATERIALS. ICLAN 160
C |   EQUIPMENT DATA ARE OBTAINED FROM U.S. DEPT. OF LABOR, BUREAU OF ICLAN 170
C |   LABOR STATISTICS. A HYPOTHETICAL CITY CALLED "HIDDLETON" HAS ICLAN 180
C |   BEEN GENERATED FROM AN EQUAL WEIGHTED MIX OF BOSTON, NEW YORK, AND ICLAN 190
C |   PHILADELPHIA DATA TO APPROXIMATE A TYPICAL NORTHEASTERN CITY. ICLAN 200
C |                                           ICLAN 210
C -----CLAN 220
C |                                           ICLAN 230
C -----CLAN 240
C |                                           ICLAN 250
C |   * * * U.S. SINCE THE COST DATA IS POSITIONALLY DEPENDENT FOR ICLAN 260
C |   CORRECT PROCESSING AND SINCE THERE IS NO IDENTIFICATION PUNCHED IN ICLAN 270
C |   THE DATA CARDS, AN OLD CARD IMAGE FILE (HOLD) AND A NEW CARD IMAGE ICLAN 280
C |   FILE (NEW) ARE MAINTAINED IN THE CORRECT CARD SEQUENCE WHICH WILL ICLAN 290
C |   PERMIT REPUNCHING A MASTER CARD FILE IN THE EVENT THE ORIGINAL ICLAN 300
C |   CARD FILE IS COMPROMISED. * * * ICLAN 310
C |                                           ICLAN 320
C -----CLAN 330
C |                                           ICLAN 340
C |   DIMENSION LOC(8), D(30,8), P(30,16), F(30,16) ICLAN 350
C |   DIMENSION BX(30,8), EX(30,16), FX(30,16), HIDDLE(8) ICLAN 360
C |   DATA I,J,K/0,0,0/ ICLAN 370
C |   DATA HIDDLE/'USA ',' ',' ',' ','HIDD','LETS','UN ', ICLAN 380
C |   ' ' ' / ICLAN 390
C |                                           ICLAN 400
C -----CLAN 410
C |                                           ICLAN 420
C |           F I L E   N A M E S ICLAN 430
C |                                           ICLAN 440
C |   NASCON = CONLAN UNFORMATTED MASTER COST FILE ICLAN 450
C |   INP = SYSTEM INPUT FILE ICLAN 460
C |   IOPT = SYSTEM OUTPUT FILE ICLAN 470
C |   IPUN = SYSTEM PUNCH FILE ICLAN 480
C |   NEW = UPDATED FORMATTED EQUIP LABOR & MATLS MASTER ICLAN 490
C |   HOLD = OLD FORMATTED EQUIP LABOR & MATLS MASTER ICLAN 500
C |                                           ICLAN 510
C -----CLAN 520
C |                                           ICLAN 530
C |   NASCON = 9 ICLAN 540
C |   INP = 5 ICLAN 550
C |   IOPT = 6 ICLAN 560
C |   IPUN = 7 ICLAN 570
C |   NEW = 8 ICLAN 580
C |   HOLD = 4 ICLAN 590
C |                                           ICLAN 600
C -----CLAN 610
C |                                           ICLAN 620
C |   P R O G R A M   O P T I O N S   &   I N P U T   V A R I A B L E S ICLAN 630

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C |          BOPER FORMAT IS IN COL. 1-5                                ICLAN 640
C |                                                                    ICLAN 650
C | BOPER = NUMBER OF TIME-PERIODS FOR WHICH DATA IS AT HAND          ICLAN 660
C | INCLUDING THE UPDATE TIME-PERIOD.                                   ICLAN 670
C |                                                                    ICLAN 680
C | =====CLAN 690
C |                                                                    ICLAN 700
C | PERIOD NEW                                                         CLAN 710
C |                                                                    CLAN 720
C | =====CLAN 730
C |                                                                    ICLAN 740
C |          HAXREC FORMAT IS IN COL. 6-10                             ICLAN 750
C | HAXREC = ARBITRARY NUMBER OF TIME-PERIODS IN THE COST DATA ARRAY. ICLAN 760
C |                                                                    ICLAN 770
C | =====CLAN 780
C |                                                                    CLAN 790
C | REVID NEW                                                         CLAN 800
C |                                                                    CLAN 810
C | =====CLAN 820
C |                                                                    ICLAN 830
C |          NCITY FORMAT IS IN COL. 11-15                             ICLAN 840
C |                                                                    ICLAN 850
C | NCITY = NUMBER OF CITIES IN THE CITY SET WHICH IS CURRENTLY LIMITED ICLAN 860
C | TO THOSE CITIES NAMED IN THE RDR DATA PLUS THE COMPUTED VALUES FOR ICLAN 870
C | RIDDLETCUB, USA, MAKING A TOTAL OF 23 SETS.                       ICLAN 880
C |                                                                    ICLAN 890
C | =====CLAN 900
C |                                                                    CLAN 910
C | REVID NASCON                                                       CLAN 920
C |                                                                    CLAN 930
C | =====CLAN 940
C |                                                                    ICLAN 950
C |          IRHOLD FORMAT IS IN COL 16-20                             ICLAN 960
C |                                                                    ICLAN 970
C | IRHOLD DETERMINES WHETHER AN OLD FORMATTED MASTER FILE IS USED     ICLAN 980
C | FOR INPUT OR A MASTER CARD FILE DECK IS USED. ALL MASTER FILES OR ICLAN 990
C | THE FILE NEEDED TO WRITE NASCON FILE MUST BE CREATED FROM A MASTER ICLAN1000
C | CARD DECK FILE.                                                    ICLAN1010
C | IRHOLD = 0      UPDATE EXISTING MASTER FILES                       ICLAN1020
C | IRHOLD = 1      ESTABLISH NEW MASTER FILES                         ICLAN1030
C |                                                                    ICLAN1040
C | =====CLAN1050
C |                                                                    CLAN1060
C |          READ (IIP,500) BOPER,HAXREC,NCITY,IRHOLD,IPUNCH,NOLIST,NOREP, ICLAN1070
C |          1 IBLNK,XOCPT                                              CLAN1080
C |                                                                    CLAN1090
C | =====CLAN1100
C |                                                                    ICLAN1110
C |          IPUNCH FORMAT IS IN COL. 21-25                             ICLAN1120
C |                                                                    ICLAN1130
C | OPTION TO PUNCH AN ALTERED CARD DECK OF COST VALUES WHEN AN OLD ICLAN1140
C | DATA SET IS USED FOR INPUT AND A NEW DATA SET IS TO BE GENERATED ICLAN1150
C | WITH CORRECTIONS FOR A NEW VERSION OR REVISION OF THE MODEL.      ICLAN1160
C |                                                                    ICLAN1170
C | IPUNCH = 0 SKIPS THE PUNCHING OF NEW CARDS.                        ICLAN1180
C | IPUNCH = 1 PRODUCES A NEW DECK OF CITY COST DATA CARDS AS ALTERED ICLAN1190
C | BY THE PROGRAM LOGIC.                                              ICLAN1200
C |                                                                    ICLAN1210
C | =====CLAN1220
C |                                                                    CLAN1230
C |                                                                    CLAN1240
C | =====CLAN1250
C |                                                                    ICLAN1260
C |          NOLIST FORMAT IS IN COL. 26-30                             ICLAN1270
C | NOLIST = 0 PRODUCES NORMAL CARD LIST FOR EACH CITY                 ICLAN1280
C | NOLIST = 1 NO CITY CARD LIST IS PRODUCED.                         ICLAN1290

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C |                                     ICLAN1300
C | ----- MOREP FORMAT IS IN COL. 31-35 ----- ICLAN1310
C |                                     ICLAN1320
C | MOREP = 0 PRODUCTS MONTHLY COST REFERENCE TABLES FOR EACH CITY ICLAN1330
C | MOREP = 1 REFERENCE TABLES ARE OMITTED. ICLAN1340
C |                                     ICLAN1350
C | ----- ICLAN1360
C |                                     ICLAN1370
C |                                     ICLAN1380
C |                                     ICLAN1390
C |                                     ICLAN1400
C |                                     ICLAN1410
C |                                     ICLAN1420
C |                                     ICLAN1430
C |                                     ICLAN1440
C |                                     ICLAN1450
C |                                     ICLAN1460
C |                                     ICLAN1470
C |                                     ICLAN1480
C |                                     ICLAN1490
C | ----- ICLAN1500
C | THE FOLLOWING ROUTINES UPDATE AN OLD MASTER TAPE WITH AN INPUT FILE ICLAN1510
C | CARD DECK OF RECENT COST DATA FOR EQUIP., LABOR, & MATERIAL. ICLAN1520
C | ----- ICLAN1530
C | ----- ICLAN1540
C | ----- ICLAN1550
C | DO 18 K = 1, NCITY ICLAN1560
C | ----- ICLAN1570
C | FOR UPDATING AFTER MOREP REACHES MAXREC, THE D, E, AND F ARRAYS ICLAN1580
C | ARE KEPT THE SAME SIZE BY DROPPING THE EARLIEST COST PERIOD FOR A ICLAN1590
C | MAXIMUM OF THIRTY (30) PERIODS. THIS IS DONE IN THE "DO LOOP" ICLAN1600
C | STARTING WITH CARD #CLAN1670 THRU CARD #CLAN1960, A ROUTINE ICLAN1610
C | WHICH POSITIONS THE SECOND AND FOLLOWING PERIODS OF OLD DATA IN ICLAN1620
C | THE FIRST AND FOLLOWING ARRAY LOCATIONS AND ZEROES THE MAXREC ICLAN1630
C | LOCATION FOR STORAGE OF THE NEW PERIOD DATA TO BE ADDED. ICLAN1640
C | ----- ICLAN1650
C | ----- ICLAN1660
C | ----- ICLAN1670
C | ----- ICLAN1680
C | ----- ICLAN1690
C | ----- ICLAN1700
C | ----- ICLAN1710
C | READ IN ONE CITY DATA SET FROM OLD MASTER FILE ICLAN1720
C | ----- ICLAN1730
C | ----- ICLAN1740
C | ----- ICLAN1750
C | READ(HOLD,510) IC, IS, IR, LOC ICLAN1760
C | WRITE(NEW,510) IC, IS, IP, LOC ICLAN1770
C | WRITE(ICPT,512) IC, IS, IR, LOC ICLAN1780
C | DO 2 I = 1, MAXREC ICLAN1790
C | READ(HOLD,508) (D(I,J), J=1,8) ICLAN1800
C | READ(HOLD,509) (E(I,J), J=1,16) ICLAN1810
C | READ(HOLD,500) (F(I,J), J=1,16) ICLAN1820
C | F(I,8)=1000. ICLAN1830
C | IF (I.GT.MOREP) F(I,8) = 0.0 ICLAN1840
C | 2 CONTINUE ICLAN1850
C | IF (MOREP.LT.30) GO TO 8 ICLAN1860
C | DO 6 I = 2, MAXREC ICLAN1870
C | DO 4 J = 1, 16 ICLAN1880
C | IF (J.LT.9) D(I-1,J) = D(I,J) ICLAN1890
C | E(I-1,J) = E(I,J) ICLAN1900
C | F(I-1,J) = F(I,J) ICLAN1910
C | IF (I.EQ.MAXREC.AND.J.LT.9) D(I,J) = 0.0 ICLAN1920
C | IF (I.EQ.MAXREC) E(I,J) = 0.0 ICLAN1930
C | IF (I.EQ.MAXREC) F(I,J) = 0.0 ICLAN1940
C | 4 CONTINUE ICLAN1950

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6 CONTINUE
C
C =====CLAN1960
C |CLAN1970
C |CLAN1980
C |CLAN1990
C | NOTICE NOTICE NOTICE NOTICE NOTICE CLAN2000
C |CLAN2010
C | BEGIN THE UPDATE FOR A CITY IF IT IS NOT MIDDLETOWN
C |CLAN2020
C |CLAN2030
C |CLAN2040
C |CLAN2050
C |CLAN2060
C |CLAN2070
C |CLAN2080
C |CLAN2090
C | SAMPLE UPDATE DECK INPUT FORMAT
C | (FIRST CITY IN UPDATE DECK)
C |CLAN2100
C |CLAN2110
C |CLAN2120
C 1975.5    195.50    170.74    162.57    168.70    0.0    0.0    0.0
C 5.95      5.95      9.06      9.12      9.19      9.02    11.27    9.94
C 8.97      8.52      8.87      8.87      6.95      5.85     9.94     9.46
C 19.25     18.55     19.25     17.00     23.25     349.     144.     1000.00
C 0.        0.        0.        0.        0.        0.        0.        0.0
C =====CLAN2180
C |CLAN2190
C | (A BLANK CARD IS USED WHERE ONLY ZEROES ARE TO BE PUNCHED SINCE
C | MATERIAL COSTS ARE NOT YET BEING STORED IN P(I,J),J=9,16))
C |CLAN2200
C |CLAN2210
C |CLAN2220
C |CLAN2230
C |CLAN2240
C |CLAN2250
C | (SECOND CITY IN UPDATE DECK)
C |CLAN2260
C |CLAN2270
C |CLAN2280
C 1975.5    195.50    170.74    162.57    168.70    0.0    0.0    0.0
C 7.14      7.14      10.57     10.24     11.16     9.20    10.50    11.13
C 9.63      9.63      9.63      10.18     8.22      7.99    11.13    10.57
C 19.85     19.75     19.15     17.50     30.10     325.     165.     1000.00
C 0.        0.        0.        0.        0.        0.        0.        0.0
C |CLAN2330
C |CLAN2340
C |CLAN2350
C READ(INP,500) (D(NOPER,J),J=1,8)
C WRITE(IOPT,522) (D(NOPER,J),J=1,8)
C READ(INP,508) (E(NOPER,J),J=1,16)
C IF (IOCRPT.LT.1) E(NOPER,16) = E(NOPER,3)
C IF (IBLNR.LT.1) E(NOPER,15) = E(NOPER,8)
C WRITE(IOPT,522) (E(NOPER,J),J=1,8)
C WRITE(IOPT,522) (E(NOPER,J),J=9,16)
C READ(INP,508) (F(NOPER,J),J=1,16)
C F(NOPER,8) = 1000.
C WRITE(IOPT,522) (F(NOPER,J),J=1,8)
C WRITE(IOPT,522) (F(NOPER,J),J=9,16)
C IF (K.NE.4.AND.K.NE.15.AND.K.NE.16) GO TO 14
C DO 9 J=1,16
C IF (J.LT.9) DX(NOPER,J) = DX(NOPER,J) + D(NOPER,J)/3.
C EX(NOPER,J) = EX(NOPER,J) + E(NOPER,J)/3.
C FX(NOPER,J) = FX(NOPER,J) + F(NOPER,J)/3.
C 9 CONTINUE
C GO TO 14
C
C
C =====CLAN2560
C |CLAN2570
C | BEGIN UPDATE FOR MIDDLETOWN USING PREVIOUS PERIOD DATA AND COST
C | PROJECTION FACTORS.
C |CLAN2580
C |CLAN2590
C |CLAN2600
C |CLAN2610

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```

C
10 CONTINUE
DO 12 J=1,16
IF (J.LT.9) D(WOPER,J) = DX(WOPER,J)
E(WOPER,J) = EX(WOPER,J)
F(WOPER,J) = FX(WOPER,J)
12 CONTINUE
WRITE(IOPT,522) (D(WOPER,J),J=1,8)
WRITE(IOPT,522) (E(WOPER,J),J=1,8)
WRITE(IOPT,522) (E(WOPER,J),J=9,16)
WRITE(IOPT,522) (F(WOPER,J),J=1,8)
WRITE(IOPT,522) (F(WOPER,J),J=9,16)

C
C =====
C |
C | COMPLETED CITY UPDATE NOW STOPPED ON NEW FORMATTED MASTER FILE.
C |
C =====
C
14 DO 16 I = 1,MAXREC
WRITE(NEW,508) (D(I,J),J=1,8)
WRITE(NEW,508) (E(I,J),J=1,16)
WRITE(NEW,508) (F(I,J),J=1,16)
16 CONTINUE
18 CONTINUE
GO TO 32

C=====
C |
C | START HERE FOR READING ENTIRE CARD FILE
C |
C=====
C
20 NC = NCITY - 1
DO 30 K=1,NC
READ(INP,510) IC, IS, IR, LOC

C
C |
C |
C =====
C |
C | READ IN ONE CITY DATA SET FROM A MASTER CARD DECK INPUT FILE
C |
C =====
C
WRITE(NEW,510) IC, IS, IR, LOC
WRITE(IOPT,512) IC, IS, IR, LOC
DO 22 I = 1,WOPER
READ(INP,508) (D(I,J),J=1,8)
READ(INP,508) (E(I,J),J=1,16)
IF (IBLNKR.LT.1) E(I,15) = E(I,8)
IF (IOCRPT.LT.1) E(I,16) = E(I,3)
READ(INP,508) (F(I,J),J=1,16)
F(I,8) = 1000.
22 CONTINUE
IF (MAXREC.EQ.WOPER) GO TO 26
WZ = WOPER + 1
DO 24 I = WZ,MAXREC
DO 24 J = 1,16
IF (J.LE.8) D(I,J) = 0.0
E(I,J) = 0.0
F(I,J) = 0.0
24 CONTINUE
26 DO 28 I = 1,MAXREC
WRITE(NEW,508) (D(I,J),J=1,8)
WRITE(NEW,508) (E(I,J),J=1,16)
WRITE(NEW,508) (F(I,J),J=1,16)
28 CONTINUE
C | DATA GENERATION FOR MIDDLETOWN

