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Computer Programs for the Determination of Capital Costs for HTGR-RFDP Process Evaluation Project

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COMPUTER PROGRAMS FOR THE DETERMINATION OF CAPITAL COSTS FOR HTGR—RFDP PROCESS EVALUATION PROJECT

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ABSTRACT

Three computer programs, BAL, CEP, and TCP, have been written to obtain the total capital costs for the HTGR fuel recycling plant concepts in which various methods of processing are used.

BAL is a material balance program that calculates the mass flow rate of each stream and the mass throughput to and the product output from each of the 29 processes in the plant.

CEP is a *capital* equipment cost program that calculates the cost functions for each of the processes. The program produces graphical output data through ORGRAPH, expressing capital cost rates as functions of process throughput.

TCP is the total capital cost program that interfaces BAL with CEP to provide as output the breakdown of the total capital expenditures between the ^{233}U(23) recycle, ^{235}U(25) recycle, and initial and makeup (IM) fuel elements.

INTRODUCTION

Many computer programs have been developed to do quick and systematic cost estimation work on complex projects. An example is CONCEPT,[1] which is used for the evaluation of the cost of constructing power generating plants at various locations where labor and material cost data have been compiled. This type of program interfaces two or more programs to yield cost figures or, more important, to show differences in the total costs due to changes made in the plant location, size, type and distribution of power, and design. The result is to obtain optimum designs for specified conditions.

More specific programs such as FABCOST[2] have been written to calculate the fabrication cost of rod bundle fuel elements; these programs take into consideration special design parameters such as tubing requirements, testing, tolerances, and special alloys.

These programs use a technique common to the cost estimating profession which is expressing the cost or unit costs as functions of throughput or plant capacity. Usually the functions are linear, logarithmic, or exponential and can be handled by linear programming. An excellent discussion of this subject and the subject of optimization is given in ref. 3.

The basis for the cost estimation work for the BAL, CEP, and TCP programs is a compilation of area and volume cost factors for repeated processes in the HTGR fuel reprocessing plant presented by Jarvis and Anderson.[4]

This report outlines methods for identifying, organizing, and estimating the capital cost associated with a large fuel reprocessing plant. The data are based on existing technology and cost experience obtained from hot-cell and radiochemical facilities at ORNL, such as HRLEL, HRLAL, TRU, TURF, and TRL.

The purpose of these programs is to develop a system that can be used to obtain a quick and fairly reliable estimate of the total plant cost. Cost comparisons can be made which are based on different plant processes used to meet the production requirements.

The overall objective is to obtain total cost comparisons that involve the determination of operating and possibly transportation costs which will be obtained later in the project using methods similar to those employed in correlating the capital equipment cost for the project.

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It must be emphasized that the costs obtained from these programs are based on arbitrary constants that can be changed to meet the specific case under consideration. The mass throughput is based on heavy-metal content, and no effort has been made to split the fissile and fertile streams. The assumption is made on all the programs that there is neither a loss nor a gain of material in any of the processes. It is assumed that the plant is running at full capacity 80% of the time.

These programs are designed to operate independent of the input data, and the cases presented are shown only for the purpose of illustrating the use of the program. The base-case data are only expressions of one conceptual basis.

All three of the computer programs have been written in FORTRAN IV, with no machine language involved. BAL and TCP can operate on any computer capable of compiling FORTRAN IV. At ORNL the programs are operational on either the IBM 360/75 or the 360/91. CEP uses five library subroutines, which are listed in Appendix B-4. These routines must be added to the FORTRAN at other installations. CEP also uses the ORGRAPH plotting subroutine that is called from an ORNL disk by the GRAP subroutine. A CALCOMP plotter is used for the production of the graphs. In order to get plots at other installations, a similar routine will have to be written for the plotting system used there. The plotting call may simply be deleted either by not calling for the plot on the trigger card or by deleting the CALL GRAPH card in the main program.

HTGR FUEL REPROCESSING FLOWSHEET

The plant flowsheet shown in Fig. 1 shows the 29 process blocks with the flow connectors. This flowsheet shows the input and discharge from each of the process blocks. The mass flow rate in the throughput can be made by summing either the input or output streams. Each of the streams is assigned an arbitrary identification number which is used in the BAL program. The units on the flows are in terms of kilograms of heavy metal per day. Heavy metal is defined as either fissile or fertile and is either uranium or thorium. The product and throughputs from each process are tabulated in Table 1.

The cost can be based either on the throughput or the product for the processes, as discussed in the TCP program.

Each process block contains a flowsheet. At present a few of these have been made, and it will be necessary to complete the flowsheet in all the blocks before the BAL program can be completely integrated into the other programs.

The material entering the plant is either spent fuel coming in from storage or reactor sites, UF_6, or thorium oxide. The material leaving the plant goes either to storage or back to the reactors. This material is in the form of fabricated fuel elements from the 1M, 23, and 25 processes.

Table 1. Product and throughput streams for each of the processes in the HTGR fuel reprocessing plant

Product streams

Process	Product	Process	Product	Process	Product
1	W(49)	11	W(21)	21	W(60), W(61), W(62), W(63)
2	W(47)	12	W(20)	22	W(69)
3	W(45)	13	W(9)	23	W(19)
4	W(43)	14	W(7)	24	W(14), W(16)
5	W(41)	15	W(5)	25	W(15), W(17)
6	W(40)	16	W(3)	26	W(11), W(13)
7	W(29)	17	W(2)	27	W(39)
8	W(27)	18	W(68)	28	W(36), W(37), W(38)
9	W(25)	19	W(34), W(35), W(66), W(67)	29	W(31)
10	W(23)	20	W(64)		

Throughput streams

Process	Throughput	Process	Throughput	Process	Throughput
1	W(49)	11	W(21), W(24)	21	W(19), W(64)
2	W(49)	12	W(21)	22	W(69)
3	W(45), W(48)	13	W(4)	23	W(19)
4	W(45)	14	W(7), W(10)	24	W(14), W(16)
5	W(41), W(44)	15	W(7)	25	W(15), W(17)
6	W(41)	16	W(3), W(6)	26	W(11), W(13)
7	W(33)	17	W(3)	27	W(39)
8	W(29)	18	W(68)	28	W(36), W(37), W(38)
9	W(25), W(28)	19	W(34), W(35), W(66), W(67)	29	W(31)
10	W(25)	20	W(66)		

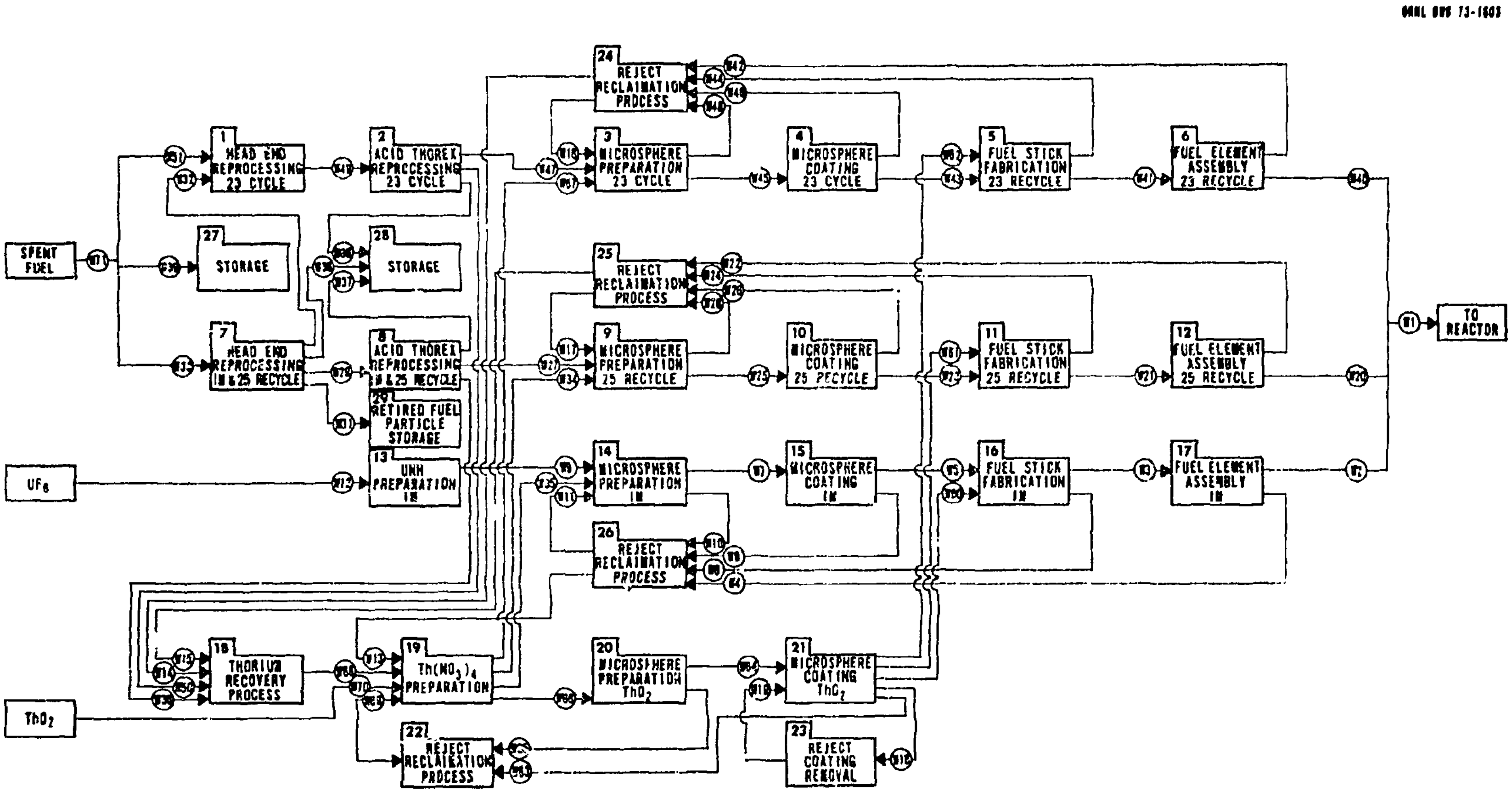

Figure 1. HTGR fuel reprocessing flowsheet

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PROCESS ALTERNATES AND BASE CASE

Most of the 29 processes that formulate the 29 process blocks can be altered. Many processes, which might be called competitive alternate processes, have been proposed for some of the blocks. The alternate processes presently being considered are shown in Table 2, Process Alternatives A–C, and in Table 3, Process Alternatives D–N.

The processes designated with an asterisk (*) are defined as a base case and are used as a reference to which other processes or process combinations can be compared for trade-off studies.

These alternates include the type of element, burner feed preparation, burning process, ash handling process, classified ash treatment, SX feed preparation, extraction process, partitioning process, stripping process, microsphere preparation and cooling processes, fuel stick fabrication process, and fuel element assembly.

An an example, in process A from Table 2, the IM fuel element used as a base case consists of equal ratios of ThO_2 with a BISO coating and $^{235}UO_2$ with a TRISO coating. The 23 recycle base-case elements consist of ThO_2 with a BISO coating with four parts of ThO_2 and one part $^{233}UO_2$ with a BISO coating. The 25 recycle elements have the same specifications as the IM elements. The selection of a base case is strictly arbitrary and is presented here as an example. The base-case data have been selected for 26 of the 29 processes and are indicated by asterisks in Tables 2 and 3.

Table 2. HTGR fuel cycle processing alternatives A–C

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A TYPE OF FUEL ELEMENTS
*REFERENCE ELEMENT

*1. IM element: ThO_2 BISO + $^{235}UO_2$ TRISO
2. IM element: ThO_2 BISO + $^{235}UC_2$ TRISO
3. IM element: ThO_2 TRISO + $^{235}UO_2$ TRISO
4. IM element: ThO_2 TRISO + $^{235}UC_2$ TRISO
5. IM element: ThO_2 BISO + $^{235}UO_2$ BISO
6. IM element: ThO_2 BISO + $^{235}UC_2$ BISO
7. 23 recycle element: ThO_2 BISO + $^{233}UO_2$ TRISO
8. 23 recycle element: ThO_2 BISO + $^{233}UC_2$ TRISO
9. 23 recycle element: ThO_2 TRISO + $^{233}UO_2$ TRISO
10. 23 recycle element: ThO_2 TRISO + $^{233}UC_2$ TRISO
11. 23 recycle element: ThO_2 BISO + $^{233}UO_2$ BISO
12. 23 recycle element: ThO_2 BISO + $^{233}UC_2$ BISO
13. 23 recycle element: ThO_2 BISO + $(Th + {}^{233}U)O_2$ TRISO 0:1 to 4:1
14. 23 recycle element: ThO_2 TRISO + $(Th + {}^{233}U)O_2$ TRISO 0:1 to 4:1
*15. 23 recycle element: ThO_2 BISO + $(Th + {}^{233}U)O_2$ BISO 0:1 to 4:1
16. 23 recycle element: ThO_2 BISO + $(Th + {}^{233}U)C_2$ TRISO 0:1 to 4:1
17. 23 recycle element: ThO_2 TRISO + $(Th + {}^{233}U)C_2$ TRISO 0:1 to 4:1
18. 23 recycle element: ThO_2 BISO + $(Th + {}^{233}U)C_2$ BISO 0:1 to 4:1
*19. 25 recycle element: ThO_2 BISO + $^{235}UO_2$ TRISO
20. 25 recycle element: ThO_2 BISO + $^{235}UC_2$ TRISO
21. 25 recycle element: ThO_2 TRISO + $^{235}UO_2$ TRISO
22. 25 recycle element: ThO_2 TRISO + $^{235}UC_2$ TRISO
23. 25 recycle element: ThO_2 BISO + $^{235}UO_2$ BISO
24. 25 recycle element: ThO_2 BISO + $^{235}UC_2$ BISO
25. 25 recycle element: ThO_2 BISO + $(Th + {}^{235}U)O_2$ TRISO 0:1 to 4:1
26. 25 recycle element: ThO_2 TRISO + $(Th + {}^{235}U)O_2$ TRISO 0:1 to 4:1
27. 25 recycle element: ThO_2 BISO + $(Th + {}^{235}U)O_2$ BISO 0:1 to 4:1
28. 25 recycle element: ThO_2 BISO + $(Th + {}^{235}U)C_2$ TRISO 0:1 to 4:1
29. 25 recycle element: ThO_2 TRISO + $(Th + {}^{235}U)C_2$ TRISO 0:1 to 4:1
30. 25 recycle element: ThO_2 BISO + $(Th + {}^{235}U)C_2$ BISO 0:1 to 4:1
31. IM element: ThO_2 BISO $(Th + {}^{235}U)O_2$ TRISO 0:1 to 4:1
32. IM element: ThO_2 TRISO $(Th + {}^{235}U)O_2$ TRISO 0:1 to 4:1
33. IM element: ThO_2 BISO $(Th + {}^{235}U)O_2$ BISO 0:1 to 4:1
34. IM element: ThO_2 BISO $(Th + {}^{235}U)C_2$ TRISO 0:1 to 4:1
35. IM element: ThO_2 TRISO $(Th + {}^{235}U)C_2$ TRISO 0:1 to 4:1
36. IM element: ThO_2 BISO $(Th + {}^{235}U)C_2$ BISO 0:1 to 4:1

B BURNER FEED PREPARATION
*REFERENCE PROCESS

1. Primary crushing 23 elements
2. Primary crushing IM spent and 25 elements
3. Primary crushing IM spent reject elements
4. Primary crushing 23 reject elements
5. Primary crushing 25 reject elements
6. Primary and secondary crushing 23 elements
7. Primary and secondary crushing IM spent and 25 elements
8. Primary and secondary crushing IM reject elements
9. Primary and secondary crushing 23 reject elements
10. Primary and secondary crushing 25 reject elements
*11. Primary, secondary and tertiary crushing 23 elements
*12. Primary, secondary and tertiary crushing IM spent and 25 elements
*13. Primary, secondary and tertiary crushing IM reject elements
*14. Primary, secondary and tertiary crushing 23 reject elements
*15. Primary, secondary and tertiary crushing 25 reject elements
16. Stick removal, mechanical, 23 elements
17. Stick removal, mechanical, IM spent and 25 elements
18. Stick removal, mechanical, IM reject elements
19. Stick removal, mechanical, 23 reject elements
20. Stick removal, mechanical, 25 reject elements
21. Moderator graphite separation 23 elements
22. Moderator graphite separation IM spent and 25 elements
23. Moderator graphite separation IM reject elements
24. Moderator graphite separation 23 reject elements
25. Moderator graphite separation 25 reject elements
26. Primary splitting, secondary crushing 23 elements
27. Primary splitting, secondary crushing IM spent and 25 elements
28. Primary splitting, secondary crushing IM reject elements
29. Primary splitting, secondary crushing 23 reject elements
30. Primary splitting, secondary crushing 25 reject elements

C BURNING
*REFERENCE PROCESS

*1. Exothermic followed by endothermic fluidized bed burning, Al_2O_3 as heat transfer media for exothermic burner, all graphite, 23 recycle elements.
2. Ex. followed by en. fluidized bed burning, Al_2O_3 as heat transfer media for ex. burner, all graphite, IM spent and 25 recycle elements.
3. Ex. followed by en. fluidized bed burning, Al_2O_3 as heat transfer media for ex. burner, all graphite, IM reject elements.
*4. Ex. followed by en. fluidized bed burning, Al_2O_3 as heat transfer media for ex burner, all graphite, 23 reject elements
5. Ex. followed by en. fluidized bed burning, Al_2O_3 as heat transfer media for ex. burner, all graphite, 25 reject elements.
6. Ex. followed by en. fluidized bed burning, all graphite, 23 recycle elements.
*7. Ex. followed by en. fluidized bed burning, all graphite, IM spent and 25 recycle elements.
*8. Ex. followed by en. fluidized bed burning, all graphite, IM reject elements.
9. Ex. followed by en. fluidized bed burning, all graphite, 23 reject elements.
*10. Ex. followed by en. fluidized bed burning, all graphite, 25 reject elements.
11. Ex. followed by en. fluidized bed burning, Al_2O_3 as heat transfer media for ex burner, fuel values only, 23 recycle elements.
12. Ex. followed by en. fluidized bed burning, Al_2O_3 as heat transfer media for ex burner, fuel values only, IM spent and 25 recycle elements.
13. Ex. followed by en. fluidized bed burning, Al_2O_3 as heat transfer media for ex burner, fuel values only, IM reject elements.
14. Ex. followed by en. fluidized bed burning, Al_2O_3 as heat transfer media for ex burner, fuel values only, 23 reject elements
15. Ex. followed by en. fluidized bed burning, Al_2O_3 as heat transfer media for ex burner, fuel values only, 25 reject elements.
16. Ex. followed by en. fluidized bed burning, fuel values only, 23 recycle elements.
17. Ex. followed by en. fluidized bed burning, fuel values only, IM spent and 25 recycle elements.
18. Ex. followed by en. fluidized bed burning, fuel values only, IM reject elements.
19. Ex. followed by en. fluidized bed burning, fuel values only, 23 reject elements.
20. Ex. followed by en. fluidized bed burning, fuel values only, 25 reject elements.
21. Ex. burn all graphite, Al_2O_3 as heat transfer media, 23 recycle elements.
22. Ex. burn all graphite, Al_2O_3 as heat transfer media, IM spent and 25 recycle elements
23. Ex. burn all graphite, Al_2O_3 as heat transfer media, IM reject elements.
*24. Ex. burn all graphite, Al_2O_3 as heat transfer media, 23 reject elements.
25. Ex. burn all graphite, Al_2O_3 as heat transfer media, 25 reject elements.
26. Ex. burn all graphite, 23 recycle elements.
27. Ex. burn all graphite, IM spent and 25 recycle elements.
28. Ex. burn all graphite, IM reject elements.
29. Ex. burn all graphite, 23 reject elements.
30. Ex. burn all graphite, 25 reject elements.
31. Ex. burn fuel values only, Al_2O_3 as heat transfer media, 23 recycle elements.
32. Ex. burn fuel values only, Al_2O_3 as heat transfer media, IM spent and 23 recycle elements.
33. Ex. burn fuel values only, Al_2O_3 as heat transfer media, IM reject elements.
34. Ex. burn fuel values only, Al_2O_3 as heat transfer media, 23 reject elements.
35. Ex. burn fuel values only, Al_2O_3 as heat transfer media, 25 reject elements.
36. Ex. followed by en. whole block burning, all graphite, 23 recycle elements.
37. Ex. followed by en. whole block burning, all graphite, IM spent and 25 recycle elements.
38. Ex. followed by en. whole block burning, all graphite, IM reject elements.
39. Ex. followed by en. whole block burning, all graphite, 23 reject elements.
40. Ex. followed by en. whole block burning, all graphite, 25 reject elements.
41. Ex. followed by en. chunk burning, fuel values only, 23 recycle elements.
42. Ex. followed by en. chunk burning, fuel values only, IM spent and 25 recycle elements.
43. Ex. followed by en. chunk burning, fuel values only, IM reject elements.
44. Ex. followed by en. chunk burning, fuel values only, 23 reject elements.
45. Ex. followed by en. chunk burning, fuel values only, 25 reject elements.
46. Ex. followed by en. chunk burning, all graphite, 23 recycle elements.
47. Ex. followed by en. chunk burning, all graphite, IM spent and 25 recycle elements.
48. Ex. followed by en. chunk burning, all graphite, IM reject elements.
49. Ex. followed by en. chunk burning, all graphite, 23 reject elements.
50. Ex. followed by en. chunk burning, all graphite, 25 reject elements.
51. En. burning of reject ThO_2.

Table 3. HTGR fuel cycle processing alternatives D–N

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D ASH HANDLING
*REFERENCE PROCESS

1. Screen size separation, IM spent and 25 recycle ash.
2. Screen size separation, IM reject ash.
3. Screen size separation, 25 reject ash.
4. Density separation by liquid media, IM spent and 25 recycle ash.
5. Density separation by liquid media, IM reject ash.
6. Density separation by liquid media, 25 recycle reject ash.
7. Density separation by gaseous media, IM spent and 25 recycle ash.
8. Density separation by gaseous media, IM reject ash.
9. Density separation by gaseous media, 25 reject ash.

*10. Al_2O_3 recycle, 23 recycle ash.

11. Al_2O_3 recycle, IM spent and 25 recycle ash.
12. Al_2O_3 recycle, IM reject ash.
13. Al_2O_3 recycle, 23 reject ash.
14. Al_2O_3 recycle, 25 reject ash.

E CLASSIFIED ASH TREATMENT
*REFERENCE PROCESS

1. Crush TRISO fuel particles and en. burn, 23 recycle.
2. Crush TRISO fertile particles and en. burn IM reject.
3. Crush TRISO fertile particles and en. burn 23 reject.
4. Crush TRISO fertile particles and en. burn IM spent and 25 reject.
5. Crush TRISO ThO_2 reject particles and en. burn.

*6. Crush TRISO fissile particles and en. burn IM spent.

*7. Crush TRISO fissile particles and en. burn IM reject.

*8. Crush TRISO fissile particles and en. burn 25 reject.

9. En. burn all fuel values (BISO), 23 recycl
10. En. burn all fuel values (BISO), IM spent and 25 recycle.
11. En. burn all fuel values (BISO), IM reject
12. En. burn all fuel values (BISO), 23 reject
13. En. burn all fuel values (BISO), 25 reject
14. TRISO fissile particles to storage, IM spent and 25 recycle.
15. Crush TRISO fuel particles and en. burn fuel from 23 recycle and fertile material from 25 recycle and IM spent.
16. Crush fissile particles, IM and 25 recycle mixed material and en. burn.

*17. En. burn ThO_2 BISO particles.

F SX FEED PREPARATION
*REFERENCE PROCESS

*1. Leaching, 23 recycle.

*2. Leaching, fissile material from IM spent

*3. Leaching, fertile material from IM spent & 25 recycle, with BT fissile present.

4. Leaching, fertile material from IM spent & 25 recycle.

*5. Leaching, fertile material from IM reject.

*6 Leaching, 23 reject.

*7. Leaching, fertile material 25 reject.

*8. Leaching, ThO_2 reject.

*9. Solids removal by centrifuge, 23 recycle

•10. Solids removal by centrifuge, IM spent

11. Solids removal by centrifuge from fertile stream, IM spent and 25 recycle with BT fissile present.
12. Solids removal by centrifuge from fertile stream, IM spent and 25 recycle.

*13. Solids removal by centrifuge, fertile material IM reject.

*14. Solids removal by centrifuge, 23 reject.

*15. Solids removal by centrifuge, fertile material 25 reject.

16. Solids removal by centrifuge, ThO_2 reject.
17. Solids removal by filtration, 23 recycle.
18. Solids removal by filtration, IM spent & 25 recycle.
19. Solids removal by filtration from fertile stream, IM spent and 25 recycle with BT fissile present.
20. *Solids removal by filtration fertile stream* IM spent and 25 recycle.
21. Solids removal by filtration, fertile material IM reject.
22. Solids removal by filtration, fertile material 23 reject.
23. Solids removal by filtration, fertile material 25 reject
24. Solids removal by filtration, ThO_2 reject.

*25. Solids washing, 23 recycle.

*26. Solids washing, IM spent

*27. Solids washing from fertile stream, IM spent and 25 recycle with BT fissile presen

28. Solids washing from fertile material, IM spent & 25 recycle.

*29. Solids washing, fertile material IM reject.

*30. Solids washing, 23 reject

*31. Solids washing, fertile material 25 reject.

32. Solids washing, ThO_2 reject.

*33. Solids drying, 23 recy

*34. Solids drying, IM spent and 25 recycle.

*35. Solids drying, IM reject

*36. Solids drying, 23 reject

*37. Solids drying, 25 reject

38. Solids drying, ThO_2 reject.

*45. Solids disposal, 23 recycle.

*46. Solids disposal, IM spent and 25 recycle.

*47. Solids disposal, IM reject.

*48. Solids disposal, 23 reject.

*49. Solids disposal, 25 reject.

50. Solids disposal, ThO_2 reject.
52. Leaching 23 recycle and fertile material from 25 recycle.
53. Solids removal by centrifuge, 23 recycle & fertile material from 25 recycle.
54. Solids washing, 23 recycle and fertile material from 25 recycle.
56. Leach fissile material from IM spent and 25 recycle with mixed fuel.
57. Solids removal by centrifuge from IM spent and 25 recycle with mixed fuel.
58. Solids washing, IM spent and 25 recycle with mixed fuel.
59. Adjustment of nitrate solution IM spent an 25 recycle.
60. Solids removal by filtration, IM spent and 25 recycle.

*61. Leach fissile material IM reject.

*62. Solids removal by centrifuge fissile material IM reject.

*63. Solids washing fissile material IM reject.

*65 Leaching fissile material 25 reject.

*66. Solids removal by centrifuge fissile material 25 reject

*67. Solids washing fissile material 25 reject.

69. Solids removal by filtration fissile material IM reject
70. Solids removal by filtration fissile material 25 reject

G EXTRACTION
*REFERENCE PROCESS

*1. Purification of ^{235}U solution to DF_1 factor, 25 recycle (IM spent).

2. Purification of ^{235}U solution to DF_2 factor, 25 recycle (IM spent).

*3. Purification of ^{233}U solution to DF_1 factor, 23 recycle.

4. Purification of ^{233}U solution to DF_2 factor, 23 recycle.

H PARTITIONING
*REFERENCE PROCESS

*1. Recovery of thorium, 23 recycle.

*2. Recovery of thorium, 25 recycle

*3. Recovery of thorium, IM reject.

*4. Recovery of thorium, 23 reject.

*5. Recovery of thorium, 25 reject.

*6. Recovery of thorium, ThO_2 reject.

J STRIPPING
*REFERENCE PROCESS

*1 Concentration and removal of ^{233}U, 23 recycle.

*2. Concentration and removal of ^{233}U, 23 reject.

*3. Concentration and removal of ^{235}U, 25 recycle (IM spent).

*4. Concentration and removal of ^{235}U, IM reject.

*5 Concentration and removal of ^{235}U, 25 reject.

K MICROSPHERE PREPARATION
*REFERENCE PROCESS

1. Steam denitration process
   - a. ThO_2 for IM, 23 and 25 recycle.
2. Steam denitration + CUSP process
   - a. $(Th^{233}U)O_2$ 1:1 23 recycle
   - b. $(Th^{235}U)O_2$ 1:1 25 recycle
   - c. $(Th^{235}U)O_2$ 1:1 IM
3. CUSP process
   - *a. $^{235}UO_2$ IM
   - b. $^{235}UC_2$ IM
   - c. $^{233}UO_2$ 23 recycle
   - d. $^{233}UC_2$ 23 recycle
   - *e. $^{235}UO_2$ 25 recycle
   - f. $^{235}UC_2$ 25 recycle
4. SNAM process
   - a. $^{235}UO_2$ IM
   - b. $^{235}UC_2$ IM
   - c. $^{233}UO_2$ 23 recycle
   - d. $^{233}UC_2$ 23 recycle
   - e. $^{235}UO_2$ 25 recycle
   - f. $^{235}UC_2$ 25 recycle
   - g. $(Th^{233}U)O_2$ 4.1 23 recycle
   - h. $(Th^{235}U)O_2$ 4:1 25 recycle
   - i. $(Th^{235}U)O_2$ 4:1 IM
   - j. $(Th^{233}U)O_2$ 1:1 23 recycle
   - k. $(Th^{235}U)O_2$ 1:1 25 recycle
   - l. $(Th^{235}U)O_2$ 1:1 IM

Table 3 (continued)

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5. SOLEX process
* a. $(Th^{233}U)O_2$ 4:1 23 recycle
  b. $(Th^{235}U)O_2$ 4:1 25 recycle
  c. $(Th^{235}U)O_2$ 4:1 IM
  d. $(Th^{233}U)O_2$ 2:1 23 recycle
  e. $(Th^{235}U)O_2$ 2:1 25 recycle
  f. $(Th^{235}U)O_2$ 2:1 IM

6. Resin process
  a. $^{235}UO_2$ IM
  b. $^{235}UC_2$ IM
  c. $^{233}UO_2$ 23 recycle
  d. $^{233}UC_2$ 23 recycle
  e. $^{235}UO_2$ 25 recycle
  f. $^{235}UC_2$ 25 recycle

* 7. UNH preparation
* 8. $Th(NO_3)_4$ preparation

L MICROSPHERE COATING
*REFERENCE PROCESS

1. BISO coating
  a. IM fertile particle ThO_2
*   (1) 500 μm
    (2) 600 μm
  b. 23 recycle particle ^{233}U
    (1) 200 μm
    (2) 400 μm (resin)
    (3) 600 μm (resin)
  c. 25 recycle particle ^{235}U
    (1) 200 μm
    (2) 400 μm (resin)
    (3) 600 μm (resin)
  d. 23 recycle particle $(Th^{233}U)$ 1:1
    (1) 250 μm
  e. 23 recycle particle $(Th^{233}U)$ 2:1
    (1) 300 μm
  f. 23 recycle particle $(Th^{233}U)$ 4.25:1
*   (1) 400 μm
  g. 25 recycle particle $(Th^{235}U)$ 1:1
    (1) 250 μm
  h. 25 recycle particle $(Th^{235}U)$ 2:1
    (1) 300 μm
  i. 25 recycle particle $(Th^{235}U)$ 4.25:1
    (1) 400 μm
  j. IM fissile particle ^{235}U
    (1) 200 μm
    (2) 400 μm (resin)
    (3) 600 μm (resin)

2. TRISO coating
  a. IM fertile particle ThO_2
    (1) 500 μm
    (2) 600 μm
  b. 23 recycle particle ^{233}U
    (1) 200 μm
    (2) 400 μm (resin)
    (3) 600 μm (resin)
  c. 25 recycle particle ^{235}U
*   (1) 200 μm
    (2) 400 μm (resin)
    (3) 600 μm (resin)
  d. 23 recycle particle $(Th^{233}U)$ 1:1
    (1) 250 μm
  e. 23 recycle particle $(Th^{233}U)$ 2:1
    (1) 300 μm
  f. 23 recycle particle $(Th^{233}U)$ 4.25:1
    (1) 400 μm
  g. 25 recycle particle $(Th^{235}U)$ 1:1
    (1) 250 μm
  h. 25 recycle particle $(Th^{235}U)$ 2:1
    (1) 300 μm
  i. 25 recycle particle $(Th^{235}U)$ 4.25:1
    (1) 400 μm
  j. IM fissile particle ^{235}U
*   (1) 200 μm
    (2) 400 μm
    (3) 600 μm

M FUEL STICK FABRICATION
*REFERENCE PROCESS

1. Intrusion thermosetting
  a. Out-of block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick
  b. In-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick

2. Admix thermoplastic
  a. Out-of-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick
  b. In-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick

3. Slug injection thermosetting
  a. Out-of-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick
  b. In-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick

4. Slug injection thermoplastic
  a. Out-of-block carbonization
*   (1) IM stick
*   (2) 23 stick
*   (3) 25 stick
  b. In-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick

5. Slurry blending thermosetting
  a. Out-of-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick
  b. In-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick

6. Slurry blending thermoplastic
  a. Out-of-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick
  b. In-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick

7. Extrusion thermosetting
  a. Out-of-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick
  b. In-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick

8. Extrusion thermoplastic
  a. Out-of-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick
  b. In-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick

9. Hot intrusion
  a. Out-of-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick
  b. In-block carbonization
    (1) IM stick
    (2) 23 stick
    (3) 25 stick

N FUEL ELEMENT ASSEMBLY
*REFERENCE PROCESS

1. Out of block carbonization
* a. IM element
* b. 23 element
* c. 25 element

2. In block carbonization
  a. IM element
  b. 23 element
  c. 25 element

MATERIAL BALANCE PROGRAM, BAL

The material balance program was written around the flowsheet to determine the component heavy-metal flow rate in the input and discharge streams of the 29 process blocks.

There are 62 unknown flow rates, W(2) through W(71). W(1) is known since W(1) = X(1). W(53) through W(59) are set to zero and are reserved for any flow lines that might be added in the future. The mass flow rates are determined from the input data, which consist of the total heavy-metal plant output, X(1), and 32 fractions, ratios, or flow splits from X(2) to X(33). These input quantities are defined in Table 4; the input variables have the base-case conditions tabulated for heavy metal flow rates of 500, 1500, and 3000 kg/day.

The material balance program is based on the following assumptions:

1. The total mass flow rate of heavy metal entering a process block is equal to the mass flow rate of heavy metal leaving the process block.
2. The sum of the component flow rates is equal to the plant capacity.
3. There are no losses in the system.
4. There is no distinction made between fertile and fissile heavy metal.

The program involves the solution of 77 linear simultaneous equations for an equal number of unknowns consisting of 63 mass flow rates and 14 parameters used in the program which are also linear functions involving X and W.

In addition to calculating the mass flow rates in each of the lines in the flowsheet, the BAL program also calculates the throughput and the product for each of the process blocks as shown in Fig. 2.

The BAL program has the option of producing a punched card output. The punched output contains the mass flow rates in both the throughput and product for the 29 process blocks. The program also has the capability of handling multiple cases.

The input format is shown in Fig. 3. The variables have been previously described, and the triggers for the program are as follows:

NC = the number of cases being run, I5

NP = a decision parameter or whether punched output will be produced, I5.

NC and NP are entered on the first card using a 2I5 format.

ID = the case number for the individual cases and is input with an I5 format on a separate card. Each case must be preceded by one of these cards in sequential order.

The variables X(1) through X(33) are input with a 6F12.5 format on cards 3 through 8 for the first case.

The program produces as output a summary of the input variables X(1) through X(33), the throughput to each of the process blocks R(1) through R(29), and the product from each of the blocks Q(1) through Q(29).

The program produces a punched card output as an option by inputting a 1 for NP. If a 0 or a blank is entered, no punched output is produced. The punched card output consists of one card indicating the total number of cases under consideration using an I5 formant and a second card indicating the case number and the mass flow rates calculated for W(1), W(12), W(70), and W(71) using an I5, 4(2X,E12.5) format. Cards 3 through 8 punch the throughput, WT(I), to each of the process blocks using a 5(4X,1PE12.5) format; and cards 9 through 14 punch the product, NP(I), for each of the process blocks using the previous format. Cards 2 through 14 are produced for each case that is run.