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      IF (K.EE.8.AND.K.EE.15.AND.K.EE.16) GO TO 30
      DO 29 I=1,NAXREC
      DO 29 J=1,16
      IF (J.LT.9) DX(I,J) = EX(I,J) + D(I,J)/3.
      EX(I,J) = EX(I,J) + E(I,J)/3.
      PX(I,J) = PX(I,J) + P(I,J)/3.
29 CONTINUE
30 CONTINUE
C | MIDDLE-GEN GENERATION
  IC = 3
  IS = .
  IR = 1
  WRITE(NEW,510) IC, IS, IP, MIDDLE
  WRITE(ICPT,512) IC, IS, IR, MIDDLE
  DO 31 I=1,NAXREC
  WRITE(NEW,500) (DX(I,J),J=1,8)
  WRITE(NEW,500) (EX(I,J),J=1,16)
  WRITE(NEW,500) (PX(I,J),J=1,16)
31 CONTINUE
C
C =====
C |
C | WRITE NEW FORMATTED MASTER FILE HERE TO ORIGINATE A TAPE MASTER
C |
C =====
C
C
C =====
C |
C | BOTH UPDATE METHODS, FROM TAPE OR FROM CARD, CONVERGE AT THIS
C | POINT AND FOLLOW THE SAME PATH OF WRITING AN UNFORMATTED MASTER
C | USED IN THE MODELING PROGRAM WITHOUT CONTINUALLY ENDANGERING THE
C | TAPES USED FOR UPDATING THE COST DATA, SINCE THE COST DATA CARDS
C | FOR THE TAPE RECORDS ARE IDENTIFIED UNIQUELY, BUT ARE IN UNIQUE
C | POSITIONS IN THE DATA SET AND IN EACH CITY RECORD IN EACH PERIOD.
C |
C =====
C
C 32 END FILE NEW
  REWIND NEW
  WRITE(IOPT,516)
C
C =====
C |
C | READ NEW FORMATTED MASTER FILE AND WRITE NEW UNFORMATTED MASTER
C | FILE
C |
C =====
C
C
C 33 DO 38 K = 1, NCITY
  READ(NEW,510,END=40) IC, IS, IR, LOC
  IF (IPUNCH.GT.0) WRITE(IPUN,510) IC, IS, IR, LOC
  WRITE(ICPT,518)
  WRITE(IOPT,520) IC, IS, IR, LOC
  DO 36 I = 1,NAXREC
  READ(NEW,500) (D(I,J),J=1,8)
  READ(NEW,500) (E(I,J),J=1,8)
  READ(NEW,500) (X(I,J),J=9,16)
  READ(NEW,500) (P(I,J),J=1,8)
  READ(NEW,500) (F(I,J),J=9,16)
C
C =====
C |
C | DO YOU WANT A NEW DECK PUNCHED WITH A CHANGED DATA SET???? IF SO
C | MAKE CHANGES BEFORE BUT PUNCH THE CARDS HERE.
C |
C =====

```

CLAN3200
CLAN3290
CLAN3300
CLAN3310
CLAN3320
CLAN3330
CLAN3340
CLAN3350
ICLAN3360
CLAN3370
CLAN3380
CLAN3390
CLAN3400
CLAN3410
CLAN3420
CLAN3430
CLAN3440
CLAN3450
CLAN3460
CLAN3470
CLAN3480
ICLAN3490
ICLAN3500
ICLAN3510
CLAN3520
CLAN3530
CLAN3540
CLAN3550
ICLAN3560
ICLAN3570
ICLAN3580
ICLAN3590
ICLAN3600
ICLAN3610
ICLAN3620
ICLAN3630
CLAN3640
CLAN3650
CLAN3660
CLAN3670
CLAN3680
CLAN3690
CLAN3700
ICLAN3710
ICLAN3720
ICLAN3730
ICLAN3740
CLAN3750
CLAN3760
CLAN3770
CLAN3780
CLAN3790
CLAN3800
CLAN3810
CLAN3820
CLAN3830
CLAN3840
CLAN3850
CLAN3860
CLAN3870
CLAN3880
CLAN3890
ICLAN3900
ICLAN3910
ICLAN3920
ICLAN3930

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C *****CLAN3940
C
  IF (I.GT.WOPER) GO TO 34
  IF (IPUNCH.GT.0) WRITE(IPUN,500) (D(I,J),J=1,8)
  IF (IPUNCH.GT.0) WRITE(IPUN,500) (E(I,J),J=1,8)
  IF (IPUNCH.GT.0) WRITE(IPUN,500) (Z(I,J),J=1,8)
  IF (IPUNCH.GT.0) WRITE(IPUN,500) (P(I,J),J=1,8)
  IF (IPUNCH.GT.0) WRITE(IPUN,500) (P(I,J),J=9,16)
34 IF (NOLIST.GT.0) GO TO 36
  WRITE(ICPT,522) (D(I,J),J=1,8)
  WRITE(ICPT,522) (E(I,J),J=1,8)
  WRITE(ICPT,522) (Z(I,J),J=9,16)
  WRITE(ICPT,522) (P(I,J),J=1,8)
  WRITE(ICPT,522) (P(I,J),J=9,16)
35 CONTINUE
  WRITE(MASCON) IC, IS, IR, LOC, D, E, P
36 CONTINUE
40 PERIOD NEW
  END FILE MASCON
  REWIND MASCON
C *****CLAN3950
C *****CLAN3960
C *****CLAN3970
C *****CLAN3980
C *****CLAN3990
C *****CLAN4000
C *****CLAN4010
C *****CLAN4020
C *****CLAN4030
C *****CLAN4040
C *****CLAN4050
C *****CLAN4060
C *****CLAN4070
C *****CLAN4080
C *****CLAN4090
C *****CLAN4100
C *****CLAN4110
C *****CLAN4120
C *****CLAN4130
C *****CLAN4140
C *****CLAN4150
C *****CLAN4160
C *****CLAN4170
C *****CLAN4180
C *****CLAN4190
C *****CLAN4200
C *****CLAN4210
C *****CLAN4220
C *****CLAN4230
C *****CLAN4240
C *****CLAN4250
C *****CLAN4260
C *****CLAN4270
C *****CLAN4280
C *****CLAN4290
C *****CLAN4300
C *****CLAN4310
C *****CLAN4320
C *****CLAN4330
C *****CLAN4340
C *****CLAN4350
C *****CLAN4360
C *****CLAN4370
C *****CLAN4380
C *****CLAN4390
C *****CLAN4400
C *****CLAN4410
C *****CLAN4420
C *****CLAN4430
C *****CLAN4440
C *****CLAN4450
C *****CLAN4460
C *****CLAN4470
C *****CLAN4480
C *****CLAN4490
C *****CLAN4500
C *****CLAN4510
C *****CLAN4520
C *****CLAN4530
C *****CLAN4540
C *****CLAN4550
C *****CLAN4560
C *****CLAN4570
C *****CLAN4580
C *****CLAN4590

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18A2 6 CLEVELAND/'00',T5,6(' '),T15,21(' '),T46,24(' '),T76,21(' '),CLAN#600
 1 T60,25(' ') CLAN#610
 516 FORMAT('MASTER RECORDS') CLAN#620
 518 FORMAT(T1,'1','SINCE CARDS ARE NOT IDENTIFIED AND MAY GET OUT OF OCLAN#630
 1800 ***** S A V E T H I S L I S T *****',/T1,' ',131(' '),/) CLAN#640
 520 FORMAT('0',212,T4,844) CLAN#650
 522 FORMAT(' ',8F10.2) CLAN#660
 524 FORMAT(T1,'1 CITY-',I2,'15,STATE-',I2,T24,'REGION-',I4,
 1 T60,844,/T1,' ',T50,'C R A P ? L A B O R R A T E S',/T1,' ',CLAN#680
 1T50,32(' '),/T1,' BLDG HEAVY BRICK CAPPEN- STROCT. PLAST- CLAN#690
 1ELECT. STEAM OPERATING TRACTOR OPRTERS CRANE AIR CNP TRUCK 2CLAN#700
 1OILER OTHER YEAR',/T1,' LABOR LABOR LAYER TER 1800 SER CLAN#710
 1ERER WORKER FITTER ENGINEER SHALL LARGE OPERATOR OPERATOR CLAN#720
 1800SER HAPER CHAPTS ',/T1,' ',T2,131(' ')) CLAN#730
 526 FORMAT(T1,' ',T2,16(P5.2,3K),P4.1) CLAN#740
 528 FORMAT(T1,'1 CITY-',I2,T15,'STATE-',I2,T24,'REGION-',I4,
 1 T60,844,/T1,' ',T50,'H A ? E R I A L C O S T S',/T1,' ',CLAN#760
 1T50,27(' ') CLAN#770
 1),/T1,' CHANNEL BEAMS I-BEAMS SIDE-PLANGE BEAMS REINTOCLAN#780
 1RCING BARS READY-MIX CONCRETE PLYFORM LUMBER LAMB YEAR',CLAN#790
 1/T1,' ',T2,'31(' ') CLAN#800
 530 FORMAT(T1,' ',T7,P6.2,T23,P7.2,T40,P5.2,T50,P6.2,T70,P6.2,T92,P6.2CLAN#810
 1,T104,P6.2,T112,P6.1,T120,P6.1) CLAN#820
 532 FORMAT(1W ,T4,P7.2,T20,P6.2,T50,P6.2,T80,P6.2,T114,P6.2) CLAN#830
 END CLAN#840

Appendix C

CONCEPT-5 PROGRAM LISTING

C	-----	MAIN	10
C		MAIN	20
C	- C O N C E P T -	MAIN	30
C	COMPUTERIZED CONCEPTUAL COST ESTIMATE	MAIN	40
C	FOR STEAM/ELECTRIC POWER PLANTS	MAIN	50
C		MAIN	60
C	PHASE 5	MAIN	70
C	-----	MAIN	80
C		MAIN	90
C		MAIN	100
C	BY: R. C. DELCIEZ	MAIN	110
C	R. J. BARNARD	MAIN	120
C		MAIN	130
C	COMPUTING APPLICATIONS	MAIN	140
C	DEPARTMENT	MAIN	150
C	COMPUTER SCIENCES DIVISION	MAIN	160
C	K-25 SITE	MAIN	170
C	UNION CARBIDE CORP.	MAIN	180
C	OAK RIDGE, TENN. 37830	MAIN	190
C		MAIN	200
C	MODIFIED BY: C. R. HUDSON	MAIN	210
C	DATE: OCTOBER 1977	MAIN	220
C		MAIN	230
C	ENGINEERING ANALYSIS SECTION	MAIN	240
C	ENGINEERING TECHNOLOGY DIVISION	MAIN	250
C	OAK RIDGE NATIONAL LABORATORY	MAIN	260
C	OAK RIDGE, TN. 37830	MAIN	270
C		MAIN	280
C	THE CONCEPT COMPUTER CODE PACKAGE PROVIDES CONCEPTUAL	MAIN	290
C	CAPITAL COST ESTIMATE FOR NUCLEAR AND FOSSIL-FUELED POWER	MAIN	300
C	PLANTS. COST ESTIMATES ARE MADE AS A FUNCTION OF PLANT TYPE,	MAIN	310
C	SIZE, LOCATION, AND DATE OF CONSTRUCTION AND OPERATION.	MAIN	320
C	OUTPUT INCLUDES A DETAILED BREAKDOWN OF THE ESTIMATE INTO	MAIN	330
C	DIRECT AND INDIRECT COSTS ACCORDING TO THE U.S.A.E.C.	MAIN	340
C	ACCOUNTING SYSTEM DESCRIBED IN DOCUMENT NUS-531.	MAIN	350
C	COST MODELS CURRENTLY AVAILABLE ARE:	MAIN	360
C	INITIAL- AND ADDITIONAL-UNIT MODELS FOR MIXED MULTI-UNIT POWER	MAIN	370
C	PLANTS. NUCLEAR PLANTS INCLUDE PRESSURIZED AND BOILING WATER	MAIN	380
C	REACTORS. FOSSIL PLANTS INCLUDE COAL-FIRED UNITS	MAIN	390
C	WITH AND WITHOUT SULFUR REMOVAL SYSTEMS.	MAIN	400
C		MAIN	410
C	-----	MAIN	420
C		MAIN	430
C	THIS WORK WAS PERFORMED BY MEMBERS OF THE ENGINEERING	MAIN	440
C	ANALYSIS SECTION OF THE OAK RIDGE NATIONAL LABORATORY	MAIN	450
C	ENGINEERING TECHNOLOGY DIVISION AND THE	MAIN	460
C	COMPUTING APPLICATIONS DEPARTMENT, K-25 SITE, OF THE	MAIN	470
C	COMPUTER SCIENCES DIVISION	MAIN	480
C		MAIN	490
C		MAIN	500
C	PROGRAM DOCUMENTATION:	MAIN	510
C	CONCEPT-5 USER'S MANUAL (ORNL-5470)	MAIN	520
C		MAIN	530
C	-----	MAIN	540
C	PEARL AC2, AC3, AC4, AC5, CITY, DATE, LOC	MAIN	550
C	REAL * 8 TYPE(2), TYPE1(2), LOCIN(4), SPACE	MAIN	560
C	DIMENSION ICARD(80), CH(50), CH1(50), CX(50)	MAIN	570
C	DIMENSION CSX(4,400), CXX(4,180), CXH(4,60), C2X(4,12), C2CX(4,12)	MAIN	580
C	DIMENSION C2TX(4,12), HNSX(7)	MAIN	590
C	DIMENSION CHD(50), CHDS(50), TCONB(50)	MAIN	600
C	DATA ICON /'C'/, IAREND /'END'/, SPACE/'	MAIN	610
C	CONNOB/NDHAIN/ ISTSIG	MAIN	620
C	CONNOB /NOT/DICI, ESCI	MAIN	630
C	CONNOB / PORN /	MAIN	640
C	1 TYPE, TYPE1, LOCIN, AC2(8,12), AC3(8,60), AC4(8,180),	MAIN	650
C	1 AC5(8,320), DATE, D(3,380), TITLE(20),	MAIN	660
C	1 IAR1, IAR2(5), IAR3(15), IAR4(60), IAR5(180), IST, IGO,	MAIN	670
C	1 MIN, NOT, ID1, ID2, ID3, ICON, CONO, LANA, ISDJ(3)	MAIN	680
C	CONNOB / PROG /	MAIN	690
C	1 LOC(3), CITY(25), CPCA(12,50), YPSS, YPER, YRCOP, INN,	MAIN	700

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1 HUE, IDS                                HAIN 640
COMMON / OUT /                             HAIN 650
1 HUE, C2(4,12), C3(4,60), C4(4,130), C5(4,400), C2C(4,12), HAIN 660
1 C2C(4,12), ESCL, SPNC, SSNC, SCNT, STDC, TIC, HAIN 670
1 TDA, HNS(7), HHNS, IAC, YPG, H2 HAIN 680
COMMON / HAINL / HAIN 690
1 ARB(12), ALB(12), ANB(12), APC(12,50), ALS(12,50), HAIN 700
1 ANS(12,50), BPC(12,50), BLS(12,50), BNS(12,50), APC(12), HAIN 710
1 BPC(12), YES(50), AA(3,12), CCB(12), COS(12), CONTL(12), HAIN 720
1 CONTH(12), CONTE(12), DEOT(12), PACS1(12,16), PACS2(12,16), HAIN 730
1 PACS3(12,8), RIB, RIBA, RINT(50), PO, YDC, YFIRST, YLAST, HAIN 740
1 FILS(20), FACE(3,12), ANAW, ANAUD, NU, ISITE(20), UNHSL, HAIN 750
1 OTP(12), OTPP(12), OVERS(12), HNT, HNP(12), HWI(12) HAIN 760
HAINLIST /CONOPT/ HAIN 770
1 AA, BPC, BPC, CCB, COS, CONTL, CONTH, CONTE, DEOT, OTP, HAIN 780
1 PACS1, PACS2, PACS3, FILS, ISITE, OVERS, RINT, YFIRST, HAIN 790
1 YLAST, NU, ANAW, CPKA, D, HWI HAIN 800
INTEGER CONO HAIN 810
INTEGER WANT(9)/2,1,7*0/ HAIN 820
CALL IDAY (DATE) HAIN 830
ISBJ(1) = 1 HAIN 840
ISBJ(2) = 1 HAIN 850
ISBJ(3) = 2 HAIN 860
ICOB = 2 HAIN 870
ID1 = 3 HAIN 880
ID3 = 4 HAIN 890
HIN = 5 HAIN 900
HOUT = 6 HAIN 910
LANA = 8 HAIN 920
CONO = 9 HAIN 930
ID2 = 11 HAIN 940
INN = 50 HAIN 950
C |=====| HAIN 960
C | HAIN 970
C | READ AND LIST ALL INPUT DATA PRIOR TO PROCESSING HAIN 980
C | HAIN 990
C |=====| HAIN 1000
2 READ(WIN,506,EUB=4) ICARD HAIN 1010
WRITE(WOUT,508) ICARD HAIN 1020
GO TO 2 HAIN 1030
4 PERIOD HIN HAIN 1040
C |=====| HAIN 1050
C | HAIN 1060
C | SEARCH AND LIST ALL COST MODELS AND ALL CITY LABOR, EQUIPMENT, HAIN 1070
C | AND MATERIALS COST HISTORIES. HAIN 1080
C | HAIN 1090
C |=====| HAIN 1100
CALL SCAN HAIN 1110
WRITE(WOUT,504) HAIN 1120
C |=====| HAIN 1130
C | HAIN 1140
C | BEGIN THE INITIAL LOOP THROUGH THE PROGRAM HAIN 1150
C | HAIN 1160
C |=====| HAIN 1170
10 CONTINUE HAIN 1180
DO 12 I = 1,INN HAIN 1190
CH1(I) = 0.0 HAIN 1200
IF(I .LE. 20) FILS(I) = 0. HAIN 1210
IF(I .LE. 20) ISITE(I) = 0 HAIN 1220
12 CONTINUE HAIN 1230
FILS(1) = 1.0 HAIN 1240
IBIN = 0 HAIN 1250
ISTSIG = 0 HAIN 1260
IPG = 0 HAIN 1270
IAC = 1 HAIN 1280
IGO = 1 HAIN 1290

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IS      = 1                                MAIN1300
IST = 0                                MAIN1310
YPS     = 9999.0                          MAIN1320
YPS     = 0000.0                          MAIN1330
REWIND ID2                                MAIN1340
C |-----| MAIN1350
C | CONTINUATION LOOP THROUGH MAIN PROGRAM FOR MULTI-UNIT PLANTS | MAIN1360
C |-----| MAIN1370
C |-----| MAIN1380
C |-----| MAIN1390
16 CONTINUE                                MAIN1400
DO 14 I = 1,12                             MAIN1410
APC(I) = 1.0                             MAIN1420
BPC(I) = 0.0                             MAIN1430
IF (I.LE.4) OTP(I) = 2.0                 MAIN1440
IF (I.GT.4) OTP(I) = 1.5                 MAIN1450
OVERS(I) = 0.0                           MAIN1460
DEOT(I) = 0.01                           MAIN1470
COS(I) = 0.0                             MAIN1480
MWI(I) = 40.0                            MAIN1490
CONTE(I) = 10.0                          MAIN1500
CONTL(I) = 10.0                          MAIN1510
CONTH(I) = 10.0                          MAIN1520
14 CONTINUE                                MAIN1530
CONTE(I) = 0.0                            MAIN1540
CONTL(I) = 0.0                            MAIN1550
CONTH(I) = 0.0                            MAIN1560
YFIRST = 1961.5                           MAIN1570
YLAST = 2000.0                            MAIN1580
ANNU = 6.0                                MAIN1590
NW = 40.0                                MAIN1600
DO 15 I=1,NW                               MAIN1610
RIWT(I) = .08                             MAIN1620
15 CONTINUE                                MAIN1630
WRITE(ROUT,504)                            MAIN1640
16 READ(RIN,506,END=82) ICARD              MAIN1650
IF (ICARD(1).NE.ICON) GO TO 20            MAIN1660
WRITE(ROUT,508) ICARD                     MAIN1670
C |-----| MAIN1680
C |-----| MAIN1690
C | COMMENTS PRINTED BUT NOT STORED ON ANY DEVICE | MAIN1700
C |-----| MAIN1710
C |-----| MAIN1720
GO TO 18                                MAIN1730
20 REWIND ID1                              MAIN1740
C |-----| MAIN1750
C |-----| MAIN1760
C | SELECTION CARDS STORED ON ID1 | MAIN1770
C |-----| MAIN1780
C |-----| MAIN1790
WRITE(IE1,506) ICARD                      MAIN1800
REWIND IE1                                MAIN1810
C |-----| MAIN1820
C |-----| MAIN1830
C |-----| MAIN1840
C | DESCRIPTION OF STANDARD INPUT CARD. | MAIN1850
C |-----| MAIN1860
C |-----| MAIN1870
C |-----| MAIN1880
C | COLUMNS VARIABLE FUNCTION AND FORMAT | MAIN1890
C |-----| MAIN1900
C | 1-4 NWE NOMINAL MEGAWATT'S OUTPUT OF THE PLANT UNIT | MAIN1910
C | 6-13 TYPE POWER PLANT SYSTEM TYPE, AS FORMAT | MAIN1920
C | 15-30 LOC(I),I=1,2 CITY, BEGIN IN COLUMN 15. | MAIN1930
C | 32-39 LOC(I),I=1 EXTRA IDENTIFICATION BEGIN IN COLUMN 32. | MAIN1940
C | 41-47 YRSSS DATE S. S. S. PURCHASED : P7.3 | MAIN1950

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C	48-58	YRPER	DATE CONSTRUCTION PERMIT ISSUED: P7.3	MAIN1960
C	55-61	YRCOP	DATE OF COMMERCIAL OPERATION : P7.3	MAIN1970
C	62-66	RTB	INTEREST DURING CONSTRUCTION IN %, (P5.3)	MAIN1980
C	68	ILAZ	NAMELIST DATA NEITHER SAVED NOR RETRIEVED	MAIN1990
C		IF = 0	FLAG FOR STORING CONOPT DATA FOR REPETITIVE USE OF DATA FROM THE ICON FILE	MAIN2000
C		IF = 1	FOR SIMILAR PROBLEMS.	MAIN2010
C			PERMITS READING ONLY PREVIOUSLY STORED CONOPT REPETITIVE DATA.	MAIN2020
C		IF = 2		MAIN2030
C				MAIN2040
C				MAIN2050
C				MAIN2060
C				MAIN2070
C				MAIN2080
C				MAIN2090
C				MAIN2100
C				MAIN2110
C				MAIN2120
C				MAIN2130
C				MAIN2140
C				MAIN2150
C				MAIN2160
C				MAIN2170
C				MAIN2180
C				MAIN2190
C				MAIN2200
C				MAIN2210
C				MAIN2220
C				MAIN2230
C				MAIN2240
C				MAIN2250
C				MAIN2260
C				MAIN2270
C				MAIN2280
C				MAIN2290
C				MAIN2300
C				MAIN2310
C				MAIN2320
C				MAIN2330
C				MAIN2340
C				MAIN2350
C				MAIN2360
C				MAIN2370
C				MAIN2380
C				MAIN2390
C				MAIN2400
C				MAIN2410
C				MAIN2420
C				MAIN2430
C				MAIN2440
C				MAIN2450
C				MAIN2460
C				MAIN2470
C				MAIN2480
C				MAIN2490
C				MAIN2500
C				MAIN2510
C				MAIN2520
C				MAIN2530
C				MAIN2540
C				MAIN2550
C				MAIN2560
C				MAIN2570
C				MAIN2580
C				MAIN2590
C				MAIN2600
C				MAIN2610

*** NO OTHER CONOPT DATA WILL BE ACCEPTED WHEN ILAZ = 2 ***

IF = 3 REPETITIVE CONOPT DATA IS READ IN FROM
ICON FILE AND THEN PROGRAM EXPECTS OVER-
RIDING OR SUPPLEMENTAL CONOPT DATA INPUT

N.B. ICON FILE (CONTROLLED BY ILAZ), IF PERMITTED BY
IPLAG CONTROLS IS ALWAYS READ FIRST SO VARIABLES
STORED ON ID1 (CONTROLLED BY IPLAG) MAY BE READ
LAST AND OVER-RIDE TEMPORARILY DATA FROM ICON.
THIS LEAVES ICON INTACT FOR FURTHER USE BUT
PERMITS FLEXIBILITY IN ALTERING VARIABLES
INTERMITTENTLY DURING A DATA RUN.
ICON FILE IS WRITTEN ONLY WHEN ILAZ = 1 BUT IS NOT
READ AT ALL WHEN CONTROL IS SET FOR WRITING.

70 IPLAG FLAG FOR OPTIONAL NAMELIST INPUT; CALLS MADE

0 - NO NAMELIST CALLS MADE

1 - PERMITS CHANGING YFIRST AND YLAST PRIOR TO THE
ANALYSIS OF HISTORICAL EQUIP. LABOR AND MATLS.
COST DATA AND PERMITS OVERRIDING ALL NAMELIST
VARIABLES PRIOR TO THE DETAILED COST
CALCULATIONS.

2 - PERMITS OVERRIDING CALCULATED COSTS, ONLY, 1
AFTER ESCALATION TO YEAR OF PURCHASE OF \$\$\$ IF
IESC=0 OR 2; AND PERMITS OVERRIDING CALCULATED
COSTS, ONLY, AFTER ESCALATION TO COMMERCIAL
OPERATION IF IESC = 1.

3 - THE FIRST NAMELIST CALL IS IDENTICAL TO FLAG=1 2
AND THE SECOND IS IDENTICAL TO IPLAG=2.

72 IOF OUTPUT FLAG; 0 = 2-DIGIT SUMMARY PAGE
1 = 2-DIGIT SUMMARY & CASH FLOW INFO.
2 = DETAILED ACCOUNT BREAKDOWN

74 IESC FLAG FOR ESCALATION DURING CONSTRUCTION;
0 = ESCALATION STATED SEPARATELY
1 = ESCALATION INCLUDED IMPLICITLY
2 = NO ESCALATION

76 IBS FLAG USED TO CHANGE ESCALATION AS A
FUNCTION OF TIME BY CALL TO THE
INDUSE SUBROUTINE.
0 - INOPERATIVE
1 - ESCALATION DATA EXPECTED IN INPUT.
2 - RETRIEVE DATA USED WHEN IBS WAS 1

78 IAC FLAG USED TO COMPUTE TYPE OF INTEREST
0 - STRAIGHT INTEREST
1 - COMPOUND INTEREST

	80	ISTACK	NUMBER OF UNITS TO BE CONSIDERED ONE	PLANT SITE.	
C					HAIR2620
C					HAIR2630
C					HAIR2640
C					HAIR2650
C		*****			HAIR2660
C		*****			HAIR2670
C					HAIR2680
C		SELECTION DATA CARD READ BACK INTO CORE			HAIR2690
C					HAIR2700
C		*****			HAIR2710
		READ(ID1,510) HWE,TYPE(1),(LOC(I), I=1,3),YRSSS,YRPER,YRCOP,RIB,			HAIR2720
		1ILAZ,IPLAG,IOP, IESC,IBS,IAC,ISTACK			HAIR2730
		IWANT = WANT(IESC + 1)			HAIR2740
		RIBA = RIB			HAIR2750
		WRITE(BCUT,512)			HAIR2760
		WRITE(BCUT,514)HWE,TYPE(1),(LOC(I),I=1,3),YRSSS,YRPER,YRCOP,RIBA,			HAIR2770
		1ILAZ,IPLAG,IOP, IESC,IBS,IAC,ISTACK			HAIR2780
		TYPE(2) = SPACE			HAIR2790
		IF (YRS.GT.YRSSS) YRS = YRSSS			HAIR2800
		IF (YRP.LT.YRCOP) YRE = YRCOP			HAIR2810
		REWIND ICON			HAIR2820
		REWIND ID1			HAIR2830
		RIB = RIB / 100.0			HAIR2840
		IF (RIB.LE.0.) GO TO 22			HAIR2850
		DO 21 I=1,INH			HAIR2860
		21 PRINT(I) = RIB			HAIR2870
C		*****			HAIR2880
C					HAIR2890
C		READY TO PICK UP CONOPT DATA DEPENDING ON IPLAG VALUE 0 THRU 3			HAIR2900
C					HAIR2910
C		*****			HAIR2920
		22 IF (IPLAG.EQ.0) GO TO 40			HAIR2930
		IF (ILAZ.EQ.2) GO TO 28			HAIR2940
		IPE = ISDJ(IPLAG)			HAIR2950
		DO 26 IJK = 1,INE			HAIR2960
C		*****			HAIR2970
C					HAIR2980
C		READ ADDITIONAL CARDS DEPENDING ON IPLAG > 0			HAIR2990
C					HAIR3000
C		*****			HAIR3010
		24 READ(WIN,516) (ICARD(KK),KK=1,20)			HAIR3020
		WRITE(BCUT,518) (ICARD(KK),KK=1,20)			HAIR3030
		WRITE(ID1,516) (ICARD(KK),KK=1,20)			HAIR3040
		IF (ILAZ.EQ.1) WRITE(ICON,516) (ICARD(KK),KK=1,20)			HAIR3050
		IF (ICARD(1).NE.IAEND) GO TO 24			HAIR3060
C		*****			HAIR3070
C					HAIR3080
C		FIRST GROUP OF CONOPT STORED ON ID1 AND ICON FOR REPETITIVE READ			HAIR3090
C					HAIR3100
C		*****			HAIR3110
		26 CONTINUE			HAIR3120
		28 CONTINUE			HAIR3130
		REWIND ID1			HAIR3140
		REWIND ICON			HAIR3150
		IF (ILAZ.EQ.0) GO TO 40			HAIR3160
		WRITE(BCUT,500)			HAIR3170
C		*****			HAIR3180
C					HAIR3190
C		READ ICON TO LIST REPETITIVE CONOPT DATA WITH EACH PROBLEM			HAIR3200
C					HAIR3210
C		*****			HAIR3220
		30 READ(ICON,516,END=32) (ICARD(KK),KK=1,20)			HAIR3230
		WRITE(BCUT,518) (ICARD(KK),KK=1,20)			HAIR3240
		GO TO 30			HAIR3250
		32 REWIND ICON			HAIR3260
		IF (ILAZ.EQ.3) GO TO 34			HAIR3270

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      GO TO 40
      34 WRITE (NCUT,502)
C |=====
C |
C | READ IC1 TO LIST THE OVER-RIDING CONCEPT DATA WITH EACH PROBLEM
C |=====
C |
      36 READ (IC1,516,END=38) (ICAPD(KK),KK=1,20)
      WRITE (WOUT,518) (ICARD(KK),KK=1,20)
      GO TO 36
      39 REWIND ID1
      40 CONTINUE
          IST = IST+1
          CALL HEADS (DATE,IST,NUE,TYPE,LOC,YRSSS,YPPER,YRCOP,IWANT,
1 WOUT,IPG)
          IST = IST-1
          ESCL = 0.
          IWANTS = IWANT
          IP (IWANT.EQ.2) IWANTS = -1
          KONTBL = 1
          CALL CCST (-IWANTS,IPLAG,KONTBL,ILAZ)
          IST = IST + 1
          DO 35 I=1,INH
              CH(I) = 0.
      35 CH(I) = 0.
          CHT = 0.
          IF (IWANT.EQ.0) GO TO 42
          DO 39 I=2,INH
              Y1D = YES(I)
              CHE=0.
              DO 37 J=1,N2
                  CFPAT = CPCA(J+1,I) - CPCA(J+1,I-1)
              DO 37 K=1,3
                  CFPAC = CFPAT/CLAB(J,K,YRSSS)
                  CHE = CHE + CFPAC*CLAB(J,K,Y1D)*C2T(K,J)/PACE(K,J)
      37 CONTINUE
          CH(I) = CHE + CHT
          CHT = CH(I)
      39 CONTINUE
          GO TO 43
      42 DO 41 I=2,INH
          CHE=0.
          DO 49 J=1,N2
              CFPAC = CPCA(J+1,I) - CPCA(J+1,I-1)
          DO 49 K=1,3
              CHE = CHE + CFPAC*C2T(K,J)
      49 CONTINUE
          CH(I) = CHE + CHT
          CHT = CH(I)
      41 CONTINUE
      43 RIBA = 0.
          RUCH = 0.
          DO 48 J=1,INH
              RIBA = RIBA + RIWT(J)*CH(J)
              RUCH = RUCH + CH(J)
      48 CONTINUE
          RIBA = RIBA/RUCH*100.
          IF (IWANT.LT.2) CALL DELIN(RIWT,CH,CPCA,YRSSS,YRCOP,DIDCI,INH,IAC)
          IF (IWANT.LT.2) GO TO 44
C |=====
C |
C | BREAK OUT ESCALATION
C |=====
C |
          IWANTS = 0
          SVIC = TDA

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      HAI W3280
      HAI W3290
      HAI W3300
      HAI W3310
      HAI W3320
      HAI W3330
      HAI W3340
      HAI W3350
      HAI W3360
      HAI W3370
      HAI W3380
      HAI W3390
      HAI W3400
      HAI W3410
      HAI W3420
      HAI W3430
      HAI W3440
      HAI W3450
      HAI W3460
      HAI W3470
      HAI W3480
      HAI W3490
      HAI W3500
      HAI W3510
      HAI W3520
      HAI W3530
      HAI W3540
      HAI W3550
      HAI W3560
      HAI W3570
      HAI W3580
      HAI W3590
      HAI W3600
      HAI W3610
      HAI W3620
      HAI W3630
      HAI W3640
      HAI W3650
      HAI W3660
      HAI W3670
      HAI W3680
      HAI W3690
      HAI W3700
      HAI W3710
      HAI W3720
      HAI W3730
      HAI W3740
      HAI W3750
      HAI W3760
      HAI W3770
      HAI W3780
      HAI W3790
      HAI W3800
      HAI W3810
      HAI W3820
      HAI W3830
      HAI W3840
      HAI W3850
      HAI W3860
      HAI W3870
      HAI W3880
      HAI W3890
      HAI W3900
      HAI W3910
      HAI W3920
      HAI W3930

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      KONTRL = 2
      CALL CCST(IWANTS,IFLAG,KONTRL,ILAZ)
      ESCLD = SVIC - TDA
      CHT=0.
      DO 47 I=2,INH
      CHE = 0.
      DO 45 J=1,N2
      CPPAC = CPCA(J+1,I) - CPCA(J+1,I-1)
      DO 45 K=1,3
      CHE = CHE + CPPAC*C2T(K,J)
45 CONTINUE
      CHU(I) = CHE + CHT
      CHT = CHU(I)
47 CONTINUE
      DO 46 I=1,INH
      CHES(I) = CH(I) - CHU(I)
46 CONTINUE
      CALL DELIN(RINT,CHES,CPCA,YRSSS,YRCOP,ESCI,INH,IAC)
      CALL DELIN(RINT,CHU,CPCA,YRSSS,YRCOP,DIDCI,INH,IAC)
      DO 50 I=1,INH
      CH(I) = CHES(I) + CHU(I)
50 CONTINUE
C |=====|
C |
C | WRITE OUTPUT FOR A SINGLE UNIT
C |
C |=====|
C | CALL OUTPUT(IOP,IWANT,ESCLD)
C |=====|
C |
C | GENERATE PROJECT CASH FLOW
C |
C |=====|
      IF (IOP.EQ.0) GO TO 54
      CALL TAILS(DATE,IST,NWE,TYPE,LOC,YRSSS,YRPER,YRCOP,IWANT,
1 NOUT,IFG)
      CALL PLOT(YRSSS,YRCOP,CH,INH)
      CALL TAILS(DATE,IST,NWE,TYPE,LOC,YRSSS,YRPER,YRCOP,IWANT,
1 NOUT,IPG)
      DO 55 I=1,INH
55 CX(I) = CH(I)/1000.
      WRITE(NOUT,520)
      WRITE(NOUT,522) (YES(I),CX(I),I=1,INH)
      WRITE(NOUT,504)
54 CONTINUE
      IF (ISTACK.EQ.1) GO TO 10
      CALL ADYR(YES,YCONB,CH,CH1,YRS,YRE,CPCA,INH,IBIN)
      IBIN = 1
      IF (ISTACK.GT.1) IS = ISTACK - 1
      IGO = IGO - 1 + ISTACK
      IF (IGC.GT.1) WRITE(ID2) C5,C4,C3,C2,C2C,C2T,NHS,MNHS,SPHC,SSLC,
1 SSHC,NWE,ESCLD,SCONT,TIC,DIDCI,ESCI
      IF (IGO.GT.1) GO TO 16
      REWIND ID2
      DO 56 II = 1,IS
      READ(ID2) C5X,C4X,C3X,C2X,C2CX,C2TX,MHSX,MNHSX,SPHCX,SSLCX,
1 SSHCX,NWEX,ESCLDX,SCONTX,TICX,DIDCIX,ESCI
      DO 57 J = 1,N2
      DO 58 I = 1,4
      C2(I,J) = C2(I,J) + C2X(I,J)
      C2C(I,J) = C2C(I,J) + C2CX(I,J)
      C2T(I,J) = C2T(I,J) + C2TX(I,J)
58 CONTINUE
      IF (J.IT.8) NHS(J) = NHS(J) + MHSX(J)
57 CONTINUE
      MNHS = MNHS + MNHSX
      HAIN3940
      HAIN3950
      HAIN3960
      HAIN3970
      HAIN3980
      HAIN3990
      HAIN4000
      HAIN4010
      HAIN4020
      HAIN4030
      HAIN4040
      HAIN4050
      HAIN4060
      HAIN4070
      HAIN4080
      HAIN4090
      HAIN4100
      HAIN4110
      HAIN4120
      HAIN4130
      HAIN4140
      HAIN4150
      HAIN4160
      HAIN4170
      HAIN4180
      HAIN4190
      HAIN4200
      HAIN4210
      HAIN4220
      HAIN4230
      HAIN4240
      HAIN4250
      HAIN4260
      HAIN4270
      HAIN4280
      HAIN4290
      HAIN4300
      HAIN4310
      HAIN4320
      HAIN4330
      HAIN4340
      HAIN4350
      HAIN4360
      HAIN4370
      HAIN4380
      HAIN4390
      HAIN4400
      HAIN4410
      HAIN4420
      HAIN4430
      HAIN4440
      HAIN4450
      HAIN4460
      HAIN4470
      HAIN4480
      HAIN4490
      HAIN4500
      HAIN4510
      HAIN4520
      HAIN4530
      HAIN4540
      HAIN4550
      HAIN4560
      HAIN4570
      HAIN4580
      HAIN4590

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SPRC = SPRC + SPRCX
SSLC = SSLC + SSLCX
SSMC = SSPC + SSMCX
HWE = HWE + HWEK
ESCLD = ESCLD + ESCLDX
SCOUT = SCOUT + SCOUTX
TIC = TIC + TICK
DIDCI = DIDCI + DIDCIX
ESCI = ESCI + ESCIX
IF (IOF.LT.2) GO TO 56
DO 59 I=1,8
DO 60 J = 1,400
60 C5(I,J) = C5(I,J) + C5X(I,J)
DO 61 J=1,180
61 C4(I,J) = C4(I,J) + C4X(I,J)
DO 62 J=1,60
62 C3(I,J) = C3(I,J) + C3X(I,J)
59 CONTINUE
56 CONTINUE
YRSSS = YRS
YRCOP = YRE
ISTSIG = 1
C |=====|
C |
C | WRITE OUTPUT FOR COMBINED UNITS
C |
C |=====|
C |
CALL OUTPUT(IOF,IWANT,ESCLD)
IF (IOF.EQ.0) GO TO 76
CALL TAILS (DATE,IST,HWE,TYPE,LOC,YRSSS,YRPER,YRCOP,IWANT,
1 WOUT,IPG)
CALL PLOT(YRSSS,YRCOP,CH1,INN)
CALL TAILS (DATE,IST,HWE,TYPE,LOC,YRSSS,YRPER,YRCOP,IWANT,
1 WOUT,IPG)
DO 70 I=1,INN
70 CX(I) = CH1(I)/1000.
WRITE(WOUT,520)
WRITE(WOUT,522) (YCONB(I),CX(I),I=1,INN)
WRITE(WOUT,504)
76 CONTINUE
C |=====|
C |
C | RETURN TO INITIAL PLANT PROGRAM LOOP START
C |
C |=====|
C |
GO TO 10
82 STO?
500 FORMAT ('0 LIST OF REPEATED CONOPT DATA FROM ICON FILE' /)
502 FORMAT ('0 LIST OF OVER-RIDING CONOPT DATA FROM ID1 FILE' /)
504 FORMAT ('1')
506 FORMAT (80A1)
508 FORMAT (' ',80A1 /)
510 FORMAT (I4,1X,A8,1X,2A8,1X,A8,1X,3F7.3,F5.3,7I2)
512 FORMAT ('0',T20,'DATA CARD COLUMNS USED'
1 /' ',T20,42(' ') /'0 1--4 6-----13 15-----30 32--
1--39 41-----47 48-----54 55-----61 62--66 68 70 72 74 76
1 78 80'
1 /' HWE MODEL',T22,'CITY',T35,'EXTRA ID YR'
1 SSS YR PER YR COP % INT ILAZ IFLAG IOF IESC IBS IAC
1 ISTACK' /)
514 FORMAT ('0',T3,I4,T9,A8,1.8,2A8,T35,A8,T44,F8.3,T53,F8.3,T62,F8.3,
1T71,F6.3,T80,I1,T86,I1,T92,I1,T97,I1,T103,I1,T108,I1,T115,I1)
516 FORMAT (1X,19A4,A3)
518 FORMAT (' ',T4,20A4)
520 FORMAT ('0',T46,'C O N T R I B U T I V E C A S H F L O W' /
1 '0',T32,'BOTH THE CASH FLOW CURVE SHOWN ABOVE AND THE FOLLOWING'

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1  'CASH FLOW TABLE'/' ',T32,'HAVE COSTS EXPRESSED AS TOTAL COST ' HAIN5260
1  'INCURRED TO DATE (INCLUDING INTEREST CHARGES TO DATE) .'/ HAIN5270
1  '0',T06,'DATE',T66,'COST TO DATE (BILLIONS OF DOLLARS)'/ HAIN5280
522 FORMAT(1H ,T04,P0.3,T75,P0.3) HAIN5290
END HAIN5300
SUBROUTINE SCAN SCAN 10
C |===== SCAN 20
C | SCAN SUBPROGRAM ITERIZES THE CONTENTS OF THE CONO FILE FOR ALL | SCAN 30
C | COST MODELS AND THE LANA FILE FOR ALL CITY NAMES | SCAN 40
C | ----- | SCAN 50
C | | SCAN 60
C | | SCAN 70
C | | SCAN 80
C | BY: N. J. BARWARD, MAY 1975 | SCAN 90
C | | SCAN 100
C |===== SCAN 110
REAL*8 AC2, AC3, AC4, AC5, CITY, DATE, LOC SCAN 120
REAL * 8 TYPE(2),TYPE1(2),LOCIN(4),IDD(300) SCAN 130
DIMENSION AT(36,8),BL(30,16),CNT(30,16),NAC(12) SCAN 140
COMMON / FORM / SCAN 150
1 TYPE, TYPE1, LOCIN, AC2(8,12), AC3(8,60), AC4(8,180), SCAN 160
1 AC5(8,320), DATE, D(3,380), TITLE(20), SCAN 170
1 IAR1, IAR2(5), IAR3(15), IAR4(60), IAR5(180), IST, IGO, SCAN 180
1 B1N, BOUT, ID1, ID2, ID3, ICON, CONO, LANA, IS9J(3) SCAN 190
COMMON / FROG / SCAN 200
1 LOC(3), CITY(25), CPCA(12,50), YRSSS, YRPER, YRCOP, INH, SCAN 210
1 HWE, IBS SCAN 220
COMMON / OUT / SCAN 230
1 BWE, C2(4,12), C3(4,60), C4(4,180), C5(4,420), C2C(4,12), SCAN 240
1 C2T(4,12), PSCL, SPHC, SSRC, SSLC, SCORT, STDC, TIC, SCAN 250
1 TDA, HNS(7), HHNS, IAC, IPG, W2 SCAN 260
COMMON / HATL / SCAN 270
1 AEB(12), ALB(12), AHB(12), APC(12,50), ALS(12,50), SCAN 280
1 ANS(12,50), BPC(12,50), BLS(12,50), BHS(12,50), APC(12), SCAN 290
1 BPC(12), YES(50), AA(3,12), COB(12), COS(12), CONTL(12), SCAN 300
1 COMTH(12), COMTE(12), DEOT(12), PACS1(12,16), PACS2(12,16), SCAN 310
1 PACS3(12,8), RIB, RIBA, RINT(50), PO, YDC, YFIRST, YLAST, SCAN 320
1 PILS(20), PACE(3,12), ANAN, ANANB, HW, ISITE(20), WUNSL, SCAN 330
1 OTP(12), OTPP(12), OVERS(12), HNT, HNP(12), HWI(12) SCAN 340
INTEGER CONC SCAN 350
REWIND CONO SCAN 360
REWIND LANA SCAN 370
IND8 = 0 SCAN 380
LIN = 0 SCAN 390
IND9 = 0 SCAN 400
WUNSL = 0 SCAN 410
WRITE(NOUT,500) SCAN 420
C |===== SCAN 430
C | SCAN 440
C | READ THE CONLAN PRODUCED LABOR EQUIP & HATL FILE "LANA" AND SCAN 450
C | STORE AND DISPLAY THE CITY NAMES AVAILABLE. SCAN 460
C | | SCAN 470
C |===== SCAN 480
DO 16 I = 1,100 SCAN 490
IF (IND8) 6,2,6 SCAN 500
2 READ(LANA,END=4)IB,IS,IT,LOCIN,AT,BL,CNT SCAN 510
CITY(I) = LOCIN(3) SCAN 520
WUNSL = WUNSL + 1 SCAN 530
GO TO 6 SCAN 540
4 IND8 = 1 SCAN 550
6 IF (IND9) 12,8,12 SCAN 560
C |===== SCAN 570
C | SCAN 580
C | READ THE CONLAN PRODUCED FILE "CONO" CONTAINING THE COST MODELS | SCAN 590
C | AND DISPLAY THE COST MODEL TYPES AVAILABLE. | SCAN 600
C | | SCAN 610

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C |=====|SCAN 620
  9 READ(CCP0,END=10)                                SCAN 630
  1  TYPE1, IDD, TITLE, YBC, BW2, AA, IAR1, IAR2, IAR3,  SCAN 640
  1  IAR4, IAR5, CPCA, PACS1, PACS2, PACS3, A2B,      SCAN 650
  1  A2B, ALB, D, AC2, AC3, AC4, AC5, PO, COB,       SCAN 660
  1  HWT, HWP, HAA, HIAR4, HIAR5, RCCD, BAC, IAC2,    SCAN 670
  1  IAC3, IAC4, IAC5                                SCAN 680
  GO TO 12                                             SCAN 690
10 IND9 = 1                                           SCAN 700
12 IF (INCB.GT.0.AND.IND9.GT.0) GO TO 18             SCAN 710
  LIN = LIN + 1                                       SCAN 720
  IF (LIN.LE.50) GO TO 14                             SCAN 730
  WRITE(ROUT,500)                                     SCAN 740
  LIN = 1                                             SCAN 750
14 IF (INDB.EQ.0.AND.IND9.EQ.0) WRITE(ROUT,502)      I,TYPE1 SCAN 760
121(1),TYPE1(2),I,CITY(I),LOCIN(4),LOCIN(1),LOCIN(2)  SCAN 770
  IF (INDB.EQ.0.AND.IND9.GT.0) WRITE(ROUT,504) I,CITY(I), LOCIN(4),LOSCAN 780
1CIN(1),LOCIN(2)                                     SCAN 790
  IF (INDB.GT.0.AND.IND9.EQ.0) WRITE(ROUT,506) I,TYPE1(1),TYPE1(2) SCAN 800
16 CONTINUE                                           SCAN 810
18 REWIND CONO                                         SCAN 820
  REWIND LANA                                         SCAN 830
  WRITE(ROUT,508)                                     SCAN 840
  RETURN                                             SCAN 850
500 FORMAT('1',T41,'CONCEPT PHASE 5 DATA SETS' SCAN 860
  1 '/'+'',T41,52(' ')/'0',T21,'POWER PLANT TYPE CO' SCAN 870
  1D E S',T84,'CITY NAME CODE S'/'+'',T21,43(' ')/T84,29{SCAN 880
  1'-'})//)                                           SCAN 890
502 FORMAT(' ',T32,I2,2(2X,A8),T81,I2,2(2X,2A8))    SCAN 900
504 FORMAT(' ',T81,I2,2(2X,2A8))                     SCAN 910
506 FORMAT(' ',T32,I2,2(2X,A8))                     SCAN 920
508 FORMAT('0',T41,' IF THE PLANT TYPE OR CITY SELECTED WAS NOT USSCAN 930
1ED'/' ',T41,'IN COMPUTATIONS, CHECK SPELLING AND FIELD JUSTIFICATISCAN 940
1OW'/' ',T41,'WITH THE AVAILABLE PLANT TYPE AND CITY NAME CODES') SCAN 950
  END                                             SCAN 960
  SUBROUTINE COST(IWANT,IPLAG,KONTBL,ILAZ)           COST 10
C |=====|COST 20
C | COST 30
C | THE COST SUBPROGRAM PROCESSES ONLY THE LOWEST LEVEL ACCOUNT |COST 40
C | IN A SYSTEM BY THE CONCEPT ALGORITHM.           |COST 50
C | ----- |COST 60
C | |COST 70
C | |COST 80
C | R. C. DE LOZIER AND R. J. BARNARD IN APRIL 1975 |COST 90
C | |COST 100
C | MODIFIED BY C. R. HUDSON IN OCTOBER 1977         |COST 110
C | |COST 120
C |=====|COST 130
C |=====|COST 140
C | LIST OF NOMENCLATURE |COST 150
C | VARIABLE |COST 160
C | NAME |COST 170
C | DESCRIPTION |COST 180
C |-----|COST 190
C | C2 | 2-DIGIT COST ACCOUNTS |COST 200
C | C3 | 3-DIGIT COST ACCOUNTS |COST 210
C | C4 | 4-DIGIT COST ACCOUNTS |COST 220
C | C5 | 5-DIGIT COST ACCOUNTS |COST 230
C | C2C | CONTINGENCY FOR 2-DIGIT ACCOUNTS |COST 240
C | C2T | TOTAL COSTS FOR 2-DIGIT ACCOUNTS |COST 250
C | SUBSCRIPTS FOR C ARRAYS |COST 260
C | 1 - FACTORY |COST 270
C | 2 - LABOR |COST 280
C | 3 - MATERIAL |COST 290
C | 4 - TOTAL OF FACTORY, LABOR AND MATERIAL |COST 300
C | CONTE(I) | EQUIP CONTINGENCY AS PERCENTAGE OF 2-DIGIT SUBTOTAL |COST 310

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C | CONTL(I)      LABOR CONTINGENCY AS PERCENTAGE OF 2-DIGIT SUBTOTAL |COST 320
C | CONTH(I)     HTL CONTINGENCY AS PERCENTAGE OF 2-DIGIT SUBTOTALS |COST 330
C | |                                                    |COST 340
C |=====|COST 350
  REAL * 8 TYPE(2),TYPE1(2),LOCIN(4)                                COST 360
  REAL*8 AC2, AC3, AC4, AC5, CITY, DATE, LOC                        COST 370
  DIMENSION BLSS(12),BHSS(12),BPCC(12),ALSS(12),AHSS(12),APCC(12)  COST 380
  DIMENSION PAD(3,12), OVER(12)                                    COST 390
  COMMON / PORN /                                                  COST 400
  1 TYPE, TYPE1, LOCIN, AC2(8,12), AC3(8,60), AC4(8,180),        COST 410
  1 AC5(8,320), DATE, D(3,380), TITLE(20),                       COST 420
  1 IAR1, IAR2(5), IAP3(15), IAP4(60), IAR5(180), IST, IGO,       COST 430
  1 MIN, MOUT, ID1, ID2, ID3, ICON, CONO, LANA, ISDJ(3)           COST 440
  COMMON / PROG /                                                  COST 450
  1 LOC(3), CITY(25), CPCA(12,50), YRSSS, YRPER, YRCOP, INH,      COST 460
  1 HWE, IBS                                                       COST 470
  COMMON / OUT /                                                  COST 480
  1 BWE, C2(4,12), C3(4,60), C4(4,180), C5(4,400), C2C(4,12),   COST 490
  1 C2T(4,12), ESCL, SPNC, SSNC, SSLC, SCOUT, STDC, TIC,          COST 500
  1 TDA, HNS(7), HHNS, IAC, IPG, W2                                COST 510
  COMMON / NAME /                                                  COST 520
  1 AEB(12), ALB(12), AHB(12), APC(12,50), ALS(12,50),           COST 530
  1 AHS(12,50), BPC(12,50), BLS(12,50), BHS(12,50), APC(12),     COST 540
  1 BPC(12), YES(50), AA(3,12), COB(12), COS(12), CONTL(12),     COST 550
  1 CONTH(12), CONTE(12), DEOT(12), PACS1(12,16), PACS2(12,16),  COST 560
  1 PACS3(12,8), RIB, RIBA, RINT(50), PO, YBC, YFIRST, YLAST,     COST 570
  1 PILS(20), PACE(3,12), ANAN, ANAH, HW, ISITE(20), MUMSL,      COST 580
  1 OTP(12), OTPP(12), OVERS(12), MHT, MHP(12), HWI(12)          COST 590
  NAMELIST /CONOPT/                                                COST 600
  1 AA, APC, BPC, COB, COS, CONTL, CONTH, CONTE, DEOT, OTP,      COST 610
  1 PACS1, PACS2, PACS3, PILS, ISITE, OVERS, RINT, YFIRST,        COST 620
  1 YLAST, HW, ANAN, CPCA, D, HWI                                  COST 630
  INTEGER CONO                                                       COST 640
  W2 = 0                                                            COST 650
  DO 4 I = 1,IAR1                                                    COST 660
  4 W2 = W2 + IAR2(I)                                                COST 670
  CALL MODLAN(KONTROL)                                              COST 680
  IF (IPLAG.EQ.0) GO TO 8                                           COST 690
  IF (IPLAG.EQ.2) GO TO 8                                           COST 700
C |=====|COST 710
C | |                                                    |COST 720
C | IF IPLAG = 1 READ CONOPT ONE TIME ONLY HERE                  |COST 730
C | IF IPLAG = 3 READ CONOPT FOR THE FIRST TIME HERE            |COST 740
C | |                                                    |COST 750
C |=====|COST 760
  IF (ILAZ.GT.1) READ(ICON,CONOPT,END=6)                            COST 770
  6 CONTINUE                                                         COST 780
  IF (ILAZ.EQ.2) GO TO 8                                             COST 790
  IF (IPLAG.EQ.2) READ(ID1,CONOPT,END=8)                            COST 800
  8 CONTINUE                                                         COST 810
  IF (KONTROL.EQ.2) GO TO 14                                         COST 820
  CALL CONIV(APCC,BPCC,ALSS,BLSS,AHSS,BHSS,ISITE,PACS1,PACS2,     COST 830
  1 PACS3,PILS,YFIRST,YLAST,YBC,W2,LANA)                           COST 840
  DO 12 JJ = 1,INH                                                  COST 850
  YES(JJ) = YRSSS + (CPCA(1,JJ) * (YRCOP-YRSSS))                   COST 860
  YTIME = YES(JJ) - YBC                                             COST 870
  DO 10 JI = 1,W2                                                  COST 880
  IF (BLSS(JI).LE.0.0) BLSS(JI) = 1.0                             COST 890
  IF (BHSS(JI).LE.0.0) BHSS(JI) = 1.0                             COST 900
  IF (BPCC(JI).LE.0.0) BPCC(JI) = 1.0                             COST 910
  ALS(JI,JJ) = ALSS(JI) * BLSS(JI) ** YTIME                       COST 920
  BLS(JI,JJ) = BLSS(JI)                                            COST 930
  AHS(JI,JJ) = AHSS(JI) * BHSS(JI) ** YTIME                       COST 940
  BHS(JI,JJ) = BHSS(JI)                                            COST 950
  APC(JI,JJ) = APCC(JI) * BPCC(JI) ** YTIME                       COST 960
  BPC(JI,JJ) = BPCC(JI)                                            COST 970

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10 CONTINUE
12 CONTINUE
   IF (IPS.GT.0) CALL      INDUSE (N2)
14 CONTINUE
   IWANT = IABS(IWANT)
   DO 18 I = 1,8
   DO 16 J = 1,400
   IF (J.LT.13) C2(I,J) = 0.0
   IF (J.LT.67) C3(I,J) = 0.0
   IF (J.LT.187) C4(I,J) = 0.0
   C5(I,J) = 0.0
16 CONTINUE
19 CONTINUE
   IF (HW.EQ.40.) GO TO 22
   DO 21 J=1,N2
   HWI(J) = HW
21 CONTINUE
22 DO 19 J=1,N2
   OVER(J) = 1.0 - DEOT(J) * (HWI(J) - 40.0)
   IF (OVERS(J).GT.C.001) OVER(J) = OVERS(J)
   OTTP(J) = (40. + OTF(J) * (HWI(J) - 40.1) / HWI(J)
19 CONTINUE
   DO 20 I = 1,3
   DO 20 J = 1,12
   PACE(I,J) = 1.0
   IF (IWANT.EQ.1) PACE(I,J)=0.
20 CONTINUE
   IF (IWANT.EQ.0) GO TO 30
   DO 28 K = 1,2
   DO 26 J = 1,N2
   DO 24 I = 2, INH
   YID = YRSSS + ((YRCOP - YRSSS) * CPCA(I,I))
   CYPAC = CPCA(J+1,I) - CPCA(J+1,I-1)
   CYPAC = CYPAC/CLAB(J,K,YRSSS)
   PACE(K,J) = PACE(K,J) + CLAB(J,K,YID) * CYPAC
24 CONTINUE
   IF (PACE(K,J).LE.0.) PACE(K,J) = 1.0
26 CONTINUE
28 CONTINUE
30 DO 52 I = 1,3
   IC = 1
   N32 = 0
   N42 = 0
   N52 = 0
   DO 50 I2 = 1,N2
   PRATIO = 1.0
   ORATIO = 1.0
   IF (I.NE.2) GO TO 32
   PRATIO = APC(I2) + BPC(I2) * (YRSSS - YBC)
   ORATIO = OTTP(I2) / OVER(I2) * (1. + COS(I2)) / (1. + COB(I2))
32 CONTINUE
   PAD(I,I2) = CLAB(I2,I,YRSSS)
C ;-----
C |
C | COST LEVELING FROM BASE POWER OUTPUT TO PROBLEM NEGAWATT LEVEL
C |
C |-----
C |
   PACH = 1.0
   PAC1 = AA(1,I2) + AA(2,I2) * (HWE/BWE) ** AA(3,I2)
   IF (AHAN.GT.0.) PACH = AHAN/AHAMB / PAC1 *HWP
   CONBP = PAC1*PAD(I,I2)/PRATIO*ORATIO
   IF (IAR3(I2).EQ.0) GO TO 46
   N31 = N32 + 1
   N32 = N31 + IAR3(I2) - 1
   DO 44 I3 = N31,N32
   IF (IAR4(I3).EQ.0) GO TO 42