Table 4. Input variables for material balance program, BAL

HMFR = heavy-metal flow rate = X(1)

Variable	Item	Units	Quantity		
			Case 1	Case 2	Case 3
X(1)	Total heavy-metal product from recycle plant	Kilograms per day	500.0	1500.0	3000.0
X(2)	23 recycle fuel from recycle plant	$\frac{\text{HMFR to 23 recycle fuel}}{\text{Total HMFR}}$	0.3700	0.3700	0.3700
X(3)	25 recycle fuel from recycle plant	$\frac{\text{HMFR to 25 recycle fuel}}{\text{Total HMFR}}$	0.0450	0.0450	0.0450
X(4)	IM fuel from recycle plant	$\frac{\text{HMFR to IM fuel}}{\text{Total HMFR}}$	0.5850	0.5850	0.5850
X(5)	IM fuel from reject	$\frac{\text{HMFR to IM fuel element reject}}{\text{HMFR to IM fuel elements}}$	0.0100	0.0100	0.0100
X(6)	IM stick fab reject	$\frac{\text{HMFR to IM stick fab reject}}{\text{HMFR to IM stick fab}}$	0.0500	0.0500	0.0500
X(7)	Ratio of Th to total U in type IM fuel stick	$\frac{\text{Thorium in IM stick fab process}}{\text{Uranium in IM stick fab process}}$	13.100	13.100	13.100
X(8)	IM particle coating reject	$\frac{\text{HMFR in reject from IM particle coating process}}{\text{HMFR to IM particle coating process}}$	0.0500	0.0500	0.0500
X(9)	IM microsphere preparation reject	$\frac{\text{HMFR in reject from IM microsphere preparation process}}{\text{HMFR to IM microsphere preparation process}}$	0.1000	0.1000	0.1000
X(10)	Type 25 recycle fuel element reject	$\frac{\text{HMFR in reject from type 25 fuel element assembly}}{\text{HMFR to type 25 fuel element assembly}}$	0.0100	0.0100	0.0100
X(11)	Type 25 recycle stick fab reject	$\frac{\text{HMFR in reject from type 25 fuel stick fab process}}{\text{HMFR to type 25 fuel stick fab process}}$	0.0500	0.0500	0.0500
X(12)	Ratio of Th to total U in type 25 recycle fuel stick	$\frac{\text{Thorium type 25 fuel stick}}{\text{Uranium in type 25 fuel stick}}$	3.50	3.50	3.50
X(13)	Type 25 recycle particle coating reject	$\frac{\text{HMFR in reject from type 25 recycle particle coating process}}{\text{HMFR to type 25 recycle particle coating process}}$	0.0500	0.0500	0.0500

Table 4 (continued)

Variable	Item	Units	Quantity		
			Case 1	Case 2	Case 3
X(14)	Type 25 recycle microsphere preparation reject	HMFR in reject from type 25 recycle microsphere preparation process / HMFR to type 25 recycle microsphere preparation process	0.1000	0.1000	0.1000
X(15)	Thorium to Acid Thorex reprocessing IM and 25 recycle from fissile particles in spent IM and 25 recycle fuel	HMFR of thorium in feed to Acid Thorex processing (IM and 25 recycle) / HMFR to Acid Thorex reprocessing (IM and 25 recycle)	0.0000	0.0000	0.0000
X(16)	Th, ^{233}U, and ^{235}U separated in head-end reprocessing IM and 25 recycle expressed as fraction of total heavy metal from plant	U plus thorium separated in head-end reprocessing process / Total HMFR	0.5463	0.5463	0.5463
X(17)	Discard from type 25 recycle head-end reprocessing	HMFR in 25 recycle stream / HMFR in 25 recycle plus IM streams	0.2238	0.2238	0.2238
X(18)	Type 23 recycle fuel element reject	HMFR in reject from type 23 recycle fuel element assembly / HMFR in type 23 recycle fuel element assembly	0.0100	0.0100	0.0100
X(19)	Type 23 recycle stick fab reject	HMFR in reject from type 23 recycle stick fab process / HMFR to type 23 recycle stick fab process	0.0500	0.0500	0.0500
X(20)	Ratio of Th to total U in type 23 recycle fuel stick	Thorium in type 23 recycle fuel stick / Uranium in type 23 recycle fuel stick	8.8000	8.8000	8.8000
X(21)	Type 23 recycle particle coating reject	HMFR to reject from type 23 recycle particle coating process / HMFR from type 23 recycle particle coating process	0.0500	0.0500	0.0500
X(22)	Type 23 recycle microsphere preparation reject	HMFR to reject from type 23 recycle microsphere preparation process / HMFR from type 23 recycle microsphere preparation process	0.1000	0.1000	0.1000
X(23)	Ratio of Th to U feed to type 23 recycle microsphere preparation	Thorium in feed to 23 recycle preparation process / Uranium in feed to 23 recycle preparation process	4.2500	4.2500	4.2500
X(24)	Thorium to type 23 recycle Acid Thorex process	Thorium flow rate to Acid Thorex reprocessing (IM and 25 recycle) / HMFR to Acid Thorex reprocessing (23 recycle)	0.9561	0.9561	0.9561

Table 4 (continued)

Variable	Item	Units	Quantity Case 1	Case 2	Case 3
X(25)*	Thorium particle coating reject	HMFR to reject from IM particle coating process / HMFR from IM particle coating process	0.0	0.0	0.0
X(26)	Thorium microsphere preparation reject	HMFR to reject from IM microsphere preparation process / HMFR from IM microsphere preparation process	0.1000	0.1000	0.1000
X(27)	Ratio of Th to U feed to type 25 recycle microsphere preparation	Thorium in feed to 25 microsphere preparation process / Uranium in feed to 25 microsphere preparation process	0.0000	0.0000	0.0000
X(28)	Ratio of Th to U feed to type IM microsphere preparation	Thorium in feed to IM microsphere preparation process / Uranium in feed to IM microsphere preparation process	0.0000	0.0000	0.0000
X(29)	Uranium to storage from type 23 recycle Acid Thorex process	HMFR to storage from type 23 recycle Acid Thorex process / HMFR to type 23 recycle Acid Thorex process	0.0000	0.0000	0.0000
X(30)	Uranium to storage from type 25 recycle Acid Thorex process	HMFR to storage from type 25 recycle Acid Thorex process / HMFR to type 25 recycle Acid Thorex process	0.0000	0.0000	0.0000
X(31)	Heavy metal to storage from type 25 and IM spent recycle head-end process	HMFR to storage from IM spent-fuel head-end process / HMFR to IM spent-fuel head-end process	0.0000	0.0000	0.0000
X(32)	Heavy metal to storage from reactor	HMFR to storage from reactor / HMFR to plant	0.0000	0.0000	0.0000
X(33)*	Ratio of feed to ThO_2 microsphere coating to feed to reject coating removal	HMFR to IM microsphere coating process / HMFR to reject coating removal process	0.0500	0.0500	0.0500

*Either X(25) or X(33) must be equal to 0.000.

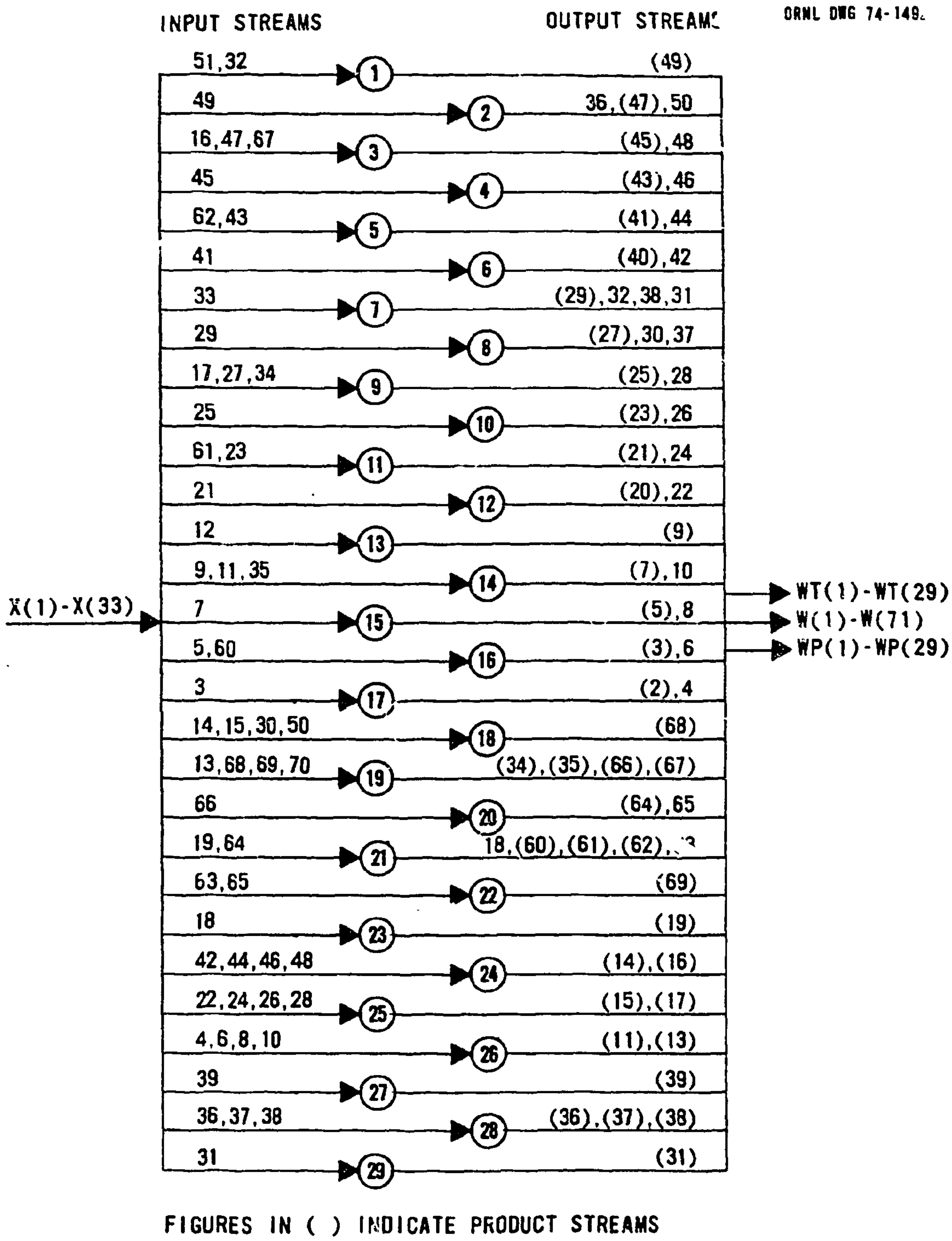

Figure 2. Input, output, and product streams for the process blocks in the HTGR fuel reprocessing plant

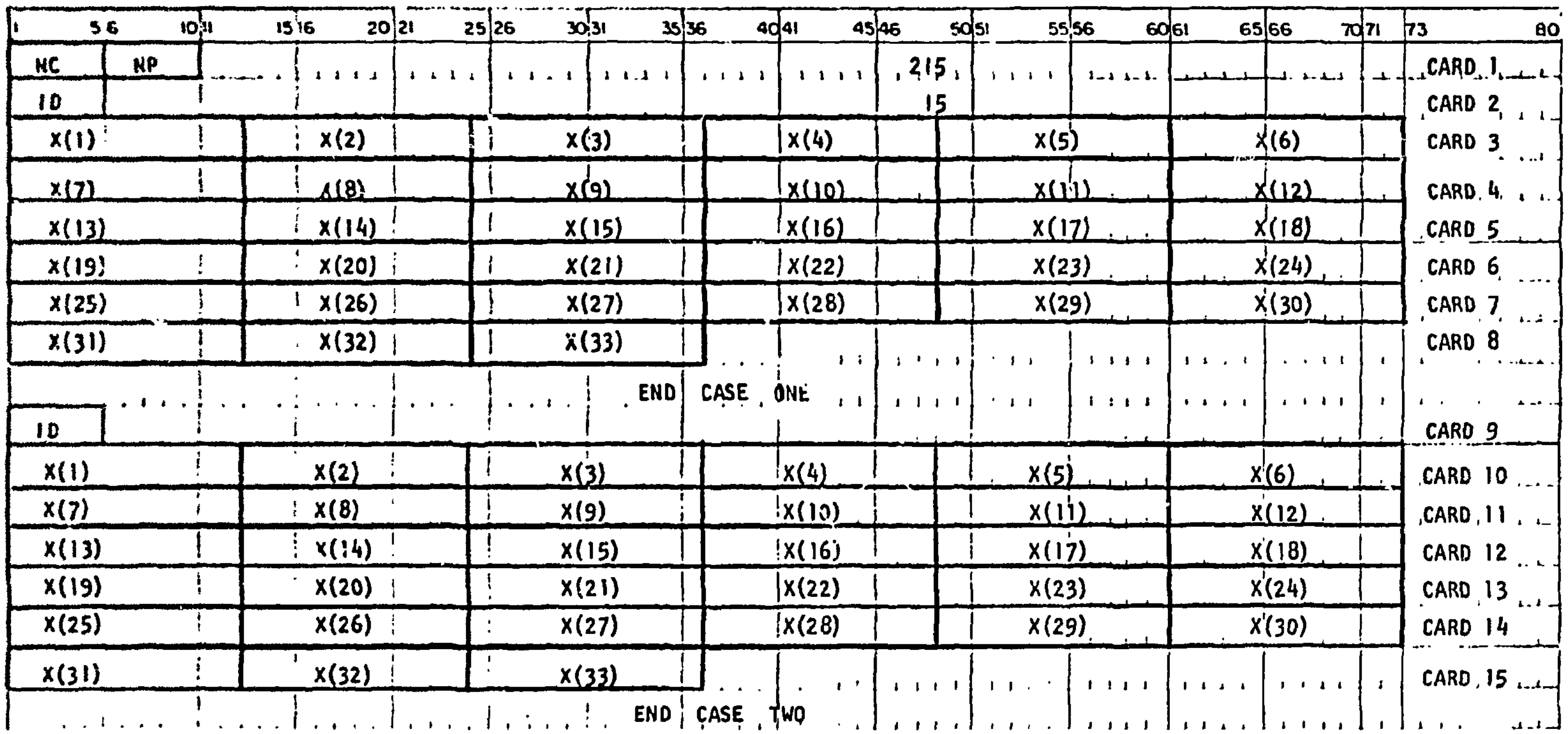

Figure 3. Input format for BAL program

CAPITAL EQUIPMENT COST PROGRAM, CEP

CEP is a computer program version of the capital cost estimating procedure for commercial fuel recycle plants described fully in ref. 4.

Two kinds of factors are used to relate actual space requirements to gross space requirements; these are equipment stacking factors, ESF, and space utilization factors, SUF. These factors are shown in Table 5, which lists the ESF and SUF for different types of processes and processing support spaces.

Cost estimating factors are utilized in the program for estimating incremental building and support space cost. These factors are unit costs per cubic foot, UCCF, and unit costs per square foot, UCSF. These factors are shown in Table 6.

Indirect construction estimating factors are shown for various cost elements in the form of unit cost factors, UCF, in Table 7.

The owner's cost estimation factors, OCEF, are shown in Table 8. The factors shown in Tables 5–8 are input into CEP through the block data file PLCEST. The complete program consists of the data block PLCEST, the main program MAIN, and eight subroutines: INPUT, PRODAT, OUTPUT, SHIFTS, INITS, FDBK, FUNC, and GRAP, as listed in Appendix B-2.

The MAIN program is used for processing, and it calls the subroutines. The INPUT subroutine reads the input data and transfers the information to PRODAT. Subroutine PRODAT is used for calculation of the output parameters. Subroutine OUTPUT is used to output the desired information. Subroutine FUNC is used to calculate the coefficients and exponents for the evaluation of costs. Subroutine GRAP provides a graphical display using the ORNL library routine ORGRAPH. This subroutine produces semilogarithmic plots on demand for any or all of the processes being investigated. This subroutine will plot from two to five points whose coordinates are obtained from the input data. Subroutines SHIFT, INITS, and FDBK are character and string manipulation subroutines. Library subroutines PUTIN, REPLAC, SQUEEZE, LENGTH, and BCDTOI are also called on for character manipulation. These subroutines are listed in Appendix B-4. These routines must be included in the programs that are run at installations other than ORNL.

The computations are done in the PRODAT subroutine, which is the computer version of the calculations shown in Table 9.

Case data input is prepared for the CEP program by filling in the data sheets shown in Fig. 4. The sheets, for the most part, are self-explanatory. Character manipulation subroutines used in the program allow data output in the same form chosen in the input. Except for the first four cards, the data can be entered for up to five plant sizes in a 5F10.2 format in columns 1–50. Data for various plant sizes may be placed in any order as long as the format is adhered to. An example of this feature is illustrated in the case where the data for three plant sizes is desired to be input into the program; the data may be entered in columns 1–10 for the first plant, 21–30 for the second plant, and 41–50 for the third plant size. The output would have a similar spacing. The data could have been entered in columns 1–30 consecutively, but very little spacing would be offered in the output. Once the choice of the arrangement is made in card 5, it must be adhered to for the rest of the input data. The process title is entered in card 1 using a 20A4 format. In order for the title to be printed on the graphs, the title must be followed by a dollar sign ($). Any identifying number may appear after the dollar sign without being printed on the graph.

Case names such as CASE-1, CASE-2, and CASE-3, are entered on card 2 using a 5(8A, 2X) format.

Card 3 lists the capital charge rate expressed as a percentage for all cases and the three types of cells using a (F10.2, 10X, 3I2) format.

Card 4 lists the plant capacity for each case in terms of metric tonnes per day using a 5(4X, F6.2) format.

Cards 12–20 can include from one to three cards as A, A and B, or A, B, and C. Only one card is required if only one type of cell is designated on card 3. Two cards are required if two cells are designated on card 3, and three cards are required if three types of cells are specified on card 3. These three cells might be (5, 7, and 4). If only one cell is required, only the A card is necessary, with the B and C cards being deleted.

The input consists of a data file containing the headings used in the CEP printed output which precedes the case data. In the heading data the cell types (TYP) data is preceded and followed by four asterisk in columns 1–4 as sentinels for reading. Both of these decks are preceded by a trigger card. The trigger card uses a (2I5, 4X, 29I1, 8X, 29I1) format, with variables NX, NC, JP, and JG read in. NX is the plant number (1–10,000). NC is the number of process blocks being run (1–29). JP is a trigger for each of the NC cases being processed. If JP = 1, the case will be printed; if JP = 0 or is left blank, the printed output will be deleted. In like manner, JG is a plotting trigger for each of the NC cases being processed. If JG = 1, the case will be plotted, and if JG = 0 or is left blank, the plotting for that case will be deleted.

In recapitulation, the stacking order of a case to be run with a FORTRAN deck of CEP is as follows: the necessary JCL cards, the CEP FORTRAN deck, JCL necessary for the GO step, the heading data, the trigger card, the case data for each of the cases called for by NC in the trigger card, and the end of file cards (/*,//).

The program produces output in printed graphical and punched form. The printed and graphical output can be deleted, but the punched output has no option. The punched output is used for input into the TCP program along with output from the BAL program. The punched output consists of one trigger card with the plant number NX and the number of processes, NC, being run (1–29) using a 2I5 format.

Each process block that is run produces three output cards. The first contains the title of the process. The second card contains the number of cases or points being run and the throughput in kilograms using an I2, 5 (3X,PE125) format. The third card contains the process block number and the unit cost in thousands of dollars using the same format as the preceding card.

These cards are input into the TCP program and are followed by the output cards from the BAL program.

Table 5. Summary of space estimating factors

Type of space	Equipment stacking factor, ESF	Space utilization factor, SUF
1. Heavily shielded hot cell—remote maintenance	0.7	4.0
2. Heavily shielded hot cell—contact maintenance	0.6	2.33
3. Medium shielded hot cell—remote maintenance	0.7	4.0
4. Medium shielded hot cell—contact maintenance	0.6	2.33
5. Lightly shielded hot cell—remote maintenance	0.7	4.0
6. Lightly shielded hot cell—contact maintenance	0.6	2.33
7. Unshielded hot cell (alpha cell)—contact maintenance	0.6	2.5
8. Glove boxes and hoods—direct maintenance	0.8	2.2
9. Shielded hot cell (analytical cell)—remote maintenance	0.8	3.6
10. Shielded hot cell (liquid waste storage)—contact maintenance	1.0	2.5
11. Shielded hot cell (solid waste storage)—contact maintenance	1.0	5.3
12. Indirect processing support area—direct maintenance	0.0	5.6
Controlled atmosphere building areas		
13. Chemical makeup and process support system space	0.6	2.7
14. Cell operating space	0.0	0.0
15. Crane bay space	0.0	3.5

Table 6. Summary of cost estimating factors

Type of space	Unit cost per cubic foot, UCCF (dollars)	Unit cost per square foot, UCSF (dollars)
1. Heavily shielded hot cell—remote maintenance	42.00	1258.00
2. Heavily shielded hot cell—contact maintenance	18.00	730.00
3. Medium shielded hot cell—remote maintenance	39.00	1174.00
4. Medium shielded hot cell—contact maintenance	16.00	622.00
5. Lightly shielded hot cell—remote maintenance	34.00	1028.00
6. Lightly shielded hot cell—contact maintenance	13.00	538.00
7. Unshielded hot cell (alpha cell)—contact maintenance	9.00	180.00
8. Glove boxes and hoods—direct maintenance	146.00	500.00
9. Shielded hot cell (analytical cell)—remote maintenance	78.00	934.00
10. Shielded hot cell (liquid waste storage)—contact maintenance	2.30	114.00
11. Shielded hot cell (solid waste storage)—contact maintenance	2.30	114.00
12. Indirect processing support space—direct maintenance	7.00	100.00
Controlled atmosphere building space		
13. Chemical makeup and process support system space	7.00	100.00
14. Cell operating space	7.00	100.00
15. Crane bay space	2.30	100.00

Table 7. Summary of indirect construction estimating factors

Cost element	Unit cost factor, UCF[a]	FORTRAN name
1. General and administrative	0.10	GAUCF
2. Engineering	0.30	ENGUCF
3. Miscellaneous construction	0.05	PSCUCF
4. Contingency	0.20	CNUCF
5. Spare parts	0.007	SPUCF
6. Noninstalled spare equipment	0.03	SEQUCF
7. Quality assurance	0.06	QLAUCF
8. Outside utilities	0.10	OUUCF

[a]Fraction of direct construction costs.

Table 8. Summary of owner's cost estimating factors, OCEF

Cost element	Unit cost factor, UCF[a]	FORTRAN name
1. Land	0.01	OLNUCF
2. Project management	0.02	PJMUCF
3. Licensing	0.04	OLCUCF
4. Taxes, insurance, and interest	0.20	THUCF
5. Preoperational testing and startup	0.20	POTUCF
6. Site improvement costs (1/2% of direct construction costs for equipment and space)	0.005	SICUCF

[a]Fraction of direct construction costs.

Table 9. Cost estimate preparation procedure for HTGR fuel reprocessing plant

Direct construction cost		
Processing equipment cost		
1	Estimated equipment cost ($)	Record
	Actual in-cell equipment space required (ft^3)	
2	Type (1)	Record
3	Type (2)	Record
4	Type (3)	Record
5	Actual out-of-cell equipment space required (ft^3)	Record
Processing space cost (hot cells) ($)		
	Gross in-cell space required	
6	Type (1) Standard cell width (ft)	Record
7	Standard cell height (ft)	Record
8	SUF (from Table 5)	Record
9	Gross cell volume (ft^3)	2 × 8
10	Linear feet of cell (ft)	9 ÷ [6 × 7]
11	Type (2) Standard cell width (ft)	Record
12	Standard cell height (ft)	Record
13	SUF (from Table 5)	Record
14	Gross cell volume (ft^3)	3 × 13
15	Linear feet of cell (ft)	14 ÷ [11 × 12]
16	Type (3) Standard cell width (ft)	Record
17	Standard cell height (ft)	Record
18	SUF (from Table 5)	Record
19	Gross cell volume (ft^3)	4 × 18
20	Linear feet of cell (ft)	19 ÷ [16 × 17]
	In-cell space unit cost ($/$ft^3$)	
21	Type (1) UCCF (from Table 6)	Record
22	Type (2) UCCF (from Table 6)	Record
23	Type (3) UCCF (from Table 6)	Record
	In-cell space total cost ($)	
24	Type (1)	9 × 21
25	Type (2)	14 × 22
26	Type (3)	19 × 23
27	Total	24 + 25 + 26

Table 9 (continued)

	Gross out-of-cell space required (ft^3)	
	Makeup and process service space	
28	Standard area width (ft)	Record
29	Standard area height (ft)	Record
30	SUF (from Table 5)	Record
31	Gross volume (ft^3)	[illegible] × 30
	Cell operating space (ft^3)	
32	Type (1) Standard area width (ft)	Record
33	Standard area height (ft)	Record
34	Number of cell sides with operating area	Record
35	Gross volume (ft^3)	10 × 32 × 33 × 34
36	Type (2) Standard area width (ft)	Record
37	Standard area height (ft)	Record
38	Number of cell sides with operating area	Record
39	Gross volume (ft^3)	15 × 36 × 37 × 38
40	Type (3) Standard area width (ft)	Record
41	Standard area height (ft)	Record
42	Number of cell sides with operating area	Record
43	Gross volume (ft^3)	21 × 40 × 41 × 42
	Crane bay space	
44	Type (1) Cell area (ft^2)	6 × 10
45	SUF (from Table 5)	Record
46	Standard bay height (ft)	Record
47	Gross volume (ft^3)	44 × 45 × 46
48	Type (2) Cell area (ft^2)	11 × 15
49	SUF (from Table 5)	Record
50	Standard bay height (ft)	Record
51	Gross volume (ft^3)	48 × 49 × 50
52	Type (3) Cell area (ft^2)	16 × 20
53	SUF (from Table 5)	Record
54	Standard bay height (ft)	Record
55	Gross volume (ft^3)	52 × 53 × 54
	Out-of-cell space unit cost ($/$ft^3$)	
56	Makeup and process service space	Record
	Cell operating space (from Table 6)	

Table 9 (continued)

57	Type (1)	Record
58	Type (2)	Record
59	Type (3)	Record
	Crane bay space (from Table 6)	
60	Type (1)	Record
61	Type (1)	Record
62	Type (3)	Record
	Out-of-cell space total cost ($)	
63	Makeup and process service space	31 × 56
	Cell operating space	
64	Type (1)	35 × 57
65	Type (2)	39 × 58
66	Type (3)	43 × 59
67	Total	64 + 65 + 66
	Crane bay space	
68	Type (1)	47 × 60
69	Type (2)	51 × 61
70	Type (3)	55 × 62
71	Total	68 + 69 + 70
72	Total out-of-cell space cost	63 + 67 + 71
73	Processing space total cost ($)	27 + 72
	Processing support space cost (building excluding hot cells)	
	Indirect process support space	
74	Standard area height (ft)	Record
75	SUF (from Table 5)	Record
76	Total space required (ft^3)	74 × 75 (44 + 48 + 52)
	Indirect process support space unit cost ($\$/ft^3$)	
77	UCCF (from Table 6) ($\$/ft^3$)	Record
78	Processing support space total cost ($)	76 × 77
	Outside utilities cost ($)	
79	UCF (from Table 7) (%)	Record
80	Equipment and facility cost	1 + 73 + 78
81	Outside utilities cost	79 × 80

Table 9 (continued)

Site improvements cost ($)		
82	UCF (from Table 8) (%)	Record
83	Subtotal direct construction cost ($)	80 + 81
84	Site improvement cost ($)	82 × 83
85	Total direct construction cost ($)	83 + 84
Indirect construction cost		
General and administrative cost		
86	UCF (from Table 7) (%)	Record
87	Subtotal general and administrative ($)	86 × 85
Engineering cost		
88	UCF (from Table 7) (%)	Record
89	Subtotal engineering cost ($)	88 × 85
Miscellaneous construction cost		
90	UCF (from Table 7) (%)	Record
91	Subtotal miscellaneous construction cost ($)	90 × 85
Contingency allowance		
92	UCF (from Table 7) (%)	Record
93	Subtotal contingency allowance ($)	92 × 85
Spare parts cost		
94	UCF (from Table 7) (%)	Record
95	Subtotal spare parts cost ($)	94 × 85
Noninstalled spare equipment cost		
96	UCF (from Table 70) (%)	Record
97	Subtotal noninstalled spare equipment cost ($)	96 × 85
Quality assurance cost		
98	UCF (from Table 7) (%)	Record
99	Subtotal quality assurance cost ($)	98 × 85
100	Total indirect construction cost ($)	87 + 89 + 91 + 93 + 95 + 97 + 99
Owner's cost		
Land cost		
101	UCF (from Table 8) (%)	Record
102	Subtotal land cost ($)	101 × 85

Table 9 (continued)

Project management cost		
(103)	UCF (from Table 8) (%)	Record
(104)	Subtotal project management ($)	(103) × (85)
Licensing cost		
(105)	UCF (from Table 8) (%)	Record
(106)	Subtotal licensing cost ($)	(105) × (85)
Taxes, insurance, and interest		
(107)	UCF (from Table 8) (%)	Record
(108)	Subtotal taxes, insurance, and interest ($)	(107) × (85)
Preoperational testing and startup		
(109)	UCF (from Table 8) (%)	Record
(110)	Subtotal preoperational testing and startup ($)	(109) × (85)
(111)	Total owner's cost ($)	(102) + (104) + (106) + (108) + (110)
Total capital construction cost		
(112)	Increment of total plant cost ($)	(85) + (100) + (111)
(113)	Processing throughput of acceptable product (kg of heavy metal per day)	Record
(114)	Annual production rate (kg of heavy metal per year)	292.0 × (113)
(115)	Capital charge rate (%)	Record
(116)	Annual capital charge ($/year)	(112) × (115)
(117)	Product unit cost (dollars per kilogram of heavy metal)	(116) ÷ (114)

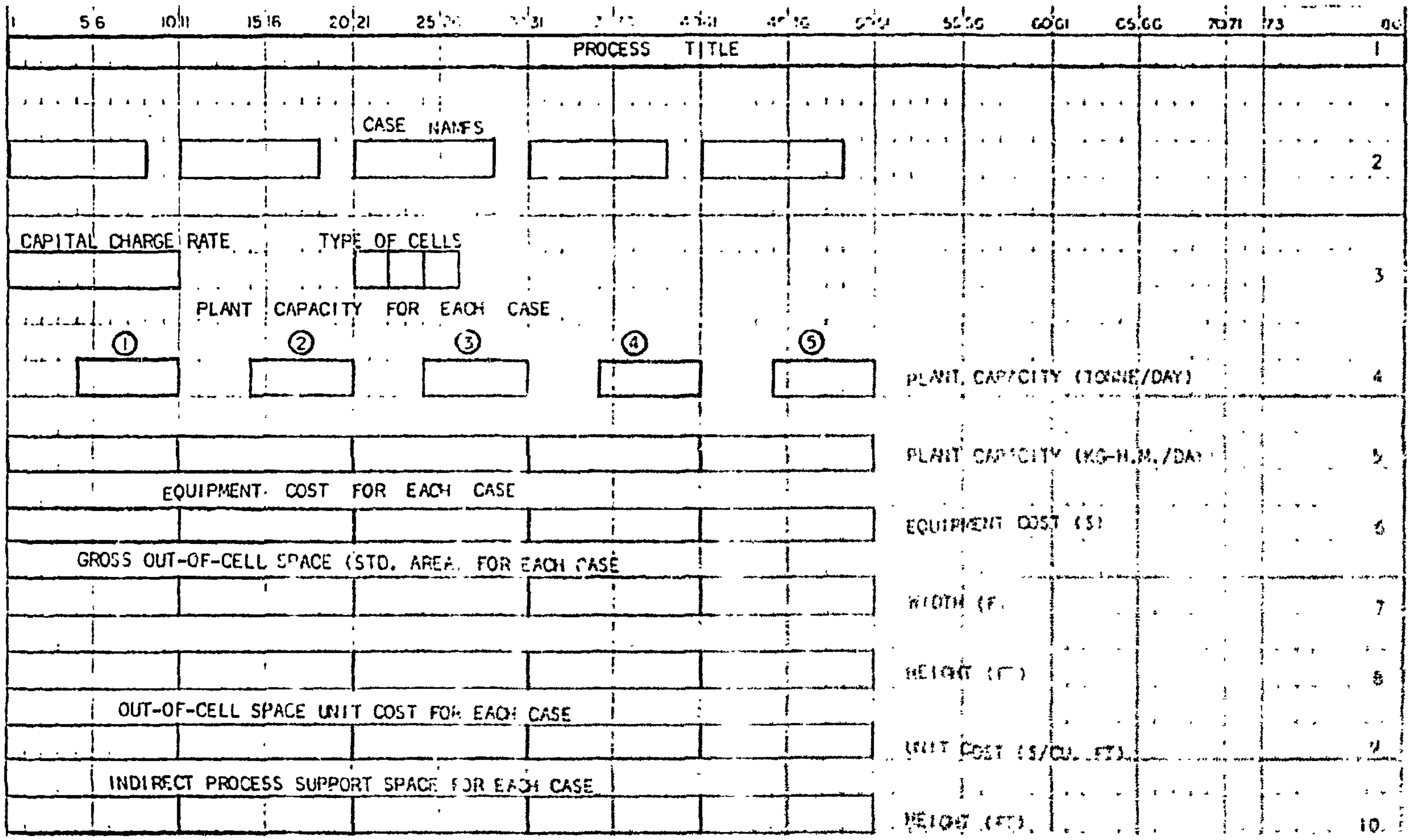

Figure 4. Input data for CEP program

ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED FOR EACH CASE

					VOLUME (CU FT) 11

ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED FOR EACH CASE

					UNIT 1 [illegible] 12A
					UNIT 2 [illegible] VOLUME (CU FT) 12B
					UNIT 3 [illegible] 12C

GROSS IN-CELL SPACE FOR EACH CASE

1	2	3	4	5	
					UNIT 1 13A
					UNIT 2 WIDTH (FT) 13B
					UNIT 3 13C

CELL HEIGHT FOR EACH CASE

					UNIT 1 14A
					UNIT 2 HEIGHT (FT) 14B
					UNIT 3 14C

CELL OPERATING SPACE (WIDTH) FOR EACH CASE

					UNIT 1 15A
					UNIT 2 WIDTH (FT) 15B
					UNIT 3 15C

Figure 4 (continued)

1 5 6 10 11 15 16 20 21 25 26 30 31 35 36 40 41 45 46 50 51 55 56 60 61 65 66 70 71 73 80

STANDARD AREA HEIGHT FOR EACH CASE

UNIT 1 HEIGHT (FT) 16A
UNIT 2 16B
UNIT 3 16C

NUMBER OF CELL SIDES WITH OPERATING AREA

UNIT 1 17A
UNIT 2 17B
UNIT 3 17C

CRANE BAY HEIGHT

UNIT 1 HEIGHT (FT) 18A
UNIT 2 18B
UNIT 3 18C

Figure 4 (continued)

1 5 | 6 10 | 11 15 | 16 20 | 21 25 | 26 30 | 31 35 | 36 40 | 41 45 | 46 50 | 51 55 | 56 60 | 61 65 | 66 70 | 71 | 73 80

UNIT COST FOR CELL OPERATING SPACE

UNIT 1 19A
UNIT 2 ($/CU FT) 19B
UNIT 3 19C

CRANE BAY SPACE UNIT COST

UNIT 1 20A
UNIT 2 ($/CU FT) 20B
UNIT 3 20C

Figure 4 (continued)

TOTAL CAPITAL COST PROGRAM, TCP

The TCP program was written to interface the BAL program with the CEP program. The TCP program reads in the throughput and product flow rates from each of the process blocks from the punched output obtained from the BAL program. The cost rates for several arbitrary throughputs are obtained from the CEP program. The cost of the throughput for a specific block is determined by interpolation, and the cost is summed to obtain specific totals and subtotals of capital cost for a specified plant size.

Output from the BAL program consists of a number of cases of flow throughput and product output. The product information is not presently being utilized because the functions generated in CEP are based on throughput data only.

Output from the CEP program consists of the title of the process block, the mass flow rate for each of the cases (plant sizes), and the cost rate (dollars per pound of heavy metal) of the process for the given flow rate. The point pairs may consist of a minimum of one and a maximum of five. This information is included for each of the process blocks considered. Punched output from the two programs, CEP and BAL, are combined as input data for the TCP program, with the BAL output cards immediately following the CEP output cards. A cost function is generated for each process block considered, and the mass flow rate is used to determine the capital cost in dollars for each of the process blocks.

Referring to Fig. 5 (Unit capital costs as a function of mass throughput), the flow rates VALST(ICN,I,1) and the unit cost data VALST(ICN,I,2) are read in from the CEP program as point pairs, where ICN is the process block number and I is the case number or plant size. The mass flow rate is read in from the BAL program WX(ICN) for each process block. The TCP program finds which function WX(ICN) is associated and calculates the coefficient and exponent required to calculate the unit capital cost C(I) and the total capital cost, CST(IBX,ICN), for each process block, ICN, and each plant size, IBX.

The algorithm in TCP which calculates the costs requires much of the information available in the CEP program. It was expedient to transfer the point pairs calculated by CEP to the TCP program rather than transfer the coefficient and exponents calculated by the CEP program. The TCP program recalculates these coefficients and exponents and arrives at the costs by the procedures described below.

If the flow rate WX(ICN) is equal to or less than VALST(ICN,2,1), then the coefficient is equal to A(1), and the exponent is equal to B(1). If WX(ICN) is greater than VALST(ICN,2,1) and less than or equal to VALST(ICN,3,1), then the coefficient is equal to A(2), and the exponent is equal to B(2). If WX(ICN) is greater than VALST(ICN,3,1) and less than or equal to VALST(ICN,4,1), then the coefficient is equal to A(3), and the exponent is equal to B(3). If WX(ICN) is greater than VALST(ICN,4,1), then the coefficient is equal to A(4), and the exponent is equal to B(4). The cost rate is then established for WX(ICN) as VALFX(ICN,I,1) * EXP [VALFX(ICN,I,2) * WX(ICN)], and the total cost for the process block is established as VALFX(ICN,I,1) * EXP [VALFX(ICN,I,2) * WX(ICN)] WX(ICN).

The costs of certain blocks are summed to obtain the cost of such items as refabrication, storage, and 23, 25, and IM recycle reprocessing for cost-breakdown information. The total cost is determined by summation of the individual processes.

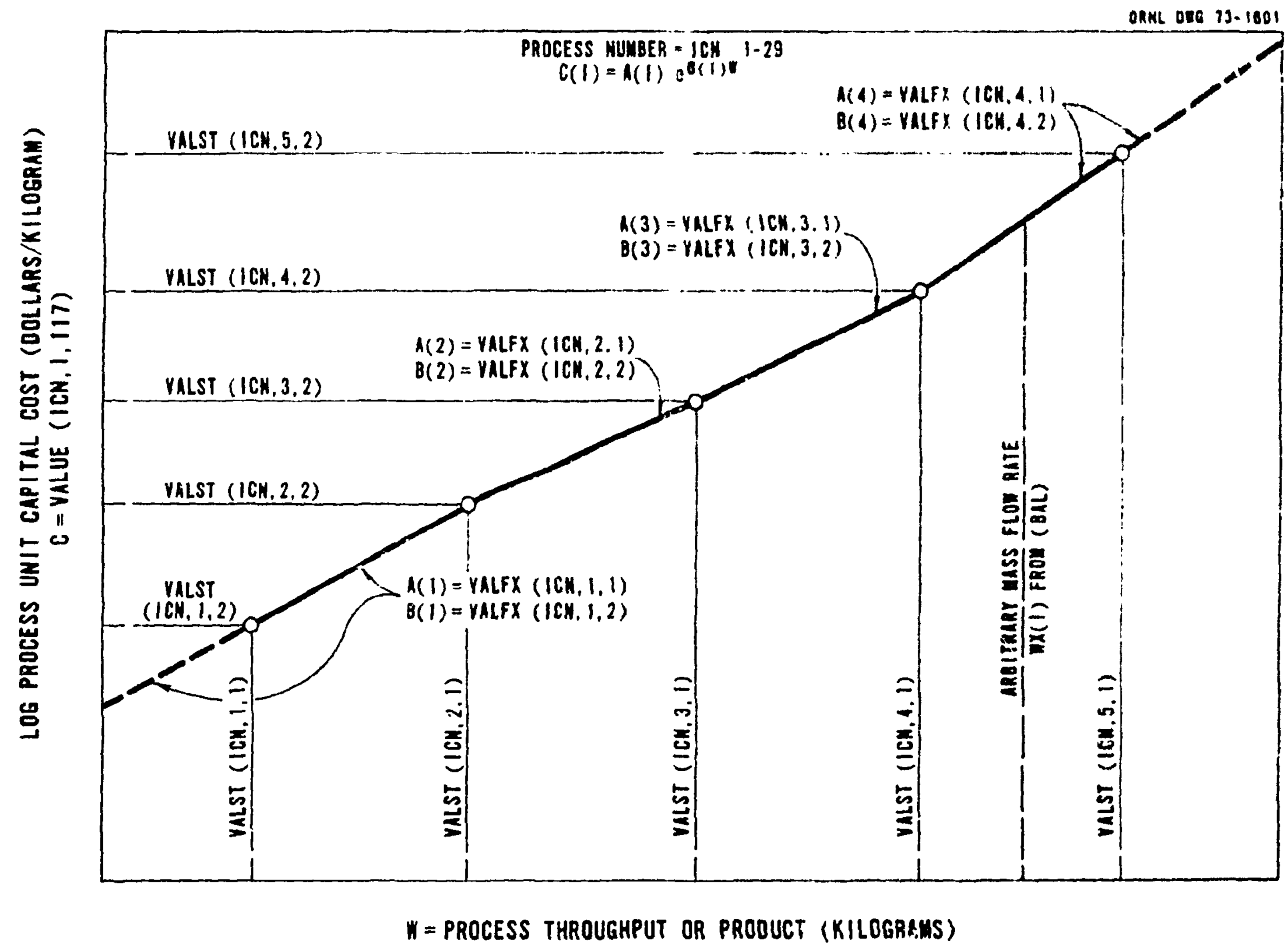

Figure 5. Unit capital costs as a function of mass throughput

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2. A. L. Lotts, T. N. Washburn, and F. J. Homan, *FABCOST9: A Computer Code for Estimating Fabrication Costs for Rod-Bundle Fuel Elements*, ORNL-4287 (August 1968).