```

```

COST 980
COST 990
COST1000
COST1010
COST1020
COST1030
COST1040
COST1050
COST1060
COST1070
COST1080
COST1090
COST1100
COST1110
COST1120
COST1130
COST1140
COST1150
COST1160
COST1170
COST1180
COST1190
COST1200
COST1210
COST1220
COST1230
COST1240
COST1250
COST1260
COST1270
COST1280
COST1290
COST1300
COST1310
COST1320
COST1330
COST1340
COST1350
COST1360
COST1370
COST1380
COST1390
COST1400
COST1410
COST1420
COST1430
COST1440
COST1450
COST1460
COST1470
COST1480
COST1490
COST1500
COST1510
COST1520
COST1530
COST1540
COST1550
COST1560
COST1570
COST1580
COST1590
COST1600
COST1610
COST1620
COST1630

```

```

      W41      = W42 + 1
      W42      = W41 + IAR4(I3) - 1
      DO 40 I4 = W41, W42
      IF (IAR5(I4).EQ.0) GO TO 38
      W51      = W52 + 1
      W52      = W51 + IAR5(I4) - 1
      DO 36 I5 = W51, W52
      D(I,IC) = D(I,IC) * COMBP
      IF (I.EQ.2.AND.ANAP.GT.0.) D(I,IC) = D(I,IC) * PACM
      IC = IC + 1
36  CONTINUE
      GO TO 40
38  CONTINUE
      D(I,IC) = D(I,IC) * COMBP
      IF (I.EQ.2.AND.ANAP.GT.0.) D(I,IC) = D(I,IC) * PACM
      IC = IC + 1
40  CONTINUE
      GO TO 44
42  CONTINUE
      D(I,IC) = D(I,IC) * COMBP
      IF (I.EQ.2.AND.ANAP.GT.0.) D(I,IC) = D(I,IC) * PACM
      IC = IC + 1
44  CONTINUE
      GO TO 48
46  CONTINUE
      D(I,IC) = D(I,IC) * COMBP
      IF (I.EQ.2.AND.ANAP.GT.0.) D(I,IC) = D(I,IC) * PACM
      IC = IC + 1
48  CONTINUE
50  CONTINUE
52  CONTINUE
      IF (IPLAG.LT.2) GO TO 62
=====
C 1 =====
C 1
C 1      IF IPLAG=2 READ CONOPT ONE TIME ONLY HERE
C 1      IF IPLAG = 3 READ CONOPT FOR THE SECOND TIME HERE
C 1
C 1 =====
      IF (ILAZ.GT.1) READ(ICON,CONOPT,END=60)
60  CONTINUE
      IF (ILAZ.EQ.2) GO TO 62
      READ(ID1,CONOPT,END=62)
62  CONTINUE
      REWIND ID1
      REWIND ICON
      DO 82 I = 1,3
      IC = 1
      W32 = 0
      W42 = 0
      W52 = 0
      DO 80 I2 = 1,W2
      IF (IAR3(I2).EQ.0) GO TO 74
      W31 = W32 + 1
      W32 = W31 + IAR3(I2) - 1
      DO 72 I3 = W31, W32
      IF (IAR4(I3).EQ.0) GO TO 70
      W41 = W42 + 1
      W42 = W41 + IAR4(I3) - 1
      DO 68 I4 = W41, W42
      IF (IAR5(I4).EQ.0) GO TO 66
      W51 = W52 + 1
      W52 = W51 + IAR5(I4) - 1
      DO 64 I5 = W51, W52
      C5(I,I5) = D(I,IC) * PACE(I,I2)
      IC = IC + 1
64  CONTINUE

```

COST1640
 COST1650
 COST1660
 COST1670
 COST1680
 COST1690
 COST1700
 COST1710
 COST1720
 COST1730
 COST1740
 COST1750
 COST1760
 COST1770
 COST1780
 COST1790
 COST1800
 COST1810
 COST1820
 COST1830
 COST1840
 COST1850
 COST1860
 COST1870
 COST1880
 COST1890
 COST1900
 COST1910
 COST1920
 COST1930
 COST1940
 COST1950
 COST1960
 COST1970
 COST1980
 COST1990
 COST2000
 COST2010
 COST2020
 COST2030
 COST2040
 COST2050
 COST2060
 COST2070
 COST2080
 COST2090
 COST2100
 COST2110
 COST2120
 COST2130
 COST2140
 COST2150
 COST2160
 COST2170
 COST2180
 COST2190
 COST2200
 COST2210
 COST2220
 COST2230
 COST2240
 COST2250
 COST2260
 COST2270
 COST2280
 COST2290

```

GO TO 68
66 CONTINUE
C4(I,I4) = D(I,IC) * FACE(I,I2)
IC = IC + 1
68 CONTINUE
GO TO 72
70 CONTINUE
C3(I,I3) = D(I,IC) * FACE(I,I2)
IC = IC + 1
72 CONTINUE
GO TO 76
74 CONTINUE
C2(I,I2) = D(I,IC) * FACE(I,I2)
IC = IC + 1
76 CONTINUE
80 CONTINUE
82 CONTINUE
CALL SUB(PAD)
RETURN
END
SUBROUTINE MODLAN (KONTROL)

C
C |=====|
C |
C |          BY P. J. BARNARD      NOV 1974
C |          -----
C |
C |-----|
C | MODLAN SUBPROGRAM CONTROLS THE ENTRY OF COST MODEL DATA FROM
C | THE CONO FILE AND THE LABOR EQUIP & NATL DATA FROM LANA FILE.
C | EACH FILE MUST BE SEARCHED FOR SPECIFIC DATA RECORDS THEN
C | PROCESSING CONTINUES WITH PROPER DATA IF FOUND OR THE LAST
C | RECORD ON EITHER FILE IS USED IF IMPROPER SELECTIONS HAVE BEEN
C | REQUESTED IN THE INPUT DATA CARDS.
C |=====|
C |
REAL*8 AC2, AC3, AC4, AC5, CITY, DATE, LOC
REAL * 8 TYPE(2),TYPE1(2),LOCIN(4),IDD(380)
DIMENSION AT(30,8),BL(30,16),CNT(30,16),MAC(12)
DIMENSION P(50)
COMMON / FORM /
1 TYPE, TYPE1, LOCIN, AC2(8,12), AC3(8,60), AC4(8,180),
1 AC5(8,320), DATE, D(3,380), TITLE(20),
1 IAR1, IAR2(5), IAR3(15), IAR4(60), IAR5(180), IST, IGO,
1 NIW, NOUT, ID1, ID2, ID3, ICON, CONO, LANA, ISDJ(3)
COMMON / PROG /
1 LOC(3), CITY(25), CFCA(12,50), YRSSS, YRPER, YRCOP, INH,
1 NWE, IBS
COMMON / OUT /
1 BWE, C2(4,12), C3(4,60), C4(4,180), C5(4,400), C2C(4,12),
1 C2T(4,12), ESCL, SPNC, SSNC, SSLC, SCOWT, STDC, TIC,
1 TDA, NNS(7), NNS, IAC, IPG, N
COMMON / NAME /
1 AEB(12), ALB(12), ANB(12), APC(12,50), ALS(12,50),
1 ANS(12,50), BPC(12,50), BLS(12,50), BNS(12,50), APC(12),
1 BPC(12), YES(50), AA(3,12), COB(12), COS(12), CONTL(12),
1 CONTH(12), CONTE(12), DEOT(12), PACS1(12,16), PACS2(12,16),
1 PACS3(12,8), RIN, RINA, RIWT(50), PO, YBC, YFIRST, YLAST,
1 PILS(20), FACE(3,12), ANAN, ANANB, NN, ISITE(20), NUNSL,
1 OTP(12), OTTP(12), OVERS(12), HRT, HRP(12), HWI(12)
INTEGER CONO
REWIND CONO
REWIND LANA
C |=====|
C |
C |          IF KONTROL = 1 BOTH THE COST MODEL FILE (CONO) AND THE
C |

```

COST2300
COST2310
COST2320
COST2330
COST2340
COST2350
COST2360
COST2370
COST2380
COST2390
COST2400
COST2410
COST2420
COST2430
COST2440
COST2450
COST2460
COST2470
COST2480
COST2490
MODL 10
MODL 20
MODL 30
MODL 40
MODL 50
MODL 60
MODL 70
MODL 80
MODL 90
MODL 100
MODL 110
MODL 120
MODL 130
MODL 140
MODL 150
MODL 160
MODL 170
MODL 180
MODL 190
MODL 200
MODL 210
MODL 220
MODL 230
MODL 240
MODL 250
MODL 260
MODL 270
MODL 280
MODL 290
MODL 300
MODL 310
MODL 320
MODL 330
MODL 340
MODL 350
MODL 360
MODL 370
MODL 380
MODL 390
MODL 400
MODL 410
MODL 420
MODL 430
MODL 440
MODL 450
MODL 460

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C | EQUIP LABOR & MATL COST FILE (LANA) WILL BE READ IN. |NODL 470
C | - - - IF KONTBL = 2 THE COST MODEL FILE (CONO) IS READ IN AND THE - |NODL 480
C | EQUIP LABOR & MATL COST FILE (LANA) WILL BE SKIPPED. |NODL 490
C | |NODL 500
C | |NODL 510
C | |NODL 520
  2 READ(CCP0,END=4) |NODL 530
    1 TYPE1, IDD, TITLE, YBC, PWE, AA, IAR1, IAR2, IAR3, |NODL 540
    1 IAP4, IAN5, CPCA, PACS1, PACS2, PACS3, AEB, |NODL 550
    1 ANB, ALB, D, AC2, AC3, AC4, AC5, PO, COB, |NODL 560
    1 RHT, RHP, HAA, RIAR4, RIAR5, MCCD, MAC, IAC2, |NODL 570
    1 IAC3, IAC4, IAC5 |NODL 580
    IF (TYPE1(1).EQ.TYPE(1)) GO TO 8 |NODL 590
    GO TO 2 |NODL 600
  4 WRITE(BCUT,500) TYPE (1) |NODL 610
    DO 6 I = 1,20 |NODL 620
  6 WRITE(WOUT,502) |NODL 630
  8 CONTINUE |NODL 640
    ANANB = RHT |NODL 650
    REWIND CONO |NODL 660
    TYPE(1) = TYPE1(1) |NODL 670
    TYPE(2) = TYPE1(2) |NODL 680
    P = (YRPER - YRSSS) / (YRCOP - YRSSS) |NODL 690
    NX = N2 + 1 |NODL 700
    DO 10 I=2,NX |NODL 710
    DO 10 K = 1,IMH |NODL 720
  10 F(K) = CPCA(I,K) |NODL 730
    CALL DELOP(P,P,PO,IMH) |NODL 740
    DO 12 K = 1,IMH |NODL 750
    CPCA(I,K) = F(K) |NODL 760
  12 CONTINUE |NODL 770
  14 CONTINUE |NODL 780
    IF (KONTBL.EQ.2) RETURN |NODL 790
C | |NODL 800
C | |NODL 810
C | CHECK FOR LOCATION IN GEOGRAPHIC TABLE |NODL 820
C | ** NO DEFAULT OPERATIONS - ERRORS UTILIZE THE LAST LOCATION FOR |NODL 830
C | CONTINUING EXECUTION WITH ERROR NOTICE GIVEN. |NODL 840
C | |NODL 850
C | |NODL 860
    DO 16 J = 1,NUNSL |NODL 870
    READ(LANA,END=18)IR,IS,IT,LOCIN,AT,BL,CHT |NODL 880
    IF (LOC(1).NE.LOCIN(3)) GO TO 16 |NODL 890
    GO TO 22 |NODL 900
  16 CONTINUE |NODL 910
  18 REWIND LANA |NODL 920
    WRITE(WOUT,504) (LOC(I), I=1,3) |NODL 930
    DO 20 I = 1,20 |NODL 940
  20 WRITE(WOUT,502) |NODL 950
    J = NUNSL |NODL 960
C | |NODL 970
C | |NODL 980
C | |NODL 990
C | DETERMINE LATEST YEAR OF LABOR AND MATERIAL COSTS FOR THIS |NODL1000
C | LOCATION. |NODL1010
C | |NODL1020
C | |NODL1030
C | |NODL1040
  22 ISITE(1) = J |NODL1050
    NAT = 0.0 |NODL1060
    DO 24 I = 1,30 |NODL1070
  24 IF (AT(I,1).GT.NAT) NAT = AT(I,1) |NODL1080
    YLAST = NAT |NODL1090
    RETURN |NODL1100
500 FORMAT('1',T12,A8,' TYPE OF PLANT NOT FOUND ON COST MODEL TAPE, CHNODL1110
1ECK REQUESTED TYPE FOR SPELLING AND CARD POSITION'//) |NODL1120

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502 FORMAT(' ',T20,50(' '<'>'))
504 FORMAT('1',3A8,' WAS NOT FOUND IN TABLE OF CITIES- CHECK CITY NAME)
1 FOR SPELLING AND CARD POSITION'//)
END
SUBROUTINE DELOP(P,P,PO,IN)
C |-----|
C |
C |      THIS SUBPROGRAM MAPS THE FUNCTION F(Y,PO)
C |      INTO A NEW FUNCTION F(T,P), WHERE BOTH FUNCTIONS
C |      HAVE THE SAME END POINTS (YS AND YE) BUT SOME
C |      ARBITRARY POINT YH IS CHANGED -
C |      WHERE ? =(YH-YS)/(YE-YS) USED FOR ADJUSTING CASH FLOW CURVES.
C |-----|
C |      BY: R. C. DELOZIER          DATE: AUGUST 5, 1974
C |      MODIFIED BY: C. R. HUDSON    DATE: OCTOBER 17, 1977
C |-----|
C |      DIMENSION F(IN),G(50)
C |      LN1 = PO*IN + .5
C |      LN2 = P *IN + .5
C |      IF (LN2.LT.2) LN2 = 2
C |      IF (LN1.EQ.LN2) RETURN
C |      DO 3 I=1,IN
C |      3 G(I) = F(I)
C |      B1 = LN1 - B1*LN2
C |      B1 = B1 / (LN2-1)
C |      A1 = LN1 - B1*LN2
C |      B2 = IN - LN1
C |      B2 = B2 / (IN-LN2)
C |      A2 = LN1 - B2*LN2
C |      DO 2 I=1,LN2
C |      L = A1 + B1*I + .5
C |      IF (L.LT.1) L=1
C |      IF (L.GT.LN1) L=LN1
C |      F(I) = G(L)
C |      2 CONTINUE
C |      LX = LN2 + 1
C |      DO 4 I=LX,IN
C |      L = A2 + B2*I + .5
C |      IF (L.LT.LN1) L=LN1
C |      IF (L.GT.IN) L=IN
C |      F(I) = G(L)
C |      4 CONTINUE
C |      RETURN
C |      END
C |      SUBROUTINE CONIV(AE,BE,AL,BL,AH,BH,IL,PL,PH,PR,FIL,YFIRST,YLAST,
C |      1 YBC,N2,LANA)
C |-----|
C |      CONIV IS CALLED FROM COST SUBROUTINE FOR EVALUATION OF
C |      ESCALATION COMPONENTS.
C |-----|
C |      BY R. C. DELOZIER AND B. E. SMITH 01/01/72
C |      MODIFIED BY C. R. HUDSON 10-17-77
C |-----|
C |      AE      EQUIPMENT COST IN YBC
C |      BE      ESCALATION RATE FOR EQUIPMENT
C |      AL      LABOR RATE IN YBC

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C I  BL      ESCALATION RATE FOR LABOR          |CONI 200
C I  AM      MATERIAL COST IN YBC                |CONI 210
C I  BM      ESCALATION RATE FOR MATERIAL        |CONI 220
C I  IL      LOCATIONS TO BE STUDIED             |CONI 230
C I  PE      FACTOR FOR EQUIPMENT TYPE          |CONI 240
C I  PL      FACTOR FOR LABOR TYPE              |CONI 250
C I  PM      FACTOR FOR MATERIAL TYPE           |CONI 260
C I  PIL     FACTOR FOR LOCATION                |CONI 270
C I  YFIRST  FIRST YEAR PERTAINING TO LANA FILE DATA |CONI 280
C I  YLAST   LAST YEAR PERTAINING TO LANA FILE DATA |CONI 290
C I  N2      NUMBER OF 2-DIGIT ACCOUNTS (DIRECTS & INDIRECTS) |CONI 300
C I  YBC     YEAR OF BASE MODEL COSTS           |CONI 310
C I  |-----|CONI 320
C I  |-----|CONI 330
C I  |-----|CONI 340
C I  |-----|CONI 350
C I  |-----|CONI 360
C I  |-----|CONI 370
C I  |-----|CONI 380
C I  |-----|CONI 390
C I  |-----|CONI 400
C I  |-----|CONI 410
C I  |-----|CONI 420
C I  |-----|CONI 430
C I  |-----|CONI 440
C I  |-----|CONI 450
C I  |-----|CONI 460
C I  |-----|CONI 470
C I  |-----|CONI 480
C I  |-----|CONI 490
C I  |-----|CONI 500
C I  |-----|CONI 510
C I  |-----|CONI 520
C I  |-----|CONI 530
C I  |-----|CONI 540
C I  |-----|CONI 550
C I  |-----|CONI 560
C I  |-----|CONI 570
C I  |-----|CONI 580
C I  |-----|CONI 590
C I  |-----|CONI 600
C I  |-----|CONI 610
C I  |-----|CONI 620
C I  |-----|CONI 630
C I  |-----|CONI 640
C I  |-----|CONI 650
C I  |-----|CONI 660
C I  |-----|CONI 670
C I  |-----|CONI 680
C I  |-----|CONI 690
C I  |-----|CONI 700
C I  |-----|CONI 710
C I  |-----|CONI 720
C I  |-----|CONI 730
C I  |-----|CONI 740
C I  |-----|CONI 750
C I  |-----|CONI 760
C I  |-----|CONI 770
C I  |-----|CONI 780
C I  |-----|CONI 790
C I  |-----|CONI 800
C I  |-----|CONI 810
C I  |-----|CONI 820
C I  |-----|CONI 830
C I  |-----|CONI 840
C I  |-----|CONI 850

```

DIMENSION AR(12),BE(12),AL(12),BL(12),AM(12),BM(12),PL(12,16),
 1PH(12,16),PE(12,8),1TL(20),A(30,8),B(30,16),C(30,16),YE(30),
 2RE(30),RH(30),RL(30)
 DIMENSION 1L(20),SAE(12),SAH(12),SAL(12),SBE(12),SBH(12),SDL(12)
 DIMENSION LOCIN(8)
 REWIND LANA
 DO 2 I = 1,20
 IF (1L(I).EQ.0) GO TO 4
 2 CONTINUE
 I = 21
 4 CONTINUE
 INX = 1L(I-1)
 DO 6 I = 1,N2
 SAE(I) = 0.0
 SBE(I) = 0.0
 SAH(I) = 0.0
 SBH(I) = 0.0
 SAL(I) = 0.0
 SDL(I) = 0.0
 6 CONTINUE
 IC = 1
 DO 18 I = 1,INX
 READ(LANA,END=22) IB, IS, IT, LOCIN, A, B, C
 IF (1L(IC).NE.I) GO TO 18
 WRITE(6,500) LOCIN
 IC = IC + 1
 18 CONTINUE
 PROCESS THE 2-DIGIT ACCOUNTS
 DO 16 J = 1,N2
 DO 8 K = 1,30
 BE(K) = 0.0
 BL(K) = 0.0
 BM(K) = 0.0
 8 CONTINUE
 KK = 0
 DO 12 K = 1,30
 IF (A(K,1).EQ.0.0) GO TO 14
 IF (A(K,1).GT.YLAST) GO TO 14


```

IF (YFIRST.GT.A(K,1)) GO TO 12
SPHEQT = 0.
  SUNLAB = 0.
  SUNHAT = 0.
  KK = KK + 1
  DO 10 L = 1,16
    SUNHAT = SUNHAT+PH(J,L)
    SUNLAB = SUNLAB+PL(J,L)
  IF (L.IT.9) SPHEQT = SPHEQT + PE(J,L)
  IF (L.IT.9) BE(KK) = BE(KK) + A(K,L) * PE(J,L)
  BL(KK) = BL(KK) + B(K,L) * PL(J,L)
  BH(KK) = BH(KK) + C(K,L) * PH(J,L)
10 CONTINUE
IF (SPHEQT.NE.0.) BE(KK) = BE(KK)/SPHEQT
IF (SUNLAB.NE.0.) BL(KK) = BL(KK)/SUNLAB
IF (SUNHAT.NE.0.) BH(KK) = BH(KK)/SUNHAT
IF (BE(KK).GT.0.) JE(KK) = ALOG(PE(KK))
IF (BL(KK).GT.0.) JL(KK) = ALOG(BL(KK))
IF (BH(KK).GT.0.) JH(KK) = ALOG(BH(KK))
YB(KK) = A(K,1) - YBC
12 CONTINUE
14 CONTINUE
  CALL FITS (YB, BE, KK, AE1, BE1)
  CALL FITS (YB, BL, KK, AL1, BL1)
  CALL FITS (YB, BH, KK, AH1, BH1)
  SAE(J) = SAE(J) + PIL(IC-1) * AE1
  SAL(J) = SAL(J) + PIL(IC-1) * AL1
  SAH(J) = SAH(J) + PIL(IC-1) * AH1
  SBE(J) = SBE(J) + PIL(IC-1) * BE1
  SBL(J) = SBL(J) + PIL(IC-1) * BL1
  SBH(J) = SBH(J) + PIL(IC-1) * BH1
16 CONTINUE
18 CONTINUE
  DO 20 J = 1,N2
    AE(J) = SAE(J)
    BE(J) = SBE(J)
    AL(J) = SAL(J)
    BL(J) = SBL(J)
    AH(J) = SAH(J)
    BH(J) = SBH(J)
20 CONTINUE
22 RETURN
500 FORMAT('CONV CALLED - DATA FIT DONE OK ',8A4)
END
SUBROUTINE FITS(X,Y,N,A,B)
C
C |-----|
C |
C | EVALUATE COEFFICIENTS A AND B OF LN(Y) = LN(A) + B LN(X)
C |-----|
C | LINEAR FIT .... R.C. DELOZIER ..... 5/17/72
C |-----|
C |
C
  REAL X(N),Y(N)
  N = N
  SX = 0.
  SX2 = 0.
  SY = 0.
  SKY = 0.
  DO 2 I = 1,N
    SX = SX + X(I)
    SX2 = SX2 + X(I)**2
    SY = SY + Y(I)
    SKY = SKY + Y(I)*X(I)
  2 CONTINUE

```

```

CONV 860
CONV 870
CONV 880
CONV 890
CONV 900
CONV 910
CONV 920
CONV 930
CONV 940
CONV 950
CONV 960
CONV 970
CONV 980
CONV 990
CONV1000
CONV1010
CONV1020
CONV1030
CONV1040
CONV1050
CONV1060
CONV1070
CONV1080
CONV1090
CONV1100
CONV1110
CONV1120
CONV1130
CONV1140
CONV1150
CONV1160
CONV1170
CONV1180
CONV1190
CONV1200
CONV1210
CONV1220
CONV1230
CONV1240
CONV1250
CONV1260
CONV1270
CONV1280
CONV1290
FITS 10
FITS 20
FITS 30
FITS 40
FITS 50
FITS 60
FITS 70
FITS 80
FITS 90
FITS 100
FITS 110
FITS 120
FITS 130
FITS 140
FITS 150
FITS 160
FITS 170
FITS 180
FITS 190
FITS 200
FITS 210
FITS 220

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      B      = (SY*SI-SY*B)/(SI*SI-SI*B)      PITS 230
      A      = (SY-B*SI)/R                    PITS 240
      A      = EXP(A)                          PITS 250
      B      = EXP(B)                          PITS 260
      RETURN                                    PITS 270
      END                                        PITS 280
      SUBROUTINE INDUSE(N2)                      INDU 10
C |=====|INDU 20
C |      THIS SUBPROGRAM USES NORMAL INPUT CARDS |INDU 30
C |      TO ALTER THE ESCALATION RATES TO FORM A |INDU 40
C |      TIME DEPENDENT NONLINEAR FUNCTIONAL SYSTEM. |INDU 50
C |      -----|INDU 60
C |      |INDU 70
C |      |INDU 80
C |      |INDU 90
C |      BY:  R. C. DELOZIER          DATE:  SEPT. 12, 1974 |INDU 100
C |      -----|INDU 110
C |      MODIFIED BY :  C. R. HUDSON      OCT. 6, 1977 |INDU 120
C |      -----|INDU 130
C |=====|INDU 140
C |      DIMENSION ICARD(20),A(12,3),B(12,3),AX(12,3),BX(12,3) |INDU 150
C |      DIMENSION PNT(7),PCN(4) |INDU 160
C |      REAL * 8 TYPE(2),TYPE1(2),LOCIN(4) |INDU 170
C |      REAL*8 AC2,AC3,AC4,AC5,CITY,DATE,LOC |INDU 180
C |      COMMON / FORM / |INDU 190
C |      1 TYPE,TYPE1,LOCIN,AC2(8,12),AC3(8,60),AC4(8,180), |INDU 200
C |      1 AC5(8,320),DATE, |INDU 210
C |      1 IAR1,IAR2(5),IAR3(15),IAR4(60),IAR5(180),IST,IGO, |INDU 220
C |      1 IIN,NOUT,ID1,ID2,ID3,ICON,COMO,LANA,ISDJ(3) |INDU 230
C |      COMMON / PROG / |INDU 240
C |      1 LGC(3),CITY(25),CPCA(12,50),YRSSS,YRPER,YRCOP,INR, |INDU 250
C |      1 NWE,IBS |INDU 260
C |      COMMON / NAME / |INDU 270
C |      1 AEB(12),ALB(12),ANB(12),APC(12,50),ALS(12,50), |INDU 280
C |      1 AHS(12,50),BPC(12,50),JLS(12,50),BHS(12,50),APC(12), |INDU 290
C |      1 BPC(12),YES(50),AA(3,12),COB(12),COS(12),CONTL(12), |INDU 300
C |      1 CONTH(12),CONTE(12),DEOT(12),FACS1(12,16),FACS2(12,16), |INDU 310
C |      1 FACS3(12,8),RIB,RIBA,RINT(50),PO,YBC,YFIRST,YLAST, |INDU 320
C |      1 PILS(20),PACE(3,12),AHAN,AHANB,HV,ISITE(20),MUNSL, |INDU 330
C |      1 OTP(12),OTPP(12),OVERS(12),HNT,HNP(12),HWI(12) |INDU 340
C |      COMMON / TELPRT / ISET |INDU 350
C |      DATA PNT/'(4P5','3,T','71,P','10-2','T1','20A4',')' |INDU 360
C |      DATA PCN/'(2P5','(4P5','(6P5','(8P5'/' |INDU 370
C |      ISET = 0 |INDU 380
C |      IN = 1 |INDU 390
C |      I = 1 |INDU 400
C |      REVIND ID3 |INDU 410
C |      N = N2 - 7 |INDU 420
C |      PNT(1) = PCN(N) |INDU 430
C |      NOW = NIN |INDU 440
C |      IF (IPS.NE.1) N2 = ID3 |INDU 450
C |      WRITE(NOUT,500) |INDU 460
C |      2 CONTINUE |INDU 470
C |      IC = 0 |INDU 480
C |      DO 4 J=1,3 |INDU 490
C |      READ(NOW,504) (A(K,J),B(K,J),K=1,7),T,ICARD |INDU 500
C |      WRITE(NOUT,502) ICARD |INDU 510
C |      IF (IBS.EQ.1) WRITE(ID3,508) ICARD |INDU 520
C |      IF (T.LE.-1.) GO TO 6 |INDU 530
C |      READ(NOW,PNT) (A(K,J),B(K,J),K=8,N2),T,ICARD |INDU 540
C |      WRITE(NOUT,502) ICARD |INDU 550
C |      IF (IBS.EQ.1) WRITE(ID3,508) ICARD |INDU 560
C |      4 CONTINUE |INDU 570
C |      IF (T.GE.YES(1)) GO TO 6 |INDU 580
C |      DO 20 K=1,N2 |INDU 590
C |      |INDU 600

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    AX(K,1) = APC(K,1)
    AX(K,2) = ALS(K,1)
    AX(K,3) = ANS(K,1)
    BX(K,1) = BPC(K,1)
    BX(K,2) = BLS(K,1)
    BX(K,3) = BHS(K,1)
20 CONTINUE
    IP = 1
    I = 1
    TW = YES(1) - T
    T = YES(1)
    IC = 1
    DO 30 J=1,3
    DO 30 K=1,N2
    IF (A(K,J).LE.0.AND.B(K,J).LE.0.) GO TO 30
    IF (B(K,J).LE.0.) B(K,J) = BX(K,J)
    IF (A(K,J).GT.0.) GO TO 15
    A(K,J) = AX(K,J) * (B(K,J)/BX(K,J)) **TW
    GO TO 30
15 A(K,J) = A(K,J) * B(K,J) **TH
30 CONTINUE
    6 CONTINUE
    IF (I.NE.1) IN=I-1
    IN1 = 1
    IF (I.GT.INN) RETURN
    DO 10 I = 1,INN
    IF (II.NE.1) IN1=II-1
    DY = YES(II)-YES(IN)
    DO 8 KK = 1,N2
    APC(KK,II) = APC(KK,IN) * BPC(KK,IN) **DY
    ALS(KK,II) = ALS(KK,IN) * BLS(KK,IN) **DY
    ANS(KK,II) = ANS(KK,IN) * BHS(KK,IN) **DY
    BPC(KK,II) = BPC(KK,IN)
    BLS(KK,II) = BLS(KK,IN)
    BHS(KK,II) = BHS(KK,IN)
    8 CONTINUE
    IF (T.GE.YES(IN1).AND.T.LE.(YES(II)+.001)) GO TO 14
10 CONTINUE
    RETURN
14 CONTINUE
    I = II
    DO 16 K = 1,N2
    IF (A(K,1).GT.0.) APC(K,II)=A(K,1)
    IF (A(K,2).GT.0.) ALS(K,II)=A(K,2)
    IF (A(K,3).GT.0.) ANS(K,II)=A(K,3)
    IF (B(K,1).GT.0.) BPC(K,II)=B(K,1)
    IF (B(K,2).GT.0.) BLS(K,II)=B(K,2)
    IF (B(K,3).GT.0.) BHS(K,II)=B(K,3)
16 CONTINUE
    * (T.NE.YES(1)) ISET=1
    YES(II) = T
    IF (IC.EQ.1) GO TO 2
    I = I + 1
    GO TO 2
500 FORMAT('OINPUT CARDS TO PRODUCE TIME DEPENDENT ESCALATION RATES'
1 /,'+',60(' '))
502 FORMAT(1X,T10,20A4)
504 FORMAT (10P5.3,P10.2,T1,20A4)
508 FORMAT(20A4)
    END
    FUNCTION CLAB(K,ITYP,T)
C
C |=====|CLAB 30
C |
|CLAB 40

```

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C | EVALUATE PROJECTED INDEXES FOR LABOR OR MATERIAL |CLAB 50
C | |CLAB 60
C | K = ACCOUNT INDEX |CLAB 70
C | ITYP = ACCOUNT COST TYPE WHERE: 1 = FACTORY COSTS |CLAB 80
C | |CLAB 90
C | |CLAB 100
C | |CLAB 110
C | |CLAB 120
C | |CLAB 130
C | |CLAB 140
C | |CLAB 150
C | |CLAB 160
C | |CLAB 170
C | |CLAB 180
C | |CLAB 190
C | |CLAB 200
C | |CLAB 210
C | |CLAB 220
C | |CLAB 230
C | |CLAB 240
C | |CLAB 250
C | |CLAB 260
C | |CLAB 270
C | |CLAB 280
C | |CLAB 290
C | |CLAB 300
C | |CLAB 310
C | |CLAB 320
C | |CLAB 330
C | |CLAB 340
C | |CLAB 350
C | |CLAB 360
C | |CLAB 370
C | |CLAB 380
C | |CLAB 390
C | |CLAB 400
C | |CLAB 410
C | |CLAB 420
C | |CLAB 430
C | |CLAB 440
C | |CLAB 450
C | |CLAB 460
C | |CLAB 470
C | |CLAB 480
C | |CLAB 490
C | |ADYR 10
C | |ADYR 20
C | |ADYR 30
C | |ADYR 40
C | |ADYR 50
C | |ADYR 60
C | |ADYR 70
C | |ADYR 80
C | |ADYR 90
C | |ADYR 100
C | |ADYR 110
C | |ADYR 120
C | |ADYR 130
C | |ADYR 140
C | |ADYR 150
C | |ADYR 160
C | |ADYR 170
C | |ADYR 180
C | |ADYR 190
C | |ADYR 200
C | |ADYR 210

```

REAL*8 LOC,CITY
 COMMON / WAHL /
 1 AEB(12), ALB(12), ANB(12), APC(12,50), ALS(12,50),
 1 ANS(12,50), BPC(12,50), BLS(12,50), BMS(12,50), APC(12),
 1 BPC(12), YES(50), AA(3,12), COB(12), COS(12), CONTL(12),
 1 COWH(12), CONTE(12), DEOT(12), PACS1(12,16), PACS2(12,16),
 1 PACS3(12,8), PIB, RIBA, RINT(50), PO, YBC, YFIRST, YLAST,
 1 PILS(20), PACE(3,12), ANAW, ANAWB, HW, ISITE(20), WUNSL,
 1 OTP(12), OTPP(12), OVERS(12), HNT, HNP(12), HWI(12)
 COMMON / PROG /
 1 LOC(3), CITY(25), CPCA(12,50), YRSSS, YRPER, YRCOP, INN,
 1 HWP, IBS
 IN1 = INN - 1
 DO 2 J = 1,IN1
 IF (Y.GE.YES(J).AND.Y.LE.YES(J+1)) GO TO 4
 2 CONTINUE
 J = INN
 4 CONTINUE
 IF (Y.LE.YES(1)) J= 1
 IID = Y - YES(J)
 GO TO (6,8,12),ITYP
 6 CONTINUE
 CLAB=APC(K,J) * BPC(K,J) ** IID / AEB(K)
 RETURN
 8 CONTINUE
 10 CLAB = ALS(K,J) * BLS(K,J) ** IID / ALB(K)
 RETURN
 12 CONTINUE
 14 CLAB = ANS(K,J) * BMS(K,J) ** IID / ANB(K)
 RETURN
 END
 SUBROUTINE ADYR(YES,YCONB,CH,CH1,YRS,YRE,CPCA,INN,IBIN)
 ADYR 20
 ADYR 30
 ADYR 40
 ADYR 50
 ADYR 60
 ADYR 70
 ADYR 80
 ADYR 90
 ADYR 100
 ADYR 110
 ADYR 120
 ADYR 130
 ADYR 140
 ADYR 150
 ADYR 160
 ADYR 170
 ADYR 180
 ADYR 190
 ADYR 200
 ADYR 210

ADYR SUBPROGRAM ADDS THE MULTIPLE UNIT'S CASHFLOW CURVES TOGETHER
 BY C. R. HUDSON OCTOBER 1977

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C | |ADYR 80
C | |ADYR 90
C | |ADYR 100
C | |ADYR 110
C | |ADYR 120
C | |ADYR 130
C | |ADYR 140
C | |ADYR 150
C | |ADYR 160
C | |ADYR 170
C | |ADYR 180
C | |ADYR 190
C | |ADYR 200
C | |ADYR 210

```

DIMENSION YES(50),YCONB(50),CH(50),CH1(50),CH2(50),CH3(50)
 DIMENSION YX(50),CPCA(12,50)
 TIN = YRE - YRS
 DO 14 I=1,INN
 CH2(I) = 0.
 14 CH3(I) = 0.
 J = 2
 K = 2
 DO 15 I=1,INN
 YX(I) = YRS + CPCA(1,I)*TIN
 IF (IBIN.EQ.0) GO TO 30
 05 IF (J.GT.INN) CH2(I) = CH1(INN)
 IF (J.GT.INN) GO TO 30