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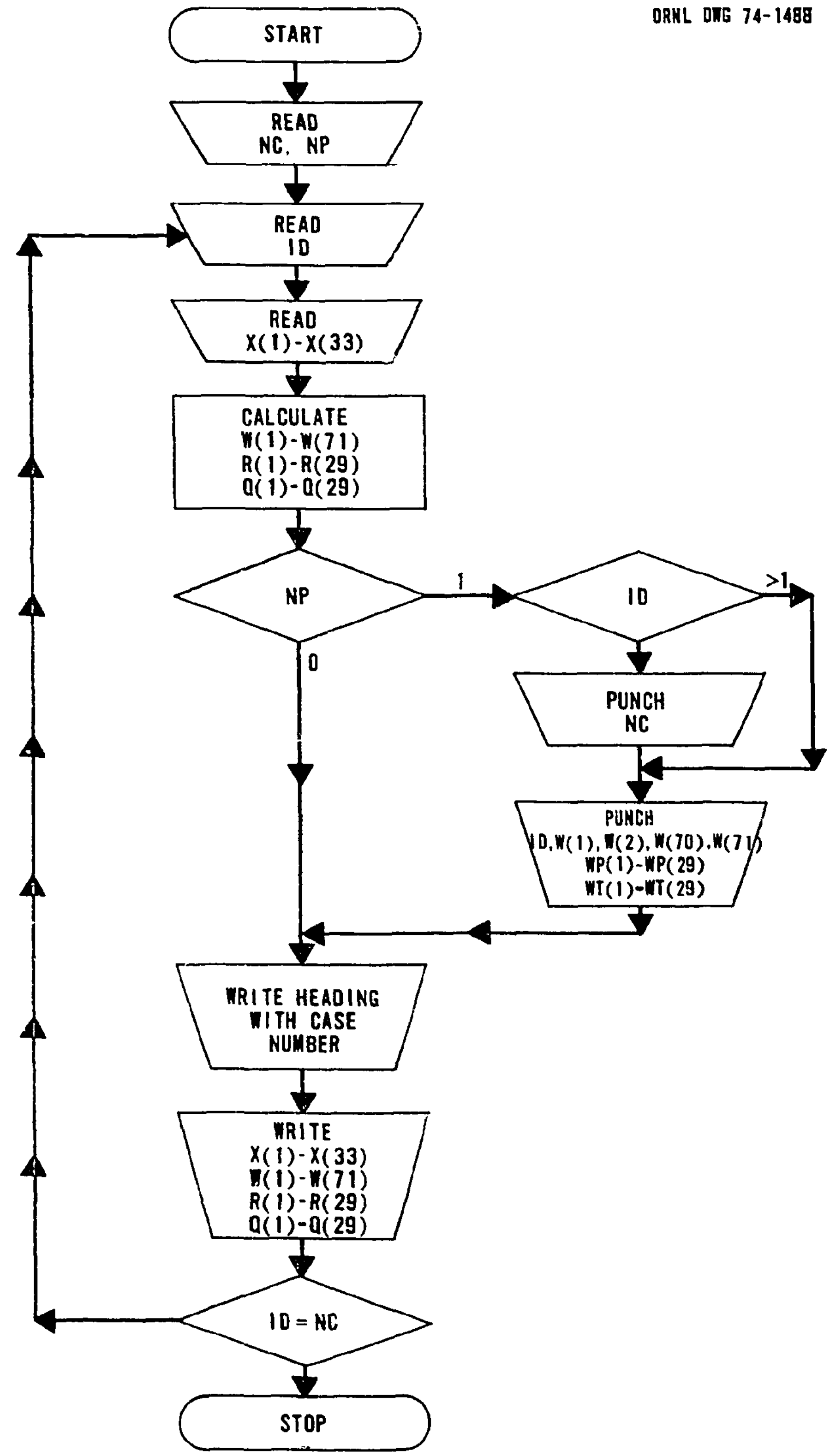
Appendix A-1

BLOCK DIAGRAM OF BAL


ORNL DWG 74-1488
START
READ
NC, NP
READ
ID
READ
X(1)-X(33)
CALCULATE
W(1)-W(71)
R(1)-R(29)
Q(1)-Q(29)
NP
1
0
ID
>1
PUNCH
NC
PUNCH
ID,W(1),W(2),W(70),W(71)
WP(1)-WP(29)
WT(1)-WT(29)
WRITE HEADING
WITH CASE
NUMBER
WRITE
X(1)-X(33)
W(1)-W(71)
R(1)-R(29)
Q(1)-Q(29)
ID = NC
STOP

Appendix A-2

FORTRAN LISTING OF BAL

```
C       PROGRAM BAL
C       BAL (MATERIAL BALANCE PROGRAM)
C
C       THIS PROGRAM CALCULATES THE MATERIAL ENTERING AND LEAVING EACH
C       PROCESS IN THE HTGR FUEL REPROCESSING PLANT.
C       THE REQUIRED INPUT DATA IS
C
C         (1) THE TOTAL HEAVY METAL PLANT OUTPUT (KG/DAY), X(1)
C         (2) 32 FRACTIONS REPRESENTING STREAM FLOW SPLITS OR RATIOS
C             OF COMPONENT MATERIAL TO HEAVY METAL, X(2) THRU X(33).
C
C       THE OUTPUT PRODUCES 63 CALCULATED FLOW RATES FROM W(1) TO W(71).
C       W(52) THRU W(59) ARE NOT USED AND ARE ALWAYS ZERO.
C       THE TOTAL HEAVY METAL THRUPUT TO EACH PROCESS, R(1) THRU R(29),
C       AND THE TOTAL HEAVY METAL PROD. Q(1) THRU Q(29) FOR EACH PROCESS.
C       THE PROGRAM ALSO PRODUCES PUNCHED CARD OUTPUT ON DEMAND, BASED ON
C       EITHER THE THRUPUT OR THE PRODUCT FOR INPUT TO THE TOTAL CAPITAL
C       COST PROGRAM, TCP.
C       MULTIPLE CASES CAN BE RUN ON BAL PRODUCING MULTIPLE CARD
C       OUTPUT IF DESIRED.
C
        DIMENSION X(33),W(71),R(29),WT(25,29),WP(25,29),Q(29)
        DO 1 I=1,71
  1     W(I)=0.0
        READ(50,1001)NC,NP
        DO 32 L=1,NC
        READ(50,1007)ID
        IX=33
        IW = 71
        IR = 29
        IQ = 29
        READ(50,1002)(X(I),I=1,IX)
        W(1)=X(1)
        W(32)=X(26)*W(1)
        W(36)=X(29)*W(1)
        W(37)=X(30)*W(1)
        W(38)=X(31)*W(1)
        W(39)=X(32)*W(1)
        W(2)=W(1)*X(4)
        W(3)=W(2)/(1.0-X(5))
        W(4)=W(3)-W(2)
        W(6)=W(3)*X(6)/(1.0-X(6))
        W(5)=(W(3)+W(6))*(X(28)+1.0)/(X(7)+1.0)
        W(60)=W(3)+W(6)-W(5)
        W(7)=W(5)/(1.0-X(8))
        W(8)=W(7)-W(5)
        WF=W(7)/(1.0-X(9))
        W(10)=WF-W(7)
        A=X(7)/(1.0 +X(7))
        B=X(28)/(1.0 + X(28))
        W(13) = (W(4) + W(6))*A + (W(8) + W(10))*B
        W(35)=WF*X(28)/(1.0+X(28))
        W(11)=W(4)+W(6)+W(8)+W(10)-W(13)
        W(9)=WF-W(11)-W(35)
        W(12)=W(9)
        W(20)=W(1)*X(3)
        W(21)=W(20)/(1.0-X(10))
        W(22)=W(21)-W(20)
        A=(X(27)+1.0)/(X(12)+1.0)
        B=1.0/(1.0-X(11))
        W(23)=A*B*W(21)
        W(24)=B*X(11)*W(21)
        W(61)=W(21)+W(24)-W(23)
        W(25)=W(23)/(1.0-X(13))
        W(26)=W(25)-W(23)
        W(40)=W(1)*X(2)
        W(41)=W(40)/(1.0-X(18))
        W(42)=W(41)-W(40)
        W(44)=W(41)*X(19)/(1.0-X(19))
        W(43)=(W(41)+W(44))*(X(23)+1.0)/(X(20)+1.0)
        W(62)=W(41)+W(44)-W(43)
```

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```
W(45)=W(43)/(1.0-X(21))
WZ=W(45)/(1.0-X(22))
W(48)=W7-W(45)
W(46)=W(45)-W(43)
C = X(20)/(1.0 + X(20))
D = X(23)/(1.0 + X(23))
W(14) = (W(42) + W(44))*C + (W(46) + W(48))*D
W(16)=W(42)+W(44)+W(46)+W(48)-W(14)
W(67) = WZ*D
W(47) = W(45) + W(48) - W(16) - W(67)
WB=W(60)+W(61)+W(62)
W(64)=WB/(1.0-X(25))
W(18) = X(33)*W(64)
W(19) = W(18)
W(63) = W(64) - WB
W(66)=W(64)/(1.0-X(26))
W(65)=W(66)-W(64)
W(69)=W(63)+W(65)
WA=W(25)/(1.0-X(14))
W(28)=WA-W(25)
A = X(12)/(1.0 + X(12))
B = X(27)/(1.0 + X(27))
W(15) = (W(22) + W(24))*A + (W(26) + W(28))*B
W(17)=W(22)+W(24)+W(26)+W(28)-W(15)
W(34) = WA*B
W(27) = W(25) + W(28) - W(17) - W(34)
W(51) = (W(47) + W(36))/(1.0 - X(24)) - W(32)
W(50) = X(24)*(W(51) + W(32))
A = (W(37) + W(27) + W(38)*X(17))/(1.0 - X(17))
D = 1.0 - X(15)/(1.0 - X(17))
W(33) = (W(32) + W(38) + A)/D
W(71)=W(39)+W(51)+W(33)
W(49) = W(50) + W(47) + W(36)
W(30) = X(15)*W(33)
W(68)=W(30)+W(50)+W(14)+W(15)
W(70)=W(66)+W(67)+W(34)+W(35)-W(13)-W(68)-W(69)
W(29)=W(30)+W(27)+W(37)
W(31) = (W(38) + W(29))*X(17)/(1.0 - X(17))
R(1) = W(49)
R(2) = W(49)
R(3) = W(45) + W(48)
R(4) = W(45)
R(5) = W(62) + W(43)
R(6) = W(41)
R(7) = W(33)
R(8) = W(29)
R(9) = W(25) + W(28)
R(10) = W(25)
R(11) = W(61) + W(23)
R(12) = W(21)
R(13) = W(12)
R(14) = W(7) + W(10)
R(15) = W(7)
R(16) = W(3) + W(6)
R(17) = W(2) + W(4)
R(18) = W(68)
R(19) = W(34) + W(35) + W(66) + W(67)
R(20) = W(66)
R(21) = W(19) + W(64)
R(22) = W(69)
R(23) = W(18)
R(24) = W(14) + W(16)
R(25) = W(15) + W(17)
R(26) = W(11) + W(13)
R(27) = W(39)
R(28) = W(36) + W(37) + W(38)
R(29) = W(31)
O(1) = W(49)
O(2) = W(47)
O(3) = W(45)
O(4) = W(43)
O(5) = W(41)
```

```
      Q(6) = W(40)
      Q(7) = W(29)
      Q(8) = W(27)
      Q(9) = W(25)
      Q(10) = W(23)
      Q(11) = W(21)
      Q(12) = W(20)
      Q(13) = W(9)
      Q(14) = W(7)
      Q(15) = W(5)
      Q(16) = W(3)
      Q(17) = W(2)
      Q(18) = W(68)
      Q(19) = W(66) + W(67) + W(35) + W(34)
      Q(20) = W(64)
      Q(21) = W(60) + W(61) + W(62)
      Q(22) = W(69)
      Q(23) = W(19)
      Q(24) = W(14) + W(16)
      Q(25) = W(15) + W(17)
      Q(26) = W(11) + W(13)
      Q(27) = W(39)
      Q(28) = W(36) + W(37) + W(38)
      Q(29) = W(31)
      IF(NP.EQ.0) GO TO 7
      DO 2 K=1,29
      WT(ID,K) = R(K)
      WP(ID,K) = Q(K)
 2    CONTINUE
 3    N=0
      IF(ID.EQ.1) PUNCH 1005, NC
      PUNCH 115  ID , W(1), W(12), W(70), W(71)
 4    IF(N.LE.20) PUNCH 1003, WT(ID,N+1),WT(ID,N+2),WT(ID,N+3),
     1 WT(ID,N+4),WT(ID,N+5)
      IF(N.EQ.25) PUNCH 1004, WT(ID,N+1),WT(ID,N+2),WT(ID,N+3),
     1 WT(ID,N+4)
      N=N+5
      IF(N.EQ.30) GO TO 5
      GO TO 4
 5    N=0
 6    IF(N.LE.20) PUNCH 1003,  WP(ID,N+1),WP(ID,N+2),WP(ID,N+3),
     1 WP(ID,N+4), WP(ID,N+5)
      IF(N.EQ.25) PUNCH 1004,  WP(ID,N+1),WP(ID,N+2),WP(ID,N+3),
     1 WT(ID,N+4)
      N = N+5
      IF(N.EQ.30) GO TO 7
      GO TO 6
 7    WRITE(51,1015)
      WRITE(51,1008)ID
      WRITE(51,1015)
      WRITE(51,1010)
      WRITE(51,1015)
      IXB = IX
      IS = 0
      IE = 0
 8    IS = IX - IXB + 1
      IF(IXB.LT.4) GO TO 9
      IE = IS + 3
      WRITE(51,1011) ((I,X(I)),I=IS,IE)
      IF(IXB.EQ.4) GO TO 13
      IXB = IXB -4
      GO TO 8
 9    GO TO (10,11,12),IXB
 10   WRITE(51,1014) ((I,X(I)),I=IS,IX)
      GO TO 13
 11   WRITE(51,1013) ((I,X(I)),I=IS,IX)
      GO TO 13
 12   WRITE(51,1012) ((I,X(I)),I=IS,IX)
 13   CONTINUE
      WRITE(51,1015)
      WRITE(51,1015)
```

```
      WRITE(51,1009)
      WRITE(51,1015)
      IWB = IW
      IS = 0
      IE = 0
14    IS = IW - IWB + 1
      IF(IWB.LT.4) GO TO 15
      IE = IS + 3
      WRITE(51,1018) ((I,W(I)),I=IS,IE)
      IF(IWB.EQ.4) GO TO 19
      IWB = IWB - 4
      GO TO 14
15    GO TO (16,17,18), IWB
16    WRITE(51,1021) ((I,W(I)),I=IS,IW)
      GO TO 19
17    WRITE(51,1020) ((I,W(I)),I=IS,IW)
      GO TO 19
18    WRITE(51,1019) ((I,W(I)),I=IS,IW)
19    CONTINUE
      WRITE(51,1015)
      WRITE(51,1015)
      WRITE(51,1016)
      WRITE(51,1015)
      IRB = IR
      IS = 0
      IE = 0
20    IS = IR - IRB + 1
      IF(IRB.LT.4) GO TO 21
      IE = IS + 3
      WRITE(51,1022) ((I,R(I)),I=IS,IE)
      IF(IRB.EQ.4) GO TO 25
      IRB = IRB - 4
      GO TO  20
21    GO TO (22,23,24),IRB
22    WRITE(51,1025) ((I,R(I)),I=IS,IR)
      GO TO 25
23    WRITE(51,1024) ((I,R(I)),I=IS,IR)
      GO TO 25
24    WRITE(51,1023) ((I,R(I)),I=IS,IR)
25    CONTINUE
      WRITE(51,1015)
      WRITE(51,1015)
      WRITE(51,1017)
      WRITE(51,1015)
      IQB = IQ
      IS = 0
      IE = 0
26    IS = IQ - IQB + 1
      IF(IQB.LT.4) GO TO 27
      IE = IS + 3
      WRITE(51,1026) ((I,Q(I)),I=IS,IE)
      IF(IQB.EQ.4) GO TO 31
      IQB = IQB - 4
      GO TO 26
27    GO TO (28,29,30),IQB
28    WRITE(51,1029) ((I,Q(I)),I=IS,IQ)
      GO TO 31
29    WRITE(51,1028) ((I,Q(I)),I=IS,IQ)
      GO TO 31
30    WRITE(51,1027) ((I,Q(I)),I=IS,IQ)
31    CONTINUE
32    CONTINUE
1001  FORMAT (2I5)
1002  FORMAT(6(E12.5))
1003  FORMAT(5(4X,1PE12.5))
1004  FORMAT(4(4X,1PE12.5))
1005  FORMAT(2I5)
1006  FORMAT(I5, 4(2X,E12.5))
1007  FORMAT(I5)
1008  FORMAT(60H1OVERALL HTGR FUEL PROCESSING MATERIAL BALANCE, CASE NUM
     1BER ,I2)
```

```
1009 FORMAT(37H HEAVY METAL FLOW RATES , KG PER DAY )                BAL 2810
1010 FORMAT(18H INPUT PARAMETERS )                                   BAL 2820
1011 FORMAT(2H  ,4(2HX(,I2,3H) =,F11.4,7X))                          BAL 2830
1012 FORMAT(2H  ,3(2HX(,I2,3H) =,F11.4,7X))                          BAL 2840
1013 FORMAT(2H  ,2(2HX(,I2,3H) =,F11.4,7X))                          BAL 2850
1014 FORMAT(2H  ,1(2HX(,I2,3H) =,F11.4,7X))                          BAL 2860
1015 FORMAT (1H )                                                    BAL 2870
1016 FORMAT(49H TOTAL PROCESS THROUGHPUT, KG/DAY OF HEAVY METAL )    BAL 2880
1017 FORMAT('0PRODUCT OUTPUT FOR EACH PROCESS BLOCK, KG/DAY OF HEAVY', BAL 2890
    1' METAL ')                                                      BAL 2891
1018 FORMAT(2H  ,4(2HW(,I2,3H) =,F11.4,7X))                          BAL 2900
1019 FORMAT(2H  ,3(2HW(,I2,3H) =,F11.4,7X))                          BAL 2910
1020 FORMAT(2H  ,2(2HW(,I2,3H) =,F11.4,7X))                          BAL 2920
1021 FORMAT(2H  ,1(2HW(,I2,3H) =,F11.4,7X))                          BAL 2930
1022 FORMAT(2H  ,4(2HR(,I2,3H) =,F11.4,7X))                          BAL 2940
1023 FORMAT(2H  ,3(2HR(,I2,3H) =,F11.4,7X))                          BAL 2950
1024 FORMAT(2H  ,2(2HR(,I2,3H) =,F11.4,7X))                          BAL 2960
1025 FORMAT(2H  ,1(2HR(,I2,3H) =,F11.4,7X))                          BAL 2970
1026 FORMAT(2H  ,4(2HQ(,I2,3H) =,F11.4,7X))                          BAL 2980
1027 FORMAT(2H  ,3(2HQ(,I2,3H) =,F11.4,7X))                          BAL 2990
1028 FORMAT(2H  ,2(2HQ(,I2,3H) =,F11.4,7X))                          BAL 3000
1029 FORMAT(2H  ,1(2HQ(,I2,3H) =,F11.4,7X))                          BAL 3010
     STOP                                                            BAL 3020
     END                                                             BAL 3030
```

Appendix A-3

INPUT TO SAMPLE PROBLEM FOR BAL

One sample problem has been run with three cases to be used as an illustrative example of the use of the BAL program. The input is set up as shown in Fig. 3. The mass flow rates in these examples are based on the throughput in each of the process blocks. The input used in the sample problem is strictly one concept of the flow split for three arbitrary plant production rates. The example used here assumes heavy-metal production rates or plant sizes of 500, 1500, and 3000 kg/day. The flow splits are shown in Fig. 3, where the splits are the same for all the cases. The only difference in the input is the production rate X(1).

The output from the BAL is shown in Appendix A-4, listing the 33 input variables, X, the 71 component rates W, the 29 process throughputs R, and 29 product outputs, Q. The optional card output for BAL is shown in Appendix A-5, which is combined with the card output from the CEP program to be used as input data to TCP.

The card output lists the number of cases on the first card, which is 3. The second card lists the case number (1) and specific information on the flow rates W(1), W(9), W(70), and W(71). Cards 3 through 8 list the 29 process throughputs, R, and cards 9 through 14 list the 29 process products, Q. The 15th card introduces case 2, and the 28th card introduces case 3. There is a total of 40 cards in the punched output for the sample case.

```
 3      0      1
 1
 0.500E+03    3.700E-01    0.450E-01    0.585E+00    0.010E+00    0.050E+00
13.100E+00    0.050E+00    0.100E+00    0.010E+00    0.050E+00    3.500E+00
 0.050E+00    0.100E+00    0.000E+00    5.463E-01    2.238E-01    0.010E+00
 0.050E+00    8.800E+00    0.050E+00    0.100E+00    4.250E+00    9.561E-01
 0.000E+00    0.100E+00    0.000E+00    0.000E+00    0.000E+00    0.000E+00
 0.000E+00    0.000E+00    0.050E+00
 2
 1.500E+03    3.700E-01    0.450E-01    0.585E+00    0.010E+00    0.050E+00
13.100E+00    0.050E+00    0.100E+00    0.010E+00    0.050E+00    3.500E+00
 0.050E+00    0.100E+00    0.000E+00    5.463E-01    2.238E-01    0.010E+00
 0.050E+00    8.800E+00    0.050E+00    0.100E+00    4.250E+00    9.561E-01
 0.000E+00    0.100E+00    0.000E+00    0.000E+00    0.000E+00    0.000E+00
 0.000E+00    0.000E+00    0.050E+00
 3
 3.000E+03    3.700E-01    0.450E-01    0.585E+00    0.010E+00    0.050E+00
13.100E+00    0.050E+00    0.100E+00    0.010E+00    0.050E+00    3.500E+00
 0.050E+00    0.100E+00    0.000E+00    5.463E-01    2.238E-01    0.010E+00
 0.050E+00    8.800E+00    0.050E+00    0.100E+00    4.250E+00    9.561E-01
 0.000E+00    0.100E+00    0.000E+00    0.000E+00    0.000E+00    0.000E+00
 0.000E+00    0.000E+00    0.050E+00
```

Appendix A-4

OUTPUT FROM SAMPLE FOR BAL PROGRAM

OVERALL HTGR FUEL PROCESSING MATERIAL BALANCE, CASE NUMBER 1

INPUT PARAMETERS

X(1) =	500.0000	X(2) =	0.3700	X(3) =	0.0450	X(4) =	0.5850
X(5) =	0.0100	X(6) =	0.0500	X(7) =	13.1000	X(8) =	0.0500
X(9) =	0.1000	X(10) =	0.0100	X(11) =	0.0500	X(12) =	3.5000
X(13) =	0.0500	X(14) =	0.1000	X(15) =	0.0000	X(16) =	0.5463
X(17) =	0.2238	X(18) =	0.0100	X(19) =	0.0500	X(20) =	8.8000
X(21) =	0.0500	X(22) =	0.1000	X(23) =	4.2500	X(24) =	0.9561
X(25) =	0.0000	X(26) =	0.1000	X(27) =	0.0000	X(28) =	0.0000
X(29) =	0.0000	X(30) =	0.0000	X(31) =	0.0000	X(32) =	0.0000
X(33) =	0.0500						

HEAVY METAL FLOW RATES , KG PER DAY

W(1) =	500.0000	W(2) =	292.5000	W(3) =	295.4545	W(4) =	2.9545
W(5) =	22.0571	W(6) =	15.5502	W(7) =	23.2180	W(8) =	1.1609
W(9) =	20.7447	W(10) =	2.5796	W(11) =	5.0531	W(12) =	20.7447
W(13) =	17.1924	W(14) =	24.9766	W(15) =	1.1071	W(16) =	4.5983
W(17) =	1.2179	W(18) =	19.9441	W(19) =	19.9441	W(20) =	22.5000
W(21) =	22.7273	W(22) =	0.2273	W(23) =	5.3163	W(24) =	1.1962
W(25) =	5.5961	W(26) =	0.2796	W(27) =	5.0000	W(28) =	0.6218
W(29) =	5.0000	W(30) =	0.0000	W(31) =	1.4416	W(32) =	273.1500
W(33) =	279.5916	W(34) =	0.0000	W(35) =	0.0000	W(36) =	0.0000
W(37) =	0.0000	W(38) =	0.0000	W(39) =	0.0000	W(40) =	165.0000
W(41) =	186.8687	W(42) =	1.8687	W(43) =	105.3771	W(44) =	9.8352
W(45) =	110.9232	W(46) =	5.5462	W(47) =	18.8776	W(48) =	12.3248
W(49) =	430.0126	W(50) =	411.1350	W(51) =	156.8626	W(52) =	0.0000
W(53) =	0.0000	W(54) =	0.0000	W(55) =	0.0000	W(56) =	0.0000
W(57) =	0.0000	W(58) =	0.0000	W(59) =	0.0000	W(60) =	288.9477
W(61) =	18.6071	W(62) =	91.3268	W(63) =	0.0000	W(64) =	398.8816
W(65) =	44.3202	W(66) =	443.2018	W(67) =	99.7722	W(68) =	437.2187
W(69) =	44.3202	W(70) =	44.2427	W(71) =	436.4542		

TOTAL PROCESS THROUGHPUT, KG/DAY OF HEAVY METAL

R(1) =	430.0126	R(2) =	430.0126	R(3) =	123.2480	R(4) =	110.9232
R(5) =	196.7039	R(6) =	186.8687	R(7) =	279.5915	R(8) =	5.0000
R(9) =	6.2179	R(10) =	5.5961	R(11) =	23.9234	R(12) =	22.7273
R(13) =	20.7447	R(14) =	25.7978	R(15) =	23.2180	R(16) =	311.0048
R(17) =	295.4545	R(18) =	437.2167	R(19) =	542.9740	R(20) =	443.2018
R(21) =	418.8257	R(22) =	44.3202	R(23) =	19.9441	R(24) =	29.5748
R(25) =	2.3250	R(26) =	22.2455	R(27) =	0.0000	R(28) =	0.0000
R(29) =	1.4416						

PRODUCT OUTPUT FOR EACH PROCESS BLOCK, KG/DAY OF HEAVY METAL

Q(1) =	430.0126	Q(2) =	18.8776	Q(3) =	110.9232	Q(4) =	105.3771
Q(5) =	186.8687	Q(6) =	185.0000	Q(7) =	5.0000	Q(8) =	5.0000
Q(9) =	5.5961	Q(10) =	5.3163	Q(11) =	22.7273	Q(12) =	22.5000
Q(13) =	20.7447	Q(14) =	23.2180	Q(15) =	22.0571	Q(16) =	295.4545
Q(17) =	292.5000	Q(18) =	437.2187	Q(19) =	542.9740	Q(20) =	398.8816
Q(21) =	398.8816	Q(22) =	44.3202	Q(23) =	19.9441	Q(24) =	29.5748
Q(25) =	2.3250	Q(26) =	22.2455	Q(27) =	0.0000	Q(28) =	0.0000
Q(29) =	1.4416						

OVERALL HTGR FUEL PROCESSING MATERIAL BALANCE, CASE NUMBER 2

INPUT PARAMETERS

X(1) =	1500.0000	X(2) =	0.3700	X(3) =	0.0450	X(4) =	0.5850
X(5) =	0.0100	X(6) =	0.0500	X(7) =	13.1000	X(8) =	0.0500
X(9) =	0.1000	X(10) =	0.0100	X(11) =	0.0500	X(12) =	3.5000
X(13) =	0.0500	X(14) =	0.1000	X(15) =	0.0000	X(16) =	0.5463
X(17) =	0.2238	X(18) =	0.0100	X(19) =	0.0500	X(20) =	8.8000
X(21) =	0.0500	X(22) =	0.1000	X(23) =	4.2500	X(24) =	0.9561
X(25) =	0.0000	X(26) =	0.1000	X(27) =	0.0000	X(28) =	0.0000
X(29) =	0.0000	X(30) =	0.0000	X(31) =	0.0000	X(32) =	0.0000
X(33) =	0.0500						

HEAVY METAL FLOW RATES , KG PER DAY

W(1) = 1500.0000	W(2) = 877.5000	W(3) = 886.3636	W(4) = 8.8636
W(5) = 66.1712	W(6) = 46.6507	W(7) = 69.6539	W(8) = 3.4827
W(9) = 62.2340	W(10) = 7.7393	W(11) = 15.1592	W(12) = 62.2340
W(13) = 51.5772	W(14) = 74.9297	W(15) = 3.3214	W(16) = 13.7948
W(17) = 3.6538	W(18) = 59.8322	W(19) = 59.8322	W(20) = 67.5000
W(21) = 68.1818	W(22) = 0.6618	W(23) = 15.9490	W(24) = 3.5885
W(25) = 16.7884	W(26) = 0.8394	W(27) = 15.0000	W(28) = 1.8654
W(29) = 15.0000	W(30) = 0.0000	W(31) = 4.3249	W(32) = 819.4500
W(33) = 838.7749	W(34) = 0.0000	W(35) = 0.0000	W(36) = 0.0000
W(37) = 0.0000	W(38) = 0.0000	W(39) = 0.0000	W(40) = 555.0000
W(41) = 560.6061	W(42) = 5.6061	W(43) = 316.1312	W(44) = 29.5056
W(45) = 332.7697	W(46) = 16.6385	W(47) = 56.6327	W(48) = 36.9744
W(49) = 1290.0378	W(50) = 1233.4051	W(51) = 470.5878	W(52) = 0.0000
W(53) = 0.0000	W(54) = 0.0000	W(55) = 0.0000	W(56) = 0.0000
W(57) = 0.0000	W(58) = 0.0000	W(59) = 0.0000	W(60) = 866.8431
W(61) = 55.6214	W(62) = 273.9834	W(63) = 0.0000	W(64) = 1196.6449
W(65) = 132.9605	W(66) = 1329.6054	W(67) = 299.3167	W(68) = 1311.6562
W(69) = 132.9605	W(70) = 132.7282	W(71) = 1309.3627	

TOTAL PROCESS THROUGHPUT, KG/DAY OF HEAVY METAL

R(1) = 1290.0378	R(2) = 1290.0378	R(3) = 369.7441	R(4) = 332.7697
R(5) = 590.1116	R(6) = 560.6061	R(7) = 838.7749	R(8) = 15.0000
R(9) = 16.6538	R(10) = 16.7884	R(11) = 71.7703	R(12) = 68.1818
R(13) = 62.2340	R(14) = 77.3933	R(15) = 69.6539	R(16) = 933.0144
R(17) = 886.3636	R(18) = 1311.6562	R(19) = 1628.9221	R(20) = 1329.6054
R(21) = 1256.4771	R(22) = 132.9605	R(23) = 59.8322	R(24) = 88.7245
R(25) = 6.9751	R(26) = 66.7364	R(27) = 0.0000	R(28) = 0.0000
R(29) = 4.3249			

PRODUCT OUTPUT FOR EACH PROCESS BLOCK, KG/DAY OF HEAVY METAL

Q(1) = 1290.0378	Q(2) = 56.6327	Q(3) = 332.7697	Q(4) = 316.1312
Q(5) = 560.6061	Q(6) = 555.0000	Q(7) = 15.0000	Q(8) = 15.0000
Q(9) = 16.7884	Q(10) = 15.9490	Q(11) = 68.1818	Q(12) = 67.5000
Q(13) = 62.2340	Q(14) = 69.6539	Q(15) = 66.1712	Q(16) = 886.3636
Q(17) = 877.5000	Q(18) = 1311.6562	Q(19) = 1628.9221	Q(20) = 1196.6449
Q(21) = 1196.6449	Q(22) = 132.9605	Q(23) = 59.8322	Q(24) = 88.7245
Q(25) = 6.9751	Q(26) = 66.7364	Q(27) = 0.0000	Q(28) = 0.0000
Q(29) = 4.3249			

OVERALL HTGR FUEL PROCESSING MATERIAL BALANCE, CASE NUMBER 3

INPUT PARAMETERS

X(1) = 3000.0000	X(2) = 0.3700	X(3) = 0.0450	X(4) = 0.5850
X(5) = 0.0100	X(6) = 0.0500	X(7) = 13.1000	X(8) = 0.0500
X(9) = 0.1000	X(10) = 0.0100	X(11) = 0.0500	X(12) = 3.5000
X(13) = 0.0500	X(14) = 0.1000	X(15) = 0.0000	X(16) = 0.5463
X(17) = 0.2238	X(18) = 0.0100	X(19) = 0.0500	X(20) = 8.8000
X(21) = 0.0500	X(22) = 0.1000	X(23) = 4.2500	X(24) = 0.9561
X(25) = 0.0000	X(26) = 0.1000	X(27) = 0.0000	X(28) = 0.0000
X(29) = 0.0000	X(30) = 0.0000	X(31) = 0.0000	X(32) = 0.0000
X(33) = 0.0500			

HEAVY METAL FLOW RATES , KG PER DAY

W(1) = 3000.0000	W(2) = 1755.0000	W(3) = 1772.7273	W(4) = 17.7273
W(5) = 132.3425	W(6) = 93.3014	W(7) = 139.3079	W(8) = 6.9654
W(9) = 124.4681	W(10) = 15.4787	W(11) = 30.3184	W(12) = 124.4681
W(13) = 103.1543	W(14) = 149.8595	W(15) = 6.6427	W(16) = 27.5896
W(17) = 7.3075	W(18) = 119.6645	W(19) = 119.6645	W(20) = 135.0000
W(21) = 136.3636	W(22) = 1.3636	W(23) = 31.8979	W(24) = 7.1770
W(25) = 33.5768	W(26) = 1.6788	W(27) = 30.0000	W(28) = 3.7308
W(29) = 30.0000	W(30) = 0.0000	W(31) = 8.6498	W(32) = 1638.9000
W(33) = 1677.5498	W(34) = 0.0000	W(35) = 0.0000	W(36) = 0.0000
W(37) = 0.0000	W(38) = 0.0000	W(39) = 0.0000	W(40) = 1110.0000
W(41) = 1121.2121	W(42) = 11.2121	W(43) = 632.2625	W(44) = 59.0112
W(45) = 665.5394	W(46) = 33.2770	W(47) = 113.2653	W(48) = 73.9488
W(49) = 2560.0756	W(50) = 2466.8102	W(51) = 941.1756	W(52) = 0.0000
W(53) = 0.0000	W(54) = 0.0000	W(55) = 0.0000	W(56) = 0.0000
W(57) = 0.0000	W(58) = 0.0000	W(59) = 0.0000	W(60) = 1733.6862
W(61) = 111.6427	W(62) = 547.9608	W(63) = 0.0000	W(64) = 2393.2898
W(65) = 265.9211	W(66) = 2659.2109	W(67) = 598.6334	W(68) = 2623.3125
W(69) = 265.9211	W(70) = 265.4564	W(71) = 2618.7254	

```
TOTAL PROCESS THROUGHPUT, KG/DAY OF HEAVY METAL

 R( 1) =  2580.0756        R( 2) =  2580.0756        R( 3) =   739.4883        R( 4) =   665.5394
 R( 5) =  1180.2233        R( 6) =  1121.2121        R( 7) =  1677.5496        R( 8) =    30.0000
 R( 9) =    37.3075        R(10) =    33.5768        R(11) =   143.5407        R(12) =   136.3636
 R(13) =   124.4681        R(14) =   154.7865        R(15) =   139.3079        R(16) =  1866.0287
 R(17) =  1772.7273        R(18) =  2623.3125        R(19) =  3257.8442        R(20) =  2659.2109
 R(21) =  2512.9543        R(22) =   265.9211        R(23) =   119.6645        R(24) =   177.4491
 R(25) =    13.9503        R(26) =   133.4727        R(27) =     0.0000        R(28) =     0.0000
 R(29) =     6.6498