```

      IF (YCONB(J-1).GT.YX(I)) GO TO 30
      IF (YCCRB(J).LT.YX(I)) GO TO 25
      CH2(I) = CH1(J-1) + (YX(I) - YCONB(J-1))/(YCONB(J) - YCONB(J-1))
      1 * (CH1(J) - CH1(J-1))
      GO TO 30
25  J = J + 1
      GO TO 45
30  IF (K.GT.INH) CH3(I) = CH(INH)
      IF (K.GT.INH) GO TO 15
      IF (YES(K-1).GT.YX(I)) GO TO 15
      IF (YES(K).LT.YX(I)) GO TO 35
      CH3(I) = CH(K-1) + (YX(I) - YES(K-1))/(YES(K) - YES(K-1))
      1 * (CH(K) - CH(K-1))
      GO TO 15
35  K = K + 1
      GO TO 30
15  CONTINUE
      DO 50 I=1,INH
      CH1(I) = CH2(I) + CH3(I)
50  YCONB(I) = YX(I)
      RETURN
      END
      SUBROUTINE SUN(PAD)
C
C |=====|
C |
C | SUN SUBPROGRAM SUNS ALL THE LOWEST LEVEL COSTS TO THEIR HIGHEST
C | LEVEL.
C |
C | BY R. C. DE LOZIER AND R. J. BARNARD APRIL 1975
C |
C | MODIFIED BY : C. B. HUDSON OCTOBER 1977
C |=====|
C |
      REAL * 8 TYPE(2),TYPE1(2),LOCIN(4)
      REAL*8 AC2,AC3,AC4,AC5,DATE
      DIMENSION PAD(3,12)
      COMMON / FORM /
      1 TYPE, TYPE1, LOCIN, AC2(8,12), AC3(8,60), AC4(8,180),
      1 AC5(8,320), DATE, D(3,380), TITLE(20),
      1 IAR1, IAR2(5), IAR3(15), IAR4(60), IAR5(180), IST, IGO,
      1 WIN, WOUT, ID1, ID2, ID3, ICON, CONO, LANA, ISDJ(3)
      COMMON / OUT /
      1 BWE, C2(4,12), C3(4,60), C4(4,180), C5(4,400), C2C(4,12),
      1 C2T(4,12), ESCL, SPNC, SSNC, SSLC, SCOUT, STDC, TIC,
      1 TDA, HNS(7), HNS, IAC, IPG, W2
      COMMON / NAMEL /
      1 AEB(12), ALB(12), ANB(12), APC(12,50), ALS(12,50),
      1 AHS(12,50), BPC(12,50), BLS(12,50), BNS(12,50), APC(12),
      1 BPC(12), YES(50), AA(3,12), COB(12), COS(12), COMPL(12),
      1 CONTH(12), CONTE(12), DEOT(12), PACS1(12,16), PACS2(12,16),
      1 PACS3(12,8), BIB, RIBA, RINT(50), PO, YBC, YPINT, YLAST,
      1 PILS(20), PACB(3,12), ANAN, ANAND, HW, ISITE(20), WUNSL,
      1 OTP(12), OTPP(12), OVERS(12), HNT, HNP(12), HWI(12)
      INTEGER CONO
C |=====|
C |
C | CLEAR ALL COST COLLECTING ARRAYS
C |
C |=====|
      DO 18 I = 1,3
      W32 = 0
      W42 = 0
      W52 = 0
      DO 16 I2 = 1,W2
      IF (IAR3(I2).EQ.0) GO TO 12

```

N31 = N32 + 1	SUM 450
I32 = N31 + IAR3(I2) - 1	SUM 460
DO 10 I3 = N31,N32	SUM 470
IF (IAR4(I3).EQ.0) GO TO 8	SUM 480
N41 = N42 + 1	SUM 490
N42 = N41 + IAR4(I3) - 1	SUM 500
DO 6 I4 = N41,N42	SUM 510
IF (IAR5(I4).EQ.0) GO TO 4	SUM 520
N51 = N52 + 1	SUM 530
N52 = N51 + IAR5(I4) - 1	SUM 540
DO 2 I5 = N51,N52	SUM 550
C5(4,I5) = 0.	SUM 560
C4(I,I4) = 0.	SUM 570
C4(4,I4) = 0.	SUM 580
C3(I,I3) = 0.	SUM 590
C3(4,I3) = 0.	SUM 600
C2(I,I2) = 0.	SUM 610
C2(4,I2) = 0.	SUM 620
2 CONTINUE	SUM 630
GO TO 14	SUM 640
4 CONTINUE	SUM 650
C4(4,I4) = 0.	SUM 660
C3(I,I3) = 0.	SUM 670
C3(4,I3) = 0.	SUM 680
C2(I,I2) = 0.	SUM 690
C2(4,I2) = 0.	SUM 700
6 CONTINUE	SUM 710
GO TO 14	SUM 720
8 CONTINUE	SUM 730
C3(4,I3) = 0.	SUM 740
C2(I,I2) = 0.	SUM 750
C2(4,I2) = 0.	SUM 760
10 CONTINUE	SUM 770
GO TO 14	SUM 780
12 CONTINUE	SUM 790
C2(4,I2) = 0.	SUM 800
14 CONTINUE	SUM 810
C2C(4,I2) = 0.	SUM 820
C2T(4,I2) = 0.	SUM 830
IF (I2.LE.IAR2(1)) NMS(I2) = 0	SUM 840
16 CONTINUE	SUM 850
18 CONTINUE	SUM 860
SPMC = 0.	SUM 870
SSLC = 0.	SUM 880
SSMC = 0.	SUM 890
TIC = 0.	SUM 900
TICT=0.	SUM 910
SCONT = 0.	SUM 920
STDC = 0.	SUM 930
NNMS = 0	SUM 940
C =====	SUM 950
C	SUM 960
C SUM ALL ACCOUNTS TO THE NEXT ACCUMULATIVE LEVEL	SUM 970
C	SUM 980
C =====	SUM 990
DO 38 I = 1,3	SUM 1000
N32 = 0	SUM 1010
N42 = 0	SUM 1020
N52 = 0	SUM 1030
DO 36 I2 = 1,N2	SUM 1040
IF (IAR3(I2).EQ.0) GO TO 30	SUM 1050
N31 = N32 + 1	SUM 1060
N32 = N31 + IAR3(I2) - 1	SUM 1070
DO 28 I3 = N31,N32	SUM 1080
IF (IAR4(I3).EQ.0) GO TO 26	SUM 1090
N41 = N42 + 1	SUM 1100

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      W#2      = W#1 + IAR#(I3) - 1          SUN 1110
      DO 2# I# = W#1,W#2                     SUN 1120
      IF (IAR5(I#).EQ.0) GO TO 22            SUN 1130
      W51      = W52 + 1                     SUN 1140
      W52      = W51 + IAR5(I#) - 1          SUN 1150
      DO 20 I5 = W51,W52                     SUN 1160
      C5(#,I5) = C5(#,I5) + C5(I,I5)         SUN 1170
      C#(I,I#) = C#(I,I#) + C5(I,I5)         SUN 1180
      C#(#,I#) = C#(#,I#) + C5(I,I5)         SUN 1190
      C3(I,I3) = C3(I,I3) + C5(I,I5)         SUN 1200
      C3(#,I3) = C3(#,I3) + C5(I,I5)         SUN 1210
      C2(I,I2) = C2(I,I2) + C5(I,I5)         SUN 1220
      C2(#,I2) = C2(#,I2) + C5(I,I5)         SUN 1230
20  CONTINUE                                SUN 1240
      GO TO 2#                               SUN 1250
22  CONTINUE                                SUN 1260
      C#(#,I#) = C#(#,I#) + C#(I,I#)         SUN 1270
      C3(I,I3) = C3(I,I3) + C#(I,I#)         SUN 1280
      C3(#,I3) = C3(#,I3) + C#(I,I#)         SUN 1290
      C2(I,I2) = C2(I,I2) + C#(I,I#)         SUN 1300
      C2(#,I2) = C2(#,I2) + C#(I,I#)         SUN 1310
2#  CONTINUE                                SUN 1320
      GO TO 2#                               SUN 1330
26  CONTINUE                                SUN 1340
      C3(#,I3) = C3(#,I3) + C3(I,I3)         SUN 1350
      C2(I,I2) = C2(I,I2) + C3(I,I3)         SUN 1360
      C2(#,I2) = C2(#,I2) + C3(I,I3)         SUN 1370
2#  CONTINUE                                SUN 1380
      GO TO 32                               SUN 1390
30  CONTINUE                                SUN 1400
      C2(#,I2) = C2(#,I2) + C2(I,I2)         SUN 1410
32  CONTINUE                                SUN 1420
      IF (I.EQ.2.AND.I2.LE.IAR2(1)) N#5(I2) = C2(2,I2) / ALB(I2) SUN 1430
      1 / FACE(2,I2) / PAD(2,I2) / OTTP(I2) / (1. + COS(I2)) SUN 1440
      IF (I.EQ.2.AND.I2.LE.IAR2(1)) N#HS = N#HS + N#5(I2) SUN 1450
      IF (I.EQ.1) C2C(I,I2) = COWT(I2) * C2(I,I2) / 100. SUN 1460
      IF (I.EQ.2) C2C(I,I2) = COWTL(I2) * C2(I,I2) / 100. SUN 1470
      IF (I.EQ.3) C2C(I,I2) = COWTH(I2) * C2(I,I2) / 100. SUN 1480
      C2C(#,I2) = C2C(#,I2) + C2C(I,I2)      SUN 1490
      C2T(I,I2) = C2(I,I2) + C2C(I,I2)      SUN 1500
      C2T(#,I2) = C2T(#,I2) + C2T(I,I2)      SUN 1510
      IF (I.EQ.1.AND.I2.LE.IAR2(1)) SP#C = SP#C + C2(1,I2) SUN 1520
      IF (I.EQ.2.AND.I2.LE.IAR2(1)) SSLC = SSLC + C2(2,I2) SUN 1530
      IF (I.EQ.3.AND.I2.LE.IAR2(1)) SS#C = SS#C + C2(3,I2) SUN 1540
36  CONTINUE                                SUN 1550
38  CONTINUE                                SUN 1560
      IX = IAR2(1)                            SUN 1570
      DO 3# I2 = 1,IX                          SUN 1580
      SC#T      = SC#T + C2C(#,I2)            SUN 1590
      ST#C      = ST#C + C2T(#,I2)            SUN 1600
3#  CONTINUE                                SUN 1610
      I = IAR2(1) + 1                          SUN 1620
      DO 35 I2 = 1,W2                          SUN 1630
      TIC = TIC + C2(#,I2)                     SUN 1640
      TICT = TICT + C2T(#,I2)                  SUN 1650
      SC#T = SC#T + C2C(#,I2)                  SUN 1660
35  CONTINUE                                SUN 1670
      TDA = ST#C + TICT                        SUN 1680
      RETURN                                    SUN 1690
      END                                        SUN 1700
      SUBROUTINE DELIN(R,C,G,YS,YE,CI,N,IAC)    DLIN 10
C |-----| DLIN 20
C | | DLIN 30
C | | DLIN 40
C | | THIS SUBPROGRAM EVALUATES THE INTEREST AND | DLIN 50
C | | ESCALATION INTEREST DURING CONSTRUCTION | DLIN 60

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C |
C | ----- |DLIN 70
C | |DLIN 80
C | |DLIN 90
C | BY R. C. DELOZIER DATE: JULY 21, 1975 |DLIN 100
C | ----- |DLIN 110
C | |DLIN 120
C | MODIFIED BY : C. R. HUDSON OCTOBER 1977 |DLIN 130
C | |DLIN 140
C | ===== |DLIN 150
C | DIMENSION R(50),C(50),G(12,50) |DLIN 160
C | DY = YE-YS |DLIN 170
C | CA= (H-Y)/(YE-YS) |DLIN 180
C | CX = 1./CA |DLIN 190
C | CI = 0. |DLIN 200
C | DC = 0. |DLIN 210
C | DO 4 I = 2,N |DLIN 220
C | P: ADJUSTS INTEREST RATE TO REFLECT FREQ. OF COMPOUNDING |DLIN 230
C | R1 = R(I) |DLIN 240
C | IF (IAC.EQ. 1) R1 = CA* ((1.+R(I))*CX - 1.) |DLIN 250
C | PAC = R1*(G(1,I)-G(1,I-1))*DY |DLIN 260
C | CI = CI+(C(I)+DC)*PAC |DLIN 270
C | IF (IAC.EQ. 1) DC = CI |DLIN 280
C | C(I) = C(I) + CI |DLIN 290
C | CONTINUE |DLIN 300
C | RETURN |DLIN 310
C | END |DLIN 320
C | SUBROUTINE OUTPUT(IOP,INANT,ESCLD) |OUTP 10
C | ===== |OUTP 20
C | |OUTP 30
C | ROUTINE TO GENERATE OUTPUT REPORTS |OUTP 40
C | |OUTP 50
C | ----- |OUTP 60
C | |OUTP 70
C | |OUTP 80
C | BY : |OUTP 90
C | R.C.DELOZIER |OUTP 100
C | R. J. BARWARD |OUTP 110
C | |OUTP 120
C | MODIFIED BY : C. R. HUDSON SEPTEMBER 1977 |OUTP 130
C | ENGINEERING TECHNOLOGY DIVISION |OUTP 140
C | OAK RIDGE NATIONAL LABORATORY |OUTP 150
C | |OUTP 160
C | ===== |OUTP 170
C | |OUTP 180
C | REAL * 8 TYPE(2),TYPE1(2),LOCIN(4) |OUTP 190
C | REAL * 8 SINP/'SIMPLE',COMP/'COMPOUND',TIME |OUTP 200
C | REAL*8 AC2, AC3, AC4, AC5, CITY, DATE, LOC |OUTP 210
C | REAL*4 AL(12)/12*'A' '/',BL(12)/12*'B' '/' |OUTP 220
C | DIMENSION IC2R(12),PHNS(7),XC2(4,12),WX(12) |OUTP 230
C | COMMON /ROUT/DIDCI,ESCI |OUTP 240
C | COMMON /WDHAIN/ ISTSIG |OUTP 250
C | COMMON / PORN / |OUTP 260
C | 1 TYPE, TYPE1, LOCIN, AC2(8,12), AC3(8,60), AC4(8,180), |OUTP 270
C | 1 AC5(8,320), DATE, D(3,380), TITLE(20), |OUTP 280
C | 1 IAR1, IAR2(5), IAR3(15), IAR4(60), IAR5(180), IST, IGO, |OUTP 290
C | 1 NIN, NOUT, ID1, ID2, ID3, ICON, CONO, LANA, ISDJ(3) |OUTP 300
C | COMMON / PNOG / |OUTP 310
C | 1 LOC(3), CITY(25), CPCA(12,50), YRSSS, YRPER, YRCOP, INH, |OUTP 320
C | 1 NWE, IDS |OUTP 330
C | COMMON / OUT / |OUTP 340
C | 1 BWE, C2(4,12), C3(4,60), C4(4,180), C5(4,400), C2C(4,12), |OUTP 350
C | 1 C2T(4,12), ESCL, SPNC, SSNC, SSLC, SCOWT, STDC, TIC, |OUTP 360
C | 1 TDA, NNS(7), NNNS, IAC, IPG, N2 |OUTP 370
C | COMMON / WABL / |OUTP 380
C | 1 AEB(12), ALB(12), AHB(12), APC(12,50), ALS(12,50), |OUTP 390
C | 1 ANS(12,50), BPC(12,50), BLS(12,50), BNS(12,50), APC(12), |OUTP 400

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1 BPC(12), YES(50), AA(3,12), COB(12), COS(12), CONTL(12),      OUTPUT 410
1 CONTH(12), CONTE(12), DEOT(12), PACS1(12,16), PACS2(12,16),    OUTPUT 420
1 PACS3(12,8), PIB, RIBA, RINT(50), PO, YBC, YFIRST, YLAST,      OUTPUT 430
1 PILS(20), PACE(3,12), ANAN, ANAND, HW, ISITE(20), WUHSI,      OUTPUT 440
1 OTP(12), OTPP(12), OVERS(12), HNT, HNP(12), HWI(12)           OUTPUT 450
COMMON /TBLPRT/ ISET                                           OUTPUT 460
INTEGER CONO                                                    OUTPUT 470
IRND(X) = X*1.E-3 + .5                                          OUTPUT 480
IF (IAC.EQ.0) TIMT = SINP                                       OUTPUT 490
IF (IAC.EQ.1) TIMT = COMP                                       OUTPUT 500
IP = IAR2(1)                                                    OUTPUT 510
DO 4 I=1,IR                                                      OUTPUT 520
4 WX(I) = 19 + I                                                 OUTPUT 530
IR = IAR2(2)                                                     OUTPUT 540
DO 5 I=1,IR                                                      OUTPUT 550
IX = IAR2(1) + I                                                 OUTPUT 560
5 WX(IX) = 90 + I                                               OUTPUT 570
DO 10 I = 1,12                                                   OUTPUT 580
DO 8 J = 1,8                                                     OUTPUT 590
XC2(J,I) = C2(J,I) / 1000.                                       OUTPUT 600
8 CONTINUE                                                       OUTPUT 610
IC2R(I) = XC2(4,I) + .5                                         OUTPUT 620
10 CONTINUE                                                       OUTPUT 630
IF (ISTSIG.GT.0) GO TO 16                                         OUTPUT 640
IF (ISITE(2).GT.0) WRITE(NOUT,500)ISITE,PILS                    OUTPUT 650
WRITE(NCUT,502)YFIRST,YLAST                                     OUTPUT 660
WRITE(NOUT,504) (WX(I),I=1,W2)                                  OUTPUT 670
WRITE(NOUT,506) (AL(I),BL(I),I=1,W2)                           OUTPUT 680
DO 14 K=1,INH                                                    OUTPUT 690
WRITE(NOUT,508) YES(K)                                           OUTPUT 700
WRITE(NOUT,510) (APC(J,K),BPC(J,K),J=1,W2)                     OUTPUT 710
WRITE(NOUT,512) (PLS(J,K),BLS(J,K),J=1,W2)                     OUTPUT 720
WRITE(NOUT,514) (ANS(J,K),BNS(J,K),J=1,W2)                     OUTPUT 730
IF (IBS.EQ.0) GO TO 16                                           OUTPUT 740
IF (ISET.EQ.0) GO TO 16                                           OUTPUT 750
14 CONTINUE                                                       OUTPUT 760
16 CONTINUE                                                       OUTPUT 770
CALL READS(DATE,IST,HWE,TYPE,LOC,YPSSS,YRPER,YRCOP,INANT,      OUTPUT 780
1 NOUT,IFG)                                                       OUTPUT 790
WRITE(NCUT,516)                                                  OUTPUT 800
WRITE(NOUT,518)                                                  OUTPUT 810
W21 = IAR2(1)                                                    OUTPUT 820
W22 = IAR2(2)                                                    OUTPUT 830
ISTDCS = 0                                                       OUTPUT 840
DO 18 I2 = 1,W21                                                 OUTPUT 850
PHNS(I2) = HNS(I2)                                               OUTPUT 860
IF (PHNS(I2).GT.0.) PHNS(I2) = PHNS(I2) / 1000.                OUTPUT 870
ISTDCS = ISTDCS + IC2R(I2)                                       OUTPUT 880
WRITE(NCUT,522) (AC2(J,I2),J=1,8),IC2R(I2),XC2(1,I2),PHNS(I2), OUTPUT 890
XC2(2,I2),XC2(3,I2)                                             OUTPUT 900
18 CONTINUE                                                       OUTPUT 910
WRITE(NOUT,524)                                                  OUTPUT 920
PHNS = HNS                                                       OUTPUT 930
PHNS = PHNS / 1000.                                              OUTPUT 940
TPHC = SPHC / 1000.                                              OUTPUT 950
TSLC = SSLC / 1000.                                              OUTPUT 960
TSHC = SSHC / 1000.                                              OUTPUT 970
WRITE(NOUT,526)ISTDCS,TPHC,PHNS,TSLC,TSHC                       OUTPUT 980
ISCONT = IRND(SCONT)                                             OUTPUT 990
PHVE = HVE                                                       OUTPUT1000
PHKW = PHNS / PHVE * 1000                                         OUTPUT1010
WRITE(NOUT,528) PHKW                                             OUTPUT1020
I2 = W21                                                         OUTPUT1030
DO 20 I = 1,W22                                                  OUTPUT1040
I2 = I2 + 1                                                       OUTPUT1050
WRITE(NOUT,530) (AC2(J,I2),J=1,8),IC2R(I2)                     OUTPUT1060

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20 CONTINUE
  WRITE(BCUT,524)
  ITIC = IRND(ITIC)
  WRITE(BCUT,530) ITIC
  ITPCSC = IS*DCS + ITIC
  ICKW = 1000. * FLOAT(ITPCSC) / HWE + 0.5
  WRITE(BCUT,531) ICKW,ITPCSC
  WRITE(BCUT,532) ISCONT
  WRITE(BCUT,536)
  ITPCSC = ITPCSC + ISCONT
  ICSW = 1000. * FLOAT(ITPCSC) / HWE + .5
  WRITE(BCUT,538) ICSW,ITPCSC
  ITPCOP = ITPCSC
  IF (IWANT.NE.2) GO TO 24
  WRITE(BCUT,539)
  XNUMER = 0.
  XDENOM = 0.
  XN1 = 0.
  XN2 = 0.
  XN3 = 0.
  XD1 = 0.
  XD2 = 0.
  XD3 = 0.
  DO 21 I2 = 2,N2
    XNUMER = XNUMER + XC2(1,I2)*BPC(I2,1) + XC2(2,I2)*BLS(I2,1) +
1 XC2(3,I2)*BHS(I2,1)
    XDENOM = XDENOM + XC2(4,I2)
    XN1 = XN1 + XC2(1,I2)*BPC(I2,1)
    XN2 = XN2 + XC2(2,I2)*BLS(I2,1)
    XN3 = XN3 + XC2(3,I2)*BHS(I2,1)
    XD1 = XD1 + XC2(1,I2)
    XD2 = XD2 + XC2(2,I2)
    XD3 = XD3 + XC2(3,I2)
21 CONTINUE
  PES = (XNUMER/XDENOM - 1.) * 100.
  P1 = (XN1/XD1 - 1.) * 100.
  P2 = (XN2/XD2 - 1.) * 100.
  P3 = (XN3/XD3 - 1.) * 100.
  IESCL = IRND(IESCLD)
  ITPCOP = ITPCSC + IESCL
  WRITE(BCUT,540) PES,IESCL,P1,P2,P3
  ICKW = 1000. * FLOAT(ITPCOP) / HWE + .5
  WRITE(BCUT,524)
  WRITE(BCUT,542) ICKW,ITPCOP
  WRITE(BCUT,536)
24 CONTINUE
  IDIDCI = IRND(DIDCI)
  WRITE(BCUT,544) TINT,RIBA
  IF (IWANT.NE.2) GO TO 26
  IESCI = IRND(ESCI)
  WRITE(BCUT,546) IDIDCI
  WRITE(BCUT,548) IESCI
  WRITE(BCUT,524)
26 CONTINUE
  IF (IWANT.NE.2) IESCI = 0
  ITIDC = IDIDCI + IESCI
  INKW = 1000. * FLOAT(ITIDC) / HWE + .5
  WRITE(BCUT,550) INKW,ITIDC
  WRITE(BCUT,536)
  ITPCIT = ITPCOP + ITIDC
  ICKWT = 1000. * FLOAT(ITPCIT) / HWE + .5
  WRITE(BCUT,552) ICKWT,ITPCIT
  IF (JOP.LT.2) GO TO 62
  I2 = 0
  I3 = 0
  I4 = 0
  OUTP1070
  OUTP1080
  OUTP1090
  OUTP1100
  OUTP1110
  OUTP1120
  OUTP1130
  OUTP1140
  OUTP1150
  OUTP1160
  OUTP1170
  OUTP1180
  OUTP1190
  OUTP1200
  OUTP1210
  OUTP1220
  OUTP1230
  OUTP1240
  OUTP1250
  OUTP1260
  OUTP1270
  OUTP1280
  OUTP1290
  OUTP1300
  OUTP1310
  OUTP1320
  OUTP1330
  OUTP1340
  OUTP1350
  OUTP1360
  OUTP1370
  OUTP1380
  OUTP1390
  OUTP1400
  OUTP1410
  OUTP1420
  OUTP1430
  OUTP1440
  OUTP1450
  OUTP1460
  OUTP1470
  OUTP1480
  OUTP1490
  OUTP1500
  OUTP1510
  OUTP1520
  OUTP1530
  OUTP1540
  OUTP1550
  OUTP1560
  OUTP1570
  OUTP1580
  OUTP1590
  OUTP1600
  OUTP1610
  OUTP1620
  OUTP1630
  OUTP1640
  OUTP1650
  OUTP1660
  OUTP1670
  OUTP1680
  OUTP1690
  OUTP1700
  OUTP1710
  OUTP1720

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IS          = 0
DO 50 J     = 1, N2
I2          = I2 + 1
N3          = IAR3(I2)
CALL TAILS (DATE, IST, HWE, TYPE, LOC, YR555, YPPER, YRCOP, IWANT,
1 HOUT, IPG)
WRITE (HOUT, 554)
LIN = 0
WRITE (HOUT, 558) (AC2(LL, I2), LL=1, 8)
IF (N3.EQ.0) GO TO 50
DO 50 K     = 1, N3
I3          = I3 + 1
N4          = IAR4(I3)
IF (N4.EQ.0) GO TO 40
WRITE (HOUT, 560) (AC3(LL, I3), LL=1, 8)
LIN = LIN + 1
DO 30 I     = 1, N4
I4          = I4 + 1
N5          = IAR5(I4)
IF (N5.EQ.0) GO TO 36
WRITE (HOUT, 562) (AC4(LL, I4), LL=1, 8)
LIN = LIN + 1
DO 30 H     = 1, N5
I5          = I5 + 1
WRITE (HOUT, 562) (AC5(LL, I5), LL=1, 8), C5(1, I5), C5(2, I5),
1C5(3, I5), C5(4, I5)
LIN = LIN + 1
IF (H.EQ.1) WRITE (HOUT, 564)
30 CONTINUE
WRITE (HOUT, 566) C4(1, I4), C4(2, I4), C4(3, I4), C4(4, I4)
LIN = LIN + 1
GO TO 37
36 CONTINUE
WRITE (HOUT, 562) (AC4(LL, I4), LL=1, 8), C4(1, I4), C4(2, I4),
1C4(3, I4), C4(4, I4)
LIN = LIN + 1
37 IF (LIN.LT.45) GO TO 38
CALL TAILS (DATE, IST, HWE, TYPE, LOC, YR555, YPPER, YRCOP, IWANT,
1 HOUT, IPG)
WRITE (HOUT, 554)
LIN = 0
38 CONTINUE
WRITE (HOUT, 566) C3(1, I3), C3(2, I3), C3(3, I3), C3(4, I3)
LIN = LIN + 1
GO TO 44
40 CONTINUE
WRITE (HOUT, 560) (AC3(LL, I3), LL=1, 8), C3(1, I3), C3(2, I3),
1C3(3, I3), C3(4, I3)
LIN = LIN + 1
WRITE (HOUT, 564)
44 IF (LIN.LT.45) GO TO 50
CALL TAILS (DATE, IST, HWE, TYPE, LOC, YR555, YPPER, YRCOP, IWANT,
1 HOUT, IPG)
WRITE (HOUT, 554)
LIN = 0
50 CONTINUE
WRITE (HOUT, 570) C2(1, I2), C2(2, I2), C2(3, I2), C2(4, I2)
WRITE (HOUT, 572) COMTE(I2), COMTL(I2), COMTH(I2), C2C(1, I2), C2C(2, I2),
1C2C(3, I2), C2C(4, I2)
WRITE (HOUT, 576)
WRITE (HOUT, 582) AC2(1, I2), C2T(1, I2), C2T(2, I2), C2T(3, I2),
1C2T(4, I2)
58 CONTINUE
62 RETURN
500 FORMAT ('0 OPTIONAL COMBINED COSTS BY CITY AND WEIGHTING FACTORS'
1/'0 CITY ', 20(2X, I4) /'+', 110, 20(2X, 4(' ')) /'0 FACTOR ', 20F6.2/

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OUTP1730
 OUTP1740
 OUTP1750
 OUTP1760
 OUTP1770
 OUTP1780
 OUTP1790
 OUTP1800
 OUTP1810
 OUTP1820
 OUTP1830
 OUTP1840
 OUTP1850
 OUTP1860
 OUTP1870
 OUTP1880
 OUTP1890
 OUTP1900
 OUTP1910
 OUTP1920
 OUTP1930
 OUTP1940
 OUTP1950
 OUTP1960
 OUTP1970
 OUTP1980
 OUTP1990
 OUTP2000
 OUTP2010
 OUTP2020
 OUTP2030
 OUTP2040
 OUTP2050
 OUTP2060
 OUTP2070
 OUTP2080
 OUTP2090
 OUTP2100
 OUTP2110
 OUTP2120
 OUTP2130
 OUTP2140
 OUTP2150
 OUTP2160
 OUTP2170
 OUTP2180
 OUTP2190
 OUTP2200
 OUTP2210
 OUTP2220
 OUTP2230
 OUTP2240
 OUTP2250
 OUTP2260
 OUTP2270
 OUTP2280
 OUTP2290
 OUTP2300
 OUTP2310
 OUTP2320
 OUTP2330
 OUTP2340
 OUTP2350
 OUTP2360
 OUTP2370
 OUTP2380


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C | -----
C |                                     (HEAD 70
C |                                     (HEAD 80
C | -----
C |                                     (HEAD 90
C |                                     (HEAD 100
C | SUBPROGRAM HEADS PREPARES THE HEADING LINES FOR ALL OF THE (HEAD 110
C | SUMMARY PAGE OUTPUT OF CONCEPT. (HEAD 120
C |                                     (HEAD 130
C | =====
C |                                     (HEAD 140
C |                                     (HEAD 150
C | REAL*8 TYPE(2),LOC(3),DATE (HEAD 160
C | REAL*8 NOT(9)/'UNIT 1 ','UNIT 2 ','UNIT 3 ','UNIT 4 ','UNIT 5 (HEAD 170
C | 1 ','UNIT 6 ','UNIT 7 ','UNIT 8 ','UNIT 9 '//,ALL/'TOTAL '//, (HEAD 180
C | 1ISTOUT (HEAD 190
C | REAL * 8 SCE(9),EDC(9) (HEAD 200
C | DATA SCE/ (HEAD 210
C | 1'YEAR',' OF ','STEAM','H 50','PPL',' SYS','TEN ','PUBC','BASE'/ (HEAD 220
C | DATA EDC/ (HEAD 230
C | 1'YEAR',' OF ','CONC','ENCI','AL O','PERA','TION',' ',' ' (HEAD 240
C | COMPOH/HDRAIN/ ISTSIG (HEAD 250
C | ISTOUT = NOT(IST) (HEAD 260
C | IF (IST.LT.1) ISTOUT = NOT (1) (HEAD 270
C | IF (ISTSIG.GT.0) ISTOUT = ALL (HEAD 280
C | IPG = IPG + 1 (HEAD 290
C | WRITE(BCUT,500) DATE,IPG (HEAD 300
C | WRITE(BCUT,502)ISTOUT (HEAD 310
C | WRITE(NOUT,504)HWE,TYPE(1),TYPE(2),(LOC(11),11=1,3) (HEAD 320
C | IF (IWANT.EQ.1) GO TO 2 (HEAD 330
C | WRITE(NOUT,506) SCE (HEAD 340
C | GO TO 4 (HEAD 350
C | 2 WRITE(BCUT,506) EDC (HEAD 360
C | 4 CONTINUE (HEAD 370
C | WRITE(NOUT,512)YRSSS (HEAD 380
C | WRITE(NOUT,514)YRPER (HEAD 390
C | WRITE(BCUT,516)YRCOP (HEAD 400
C | RETURN (HEAD 410
C | 500 FORMAT('1 DATE ',A8,' CONCEPT COST ESTIMATE (HEAD 420
C | 1 E S (PHASE 5)',T125,'PAGE ',I3, (HEAD 430
C | 502 FORMAT(' ',A8,' CAPITAL INVESTMENT SUMMARY (MILLIONS OF (HEAD 440
C | 1DOLLARS) ') (HEAD 450
C | 504 FORMAT(5X,I5,' HWE ',A8,1X,(' ',A8,') ',1X,'POWER PLANT AT ',3A8) (HEAD 460
C | 506 FORMAT(5X,'COST BASIS:',7X,9A4) (HEAD 470
C | 512 FORMAT(5X,'DESIGN & CONSTRUCTION PERIOD:',T40,'STEAM SUPPLY SYSTEM (HEAD 480
C | 1 PURCHASE: ',T71,P8.3) (HEAD 490
C | 514 FORMAT(' ',T40,' CONSTRUCTION PERMIT:',T71,P8.3) (HEAD 500
C | 516 FORMAT(' ',T40,' COMMERCIAL OPERATION:',T71,P8.3) (HEAD 510
C | END (HEAD 520
C | SUBROUTINE TAILS (DATE,IST,HWE,TYPE,LOC,YRSSS,YRPER,YRCOP,IWANT, (TAIL 10
C | 1 NOUT,IPG) (TAIL 20
C | -----
C |                                     (TAIL 30
C |                                     (TAIL 40
C | -----
C |                                     (TAIL 50
C |                                     (TAIL 60
C | -----
C |                                     (TAIL 70
C | -----
C |                                     (TAIL 80
C | -----
C |                                     (TAIL 90
C | -----
C |                                     (TAIL 100
C | SUBPROGRAM TAILS PREPARES THE HEADINGS FOR THE DETAILED (TAIL 110
C | ACCOUNT OUTPUT OF CONCEPT PROGRAM. (TAIL 120
C |                                     (TAIL 130
C | =====
C |                                     (TAIL 140
C |                                     (TAIL 150
C | REAL*8 TYPE(2),LOC(3),DATE (TAIL 160
C | REAL*8 NOT(9)/'UNIT 1 ','UNIT 2 ','UNIT 3 ','UNIT 4 ','UNIT 5 (TAIL 170
C | 1 ','UNIT 6 ','UNIT 7 ','UNIT 8 ','UNIT 9 '//,ALL/'TOTAL '//, (TAIL 180
C | 1ISTOUT (TAIL 190
C | REAL * 8 SCE(9),EDC(9) (TAIL 200

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DATA SCE/	TAIL 210
1'YEAR', ' OF ', 'STEAM', 'H SUPPLY', 'SYS', 'TER ', 'PURCH', 'BASE' /	TAIL 220
DATA ECC/	TAIL 230
1'YEAR', ' OF ', 'CCHN', 'ENCI', 'AL O', 'PERA', 'TION', ' ', ' ' /	TAIL 240
CONNO/EDRAIN/ ISTSIG	TAIL 250
ISTOUT = INT(IST)	TAIL 260
IF (IST.LT.1) ISTOUT = INT (1)	TAIL 270
IF (ISTSIG.GT.0) ISTOUT = ALL	TAIL 280
ING = IFG + 1	TAIL 290
WRITE(WOUT,500) DATE,ING	TAIL 300
WRITE(WOUT,502) ISTOUT,YR55	TAIL 310
WRITE(WOUT,500) HWE,TYPE (1),TYPE (2), (LOC(I),I=1,3),YRPER	TAIL 320
IF (INVT.EQ.1) GO TO 2	TAIL 330
WRITE(WOUT,506) SCE,YRCOP	TAIL 340
GO TO 4	TAIL 350
2 WRITE(WOUT,506) EDC,YRCOP	TAIL 360
4 RETURN	TAIL 370
500 FORMAT('DATE ',A8,' CONCEPT COST ESTIMATES	TAIL 380
1 (PHASE 5) ',T122,'PAGE ', I4)	TAIL 390
502 FORMAT(' ',A8,' CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS	OTAIL 400
1P DOLLARS)',T82,'STEAM SUPPLY SYSTEM PURCHASE:',T113,P9.3)	TAIL 410
504 FORMAT(' ',I5,' HWE ',A8,'(',A9,') POWER PLANT AT: ',JAB,	TAIL 420
1T82,'CONSTRUCTION PERMIT:',T113,P8.3)	TAIL 430
506 FORMAT(' COST BASIS: ',JAB,T82,'COMMERCIAL OPERATION:',T113,P8.3)	TAIL 440
END	TAIL 450
SUBROUTINE PLOT (XPYB, XLYB, SCST, INH)	PLOT 10
	PLOT 20
=====	PLOT 30
GENERATE PRINTED PLOT OF PROJECT CASH FLOW	PLOT 40
***** DAVID BERNSTEIN ***** 05/20/72 *****	PLOT 50
=====	PLOT 60
	PLOT 70
=====	PLOT 80
LOGICAL I IVERT(52) / ' ', ' ', 'C', 'A', 'P', 'I', 'T', 'A', 'L', ' ', ' ', 'C',	PLOT 90
1 'O', 'S', 'T', ' ', ' ', ' ', 'H', 'I', 'L', 'L', 'I', 'O', 'N', 'S', ' ', ' ', 'O', 'F',	PLOT 100
1 ' ', 'C', 'C', 'L', 'L', 'A', 'S', 'S', ' ', ' ', '16' ' /	PLOT 110
DIMENSION CCST(100), IOW(101), YR(5), SCST(INH)	PLOT 120
WOUT = 5	PLOT 130
DATA ISTAR/' ' /	PLOT 140
	PLOT 150
=====	PLOT 160
	PLOT 170
FIND X (YCAP) AXIS DIVISIONS.	PLOT 180
=====	PLOT 190
	PLOT 200
=====	PLOT 210
TST = 2.0	PLOT 220
DIP = XLYB - XPYB	PLOT 230
PP1 = 100.0	PLOT 240
PP2 = INH	PLOT 250
DPP = PP2 / PP1	PLOT 260
DII = 1.0	PLOT 270
II = 1	PLOT 280
III = 2	PLOT 290
DO 2 I = 1,100	PLOT 300
COST(I) = (SCST(II) + (DII - II) * (SCST(III) - SCST(II)))	PLOT 310
/1000.0	PLOT 320
DII = DII + DPP	PLOT 330
II = DII	PLOT 340
IF (II.GT.INH) II = INH	PLOT 350
IF (III+1.LE.INH) III = II + 1	PLOT 360
2 CONTINUE	PLOT 370
4 IF (TST.GT.DIP) GO TO 6	PLOT 380
TST = 2.0 + TST	PLOT 390
GO TO 3	PLOT 400
	PLOT 410

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C                                                     PLOT 420
C |=====| PLOT 430
C | PLOT 440
C | FIND Y (COST) AXIS DIVISIONS. | PLOT 450
C | PLOT 460
C |=====| PLOT 470
C                                                     PLOT 480
C 6 ICST=(COST(100)+100.0)/100 PLOT 490
  ICST = ICST PLOT 500
      N50 = ((ICST + 50.) / 50.) PLOT 510
  I50 = (N50 + 1) * 50 PLOT 520
  IF (ICST.LT.1) ICST = 1 PLOT 530
  INULT = 1 PLOT 540
  ISPACE = (INULT * I50) / (ICST * 7) PLOT 550
  IF (ISPACE .LT. 1) ISPACE = 1 PLOT 560
  IDIVS = (INULT * I50) / ISPACE PLOT 570
  IXTA = 50-ISPACE*IDIVS PLOT 580
  CST=ICST*100.0 PLOT 590
  RANGE = I50 * INULT PLOT 600
  DIV = RANGE / ISPACE PLOT 610
8 IYEAR = XFYR PLOT 620
  YRDIP = XFYR - IYEAR PLOT 630
  YR(1) = IYEAR PLOT 640
  DO 10 I=2,5 PLOT 650
10 YR(I) = YR(I-1) + TST / 4.0 PLOT 660
C                                                     PLOT 670
C |=====| PLOT 680
C | PLOT 690
C | WRITE TOP LEGEND. | PLOT 700
C | PLOT 710
C |=====| PLOT 720
C                                                     PLOT 730
  WRITE(NOUT,500) (YR(N), N=1,5) PLOT 740
  WRITE(NOUT,502) PLOT 750
C                                                     PLOT 760
C |=====| PLOT 770
C | PLOT 780
C | CALCULATIONS TO FIND START OF SHADED AREA. | PLOT 790
C | PLOT 800
C |=====| PLOT 810
C                                                     PLOT 820
  LSTCOL = (DIP / TST) * 100.0 + (YRDIP/TST) * 100.0 PLOT 830
  IF (LSTCOL.GT.101) LSTCOL = 101 PLOT 840
C                                                     PLOT 850
C |=====| PLOT 860
C | PLOT 870
C | BLANK OUTPUT ARRAY. | PLOT 880
C | PLOT 890
C |=====| PLOT 900
C                                                     PLOT 910
  DO 12 I = 1,101 PLOT 920
12 IOUT(I) = 0 PLOT 930
  NUN = CST PLOT 940
  IF (IXTA.EQ.0) GO TO 16 PLOT 950
  DO 14 N=1,IXTA PLOT 960
14 WRITE(NOUT,504) PLOT 970
16 WRITE(NOUT,506) NUN, NUN PLOT 980

```

```

C
C |=====| PLOT 990
C | PLOT1000
C | PLOT1010
C | PRINT GRAPH WITH VERTICAL MARGINS. | PLOT1020
C | PLOT1030
C |=====| PLOT1040
C
DO 32 I      = 1, IDIVS          PLOT1050
DO 30 J      = 1, ISPACE        PLOT1060
KK          = ((I-1) * ISPACE) + J PLOT1070
ID = J - 1          PLOT1080
PRCOST = NUN - ID * DIV          PLOT1090
DPRC = PRCOST - DIV          PLOT1100
IF (COST(100).LT.DPRC) GO TO 28 PLOT1110
DO 18 K      = 1, 100          PLOT1120
IH          = K                PLOT1130
IF (COST(IH).LE.PRCOST.AND.COST(IH).GE.DPRC) GO TO 20 PLOT1140
18 CONTINUE          PLOT1150
GO TO 26            PLOT1160
20 X          = IH            PLOT1170
IFRCOL = (((X/100.0) * DIV) + YRDIV) / TST * 100.0 PLOT1180
IF (IFRCOL.GT.101) IFRCOL = 101 PLOT1190
22 DO 24 LL = IFRCOL, LSTCOL PLOT1200
24 IOUT(LL)   = ISTAR          PLOT1210
26 CONTINUE          PLOT1220
IF (J.EQ.ISPACE) GO TO 30 PLOT1230
WRITE(NOUT,508) IVERT(KK), (IOUT(JP), JP=1,101), IVERT(KK) PLOT1240
GO TO 30            PLOT1250
28 WRITE(NOUT,504) IVERT(FK), IVERT(KK) PLOT1260
30 CONTINUE          PLOT1270
NUN = CST - I * (150 * INULT) PLOT1280
IF (NUN.LT.0) GO TO 32 PLOT1290
WRITE(NOUT,510) IVERT(I*ISPACE), NUN, (IOUT(JP), JP=1,101), NUN, PLOT1300
1 IVERT(I*ISPACE) PLOT1310
IF (NUN.LE.0) GO TO 34 PLOT1320
32 CONTINUE          PLOT1330
34 CONTINUE          PLOT1340
C
C |=====| PLOT1350
C | PLOT1360
C | PLOT1370
C | PLOT1380
C | PRINT BOTTOM SCALES. | PLOT1390
C | PLOT1400
C |=====| PLOT1410
C
WRITE(NOUT,502) PLOT1420
WRITE(NOUT,500) (YR(N), N=1,5) PLOT1430
RETURN PLOT1440
500 FORMAT ('0', 11X, 4(P6.1, 19X), P6.1) PLOT1450
502 FORMAT (' ', 16X, 4('0.....'), '+') PLOT1460
504 FORMAT (' ', 2X, A1, 11X, '- ', 101X, '- ', 10X, A1) PLOT1470
506 FORMAT (' ', 6X, I6, 3X, '+', 102X, '+', I6) PLOT1480
508 FORMAT (' ', 2X, A1, 11X, '- ', 101A1, '- ', 10X, A1) PLOT1490
510 FORMAT (' ', 2X, A1, 3X, I6, 3X, '+', 101A1, '+', I6, 3X, A1) PLOT1500
END PLOT1510
PLOT1520

```


Appendix D

EXAMPLE PROBLEMS LISTING

1100 CBIGSNET CLEVELAND EXAMPLE3 197900 198303 198730 8500 0 1 1 0 0 1 1

ECONOPT ANAN=8.0, D(3,1)=1500.,

END

1100 PWB1NET ATLANTA EXAMPLE6 197850 198253 198653 9000 0 0 0 1 1 1 2

1.085 1.085 1.085 1.085 1.095 1.035 1.085

1.085 1.085 1.085 1.085

1978.5

-1.