PRODUCT OUTPUT FOR EACH PROCESS BLOCK, KG/DAY OF HEAVY METAL

 Q( 1) =  2580.0756        Q( 2) =   113.2653        Q( 3) =   665.5394        Q( 4) =   632.2625
 Q( 5) =  1121.2121        Q( 6) =  1110.0000        Q( 7) =    30.0000        Q( 8) =    30.0000
 Q( 9) =    33.5768        Q(10) =    31.8979        Q(11) =   136.3636        Q(12) =   135.0000
 Q(13) =   124.4681        Q(14) =   139.3079        Q(15) =   132.3425        Q(16) =  1772.7273
 Q(17) =  1755.0000        Q(18) =  2623.3125        Q(19) =  3257.8442        Q(20) =  2393.2898
 Q(21) =  2393.2898        Q(22) =   265.9211        Q(23) =   119.6645        Q(24) =   177.4491
 Q(25) =    13.9503        Q(26) =   133.4727        Q(27) =     0.0000        Q(28) =     0.0000
 Q(29) =     6.6498
```

Appendix A-5

PUNCHED OUTPUT FROM BAL

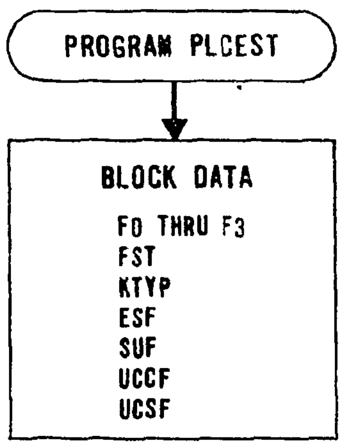
3

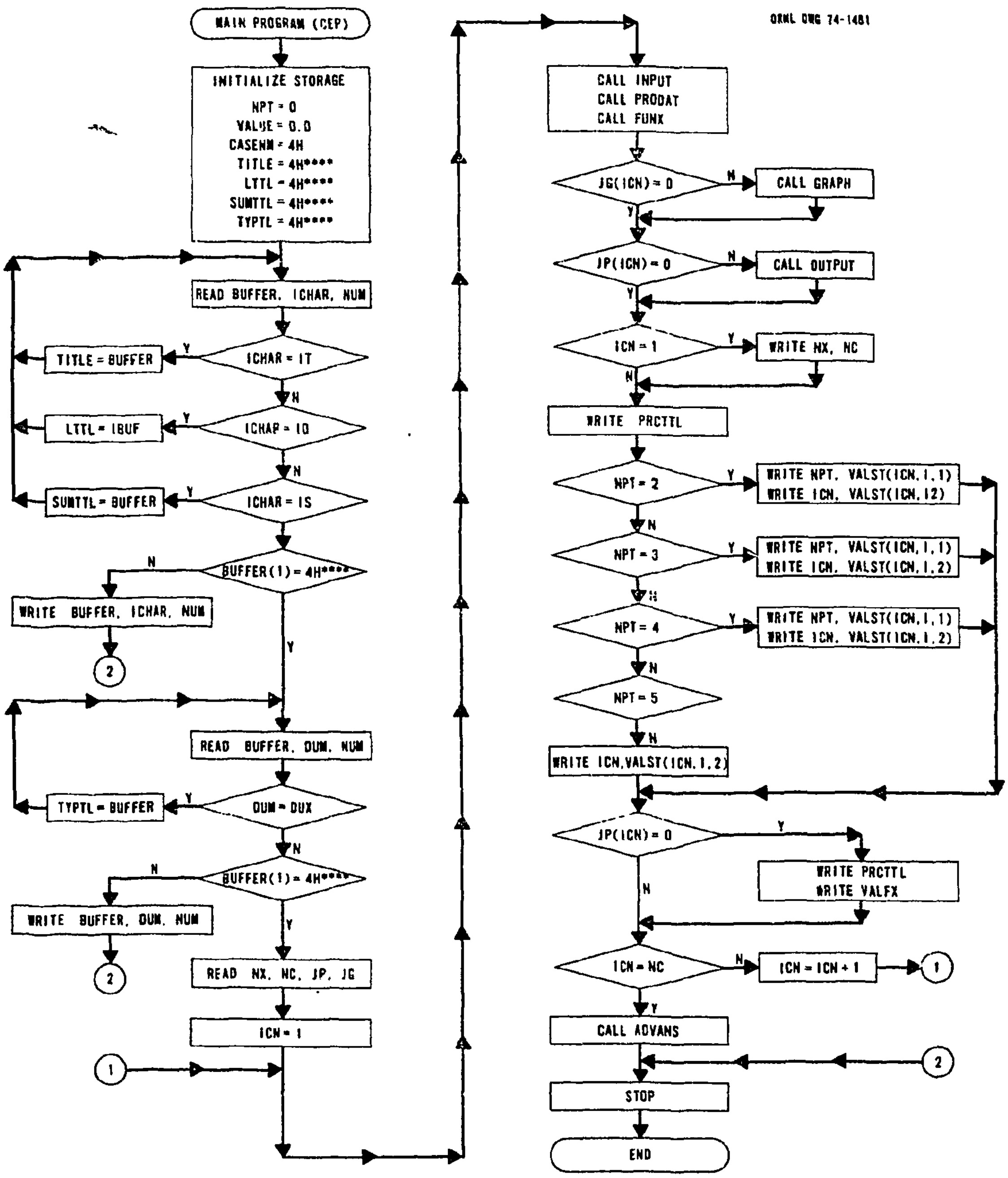
1	0.50000E+03	0.20745E+02	0.44243E+02	0.43645E+03	
	4.30013E+02	4.30013E+02	1.23248E+02	1.10923E+02	1.96704E+02
	1.86869E+02	2.79592E+02	5.00000E+00	6.21792E+00	5.59613E+00
	2.39234E+01	2.27273E+01	2.07447E+01	2.57978E+01	2.32180E+01
	3.11005E+02	2.95455E+02	4.37219E+02	5.42974E+02	4.43202E+02
	4.18826E+02	4.43202E+01	1.99441E+01	2.95748E+01	2.32504E+00
	2.22455E+01	0.00000E-01	0.00000E-01	1.44164E+00	
	4.30013E+02	1.88776E+01	1.10923E+02	1.05377E+02	1.86869E+02
	1.85000E+02	5.00000E+00	5.00000E+00	5.59613E+00	5.31632E+00
	2.27273E+01	2.25000E+01	2.07447E+01	2.32180E+01	2.20571E+01
	2.95455E+02	2.92500E+02	4.37219E+02	5.42974E+02	3.98882E+02
	3.98882E+02	4.43202E+01	1.99441E+01	2.95748E+01	2.32504E+00
	2.22455E+01	0.00000E-01	0.00000E-01	1.44164E+00	
2	0.15000E+04	0.62234E+02	0.13273E+03	0.13094E+04	
	1.29004E+03	1.29004E+03	3.69784E+02	3.32770E+02	5.90112E+02
	5.60606E+02	8.38775E+02	1.50000E+01	1.86538E+01	1.67884E+01
	7.17703E+01	6.81818E+01	6.22340E+01	7.73933E+01	6.96539E+01
	9.33014E+02	8.86364E+02	1.31166E+03	1.62892E+03	1.32961E+03
	1.25648E+03	1.32961E+02	5.98322E+01	8.87245E+01	6.97513E+00
	6.67364E+01	0.00000E-01	0.00000E-01	4.32492E+00	
	1.29004E+03	5.66327E+01	3.32770E+02	3.16131E+02	5.60606E+02
	5.55000E+02	1.50000E+01	1.50000E+01	1.67884E+01	1.59490E+01
	6.81818E+01	6.75000E+01	6.22340E+01	6.96539E+01	6.61712E+01
	8.86364E+02	8.77500E+02	1.31166E+03	1.62892E+03	1.19664E+03
	1.19664E+03	1.32961E+02	5.98322E+01	8.87245E+01	6.97513E+00
	6.67364E+01	0.00000E-01	0.00000E-01	4.32492E+00	
3	0.30000E+04	0.12447E+03	0.26546E+03	0.26187E+04	
	2.58008E+03	2.58008E+03	7.39488E+02	6.65539E+02	1.18022E+03
	1.12121E+03	1.67755E+03	3.00000E+01	3.73075E+01	3.35768E+01
	1.43541E+02	1.36364E+02	1.24468E+02	1.54787E+02	1.39308E+02
	1.86603E+03	1.77273E+03	2.62331E+03	3.25784E+03	2.65921E+03
	2.51295E+03	2.65921E+02	1.19664E+02	1.77449E+02	1.39503E+01
	1.33473E+02	0.00000E-01	0.00000E-01	8.64983E+00	
	2.58008E+03	1.13265E+02	6.65539E+02	6.32262E+02	1.12121E+03
	1.11000E+03	3.00000E+01	3.00000E+01	3.35768E+01	3.18979E+01
	1.36364E+02	1.35000E+02	1.24468E+02	1.39308E+02	1.32342E+02
	1.77273E+03	1.75500E+03	2.62331E+03	3.25784E+03	2.39329E+03
	2.39329E+03	2.65921E+02	1.19664E+02	1.77449E+02	1.39503E+01
	1.33473E+02	0.00000E-01	0.00000E-01	8.64933E+00	

Appendix B-1
BLOCK DIAGRAM OF CEP

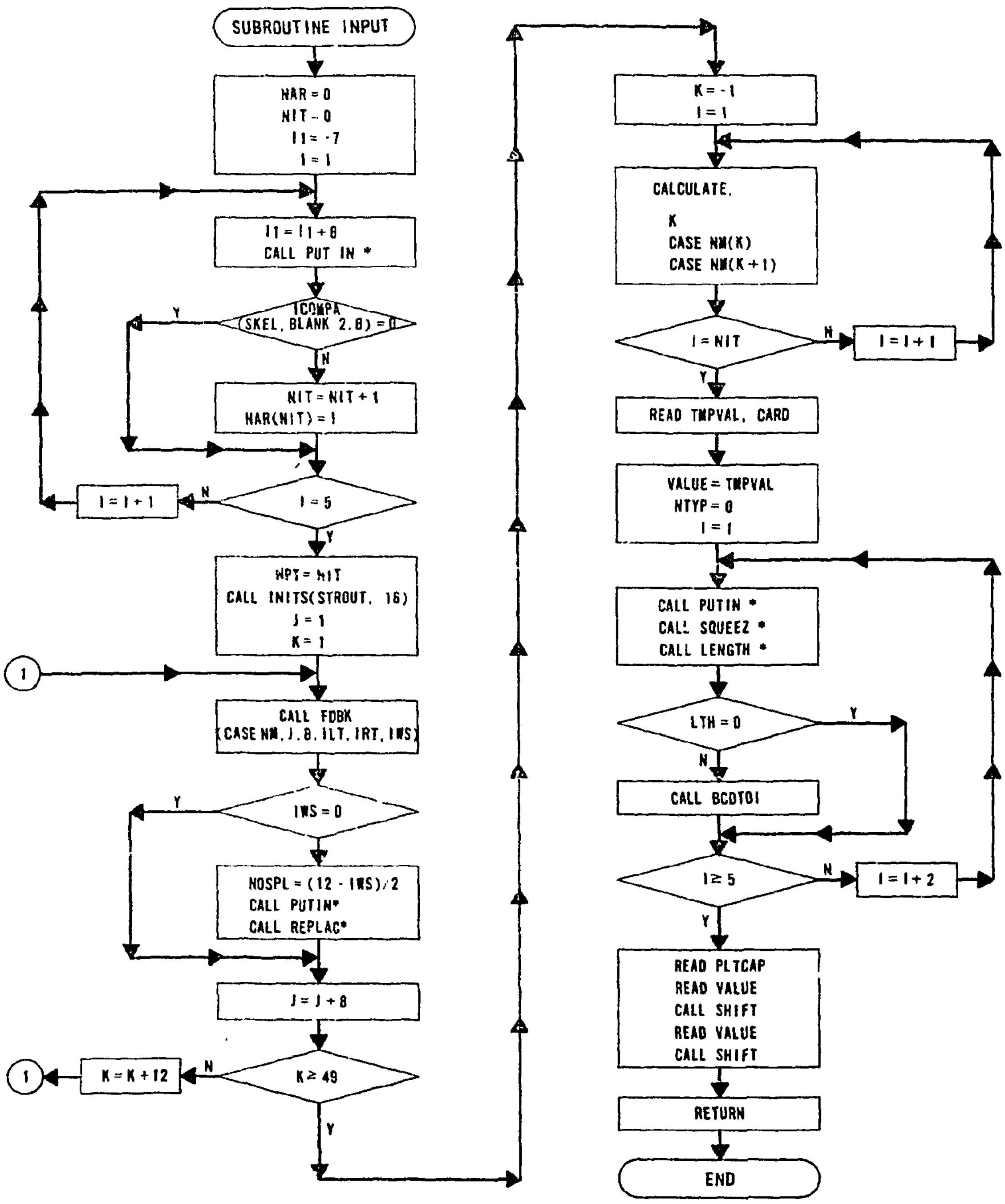
Program PLCEST
MAIN Program
INPUT Subroutine
PRODAT Subroutine
OUTPUT Subroutine
FUNX Subroutine
GRAPH Subroutine
SHIFT Subroutine
FDBK Subroutine
INITS Subroutine

ORNL DWG 74-1484

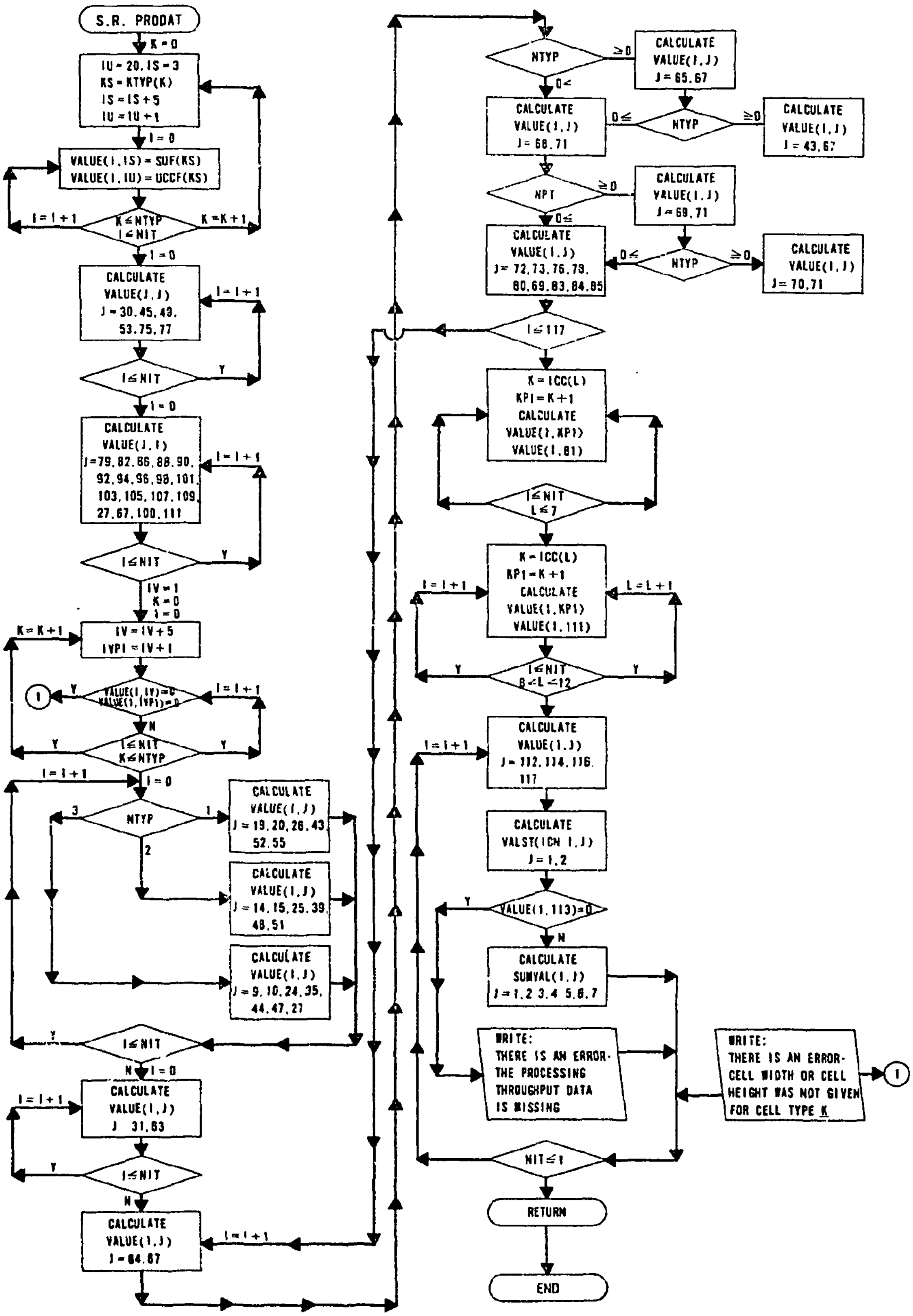



ORNL DWG 74-1481
MAIN PROGRAM (CEP)
INITIALIZE STORAGE
NPT = 0
VALUE = 0.0
CASENM = 4H
TITLE = 4H****
LTTL = 4H****
SUMTTL = 4H****
TYPTL = 4H****
READ BUFFER, ICHAR, NUM
ICHAR = IT
TITLE = BUFFER
ICHAR = IO
LTTL = IBUF
ICHAR = IS
SUMTTL = BUFFER
BUFFER(1) = 4H****
WRITE BUFFER, ICHAR, NUM
2
READ BUFFER, DUM, NUM
DUM = DUX
TYPTL = BUFFER
BUFFER(1) = 4H****
WRITE BUFFER, DUM, NUM
2
READ NX, NC, JP, JG
ICN = 1
1
CALL INPUT
CALL PRODAT
CALL FUNX
JG(ICN) = 0
CALL GRAPH
JP(ICN) = 0
CALL OUTPUT
ICN = 1
WRITE NX, NC
WRITE PRCTTL
NPT = 2
WRITE NPT, VALST(ICN, I, 1)
WRITE ICN, VALST(ICN, I2)
NPT = 3
WRITE NPT, VALST(ICN, I, 1)
WRITE ICN, VALST(ICN, I, 2)
NPT = 4
WRITE NPT, VALST(ICN, I, 1)
WRITE ICN, VALST(ICN, I, 2)
NPT = 5
WRITE ICN,VALST(ICN, I, 2)
JP(ICN) = 0
WRITE PRCTTL
WRITE VALFX
ICN = NC
ICN = ICN + 1
1
CALL ADVANS
2
STOP
END
Y
N

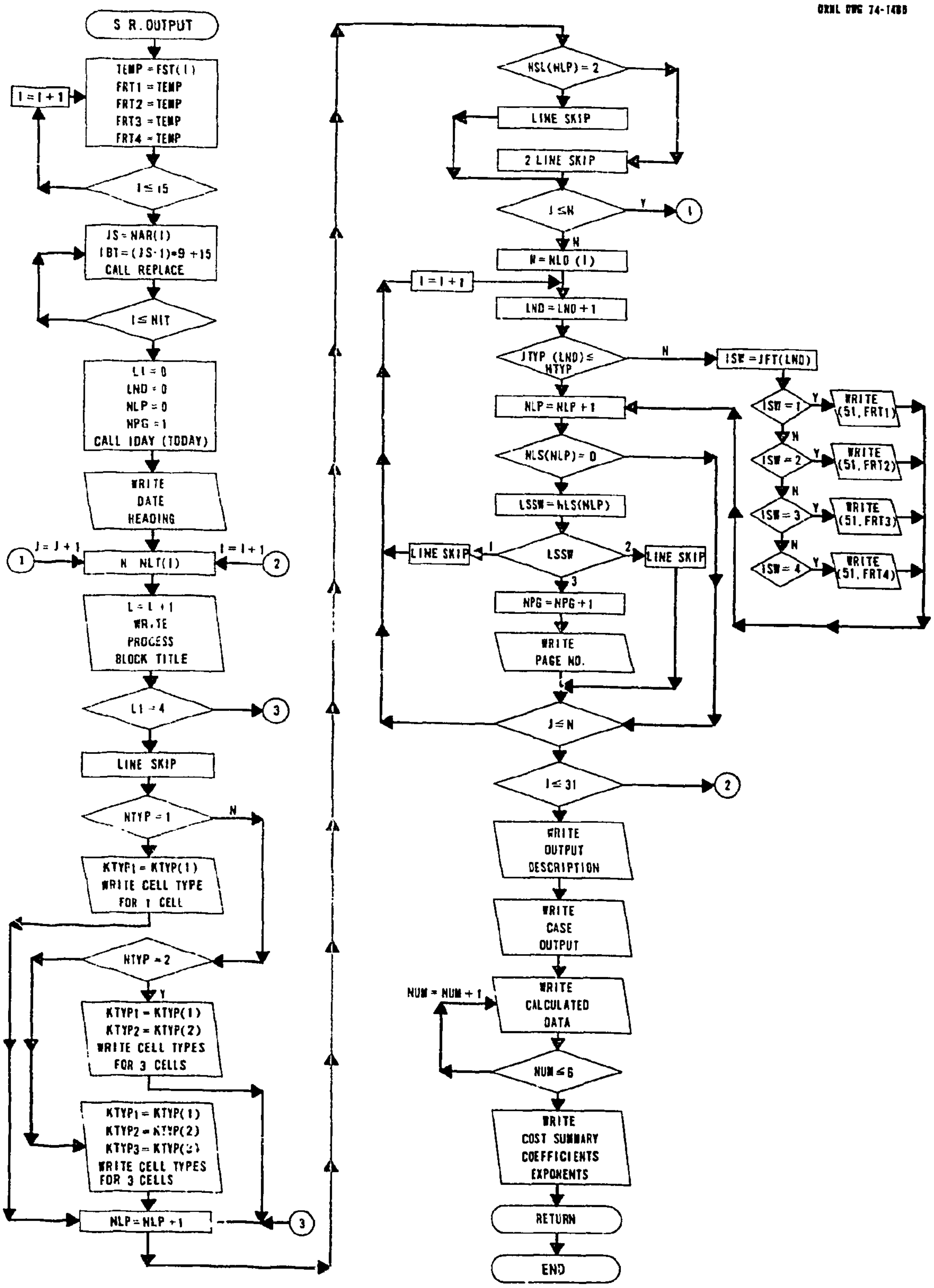
ORNL DWG 74-1485



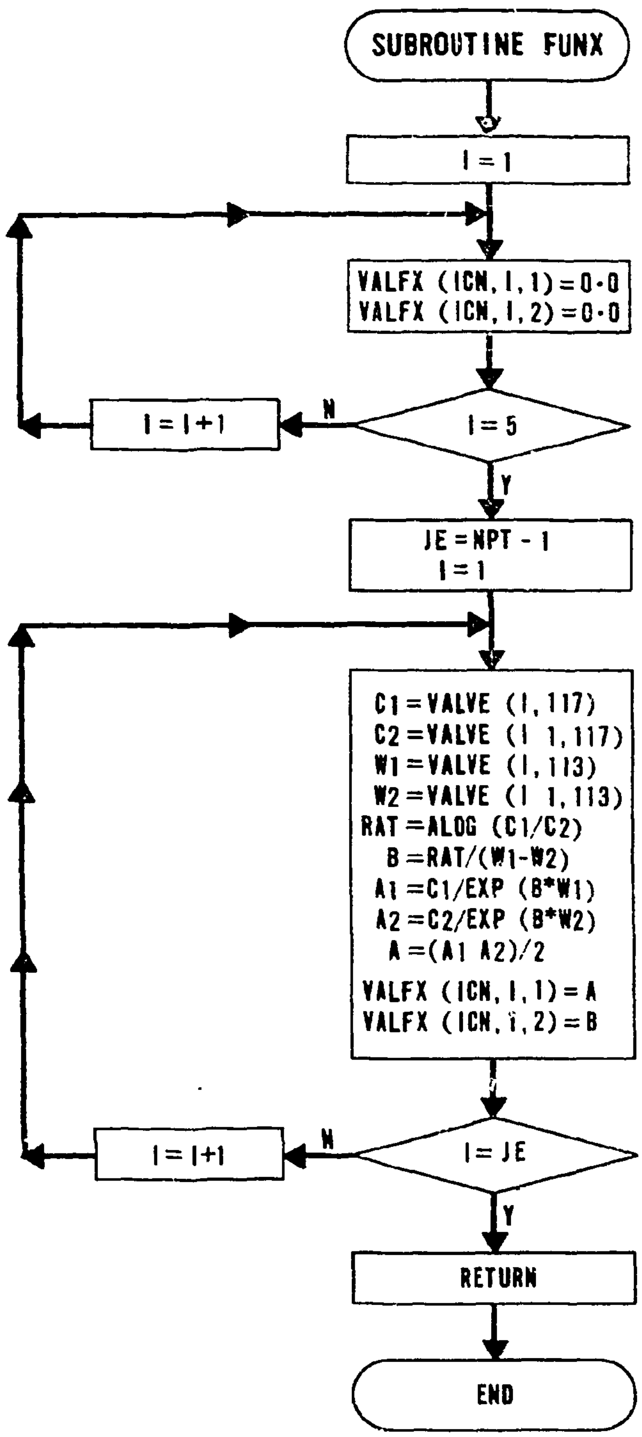
ORNL DWG 74-1487



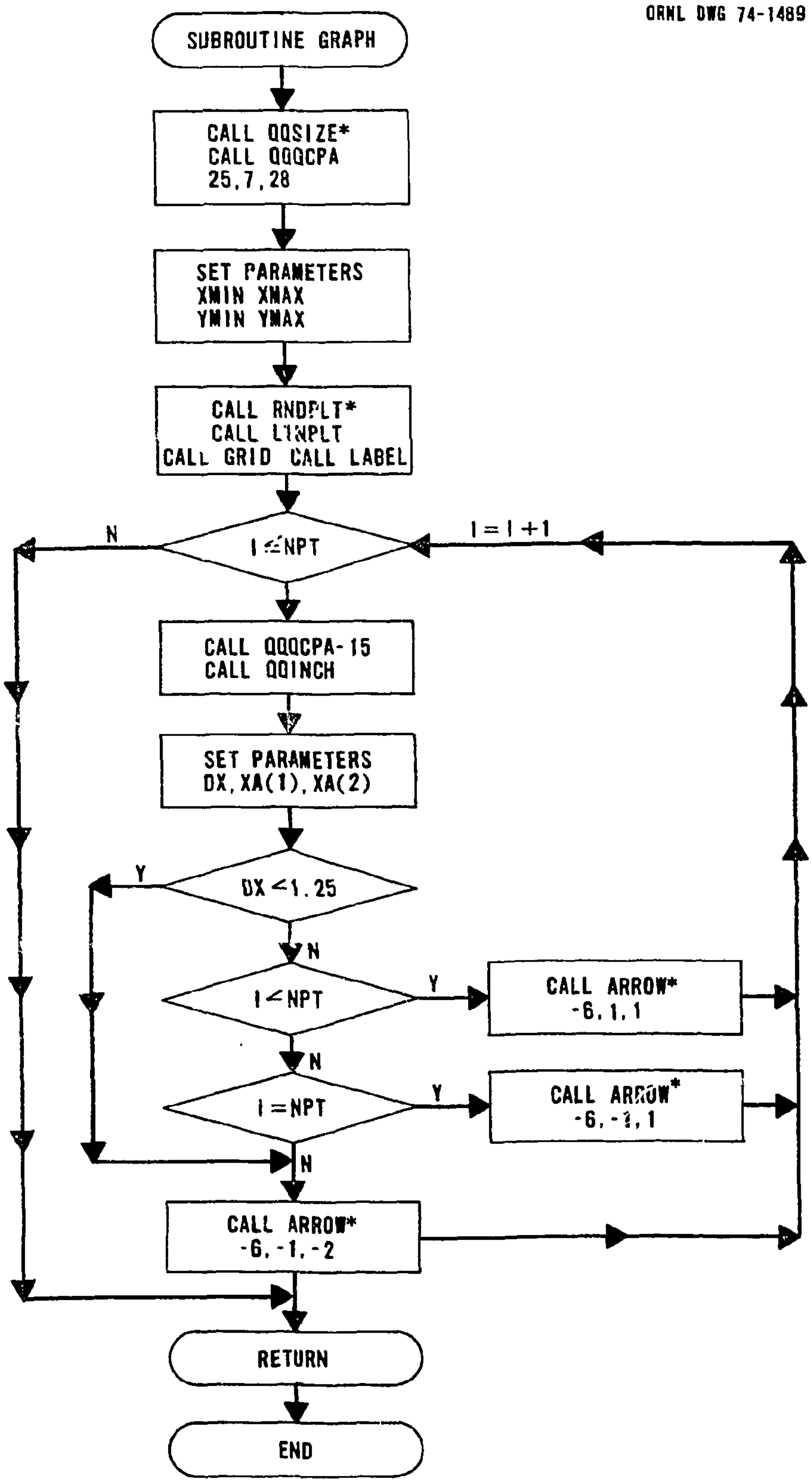
ORNL DWG 74-1488



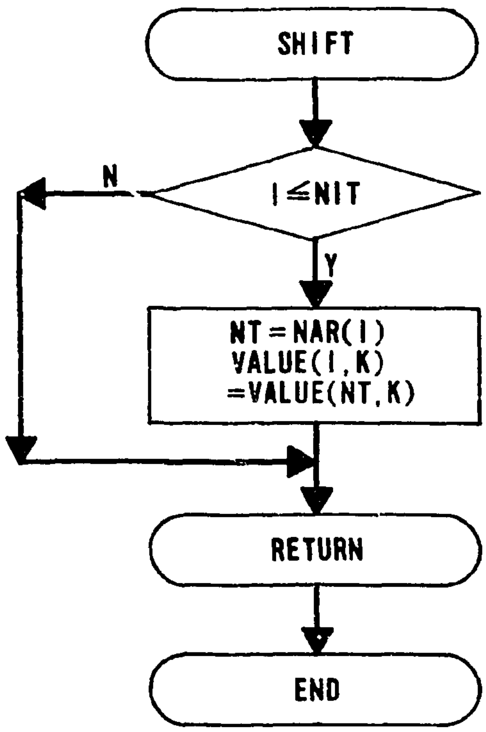
ORNL DWG 74-1483



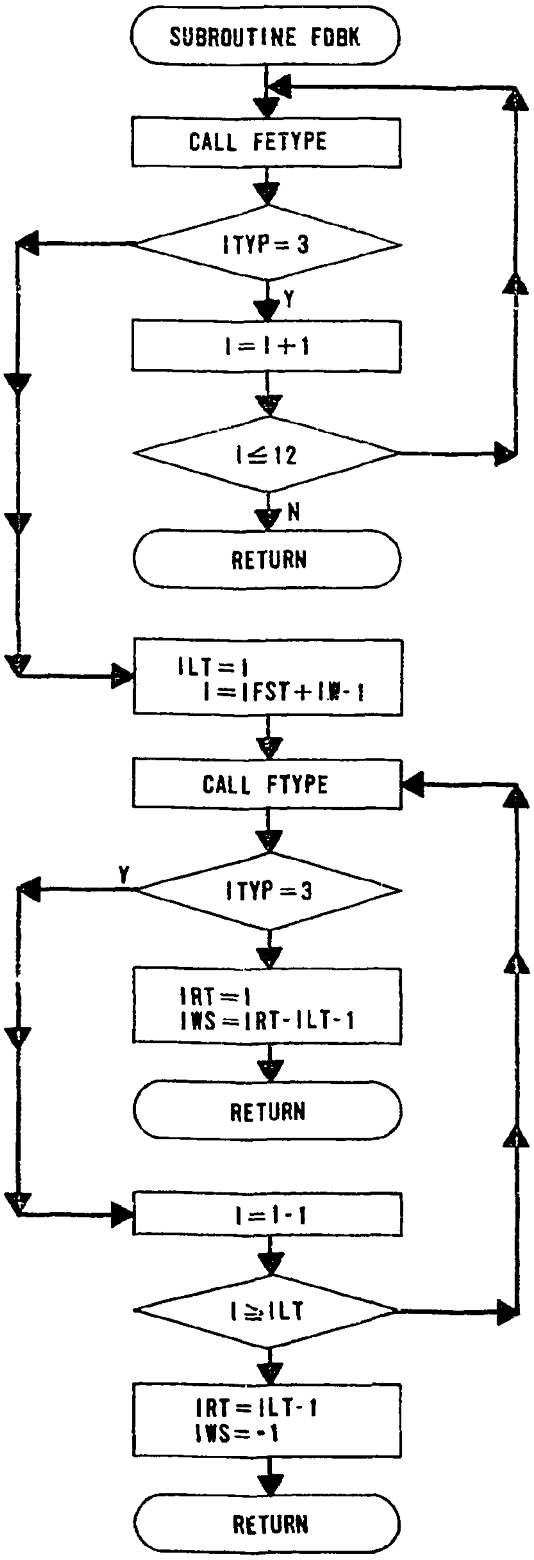
ORNL DWG 74-1489



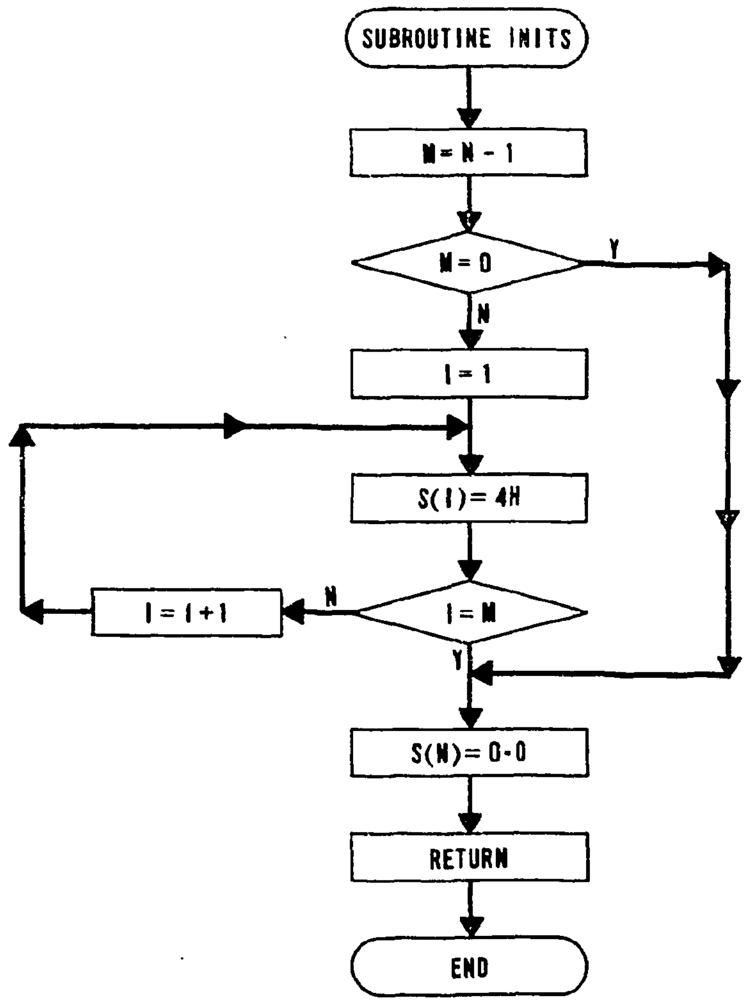
ORNL DWG 74-1491



ORNL DWG 74-1490



ORNL DWG 74-1482



Appendix B-2

PROGRAM LISTING OF CEP

Program PLCEST

```
C     PROGRAM   PLCEST                                                   PLCES 10
C * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * PLCES 20
C   THIS PROGRAM CALCULATES THE ESTIMATED COST OF A PLANT FOR            PLCES 30
C    PROCESSING REACTOR FUEL MATERIALS ETC. REQUIRING EITHER             PLCES 40
C    REMOTE EQUIPMENT OR CONTROLLED ATMOSPHERE AND TABULATES             PLCES 50
C    THE RESULTS.                                                        PLCES 60
C * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * PLCES 70
      BLOCK DATA                                                         PLCES 80
      COMMON/XMAIN/ BLANK1,        BLANK2(3),      CASENM(10),           PLCES 90
     1              STROUT(16),    PLTCAP(5)                             PLCES 91
      COMMON/TITLAB/TITLE(15,38),SUMTTL(15,7),LTTL(15,117),TYPTL(19,15) PLCE 100
      COMMON/TABDAT/PRCTTL(20),    VALUE(5,124), VALST(30,5,2),          PLCE 110
     1              IAR1(7),       IAR2(9,3)    , VALFX(30,4,2)          PLCE 111
      COMMON/DATUCF/CNUCF,         ENGUCF,         GAUCF,                PLCE 120
     1              OLCUCF,        OLNUCF,         OUUCF,                PLCE 121
     2              PJMUCF,        POTUCF,         PSCUCF,               PLCE 122
     3              OLAUCF,        SEQUCF,         SPUCF,                PLCE 123
     4              TIIUCF,        SICUCF                                PLCE 124
      COMMON/FDAT/  ESF(15),       SUF(15),        UCCF(15),             PLCE 130
     1              UCSF(15),      KTYP(15)                              PLCE 131
      COMMON/DATAB/ IFT(117),      NLT(31),        NLD(31),              PLCE 140
     1              NLS(155)                                             PLCE 141
      COMMON/FMTDAT/F0(3),         F1(3),          F2(3),                PLCE 150
     1              F3(3),         FST(15)                               PLCE 151
      DATA F0/4HF10.,4H0   ,0.0/,F1/4HF10.,4H1   ,0.0/,F2/4HF10.,4H2   ,PLCE 160
     10.0/,F3/4HF10.,4H3   ,0.0/                                         PLCE 161
      DATA FST(1),FST(2),FST(3),FST(4),FST(5),FST(6),FST(7),FST(8),FST(9PLCE 170
     1),FST(10),FST(11),FST(12),FST(13),FST(14),FST(15)/4H(1H ,4H,15A,  PLCE 171
     24H4, 5,4HX,10,4HX   ,,4H2X,1,4H0X  ,4H,2X,,4H10X ,4H ,2X,4H,10X,   PLCE 172
     34H  ,2,4HX,10,4HX  ),0.0/                                          PLCE 173
      DATA KTYP/1,2,3,4,5,6,7,8,9,10,11,12,13,14,15/                     PLCE 180
      DATA ESF/0.7,0.6,0.7,0.6,0.7,0.6,0.6,0.8,0.8,1.0,1.0,0.0,0.6,0.0, PLCE 190
     10.0/,SUF/4.0,2.33,4.0,2.33,4.0,2.33,2.5,2.2,3.6,2.5,5.3,5.6,2.7,  PLCE 191
     20.0,3.5/                                                           PLCE 192
      DATA UCCF/42.00,18.00,39.00,16.00,34.00,13.00,9.00,146.00,78.00,  PLCE 200
     12.30,2.30,7.00,7.00,7.00,2.30/,UCSF/1258,730,1174,622,1028,       PLCE 201
     2538,180,500,934,114,114,100,100,100,100/                          PLCE 202
      DATA GAUCF,ENGUCF,PSCUCF,CNUCF,SPUCF,SEQUCF,OLAUCF,OUUCF/0.10,0.30PLCE 210
     1,0.05,0.20,0.007,0.03,0.06,0.10/                                   PLCE 211
      DATA OLNUCF,PJMUCF,OLCUCF,TIIUCF,POTUCF,SICUCF/0.01,0.02,0.04,    PLCE 220
     10.20,0.20,0.005/                                                   PLCE 221
      DATA BLANK1/2H  /,BLANK2/4H    ,4H    ,4H    /                     PLCE 230
      DATA IFT/1,1,1,1,1,2,2,3,1,3,2,2,3,1,3,2,2,3,1,3,3,3,3,1,1,1,1,2, PLCE 240
     12,3,1,2,2,2,1,2,2,2,1,2,2,2,1,1,3,2,1,1,3,2,1,1,3,2,1,3,3,3,3,3,3,PLCE 241
     23,1,1,1,1,1,1,1,1,1,1,1,2,3,1,3,1,3,1,1,4,1,1,1,3,1,3,1,3,1,3,1,4,PLCE 242
     31,3,1,3,1,1,3,1,3,1,3,1,3,1,3,1,1,1,3,1,3,1,3/                     PLCE 243
      DATA NLT/3,1,2,1,1,2,1,1,1,1,1,1,1,1,2,1,1,1,2,1,1,1,1,1,1,2,1,1, PLCE 250
     11,1,1/                                                             PLCE 251
      DATA NLD/1,4,15,3,4,4,12,12,1,3,3,1,4,6,3,2,3,4,2,2,2,2,2,2,3,2,2,PLCE 260
     12,2,3,6/                                                           PLCE 261
      DATA NLS/2,1,1,1,1,0,0,0,2,1,1,0,0,0,0,1,0,0,0,0,1,0,0,0,0,1,1,0,0PLCE 270
     1,1,1,0,0,0,3,1,1,0,0,0,1,1,0,0,0,1,0,0,0,1,0,0,0,1,1,0,0,0,1,0,0,0PLCE 271
     2,1,0,0,0,1,1,1,1,0,0,1,1,0,0,3,1,1,1,0,0,0,1,1,0,0,0,0,0,0,2,1,1,0,0PLCE 272
     3,1,1,0,2,1,0,0,1,1,0,0,0,3,1,1,0,2,1,0,2,1,0,2,1,0,2,1,0,2,1,0,2,1PLCE 273
     4,0,0,3,1,1,0,2,1,0,2,1,0,2,1,0,2,1,0,0,2,1,0,0,0,0,0,0/           PLCE 274
      DATA IAR1/113,1,28,29,56,74,5/                                     PLCE 280
      DATA IAR2/2,6,7,32,33,34,46,57,60,3,11,12,36,37,38,50,58,61,4,16, PLCE 290
     117,40,41,42,54,59,62/                                              PLCE 291
      END                                                                PLCE 300
```

BLANK PAGE

MAIN Program

```
C      PROGRAM MAIN
       COMMON/XMAIN/ BLANK1,         BLANK2(3),     CASENM(10),
      1              STROUT(16),   PLTCAP(5)
       COMMON/YMAIN/NX,NC,ICN,NPT,JG(30),JP(30)
       COMMON/TITLAB/TITLE(15,38),SUMTTL(15,7),LTTL(15,117),TYPTL(19,15)
       COMMON/TABDAT/PRCTTL(20),    VALUE(5,124), VALST(30,5,2),
      1              IAR1(7),      IAR2(9,3)     , VALFX(30,4,2)
       DIMENSION     BUFFER(20),    IBUF(20)
       EQUIVALENCE (BUFFER(1),IBUF(1))
       EQUIVALENCE (STAR,ISTAR)
       DATA IT/1HT/,ID/1HD/,IS/1HS/
       DATA STAR /4H****/ , DUX/4HTY  /
  1001 FORMAT(20A4)
  1002 FORMAT(2I5)
  1003 FORMAT(15A4,15X,A1,I4)
  1004 FORMAT(1H1)
  1005 FORMAT(1H ,10X,15A4,10X,I3)
  1006 FORMAT(1H0,10X,'* * * * THERE IS AN ERROR IN THE TITLE DATA DECK -
      1--THE CARD IN ERROR IS * * * *'/1H ,10X,15A4,15X,A1,I4)
  1007 FORMAT(19A4,A2,I2)
  1008 FORMAT(1H0,10X,'* * * * THERE IS AN ERROR IN THE TYPE TITLE DATA D
      1ECK---THE CARD IN ERROR IS * * * *'/1H ,10X,19A4,A2,I2)
  1009 FORMAT(2I5,4X,29I1,8X,29I1)
  1010 FORMAT(1H0'FUNCTION COEFFICIENTS ARE AS FOLLOWS :')
  1011 FORMAT(1H0'A1 = ',1PE12.5,5X,'A2 = ',1PE12.5,5X,'A3 = ',1PE12.5,5X
      1,'A4 = ',1PE12.5)
  1012 FORMAT(1H0'FUNCTION EXPONENTS ARE AS FOLLOWS :')
  1013 FORMAT(1H0'B1 = ',1PE12.5,5X,'B2 = ',1PE12.5,5X,'B3 = ',1PE12.5,5X
      1,'B4 = ',1PE12.5)
  1014 FORMAT(I2,2(2X,1PE12.5))
  1015 FORMAT(I2,3(2X,1PE12.5))
  1016 FORMAT(I2,4(2X,1PE12.5))
  1017 FORMAT(I2,5(2X,1PE12.5))
       NPT = 0
       DO 1 J = 1,124
       DO 1 I = 1,5
  1    VALUE(I,J) = 0.0
       DO 2 I = 1,10
       CASENM(I) = BLANK2(1)
  2    CONTINUE
       DO 3 J = 1,38
       DO 3 I = 1,15
  3    TITLE(I,J) = STAR
       DO 4 J = 1,117
       DO 4 I = 1,15
  4    LTTL(I,J) = ISTAR
       DO 5 J = 1,7
       DO 5 I = 1,15
  5    SUMTTL(I,J) = STAR
       DO 6 J = 1,15
       DO 6 I = 1,19
  6    TYPTL(I,J) = STAR
  7    READ(50,1003) (BUFFER(K),K=1,15),ICHAR,NUM
       IF(ICHAR.NE.IT) GO TO 9
       DO 8 I = 1,15
  8    TITLE(I,NUM) = BUFFER(I)
       GO TO 14
  9    IF(ICHAR.NE.ID) GO TO 11
       DO 10 I = 1,15
  10   LTTL(I,NUM) = IBUF(I)
       GO TO 14
  11   IF(ICHAR.NE.IS) GO TO 13
       DO 12 I= 1,15
  12   SUMTTL(I,NUM) = BUFFER(I)
       GO TO 14
  13   IF(BUFFER(1).EQ.STAR) GO TO 15
       WRITE(51,1006) (BUFFER(K),K=1,15),ICHAR,NUM
       GO TO 28
  14   GO TO 7
```

```
15    READ(50,1007) (BUFFER(K),K=1,19),DUM, NUM
      IF(DUM.NE.DUX) GO TO 17
      DO 16 I=1,19
      TYPTL(I,NUM) = BUFFER(I)
16    CONTINUE
      GO TO 18
17    IF(BUFFER(1).EQ.STAR) GO TO 19
      WRITE(51,1008) (BUFFER(K),K=1,19),DUM,NUM
      GO TO 28
18    GO TO 15
19    CONTINUE
      READ(50,1009) NX,NC,(JP(ICN), ICN=1,29), (JG(ICN), ICN=1,29)
      DO 26 ICN=1,NC
      CALL INPUT
      CALL PRODAT
      CALL FUNX
      IF(JG(ICN).EQ.0) GO TO 20
      CALL GRAPH
20    IF(JP(ICN).EQ.0) GO TO 21
      CALL OUTPUT
21    IF(ICN.EQ.1) WRITE(52,1002) NX,NC
      WRITE(52,1001)  PRCTTL
      IF(NPT.NE.2) GO TO 22
      IF(NPT.EQ.2) WRITE(52,1014) (NPT,(VALST(ICN,I,1),I=1,2))
      WRITE(52,1014) (ICN,(VALST(ICN,I,2),I=1,2))
      GO TO 25
22    IF(NPT.NE.3) GO TO 23
      IF(NPT.EQ.3) WRITE(52,1015) (NPT,(VALST(ICN,I,1),I=1,3))
      WRITE(52,1015) (ICN,(VALST(ICN,I,2),I=1,3))
      GO TO 25
23    IF(NPT.NE.4) GO TO 24
      IF(NPT.EQ.4) WRITE(52,1016) (NPT,(VALST(ICN,I,1),I=1,4))
      WRITE(52,1016) (ICN,(VALST(ICN,I,2),I=1,4))
      GO TO 25
24    IF(NPT.EQ.5) WRITE(52,1017) (NPT,(VALST(ICN,I,1),I=1,5))
      WRITE(52,1017) (ICN,(VALST(ICN,I,2),I=1,5))
25    IF(JP(ICN).NE.0) GO TO 26
      WRITE(51,1001) (PRCTTL(I),I=1,20)
      WRITE(51,1010)
      WRITE(51,1011)VALFX(ICN,1,1),VALFX(ICN,2,1),VALFX(ICN,3,1),VALFX(I
     1CN,4,1)
      WRITE(51,1012)
      WRITE(51,1013)VALFX(ICN,1,2),VALFX(ICN,2,2),VALFX(ICN,3,2),VALFX(I
     1CN,4,2)
26    CONTINUE
27    CALL ADVANS
28    CONTINUE
      STOP
      END
```

INPUT Subroutine

```
      SUBROUTINE INPUT
C * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
C   EXCEPT FOR THE 1ST 4 CARDS THE INPUT DATA MUST BE RIGHT ADJUSTED IN
C   THE ALLOTTED FIELD OR EACH NUMBER WHICH DOES NOT CONTAIN A DECIMAL
C   MUST BE FOLLOWED BY ONE.
C * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
      COMMON/XMAIN/ BLANK1,          BLANK2(3),       CASENM(10),
     1              STROUT(16),    PLTCAP(5)
      COMMON/YMAIN/NX,NC,ICN,NPT,JG(30),JP(30)
      COMMON/TABDAT/PRCTTL(20),    VALUE(5,124), VALST(30,5,2),
     1              IAR1(7),       IAR2(9,3)    , VALFX(30,4,2)
      COMMON/INDX/  NIT,           NAR(5),          NTYP
      COMMON/FDAT/  ESF(15),       SUF(15),         UCCF(15),
     1              UCSF(15),      KTYP(15)
      DIMENSION     SKEL(3),       STR(21),         CARD(20)
 1001 FORMAT(20A4)
 1002 FORMAT(5(2A4,2X))
 1003 FORMAT(1H1,20X,'* * * * * THERE IS AN ERROR -- YOU DID NOT GIVE AN
     1 ESTIMATED PLANT LIFE * * * * * ')
 1004 FORMAT(5F10.0)
 1005 FORMAT(5(A4,6X))
 1006 FORMAT(F10.4,10X,15A4)
      READ(50,1001) PRCTTL
      READ(50,1002) (CASENM(I),I=1,10)
      DO 1 JZ=1,5
 1    NAR(JZ) = 0
      NIT = 0
      I1 = -7
      DO 3 I = 1,5
      I1 = I1 + 8
      CALL PUTIN(SKEL,8,CASENM,I1)
      IF(ICOMPA(SKEL,BLANK2,8).EQ.0) GO TO 3
 2    CONTINUE
      NIT = NIT + 1
      NAR(NIT) = I
 3    CONTINUE
      NPT = NIT
      CALL INITS(STROUT,16)
      J = 1
      DO 5 K = 1,49,12
      CALL FDBK(CASENM,J,8,ILT,IRT,IWS)
      IF(IWS.EQ.0) GO TO 4
      NOSPL = (12 - IWS) / 2
      CALL PUTIN(TEMP,IWS,CASENM,ILT)
      CALL REPLAC(STROUT,K+NOSPL,IWS,TEMP)
 4    J = J + 8
 5    CONTINUE
      K = -1
      DO 6 I = 1,NIT
      J = 2 * NAR(I) - 1
      K = K + 2
      CASENM(K) = CASENM(J)
      CASENM(K+1) = CASENM(J+1)
 6    CONTINUE
      READ(50,1006) TMPVAL, (CARD(I),I=1,15)
      DO 7 I =1,NIT
 7    VALUE(I,115) = TMPVAL
      NTYP = 0
      DO 9 I = 1,5,2
      CALL PUTIN(STR,2,CARD,I)
      CALL SQUEEZ(STR,1H )
      CALL LENGTH(STR,LTH)
      IF(LTH.EQ.0) GO TO 9
 8    CONTINUE
      NTYP = NTYP + 1
      CALL BCDTOI(STR,INT)
      KTYP(NTYP) = INT
 9    CONTINUE
      READ(50,1005) (PLTCAP(I),I=1,5)
```

```
      DO 10 I = 1,NIT
      NT = NAR(I)
      PLTCAP(I) = PLTCAP(NT)
   10 CONTINUE
      DO 11 I =1,7
      K = IAR1(I)
      READ(50,1004) (VALUE(I1,K),I1=1,5)
      CALL SHIFT(K)
   11 CONTINUE
      DO 12 I = 1,9
      DO 12 J = 1,NTYP
      K = IAR2(I,J)
      READ(50,1004) (VALUE(L,K),L=1,5)
      CALL SHIFT(K)
   12 CONTINUE
      RETURN
      END
```

PRODAT Subroutine

```
      SUBROUTINE PRODAT
C * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
C   THIS SUBROUTINE CALCULATES THE RESULTS FROM THE INPUT DATA.
C * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
      COMMON/YMAIN/NX,NC,ICN,NPT,JG(30),JP(30)
      COMMON/TABDAT/PRCTTL(20),   VALUE(5,124), VALST(30,5,2),
     1             IAR1(7),       IAR2(9,3)     , VALFX(30,4,2)
      COMMON/INDX/  NIT,           NAR(5),          NTYP
      COMMON/FDAT/  ESF(15),       SUF(15),         UCCF(15),
     1             UCSF(15),      KTYP(15)
      COMMON/DATUCF/CNUCF,         ENGUCF,          GAUCF,
      OLCUCF,        OLNUCF,         OUUCF,
     1PJMUCF,        POTUCF,         PSCUCF,
     2OLAUCF,        SEQUCF,         SPUCF,
     3TIIUCF,        SICUCF
      EQUIVALENCE (VALUE(1,118),SUMVAL(1,1))
      DIMENSION ICC(12)
      DIMENSION      SUMVAL(5,7)
      DATA ICC/86,88,90,92,94,96,98,101,103,105,107,109/
 1001 FORMAT(1H0,10X,' * * * THERE IS AN ERROR - CELL WIDTH OR CELL HEIG
     1HT WAS NOT GIVEN FOR CELL TYPE ',I2,'    * * * ')
 1002 FORMAT(1H0,10X,'* * * * THERE IS AN ERROR -- THE PROCESSING THROUG
     1HPUT DATA IS MISSING * * * * ')
      IU = 20
      IS = 3
      DO 1 K = 1,NTYP
      KS = KTYP(K)
      IS = IS + 5
      IU = IU + 1
      DO 1 I = 1,NIT
      VALUE(I,IS) = SUF(KS)
      VALUE(I,IU) = UCCF(KS)
    1 CONTINUE
      DO 2  I = 1,NIT
      VALUE(I,30) = SUF(13)
      VALUE(I,45) = SUF(15)
      VALUE(I,49) = SUF(15)
      VALUE(I,53) = SUF(15)
      VALUE(I,75) = SUF(12)
      VALUE(I,77) = UCCF(12)
    2 CONTINUE
      DO 3 I = 1,5
      VALUE(I,79) = OUUCF
      VALUE(I,82) = SICUCF
      VALUE(I,86) = GAUCF
      VALUE(I,88) = ENGUCF
      VALUE(I,90) = PSCUCF
```

```
      VALUE(I,92) = CNUCF
      VALUE(I,94) = SPUCF
      VALUE(I,96) = SEQUCF
      VALUE(I,98) = OLAUCF
      VALUE(I,101) = OLNUCF
      VALUE(I,103) = PJMUCF
      VALUE(I,105) = OLCUCF
      VALUE(I,107) = TIIUCF
      VALUE(I,109) = POTUCF
      VALUE(I,27) = 0.0
      VALUE(I,67) = 0.0
      VALUE(I,71) = 0.0
      VALUE(I,100) = 0.0
      VALUE(I,111) = 0.0
3     CONTINUE
      IV = 1
      DO 4 K = 1,NTYP
      IV = IV + 5
      IVP1 = IV + 1
      DO 4 I = 1,NIT
      IF(VALUE(I,IV).EQ.0.0.OR.VALUE(I,IVP1).EQ.0.0) GO TO 19
4     CONTINUE
      DO 8 I = 1,NIT
      GO TO (7,6,5),NTYP
5     VALUE(I,19) = VALUE(I,4) * VALUE(I,18)
      VALUE(I,20) = VALUE(I,19) / (VALUE(I,16) * VALUE(I,17))
      VALUE(I,26) = VALUE(I,19) * VALUE(I,23)
      VALUE(I,43) = VALUE(I,20) * VALUE(I,40) * VALUE(I,41) *VALUE(I,42)
      VALUE(I,52) = VALUE(I,16) * VALUE(I,20)
      VALUE(I,55) = VALUE(I,52) * VALUE(I,53) * VALUE(I,54)
6     VALUE(I,14) = VALUE(I,3) * VALUE(I,13)
      VALUE(I,15) = VALUE(I,14) / (VALUE(I,11) * VALUE(I,12))
      VALUE(I,25) = VALUE(I,14) * VALUE(I,22)
      VALUE(I,39) = VALUE(I,15) * VALUE(I,36) * VALUE(I,37) *VALUE(I,38)
      VALUE(I,48) = VALUE(I,11) * VALUE(I,15)
      VALUE(I,51) = VALUE(I,48) * VALUE(I,49) * VALUE(I,50)
7     VALUE(I,9) = VALUE(I,2) * VALUE(I,8)
      VALUE(I,10) = VALUE(I,9)/(VALUE(I,7)*VALUE(I,6))
      VALUE(I,24) = VALUE(I,9) * VALUE(I,21)
      VALUE(I,35) = VALUE(I,10) * VALUE(I,32) * VALUE(I,33) *VALUE(I,34)
      VALUE(I,44) = VALUE(I,6) * VALUE(I,10)
      VALUE(I,47) = VALUE(I,44) * VALUE(I,45) * VALUE(I,46)
      VALUE(I,27) = VALUE(I,24) + VALUE(I,25) + VALUE(I,26)
8     CONTINUE
      DO 9 I = 1,NIT
      VALUE(I,31) = VALUE(I,5) * VALUE(I,30)
9     VALUE(I,63) = VALUE(I,31) * VALUE(I,56)
      DO 16 I = 1,NIT
      VALUE(I,64) = VALUE(I,35) * VALUE(I,57)
      VALUE(I,67) = VALUE(I,64)
      GO TO (12,10,10),NTYP
10    VALUE(I,65) = VALUE(I,39) * VALUE(I,58)
      VALUE(I,67) = VALUE(I,67) + VALUE(I,65)
      GO TO (12,12,11),NTYP
11    VALUE(I,66) = VALUE(I,43) * VALUE(I,59)
      VALUE(I,67) = VALUE(I,67) + VALUE(I,66)
12    VALUE(I,68) = VALUE(I,47) * VALUE(I,60)
      VALUE(I,71) = VALUE(I,68)
      GO TO (15,13,13),NTYP
13    VALUE(I,69) = VALUE(I,51) * VALUE(I,61)
      VALUE(I,71) = VALUE(I,71) + VALUE(I,69)
      GO TO (15,15,14),NTYP
14    VALUE(I,70) = VALUE(I,55) * VALUE(I,62)
      VALUE(I,71) = VALUE(I,71) + VALUE(I,70)
15    VALUE(I,72) = VALUE(I,63) + VALUE(I,67) + VALUE(I,71)
      VALUE(I,73) = VALUE(I,27) + VALUE(I,72)
      VALUE(I,76) = VALUE(I,74) * VALUE(I,75) * (VALUE(I,44) + VALUE(I,
     148) + VALUE(I,52))
      VALUE(I,78) = VALUE(I,76) * VALUE(I,77)
      VALUE(I,80) = VALUE(I,1) + VALUE(I,73) + VALUE(I,78)
```

```
      VALUE(I,81) = VALUE(I,79)*VALUE(I,80)
      VALUE(I,83) = VALUE(I,80) + VALUE(I,81)
      VALUE(I,84) = VALUE(I,82) * VALUE(I,83)
      VALUE(I,85) = VALUE(I,83) + VALUE(I,84)
16    CONTINUE
      DO 17  I = 1,NIT
      DO 17  L = 1,7
      K = ICC(L)
      KP1 = K + 1
      VALUE(I,KP1) = VALUE(I,K) * VALUE(I,85)
      VALUE(I,100) = VALUE(I,100)+VALUE(I,KP1)
17    CONTINUE
      DO 18  I = 1,NIT
      DO 18  L = 8,12
      K = ICC(L)
      KP1 = K + 1
      VALUE(I,KP1) = VALUE(I,K) * VALUE(I,85)
      VALUE(I,111) = VALUE(I,111) + VALUE(I,KP1)
18    CONTINUE
      DO 21 I = 1,NIT
      VALUE(I,112) = VALUE(I,85) + VALUE(I,100) + VALUE(I,111)
      VALST(ICN,I,1) = VALUE(I,113)
      VALUE(I,114) = VALUE(I,113) * 292
      VALUE(I,116) = VALUE(I,112) * VALUE(I,115)
      VALUE(I,117) = VALUE(I,116) / VALUE(I,114)
      VALST(ICN,I,2) = VALUE(I,117)
      IF(VALUE(I,113).EQ.0.0) GO TO 20
      SUMVAL(I,1) = VALUE(I,113)
      SUMVAL(I,7) = VALUE(I,117)
      SUMVAL(I,2) = 0.001 * VALUE(I,1)
      SUMVAL(I,3) = 0.001 * VALUE(I,85)
      SUMVAL(I,4) = 0.001 * VALUE(I,100)
      SUMVAL(I,5) = 0.001 * VALUE(I,111)
      SUMVAL(I,6) = 0.001 * VALUE(I,112)
      GO TO 21
19    WRITE(51,1001) K
      GO TO 21
20    WRITE(51,1002)
21    CONTINUE
      RETURN
      END
```

OUTPUT Subroutine

```
      SUBROUTINE OUTPUT
C * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
C   THIS SUBROUTINE SPECIFIES HOW THE INFORMATION (BOTH THE INPUT DATA
C   AND THE CALCULATED RESULTS) IS TO APPEAR ON THE OUTPUT SHEETS.
C * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
      REAL *8 WGT, PERTM
      COMMON/XMAIN/ BLANK1,        BLANK2(3),      CASENM(10),
     1              STROUT(16),    PLTCAP(5)
      COMMON/YMAIN/NX,NC,ICN,NPT,JG(30),JP(30)
      COMMON/TITLAB/TITLE(15,38),SUMTTL(15,7),LTTL(15,117),TYPTL(19,15)
      COMMON/FDAT/  ESF(15),      SUF(15),     UCCF(15),
     1              UCSF(15),     KTYP(15)
      COMMON/TABDAT/PRCTTL(20),   VALUE(5,124), VALST(30,5,2),
     1              IAR1(7),      IAR2(9,3)    , VALFX(30,4,2)
      COMMON/INDX/  NIT,          NAR(5),        NTYP
      COMMON/DATAB/ IFT(117),     NLI(31),       NLD(31),
     1              NLS(155)
      COMMON/FMTDAT/F0(3),        F1(3),         F2(3),
     1              F3(3),        FST(15)
      COMMON/FMTCM/ FRT1(15),FRT2(15),FRT3(15),FRT4(15)
      EQUIVALENCE (VALUE(1,118),SUMVAL(1,1))
      DIMENSION     TODAY(2),     JTYP(117)
      DIMENSION     WGT(5) ,      PERTM(5)
```

```
      DIMENSION     SUMVAL(5,7)
      DATA WGT/5*8H TONNE  /,PERTM/5*8HPER DAY /
      DATA JTYP/0,1,2,3,0,1,1,1,1,1,2,2,2,2,2,3,3,3,3,3,1,2,3,1,2,3,0,0,
     10,0,0,1,1,1,1,2,2,2,2,3,3,3,3,1,1,1,1,2,2,2,2,3,3,3,3,0,1,2,3,1,2,
     23,0,1,2,3,0,1,2,3,0,0,C,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
     30,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0/
 1001 FORMAT(1H ,4X,'* * * ',20A4,'* * *',3X,'DATE IS ',2X,2A4,4X,'PAGE
     1 ',I2//)
 1002 FORMAT(1H ,15A4)
 1003 FORMAT(1H )
 1004 FORMAT(1H0)
 1005 FORMAT(1H1)
 1006 FORMAT('CASE NUMBER = ',I3)
 1007 FORMAT(1H ,15A4)
 1008 FORMAT(1H1,120X,'PAGE  ',I2)
 1009 FORMAT(1H0'FUNCTION COEFFICIENTS ARE AS FOLLOWS =')
 1010 FORMAT(1H0'A1 = ',1PE12.5,5X,'A2 = ',1PE12.5,5X,'A3 = ',1PE12.5,5X
     1,'A4 = ',1PE12.5)
 1011 FORMAT(1H0'FUNCTION EXPONENTS ARE AS FOLLOWS =')
 1012 FORMAT(1H0'B1 = ',1PE12.5,5X,'B2 = ',1PE12.5,5X,'B3 = ',1PE12.5,5X
     1,'B4 = ',1PE12.5)
C     INITIALIZE FORMAT IN ARRAYS
      DO 1 I = 1,15
      TEMP = FST(I)
      FRT1(I) = TEMP
      FRT2(I) = TEMP
      FRT3(I) = TEMP
      FRT4(I) = TEMP
    1 CONTINUE
C     PRODUCE THE FORMATS IN THE ARRAYS
      DO 2 I = 1,NIT
      JS = NAR(I)
      IBT = (JS-1) * 9 + 15
      CALL REPLAC(FRT1,IBT,5,F0)
      CALL REPLAC(FRT2,IBT,5,F1)
      CALL REPLAC(FRT3,IBT,5,F2)
      CALL REPLAC(FRT4,IBT,5,F3)
    2 CONTINUE
      L1 = 0
      LND = 0
      NLP = 0
      NPG = 1
      CALL IDAY(TODAY)
      WRITE(51,1005)
      WRITE(51,1001)  (PRCTTL(I),I=1,20), TODAY, NPG
      WRITE(51,1013) (STROUT(I),I=1,15)
 1013 FORMAT(1H ,87X,'CASE ESTIMATES'/1H ,65X,15A4)
      DO 18 I = 1,31
      N = NLT(I)
      DO 7 J =1,N
      L1 = L1 + 1
      WRITE (51,1002) (TITLE(L,L1),L=1,15)
      IF(L1.NE.4) GO TO 5
      WRITE(51,1003)
      IF(NTYP.NE.1) GO TO 3
      KTYP1 = KTYP(1)
      WRITE(51,1014) (TYPTL(KN,KTYP1),KN=1,19)
 1014 FORMAT(1H ,8X,'TYPE (1) = ',19A4)
      GO TO 5
    3 IF(NTYP.NE.2) GO TO 4
      KTYP1 = KTYP(1)
      KTYP2 = KTYP(2)
      WRITE(51,1015) (TYPTL(KN,KTYP1),KN=1,19),(TYPTL(KN,KTYP2),KN=1,19)
 1015 FORMAT(1H ,8X,'TYPE (1) = ',19A4/1H ,8X,'TYPE (2) = ',19A4)
      GO TO 5
    4 KTYP1 = KTYP(1)
      KTYP2 = KTYP(2)
      KTYP3 = KTYP(3)
      WRITE(51,1016) (TYPTL(KN,KTYP1),KN=1,19),(TYPTL(KN,KTYP2),KN=1,19)
     1,(TYPTL(KN,KTYP3),KN=1,19)
 1016 FORMAT(1H ,8X,'TYPE (1) = ',19A4/1H ,8X,'TYPE (2) = ',19A4/1H ,8X
     1 ,'TYPE (3) = ',19A4)
    5 CONTINUE
```

```
      NLP = NLP + 1
      IF(NLS(NLP).” .2)GO TO 6
      WRITE(51,1003.
      GO TO 7
6     WRITE(51,1004)
7     CONTINUE
      N = NLD(I)
      DO 17 J = 1,N
      LND = LND + 1
      IF(JTYP(LND).LE.NTYP) GO TO 8
      WRITE(51,1007)(LTTL(L3,LND),L3=1,15)
      GO TO 13
8     ISW = IFT(LND)
      GO TO (9,10,11,12),ISW
9     WRITE(51,FRT1) (LTTL(L3,LND),L3=1,15),(VALUE(M2,LND),M2=1,NIT)
      GO TO 13
10    WRITE(51,FRT2) (LTTL(L3,LND),L3=1,15),(VALUE(M2,LND),M2=1,NIT)
      GO TO 13
11    WRITE(51,FRT3) (LTTL(L3,LND),L3=1,15),(VALUE(M2,LND),M2=1,NIT)
      GO TO 13
12    WRITE(51,FRT4) (LTTL(L3,LND),L3=1,15),(VALUE(M2,LND),M2=1,NIT)
13    NLP = NLP + 1
      IF(NLS(NLP).EQ.0)GO TO 17
      LSSW = NLS(NLP)
      GO TO ( 14,15,16) ,LSSW
14    WRITE(51,1003)
      GO TO 17
15    WRITE(51,1004)
      GO TO 17
16    NPG = NPG + 1
      WRITE(51,1008) NPG
17    CONTINUE
18    CONTINUE
      WRITE(51,1017) (PRCTTL(I),I=1,20)
1017 FORMAT(1H1,14X,'* * * ',20A4,'* * *',3X//)
      WRITE(51,1018) ((PLTCAP(I),WGT(I)),I=1,NIT)
1018 FORMAT(1H ,50X,'SUMMARY OF RESULTS'///1H ,73X,'PLANT CAPACITY'/
     11H ,15X,'DESCRIPTION ',37X,5(A4,A8))
      WRITE(51,1019) (PERTM(I),I=1,NIT)
1019 FORMAT(1H ,66X,5(A8,4X)/)
      DO 19 NUM = 1,6
      WRITE(51,1020) (SUMTTL(I,NUM),I=1,15),(SUMVAL(M1,NUM),   M1=1,NIT)
1020 FORMAT( 1H0,15A4,2X,5(F10.1,2X) )
19    CONTINUE
      WRITE(51,1003)
      WRITE(51,1021) (SUMTTL(I,7),I=1,15),(SUMVAL(M1,7), M1=1,NIT)
1021 FORMAT(1H ,15A4,3X,5(F10.2,2X))
      WRITE(51,1009)
      WRITE(51,1010)VALFX(ICN,1,1),VALFX(ICN,2,1),VALFX(ICN,3,1),VALFX(I
     1CN,4,1)
      WRITE(51,1011)
      WRITE(51,1012)VALFX(ICN,1,2),VALFX(ICN,2,2),VALFX(ICN,3,2),VALFX(I
     1CN,4,2)
      WRITE(51,1005)
      RETURN
      END
```

FUNX Subroutine

```
      SUBROUTINE FUNX
      COMMON/INDX/  NIT,          NAR(5),        NTYP
      COMMON/TABDAT/PRCTTL(20),   VALUE(5,124), VALST(30,5,2),
     1              IAR1(7),      IAR2(9,3)    , VALFX(30,4,2)
      COMMON/YMAIN/NX,NC,ICN,NPT,JG(30),JP(30)
      DO 1 I=1,4
      VALFX(ICN,I,1) = 0.0
      VALFX(ICN,I,2) = 0.0
    1 CONTINUE
      JE=NPT-1
      DO 2 I=1,JE
      C1 = VALUE(I,117)
      C2 = VALUE(I+1,117)
      W1 = VALUE(I,113)
      W2 = VALUE(I+1,113)
      RAT = ALOG(C1/C2)
      B = RAT/(W1-W2)
      A1 = C1/EXP(B*W1)
      A2 = C2/EXP(B*W2)
      A = 0.5*(A1+A2)
      VALFX(ICN,I,1) = A
      VALFX(ICN,I,2) = B
    2 CONTINUE
      RETURN
      END
```

GRAPH Subroutine

```
      SUBROUTINE GRAPH
      COMMON/YMAIN/NX,NC,ICN,NPT,JG(30),JP(30)
      COMMON/TABDAT/PRCTTL(20),   VALUE(5,124), VALST(30,5,2),
     1              IAR1(7),      IAR2(9,3)    , VALFX(30,4,2)
      COMMON/INDX/  NIT,          NAR(5),        NTYP
      DIMENSION IPX(2), XA(2), LA(2), ISA(3)
      DATA IPX/-2,-1/, ISA/-2,-2,-1/, LA/2,2/
      CALL QQSIZE(14.,9.6)
      CALL QQQCPA(25,0.55)
      CALL QQQCPA(7,0.70)
      CALL QQQCPA(28,0.1)
      XMIN = VALUE(1,113)
      XMAX = VALUE(NPT,113)
      YMIN = VALUE(NPT,117)
      YMAX = VALUE(1,117)
      CALL RNDPLT(XMIN,XMAX,YMIN,YMAX,'YLOG','MECH',-1.,-1.,8,4000,'LLEW
     1ELLYNS')
      CALL GRID(-.5,0.,0.)
      CALL GRID(1.,0.,0.)
      CALL LINPLT(VALUE(1,113),VALUE(1,117),NPT,1,0)
      CALL LABEL(2.,20,PRCTTL,-1)
      CALL LABEL(1.,20,'HEAVY METAL PRODUCT THROUGHPUT  (KILOGRAMS/DAY)
     1$',-1)
      CALL LABEL(-1.,20,'UNIT CAPITAL COST  (DOLLARS/KILOGRAM)$',-1)
      CALL LABEL(-2.,2,'PROCESS BLOCK NUMBER = $$ ',IPX,ICN,0)
      DO 2 I=1,NPT
      CALL QQQCPA(-15,YT)
      CALL QQINCH(VALUE(1,113),VALUE(1,117),XP,YP)
      DX = YT - YP
      XA(1)=VALUE(I,113)
      XA(2)=VALUE(I,117)
      IF((DX.LT.1.25).AND.(I.EQ.1)) GO TO 1
      IF(I.LT.NPT) CALL ARROW(VALUE(I,113),VALUE(I,117),-6, 1.,1.,1,'($
     1,$)$',ISA,XA,LA)
      IF(I.EQ.NPT) CALL ARROW(VALUE(I,113),VALUE(I,117),-6,-1.,1.,1,'($
```

```
     1,$)$',ISA,XA,LA)
      GO TO 2
 1    CALL ARROW(VALUE(I,113),VALUE(I,117),-6,1.,-2.,.1,'($,$)$',ISA,XA,
     1LA)
 2    CONTINUE
      RETURN
      END
```

SHIFT Subroutine

```
      SUBROUTINE SHIFT(K)
      COMMON/TABDAT/PRCTTL(20),    VALUE(5,124),  VALST(30,5,2),
     1              IAR1(7),       IAR2(9,3)
      COMMON/INDX/  NIT,            NAR(5),        NTYP
      DO 1 I = 1,NIT
      NT = NAR(I)
      VALUE(I,K) = VALUE(NT,K)
 1    CONTINUE
      RETURN
      END
```

FDBK Subroutine

```
      SUBROUTINE FDBK(STR,IFST,IW,ILT,IRT,IWS)
C GIVEN A SUBSTRING, THIS SUBROUTINE FINDS THE POSITIONS IN THE STRING
C  OF THE FIRST AND LAST NONBLANK CHARACTERS OF THE SUBSTRING AND
C  REPORTS THE NUMBER OF CHARACTERS IN THE SUBSTRING FROM THE FIRST
C  TO THE LAST NONBLANK CHARACTERS
C
CI        INPUT PARAMETERS
CI          STR     CONTAINS THE STRING
CI          IFST    THE CHARACTER OF THE STRING WHICH IS THE FIRST
CI                    CHARACTER OF THE SUBSTRING TO BE SCANNED
CI          IW      THE NUMBER OF CHARACTERS OF THE SUBSTRING TO BE SCANNED
C
CO        OUTPUT PARAMETERS
CO          ILT     THE POSITION OF THE FIRST NONBLANK CHARACTER IN THE
CO                    SUBSTRING. IT IS THE POSITION OF THE LAST CHARACTER
CO                    IF ALL CHARACTERS ARE BLANK.
CO          IRT     THE POSITION OF THE LAST NONBLANK CHARACTER IN THE
CO                    SUBSTRING. IT IS THE POSITION OF THE LAST CHARACTER
CO                    IF ALL CHARACTERS ARE BLANK.
CO                  AN IMPROPER CALL TO THE SUBROUTINE MAY LEAD TO THE
CO                    VALUE OF IRT BEING LESS THAN THAT OF ILT.
CO          IWS     THE NUMBER OF CHARACTERS FROM THE FIRST TO THE LAST
CO                    NONBLANK CHARACTERS IN THE SUBSTRING. IT IS ZERO IF
CO                    ALL CHARACTERS ARE BLANK AND NEGATIVE IF THE
CO                    SUBROUTINE IS IMPROPERLY CALLED
C
C THE FOLLOWING LOOP FINDS THE FIRST NONBLANK ON LEFT
C
      DIMENSION STR(1)
      I=IFST
      I2=IFST+IW-1
 1    CALL FETYPE(STR,I,I1,ITYP)
      IF(ITYP.NE.3) GO TO 2
      I=I+1
      IF(I.LE.I2) GO TO 1
C AT THIS POINT HAVE ENDED LOOP TO FIND FIRST NONBLANK ON LEFT AND
C  HAVE FOUND ALL BLANKS
      ILT=IFST+IW-1
      IRT=ILT
      IWS=0
C ANY TRANSFER TO 1J4 ON THE FLOWCHART IS CODED AS A RETURN TO THE
```

```
C  CALLING PROGRAM
      RETURN
C A TRANSFER TO STATEMENT 20(1A4) BEGINS A BACKWARD LOOP TO FIND THE
C  FIRST NONBLANK ON THE RIGHT
 2    ILT=I
      I=IFST+IW-1
 3    CALL FETYPE(STR,I,I1,ITYP)
      IF(ITYP.EQ.3) GO TO 4
      IRT=I
      IWS=IRT-ILT+1
      RETURN
 4    I=I-1
      IF(I.GE.ILT)GO TO 3
      IRT=ILT-1
      IWS=-1
      RETURN
      END
```

INITS Subroutine

```
      SUBROUTINE INITS(S,N)
C
C GIVEN A ONE-DIMENSIONAL REAL ARRAY S OF DIMENSION N, THIS SUBROUTINE
C  ASSIGNS A BLANK TO THE FIRST N-1 WORDS AND 0.0 TO THE LAST WORD
C
      DIMENSION S(1)
      DATA BLANK/4H    /
      M=N-1
      IF(M.EQ.0) GO TO 2
      DO 1 I=1,M
 1    S(I)=BLANK
 2    S(N)=0.0
      RETURN
      END
```

Appendix B-3

HEADINGS FOR CEP (BLOCK DATA)
(Submitted with Data)