1100 PWB2NET ATLANTA EXAMPLE6 197850 198453 199053 9000 0 0 0 1 2 1

1200 CBIGSNET MIDDLETOWN EXAMPLE7 197900 198303 198730 8150 0 2 2 1 1 0 1

ECONOPT CONT2=0.,10*15.,CONT1=3.,10*15.,CONTH=0.,10*15.,

END

1.06 1.06 1.06 1.06 1.06 1.06 1.06

1.06 1.06 1.06 1.06

1.08 1.08 1.08 1.08 1.08 1.08 1.08

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1.08 1.08 1.08 1.08

1978.0

-1.

CONCEPT PHASE 2 DATA SET

POWER PLANT TYPE CODES

CITY NAME CODES

1	PWRNET	05-02-78
2	PWR1NET	03-21-78
3	PWR2NET	03-31-78
4	BWRNET	05-16-78
5	BWR1NET	04-04-78
6	BWR2NET	04-05-78
7	CBIGSNET	05-16-78
8	CBIG1SNT	04-10-78
9	CBIG2SNT	04-10-78
10	COALNET	05-19-78
11	COAL1NET	04-11-78
12	COAL2NET	04-11-78
13	COAL3NET	04-12-78
14	COALSNET	04-25-78
15	COAL1SNT	04-14-78
16	COAL2SNT	04-14-78
17	COAL3SNT	04-14-78
18	CBIGNET	04-24-78
19	CBIG1NET	04-13-78
20	CBIG2NET	04-13-78

1	ATLANTA	GEORGIA
2	BALTIMORE	MARYLAND
3	BIRMINGHAM	ALABAMA
4	BOSTON	MASSACHUSETTS
5	CHICAGO	ILLINOIS
6	CINCINNATI	OHIO
7	CLEVELAND	OHIO
8	DALLAS	TEXAS
9	DENVER	COLORADO
10	DETROIT	MICHIGAN
11	KANSAS CITY	KANSAS
12	LOS ANGELES	CALIFORNIA
13	MINNEAPOLIS	MINNESOTA
14	NEW ORLEANS	LOUISIANA
15	NEW YORK	NEW YORK
16	PHILADELPHIA	PENNSYLVANIA
17	PITTSBURGH	PENNSYLVANIA
18	ST. LOUIS	MISSOURI
19	SAN FRANCISCO	CALIFORNIA
20	SEATTLE	WASHINGTON
21	MONTREAL	CANADA
22	TORONTO	CANADA
23	MIDDLETOWN	USA

IF THE PLANT TYPE OR CITY SELECTED WAS NOT USED
IN COMPUTATIONS, CHECK SPELLING AND FIPID JUSTIFICATION
WITH THE AVAILABLE PLANT TYPE AND CITY NAME CODES

D A T A C A R D C O L U M N S D E F

1--8 6-----13 15-----30 32----39 41----47 48----54 55-----61 62--66 68 70 72 74 76 78 80
 NNR MODEL CITY EXTRA ID YR SSR YR PER YR COP % INT ILAZ IPLAU IOP IESC IRR IAC ISTACK

1100 CBIGSNET CLEVELAND EXAMPLE3 1979.000 1983.000 1987.000 8.500 0 1 1 0 0 1 1
 SCWOPT ANAR=8.0, D(3,1)=1500.,
 SEND

DATE 11-10-78 C O N C E P T C O S T E S T I M A T E S (PHASE 4)
 UNIT 1 CAPITAL INVESTMENT SUMMARY (MILLIONS OF DOLLARS)
 1100 NNR CBIGSNET () POWER PLANT AT CLEVELAND EXAMPLE3
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE
 DESIGN & CONSTRUCTION PERIOD: STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION PERMIT: 1983.000
 COMMERCIAL OPERATION: 1987.000

CONIV CALLED - DATA FIT DONE ON OHIO

CLEVELAND

SITE RATE AND ESCALATION USED IN COST PROJECTIONS

YFIRST = 1964.00 YLAST = 1978.50

ACCT	20	ACCT	21	ACCT	22	ACCT	23	ACCT	24	ACCT	25	ACCT	26	ACCT	91	ACCT	92	ACCT	93	ACCT	94
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	P	A	B	A	P	A	B
*****				1979.000				*****													
2218.6	1.067	218.6	1.067	218.6	1.067	218.6	1.067	218.6	1.067	218.6	1.067	218.6	1.067	218.6	1.067	206.4	1.061	206.4	1.061	206.4	1.061
115.40	1.086	15.40	1.086	16.29	1.088	16.17	1.089	16.02	1.087	16.14	1.089	15.67	1.088	15.25	1.086	16.48	1.087	16.48	1.087	16.58	1.087
41000.	1.000	23.76	1.080	23.76	1.080	23.76	1.090	23.76	1.080	23.76	1.080	23.76	1.080	23.76	1.080	23.76	1.080	23.76	1.080	23.76	1.080

DATE 11-10-78 C O N C E P T P L A N T M O D E L N A M E (PAGE 1)
 UNIT 1 CAPITAL INVESTMENT SUMMARY (MILLIONS OF DOLLARS)
 1100 MW CRIGSMT (05-10-78) POWER PLANT AT CLEVELAND
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE
 DESIGN & CONSTRUCTION PERIOD: STEAM SUPPLY SYSTEM PURCHASE: 1979, 1980
 CONSTRUCTION PERIOD: 1981, 1982
 COMMERCIAL OPERATION: 1987, 1988

ACCOUNT NUMBER	DESCRIPTION	TOTAL COSTS	EQUIPMENT COSTS	LABOR HOURS	NATURAL GAS COSTS
20	LAND AND LAND RIGHTS	0	0.0 (0.0)	0.0	1.507
21	STRUCTURES & IMPROVEMENTS	0.7	2.943 (1.474)	22,706	11.106
22	BOILER PLANT EQUIPMENT	196	117,484 (1,656)	59,560	18,184
23	TURBINE PLANT EQUIPMENT	126	80,240 (1,840)	10,404	1,716
24	ELECTRIC PLANT EQUIPMENT	41	10,567 (1,261)	10,261	10,644
25	MISCELLANEOUS PLANT EQUIP	12	6,716 (0,262)	4,242	0,917
26	WATER COND HEAT REJECT SYS	13	11,222 (1,222)	4,152	1,152
	SUBTOTAL	462	241,260 (8,794)	141,240	49,564
				7,344 HOURS/KW	
91	CONSTRUCTION SERVICES	57			
92	HOME OFFICE ENGRG. SERVICE	21			
93	FIELD OFFICE ENGRG. SERVICE	15			
94	OWNER'S COSTS	22			
	SUBTOTAL	115			
	DIRECT & INDIRECT COSTS (1.531/KW)	546			
	CONTINGENCY ALLOWANCE	49			
	TOTAL DIRECT & INDIRECT COSTS (1.585/KW)	644			
	ESCALATION DURING CONSTRUCTION (7.415%/YR)	252			
	TOTAL ESCALATED DIRECT & INDIRECT COSTS (1.655/KW)	841			
	INTEREST DURING CONSTRUCTION COMPOUND (7.500%/YR)				
	ON DIRECT & INDIRECT COSTS	166			
	ON ESCALATION DURING CONSTRUCTION	64			
	TOTAL INTEREST DURING CONSTRUCTION (1.214/KW)	215			
	TOTAL PLANT CAPITAL INVESTMENT (1.1069/KW)	1176			

WEIGHTED AVERAGE ESCALATION (1/YR)
 EQUIPMENT LABOUR NATURAL
 6.542 6.714 8.134

DATE 11-10-78 CONCEPT COST ESTIMATES (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1100 NEW CRIGGET (05-16-78) POWER PLANT AT: CLEVELAND EXAMINER
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979,000
 CONSTRUCTION PERMIT: 1981,000
 COMMERCIAL OPERATION: 1987,000

DATE 11-10-78 C O M C E R T C O N S C P T I M A T I O N (P O U R C E)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1100 REP CRISGEN (05-16-78) POWER PLANT AT CLEVELAND OHIO
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE 1979, 000
 CONSTRUCTION EXPENSE 1979, 000
 COMMERCIAL OPERATION 1987, 000

C O M P L A T I V E C A L C U L A T I O N

BOTH THE CASH FLOW CURVE SHOWN ABOVE AND THE FOLLOWING CASH FLOW TABLE
 HAVE COSTS EXPRESSED AS TOTAL COST INCURRED TO DATE (INCLUDING INTEREST CHARGES TO DATE).

COST TO DATE (MILLIONS OF DOLLARS)

DATE

1979, 000
 1979, 160
 1979, 320
 1979, 490
 1979, 640
 1979, 800
 1979, 960
 1980, 120
 1981, 240
 1981, 400
 1981, 560
 1981, 720
 1981, 880
 1981, 1040
 1982, 1200
 1982, 1360
 1982, 1520
 1982, 1680
 1982, 1840
 1982, 2000
 1983, 160
 1983, 320
 1983, 480
 1983, 640
 1983, 800
 1983, 960
 1984, 120
 1984, 240
 1984, 400
 1984, 560
 1984, 720
 1984, 880
 1984, 1040
 1984, 1200
 1985, 160
 1985, 320
 1985, 480
 1985, 640
 1985, 800
 1985, 960
 1986, 120
 1986, 240
 1986, 400
 1986, 560
 1986, 720
 1986, 880
 1986, 1040
 1986, 1200
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 1987, 640
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 1987, 2880
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 1987, 3680
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 1987, 89440
 1987, 89600
 1987, 89760
 1987, 89920
 1987, 90080
 1987, 90240
 1987, 90400
 1987, 90560
 1987, 90720
 1987, 90880
 1987, 91040
 1987, 91200
 1987, 91360
 1987, 91520
 1987, 91680
 1987, 91840
 1987, 92000
 1987, 92160
 1987, 92320
 1987, 92480
 1987, 92640
 1987, 92800
 1987, 92960
 1987, 93120
 1987, 93280
 1987, 93440
 1987, 93600
 1987, 93760
 1987, 93920
 1987, 94080
 1987, 94240
 1987, 94400
 1987, 94560
 1987, 94720
 1987, 94880
 1987, 95040
 1987, 95200
 1987, 95360
 1987, 95520
 1987, 95680
 1987, 95840
 1987, 96000
 1987, 96160
 1987, 96320
 1987, 96480
 1987, 96640
 1987, 96800
 1987, 96960
 1987, 97120
 1987, 97280
 1987, 97440
 1987, 97600
 1987, 97760
 1987, 97920
 1987, 98080
 1987, 98240
 1987, 98400
 1987, 98560
 1987, 98720
 1987, 98880
 1987, 99040
 1987, 99200
 1987, 99360
 1987, 99520
 1987, 99680
 1987, 99840
 1987, 100000
 1987, 100160
 1987, 100320
 1987, 100480
 1987, 100640
 1987, 100800
 1987, 100960
 1987, 101120
 1987, 101280
 1987, 101440
 1987, 101600
 1987, 101760
 1987, 101920
 1987, 102080
 1987, 102240
 1987, 102400
 1987, 102560
 1987, 102720
 1987, 102880
 1987, 103040
 1987, 103200
 1987, 103360
 1987, 103520
 1987, 103680
 1987, 103840
 1987, 104000
 1987, 104160
 1987, 104320
 1987, 104480
 1987, 104640
 1987, 104800
 1987, 104960
 1987, 105120
 1987, 105280
 1987, 105440
 1987, 105600
 1987, 105760
 1987, 105920
 1987, 106080
 1987, 106240
 1987, 106400
 1987, 106560
 1987, 106720
 1987, 106880
 1987, 107040
 1987, 107200
 1987, 107360
 1987, 107520
 1987, 107680
 1987, 107840
 1987, 108000
 1987, 108160
 1987, 108320
 1987, 108480
 1987, 108640
 1987, 108800
 1987, 108960
 1987, 109120
 1987, 109280
 1987, 109440
 1987, 109600
 1987, 109760
 1987, 109920
 1987, 110080
 1987, 110240
 1987, 110400
 1987, 110560
 1987, 110720
 1987, 110880
 1987, 111040
 1987, 111200
 1987, 111360
 1987, 111520

DATA CAPD COLUMNS USED

1--8	6-----13	15-----30	32-----39	41-----47	49-----54	55-----61	62-----68	69	70	72	74	76	78	80					
WEE	MODEL	CITY	EXTRA ID	YR	SSS	YR	PER	YR	COP	%	INT	ILAZ	IPLAG	IOF	YESC	IBN	IAC	NO	IS*ALN
1100	PERNET	ATLANTA	EXAMPLE6	1978.500	1982.500	1988.500	9.000	0	0	0	1	1	1	2					

11-10-78 CONCEPT COST ESTIMATES (PHASE 5)
 OMIT 1 CAPITAL INVESTMENT SUMMARY (MILLIONS OF DOLLARS)
 1100 WEE PERNET () POWER PLANT AT ATLANTA EXAMPLE6
 COST BASIS: YEAR OF COMMERCIAL OPERATION
 DESIGN & CONSTRUCTION PERIOD: STEAM SUPPLY SYSTEM PURCHASE: 1978.500
 CONSTRUCTION PERMIT: 1982.500
 COMMERCIAL OPERATION: 1988.500

CONIV CALLED - DATA FIT DONE ON GEORGIA ATLANTA

INPUT CARDS TO PRODUCE TIME DEPENDENT ESCALATION RATES-----

1.085	1.085	1.085	1.085	1.085	1.085	1.085
1.085	1.085	1.085	1.085			

1978.5
 -1.

SITE RATE AND ESCALATION USED IN COST PROJECTIONS

YFIRST = 1964.00 YLAST = 1978.50

ACCT	20	ACCT	21	ACCT	22	ACCT	23	ACCT	24	ACCT	25	ACCT	26	ACCT	27	ACCT	28	ACCT	29	ACCT	30
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
***** 1978.500 *****																					
211.6	1.067	211.6	1.067	211.6	1.067	211.6	1.067	211.6	1.067	211.6	1.067	211.6	1.067	211.6	1.067	211.6	1.067	211.6	1.067	211.6	1.067
110.65	1.085	10.45	1.085	12.21	1.085	11.96	1.085	13.19	1.085	12.27	1.085	11.43	1.085	10.45	1.085	11.46	1.085	11.46	1.085	11.46	1.085
11000.	1.000	22.21	1.072	22.21	1.072	22.21	1.072	22.21	1.072	22.21	1.072	22.21	1.072	22.21	1.072	22.21	1.072	22.21	1.072	22.21	1.072

DATE 11-10-78 C C N C R P T C O N T R O L L E D A T E X (PAGE 5)
 UNIT 1 CAPITAL INVESTMENT SUMMARY (MILLIONS OF DOLLARS)
 1100 MW PURINET (01-21-78) POWER PLANT AT ATLANTA EXAMPLE
 COST BASIS: YEAR OF COMMERCIAL OPERATION
 DESIGN & CONSTRUCTION PERIOD: STRAIN SUPPLY SYSTEM DURATION: 1978, 1980
 CONSTRUCTION PERIOD: 1980, 1981
 COMMERCIAL OPERATION: 1984, 1985

ACCOUNT NUMBER	ACCOUNT	TOTAL COST	EQUIPMENT COST	LABOR COST	MAINTENANCE COST
20	LAND & LAND RIGHTS (COMMON)	2	0.0	0.0	2.0
21	STRUCTURES & IMPROVEMENTS	154	17,772	4,772	61,740
22	REACTOR PLANT EQUIPMENT	212	171,516	2,143	44,501
23	TURBINE PLANT EQUIPMENT	149	144,356	1,771	36,163
24	ELECTRIC PLANT EQUIPMENT	44	22,824	1,429	11,196
25	MISCELLANEOUS PLANT EQUIP	14	12,321	0,114	6,085
26	MAIN COND HPAT REJECT SYS	12	12,161	0,171	1,261
	SUBTOTAL	706	344,121	15,740	200,479
				9,764	9,764
91	CONSTRUCTION SERVICES	47			
92	HOME OFFICE ENGRG. SERVICE	74			
93	FIELD OFFICE ENGRG. SERVICE	47			
94	OWNER'S COSTS	12			
	SUBTOTAL	206			
	DIRECT & INDIRECT COSTS (\$ 931/100)	441			
	CONTINGENCY ALLOWANCE	90			
	TOTAL DIRECT & INDIRECT COSTS (\$ 931/100)	1091			
	INTEREST DURING CONSTRUCTION COMPOUND (\$ 1,000/100)	442			
	TOTAL INTEREST DURING CONSTRUCTION (\$ 432/100)	442			
	TOTAL PLANT CAPITAL INVESTMENT (\$ 1,961/100)	1513			

DATA CARD COLUMNS USED

1--8 6-----13 15-----30 32-----39 41-----47 48-----54 55-----61 62-----68 69 70 72 74 76 78 80
 NME MODE1 CITY EXTRA ID YR SSS YR PER YR COP T INT ILA2 IFLAG ICF IFSC IDS IAC ISTACK

1200 CBIGSNET MIDDLETOWN EXAMPLE7 1979.000 19 3.000 1987.000 8.150 0 0 0 0 1 0 1
 SCOROPT CONTE=0., 10*15., CONTL=0., 10*15., CONTY=0., 10* 5.,
 SEND

DATE 11-10-79 C O N C E P T C O S T E S T I M A T E S (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT SUMMARY (MILLIONS OF DOLLARS)
 1200 NME CBIGSNET () POWER PLANT AT MIDDLETOWN EXAMPLE7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE
 DESIGN & CONSTRUCTION PERIOD: STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION PERMIT: 1983.000
 COMMERCIAL OPERATION: 1987.000

CONIV CALLED - DATA FIT DONE ON N5A MIDDLETOWN

INPUT CARDS TO PRODUCE TIME DEPENDENT ESCALATION RATES

1.08	1.08	1.08	1.08	1.08	1.08	1.08
1.06	1.06	1.06	1.06	1.06	1.06	1.06
1.08	1.08	1.08	1.08	1.08	1.08	1.08
1.08	1.08	1.08	1.08	1.08	1.08	1.08
1.08	1.08	1.08	1.08	1.08	1.08	1.08
1.08	1.08	1.08	1.08	1.08	1.08	1.08

1978.0
 -1.

SITE RATE AND ESCALATION USED IN COST PROJECTIONS YFIRST = 1964.00 YLAST = 1978.50

ACCT	20	ACCT	21	ACCT	22	ACCT	23	ACCT	24	ACCT	25	ACCT	26	ACCT	91	ACCT	92	ACCT	93	ACCT	94
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
5217.2	1.060	217.2	1.060	217.2	1.060	217.2	1.060	217.2	1.060	217.2	1.060	217.2	1.060	217.2	1.060	206.2	1.060	206.2	1.060	206.2	1.060
115.42	1.080	15.42	1.080	15.91	1.080	16.01	1.090	15.16	1.080	16.06	1.080	15.60	1.080	15.33	1.080	15.79	1.080	15.79	1.080	15.79	1.080
11080.	1.080	24.96	1.080	24.96	1.080	24.36	1.080	24.96	1.080	24.96	1.080	24.96	1.080	24.96	1.080	24.96	1.080	24.96	1.080	24.96	1.080

DATE 11-10-78 CONCEPT COST ESTIMATES (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT SUMMARY (MILLIONS OF DOLLARS)
 1200 MWE CBIGSNET (05-16-78) POWER PLANT AT MIDDLETOWN EXAMPLE 7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE
 DESIGN & CONSTRUCTION PERIOD: STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION PERMIT: 1983.000
 COMMERCIAL OPERATION: 1987.000

ACCOUNT NUMBER	ACCOUNT TITLE	TOTAL COSTS	EQUIPMENT COSTS	LABOR MANHOURS	LABOR COSTS	MATERIAL COSTS
20 .	LAND AND LAND RIGHTS	2	0.0	(0.3)	0.0	2.160
21 .	STRUCTURES & IMPROVEMENTS	59	3.052	(1.434)	22.115	34.115
22 .	BOILER PLANT EQUIPMENT	202	124.861	(3.533)	56.208	20.633
23 .	TURBINE PLANT EQUIPMENT	132	96.189	(1.815)	29.057	6.506
24 .	ELECTRIC PLANT EQUIPMENT	42	10.802	(1.232)	19.914	11.519
25 .	MISCELLANEOUS PLANT EQUIPT	12	6.867	(0.257)	6.129	1.010
26 .	MAIN COND HEAT REJECT SYS	19	11.236	(0.257)	4.012	1.222
	SUBTOTAL	469	255.508	(8.528)	135.435	77.266
				7.107	MANHOURS/KW	
91 .	CONSTRUCTION SERVICES	58				
92 .	HOME OFFICE ENGBG. & SERVICE	23				
93 .	FIELD OFFICE ENGBG. & SERVICE	16				
94 .	OWNER'S COSTS	42				
	SUBTOTAL	139				
	DIRECT & INDIRECT COSTS	(\$ 506/KW)	607			
	CONTINGENCY ALLOWANCE	91				
	TOTAL DIRECT & INDIRECT COSTS	(\$ 582/KW)	698			
	ESCALATION DURING CONSTRUCTION	(6.894%/YR)	294			
	TOTAL ESCALATED DIRECT & INDIRECT COSTS	(\$ 827/KW)	992			
	INTEREST DURING CONSTRUCTION SIMPLE	(9.3504%/YR)				
	ON DIRECT & INDIRECT COSTS	161				
	ON ESCALATION DURING CONSTRUCTION	52				
	TOTAL INTEREST DURING CONSTRUCTION	(\$ 126/KW)	223			
	TOTAL PLANT CAPITAL INVESTMENT	(\$ 1013/KW)	1215			

WEIGHTED AVERAGE ESCALATION (%/YR)
 EQUIPMENT 6.000
 LABOR 9.000
 MATERIAL 8.000

DATE 11-10-78 CONCEPT COST ESTIMATES (PHASE 4)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 WER CUBISSET (05-16-78) POWER PLANT AT: MIDDLETOWN EXAMPLE 7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1679,000
 CONSTRUCTION PERMIT: 1687,000
 COMMERCIAL OPERATION: 1687,000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LABOR	SITE MATERIALS	TOTAL
20 .	LAND AND LAND RIGHTS				
201.	LAND AND PRIVILEGE ACQUISITION	\$ 0.	\$ 0.	\$ 2160.	2160.
202.	RELOCATION OF BUILDINGS, UTILITIES, ETC.	\$ 0.	\$ 0.	\$ 0.	0.
SUBTOTAL FOR ACCOUNT		\$ 0.	\$ 0.	\$ 2160.	\$ 2160.
CONTINGENCY (0.08EOP- 0.04LABOR- 0.04MTL) . . .		24	24	24	84
TOTAL FOR ACCOUNT 20		\$ 24	\$ 24	\$ 2184	\$ 2184

DATE 11-10-78 C O N C E P T C O S T E S T I M A T E S (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 WUE CRIGRHT (05-16-78) POWER PLANT AT: HIDDLESTOWN EXAMPLE 7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION PERMIT: 1981.000
 COMMERCIAL OPERATION: 1987.000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LANDS	SITE BUILDINGS	TOTAL
211	STRUCTURES & IMPROVEMENTS				
211.1	YARDWORK				
211.11	GENERAL YARDWORK	\$ 0.	\$ 291.	\$ 332.	\$ 623.
211.12	GENERAL CUT & FILL	0.	268.	752.	1020.
211.13	POLES, WALLS-PARKING AREA	0.	106.	152.	258.
211.14	FENCING & GATES	138.	45.	40.	223.
211.15	SANITARY STEEN FACILITY	0.	129.	97.	226.
211.16	YARD DRAINAGE STORM SEWERS	0.	178.	140.	318.
211.17	ROADWAY & YARD LIGHTING	138.	103.	151.	392.
211.18	SUBTOTAL	138.	642.	672.	1452.
211.19	RAILROADS				
211.20	CUT & FILL	\$ 0.	\$ 19.	\$ 25.	\$ 44.
211.21	GRADING	0.	10.	22.	32.
211.22	TRUCK(BALLAST,TIES,RAIL)	0.	1593.	1611.	3204.
211.23	SWITCHES & BUMPERS	0.	1652.	1702.	3354.
211.24	SUBTOTAL	0.	1672.	1724.	3396.
211.25	STRUCTURE ASSOCIATED YDWR.				
211.26	CUT & FILL	\$ 0.	\$ 268.	\$ 144.	\$ 412.
211.27	SUBTOTAL	0.	268.	144.	412.
212	STEAM GENERATOR BUILDING				
212.1	BUILDING STRUCTURE	\$ 0.	\$ 926.	\$ 1003.	\$ 1929.
212.2	SUBSTRUCTURE CONCRETE	0.	624.	716.	1340.
212.3	SUBTOTAL	0.	1550.	1719.	3269.
212.4	BUILDING SERVICES				
212.21	PLUMBING & DRAINS	\$ 98.	\$ 149.	\$ 15.	\$ 262.
212.22	HEATING, VENT & AIR COND	442.	344.	50.	836.
212.23	LIGHTING & SERVICE POWER	0.	296.	139.	435.
212.24	ELEVATOR	98.	41.	4.	143.
212.25	PIRE PROTECTION SYSTEM	10.	4.	0.	14.
212.26	SUBTOTAL	648.	534.	79.	1261.
213	TURBINE, HEATER, CONTROL BLD				
213.1	BUILDING STRUCTURE	\$ 0.	\$ 755.	\$ 901.	\$ 1656.
213.2	SUBSTRUCTURE CONCRETE	0.	2748.	2824.	5572.
213.3	SUBTOTAL	0.	3503.	3725.	7228.
213.4	BUILDING SERVICES				
213.21	PLUMBING & DRAINS	\$ 109.	\$ 167.	\$ 14.	\$ 290.
213.22	HEATING, VENT & AIR COND	100.	235.	33.	368.
213.23	LIGHTING & SERVICE POWER	0.	202.	128.	330.
213.24	SUBTOTAL	209.	397.	157.	763.
214	OTHER STRUCTURES				
214.1	ADMINISTRATION-SERVICE BLD	\$ 0.	\$ 515.	\$ 895.	\$ 1410.
214.2	BUILDING STRUCTURE	237.	414.	124.	775.
214.3	BUILDING SERVICES	237.	97.	1022.	2256.