```
   * * C O S T   E S T I M A T E   P R E P A R A T I O N * *                    T  1
DIRECT CONSTRUCTION COST                                                        T  2
PROCESSING EQUIPMENT COST                                                       T  3
     ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED     (CU FT)                        T  4
PROCESSING SPACE COST (HOT CELLS)                      ($)                      T  5
     GROSS IN-CELL SPACE REQUIRED                                               T  6
     IN-CELL SPACE UNIT COST                   ($/CU FT)                        T  7
     IN-CELL SPACE TOTAL COST                          ($)                      T  8
     GROSS OUT-OF-CELL SPACE REQUIRED            (CU FT)                        T  9
          MAKE UP AND PROCESS SERVICE SPACE                                     T 10
          CELL OPERATING SPACE                   (CU FT)                        T 11
          CRANE BAY SPACE                                                       T 12
     OUT-OF-CELL SPACE UNIT COST               ($/CU FT)                        T 13
          CELL OPERATING SPACE  UCCF (FROM TM-4613, TABLE 6)                    T 14
          CRANE BAY SPACE       UCCF (FROM TM=4613, TABLE 6)                    T 15
     OUT-OF-CELL SPACE TOTAL COST                      ($)                      T 16
          CELL OPERATING SPACE                                                  T 17
          CRANE BAY SPACE                                                       T 18
PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)                       T 19
     INDIRECT PROCESS SUPPORT SPACE                                             T 20
     INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)                         T 21
OUTSIDE UTILITIES COST                                 ($)                      T 22
SITE IMPROVEMENT COST                                  ($)                      T 23
INDIRECT CONSTRUCTION COST                                                      T 24
GENERAL AND ADMINISTRATIVE COST                                                 T 25
ENGINEERING COST                                                                T 26
MISC. CONSTRUCTION COST                                                         T 27
CONTINGENCY ALLOWANCE                                                           T 28
SPARE PARTS COST                                                                T 29
NONINSTALLED SPARE EQUIPMENT COST                                               T 30
QUALITY ASSURANCE COST                                                          T 31
OWNER'S COST                                                                    T 32
LAND COST                                                                       T 33
PROJECT MANAGEMENT COST                                                         T 34
LICENSING COST                                                                  T 35
TAXES, INSURANCE AND INTEREST                                                   T 36
PREOPERATIONAL TESTING AND STARTUP                                              T 37
TOTAL CAPITAL CONSTRUCTION COST                                                 T 38
  1  ESTIMATED EQUIPMENT COST                                ($)                D  1
  2     TYPE (1)                                                                D  2
  3     TYPE (2)                                                                D  3
  4     TYPE (3)                                                                D  4
  5  ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED         (CU FT)                D  5
  6     TYPE (1) STD. CELL WIDTH                            (FT)                D  6
  7              STD. CELL HEIGHT                           (FT)                D  7
  8              SUF  (FROM ORNL TM-4613, TABLE 5)                              D  8
  9              GROSS CELL VOLUME                       (CU FT)                D  9
 10              LINEAR FT. OF CELL                         (FT)                D 10
 11     TYPE (2) STD. CELL WIDTH                            (FT)                D 11
 12              STD. CELL HEIGHT                           (FT)                D 12
 13              SUF  (FROM ORNL TM-4613, TABLE 5)                              D 13
 14              GROSS CELL VOLUME                       (CU FT)                D 14
 15              LINEAR FT. OF CELL                         (FT)                D 15
 16     TYPE (3) STD. CELL WIDTH                            (FT)                D 16
 17              STD. CELL HEIGHT                           (FT)                D 17
 18              SUF  (FROM ORNL TM-4613, TABLE 5)                              D 18
 19              GROSS CELL VOLUME                       (CU FT)                D 19
 20              LINEAR FT. OF CELL                         (FT)                D 20
 21     TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)                              D 21
 22     TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)                              D 22
 23     TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)                              D 23
 24     TYPE (1)                                                                D 24
 25     TYPE (2)                                                                D 25
 26     TYPE (3)                                                                D 26
 27       TOTAL                                                                 D 27
 28              STD. AREA WIDTH                            (FT)                D 28
 29              STD. AREA HEIGHT                           (FT)                D 29
 30              SUF  (FROM ORNL TM-4613, TABLE 5)                              D 30
 31              GROSS VOLUME                            (CU FT)                D 31
 32     TYPE (1) STD. AREA WIDTH                            (FT)                D 32
 33              STD. AREA HEIGHT                           (FT)                D 33
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              NO. OF CELL SIDES WITH OP. AREA                      D  34
              GROSS VOLUME                        (CU FT)          D  35
     TYPE (2) STD. AREA WIDTH                        (FT)          D  36
              STD. AREA HEIGHT                       (FT)          D  37
              NO. OF CELL SIDES WITH OP. AREA                      D  38
              GROSS VOLUME                        (CU FT)          D  39
     TYPE (3) STD. AREA WIDTH                        (FT)          D  40
              STD. AREA HEIGHT                       (FT)          D  41
              NO. OF CELL SIDES WITH OP. AREA                      D  42
              GROSS VOLUME                        (CU FT)          D  43
     TYPE (1) CELL AREA                           (SQ FT)          D  44
              SUF  (FROM ORNL TM-4613, TABLE 5)                    D  45
              STD. BAY HEIGHT                        (FT)          D  46
              GROSS VOLUME                        (CU FT)          D  47
     TYPE (2) CELL AREA                           (SQ FT)          D  48
              SUF  (FROM ORNL TM-4613, TABLE 5)                    D  49
              STD. BAY HEIGHT                        (FT)          D  50
              GROSS VOLUME                        (CU FT)          D  51
     TYPE (3) CELL AREA                           (SQ FT)          D  52
              SUF  (FROM ORNL TM-4613, TABLE 5)                    D  53
              STD. BAY HEIGHT                        (FT)          D  54
              GROSS VOLUME                        (CU FT)          D  55
       MAKE-UP AND PROCESS SERVICE SPACE                           D  56
     TYPE (1)                                                      D  57
     TYPE (2)                                                      D  58
     TYPE (3)                                                      D  59
     TYPE (1)                                                      D  60
     TYPE (2)                                                      D  61
     TYPE (3)                                                      D  62
       MAKE-UP AND PROCESS SERVICE SPACE                           D  63
     TYPE (1)                                                      D  64
     TYPE (2)                                                      D  65
     TYPE (3)                                                      D  66
       TOTAL                                                       D  67
     TYPE (1)                                                      D  68
     TYPE (2)                                                      D  69
     TYPE (3)                                                      D  70
       TOTAL                                                       D  71
       TOTAL OUT-OF-CELL SPACE COST                                D  72
  PROCESSING SPACE TOTAL COST                         ($)          D  73
              STD. AREA HEIGHT                       (FT)          D  74
              SUF  (FROM ORNL TM-4613, TABLE 5)                    D  75
              TOTAL SPACE REQUIRED                (CU FT)          D  76
              UCCF (FROM ORNL TM-4613, TABLE 6) ($/CU FT)          D  77
  PROCESSING SUPPORT SPACE TOTAL COST                 ($)          D  78
              UCF (FROM ORNL TM-4613, TABLE 7)   (FRACT.)          D  79
              EQUIPMENT AND FACILITY COST                          D  80
              OUTSIDE UTILITIES COST                               D  81
              UCF (FROM ORNL TM-4613, TABLE 8)   (FRACT.)          D  82
              SUBTOTAL DIRECT CONSTRUCTION COST       ($)          D  83
              SITE IMPROVEMENT COST                   ($)          D  84
       TOTAL DIRECT CONSTRUCTION COST                 ($)          D  85
              UCF (FROM ORNL TM-4613, TABLE 7)   (FRACT.)          D  86
              SUBTOTAL GEN. + ADM. COST               ($)          D  87
              UCF (FROM ORNL TM-4613, TABLE 7)   (FRACT.)          D  88
              SUBTOTAL ENGR. COST                     ($)          D  89
              UCF (FROM ORNL TM-4613, TABLE 7)   (FRACT.)          D  90
              SUBTOTAL MISC. CONSTRUCTION COST        ($)          D  91
              UCF (FROM ORNL TM-4613, TABLE 7)   (FRACT.)          D  92
              SUBTOTAL CONTINGENCY ALLOWANCE          ($)          D  93
              UCF (FROM ORNL TM-4613, TABLE 7)   (FRACT.)          D  94
              SUBTOTAL SPARE PARTS COST               ($)          D  95
              UCF (FROM ORNL TM-4613, TABLE 7)   (FRACT.)          D  96
              SUBTOTAL NONINSTLED SPARE EQUIPMENT COST($)          D  97
              UCF (FROM ORNL TM-4613, TABLE 7)   (FRACT.)          D  98
              SUBTOTAL QUALITY ASSURANCE COST         ($)          D  99
  TOTAL INDIRECT CONSTRUCTION COST                    ($)          D 100
              UCF (FROM ORNL TM-4613, TABLE 8)   (FRACT.)          D 101
              SUBTOTAL LAND COST                      ($)          D 102
              UCF (FROM ORNL TM-4613, TABLE 8)   (FRACT.)          D 103
              SUBTOTAL PROJ. MANGT. COST              ($)          D 104
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105              UCF (FROM ORNL TM-4613, TABLE 8)   (FRACT.)              D 105
106              SUBTOTAL LICENSING COST                  ($)              D 106
107              UCF (FROM ORNL TM-4613, TABLE 8)   (FRACT.)              D 107
108              SUBTOTAL TAXES, INSURANCE AND INT.       ($)              D 108
109              UCF (FROM ORNL TM-4613, TABLE 8)   (FRACT.)              D 109
110              SUBTOTAL PREOP. TESTING AND STARTUP      ($)              D 110
111   TOTAL OWNER'S COST                                  ($)              D 111
112   INCREMENT OF TOTAL PLANT COST                       ($)              D 112
113    PROCESSING THROUGHPUT OF ACCEPTABLE PROD    (KGHM/DAY)              D 113
114    ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)              D 114
115    CAPITAL CHARGE RATE                             (FRACT.)            D 115
116    ANNUAL CAPITAL CHARGE                       (DOLLARS/YEAR)          D 116
117    PRODUCT UNIT COST    (DOLLARS/KILOGRAM OF HEAVY METAL)              D 117
       PROCESS THROUGHPUT             (KILOGRAMS)                          S   1
       PROCESSING EQUIPMENT COST           ($1000)                         S   2
       PLANT DIRECT CONSTRUCTION COST      ($1000)                         S   3
       PLANT INDIRECT CONSTRUCTION COST ($1000)                            S   4
       PLANT OWNER'S COST                  ($1000)                         S   5
       PLANT TOTAL COST                    ($1000)                         S   6
       UNIT COST               (DOLLARS/KILOGRAM)                          S   7
****
 HEAVILY SHIELDED HOT CELL - REMOTE  MAINTENANCE (ITEM  1, TABLES 5 AND 6)  TY 1
 HEAVILY SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM  2, TABLES 5 AND 6)  TY 2
 MEDIUM  SHIELDED HOT CELL - REMOTE  MAINTENANCE (ITEM  3, TABLES 5 AND 6)  TY 3
 MEDIUM  SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM  4, TABLES 5 AND 6)  TY 4
 LIGHTLY SHIELDED HOT CELL - REMOTE  MAINTENANCE (ITEM  5, TABLES 5 AND 6)  TY 5
 LIGHTLY SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM  6, TABLES 5 AND 6)  TY 6
 UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM  7, TABLES 5 AND 6)  TY 7
 GLOVE BOXES   AND   HOODS - DIRECT  MAINTENANCE (ITEM  8, TABLES 5 AND 6)  TY 8
 SHIELDED  ANALYTICAL CELL - REMOTE  MAINTENANCE (ITEM  9, TABLES 5 AND 6)  TY 9
 SHIELDED LIQUID WASTE STG - CONTACT MAINTENANCE (ITEM 10, TABLES 5 AND 6)  TY10
 SHIELDED SOLID WASTE STG. - CONTACT MAINTENANCE (ITEM 11, TABLES 5 AND 6)  TY11
 DIRECT PROC. SUPPORT AREA - DIRECT  MAINTENANCE (ITEM 12, TABLES 5 AND 6)  TY12
 CHEM. MAKEUP PROCESS AREA - DIRECT  MAINTENANCE (ITEM 13, TABLES 5 AND 6)  TY13
 CELL OPERATING SPACE                            (ITEM 14, TABLES 5 AND 6)  TY14
 CRANE BAY SPACE                                 (ITEM 15, TABLES 5 AND 6)  TY15
****
```

Appendix B-4

LISTING OF LIBRARY SUBROUTINES USED IN CEP

REPLACE Subroutine

```
REPLACE  START 0                                                         REPLA 10
         USING *,15                                                      REPLA 20
         ENTRY REPLAC         THIS IS A TRUNCATED 6-LETTER FTN-IV ENTRY. REPLA 30
REPLAC   EQU   *              THIS IS A TRUNCATED 6-LETTER FTN-IV ENTRY. REPLA 40
         STM   2,3,SAVERE        REPLACE ( STRING , J , N , C )          REPLA 50
         LM    0,3,0(1)                   X0    X1 X2  X3                REPLA 60
         L     1,0(0,1)          X1=J                                    REPLA 70
         L     2,0(0,2)          X2=N                                    REPLA 80
         ALR   1,0               X1=A(STRING)+J  X0 NOW AVAILABL'        REPLA 90
         LA    0,1               X0=1                                    REPL 100
         SR    2,0               X2=N-1                                  REPL 110
         BM    END               NO ACTION TAKEN FOR N.LE.0              REPL 120
         SR    1,0               X1=A(STRING)+J-1 = ADD. START REPLACE   REPL 130
         STC   2,M+1             STORE N-1 IN MVC INSTRUCTION M          REPL 140
         AR    2,0               RESTORE X2 TO N                         REPL 150
         LA    0,256             SET X0 TO 256                           REPL 160
TEST     SR    2,0               SUBTRACT 256 FROM N                     REPL 170
         BC    12,M              BRANCH TO M TO MOVE REMAIN.OR .LE.256   REPL 180
         MVC   0(256,1),0(3)     MOVE 256 BYTES                          REPL 190
         AR    1,0               INCREASE X1 BY 256                      REPL 200
         AR    3,0               INCREASE X3 BY 256                      REPL 210
         B     TEST              BRANCH TO TEST                          REPL 220
M        MVC   0(0,1),0(3)       MOVE N CHAR. FROM CHAR TO J IN STRING   REPL 230
END      LM    2,3,SAVERE        RESTORE X2 AND X3                       REPL 240
         BR    14                                                        REPL 250
SAVERE   DS    2F                                                        REPL 260
         END                                                             REPL 270
```

SQUEEZ Subroutine

```
SQUEEZE  START 0                 SQUEEZE(STRING , CHAR)                  SQUEE 10
         USING *,15                                                      SQUEE 20
         ENTRY SQUEEZ     THIS IS A TRUNCATED 6-LETTER FTN-IV ENTRY.     SQUEE 30
SQUEEZ   EQU   *          THIS IS A TRUNCATED 6-LETTER FTN-IV ENTRY.     SQUEE 40
*                         'SQUEEZE' ALL CHAR'S OUT OF STRING             SQUEE 50
         SPACE                                                           SQUEE 60
*  THE 'ORIGINAL' VERSION OF SQUEEZE WAS WRITTEN BY R. P. RANNIE         SQUEE 70
*  AND THE DATE OF THE VERSION USED AT ORNL WAS NOV. 2, 1966.            SQUEE 80
*  THAT VERSION HAD THE PROBLEM OF CALLING ERROR IF SOMEONE TRIED TO     SQUEE 90
*  SQUEEZE OUT THE CHARACTER '00'.                                       SQUE 100
*  THIS NEW VERSION SIMPLY RETURNS WITH NO ACTION TAKEN IF ONE TRIES     SQUE 110
*  TO DO THIS.  RPR  OCT. 8, 1968.                                       SQUE 120
         SPACE                                                           SQUE 130
*              X0 = 1                                                    SQUE 140
*              X1 = RETURN FROM TRT, ADDRESS OF NON-ZERO IN TRT TABLE    SQUE 150
*              X2 = RETURN FROM TRT, NON-ZERO CHARACTER FOUND            SQUE 160
*              X3 = ADDRESS OF POSITION TO MOVE ELEMENTS OF STRING TO    SQUE 170
*              X4 = ADDRESS OF START OF SCAN FOR CHAR TO BE SQUEEZED     SQUE 180
*              X5 = ADDRESS OF START OF SCAN FOR CHAR NOT TO SQUEEZE     SQUE 190
*              X6 = 256                                                  SQUE 200
*              X7   ADDRESS OF POSITION TO MOVE ELEMENTS OF STRING FROM  SQUE 210
*              X8 = ADDRESS OF LOCATION IN TRT TABLES TO SET/RESTORE     SQUE 220
         SPACE                                                           SQUE 230
         STM   14,8,12(13)                                               SQUE 240
         LM    4,5,0(1)          X4=A(STRING)  X5=A(CHAR)                SQUE 250
         SR    8,8               ZERO X8                                 SQUE 260
         IC    8,0(0,5)          X8 = RIGHT ADJUSTED CHARACTER           SQUE 270
         LTR   8,8               TEST X8 FOR X'00'                       SQUE 280
         BZ    ERR               BRANCH TO ERROR IF X8 = 0               SQUE 290
         LA    0,1               X0 = 1     FOR ALL OF SQUEEZE           SQUE 300
         LA    6,256             X6 = 256   FOR ALL OF SQUEEZE           SQUE 310
         LA    8,TRTX(8)         X8=ADDRESS IN TRTX TO SET X'01'         SQUE 320
         MVI   0(8),X'01'        SET X'01' IN TRTX AT LOCATION OF CHAR   SQUE 330
         AR    8,6               X8=ADDRESS IN TRTA TO SET X'00'         SQUE 340
         MVI   0(8),X'00'        SET X'00' IN TRTA AT LOCATION OF CHAR   SQUE 350
         SR    2,2               ZERO X2                                 SQUE 360
```

```
         SR    1,1                  ZERO X1
         SPACE 3
TRT0     TRT   0(256,4),TRTX        SCAN FOR CHAR TO BE SQUEEZED
         BC    6,END0
         AR    4,6                  X4 = X4 + 256
         B     TRT0
END0     SR    2,0                  TEST FOR '00' FOUND.  X0 = 1
         BP    DONE                 IF VALUE IS 1, END HAS BEEN FOUND
         LR    3,1                  X3 = ADDRESS OF FIRST CHAR TO SQUEEZE
         LA    5,1(0,1)             X5 = X1+1=ADD TO START SCAN FOR OTHER
         B     TRT2                 GO TO SCAN FOR OTHER
         EJECT
* SCAN FOR CHAR
         SPACE
SCAN1    LA    4,1(0,1)             X4 = X1+1=ADD TO START SCAN FOR OTHER
TRT1     TRT   0(256,4),TRTX        SCAN FOR CHAR TO BE SQUEEZED
         BC    6,END1
         MVC   0(256,3),0(7)        MOVE 256 FROM ADD(X7) TO ADD(X3)
         AR    3,6                  X3 = X3 + 256
         AR    7,6                  X7 = X7 + 256
         AR    4,6                  X4 = X4 + 256
         B     TRT1
END1     SR    2,0                  TEST FOR '00' FOUND.  X0 = 1
         BP    ENDFOUN1             IF VALUE IS 1, END HAS BEEN FOUND
         LA    5,1(0,1)             X5 = X1+1=ADD TO START SCAN FOR OTHER
         SR    1,7                  X1 = NUMBER OF OTHER TO MOVE
         SR    1,0                  X1 = NUMBER OF OTHER TO MOVE - 1
         STC   1,M1+1               STORE NUMBER OF OTHER TO MOVE - 1, M1
M1       MVC   0(0,3),0(7)          MOVE OTHER FROM ADD(X7) TO ADD(X3)
         AR    3,1                  X3=NEW ADD TO MOVE OTHER TO - 1
         AR    3,0                  X3=NEW ADD TO MOVE OTHER TO
         SPACE 3
* SCAN FOR OTHER (NOT CHAR)
         SPACE
TRT2     TRT   0(256,5),TRTA        SCAN FOR NONCHAR
         BC    6,END2
         AR    5,6                  X5 = X5 + 256
         B     TRT2
END2     SR    2,0                  TEST FOR '00' FOUND.  X0 = 1
         BP    ENDFOUN2             IF VALUE IS 1, END HAS BEEN FOUND
         LR    7,1                  X7=X1=ADDRESS OF NONCHAR, START MOVE
         B     SCAN1                NONCHAR FOUND, SCAN FOR CHAR
         SPACE
*  THIS IS THE CHANGED CODE OF OCT., '68.
         SPACE
*  ERR     L      15,=V(ERROR)
*        BALR  14,15                CALL ERROR
         SPACE
ENDFOUN1 SR    1,7                  X1 = NUMBER TO MOVE - 1
         SR    1,0
         STC   1,M3+1               STORE NUMBER TO MOVE - 1 IN M3
M3       MVC   0(0,3),0(7)          MOVE X1+1 TO CORRECT LOCATION
         LA    3,1(3,1)
ENDFOUN2 MVI   0(3),X'00'           PUT TERMINATOR(X'00') AT NEW END
DONE     MVI   0(8),X'01'           RESTORE X'01' IN TRTA
         SR    8,6                  X8=X8-256=ADD(TRTX)
         MVI   0(8),X'00'           RESTORE X'00' IN TRTX
         SPACE
*  THIS IS THE CHANGED CODE OF OCT., '68.
         SPACE
ERR      LM    2,8,28(13)           RESTORE X2 THROUGH X8
         SPACE
         MVI   12(13),X'FF'
         BR    14
TRTX     DC    X'02',255X'00'
TRTA     DC    X'02',255X'01'
         END
```

BCDTOINT Subroutine

```
BCDTOINT START 0
         USING *,15
         ENTRY BCDTOI   THIS IS A TRUNCATED 6-LETTER FTN-IV ENTRY.
         ENTRY BCDTINT
         ENTRY BCDTIN   THIS IS A TRUNCATED 6-LETTER FTN-IV ENTRY.
BCDTOI   EQU   *        THIS IS A TRUNCATED 6-LETTER FTN-IV ENTRY.
BCDTINT  EQU   *
BCDTIN   EQU   *        THIS IS A TRUNCATED 6-LETTER FTN-IV ENTRY.
         STM   2,4,28(13)
         LM    3,4,0(1)              X3# ADD%STR< X4#ACD%INT<
         SR    1,1
         SR    2,2                   CLEAR REGISTER TO RECEIVE CHARACTER
         IC    2,0(3)
         C     2,=F'96'       CHECK FOR MINUS
         BNE   NOTMI                 BRANCH IF NOT MINUS
         MVI   OPER,X'1B'   SR ORDER
         B     BUMP
NOTMI    MVI   OPER,X'1A'
         C     2,=F'78'       CHECK FOR PLUS
         BNE   CONVA
BUMP     LA    3,1(0,3)              INCREASE STRING
         IC    2,0(3)
CONVA    S     2,=F'240'
         BM    ENDINT                NUMERIC IS NOT MINUS
         C     2,=F'10'              CHECK FOR UPPER BOUND
         BNL   ENDINT                BR ANCH IF NOT LESS THAN 10
         LR    0,1                   INTEGER*10 # INTEGER
         SLA   0,3                   I*8
         AR    0,1                   I*8&I
         AR    1,0                   I*8&I&I
OPER     AR    1,2           I+CHAR
         B     BUMP
ENDINT   ST    1,0(0,4)
         LM    2,4,28(13)
         BR    14
         END
```

INSERT Subroutine

```
INSERT   START 0
L        THIS IS  A VERSION OF INSERT ET AL WHICH USES THE NEW
L        FAST VERSION OF SEARCH.
         USING *,15
         ENTRY LENGTH
         ENTRY DELETE
         ENTRY SEARCH
         ENTRY PUTIN
         ENTRY PUTINAT
         ENTRY PUTINA   THIS IS A TRUNCATED 6-LETTER FTN-IV ENTRY.
         STM   2,7,SAVERE           INSERT ( STRING , J , N , C )
         ST    15,SAVE15
         LM    1,4,0(1)              X1=A(STRING) X2=A(I) X3=A(J) X4=A(O)
L ENTRY AT INSERTB X1=A(STRA) X2=A(I) X3=A(N) X4=A(STRB)+J-1
INSERTB  L     2,0(0,2)              X2=I
L ENTRY AT INSERTA X1=A(STRA) X2=0     X3=A(N) X4=A(STRB)+I-1
INSERTA  LA    0,256
AAI      LTR   6,2                   X6#I
         BC    12,BRANA              BRA  I#0 OR I MINUS
         L     3,0(0,3)              X3#J
         LTR   3,3
         BC    12,EXIT               BRANCH OUT IF J .EQ.0 OR IS MINUS
         LR    5,1                   X5#A%STR<
TRTI     TRT   0(256,1),TRTAB4
         BC    6,ENDI
         LA    1,256(0,1)
         B     TRTI
```

```
ENDI     SR    1.5                  X1#L                                INSE 280
         LR    2.1                  X2#L                                INSE 290
         SR    2.6                  X2#L-I                              INSE 300
         BM    BRANC                BRANCH IF L .LT. I                  INSE 310
         LA    7.2(0.2)             X7#M#L-I&2                          INSE 320
CCI      ALR   5.6                  X5=A(STRING)+I                      INSE 330
         SL    5.=F'1'              X5=A(STRING)+I-1 = PZ               INSE 340
         CR    7.0                  M VS 256                            INSE 350
         BH    BRAND                BRANCH IF M .GT. 256                INSE 360
DDI      S     7.=F'1'              X7=M-1                              INSE 370
         STC   7.INSA+1                                                 INSE 380
         STC   7.INSB+1                                                 INSE 390
INSA     MVC   TEMPST(0).0(5)                                           INSE 400
         LR    7.3                  X7#J                                INSE 410
         ALR   7.5                  X7=J+PZ                             INSE 420
INSB     MVC   0(0.7).TEMPST                                            INSE 430
EE1      CR    3.0                  J VS 256                            INSE 440
         BH    BRANE                BRANCH IF J .GT. 256                INSE 450
         S     3.=F'1'              X3=J-1                              INSE 460
         STC   3.INSC+1                                                 INSE 470
INSC     MVC   0(0.5).0(4)                                              INSE 480
EXIT     LM    2.7.SAVERE                                   2.60        INSE 490
         L     15.SAVE15                                                INSE 500
         BR    14                                                       INSE 510
BRANA    MVI   0(1).X'00'                                               INSE 520
         LA    2.1                  MAKE I#1                            INSE 530
         B     AAI                                                      INSE 540
BRANC    LA    7.1                  X7#M#1                              INSE 550
         LA    6.1(0.1)             MAKE I#L&1                          INSE 560
         B     CCI                                                      INSE 570
BRAND    ALR   1.5                  X1=PZ+L                             INSE 580
         SLR   1.6                                                      INSE 590
         SL    1.=F'254'                                                INSE 600
         LR    2.3                  X2#J                                INSE 610
         ALR   2.1                  X2=A1+J                             INSE 620
BRANDA   MVC   TEMPST(256).0(1)                                         INSE 630
         MVC   0(256.2).TEMPST                                          INSE 640
         SR    7.0                  X7#M-256                            INSE 650
         CR    7.0                  M VS 256                            INSE 660
         BC    12.DDI                                                   INSE 670
         SLR   2.0                  X2=A1-256                           INSE 680
         SLR   1.0                  X1=AJ-256                           INSE 690
         B     BRANDA                                                   INSE 700
BRANE    MVC   0(256.5).0(4)                                            INSE 710
         ALR   5.0                  PZ=PZ+256                           INSE 720
         ALR   4.0                  QQ=QQ+256                           INSE 730
         SR    3.0                  J-256#J                             INSE 740
         B     EE1                                                      INSE 750
         EJECT                                                          INSE 760
         USING *.15                        X2    X3   X4    X5    X6    INSE 770
SEARCH   STM   2.14.SAVERF          SAVE REGISTERS                      INSE 780
L                                   SEARCH(STRING, J, N, CHARS, I)      INSE 790
L         X0   SET TO 2 FOR SOME USES                                   INSE 800
L         X1   USED FOR START AND RETURN IN TRT                         INSE 810
L         X2   AFTER A(STRING) IS SAVED IN X14, X2 RETURNS FROM TRT     INSE 820
L         X3   X3=256 AFTER FREE FROM J                                 INSE 830
L         X4   N                                                        INSE 840
L         X5   A(CHARS)                                                 INSE 850
L         X6   A(I)                                                     INSE 860
L         X7   LOCATION IN TRT TABLE                                    INSE 870
L         X8   USED WITH X1 IN MULT COMPARE                             INSE 880
L         X9   X9 = 4096                                                INSE 890
L         X10  USED WITH X5 IN MULT COMPARE                             INSE 900
L         X11  X11 = 1                                                  INSE 910
L         X12  USED AS DOUBLE REG. WITH X13 FOR SHIFT OF N              INSE 920
L         X13  USED AS DOUBLE REG. WITH X12 IN SHIFT OF N ETC.          INSE 930
L         X14  USED AS SAVE REGISTER FOR A(STRING) - 1 FROM X2          INSE 940
         EJECT                                                          INSE 950
         LM    2.6.0(1)                    X2    X3 X4    X5    X6      INSE 960
         LA    11.1                 X11=1                               INSE 970
         SR    2.11                 X2=A(STRING)-1                      INSE 980
```

```
         LR    14,2               SAVE A(STRING) - 1 FROM X2              INSE 990
         LA    0,2                X0 = 2 FOR USE IN ALL OF SEARCH         INS 1000
         LA    9,4095(0,11)       X9=4096                                 INS 1010
         L     1,0(0,3)           X1=J                                    INS 1020
         ALR   1,2                X1=A(STRING)+J-1   (START)              INS 1030
         LA    3,256              X3=256                                  INS 1040
         SR    2,2                ZERO X2 FOR USE AS RETURN BY TRT        INS 1050
         SR    7,7                X7=0                                    INS 1060
         IC    7,0(0,5)           X7=FIRST CHARACTER OF CHARS             INS 1070
         LA    7,TRTAB4(7)        X7=ADD. IN TRTAB4 FOR X'01' TO BE SET   INS 1080
         MVI   TRTAB4,X'04'       SET X'04' IN START OF TRTAB4            INS 1090
L                                  FOR BRANCH TO END22+4                  INS 1100
         SPACE 3                                                          INS 1110
         L     4,0(0,4)           X4#N                                    INS 1120
         SR    4,11               X4=N-1                                  INS 1130
         BM    BYPA               BRANCH IF N.LE.0                        INS 1140
         BZ    N1                 IF N=1 BRANCH TO N1                     INS 1150
         CR    4,3                COMPARE N-1 TO 256                      INS 1160
         BH    MULTI              BRANCH IF N.GT.257                      INS 1170
         CR    4,0                COMPARE N-1 TO 2                        INS 1180
         BL    N2                 BRANCH FOR N=2                          INS 1190
         BE    N3                 BRANCH FOR N=3                          INS 1200
L         CONTINUE TO LE257 FOR NLE.257 BUT MORE THAN 3                    INS 1210
         EJECT                                                            INS 1220
LE257     MVI   0(7),H2-END22      FOR N.LE.257                            INS 1230
         SR    4,11               X4 = N-2                                INS 1240
         STC   4,H2+1                                                     INS 1250
         B     LOOP2N                                                     INS 1260
         SPACE 3                                                          INS 1270
MULTI     MVI   0(7),OG257-END22   FOR N.GT.257                            INS 1280
         LR    12,4               PUT N-1 IN X12                          INS 1290
         SR    13,13              ZERO X13                                INS 1300
         SRDL  12,8               SHIFT  SMALL COM. INTO X13, X12=N256    INS 1310
         LTR   13,13              TEST FOR NON-INTEGRAL MULT OF 256       INS 1320
         BZ    CONX1              BRANCH IF INTEGRAL MULT OF N*256+1      INS 1330
         SRL   13,24              SHIFT SMALL INTO RIGHT                  INS 1340
         SR    13,11              X13=N-2                                 INS 1350
         STC   13,H3+1            STORE N MOD 256 IN CLC H3               INS 1360
         LR    13,12              STORE NO. OF 256 CYCLES IN X13          INS 1370
         B     LOOP2N                                                     INS 1380
CONX1     MVI   INTMUL+1,X'F0'      SET BRANCH IN INTMUL IF INTEGRAL       INS 1390
         LR    13,12              STORE NO. OF 256 CYCLES IN X13          INS 1400
         B     LOOP2N                                                     INS 1410
         SPACE 3                                                          INS 1420
N2        MVI   0(7),CN2-END22      FOR N.EQ.2                             INS 1430
         IC    0,1(0,5)           INSERT SECONC CHAR. IN X0               INS 1440
         STC   0,CN2+1             STORE SECONC CHAR. IN CLI AT CN2       INS 1450
         B     LOOP2N                                                     INS 1460
         SPACE 3                                                          INS 1470
N3        MVI   0(7),CN3A-END22     FOR N.EQ.3                             INS 1480
         IC    0,1(0,5)                                                   INS 1490
         STC   0,CN3A+1                                                   INS 1500
         IC    0,2(0,5)                                                   INS 1510
         STC   0,CN3B+1                                                   INS 1520
         B     LOOP2N                                                     INS 1530
         SPACE 3                                                          INS 1540
N1        MVI   0(7),FOUND-END22    FOR N.EQ.1                             INS 1550
         B     LOOP2N                                                     INS 1560
         EJECT                                                            INS 1570
LOOP2NI   AR    1,11                INCREASE X1 BY 1                       INS 1580
LOOP2N    TRT   0(256,1),TRTAB4                                            INS 1590
         BC    6,END22(2)                                                 INS 1600
         TRT   256(256,1),TRTAB4                                          INS 1610
         BC    6,END22(2)                                                 INS 1620
         TRT   512(256,1),TRTAB4                                          INS 1630
         BC    6,END22(2)                                                 INS 1640
         TRT   768(256,1),TRTAB4                                          INS 1650
         BC    6,END22(2)                                                 INS 1660
         TRT   1024(256,1),TRTAB4                                         INS 1670
         BC    6,END22(2)                                                 INS 1680
         TRT   1280(256,1),TRTAB4                                         INS 1690
```

```
         BC     6,END22(2)                                               INS 1700
         TRT    1536(256,1),TRTAB4                                       INS 1710
         BC     6,END22(2)                                               INS 1720
         TRT    1792(256,1),TRTAB4                                       INS 1730
         BC     6,END22(2)                                               INS 1740
         TRT    2048(256,1),TRTAB4                                       INS 1750
         BC     6,END22(2)                                               INS 1760
         TRT    2304(256,1),TRTAB4                                       INS 1770
         BC     6,END22(2)                                               INS 1780
         TRT    2560(256,1),TRTAB4                                       INS 1790
         BC     6,END22(2)                                               INS 1800
         TRT    2816(256,1),TRTAB4                                       INS 1810
         BC     6,END22(2)                                               INS 1820
         TRT    3072(256,1),TRTAB4                                       INS 1830
         BC     6,END22(2)                                               INS 1840
         TRT    3328(256,1),TRTAB4                                       INS 1850
         BC     6,END22(2)                                               INS 1860
         TRT    3584(256,1),TRTAB4                                       INS 1870
         BC     6,END22(2)                                               INS 1880
         TRT    3840(256,1),TRTAB4                                       INS 1890
         BC     6,END22(2)                                               INS 1900
END22    BXH    1,9,LOOP2N         INCREASE X1 BY 4096 AND CONTINUE TRT  INS 1910
L  THIS IS THE LOCATION TO WHICH THE BRANCH WILL GO WHEN X'00' FOUND     INS 1920
         SR     2,2                ZERO X2                               INS 1930
         ST     2,0(0,6)           STORE 0 IN I                          INS 1940
         MVI    0(7),X'00'         RESTORE X'00' IN TRTAB4               INS 1950
         MVI    TRTAB4,X'02'       RESTORE X'02' AT START OF TRTAB4      INS 1960
         LM     2,14,SAVERE        RESTORE REGISTERS                     INS 1970
         BR     14                                                       INS 1980
         EJECT                                                           INS 1990
L THE FOLLOWING SECTION IS FOR N.LE.257                                  INS 2000
H2       CLC    1(0,1),1(5)        COMPARE STARTING AT TRT MATCH + 1     INS 2010
         BNE    LOOP2NI                                                  INS 2020
         BE     FOUND                                                    INS 2030
         EJECT                                                           INS 2040
         SPACE 3                                                         INS 2050
         SPACE 3                                                         INS 2060
L THE FOLLOWING SECTION IS FOR N.GT.257                                  INS 2070
NG257    LR     8,1                STORE CURRENT MATCH FROM TRT IN X8    INS 2080
         LR     10,5                                                     INS 2090
         LR     13,12              X13=NUMBER OF MULT. OF 256 TO DO      INS 2100
         B      FIRSTMUL                                                 INS 2110
MULCOM   AR     10,3               INCREASE X10 BY 256                   INS 2120
         AR     8,3                INCREASE X8 BY 256                    INS 2130
FIRSTMUL CLC    1(256,8),1(10)     COMPARE 256 BYTES                     INS 2140
         BNE    LOOP2NI            INCREASE X1 BU 1 AND TRT              INS 2150
         BCT    13,MULCOM          LOOP FOR X13 GROUPS OF 256            INS 2160
INTMUL   BC     0,FOUNDRES         BRANCH ONLY IF INT. MULT OF 256       INS 2170
H3       CLC    257(0,8),257(10)   COMPARE NON INT.. MUL OF 256          INS 2180
         BNE    LOOP2NI                                                  INS 2190
         B      FOUND                                                    INS 2200
FOUNDRES MVI    INTMUL+1,X'00'     RESTORE NO BRANCH TO INTMUL           INS 2210
         B      FOUND                                                    INS 2220
         EJECT                                                           INS 2230
         SPACE 3                                                         INS 2240
L THE FOLLOWING SECTION IS FOR N=2                                       INS 2250
CN2      CLI    1(1),X'00'         COMPARE SECOND CHAR. WHEN FIRST MATCH INS 2260
         BNE    LOOP2NI                                                  INS 2270
         B      FOUND                                                    INS 2280
         SPACE 3                                                         INS 2290
L THE FOLLOWING SECTION IS FOR N=3                                       INS 2300
CN3A     CLI    1(1),X'00'                                               INS 2310
         BNE    LOOP2NI                                                  INS 2320
CN3B     CLI    2(1),X'00'                                               INS 2330
         BNE    LOOP2NI                                                  INS 2340
         B      FOUND                                                    INS 2350
         SPACE 3                                                         INS 2360
L THE FOLLOWING SECTION IS FOR N=1                                       INS 2370
L  AND THE COMMON POINT WHEN A MATCH IS FOUND.                           INS 2380
FOUND    SR     1,14               X1=VALUE TO STORE IN I. X6=A(I)       INS 2390
         ST     1,0(0,6)           STORE LENGTH IN IFND                  INS 2400
```