DATE 11-10-78 C O N C E P T C O S T E S T I M A T E S (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 WPC CRIGST(05-16-78) POWER PLANT AT: MIDDLE-OWN EXAMPLE7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE:
 1479,000
 CONSTRUCTION PERMIT:
 1941,000
 COMMERCIAL OPERATION:
 1987,000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LABOR	SITE MATERIALS	TOTAL
2180.	FIRE PROTECTION	0.	0.	0.	0.
2181.	ELECTRICAL SWITCHGR BLDGS	16.	53.	9.	97.
2181.1	BUILDING STRUCTURE	12.	48.	8.	68.
2181.2	BUILDING SERVICES	4.	5.	1.	10.
2181.3	SUBTOTAL	16.	58.	9.	83.
2182.	COAL CAP TRAN SHED	0.	30.	15.	45.
2182.1	BUILDING STRUCTURE	0.	30.	15.	45.
2182.2	SUBTOTAL	0.	30.	15.	45.
2183.	ROTARY CAR DUMP BLDG-TUNNEL	0.	0.	0.	0.
2183.1	BUILDING STRUCTURE	0.	0.	0.	0.
2183.2	BUILDING SERVICES	0.	0.	0.	0.
2183.3	SUBTOTAL	0.	0.	0.	0.
2184.	COAL BREAKER HOUSE	0.	0.	0.	0.
2184.1	BUILDING STRUCTURE	0.	0.	0.	0.
2184.2	BUILDING SERVICES	0.	0.	0.	0.
2184.3	SUBTOTAL	0.	0.	0.	0.
2185.	COAL CRUSHER HOUSE	0.	0.	0.	0.
2185.1	BUILDING STRUCTURE	0.	0.	0.	0.
2185.2	BUILDING SERVICES	0.	0.	0.	0.
2185.3	SUBTOTAL	0.	0.	0.	0.
2186.	SCALER HOUSE TRANSFER TOWER	0.	0.	0.	0.
2186.1	BUILDING STRUCTURE	0.	0.	0.	0.
2186.2	BUILDING SERVICES	0.	0.	0.	0.
2186.3	SUBTOTAL	0.	0.	0.	0.
2187.	ROTARY FLOW MAINTENANCE SHED	0.	0.	0.	0.
2187.1	BUILDING STRUCTURE	0.	0.	0.	0.
2187.2	BUILDING SERVICES	0.	0.	0.	0.
2187.3	SUBTOTAL	0.	0.	0.	0.
2188.	LOCOMOTIVE REPAIR GARAGE	0.	0.	0.	0.
2188.1	BUILDING STRUCTURE	0.	0.	0.	0.
2188.2	BUILDING SERVICES	0.	0.	0.	0.
2188.3	SUBTOTAL	0.	0.	0.	0.
2189.	MATERIAL HANDLING SERVICE BLD	0.	0.	0.	0.
2189.1	BUILDING STRUCTURE	0.	0.	0.	0.
2189.2	BUILDING SERVICES	0.	0.	0.	0.
2189.3	SUBTOTAL	0.	0.	0.	0.
2190.	WASTE WATER TREATMENT BLDG	0.	0.	0.	0.
2190.1	BUILDING STRUCTURE	0.	0.	0.	0.
2190.2	BUILDING SERVICES	0.	0.	0.	0.
2190.3	SUBTOTAL	0.	0.	0.	0.
2191.	WASTE WATER EQUIPMENT BLDG	0.	0.	0.	0.
2191.1	BUILDING STRUCTURE	0.	0.	0.	0.
2191.2	BUILDING SERVICES	0.	0.	0.	0.
2191.3	SUBTOTAL	0.	0.	0.	0.
2192.	API OIL SEPARATOR	0.	0.	0.	0.
2192.1	BUILDING STRUCTURE	0.	0.	0.	0.
2192.2	BUILDING SERVICES	0.	0.	0.	0.
2192.3	SUBTOTAL	0.	0.	0.	0.
2193.	MISC COAL HANDLING STRUCT	0.	0.	0.	0.
2193.1	BUILDING STRUCTURE	0.	0.	0.	0.
2193.2	BUILDING SERVICES	0.	0.	0.	0.
2193.3	SUBTOTAL	0.	0.	0.	0.
2194.	CONVEYOR GALLERIES	0.	0.	0.	0.
2194.1	BUILDING STRUCTURE	0.	0.	0.	0.
2194.2	BUILDING SERVICES	0.	0.	0.	0.
2194.3	SUBTOTAL	0.	0.	0.	0.
2195.	ROTARY FLOW ACCESS TUNNEL	0.	0.	0.	0.
2195.1	BUILDING STRUCTURE	0.	0.	0.	0.
2195.2	BUILDING SERVICES	0.	0.	0.	0.
2195.3	SUBTOTAL	0.	0.	0.	0.
2196.	COAL PILE YARDHOUSE BARRIER	0.	0.	0.	0.
2196.1	BUILDING STRUCTURE	0.	0.	0.	0.
2196.2	BUILDING SERVICES	0.	0.	0.	0.
2196.3	SUBTOTAL	0.	0.	0.	0.
2197.	LOWERING BELLS	0.	0.	0.	0.
2197.1	BUILDING STRUCTURE	0.	0.	0.	0.
2197.2	BUILDING SERVICES	0.	0.	0.	0.
2197.3	SUBTOTAL	0.	0.	0.	0.

DATE 11-17-78 CONCEPT COST ESTIMATES (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 MW CBIUSMT (05-16-78) POWER PLANT AT: MIDDLETOWN EXAMPLE?
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION PERMIT: 1981.000
 COMMERCIAL OPERATION: 1987.000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LABOR	SITE MATERIALS	TOTAL
	SUBTOTAL	\$ 678.	\$ 5082.	\$ 4991.	\$ 10761.
219.	STACK STRUCTURE				
219.1	STRUCTURE				
219.11	EXCAVATION WORK	\$ 0.	\$ 21.	\$ 6.	27.
219.11	SUPERSTRUCTURE CONCRETE	0.	121.	227.	168.
219.14	SUPERSTRUCTURE	1194.	840.	2.	2036.
	SUBTOTAL	\$ 1194.	\$ 1002.	\$ 233.	\$ 2429.
219.2	CHIMNEY SERVICES	0.	0.	0.	0.
	SUBTOTAL	\$ 1194.	\$ 1002.	\$ 233.	\$ 2429.
	SUBTOTAL FOR ACCOUNT	\$ 3052.	\$ 22115.	\$ 14115.	\$ 39282.
	CONTINGENCY (15.0% OF 3052-15.0% OF 22115-15.0% OF 14115) . . .	458.	3317.	5117.	8892.
	TOTAL FOR ACCOUNT 21	\$ 3510.	\$ 25432.	\$ 19632.	\$ 68174.

DATE 11-10-79 C O N C E P T C O S T E S T I M A T E S (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 HPE CRIGSWT (05-16-78) POWER PLANT AT: MIDDLETOWN EVANLEY7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASES
 1979,000
 1983,000
 1987,000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LARGE	SITE MINOR	TOTAL
220.	POSSIL STEAM SUPPLY SYSTEM				
220A.	POSSIL STEAM SUPPLY SYSTEM				
220A.1	QUOTED PSS PRICE	1-86003	1-12746	1-12746	1-25492
	SUBTOTAL	1-86003	1-12746	1-12746	1-25492
221.	STEAM GENERATING SYSTEM				
221.1	STEAM GENERATING EQUIPMENT	3.	0.	0.	3.
221.2	STEAM GENERATING ACCESSORY				
221.21	EXILER BYPASS SYSTEM	1-102.	1-15.	1-15.	1-257.
221.22	POILER TRAYS AND DRAINS	1-174	1-15	1-15	1-344
	SUBTOTAL	1-276	1-30	1-30	1-336
221.3	SCOTCHING SYSTEM				
221.31	ROTATING MACHINERY	1-910.	1-61.	1-61.	1-971.
221.32	TANKS AND PRESSURE VESSELS	1-4.	1-10.	1-10.	1-14.
221.33	PIPING	1-47.	1-74.	1-74.	1-121.
221.34	VALVES	1-33.	1-0.	1-0.	1-33.
221.37	PIPING-MISC ITEMS	1-1013	1-04	1-04	1-1114
	SUBTOTAL	1-1013	1-104	1-104	1-1114
222.	DRAFT SYSTEM				
222.1	ROTATING MACHINERY	1-74	1-4	1-4	1-78
222.1A	AIR HEATER DRAIN PUMP+MTR				
	SUBTOTAL	1-74	1-4	1-4	1-78
222.2	HEAT TRANSFER EQUIPMENT				
222.22	VALVE CONDUST AIR STM COIL	1-241.	1-17.	1-17.	1-258.
222.23	CONDST AIR PREHT STM COILS	1-142	1-12	1-12	1-254
	SUBTOTAL	1-383	1-29	1-29	1-412
222.3	TANKS AND PRESSURE VESSELS				
222.31	AIR HEATER DRAIN TANK	1-24	1-1	1-1	1-25
	SUBTOTAL	1-24	1-1	1-1	1-25
222.4	PURIFICATION+PRECIPITATION TO				
222.41	ELECTROSTATIC PRECIPITATOR	1-11473	1-3232	1-3232	1-14705
	SUBTOTAL	1-11473	1-3232	1-3232	1-14705
222.5	PIPING + DUCTWORK	1-156.	1-211.	1-211.	1-367.
222.51	AIR PREHEAT STEAM PIPING	1-2452	1-2234	1-2234	1-4686
222.52	DUCTWORK	1-252.	1-0.	1-0.	1-252.
	SUBTOTAL	1-252.	1-0.	1-0.	1-252.
222.6	VALVES				
222.7	PIPING-MISC ITEMS				
222.71	SPECIALTIES	1-1454	1-254	1-254	1-1708
	SUBTOTAL	1-1454	1-254	1-254	1-1708
222.8	INSTRUMENTATION + CONTROLS				
222.81	PRECIPITATOR/SKIDS	1-70.	1-10.	1-10.	1-80.
222.82	PRECIPITATOR+DUCT POUND				
222.83	PRIMARY AIR+ED VAN POUND	1-0.	1-101.	1-101.	1-101.
222.84	AIR HEATER FOUNDATIONS	1-0.	1-10.	1-10.	1-10.
	SUBTOTAL	1-0.	1-10.	1-10.	1-10.

DATE 11-10-78 C O R C E P T C O S T E S T I M A T E S (PHASE 5)			
UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)			
1200 HUB CEMENT (05-16-78) POWER PLANT AT1 MIDDLETON EXAMPLE7			
COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE			
ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	STEAM SUPPLY SYSTEM PURCHASES: CONSTRUCTION PERMIT CONSECRAIAL OPERATION
223.	ASH + DUST HANDLING SYSTEM	5335.	1979.000
223.1	ASH + DUST HANDLING EQUIP		1981.000
223.2	RISC ASH+DUST HANDLING EQ		1987.000
223.21	POTATING MACHINERY	43.	
223.25	PIDING	85.	
223.26	VALVES	22.	
	SUBTOTAL	131.	
	SUBTOTAL	5335.	
224.	FOUL HANDLING SYSTEMS		
225.	FOUL GAS DESULFOR STRUCT		
225.1	LINE SLAKING BUILDING		
225.11	BUILDING STRUCTURE	0.	
225.12	BUILDING SERVICES	22.	
	SUBTOTAL	22.	
225.2	LINE SLAKING SERVICE BLDG		
225.21	BUILDING STRUCTURE	0.	
	SUBTOTAL	0.	
225.3	DESULFOR CTRL-SWITCHER BLDG		
225.31	BUILDING STRUCTURE	0.	
225.32	BUILDING SERVICES	15.	
	SUBTOTAL	15.	
225.5	PROCESS-SEAL WATER PUMPSE		
225.51	BUILDING STRUCTURE	2.	
225.52	BUILDING SERVICES	6.	
	SUBTOTAL	8.	
225.6	THICKENER EQUIPMENT BLDG		
225.61	BUILDING STRUCTURE	0.	
225.62	BUILDING SERVICES	7.	
	SUBTOTAL	7.	
225.7	SLODGE STABILIZATION BLDG		
225.71	HANGERS AND SUPPORTS	0.	
225.72	BUILDING SERVICES	24.	
	SUBTOTAL	24.	
225.8	SLODGE PUMP HOUSE		
225.81	BUILDING STRUCTURE	0.	
225.82	BUILDING SERVICES	8.	
	SUBTOTAL	8.	
225.9	LINE UNLOADING BLDG-TUNNEL		
225.91	BUILDING STRUCTURE	0.	
225.92	BUILDING SERVICES	4.	
	SUBTOTAL	4.	
226.	DESULFORIZATION EQUIPMENT		
226.1	LINE HANDLING SYSTEM	1047.	

DATE 11-10-78 C O P Y R I G H T C O S T E S T I M A T E S (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 NRE CRIGMET (35-16-78) POWER PLANT AT: MIDDLETOWN EXAMPLE 7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION PERMIT: 1983.000
 CONVEYANCE OPERATION: 1987.000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LARGE	SITE MATERIALS	TOTAL
226.2	PROD PREPARATION SYSTEM				
226.21	POTATING MACHINERY	\$ 378.	\$ 64.	\$ 6.	399.
226.22	TANKS AND PRESSURE VESSELS	0.	168.	239.	407.
226.23	PIPING	188.	255.	76.	469.
226.24	VALVES	26.	0.	0.	26.
226.27	PIPING-MISC ITEMS	78.	0.	0.	78.
226.29	FOUNDATIONS/SKIDS	22.	22.	15.	59.
	SUBTOTAL	\$ 592.	\$ 410.	\$ 286.	\$ 1288.
226.3	SO ₂ DIOXIDE SCRUBBING SYS	11424.	6564.	4103.	22091.
226.4	GAS HANDLING SYSTEM				
226.41	ROTATING MACHINERY	\$ 2127.	\$ 778.	\$ 33.	2938.
226.45	PIPING, DUCTS, EXPANSION JTS	1056.	7115.	1719.	7711.
226.46	VALVES & DAMPERS	474.	58.	6.	539.
226.49	FOUNDATIONS/SKIDS	0.	406.	212.	618.
	SUBTOTAL	\$ 5657.	\$ 4133.	\$ 2268.	\$ 12058.
226.5	SLODGE HANDLING SYSTEM				
226.51	ROTATING MACHINERY	\$ 1515.	\$ 230.	\$ 23.	1769.
226.53	TANKS AND PRESSURE VESSELS	0.	1068.	1681.	2755.
226.55	PIPING	5006.	6774.	673.	12454.
226.56	VALVES	166.	0.	0.	166.
226.57	PIPING-MISC ITEMS	0.	93.	124.	217.
226.59	FOUNDATIONS/SKIDS	0.	1742.	2916.	4658.
	SUBTOTAL	\$ 6644.	\$ 8408.	\$ 5144.	\$ 19896.
226.6	MISC DESULFURIZATION EQUIP				
226.61	ROTATING MACHINERY	\$ 54.	\$ 19.	\$ 2.	76.
226.63	TANKS AND PRESSURE VESSELS	17.	22.	15.	54.
226.64	PURIFICATION-FILTRATION EQ	9.	1.	0.	11.
226.65	PIPING	124.	223.	34.	381.
226.66	VALVES	76.	0.	0.	76.
226.67	PIPING - MISC. ITEMS	25.	0.	0.	25.
226.69	FOUNDATIONS/SKIDS	2.	17.	12.	31.
	SUBTOTAL	\$ 266.	\$ 282.	\$ 64.	\$ 612.
226.7	INSTRUMENTATION+CONTROL	524.	128.	5.	657.
	SUBTOTAL	\$ 26308.	\$ 27844.	\$ 7222.	\$ 61374.
227.	INSTRUMENTATION + CONTROL				
227.1	BENCHBOARD, PANELS & RACKS				
227.11	SCILER - TG CONTROL PANEL	\$ 245.	\$ 99.	\$ 5.	349.
227.17	AUXILIARY PANELS+CABINETS	134.	62.	4.	200.
227.18	INSTRUMENT RACKS	252.	93.	7.	352.
	SUBTOTAL	\$ 631.	\$ 254.	\$ 16.	\$ 881.
227.2	PLANT COMPUTER SYSTEM	711.	455.	46.	1212.
227.3	STACK GAS MONITORING SYS	0.	0.	0.	0.
227.4	PLANT CONTROL SYSTEM				
227.41	COORDINATED CONTROL SYSTEM	\$ 711.	\$ 74.	\$ 7.	792.
	SUBTOTAL	\$ 711.	\$ 74.	\$ 7.	\$ 792.

DATE 11-10-78 C O R C E P T C O S T E S T I M A T E S (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 MWE CRYSTALLINE (05-16-78) POWER PLANT AT: MIDDLETON EXAMPLE 27
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASES: 1979.000
 CONSTRUCTION PERMIT: 1983.000
 COMMERCIAL OPERATION: 1987.000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LABOR	SITE MATERIALS	TOTAL
228.0	INSTRUMENT TUBING-FITTINGS	222.1	11.9	4.4	346.4
228.1	BOILER PLANT MISC ITEMS				
228.11	MISC SUSPENSE ITEMS	0.	801.	62.	863.
228.12	FINAL ALIGNMENT + CHECKING	0.	593.	284.	877.
228.13	FIELD PAINTING	0.	42.	12.	54.
228.14	QUALIFICATION OF WELDERS	0.	14.6	120.	134.6
228.15	BOILER PLANT INSULATION	0.	556.	1540.	2096.
228.16	SAMPLING EQUIPMENT	202.	21.	1.	224.
228.17	MISC PIPE BRIDGE				
228.18	EXCAVATION WORK	0.	0.	0.	0.
228.19	SUBSTRUCTURE CONCRETE	0.	74.	24.	98.
228.20		202.	74.	24.	299.
228.21			7587.	14320.	15079.
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DATE 11-10-79 C O P C E P T C O S T E S T I M A T E S (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 AER CRIGENT (05-16-79) POWER PLANT AT: WIDDISTON PERIOD 17
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE
 CONSTRUCTION PERIOD
 1979,000
 1981,000
 1987,000

ACCOUNT NUMBER	ACCOUNT TITLE	STEAM SUPPLY SYSTEM COST	STEAM SUPPLY SYSTEM COST	STEAM SUPPLY SYSTEM COST	STEAM SUPPLY SYSTEM COST
231.1	ENGINE GENERATOR	500.00	500.00	500.00	500.00
231.11	ENGINE GENERATOR ACCESSORY	0.00	0.00	0.00	0.00
231.12	ENGINE FACTORY COST	500.00	500.00	500.00	500.00
231.13	OTHER ENGINE COSTS	0.00	0.00	0.00	0.00
231.2	FOUNDATIONS	0.00	0.00	0.00	0.00
231.21	T-G pedestal	0.00	0.00	0.00	0.00
231.3	LUBRICATING OIL SYSTEM	0.00	0.00	0.00	0.00
231.4	TANKS & PRESSURE VESSELS	0.00	0.00	0.00	0.00
231.41	PIPING	0.00	0.00	0.00	0.00
231.42	VALVES	0.00	0.00	0.00	0.00
231.43	PIPING-VISC. ITEMS	0.00	0.00	0.00	0.00
231.44	INSTRUMENTATION & CONTROL	0.00	0.00	0.00	0.00
231.45	SKIDS / FOUNDATIONS	0.00	0.00	0.00	0.00
231.5	GAS SYSTEMS	0.00	0.00	0.00	0.00
231.51	HYDROGEN STORAGE SYSTEM	0.00	0.00	0.00	0.00
231.52	CARBON DIOXIDE STORAGE SYS	0.00	0.00	0.00	0.00
231.6	CONDENSING SYSTEMS	0.00	0.00	0.00	0.00
231.61	CONDENSER EQUIPMENT	0.00	0.00	0.00	0.00
231.62	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
231.7	CONDENSATE SYSTEM	0.00	0.00	0.00	0.00
231.71	ROTATING MACHINERY	0.00	0.00	0.00	0.00
231.72	TANKS & PRESSURE VESSELS	0.00	0.00	0.00	0.00
231.73	PIPING	0.00	0.00	0.00	0.00
231.74	VALVES	0.00	0.00	0.00	0.00
231.75	PIPING-VISC. ITEMS	0.00	0.00	0.00	0.00
231.76	INSTRUMENTATION & CONTROL	0.00	0.00	0.00	0.00
231.77	FOUNDATIONS	0.00	0.00	0.00	0.00
231.8	GAS REMOVAL SYSTEM	0.00	0.00	0.00	0.00
231.81	CONDENSER GAS REMOVAL SYS.	0.00	0.00	0.00	0.00
231.9	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
231.91	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
231.92	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
231.93	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
231.94	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
231.95	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
231.96	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
231.97	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
231.98	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
231.99	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.1	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.11	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.12	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.13	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.14	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.15	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.16	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.17	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.18	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.19	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.2	CONDENSATE SYSTEM	0.00	0.00	0.00	0.00
232.21	ROTATING MACHINERY	0.00	0.00	0.00	0.00
232.22	TANKS & PRESSURE VESSELS	0.00	0.00	0.00	0.00
232.23	PIPING	0.00	0.00	0.00	0.00
232.24	VALVES	0.00	0.00	0.00	0.00
232.25	PIPING-VISC. ITEMS	0.00	0.00	0.00	0.00
232.26	INSTRUMENTATION & CONTROL	0.00	0.00	0.00	0.00
232.27	FOUNDATIONS	0.00	0.00	0.00	0.00
232.28	GAS REMOVAL SYSTEM	0.00	0.00	0.00	0.00
232.29	CONDENSER GAS REMOVAL SYS.	0.00	0.00	0.00	0.00
232.3	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.31	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.32	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.33	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.34	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.35	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.36	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.37	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.38	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.39	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.4	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.41	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.42	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.43	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.44	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.45	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.46	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.47	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.48	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.49	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.5	CONDENSATE SYSTEM	0.00	0.00	0.00	0.00
232.51	ROTATING MACHINERY	0.00	0.00	0.00	0.00
232.52	TANKS & PRESSURE VESSELS	0.00	0.00	0.00	0.00
232.53	PIPING	0.00	0.00	0.00	0.00
232.54	VALVES	0.00	0.00	0.00	0.00
232.55	PIPING-VISC. ITEMS	0.00	0.00	0.00	0.00
232.56	INSTRUMENTATION & CONTROL	0.00	0.00	0.00	0.00
232.57	FOUNDATIONS	0.00	0.00	0.00	0.00
232.58	GAS REMOVAL SYSTEM	0.00	0.00	0.00	0.00
232.59	CONDENSER GAS REMOVAL SYS.	0.00	0.00	0.00	0.00
232.6	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.61	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.62	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.63	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.64	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.65	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.66	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.67	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.68	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.69	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.7	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.71	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.72	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.73	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.74	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.75	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.76	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.77	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.78	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.79	HEAT TRANSFER EQUIPMENT	0.00	0.00	0.00	0.00
232.8	CONDENSATE SYSTEM	0.00	0.00	0.00	0.00
232.81	ROTATING MACHINERY	0.00	0.00	0.00	0.00
232.82	TANKS & PRESSURE VESSELS	0.00	0.00	0.00	0.00
232.83	PIPING	0.00	0.00	0.00	0.00
232.84	VALVES	0.00	0.00	0.00	0.00
232.85	PIPING-VISC. ITEMS	0.00	0.00	0.00	0.00
232.86	INSTRUMENTATION & CONTROL	0.00	0.00	0.00	0.00
232.87	FOUNDATIONS	0.00	0.00	0.00	0.00
232.88	GAS REMOVAL SYSTEM	0.00	0.00	0.00	0.00
232.89	CONDENSER GAS REMOVAL SYS.	0.00	0.00	0.00	0.00
232.9	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.91	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.92	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.93	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.94	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.95	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.96	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.97	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.98	CONDENSATE POLISHING	0.00	0.00	0.00	0.00
232.99	CONDENSATE POLISHING	0.00	0.00	0.00	0.00

DATE 11-10-78 CONCEPT COST ESTIMATES (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 MWE CIGSNET (05-16-78) POWER PLANT AT: MIDDLETOWN EXAMPLE7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION PERMIT: 1983.000
 COMMERCIAL OPERATION: 1987.000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LABOR	SITE MATERIALS	TOTAL
234.3	EXTRACTION STEAM SYSTEM				
234.35	PIPING	\$ 918.	\$ 1047.	\$ 111.	2076.
234.36	VALVES	444.	0.	0.	444.
234.37	PIPING-MISCELLANEOUS	163.	0.	0.	163.
234.38	INSTRUMENTATION + CONTROL	45.	0.	0.	45.
	SUBTOTAL	\$ 1570.	\$ 1107.	\$ 111.	\$ 2688.
234.4	PPH VENT + DRAIN SYSTEM				
234.41	ROTATING MACHINERY	\$ 17.	\$ 7.	\$ 1.	25.
234.43	TANKS + PRESSURE VESSELS	20.	1.	0.	21.
234.45	PIPING	195.	264.	27.	486.
234.46	VALVES	178.	0.	0.	178.
234.47	PIPING-MISC. ITEMS	32.	0.	0.	32.
234.48	INSTRUMENTATION + CONTROL	67.	7.	0.	74.
	SUBTOTAL	\$ 309.	\$ 279.	\$ 27.	\$ 615.
	SUBTOTAL	\$ 16945.	\$ 4592.	\$ 502.	\$ 22039.
235.	OTHER TURBINE PLANT EQUIP.				
235.1	MAIN VAPOR PIPING SYSTEM				
235.11	MAIN STEAM SYSTEM	\$ 5956.	\$ 7079.	\$ 714.	13750.
235.12	HOT REHEAT SYSTEM	4727.	5645.	564.	10940.
235.13	COLD REHEAT SYSTEM	1175.	1219.	123.	2517.
235.15	ATTENUATING SYSTEM	117.	65.	2.	184.
	SUBTOTAL	\$ 7975.	\$ 13008.	\$ 1402.	\$ 22385.
235.2	TURBINE AUXILIARIES				
235.21	MAIN STEAM/WT VENTS & DRAIN	\$ 107.	\$ 85.	\$ 22.	214.
	SUBTOTAL	\$ 107.	\$ 85.	\$ 22.	\$ 214.
235.3	TP CLOSED CLG WATER SYS				
235.31	ROTATING MACHINERY	\$ 46.	\$ 22.	\$ 2.	71.
235.32	HEAT TRANSFER EQUIPMENT	422.	12.	1.	435.
235.33	TANKS + PRESSURE VESSELS	1.	1.	0.	2.
235.35	PIPING	282.	186.	41.	509.
235.36	VALVES	195.	0.	0.	195.
235.37	PIPING-MISC. ITEMS	57.	7.	0.	64.
235.38	INSTRUMENTATION + CONTROL	30.	2.	0.	32.
	SUBTOTAL	\$ 1033.	\$ 428.	\$ 43.	\$ 1504.
235.4	DEMIN. WATER MAKE-UP SYSTEM	1001.	78.	7.	1086.
235.5	CHEMICAL TREATMENT SYSTEM	41.	7.	2.	51.
235.6	NEUTRALIZATION SYSTEM				
235.61	ROTATING MACHINERY	\$ 18.	\$ 6.	\$ 1.	25.
235.63	TANKS AND PRESSURE VESSELS	47.	4.	0.	51.
235.65	PIPING	2.	4.	0.	6.
235.66	VALVES	0.	0.	0.	0.
235.67	PIPING - MISC ITEMS	0.	0.	0.	0.
235.68	INSTRUMENTATION + CONTROL	28.	8.	2.	38.
	SUBTOTAL	\$ 48.	\$ 20.	\$ 1.	\$ 69.
	SUBTOTAL	\$ 14250.	\$ 14622.	\$ 1491.	\$ 16243.

DATE 11-10-78 CONCEPT COST ESTIMATES (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 MWR CBIGSMT (05-16-78) POWER PLANT AT: MIDDLEBOWN EVANDLP7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979,000
 CONSTRUCTION PERMIT: 1987,000
 COMMERCIAL OPERATION: 1987,000

ACCOUNT NUMBER	ACCOUNT TITLE	FABORY EQUIPMENT	SITF LARGE	SITF MATERIALS	TOTAL
236.	INSTRUMENTATION & CONTROL				
236.1	PROCESS I+C EQUIPMENT				
236.11	BENCHBOARD, PANELS & RACKS	\$ 654.4	\$ 81.4	\$ 4.4	\$ 740.2
	SUBTOTAL	\$ 654.4	\$ 81.4	\$ 4.4	\$ 740.2
236.2	PROCESS COMPUTER	0.	0.	0.	0.
236.3	TUBE PLT I+C TUBING	0.4	0.4	0.4	1.2
	SUBTOTAL	\$ 0.4	\$ 0.4	\$ 0.4	\$ 1.2
237.	TURBINE PLANT MISC ITEMS				
237.1	MISC SUSPENSE ITEMS				
237.11	PIPE	0.	121.	138.	259.
237.12	FIELD PAINTING	0.	489.	221.	710.
237.13	QUALIFICATION OF WELDERS	0.4	120.4	37.4	158.2
	SUBTOTAL	\$ 0.4	\$ 730.4	\$ 396.4	\$ 1127.2
237.3	TURBINE PLANT INSULATION	0.4	683.4	1208.4	1892.2
	SUBTOTAL	\$ 0.4	\$ 683.4	\$ 1208.4	\$ 1892.2
	SUBTOTAL FOR ACCOUNT	\$ 654.8	\$ 795.2	\$ 650.6	\$ 2000.6
	CONTINGENCY (15.0% OP-15.0% LABO-15.0% MTL)	134.28	115.28	97.62	347.18
	TOTAL FOR ACCOUNT 23	\$ 789.08	\$ 910.48	\$ 748.22	\$ 2347.78

DATE 11-10-78 C O M C E R T C O S T E S T I M A T E S (PHASE 3)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1300 WSP CHIGSMT (03-10-78) POWER PLANT AT: MIDDLETON EXAMPLE7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASES:
 CONSTRUCTION PERMIT
 COMMERCIAL OPERATION

1979,000
 1983,000
 1987,000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LARCH	SITE BUILDINGS	XC166
241.	ELECTRIC PLANT EQUIPMENT				
241.1	SWITCHGEAR				
241.11	GEN PORT SWITCHGEAR	0.	97.	10.	107.
241.12	GEN NEUTRAL GROUNDING ROPT	0.	17.	1.	18.
241.13	GEN CURRENT POTENTIAL XPR	0.	14.	1.	15.
241.2	STATION SERVICE SWITCHGEAR	4140.	117.	50.	4707.
241.21	MEDIUM VOLTAGE METAL CLAD	1404.	87.	2.	1413.
241.22	STATION MOTOR CONTROL CNTR	2336.	117.	18.	2551.
242.	STATION SERVICE EQUIPMENT				
242.1	STATION SERVICE STARTUP XPR	400.	137.	14.	551.
242.11	UNIT AUXILIARY TRANSFORMER	845.	47.	7.	914.
242.12	RESERVE AUXILIARY XPR	1643.	123.	19.	1885.
242.13	FOUNDATIONS FOR XPRS	0.	0.	0.	0.
242.2	UNIT SUBSTATIONS	1404.	237.	25.	1666.
242.21	LOAD CENTER SWITCHGEAR	659.	232.	24.	915.
242.22	LOAD CENTER TRANSFORMERS	18.	23.	2.	32.
242.23	MISCELLANEOUS XPRS	301.	0.	0.	301.
242.3	AUXILIARY POWER SOURCES	97.	36.	2.	135.
242.31	BATTERY SYSTEMS	170.	11.	0.	181.
242.32	EMERGENCY DIESEL GEN SYS	0.	0.	0.	0.
242.33	INVERTERS	0.	0.	0.	0.
242.34	SUBTOTAL.	4011.	514.	161.	5586.
243.	SWITCHBOARDS				
243.1	CONTROL PANELS	302.	71.	7.	380.
243.11	GEN+XPR POWER SYS CTRL PNL	288.	63.	7.	358.
243.14	GEN PROTECTIVE RELAY PANEL	0.	0.	0.	0.
243.2	AUX. POWER & SIGNAL BOARDS	0.	0.	0.	0.
243.21	POWER DISTRIBUTION PANELS	25.	24.	2.	31.
243.22	BATTERY CHARGE-DC DIST PNL	14.	10.	1.	25.
243.23	SUBTOTAL.	621.	105.	10.	736.
244.	PROTECTIVE EQUIPMENT				
244.1	GEN+XPR STATION GROUND SYS	0.	172.	157.	329.
244.11	EQUIPMENT GROUNDING SYSTEM	0.	172.	157.	329.
244.12	YARD & STRUCTURE GROUNDING	0.	0.	0.	0.
244.2	FIRE DETECTION-SUPPRESSION	0.	0.	0.	0.
244.3	LIGHTING PROTECTION	0.	0.	0.	0.
244.4	CATHODIC PROTECTION	0.	0.	0.	0.