```
         MVI   0(7),X'00'          RESTORE X'01' TO X'00' IN TRTAB4
BYPA     MVI   TRTAB4,X'02'        RESTORE X'02' TO START OF TRTAB4
         LM    2,14,SAVERE         RESTORE REGISTERS
         BR    14
         EJECT
         USING *,15                  ADDRESS OF ARGLIST #X1          TIME
LENGTH   STM   2,3,SAVERE            LENGTH *STRING,LENG<
         L     3,4(0,1)            X3# A*LENGTH<                .80
         L     1,0(0,1)            X1# A*STRING<                .80
         LR    0,1                 X0 # A*STRING<                   .40
TRTL     TRT   0(256,1),TRTAB4       FINDS TERMINAL CHARACTER      3.906
         BC    6,ENDL                                            1.13
         LA    1,256(0,1)          BUMP UP BY 256               .60
         B     TRTL                                              1.13
ENDL     SLR   1,0                  A*TERM)-A(STRING)#LENGTH         .40
         ST    1,0(0,3)            STORE LENG                        .94
         LM    2,3,SAVERE
         BR    14                                                1.13
         USING *,15
DELETE   STM   2,5,SAVERE            DELETE(STRING,I,N<
         LM    1,3,0(1)            X1#A*STR< X2#A*I< X3#A*N< 2.00
         L     3,0(0,3)            X3=N
         LTR   3,3                 TEST FOR N.LE.0
         BC    12,BYPASS           N.LT.OR#0 SKIP           1.13
         L     4,0(0,2)            X4=I  X2 IS FREE FOR USE IN TRT
         S     4,=F'1'             X4=I-1  TEST FOR I.LE.0
         BM    BYPASS                                       1.13
         LR    0,1                 X0#A*STRING<
TRTD     TRT   0(256,1),TRTAB4
         BC    6,ENDD
         LA    1,256(0,1)
         B     TRTD
ENDD     SLR   1,0                  X1=A(TERM)-A(STRING)=LENGTH      .40
         SR    1,4                  X1=L-I+1
         BC    12,BYPASS           IF I.GT.L                1.13
         ALR   4,0                 X4=A(STRING)+I-1  MOVE DOWN TO
         SR    1,3                 X1=L-I+1+N=MM=M-1
         BC    11,NOR1             BRANCH TO NOR1 IF MM NOT -
         MVI   0(4),X'00'            DELETE ALL AT STR(I)  PUT 00 END
         B     BYPASS
NOR1     ALR   3,4                  X3=A(STRING)+I-1+N MOVE DOWN FROM
CYCLE1   LR    5,1                 X5#MM
         S     5,=F'255'           X5=MM-255
         BC    12,ONCE             BRANCH IF MM.LE.255
         MVC   0(256,4),0(3)       MOVE 256 CHAR TO NEW LOCATION
         LA    3,256(0,3)          X3=X3+256
         LA    4,256(0,4)          X4=X4+256
         S     1,=F'256'           MM=MM-256
         B     CYCLE1
ONCE     STC   1,C+1               LOAD MM#M-1 INTO MNC INST. C
C        MVC   0(0,4),0(3)         MOVE  M  CHAR TO NEW LOCATION
BYPASS   LM    2,5,SAVERE                                      2.20
         BR    14                                            1.13
         USING *,15
PUTINA   EQU   *        THIS IS A TRUNCATED 6-LETTER FTN-IV ENTRY.
PUTINAT  STM   2,7,SAVERE                PUTINAT(STRA,I,N,STRB,J<
         ST    15,SAVE15
         LM    1,5,0(1)    X1=A(STRA) X2=A(I) X3=A(N) X4=A(STRB) X5=A(J)
         A     4,0(0,5)            X4=A(STRB)+J
         S     4,=F'1'             X4=A(STRB)+J-1
         L     15,=A(INSERT)
         USING INSERT,15
         B     INSERTB             CHANGE TO INSERT
         USING *,15
PUTIN    STM   2,7,SAVERE            PUTIN(STRA,N,STRB,I)
         ST    15,SAVE15
         LM    1,4,0(1)            X1=A(STRA) X2=A(N) X3=A(STRB) X4=A(I)
         L     4,0(0,4)                 X4=I
```

```
         ALR    4,3                  X4=A(STRB)+I                        INS 3090
         S      4,=F'1'               X4=A(STRB)+I-1                      INS 3100
         LR     3,2                   X3=A(N)   SET UP TO USE INSERT      INS 3110
         SR     2,2                                                       INS 3120
         L      15,=A(INSERT)                                             INS 3130
         USING  INSERT,15                                                 INS 3140
         B      INSERTA                                                   INS 3150
TRTAB4   DC     X'02'                                                     INS 3160
         DC     255X'00'                                                  INS 3170
SAVERF   DS     13F                   SAVE REGISTERS                      INS 3180
SAVE15   DS     F                                                         INS 3190
TEMPST   DS     256C                                                      INS 3200
         LTORG                                                            INS 3210
         END                                                              INS 3220
```

Appendix B-5

INPUT FOR SAMPLE PROBLEM FOR CEP

The following is a tabulation of the input data to CEP. This consists of the capital cost evaluation of 26 out of the 29 process blocks. The missing process blocks 27, 28, and 29 are storage facilities which have not had a cost estimate run on them. The input data sheets shown here are in accordance with the format presented in Fig. 4 and with the exception of the last three process blocks should give a fairly accurate breakdown of the capital costs involved in the HTGR fuel reprocessing.

The first batch of cards in the input is heading data, which will be deleted since they were presented in the listing. The next card is the trigger card. A 1 is entered in column 5 to indicate that this is run 1. A 26 is entered in columns 9 and 10, indicating that 26 process blocks are being considered. Beginning in column 15, 26 consecutive 1's are placed through column 40; three zeros are added in columns 41, 42, and 43. This entry calls for printouts to be made for the first 26 cases.

Twenty-six consecutive 1's are entered from column 52 through column 77, indicating a graph is desired for the first 26 cases. Zeros (or blanks) are entered in the last three columns.

The title card for the first case appears on the next card (B1), noting that the title is ended with a dollar sign. The second card inputs the case titles, "case 1," "case 2," "case 3." These entries are ended in columns 10, 30, and 50, respectively giving a ten-column spacing on the output. This data could have been ended in columns 10, 20, and 30 with no spacing allowed and the same format adhered to for the remaining entries. On the third card is entered the capital charge rate of 0.30 expressed as a fraction ending in column 10. Since only one type of cell will be considered for each case, a 1 is entered in column 22 of the third card. The plant capacities of 0.5, 1.5, and 3.0 metric tonnes per day are entered in columns 5–10, 25–30, and 45–50 on card 4.

The input data on cards 5 through 20 for the three cases is placed in columns 1–10, 21–30, and 41–50. Since there is only one type of cell considered, there is only one card required for each category in the first process block. Process block 4 calls for three types of cells (3, 10, and 8) entered in columns ending in 23, 25, and 27. In process block 4, three cards, A, B, and C, are required for each of the categories mentioned in cards 5 through 20 in process block 1.

The output from CEP is shown in Appendix B-6 for all 26 process blocks, indicating pertinent costs and the source of the information where possible. A summary of the costs is given on the last page of the processed data, with the function coefficients and exponents calculated for the cost curves. The number on the extreme right of the output corresponds to the I in the variable VALUE (I, J) in SUBROUTINE PRODAT, where J is the case number. This has been done to expedite checking.

The punched output from CEP is listed in Appendix B-8. This output combined with the punched output from BAL is used as input for TCP. The punched output consists of one card with the concept number or run number (1) in column 5, and the number of processes being considered, 26, in columns 9 and 10. For each process block the punched output consists of three cards. The first card contains the title of the process; the second card contains the number of cases being considered for the particular process (1–5) which is entered in column 2. In columns 6, 16, 20–30, and 33–44 are tabulated the three abcissas of points on the cost graph (heavy-metal throughput) of 1.67400E02, 5.02200E02, and 1.00440E03. The third card contains the specific process block number (1) in columns 1–2. Using the same format as card 2 the three ordinates for the first process block (unit capital costs) are 6.18090E01, 3.89570E01, and 3.33257E01. Appendix B-7 contains a graph of each of the 26 functions generated which is produced by the ORGRAPH library subroutine.

```
   1   26    11111111111111111111111111111000       11111111111111111111111111111000
HEAD END REPROCESSING OF 23 RECYCLE SPENT FUEL ELEMENTS(A-15)$                  B1
CASE 1                 CASE 2                 CASE 3                             2
       0.3             1                                                         3
 0.5                   1.5                    3.0                                4
     167.4                  502.2                  1004.4                        5
1118500.00             2213600.00             3612400.00                         6
       16.                    16.                    16.                         7
       14.                    14.                    14.                         8
        7.                     7.                     7.                         9
       14.                    14.                    14.                        10
     2205.                  3423.                  5458.                        11
     9685.                 18035.                 31455.                       12A
       26.                    26.                    26.                       13A
       30.                    30.                    30.                       14A
       16.                    16.                    16.                       15A
       14.                    14.                    14.                       16A
        2.                     2.                     2.                       17A
       44.                    44.                    44.                       18A
        7.                     7.                     7.                       19A
       2.3                    2.3                    2.3                       20A
```

```
ACID THOREX REPROCESSING (23 RECYCLE FUEL)$                                     B2
CASE 1                 CASE 2                 CASE 3
       0.3             2 4
 0.5                   1.5                    3.0
      430.                  1290.                  2580.
  1436300.               3137900.               6214000.
       16.                    16.                    16.
       14.                    14.                    14.
        7.                     7.                     7.
       14.                    14.                    14.
     2544.                  5016.                 10332.
     9500.                 25376.                 25752.
    23587.                 53248.                113576.
       30.                    30.                    30.
       30.                    30.                    30.
       40.                    40.                    40.
       40.                    40.                    40.
        4.                     4.                     4.
        4.                     4.                     4.
       10.                    10.                    10.
       10.                    10.                    10.
        1.                     1.                     1.
        1.                     1.                     1.
       44.                    44.                    44.
       44.                    44.                    44.
        7.                     7.                     7.
        7.                     7.                     7.
       2.3                    2.3                    2.3
       2.3                    2.3                    2.3
```

SOLEX PROCESS FOR MICROSPHERE PREPARATION (23 RECYCLE)$ B3

MS23-4	MS23-5	MS23-6
0.3	4 3	
0.5	1.5	3.0
117.14	351.40	702.84
2756000.	5202000.	8716000.
16.0	16.0	16.0
28.0	28.0	28.0
7.0	7.0	7.0
14.0	14.0	14.0
18900.	32200.	47600.
11880.	18900.	27000.
31800.	72000.	128400.
30.0	30.0	30.0
26.0	26.0	26.0
40.0	40.0	40.
36.0	36.0	36.0
4.0	4.0	4.0
16.0	16.0	16.0
10.0	10.0	10.0
14.0	14.0	14.0
1.0	1.0	1.0
2.0	2.0	2.0
44.0	44.0	44.0
44.0	44.0	44.0
7.0	7.0	7.0
7.0	7.0	7.0
2.3	2.3	2.3
2.3	2.3	2.3

BISO MICROSPH COAT PROCESS 23 RECYCLE PARTICLES (TH233U)O2 (L-1.F(1))$ B4

CASE 1	CASE 2	CASE 3
0.3	310 8	
0.5	1.5	3.0
110.9	332.7	665.4
3051500.	6449500.	10734500.
16.	16.	16.
14.	14.	14.
7.	7.	7.
14.	14.	14.
1664.	3328.	5120.
5745.	13293.	25100.
200.	400.	600.
200.	400.	600.
26.	26.	26.
10.	10.	10.
2.5	2.5	2.5
30.	30.	30.
12.	12.	12.
4.	4.	4.
16.	16.	16.
10.	10.	10.
10.	10.	10.
14.	14.	14.
14.	14.	14.
14.	14.	14.
2.	2.	2.
1.	1.	1.
1.	1.	1.
44.	44.	44.
0.	0.	0.
0.	0.	0.
7.	7.	7.
7.	7.	7.
7.	7.	7.
2.3	2.3	2.3
0.	0.	0.
0.	0.	0.

PRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 23 RECYCLE N-4.A(2)$ B5

CASE 1	CASE 2	CASE 3	2
.3	310 8		3
0.5	1.5	3.0	4
196.7	590.1	1180.2	5
1612400.	3103700.	4594900.	6
16.	16.	16.	7
14.	14.	14.	8
7.	7.	7.	9
14.	14.	14.	10
2712.	537[illegible].	8028.	11
15498.	30996.	46278.	12A
200.	300.	400.	12B
160.	240.	320.	12C
26.	26.	26.	13A
10.	10.	10.	13B
2.5	2.5	2.5	13C
30.	30.	30.	14A
12.	12.	12.	14B
4.	4.	4.	14C
16.	16.	16.	15A
10.	10.	10.	15B
10.	10.	10.	15C
14.	14.	14.	16A
14.	14.	14.	16B
14.	14.	14.	16C
2.	2.	2.	17A
1.	1.	1.	17B
1.	1.	1.	17C
44.	44.	44.	18A
			18B
			18C
7.	7.	7.	19A
7.	7.	7.	19B
7.	7.	7.	19C
2.3	2.3	2.3	20A
			20B
			20C

FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 23 RECYCLE N-1.B$ B6

CASE 1	CASE 2	CASE3	2
.3	3		3
0.5	1.5	3.0	4
186.9	560.7	1121.4	5
500500.	763600.	1055500.	6
16.	16.	16.	7
14.	14.	14.	8
7.	7.	7.	9
14.	14.	14.	10
4440.	5772.	6660.	11
8568.	14585.	18522.	12A
26.	26.	26.	13A
30.	30.	30.	14A
16.	16.	16.	15A
14.	14.	14.	16A
2.	2.	2.	17A
44.	44.	44.	18A
7.	7.	7.	19A
2.3	2.3	2.3	20A

```
HEAD END REPROCESSING OF IN AND 25 RECYCLE SPENT FUEL ELEMENTS (A1 _A19)$    B7
CASE 1                CASE 2                CASE 3                             2
      0.3             1                                                        3
 0.5                   1.5                   3.0                               4
    268.1                 804.3                1608.6                          5
1233500.00            2342500.00            3837000.00                         6
      16.                   16.                   16.                          7
      14.                   14.                   14.                          8
       7.                    7.                    7.                          9
      14.                   14.                   14.                         10
    3265.                 4880.                 7290.                         11
   11615.                19716.                34021.                         12A
      26.                   26.                   26.                         13A
      30.                   30.                   30.                         14A
      16.                   16.                   16.                         15A
      14.                   14.                   14.                         16A
       2.                    2.                    2.                         17A
      44.                   44.                   44.                         18A
       7.                    7.                    7.                         19A
      2.3                   2.3                   2.3                         20A
```

```
ACID THOREX REPROCESSING (IN SPENT _25 RECYCLE FUEL)$                         B8
CASE 1                CASE 2                CASE 3
      0.3             2 4
 0.5                   1.5                   3.0
       5.                   15.                   30.
  660000.               750000.               905000.
      16.                   16.                   16.
      14.                   14.                   14.
       7.                    7.                    7.
      14.                   14.                   14.
    1550.                 1700.                 1900.
    4100.                 4400.                 4800.
    9000.                11000.                15000.
      30.                   30.                   30.
      30.                   30.                   30.
      40.                   40.                   40.
      40.                   40.                   40.
       4.                    4.                    4.
       4.                    4.                    4.
      10.                   10.                   10.
      10.                   10.                   10.
       1.                    1.                    1.
       1.                    1.                    1.
      44.                   44.                   44.
      44.                   44.                   44.
       7.                    7.                    7.
       7.                    7.                    7.
      2.3                   2.3                   2.3
      2.3                   2.3                   2.3
```

CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (23 RECYCLE)$ B9

MS23 1	MS23 2	MS23 3
0.300	4 3	
0.5	1.5	3.0
30.375	91.125	182.25
2155000.	3854000.	6347000.
16.0	16.0	16.0
28.0	28.0	28.0
7.0	7.0	7.0
14.0	14.0	14.0
16800.	28000.	38500.
7200.	8640.	11700.
22200.	38400.	61800.
30.0	30.0	30.0
26.0	26.0	26.0
40.0	40.0	40.
36.0	36.0	36.0
4.0	4.0	4.0
16.0	16.0	16.0
10.0	10.0	10.0
14.0	14.0	14.0
1.0	1.0	1.0
2.0	2.0	2.0
44.0	44.0	44.0
44.0	44.0	44.0
7.0	7.0	7.0
7.0	7.0	7.0
2.3	2.3	2.3
2.3	2.3	2.3

TRISO MICROSPHERE COATING PROCESS (25 RECYCLE PARTICLES) 235002 (L-2.C.(1))$ B10

CASE 1	CASE 2	CASE 3
0.3	310 8	
0 5	1.5	3.0
5.6	16.8	33.6
400000.	1100000.	2000000.
16.	16.	16.
14.	14.	14.
7.	7.	7.
14.	14.	14.
1100.	1250.	1400.
2500.	3000.	4500.
200.	250.	300.
200.	250.	300.
26.	26.	26.
10.	10.	10.
2.5	2.5	2.5
30.	30.	30.
12.	12.	12.
4.	4.	4.
16.	16.	16.
10.	10.	10.
10.	10.	10.
14.	14.	14.
14.	14.	14.
14.	14.	14.
2.	2.	2.
1.	1.	1.
1.	1.	1.
44.	44.	44.
0.	0.	0.
0.	0.	0.
7.	7.	7.
7.	7.	7.
7.	7.	7.
2.3	2.3	2.3
0.	0.	0.
0.	0.	0.

FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 25 RECYCLE N-4.B(2)$ B11

CASE 1	CASE 2	CASE 3	2
.3	310 8		3
0.5	1.5	3.0	4
23.1	71.8	143.6	5
700000.	1000000.	1350000.	6
16.	16.	16.	7
14.	14.	14.	8
7.	7.	7.	9
14.	14.	14.	10
1000.	1500.	2000.	11
7000.	10000.	14000.	12A
200.	250.	300.	12B
100.	150.	200.	12C
26.	26.	26.	13A
10.	10.	10.	13B
2.5	2.5	2.5	13C
30.	30.	30.	14A
12.	12.	12.	14B
4.	4.	4.	14C
16.	16.	16.	15A
10.	10.	10.	15B
10.	10.	10.	15C
14.	14.	14.	16A
14.	14.	14.	16B
14.	14.	14.	16C
2.	2.	2.	17A
1.	1.	1.	17B
1.	1.	1.	17C
44.	44.	44.	18A
			18B
			18C
7.	7.	7.	19A
7.	7.	7.	19B
7.	7.	7.	19C
2.3	2.3	2.3	20A
			20B
			20C

FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 25 RECYCLE N-1.C$ B12

CASE 1	CASE 2	CASE 3	2
.3	3		3
0.5	1.5	3.0	4
22.7	68.1	136.1	5
70000.	135000.	215000.	6
16.	16.	16.	7
14.	14.	14.	8
7.	7.	7.	9
14.	14.	14.	10
3500.	3700.	4200.	11
5700.	6500.	7800.	12A
26.	26.	26.	13A
30.	30.	30.	14A
16.	16.	16.	15A
14.	14.	14.	16A
2.	2.	2.	17A
44.	44.	44.	18A
7.	7.	7.	19A
2.3	2.3	2.3	20A

```
UNH PREPARATION FOR IN ELEMENTS$                                                          B13
  CASE 1                    CASE 2                      CASE 3                              2
       0.3                 7                                                                3
 0.5                       1.5                        3.0                                   4
      20.7                      62.2                       124.5                            5
   200000.                   350000.                    510000.                             6
       16.                       16.                        16.                             7
       14.                       14.                        14.                             8
        7.                        7.                         7.                             9
       14.                       14.                        14.                            10
      500.                      900.                      1200.                            11
     5000.                     7000.                     10000.                            12
       20.                       20.                        20.                            13
       20.                       20.                        20.                            14
       10.                       10.                        10.                            15
       20.                       20.                        20.                            16
        1.                        1.                         1.                            17
       44.                       44.                        44.                            18
        7.                        7.                         7.                            19
       2.3                       2.3                        2.3                            20
```