DATE 11-10-78 C O N C E P T C O S T E S T I M A T E S (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 MWE CBIGSNET (05-16-78) POWER PLANT AT: MIDDLETOWN EXAMPLE7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION PERMIT: 1993.000
 COMMERCIAL OPERATION: 1987.000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LABOR	SITE MATERIALS	TOTAL
251.	MISCELLANEOUS PLANT EQUIP				
251.	TRANSPORTATION & LIFT EQPT				
251.1	CRANES & HOISTS				
251.11	TURBINE BUILDING CRANE	\$ 456.	\$ 66.	\$ 6.	528.
251.16	MISC. CRANES, HOISTS & MONORAILS	0.	48.	105.	153.
251.17	DIESEL BUILDING CRANES	52.	12.	1.	65.
	SUBTOTAL.	\$ 508.	\$ 127.	\$ 112.	\$ 746.
251.2	RAILWAY EQUIPMENT				
251.21	DIESEL LOCOMOTIVE	\$ 480.	\$ 1.	\$ 0.	481.
	SUBTOTAL.	\$ 480.	\$ 1.	\$ 0.	\$ 481.
251.3	ROADWAY EQUIPMENT				
251.34	BUILDERS	\$ 480.	\$ 1.	\$ 0.	481.
	SUBTOTAL.	\$ 480.	\$ 1.	\$ 0.	\$ 481.
252.	AIR, WATER & STEAM SERVICE SY				
252.1	AIR SYSTEMS				
252.11	COMPRESSED AIR SYSTEM	\$ 175.	\$ 216.	\$ 59.	450.
	SUBTOTAL.	\$ 175.	\$ 216.	\$ 59.	\$ 450.
252.2	WATER SYSTEMS				
252.21	SERVICE WATER SYSTEM	\$ 389.	\$ 183.	\$ 20.	591.
252.22	YARD FIRE PROTECTION	1799.	2155.	216.	4169.
252.24	POTABLE WATER SYSTEM	53.	61.	10.	124.
	SUBTOTAL.	\$ 2240.	\$ 2398.	\$ 285.	\$ 4923.
252.3	AUXILIARY STEAM SYSTEM				
252.31	AUXILIARY BOILER SYSTEM	\$ 1141.	\$ 185.	\$ 20.	1346.
252.32	AUX BOILER FEEDWATER SYS	13.	7.	1.	22.
252.33	AUX FUEL OIL SYSTEM	19.	16.	2.	38.
252.34	AUX DEAR & MAKEUP SYSTEM	31.	26.	2.	60.
252.35	AUX CHEN FEED SYSTEM	37.	7.	2.	47.
252.36	AUX. STEAM & CONDENSATE RETRN	24.	16.	1.	41.
252.38	AUX BOILER BLOWDOWN	6.	4.	1.	11.
252.39	AUX STEAM SYS COMPLETE I+C	102.	19.	0.	121.
	SUBTOTAL.	\$ 1374.	\$ 272.	\$ 31.	\$ 1677.
252.4	PLANT FUEL OIL SYSTEM				
252.41	POTATING MACHINERY	\$ 1.	\$ 1.	\$ 0.	2.
252.43	TANKS AND PRESSURE VESSELS	0.	31.	22.	53.
252.45	PIPING	1.	2.	0.	4.
252.46	VALVES	2.	0.	0.	2.
252.47	PIPING-MISC ITEMS	0.	0.	0.	0.
252.49	FOUNDATIONS/SKIDS	0.	18.	2.	20.
	SUBTOTAL.	\$ 3.	\$ 52.	\$ 22.	\$ 77.
	SUBTOTAL.	\$ 3795.	\$ 2940.	\$ 366.	\$ 7101.
253.	COMMUNICATIONS EQUIPMENT				
253.1	LOCAL COMMUNICATIONS SYS				
253.11	GEN. PURPOSE TELEPHONE SYS	\$ 0.	\$ 46.	\$ 44.	90.
253.15	PA & INTERCOM SYS.	0.	121.	125.	246.
	SUBTOTAL.	\$ 0.	\$ 237.	\$ 178.	\$ 415.

DATE 11-10-78 C O N C E P T C O S T P S T I M A T E S (PART 6)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 WBE CRIGGHE (05-16-78) POWER PLANT AT: MIDDLETON EXAMPLE 17
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION PERMIT: 1981.000
 COMMERCIAL OPERATION: 1987.000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SIZE LARGER	NETT AVAILABLE	TOTAL
253.2	SIGNAL SYSTEMS				
253.21	WIRE DETECTION SYSTEM	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
	SUBTOTAL	120.0	15.0	12.0	147.0
253.22	FURNISHINGS + PICTURES	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.23	SAFETY EQUIPMENT	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.24	PORTABLE FIRE EXTINGUISHERS	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.25	SUBTOTAL	120.0	15.0	12.0	147.0
253.26	CHEMICAL LAB + INSTR SHOP	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.27	INSTRUMENT SHOP APPARATUS	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.28	SPEC LAB FURNITURE + PICTURE	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.29	SUBTOTAL	120.0	15.0	12.0	147.0
253.30	OFFICE EQUIP + FURNISHINGS	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.31	OFFICE FURNITURE	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.32	SUBTOTAL	120.0	15.0	12.0	147.0
253.33	CHANGE ROOM EQUIPMENT	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.34	LOCKERS + BENCHES	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.35	SUBTOTAL	120.0	15.0	12.0	147.0
253.36	ENVIRONMENT MONIT EQUIP	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.37	METEOROLOGICAL MONIT. EQUIP	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.38	WATER QUALITY MONITORING	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.39	THERMAL EFFLUENT MONITOR	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.40	AIR QUALITY MONITORING	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.41	SUBTOTAL	120.0	15.0	12.0	147.0
253.42	DINING FACILITIES	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.43	CATERING EQUIPMENT	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.44	SUBTOTAL	120.0	15.0	12.0	147.0
253.45	WASTE WATER TREATMENT EQUIP	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.46	ROTATING MACHINERY	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.47	GROUP I -	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.48	GROUP II	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.49	SUBTOTAL	120.0	15.0	12.0	147.0
253.50	TANKS AND PRESSURE VESSELS	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.51	BATCH HOLDING TANK	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.52	LINE STORAGE HOLDING TANK	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.53	API SEPARATOR TANK	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.54	CATALYTIC STORAGE TANK	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.55	SULFURIC ACID STORAGE TANK	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.56	VEGETARIAN HOLDING TANK	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.57	PH ADJUSTMENT TANK	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.58	SUBTOTAL	120.0	15.0	12.0	147.0
253.59	PIPING	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.60	2 IN + SMALLER	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.61	2.5 IN + LARGER	\$ 120.0	\$ 15.0	\$ 12.0	\$ 147.0
253.62	SUBTOTAL	120.0	15.0	12.0	147.0

DATE 11-10-78 C O N C E P T C O S T E S T I M A T E S (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 MW CRIGSST (05-16-78) POWER PLANT AT: MIDDLETOWN EXAMPLE 7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1479,000
 CONSTRUCTION PERMIT: 1081,000
 COMMERCIAL OPERATION: 1487,000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LABOR	SITE MATERIALS	TOTAL
255.6	VALVES	14.	0.	0.	14.
255.7	PIPING-MISC ITEMS				
255.71	HANGERS AND SUPPORTS	14.	0.	0.	14.
	SUBTOTAL.	14.	0.	0.	14.
255.8	WASTE WATER I + C	24.	84.	50.	158.
	SUBTOTAL.	700.	79.	118.	1007.
SUBTOTAL FOR ACCOUNT.		6867.	4129.	1010.	12006.
CONTINGENCY (15.0% EQP-15.0% LABOR-15.0% MTL).		1030.	619.	152.	1801.
TOTAL FOR ACCOUNT 25.		7897.	4748.	1162.	11807.

DATE 11-10-78 C O N C E P T C O S T P S T I M A T E S (PAGE 6)
 ORIC CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1500 NEW CRIGSMT- (05-16-78) POWER PLANT AT: HIDDLETON EXAMINER
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE
 CONSTRUCTION PERIOD
 CONSTRUCTION INVESTMENT

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY BUILDING	STEAM SUPPLY SYSTEM PURCHASE	CONSTRUCTION PERIOD	CONSTRUCTION INVESTMENT
	MAIN COND HEAT EXCHANGER				
261.	STRUCTURES				
261.1	WATERP WTR INT + DISCH STR				
261.11	INTAKE STRUCTURE				
261.12	DISCHARGE STRUCTURE				
	SUBTOTAL				
261.2	CIRC WATER PUMP HOUSE				
261.21	BUILDING STRUCTURE				
261.22	BUILDING SERVICE				
	SUBTOTAL				
261.3	WATERP WTR PRETREATMENT PLG				
261.31	BUILDING STRUCTURE				
261.32	BUILDING SERVICES				
	SUBTOTAL				
261.4	CHLORINATION BUILDING				
261.41	BUILDING STRUCTURE				
	SUBTOTAL				
262.	MECHANICAL EQUIPMENT				
262.1	WTR VIBRATION SYSTEM				
262.11	WATER INTAKE EQUIPMENT				
262.12	CIRCULATING WATER SYSTEM				
262.13	COOLING TOWERS				
262.14	WATER CT. WATER+DOWN SYS.				
	SUBTOTAL				
	SUBTOTAL FOR ACCOUNT				
	CONTINGENCY (15.0% OF 15,000,000)				
	TOTAL FOR ACCOUNT				

PAGE 11-10-78 C O N C E P T C O S T E S T I M A T E S (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 HWE CRISHTOP-16-79) POWER PLANT AT: MIDDLETON EXAMPLE7
 COST BASIS: YEAR OF STAN SUPPLY SYSTEM PURCHASE

STAN SUPPLY SYSTEM PURCHASE: 1975,000
 CONSTRUCTION PERMIT: 1981,000
 CONSTRUCTION OPERATION: 1997,000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LABOR	SITE MATERIALS	TOTAL
911.	CONSTRUCTION SERVICES				
911.1	TEMPORARY CONSTRUCTION FAC				
911.11	TEMPORARY BUILDINGS	\$ 0.	\$ 410.	\$ 1047.	\$ 1457.
911.11	FIELD OFFICE SHOPS, BHSE.	\$ 0.	\$ 1053.	\$ 121.	\$ 1174.
911.12	JANITOR SERVICES	\$ 0.	\$ 1212.	\$ 1212.	\$ 2424.
911.13	GUARDS - SECURITY	\$ 0.	\$ 1212.	\$ 1212.	\$ 2424.
911.2	SUBTOTAL.	\$ 0.	\$ 1212.	\$ 1212.	\$ 2424.
911.2	TEMPORARY FACILITIES				
911.21	RCAS, PARKING, LAYDOWN AREA	\$ 0.	\$ 1212.	\$ 1212.	\$ 2424.
911.22	TEMPORARY ELECTRICAL SUCE	\$ 0.	\$ 2480.	\$ 276.	\$ 2756.
911.23	TEMPORARY MECH. & PIPING	\$ 0.	\$ 1200.	\$ 1117.	\$ 2317.
911.24	TEMPORARY HEAT	\$ 0.	\$ 22.	\$ 491.	\$ 513.
911.26	GENERAL CLEANUP	\$ 0.	\$ 1212.	\$ 169.	\$ 1381.
	SUBTOTAL.	\$ 0.	\$ 5224.	\$ 3274.	\$ 8498.
912.	CONSTRUCTION TOOLS & EQUIP				
912.1	MAJOR EQUIPMENT	\$ 0.	\$ 0.	\$ 4460.	\$ 4460.
912.11	PURCHASE MAJOR EQUIPMENT	\$ 0.	\$ 2227.	\$ 1500.	\$ 3727.
912.13	EQUIPMENT MAINTENANCE	\$ 0.	\$ 0.	\$ 151.	\$ 151.
912.14	FUEL + LUBRICANTS	\$ 0.	\$ 2227.	\$ 18727.	\$ 20954.
912.3	PURCHASE OF SMALL TOOLS	\$ 0.	\$ 0.	\$ 2517.	\$ 2517.
912.4	EXPENDABLE SUPPLIES	\$ 0.	\$ 2227.	\$ 2227.	\$ 4454.
	SUBTOTAL.	\$ 0.	\$ 2227.	\$ 16400.	\$ 18627.
913.	PAYROLL INSURANCE & TAXES				
913.1	SOCIAL SECUR. TAX .055 X L	\$ 0.	\$ 7310.	\$ 0.	\$ 7310.
913.2	STATE+PED. UNEMPLOY. 035 X L	\$ 0.	\$ 6036.	\$ 0.	\$ 6036.
913.3	WORKERS COMP. INS .040 X L	\$ 0.	\$ 6753.	\$ 0.	\$ 6753.
913.4	P.L.+P.D. INS. .005 X L	\$ 0.	\$ 719.	\$ 0.	\$ 719.
	SUBTOTAL.	\$ 0.	\$ 19417.	\$ 0.	\$ 19417.
916.	PROPERTY, INS. & LOCAL TAXES				
916.1	BUILDING ALL RISK INS	\$ 0.	\$ 0.	\$ 801.	\$ 801.
	SUBTOTAL.	\$ 0.	\$ 0.	\$ 801.	\$ 801.
	SUBTOTAL FOR ACCOUNT.	\$ 0.	\$ 18129.	\$ 2112.	\$ 19241.
	CONTINGENCY (15.0% OF 19241)	\$ 0.	\$ 2729.	\$ 3172.	\$ 5901.
	TOTAL FOR ACCOUNT 91.	\$ 0.	\$ 20858.	\$ 5284.	\$ 26142.

DATE 11-10-78 CONCEPT COST ESTIMATES (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 MW CRIGSNET (05-16-78) POWER PLANT AT: MIDDLETOWN EXAMPLE 7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979.100
 CONSTRUCTION PERMIT: 1981.300
 COMMERCIAL OPERATION: 1982.000

ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LABOR	SITE MATERIALS	TOTAL
92	HOME OFFICE ENGRG. SERVICE				
921.	HOME OFFICE SERVICES				
921.1	SALARIES	11047.	0.	0.	11047.
921.2	EXPENSES - 15% OF SALARIES	1227.	0.	0.	1227.
921.3	DIRECT PAYROLL COST 25%	2012.	0.	0.	2012.
921.4	OVERHEAD LOADING	5541.	0.	0.	5541.
921.6	FEE FOR H/O SERVICES	1563.	0.	0.	1563.
	SUBTOTAL	\$ 21489.	\$ 0.	\$ 0.	\$ 21489.
923.	HOME OFFICE CONSTRUCTION				
923.1	SALARIES	556.	0.	0.	556.
923.2	DIRECT PAYROLL COST 25%	119.	0.	0.	119.
923.3	OVERHEAD LOADING	182.	0.	0.	182.
923.6	EXPENSES - 15% OF SALARIES	81.	0.	0.	81.
	SUBTOTAL	\$ 1158.	\$ 0.	\$ 0.	\$ 1158.
	SUBTOTAL FOR ACCOUNT	\$ 22646.	\$ 0.	\$ 0.	\$ 22646.
	CONTINGENCY (15.0% OF 22646 - 15.0% LABOR - 15.0% MTL)	3398.	0.	0.	3398.
	TOTAL FOR ACCOUNT 92	\$ 26044.	\$ 0.	\$ 0.	\$ 26044.

DATE 11-10-78 C O M C E P T C O S T S S T I M A T E S (PHASE 4)				STEAM SUPPLY SYSTEM PURCHASE: 1979,000			
UNIT 1 CAPITAL INVESTMENT RETAIL COSTS (THOUSANDS OF DOLLARS)				CONSTRUCTION PERMIT: 1981,000			
1200 HUS CHIGNET (05-16-78) POWER PLANT AT: WIDDLETON FARM (P127)				COMMERCIAL OPERATION:			
COST BASIS: TRAD OF STEAM SUPPLY SYSTEM PURCHASE							
ACCOUNT NUMBER	ACCOUNT TITLE	FACTORY EXPENSE	UNIT LABOR	SHIP MATERIALS	TOTAL		
931.	FIELD OFFICE ENGINEERING						
931.1	FIELD OFFICE EXPENSES						
931.2	OFFICE FURNITURE & EQUIP.	0.	0.	0.			
931.3	TELEPHONE & COMMUNICATIONS	0.	0.	0.			
931.4	OFFICE SUPPLIES	0.	0.	0.			
931.5	FIRST AID & MEDICAL EXP.	0.	0.	0.			
931.6	SUBTOTAL	0.	0.	0.			
932.	FIELD JOB SUPERVISION						
932.1	SALARIES	84.11	0.	0.			
932.2	DIRECT PAYROLL COST 25%	21.07	0.	0.			
932.3	OVERHEAD LOADING 15%	16.19	0.	0.			
932.4	RELOCATION EXPENSE-ALLANCE	0.	0.	0.			
932.5	PER FOR CONSTRUCTION SVCS	12.22	0.	0.			
932.6	SUBTOTAL	133.59	0.	0.			
933.	FIELD QA/QC						
933.1	SALARIES	16.0	0.	0.			
933.2	DIRECT PAYROLL COST 25%	4.0	0.	0.			
933.3	OVERHEAD LOADING 15%	3.1	0.	0.			
933.4	EXPENSES 5%	0.8	0.	0.			
933.5	SUBTOTAL	24.9	0.	0.			
934.	PLANT STARTUP & TEST						
934.1	SALARIES	24.1	0.	0.			
934.2	DIRECT PAYROLL COST 25%	6.0	0.	0.			
934.3	OVERHEAD LOADING 15%	4.2	0.	0.			
934.4	EXPENSES - 15% OF SALARIES	3.6	0.	0.			
934.5	SUBTOTAL	47.9	0.	0.			
SUBTOTAL FOR ACCOUNT		140.0	0.	0.			
CONTINGENCY (15.0% OF 140.0)		21.0	0.	0.			
TOTAL FOR ACCOUNT 93		161.0	0.	0.			

DATE 11-10-78 CONCEPT COST ESTIMATES (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 FHE CPISMET (05-16-78) POWER PLANT AT: MIDDLETOWN EVANDLE?
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION FEE: 1983.000
 COMMERCIAL OPERATION: 1987.000

ACCOUNT	ACCOUNT TITLE	FACTORY EQUIPMENT	SITE LABOR	SITE MATERIALS	TOTAL
94	OWNER'S COSTS				
941.	ENGINEERING & QA	\$ 5565.	\$ 0.	\$ 0.	5565.
942.	TAXES & INSURANCE	\$ 18086.	\$ 0.	\$ 0.	18086.
943.	SPARE PARTS	\$ 6967.	\$ 0.	\$ 0.	6967.
944.	STAFF TRAINING	\$ 2742.	\$ 0.	\$ 0.	2742.
945.	OWNER'S GEA	\$ 9149.	\$ 0.	\$ 0.	9149.
SUBTOTAL FOR ACCOUNT.		\$ 41719.	\$ 0.	\$ 0.	41719.
CONTINGENCY (15.0% EQP-15.0% LABOR-15.0% MTL)		\$ 6258.	\$ 0.	\$ 0.	6258.
TOTAL FOR ACCOUNT 94		\$ 47977.	\$ 0.	\$ 0.	47977.

DATE 11-10-78 CONCEPT COST ESTIMATES (PHASE 5)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 MWE COIGSRET (05-16-78) POWER PLANT AT: MIDDLETOWN EXAMPLE 7
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1979.000
 CONSTRUCTION PERMIT: 1981.000
 COMMERCIAL OPERATION: 1987.000

DATE 11-10-78 C O N C E P T C O S T P S T I M A T E S (PAGE 6)
 UNIT 1 CAPITAL INVESTMENT DETAIL COSTS (THOUSANDS OF DOLLARS)
 1200 MPE CIGSMP(05-16-78) POWER PLANT AT: MIDLESTOWN EVALUAT
 COST BASIS: YEAR OF STEAM SUPPLY SYSTEM PURCHASE

STEAM SUPPLY SYSTEM PURCHASE: 1974,000
 CONSTRUCTION PERMIT: 1941,000
 COMMERCIAL OPERATION: 1977,000

C U M U L A T I V E C A S H F L O W

BOTH THE CASH FLOW CURVE SHOWN ABOVE AND THE FOLLOWING CASH FLOW TABLE
 HAVE COSTS EXPRESSED AS TOTAL COST INCURRED TO DATE (INCLUDING INTEREST CHARGES TO DATE).

COST TO DATE (MILLIONS OF DOLLARS)

DATE	COST TO DATE (MILLIONS OF DOLLARS)
1979.000	0.0
1979.160	0.0
1979.320	0.0
1979.480	2.913
1979.640	2.953
1979.800	2.990
1979.960	3.028
1980.120	3.066
1980.280	3.103
1980.440	3.141
1980.600	3.179
1980.760	3.217
1980.920	3.255
1981.080	3.293
1981.240	3.331
1981.400	3.369
1981.560	3.407
1981.720	3.445
1981.880	3.483
1982.040	3.521
1982.200	3.559
1982.360	3.597
1982.520	3.635
1982.680	3.673
1982.840	3.711
1983.000	3.749
1983.160	3.787
1983.320	3.825
1983.480	3.863
1983.640	3.901
1983.800	3.939
1983.960	3.977
1984.120	4.015
1984.280	4.053
1984.440	4.091
1984.600	4.129
1984.760	4.167
1984.920	4.205
1985.080	4.243
1985.240	4.281
1985.400	4.319
1985.560	4.357
1985.720	4.395
1985.880	4.433
1986.040	4.471
1986.200	4.509
1986.360	4.547
1986.520	4.585
1986.680	4.623
1986.840	4.661
1987.000	4.699

Appendix E

INSTRUCTIONS FOR LOADING THE
PROGRAMS INTO THE COMPUTER

CONCEPT-5: EQUIPMENT, LABOR, AND MATERIALS FILE

The CONCEPT-5 program is generally structured to accept as input three separate data files: equipment, labor, and materials. The following table lists the structure of the following files:

- File 1: The CONCEPT-5 control program
- File 2: The CONCEPT-5 source program
- File 3: The CONCEPT-5 source program
- File 4: The sample data for testing CONCEPT-5
- File 5: The output results to be produced by CONCEPT-5
- File 6: The equipment, labor, and materials data file as set up by CONCEPT-5

The source programs are compiled with IBM's Basic FORTRAN compiler and are executed on an IBM 6600 or similar size with BASIC-5. The core requirements for execution of any of the three programs on the IBM 660 is less than 200K bytes. Sample IBM Job Control Language (JCL) instructions are given in Table 1.1 to assist users in preparing JCL cards. Those using other than IBM equipment may find some help in converting IBM JCL to other systems by consulting the IBM System/360 Job Control Language Reference.

As shown in Fig. 1.1, the CONCEPT and CONLAM programs must be compiled and executed prior to execution of the CONCEPT program. Steps 1 through 4 do this and establish two files named COSTMOD.LIBR and CONLAM.LIBR on a permanent system direct access device identified as SYSTEM. A temporary direct access device is also needed and is identified in this JCL as SYSDA. Steps 2 and 3 employ the IBM OS utility program IEBGENER. It is described in the IBM OS Utility Reference.

In Step 4, FT08F001 defines a formatted master file which should be saved on some device (not necessarily direct access) for periodic updating of the equipment, labor, and materials file.

Step 5 compiles and link edits the CONCEPT-5 program to create a stored load module for use in Step 7. Step 6 again uses the IBM OS utility program IEBGENER to read input data for the CONCEPT program.

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Table E.1. Example IBM job control language instructions

```

//STEP1 EXEC PGM=ICL,REGION=270K
//PORT.SYSIN DD DSN=CONTACTS,UNIT=TAPE9,VOL=SER=X1234,
// LABEL=(2,1),DISP=(OLD,PASS),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
//GO.PT06P001 DD SYSOUT=A
//PT04P001 DD DSN=COSTRODS,UNIT=TAPE9,VOL=SER=X1234,
// LABEL=(5,1),DISP=(OLD,PASS),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
//PT08P001 DD DUMMY
//PT09P001 DD DSN=COSTROD.LIBR,VOL=SER=SYSTEM1,UNIT=3330,
// DISP=(NEW,CATLG),SPACE=(CYL,(5,1),RLSE),
// DCB=(RECFM=VBS,LRECL=1,BLKSIZE=13030)
//PT05P001 DD *
*
/*
//STEP2 EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN DD DUMMY
//SYSUT2 DD DSN=66TEMP1,UNIT=SYSDA,DISP=(NEW,PASS),
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=6400),SPACE=(TRK,(1,1),RLSE)
//SYSUT1 DD *
30 30 23 1 0 0 0 0 0
*
/*
//STEP3 EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN DD DUMMY
//SYSUT2 DD DSN=66TEMP2,UNIT=SYSDA,DISP=(NEW,PASS),
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=6400),SPACE=(CYL,(2,1),RLSE)
//SYSUT1 DD DSN=ELNDATA,UNIT=TAPE9,VOL=SER=X1234,LABEL=(6,1),
// DISP=(OLD,PASS),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
//STEP4 EXEC PGM=ICL,REGION=270K
//PORT.SYSIN DD DSN=CONLAN5,UNIT=TAPE9,VOL=SER=X1234,LABEL=(3,1),
// DISP=(OLD,PASS),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
//GO.PT06P001 DD SYSOUT=A
//PT05P001 DD DSN=66TEMP1,DISP=(OLD,DELETE)
// DSN=66TEMP2,DISP=(OLD,DELETE)
//PT09P001 DD DSN=CONLAN.LIBR,VOL=SER=SYSTEM1,UNIT=3330,
// DISP=(NEW,CATLG),SPACE=(TRK,(9,1),RLSE),
// DCB=(RECFM=VBS,LRECL=4860,BLKSIZE=13030)
//PT09P001 DD DSN=NEWMASTR,VOL=SER=-----,UNIT=-----
// DISP=(NEW,KEEP),SPACE=----- 276,000 BYTES,
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=6400)
//PT04P001 DD DUMMY
//STEP5 EXEC PGM=ICL,REGION=270K
//PORT.SYSIN DD DSN=CONCEPT5,UNIT=TAPE9,VOL=SER=X1234,LABEL=(1,1),
// DISP=(OLD,PASS),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
//LKED.SYSLNCD DD DSN=CONCEPT5,LOAD(CONCEPT5),VOL=SER=SYSTEM1,
// UNIT=3330,DISP=(NEW,CATLG),SPACE=(TRK,(13,1,1),RLSE),
// DCB=(RECFM=FB,BLKSIZE=13030)
//STEP6 EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN DD DUMMY
//SYSUT2 DD DSN=66TEMP,UNIT=SYSDA,DISP=(NEW,PASS),
// SPACE=(800,(8,1),RLSE),DCB=(RECFM=FB,LRECL=80,BLKSIZE=800)
//SYSUT1 DD DSN=EXAMPLE,UNIT=TAPE9,VOL=SER=X1234,LABEL=(4,1),
// DISP=(OLD,KEEP),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
//STEP7 EXEC PGM=CONCEPT5,REGION=270K,PARM='CK=-5'
//STEPLIB DD DSN=CONCEPT5,LOAD,DISP=SHR
//PT06P001 DD SYSOUT=A
//PT04P001 DD UNIT=SYSDA,SPACE=(CYL,(1,1),RLSE),
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=80),DISP=(NEW,DELETE)
//PT02P001 DD UNIT=SYSDA,SPACE=(CYL,(1,1),RLSE),
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=80),DISP=(NEW,DELETE)
//PT03P001 DD UNIT=(SYSDA,SEP=PT02P001),SPACE=(CYL,(1,1),RLSE),
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=80)
//PT11P001 DD UNIT=(SYSDA,SEP=(PT02P001,PT03P001)),
// SPACE=(CYL,(1,1),RLSE),DCB=(RECFM=VBS,LRECL=10900,BLKSIZE=7296)
//PT08P001 DD DSN=CONLAN.LIBR,DISP=SHR
//PT09P001 DD DSN=COSTROD.LIBR,DISP=SHR
//PT05P001 DD DSN=2.STEP6.SYSUT2,DISP=(OLD,DELETE)
//

```

Input to the CONCEPT program must be read in Step 6, and the statement `PARM='CK=-5'` must be included in Step 7 when using HASP spooling systems. This is due to a HASP limitation on rewinding the input file during execution of the CONCEPT program. Users with ASP systems should not have this problem and may omit Step 6 and replace the FT05F001 card in Step 7 with

```
//PT05F001 DD DSN=EXAMPLE,UNIT=TAPE9,VOL=SER=K1234,LABEL=(*,NL),
// DISP=(OLC,KEEP),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
```

`PARM='CK=-5'` may also be omitted for those with ASP control.

As given in Table E.1, the example input data will be used. Subsequent runs of CONCEPT may now be made by using only the cards in Steps 6 and 7. The SYSUT1 card in Step 6 should be changed to

```
//SYSUT1 DD *
```

followed by the input data and a `/*` card. Again this applies for machines with HASP spooling. Those having ASP control should replace the FT05F001 card in Step 7 with

```
//FT05F001 DD *
```

followed by the input data and a `/*` card.

As an additional note, the CONCEPT MAIN program and CONTAC auxiliary program utilize a local subroutine called IDAY for obtaining the date-of-run in A8 format. Your current date subroutine should be substituted where a call to IDAY occurs. `CALL IDAY (DATE)` is used in CONCEPT-5 at MAIN 830 and in CONTAC at CONT 1210. The variable DATE should be set to the current date-of-run in A8 format. Failure to modify this will result in an unresolved external reference.

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