```
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (IN RECYCLE)$                                B14
  MS23 1                    MS23 2                     MS23 3
     0.300                 4 3
 0.5                       1.5                        3.0
    30.375                   91.125                     182.25
  2155000.                 3854000.                   6347000.
      16.0                     16.0                       16.0
      28.0                     28.0                       28.0
       7.0                      7.0                        7.0
      14.0                     14.0                       14.0
    16800.                   28000.                     38500.
     7200.                    8640.                     11700.
    22200.                   38400.                     61800.
      30.0                     30.0                       30.0
      26.0                     26.0                       26.0
      40.0                     40.0                       40.
      36.0                     36.0                       36.0
       4.0                      4.0                        4.0
      16.0                     16.0                       16.0
      10.0                     10.0                       10.0
      14.0                     14.0                       14.0
       1.0                      1.0                        1.0
       2.0                      2.0                        2.0
      44.0                     44.0                       44.0
      44.0                     44.0                       44.0
       7.0                      7.0                        7.0
       7.0                      7.0                        7.0
       2.3                      2.3                        2.3
       2.3                      2.3                        2.3
```

TRISO COATING PROCESS IN FISILE PARTICLES UO2 (L-2.J.(1))$ B15

CASE 1	CASE 2	CASE 3
0.3	7 8	
0.5	1.5	3.0
23.3	69.8	139.6
1913000.	4094200.	6366100.
16.	16.	16.
14.	14.	14.
7.	7.	7.
14.	14.	14.
1638.	3250.	4902.
2579.	4813.	7938.
307.	307.	461.
20.	20.	20.
2.5	2.5	2.5
20.	20.	20.
4.	4.	4.
10.	10.	10.
10.	10.	10.
20.	20.	20.
14.	14.	14.
1.	1.	1.
1.	1.	1.
44.	44.	44.
0.	0.	0.
7.	7.	7.
7.	7.	7.
2.3	2.3	2.3
0.	0.	0.

PRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR IN FUEL M-4.A(1)$ B16

CASE 1	CASE 2	CASE 3	2
.3	7 8		3
0.5	1.5	3.0	4
321.9	932.7	1865.4	5
525200.	1123500.	1800400.	6
16.	16.	16.	7
14.	14.	14.	8
7.	7.	7.	9
14.	14.	14.	10
1836.	3672.	5784.	11
2700.	7614.	11502.	12A
195.	300.	600.	12B
20.	20.	20.	13A
2.5	2.5	2.5	13B
20.	20.	20.	14A
4.	4.	4.	14B
10.	10.	10.	15A
10.	10.	10.	15B
20.	20.	20.	16A
14.	14.	14.	16B
1.	1.	1.	17A
1.	1.	1.	17B
44.	44.	44.	18A
			18B
7.	7.	7.	19A
7.	7.	7.	19B
2.3	2.3	2.3	20A
			20B

FUEL ELEMENT ASSEMBLY OUT OF BLOCK CABB PROCESS IN FUEL H-1.A$ B17

CASE 1	CASE 2	CASE 3	2
.3	7		3
0.5	1.5	3.0	4
295.5	886.5	1773.0	5
408900.	631400.	899400.	6
16.	16.	16.	7
14.	14.	14.	8
7.	7.	7.	9
14.	14.	14.	10
4440.	5772.	6660.	11
8568.	14585.	23216.	12A
20.	20.	20.	13A
20.	20.	20.	14A
10.	10.	10.	15A
20.	20.	20.	16A
1.	1.	1.	17A
44.	44.	44.	18A
7.	7.	7.	19A
2.3	2.3	2.3	20A

THORIUM RECOVERY PROCESS (T-2)$ B18

CASE 1	CASE 2	CASE 3	2
0.3	6		3
0.5	1.5	3.0	4
437.2	1311.6	2623.2	5
1637000.	5420000.	9875000.	6
16.	16.	16.	7
14.	14.	14.	8
7.	7.	7.	9
14.	14.	14.	10
840.	1200.	1400.	11
1200.	1800.	2000.	12A
30.	30.	30.	13A
40.	40.	40.	14A
4.	4.	4.	15B
10.	10.	10.	16A
1.	1.	1.	17A
44.	44.	44.	18A
7.	7.	7.	19A
2.3	2.3	2.3	20A

TH(NO3)4 PREPARATION PROCESS K-8$ B19

CASE 1	CASE 2	CASE 3
0.3	7	
0.5	1.5	3.0
542.9	1628.7	3257.4
252000.	360000.	570000.
16.	16.	16.
14.	14.	14.
7.	7.	7.
14.	14.	14.
700.	1260.	1680.
6600.	9800.	18000.
20.	20.	20.
20.	20.	20.
10.	10.	10.
20.	20.	20.
1.	1.	1.
44.	44.	44.
7.	7.	7.
2.3	2.3	2.3

THORIUM DIOXIDE MICROSPHERE PREPARATIONS

CASE 1	CASE 2	CASE 3	B20
0.3	7		2
0.5	1.5	3.0	4
443.2	1329.6	2659.2	5
716000.	1788500.	2985800.	6
16.	16.	16.	7
14.	14.	14.	8
7.	7.	7.	9
14.	14.	14.	10
4560.	9450.	17910.	11
12272.	25216.	48670.	12A
26.	26.	26.	13A
30.	30.	30.	14A
16.	16.	16.	15A
14.	14.	14.	16A
2.	2.	2.	17A
44.	44.	44.	18A
7.	7.	7.	19A
2.3	2.3	2.3	20A

Note: the row numbered 3 is printed in the right-hand column without any values.

BISO MICROSPHERE COATING PROCESS - FERTILE PARTICLES-THO2 (L-1.A.(1)$ B21

CASE 1	CASE 2	CASE 3
0.3	7 8	
0.5	1.5	3.0
419.9	1259.7	2519.4
2457100.	5203500.	8504200.
16.	16.	16.
14.	14.	14.
7.	7.	7.
14.	14.	14.
1704.	3408.	5112.
3646.	7804.	16338.
384.	768.	1152.
20.	20.	20.
2.5	2.5	2.5
20.	20.	20.
4.	4.	4.
10.	10.	10.
10.	10.	10.
20.	20.	20.
14.	14.	14.
1.	1.	1.
1.	1.	1.
44.	44.	44.
0.	0.	0.
7.	7.	7.
7.	7.	7.
2.3	2.3	2.3
0.	0.	0.

RECLAMATION OF THORIUM FROM REJECT KERNALS$ B22

CASE 1	CASE 2	CASE 3
0.3	7	
0.5	1.5	3.0
44.3	133.0	265.9
52000.	59000.	70000.
16.	16.	16.
14.	14.	14.
7.	7.	7.
14.	14.	14.
430.	500.	800.
820.	1100.	1500.
20.	20.	20.
20.	20.	20.
10.	10.	10.
20.	20.	20.
1.	1.	1.
44.	44.	44.
7.	7.	7.
2.3	2.3	2.3

THORIUM DIOXIDE REJECT RECLAMATION COATING REMOVALS

CASE 1	CASE 2	CASE 3	B23
0.3	7		2
0.5	1.5	3.0	3
21.0	63.0	126.0	4
79000.00	93000.00	176000.00	5
16.	16.	16.	6
14.	14.	14.	7
7.	7.	7.	8
14.	14.	14.	9
500.	700.	900.	10
500.	700.	2000.	11
20.	20.	20.	12A
20.	20.	20.	13A
10.	10.	10.	14A
20.	20.	20.	15A
1.	1.	1.	16A
44.	44.	44.	17A
7.	7.	7.	18A
2.3	2.3	2.3	19A
			20A

RECLAMATION PROCESSING OF REJECT 23 RECYCLE FUEL (A-15 ELEMENT)$ B24

CASE 1	CASE 2	CASE 3	2
0.300	3 4		3
0.5	1.5	3.0	4
17.2	51.6	103.2	5
16.	16.	16.	7
1460000.	1622700.	1872000.	6
14.	14.	14.	8
7.	7.	7.	9
14.	14.	14.	10
3485.	4060.	4595.	11
7775.	8155.	8700.	12A
13200.	16500.	21500.	12B
26.	26.	2[illegible]	13A
30.	30.	[illegible]	13B
30.	30.	30.	14A
40.	40.	40.	14B
16.	16.	16.	15A
4.0	4.0	4.0	15B
14.0	14.0	14.0	16A
10.0	10.0	10.0	16B
2.	2.	2.	17A
1.	1.	1.	17B
44.	44.	44.	18A
44.	44.	44.	18B
7.	7.	7.	19A
7.	7.	7.	19B
2.3	2.3	2.3	20A
2.3	2.3	2.3	20B

RECLAMATION PROCESSING OF REJECT 25 RECYCLE FUEL (A-19 ELEMENTS)$ B25

CASE 1	CASE 2	CASE 3
0.3	3 4	
0.5	1.5	3.0
1.7	5.1	10.2
1136000.	1192000.	1336000.
16.	16.	16.
14.	14.	14.
7.	7.	7.
14.	14.	14.
3460.	3765.	4130.
7220.	7290.	7450.
12700.	13200.	13800.
26.	26.	26.
30.	30.	30.
30.	30.	30.
40.	40.	40.
16.	16.	16.
4.	4.	4.
14.	14.	14.
10.	10.	10.
2.	2.	2.
1.	1.	1.
44.	44.	44.
44.	44.	44.
7.	7.	7.
7.	7.	7.
2.3	2.3	2.3
2.3	2.3	2.3

RECLAMATION PROCESSING OF REJECT IN FUEL (A-1 ELEMENTS) 3 B26

CASE 1	CASE 2	CASE 3	2
0.3	7		3
0.5	1.5	3.0	4
22.2	66.6	133.2	5
960100.	1094300.	1341600.	6
16.	16.	16.	7
14.	14.	14.	8
7.	7.	7.	9
14.	14.	14.	10
3950.	5010.	6030.	11
14785.	17781.	21477.	12
20.	20.	20.	13
20.	20.	20.	14
10.	10.	10.	15
20.	20.	20.	16
1.	1.	1.	17
44.	44.	44.	18
7.	7.	7.	19
2.3	2.3	2.3	20

Appendix B-6

OUTPUT FROM SAMPLE PROBLEM FOR CEP

	* * C O S T E S T I M A T E P R E P A R A T I O N * *		CASE ESTIMATES CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	1118500.	2213600.	3612400.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = HEAVILY SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 1, TABLES 5 AND 6)				
2	TYPE (1)		9685.	18035.	31455.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	2205.	3423.	5458.
	PROCESSING SPACE COST (HOT CELLS) ($)				
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT	(FT)	30.0	30.0	30.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
9	GROSS CELL VOLUME	(CU FT)	38740.	72140.	125820.
10	LINEAR FT. OF CELL	(FT)	49.67	92.49	161.31
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST ($/CU FT)				
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		42.00	42.00	42.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST ($)				
24	TYPE (1)		1627080.	3029880.	5284440.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		1627080.	3029880.	5284440.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	5953.	9242.	14737.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	22251.	41434.	72266.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	1291.	2405.	4194.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	198865.	370318.	645875.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		41674.	64695.	103156.
	CELL OPERATING SPACE				
64	TYPE (1)		155755.	290040.	505861.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		155755.	290040.	505861.
	CRANE BAY SPACE				
68	TYPE (1)		457390.	851732.	1485512.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		457390.	851732.	1485512.
72	TOTAL OUT-OF-CELL SPACE COST		654819.	1206466.	2094528.
73	PROCESSING SPACE TOTAL COST	($)	2281898.	4236346.	7378968.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	101240.	188526.	328809.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	708683.	1319680.	2301664.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		4109081.	7769626.	13293032.
81	OUTSIDE UTILITIES COST		410908.	776962.	1329302.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	4519988.	8546588.	14622334.
84	SITE IMPROVEMENT COST	($)	22600.	42733.	73112.
85	TOTAL DIRECT CONSTRUCTION COST	($)	4542587.	8589320.	14695445.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	454259.	858932.	1469543.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	1362775.	2576795.	4408632.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	227129.	429466.	734772.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	908517.	1717863.	2939088.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	31798.	60125.	102868.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	136278.	257680.	440863.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	272555.	515359.	881727.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	3393309.	6416217.	10977492.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	45426.	85893.	146954.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	90852.	171786.	293909.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	181703.	343573.	587818.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	908517.	1717863.	2939088.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	908517.	1717863.	2939088.
111	TOTAL OWNER'S COST	($)	2135015.	4036978.	6906857.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	10070911.	19042512.	32579776.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	167.40	502.20	1004.40
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		48881.	146642.	293285.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	3021272.	5712752.	9773931.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	61.81	38.96	33.33

* * * HEAD END REPROCESSING OF 23 RECYCLE SPENT FUEL ELEMENTS(A-15)$ B1* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	167.4	502.2	1004.4
PROCESSING EQUIPMENT COST	($1000)	1118.5	2213.6	3612.4
PLANT DIRECT CONSTRUCTION COST	($1000)	4542.6	8589.3	14695.4
PLANT INDIRECT CONSTRUCTION COST	($1000)	3393.3	6416.2	10977.5
PLANT OWNER'S COST	($1000)	2135.0	4037.0	6906.9
PLANT TOTAL COST	($1000)	10070.9	19042.5	32579.8
UNIT COST	(DOLLARS/KILOGRAM)	61.81	38.96	33.33

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 7.78546E 01 A2 = 4.55398E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -1.37870E-03 B2 = -3.10889E-04 B3 = 0.0 B4 = 0.0

* * * ACID THOREX REPROCESSING (23 RECYCLE FUEL) $ B2* * * DATE IS 07-18-74 PAGE 1

COST ESTIMATE PREPARATION

			CASE 1	CASE ESTIMATES CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	1436800.	3137900.	6214000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = HEAVILY SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM 2, TABLES 5 AND 6)				
	TYPE (2) = MEDIUM SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM 4, TABLES 5 AND 6)				
2	TYPE (1)		9500.	25376.	25752.
3	TYPE (2)		23587.	53248.	113576.
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	2544.	5016.	10332.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	30.0	30.0	30.0
7	STD. CELL HEIGHT	(FT)	40.0	40.0	40.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.33	2.33	2.33
9	GROSS CELL VOLUME	(CU FT)	22135.	59126.	60002.
10	LINEAR FT. OF CELL	(FT)	18.45	49.27	50.00
11	TYPE (2) STD. CELL WIDTH	(FT)	30.0	30.0	30.0
12	STD. CELL HEIGHT	(FT)	40.0	40.0	40.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		2.33	2.33	2.33
14	GROSS CELL VOLUME	(CU FT)	54958.	124068.	264632.
15	LINEAR FT. OF CELL	(FT)	45.80	103.39	220.53
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		18.00	18.00	18.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		16.00	16.00	16.00
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		398430.	1064269.	1080038.
25	TYPE (2)		879323.	1985085.	4234113.
26	TYPE (3)				
27	TOTAL		1277753.	3049354.	5314151.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	6869.	13543.	27896.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	4.0	4.0	4.0
33	STD. AREA HEIGHT	(FT)	10.0	10.0	10.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	738.	1971.	2000.
36	TYPE (2) STD. AREA WIDTH	(FT)	4.0	4.0	4.0
37	STD. AREA HEIGHT	(FT)	10.0	10.0	10.0
38	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
39	GROSS VOLUME	(CU FT)	1832.	4136.	8821.
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	553.	1478.	1500.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	85220.	227635.	231008.
48	TYPE (2) CELL AREA	(SQ FT)	1374.	3102.	6616.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
51	GROSS VOLUME	(CU FT)	211587.	477661.	1018833.
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM-4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		2.30	2.30	2.30
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		48082.	94802.	195275.
	CELL OPERATING SPACE				
64	TYPE (1)		5165.	13796.	14000.
65	TYPE (2)		12823.	28949.	61747.
66	TYPE (3)				
67	TOTAL		17988.	42745.	75748.
	CRANE BAY SPACE				
68	TYPE (1)		196005.	523561.	531318.
69	TYPE (2)		486650.	1098619.	2343315.
70	TYPE (3)				
71	TOTAL		682655.	1622180.	2874633.
72	TOTAL OUT-OF-CELL SPACE COST		748725.	1759727.	3145655.
73	PROCESSING SPACE TOTAL COST	($)	2026477.	4809081.	8459806.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	151102.	359060.	636283.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	1057710.	2513417.	4453977.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		4520987.	10460398.	19127776.
81	OUTSIDE UTILITIES COST		452099.	1046039.	1912776.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	4973085.	11506437.	21040544.
84	SITE IMPROVEMENT COST	($)	24865.	57532.	105203.
85	TOTAL DIRECT CONSTRUCTION COST	($)	4997950.	11563969.	21145744.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	499795.	1156396.	2114573.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	1499384.	3469190.	6343722.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	249897.	578198.	1057287.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	999590.	2312793.	4229148.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	34986.	80948.	148020.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	149938.	346919.	634372.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	299877.	693838.	1268744.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	3733463.	8638281.	15795866.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	49979.	115640.	211457.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	99959.	231279.	422915.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	199918.	462559.	845830.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	999590.	2312793.	4229148.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	999590.	2312793.	4229148.
111	TOTAL OWNER'S COST	($)	2349035.	5435063.	9938497.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	11080448.	25637296.	46880096.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	430.00	1290.00	2580.00
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	125560.	376680.	753360.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	3324133.	7691187.	14064026.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	26.47	20.42	18.67

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	430.0	1290.0	2580.0
PROCESSING EQUIPMENT COST	($1000)	1436.8	3137.9	6214.0
PLANT DIRECT CONSTRUCTION COST	($1000)	4997.9	11564.0	21145.7
PLANT INDIRECT CONSTRUCTION COST	($1000)	3733.5	8638.3	15795.9
PLANT OWNER'S COST	($1000)	2349.0	5435.1	9938.5
PLANT TOTAL COST	($1000)	11080.4	25637.3	46880.1
UNIT COST	(DOLLARS/KILOGRAM)	26.47	20.42	18.67

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 3.01460E 01 A2 = 2.23323E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -3.02030E-04 B2 = -6.94587E-05 B3 = 0.0 B4 = 0.0

COST ESTIMATE PREPARATION

			CASE ESTIMATES		
			MS23-4	MS23-5	MS23-6
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	2756000.	5202000.	8716000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = MEDIUM SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM 4, TABLES 5 AND 6)				
	TYPE (2) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)				
2	TYPE (1)		11880.	18900.	27000.
3	TYPE (2)		31800.	72000.	128400.
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	18900.	32200.	47600.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	30.0	30.0	30.0
7	STD. CELL HEIGHT	(FT)	40.0	40.0	40.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.33	2.33	2.33
9	GROSS CELL VOLUME	(CU FT)	27680.	44037.	62910.
10	LINEAR FT. OF CELL	(FT)	23.07	36.70	52.42
11	TYPE (2) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
12	STD. CELL HEIGHT	(FT)	36.0	36.0	36.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
14	GROSS CELL VOLUME	(CU FT)	127200.	288000.	513600.
15	LINEAR FT. OF CELL	(FT)	135.90	307.69	548.72
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		16.00	16.00	16.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		39.00	39.00	39.00
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		442886.	704592.	1006560.
25	TYPE (2)		4960800.	11232000.	20030400.
26	TYPE (3)				
27	TOTAL		5403686.	11936591.	21036944.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	28.0	28.0	28.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	51030.	86940.	128520.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	4.0	4.0	4.0
33	STD. AREA HEIGHT	(FT)	10.0	10.0	10.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	923.	1468.	2097.
36	TYPE (2) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
37	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
38	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
39	GROSS VOLUME	(CU FT)	60882.	137846.	245826.
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	692.	1101.	1573.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	106569.	169542.	242203.
48	TYPE (2) CELL AREA	(SQ FT)	3533.	8000.	14267.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
51	GROSS VOLUME	(CU FT)	544133.	1231998.	2197065.
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		2.30	2.30	2.30
62	TYPE (3)				

No.	Item	Units			
	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		357210.	608580.	899640.
	CELL OPERATING SPACE				
64	TYPE (1)		6459.	10275.	14679.
65	TYPE (2)		426174.	964922.	1720778.
66	TYPE (3)				
67	TOTAL		432633.	975197.	1735456.
	CRANE BAY SPACE				
68	TYPE (1)		245110.	389947.	557067.
69	TYPE (2)		1251505.	2833594.	5053247.
70	TYPE (3)				
71	TOTAL		1496614.	3223541.	5610314.
72	TOTAL OUT-OF-CELL SPACE COST		2286457.	4807317.	8245409.
73	PROCESSING SPACE TOTAL COST	($)	7690143.	16743908.	29282352.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	331267.	713511.	1241809.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	2318865.	4994580.	8692663.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		12765008.	26940480.	46691008.
81	OUTSIDE UTILITIES COST		1276500.	2694047.	4669099.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	14041508.	29634512.	51360096.
84	SITE IMPROVEMENT COST	($)	70208.	148173.	256800.
85	TOTAL DIRECT CONSTRUCTION COST	($)	14111715.	29782672.	51616896.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	1411170.	2978266.	5161687.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	4233513.	8934800.	15485066.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	705586.	1489133.	2580844.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	2822342.	5956534.	10323378.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	98782.	208479.	361318.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	423351.	893480.	1548506.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	846703.	1786960.	3097013.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	10541444.	22247616.	38557776.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	141117.	297827.	516169.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	282234.	595653.	1032338.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	564469.	1191306.	2064675.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	2822342.	5956534.	10323378.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	2822342.	5956534.	10323378.
111	TOTAL OWNER'S COST	($)	6632503.	13997854.	24259936.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	31285648.	66028128.	114434608.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	117.14	351.40	702.84
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		34205.	102609.	205229.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	9385692.	19808432.	34330368.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	274.40	193.05	167.28

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	117.1	351.4	702.8
PROCESSING EQUIPMENT COST	($1000)	2756.0	5202.0	8716.0
PLANT DIRECT CONSTRUCTION COST	($1000)	14111.7	29782.7	51616.9
PLANT INDIRECT CONSTRUCTION COST	($1000)	10541.4	22247.6	38557.8
PLANT OWNER'S COST	($1000)	6632.5	13997.9	24259.9
PLANT TOTAL COST	($1000)	31285.6	66028.1	114434.6
UNIT COST	(DOLLARS/KILOGRAM)	274.40	193.05	167.28

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 3.27145E 02   A2 = 2.22784E 02   A3 = 0.0   A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -1.50104E-03   B2 = -4.07698E-04   B3 = 0.0   B4 = 0.0 134

* * * BISO MICROSPH COAT PROCESS 23 RECYCLE PARTICLES (TH233U)O2 (L-1,F(1))#   894 * *   DATE IS 07-28-78   PAGE 1

* * C O S T   E S T I M A T E   P R E P A R A T I O N * *

			CASE ESTIMATES	
		CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST			
	PROCESSING EQUIPMENT COST			
1	ESTIMATED EQUIPMENT COST ($)	3053500.	6449500.	10738500.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)			
	TYPE (1) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)			
	TYPE (2) = SHIELDED LIQUID WASTE STG - CONTACT MAINTENANCE (ITEM 10, TABLES 5 AND 6)			
	TYPE (3) = GLOVE BOXES AND HOODS - DIRECT MAINTENANCE (ITEM 8, TABLES 5 AND 6)			
2	TYPE (1)	5785.	13293.	25100.
3	TYPE (2)	200.	400.	600.
4	TYPE (3)	200.	400.	600.
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED (CU FT)	1664.	3328.	5120.
	PROCESSING SPACE COST (HOT CELLS) ($)			
	GROSS IN-CELL SPACE REQUIRED			
6	TYPE (1) STD. CELL WIDTH (FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT (FT)	30.0	30.0	30.0
8	SUF (FROM ORNL TM-4613, TABLE 5)	4.00	4.00	4.00
9	GROSS CELL VOLUME (CU FT)	22980.	53172.	100400.
10	LINEAR FT. OF CELL (FT)	29.46	68.17	128.72
11	TYPE (2) STD. CELL WIDTH (FT)	10.0	10.0	10.0
12	STD. CELL HEIGHT (FT)	12.0	12.0	12.0
13	SUF (FROM ORNL TM-4613, TABLE 5)	2.50	2.50	2.50
14	GROSS CELL VOLUME (CU FT)	500.	1000.	1500.
15	LINEAR FT. OF CELL (FT)	4.17	8.33	12.50
16	TYPE (3) STD. CELL WIDTH (FT)	2.5	2.5	2.5
17	STD. CELL HEIGHT (FT)	4.0	4.0	4.0
18	SUF (FROM ORNL TM-4613, TABLE 5)	2.20	2.20	2.20
19	GROSS CELL VOLUME (CU FT)	440.	880.	1320.
20	LINEAR FT. OF CELL (FT)	44.00	88.00	132.00
	IN-CELL SPACE UNIT COST ($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)	39.00	39.00	39.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)	2.30	2.30	2.30
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)	146.00	146.00	146.00
	IN-CELL SPACE TOTAL COST ($)			
24	TYPE (1)	896220.	2073708.	3915600.
25	TYPE (2)	1150.	2300.	3450.
26	TYPE (3)	64240.	128480.	192720.
27	TOTAL	961610.	2204488.	4111770.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	4493.	8986.	13824.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	13199.	30540.	57666.
36	TYPE (2) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
37	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
38	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
39	GROSS VOLUME	(CU FT)	583.	1167.	1750.
40	TYPE (3) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
41	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
42	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
43	GROSS VOLUME	(CU FT)	6160.	12320.	18480.
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	766.	1772.	3347.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	117964.	272950.	515386.
48	TYPE (2) CELL AREA	(SQ FT)	42.	83.	125.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	0.0	0.0	0.0
51	GROSS VOLUME	(CU FT)	0.	0.	0.
52	TYPE (3) CELL AREA	(SQ FT)	110.	220.	330.
53	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
54	STD. BAY HEIGHT	(FT)	0.0	0.0	0.0
55	GROSS VOLUME	(CU FT)	0.	0.	0.
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)		7.00	7.00	7.00
	CRANE BAY SPACE UCCF (FROM TM-4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		0.0	0.0	0.0
62	TYPE (3)		0.0	0.0	0.0

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		31450.	62899.	96768.
	CELL OPERATING SPACE				
64	TYPE (1)		92391.	213779.	403659.
65	TYPE (2)		4083.	8167.	12250.
66	TYPE (3)		43120.	86240.	129360.
67	TOTAL		139595.	308185.	545269.
	CRANE BAY SPACE				
68	TYPE (1)		271317.	627784.	1185388.
69	TYPE (2)		0.	0.	0.
70	TYPE (3)		0.	0.	0.
71	TOTAL		271317.	627784.	1185388.
72	TOTAL OUT-OF-CELL SPACE COST		442361.	998868.	1827425.
73	PROCESSING SPACE TOTAL COST	($)	1403970.	3203353.	5939193.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	71945.	162737.	298051.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCP (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	503615.	1139161.	2086353.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		4959084.	10792014.	18760032.
81	OUTSIDE UTILITIES COST		495908.	1079201.	1876002.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	5454992.	11871215.	20636032.
84	SITE IMPROVEMENT COST	($)	27275.	59356.	103180.
85	TOTAL DIRECT CONSTRUCTION COST	($)	5482266.	11930571.	20739200.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	548226.	1193056.	2073919.

ENGINEERING COST

88	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	1644679.	3579170.	6221759.

MISC. CONSTRUCTION COST

90	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	274113.	596529.	1036960.

CONTINGENCY ALLOWANCE

92	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	1096453.	2386114.	4147839.

SPARE PARTS COST

94	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	38376.	83514.	145174.

NONINSTALLED SPARE EQUIPMENT COST

96	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	164468.	357917.	622176.

QUALITY ASSURANCE COST

98	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	328936.	715834.	1244351.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	4095248.	8912132.	15492176.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	54823.	119306.	207392.

PROJECT MANAGEMENT

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	109645.	238611.	414784.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	219291.	477223.	829569.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	1096453.	2386114.	4147839.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	1096453.	2386114.	4147839.
111	TOTAL OWNER'S COST	($)	2576664.	5607367.	9747421.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	12154178.	26450048.	45978784.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	110.90	332.70	665.40
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	32383.	97148.	194297.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	3646252.	7935013.	13793633.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	112.60	81.68	70.99

* * * BISO MICROSPH COAT PROCESS 23 RECYCLE PARTICLES (TH233U)O2 (L-1.F(1))$ B4* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	110.9	332.7	665.4
PROCESSING EQUIPMENT COST	($1000)	3051.5	6449.5	10734.5
PLANT DIRECT CONSTRUCTION COST	($1000)	5482.3	11930.6	20739.2
PLANT INDIRECT CONSTRUCTION COST	($1000)	4095.2	8912.1	15492.2
PLANT OWNER'S COST	($1000)	2576.7	5607.4	9747.4
PLANT TOTAL COST	($1000)	12154.2	26450.0	45978.8
UNIT COST	(DOLLARS/KILOGRAM)	112.60	81.68	70.99

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 1.32207E 02 A2 = 9.39746E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -1.44737E-03 B2 = -4.21474E-04 B3 = 0.0 B4 = 0.0

****C O S T E S T I M A T E P R E P A R A T I O N****

			CASE ESTIMATES		
			CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	1612800.	3103700.	4594900.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)				
	TYPE (2) = SHIELDED LIQUID WASTE STG - CONTACT MAINTENANCE (ITEM 10, TABLES 5 AND 6)				
	TYPE (3) = GLOVE BOXES AND HOODS - DIRECT MAINTENANCE (ITEM 8, TABLES 5 AND 6)				
2	TYPE (1)		15498.	30996.	46278.
3	TYPE (2)		200.	300.	400.
4	TYPE (3)		160.	240.	320.
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	2712.	5370.	8028.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT	(FT)	30.0	30.0	30.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
9	GROSS CELL VOLUME	(CU FT)	61992.	123984.	185112.
10	LINEAR FT. OF CELL	(FT)	79.48	158.95	237.32
11	TYPE (2) STD. CELL WIDTH	(FT)	10.0	10.0	10.0
12	STD. CELL HEIGHT	(FT)	12.0	12.0	12.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
14	GROSS CELL VOLUME	(CU FT)	500.	750.	1000.
15	LINEAR FT. OF CELL	(FT)	4.17	6.25	8.33
16	TYPE (3) STD. CELL WIDTH	(FT)	2.5	2.5	2.5
17	STD. CELL HEIGHT	(FT)	4.0	4.0	4.0
18	SUF (FROM ORNL TM-4613, TABLE 5)		2.20	2.20	2.20
19	GROSS CELL VOLUME	(CU FT)	352.	528.	704.
20	LINEAR FT. OF CELL	(FT)	35.20	52.80	70.40
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCP FROM ORNL TM-4613, TABLE 6)		39.00	39.00	39.00
22	TYPE (2) (UCCP FROM ORNL TM-4613, TABLE 6)		2.30	2.30	2.30
23	TYPE (3) (UCCP FROM ORNL TM-4613, TABLE 6)		146.00	146.00	146.00
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		2417688.	4835376.	7219368.
25	TYPE (2)		1150.	1725.	2300.
26	TYPE (3)		51392.	77088.	102784.
27	TOTAL		2470228.	4914187.	7324450.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	7322.	14499.	21676.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	35606.	71211.	106321.
36	TYPE (2) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
37	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
38	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
39	GROSS VOLUME	(CU FT)	583.	875.	1167.
40	TYPE (3) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
41	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
42	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
43	GROSS VOLUME	(CU FT)	4928.	7392.	9856.
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	2066.	4133.	6170.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	318226.	636451.	950241.
48	TYPE (2) CELL AREA	(SQ FT)	42.	63.	83.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	0.0	0.0	0.0
51	GROSS VOLUME	(CU FT)	0.	0.	0.
52	TYPE (3) CELL AREA	(SQ FT)	88.	132.	176.
53	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
54	STD. BAY HEIGHT	(FT)	0.0	0.0	0.0
55	GROSS VOLUME	(CU FT)	0.	0.	0.
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)		7.00	7.00	7.00
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		0.0	0.0	0.0
62	TYPE (3)		0.0	0.0	0.0

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		51257.	101493.	151729.
	CELL OPERATING SPACE				
64	TYPE (1)		249240.	498479.	744245.
65	TYPE (2)		4083.	6125.	8167.
66	TYPE (3)		34496.	51744.	68992.
67	TOTAL		287819.	556348.	821403.
	CRANE BAY SPACE				
68	TYPE (1)		731918.	1463836.	2185554.
69	TYPE (2)		0.	0.	0.
70	TYPE (3)		0.	0.	0.
71	TOTAL		731918.	1463836.	2185554.
72	TOTAL OUT-OF-CELL SPACE COST		1070993.	2121677.	3158686.
73	PROCESSING SPACE TOTAL COST	($)	3541221.	7035864.	10483136.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	172172.	339260.	504090.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	1205200.	2374817.	3528632.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		6358821.	12514381.	18606656.
81	OUTSIDE UTILITIES COST		635882.	1251437.	1860664.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	6994702.	13765818.	20467312.
84	SITE IMPROVEMENT COST	($)	34974.	68829.	102337.
85	TOTAL DIRECT CONSTRUCTION COST	($)	7029675.	13834647.	20569648.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	702967.	1383464.	2056964.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	2108902.	4150393.	6170893.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	351484.	691732.	1028482.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	1405934.	2766929.	4113929.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	49208.	96843.	143988.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	210890.	415039.	617089.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	421780.	830079.	1234178.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	5251163.	10334477.	15365522.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	70297.	138346.	205696.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	140593.	276693.	411393.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	281187.	553386.	822786.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	1405934.	2766929.	4113929.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	1405934.	2766929.	4113929.
111	TOTAL OWNER'S COST	($)	3303945.	6502283.	9667733.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	15584783.	30671392.	45602896.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	196.70	590.10	1180.20
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		57436.	172309.	344618.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	4675434.	9201416.	13680866.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	81.40	53.40	39.70

* * * PRP SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 23 RECYCLE M-4.A(2)$ B5* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	196.7	590.1	1180.2
PROCESSING EQUIPMENT COST	($1000)	1612.4	3103.7	4594.9
PLANT DIRECT CONSTRUCTION COST	($1000)	7029.7	13834.6	20569.6
PLANT INDIRECT CONSTRUCTION COST	($1000)	5251.2	10334.5	15365.5
PLANT OWNER'S COST	($1000)	3303.9	6502.3	9667.7
PLANT TOTAL COST	($1000)	15584.8	30671.4	45602.9
UNIT COST	(DOLLARS/KILOGRAM)	81.40	53.40	39.70

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 1.00503E 02 A2 = 7.18319E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -1.07162E-03 B2 = -5.02468E-04 B3 = 0.0 B4 = 0.0

COST ESTIMATE PREPARATION

			CASE ESTIMATES CASE 1	CASE 2	CASE3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	500500.	763600.	1055500.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)				
2	TYPE (1)		8568.	14585.	18522.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	4440.	5772.	6660.
	PROCESSING SPACE COST (HOT CELLS) ($)				
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT	(FT)	30.0	30.0	30.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
9	GROSS CELL VOLUME	(CU FT)	34272.	58340.	74088.
10	LINEAR FT. OF CELL	(FT)	43.94	74.79	94.98
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST ($/CU FT)				
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		39.00	39.00	39.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST ($)				
24	TYPE (1)		1336608.	2275260.	2889432.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		1389148.	2354071.	2994514.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	11988.	15584.	17982.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	19684.	33508.	42553.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	1142.	1945.	2470.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	175930.	299478.	380318.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		83916.	109091.	125874.
	CELL OPERATING SPACE				
64	TYPE (1)		137791.	234557.	297872.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		137791.	234557.	297872.
	CRANE BAY SPACE				
68	TYPE (1)		404638.	688800.	874732.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		404638.	688800.	874732.
72	TOTAL OUT-OF-CELL SPACE COST		626345.	1032448.	1298477.
73	PROCESSING SPACE TOTAL COST	($)	2015492.	3386518.	4292991.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	99730.	167711.	213948.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	698110.	1173973.	1497637.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		3214101.	5324091.	6846128.
81	OUTSIDE UTILITIES COST		321410.	532409.	684613.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	3535510.	5856499.	7530740.
84	SITE IMPROVEMENT COST	($)	17678.	29282.	37654.
85	TOTAL DIRECT CONSTRUCTION COST	($)	3553187.	5885781.	7568393.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	355319.	588578.	756839.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	1065955.	1765734.	2270517.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	177659.	294289.	378420.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	710637.	1177156.	1513678.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	24872.	41200.	52979.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	106596.	176573.	227052.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	213191.	353147.	454104.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	2654227.	4396675.	5653585.

OWNER'S COST

	LAND COST				
101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	35532.	58858.	75684.
	PROJECT MANAGEMENT COST				
103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	71064.	117716.	151368.
	LICENSING COST				
105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	142127.	235431.	302736.
	TAXES, INSURANCE AND INTEREST				
107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	710637.	1177156.	1513678.
	PREOPERATIONAL TESTING AND STARTUP				
109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	710637.	1177156.	1513678.
111	TOTAL OWNER'S COST	($)	1669997.	2766316.	3557143.
	TOTAL CAPITAL CONSTRUCTION COST				
112	INCREMENT OF TOTAL PLANT COST	($)	7877411.	13048772.	16779120.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	186.90	560.70	1121.40
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	54575.	163724.	327409.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	2363222.	3914630.	5033735.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	43.30	23.91	15.37

* * * FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 23 RECYCLE N-1.B$ B6* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	186.9	560.7	1121.4
PROCESSING EQUIPMENT COST	($1000)	500.5	763.6	1055.5
PLANT DIRECT CONSTRUCTION COST	($1000)	3553.2	5885.8	7568.4
PLANT INDIRECT CONSTRUCTION COST	($1000)	2654.2	4396.7	5653.6
PLANT OWNER'S COST	($1000)	1670.0	2766.3	3557.1
PLANT TOTAL COST	($1000)	7877.4	13048.8	16779.1
UNIT COST	(DOLLARS/KILOGRAM)	43.30	23.91	15.37

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 5.82746E 01 A2 = 3.71884E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -1.58886E-03 B2 = -7.87774E-04 B3 = 0.0 B4 = 0.0

* * * HEAD END REPROCESSING OF IM AND 25 RECYCLE SPENT FUEL ELEMENTS (A1 & A19)$ B7* * *   DATE IS   07-18-74   PAGE   1

			CASE ESTIMATES		
	C O S T E S T I M A T E P R E P A R A T I O N		CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	1233500.	2342500.	3837000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = HEAVILY SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 1, TABLES 5 AND 6)				
2	TYPE (1)		11615.	19716.	34021.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	3265.	4880.	7290.
	PROCESSING SPACE COST (HOT CELLS) ($)				
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT	(FT)	30.0	30.0	30.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
9	GROSS CELL VOLUME	(CU FT)	46460.	78864.	136084.
10	LINEAR FT. OF CELL	(FT)	59.56	101.11	174.47
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST ($/CU FT)				
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		42.00	42.00	42.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST ($)				
24	TYPE (1)		1951320.	3312288.	5715528.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		2003860.	3391099.	5820610.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	8815.	13176.	19683.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	26685.	45296.	78161.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	1549.	2629.	4536.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	238495.	404835.	698564.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		61708.	92232.	137781.
	CELL OPERATING SPACE				
64	TYPE (1)		186793.	317074.	547127.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		186793.	317074.	547127.
	CRANE BAY SPACE				
68	TYPE (1)		548537.	931120.	1606697.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		548537.	931120.	1606697.
72	TOTAL OUT-OF-CELL SPACE COST		797039.	1340425.	2291605.
73	PROCESSING SPACE TOTAL COST	($)	2800898.	4731524.	8112215.
	PROCESSING SUPPORT SPACE COST *(BLDG. EXCLUDING HOT CELLS)*				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	*TOTAL SPACE REQUIRED*	*(CU FT)*	131581.	221347.	375964.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	921069.	1549425.	2631748.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		4955466.	8623449.	14580963.
81	*OUTSIDE UTILITIES COST*		495546.	862345.	1458095.
	SITE IMPROVEMENT COST	($)			
82	UCT (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	5451012.	9485793.	16039058.
84	*SITE IMPROVEMENT COST*	($)	27255.	47429.	80195.
85	TOTAL DIRECT CONSTRUCTION COST	($)	5478267.	9533221.	16119253.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. & ADM. COST	($)	547827.	953322.	1611924.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	1643479.	2859965.	4835775.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	273913.	476661.	805963.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	1095653.	1906644.	3223850.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	38348.	66733.	112835.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	164348.	285997.	483578.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	328696.	571993.	967155.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	4092261.	7121312.	12041077.

OWNER'S COST

LAND COST					
101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	54783.	95332.	161192.
PROJECT MANAGEMENT COST					
103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	109565.	190664.	322385.
LICENSING COST					
105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	219131.	381329.	644770.
TAXES, INSURANCE AND INTEREST					
107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	1095653.	1906644.	3223850.
PREOPERATIONAL TESTING AND STARTUP					
109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	1095653.	1906644.	3223850.
111	TOTAL OWNER'S COST	($)	2574784.	4480613.	7576047.
TOTAL CAPITAL CONSTRUCTION COST					
112	INCREMENT OF TOTAL PLANT COST	($)	12145312.	21135136.	35736352.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	268.10	804.30	1608.60
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	78285.	234856.	469711.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	3643593.	6340539.	10720903.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	46.54	27.00	22.82

* * * HEAD END REPROCESSING OF IM AND 25 RECYCLE SPENT FUEL ELEMENTS (A1 & A19)$ B7* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	268.1	804.3	1608.6
PROCESSING EQUIPMENT COST	($1000)	1233.5	2342.5	3837.0
PLANT DIRECT CONSTRUCTION COST	($1000)	5478.3	9533.2	16119.3
PLANT INDIRECT CONSTRUCTION COST	($1000)	4092.3	7121.3	12041.1
PLANT OWNER'S COST	($1000)	2574.8	4480.6	7576.0
PLANT TOTAL COST	($1000)	12145.3	21135.1	35736.3
UNIT COST	(DOLLARS/KILOGRAM)	46.54	27.00	22.82

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 6.11101E 01 A2 = 3.19337E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -1.01570E-03 B2 = -2.08772E-04 B3 = 0.0 B4 = 0.0

*** * C O S T E S T I M A T E P R E P A R A T I O N * ***

			CASE ESTIMATES		
			CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	660000.	750000.	905000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = HEAVILY SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM 2, TABLES 5 AND 6)				
	TYPE (2) = MEDIUM SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM 4, TABLES 5 AND 6)				
2	TYPE (1)		4100.	4400.	4800.
3	TYPE (2)		9000.	11000.	15000.
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	1550.	1700.	1900.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	30.0	30.0	30.0
7	STD. CELL HEIGHT	(FT)	40.0	40.0	40.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.33	2.33	2.33
9	GROSS CELL VOLUME	(CU FT)	9553.	10252.	11184.
10	LINEAR FT. OF CELL	(FT)	7.96	8.54	9.32
11	TYPE (2) STD. CELL WIDTH	(FT)	30.0	30.0	30.0
12	STD. CELL HEIGHT	(FT)	40.0	40.0	40.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		2.33	2.33	2.33
14	GROSS CELL VOLUME	(CU FT)	20970.	25630.	34950.
15	LINEAR FT. OF CELL	(FT)	17.47	21.36	29.12
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		18.00	18.00	18.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		16.00	16.00	16.00
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		171954.	184536.	201312.
25	TYPE (2)		335520.	410080.	559200.
26	TYPE (3)				
27	TOTAL		558866.	671704.	863296.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	4185.	4590.	5130.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	4.0	4.0	4.0
33	STD. AREA HEIGHT	(FT)	10.0	10.0	10.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	318.	342.	373.
36	TYPE (2) STD. AREA WIDTH	(FT)	4.0	4.0	4.0
37	STD. AREA HEIGHT	(FT)	10.0	10.0	10.0
38	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
39	GROSS VOLUME	(CU FT)	699.	854.	1165.
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	239.	256.	280.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	36779.	39470.	43058.
48	TYPE (2) CELL AREA	(SQ FT)	524.	641.	874.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
51	GROSS VOLUME	(CU FT)	80734.	98675.	134557.
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		2.30	2.30	2.30
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		29295.	32130.	35910.
	CELL OPERATING SPACE				
64	TYPE (1)		2229.	2392.	2610.
65	TYPE (2)		4893.	5980.	8155.
66	TYPE (3)				
67	TOTAL		7122.	8372.	10765.
	CRANE BAY SPACE				
68	TYPE (1)		84592.	90781.	99034.
69	TYPE (2)		185689.	226953.	309482.
70	TYPE (3)				
71	TOTAL		270281.	317735.	408516.
72	TOTAL OUT-OF-CELL SPACE COST		306698.	358237.	455191.
73	PROCESSING SPACE TOTAL COST	($)	865563.	1029941.	1318486.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUP (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	66724.	80677.	104221.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCP (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	467069.	564742.	729547.
	OUTSIDE UTILITIES COST	($)			
79	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		1992631.	2344681.	2953032.
81	OUTSIDE UTILITIES COST		199263.	234468.	295303.
	SITE IMPROVEMENT COST	($)			
82	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	2191894.	2579149.	3248335.
84	SITE IMPROVEMENT COST	($)	10959.	12896.	16242.
85	TOTAL DIRECT CONSTRUCTION COST	($)	2202853.	2592044.	3264576.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	220285.	259204.	326457.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	660856.	777613.	979373.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	110143.	129602.	163229.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	440571.	518409.	652915.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	15420.	18144.	22852.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	66086.	77761.	97937.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	132171.	155523.	195875.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	1645529.	1936254.	2438636.

OWNER'S COST

LAND COST

101	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	22029.	25920.	32646.

PROJECT MANAGEMENT COST

103	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	44057.	51841.	65292.

LICENSING COST

105	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	88114.	103682.	130583.

TAXES, INSURANCE AND INTEREST

107	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	440571.	518409.	652915.

PREOPERATIONAL TESTING AND STARTUP

109	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	440571.	518409.	652915.
111	TOTAL OWNER'S COST	($)	1035341.	1218260.	1534350.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	4883722.	5746558.	7237562.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	5.00	15.00	30.00
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		1460.	4380.	8760.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	1465116.	1723967.	2171268.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	1003.50	393.60	247.86

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	5.0	15.0	30.0
PROCESSING EQUIPMENT COST	($1000)	660.0	750.0	905.0
PLANT DIRECT CONSTRUCTION COST	($1000)	2202.9	2592.0	3264.6
PLANT INDIRECT CONSTRUCTION COST	($1000)	1645.5	1936.3	2438.6
PLANT OWNER'S COST	($1000)	1035.3	1218.3	1534.3
PLANT TOTAL COST	($1000)	4883.7	5746.6	7237.6
UNIT COST	(DOLLARS/KILOGRAM)	1003.50	393.60	247.86

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 1.60233E 03   A2 = 6.25028E 02   A3 = 0.0   A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -9.35919E-02   B2 = -3.08309E-02   B3 = 0.0   B4 = 0.0

*** * C O S T   E S T I M A T E   P R E P A R A T I O N * ***

			CASE ESTIMATES		
			MS23 1	MS23 2	MS23 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	2155000.	3854000.	6347000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = MEDIUM SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM 4, TABLES 5 AND 6)				
	TYPE (2) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)				
2	TYPE (1)		7200.	8640.	11700.
3	TYPE (2)		22200.	38400.	61800.
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	16800.	28000.	38500.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	30.0	30.0	30.0
7	STD. CELL HEIGHT	(FT)	40.0	40.0	40.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.33	2.33	2.33
9	GROSS CELL VOLUME	(CU FT)	16776.	20131.	27261.
10	LINEAR FT. OF CELL	(FT)	13.98	16.78	22.72
11	TYPE (2) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
12	STD. CELL HEIGHT	(FT)	36.0	36.0	36.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
14	GROSS CELL VOLUME	(CU FT)	88800.	153600.	247200.
15	LINEAR FT. OF CELL	(FT)	94.87	164.10	264.10
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		16.00	16.00	16.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		39.00	39.00	39.00
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		268416.	322099.	436176.
25	TYPE (2)		3463200.	5990400.	9640800.
26	TYPE (3)				
27	TOTAL		3783006.	6389586.	10179758.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	28.0	28.0	28.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	45360.	75600.	103950.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	4.0	4.0	4.0
33	STD. AREA HEIGHT	(FT)	10.0	10.0	10.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	559.	671.	909.
36	TYPE (2) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
37	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
38	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
39	GROSS VOLUME	(CU FT)	42503.	73518.	118318.
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	419.	503.	682.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	64588.	77505.	104955.
48	TYPE (2) CELL AREA	(SQ FT)	2467.	4267.	6867.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
51	GROSS VOLUME	(CU FT)	379866.	657066.	1057466.
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		2.30	2.30	2.30
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		317520.	529200.	727650.
	CELL OPERATING SPACE				
64	TYPE (1)		3914.	4697.	6361.
65	TYPE (2)		297518.	514626.	828226.
66	TYPE (3)				
67	TOTAL		301432.	519323.	834586.
	CRANE BAY SPACE				
68	TYPE (1)		148551.	178261.	241396.
69	TYPE (2)		873693.	1511251.	2432170.
70	TYPE (3)				
71	TOTAL		1022244.	1689512.	2673565.
72	TOTAL OUT-OF-CELL SPACE COST		1641195.	2738034.	4235801.
73	PROCESSING SPACE TOTAL COST	($)	5424201.	9127620.	14415559.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	233167.	384312.	605576.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	1632166.	2690182.	4239030.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		9211367.	15671802.	25001568.
81	OUTSIDE UTILITIES COST		921136.	1567179.	2500155.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	10132503.	17238976.	27501712.
84	SITE IMPROVEMENT COST	($)	50663.	86195.	137509.
85	TOTAL DIRECT CONSTRUCTION COST	($)	10183165.	17325168.	27639216.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	1018316.	1732516.	2763920.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	3054949.	5197549.	8291763.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	509158.	866258.	1381960.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	2036632.	3465033.	5527842.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	71282.	121276.	193474.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	305495.	519755.	829176.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	610990.	1039510.	1658352.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	7606820.	12941896.	20646464.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	101832.	173252.	276392.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	203663.	346503.	552784.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	407327.	693007.	1105568.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	2036632.	3465033.	5527842.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	2036632.	3465033.	5527842.
111	TOTAL OWNER'S COST	($)	4786085.	8142827.	12990428.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	22576064.	38409872.	61276096.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	30.38	91.13	182.25
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	8870.	26609.	53217.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	6772818.	11522959.	18382816.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	763.61	433.06	345.43

* * * CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (23 RECYCLE)$ B9 * * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	30.4	91.1	182.3
PROCESSING EQUIPMENT COST	($1000)	2155.0	3854.0	6347.0
PLANT DIRECT CONSTRUCTION COST	($1000)	10183.2	17325.2	27639.2
PLANT INDIRECT CONSTRUCTION COST	($1000)	7606.8	12941.9	20646.5
PLANT OWNER'S COST	($1000)	4786.1	8142.8	12990.4
PLANT TOTAL COST	($1000)	22576.1	38409.9	61276.1
UNIT COST	(DOLLARS/KILOGRAM)	763.61	433.06	345.43

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 1.01399E 03 A2 = 5.42906E 02 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -9.33642E-03 B2 = -2.48090E-03 B3 = 0.0 B4 = 0.0

****C O S T E S T I M A T E P R E P A R A T I O N****

				CASE ESTIMATES	
			CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	400000.	1100000.	2000000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)				
	TYPE (2) = SHIELDED LIQUID WASTE STG - CONTACT MAINTENANCE (ITEM 10, TABLES 5 AND 6)				
	TYPE (3) = GLOVE BOXES AND HOODS - DIRECT MAINTENANCE (ITEM 8, TABLES 5 AND 6)				
2	TYPE (1)		2500.	3000.	4500.
3	TYPE (2)		200.	250.	300.
4	TYPE (3)		200.	250.	300.
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	1100.	1250.	1400.
	PROCESSING SPACE COST (HOT CELLS) ($)				
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT	(FT)	30.0	30.0	30.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
9	GROSS CELL VOLUME	(CU FT)	10000.	12000.	18000.
10	LINEAR FT. OF CELL	(FT)	12.82	15.38	23.08
11	TYPE (2) STD. CELL WIDTH	(FT)	10.0	10.0	10.0
12	STD. CELL HEIGHT	(FT)	12.0	12.0	12.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
14	GROSS CELL VOLUME	(CU FT)	500.	625.	750.
15	LINEAR FT. OF CELL	(FT)	4.17	5.21	6.25
16	TYPE (3) STD. CELL WIDTH	(FT)	2.5	2.5	2.5
17	STD. CELL HEIGHT	(FT)	4.0	4.0	4.0
18	SUF (FROM ORNL TM-4613, TABLE 5)		2.20	2.20	2.20
19	GROSS CELL VOLUME	(CU FT)	440.	550.	660.
20	LINEAR FT. OF CELL	(FT)	44.00	55.00	66.00
	IN-CELL SPACE UNIT COST ($/CU FT)				
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		39.00	39.00	39.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		2.30	2.30	2.30
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)		146.00	146.00	146.00
	IN-CELL SPACE TOTAL COST ($)				
24	TYPE (1)		390000.	468000.	702000.
25	TYPE (2)		1150.	1437.	1725.
26	TYPE (3)		64240.	80300.	96360.
27	TOTAL		455390.	549737.	800085.

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	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	2970.	3375.	3780.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	5744.	6892.	10338.
36	TYPE (2) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
37	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
38	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
39	GROSS VOLUME	(CU FT)	583.	729.	875.
40	TYPE (3) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
41	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
42	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
43	GROSS VOLUME	(CU FT)	6160.	7700.	9240.
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	333.	400.	600.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	51333.	61600.	92400.
48	TYPE (2) CELL AREA	(SQ FT)	42.	52.	63.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	0.0	0.0	0.0
51	GROSS VOLUME	(CU FT)	0.	0.	0.
52	TYPE (3) CELL AREA	(SQ FT)	110.	137.	165.
53	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
54	STD. BAY HEIGHT	(FT)	0.0	0.0	0.0
55	GROSS VOLUME	(CU FT)	0.	0.	0.
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)		7.00	7.00	7.00
	CRANE BAY SPACE UCCF (FROM TM-4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		0.0	0.0	0.0
62	TYPE (3)		0.0	0.0	0.0

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		20790.	23625.	26460.
	CELL OPERATING SPACE				
64	TYPE (1)		40205.	48246.	72369.
65	TYPE (2)		4083.	5104.	6125.
66	TYPE (3)		43120.	53900.	64680.
67	TOTAL		87408.	107250.	143174.
	CRANE BAY SPACE				
68	TYPE (1)		118067.	141680.	212520.
69	TYPE (2)		0.	0.	0.
70	TYPE (3)		0.	0.	0.
71	TOTAL		118067.	141680.	212520.
72	TOTAL OUT-OF-CELL SPACE COST		226265.	272555.	382154.
73	PROCESSING SPACE TOTAL COST	($)	681555.	822292.	1182238.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	38024.	46223.	64876.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCP (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	266168.	323563.	454132.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		1347821.	2245854.	3536369.
81	OUTSIDE UTILITIES COST		134782.	224585.	363637.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	1482603.	2470439.	4000005.
84	SITE IMPROVEMENT COST	($)	7413.	12352.	20000.
85	TOTAL DIRECT CONSTRUCTION COST	($)	1490016.	2482791.	4020005.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	149002.	248279.	402000.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	447005.	744837.	1206001.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	74501.	124140.	201000.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	298003.	496558.	804001.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	10430.	17380.	28140.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	44700.	74484.	120600.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	89401.	148967.	241200.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	1113041.	1854642.	3002941.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	14900.	24828.	40200.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	29800.	49656.	80400.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	59601.	99312.	160800.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	298003.	496558.	804001.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	298003.	496558.	804001.
111	TOTAL OWNER'S COST	($)	700307.	1166911.	1889401.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	3303364.	5504344.	8912347.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	5.60	16.80	33.60
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	1635.	4906.	9811.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	991009.	1651302.	2673703.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	606.05	336.62	272.52

* * * TRISO MICROSPHERE COATING PROCESS (25 RECYCLE PARTICLES) 235002 (L-2.C.(1))$ B10* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	5.6	16.8	33.6
PROCESSING EQUIPMENT COST	($1000)	400.0	1100.0	2000.0
PLANT DIRECT CONSTRUCTION COST	($1000)	1490.0	2482.8	4020.0
PLANT INDIRECT CONSTRUCTION COST	($1000)	1113.0	1854.6	3002.9
PLANT OWNER'S COST	($1000)	700.3	1166.9	1889.4
PLANT TOTAL COST	($1000)	3303.4	5504.3	8912.3
UNIT COST	(DOLLARS/KILOGRAM)	606.05	336.62	272.52

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 8.13191E 02 A2 = 4.15794E 02 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -5.25014E-02 B2 = -1.25743E-02 B3 = 0.0 B4 = 0.0

* * * PRP SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 25 RECYCLE M-4.B(2)$ B11* * * DATE IS 07-18-74 PAGE 1

COST ESTIMATE PREPARATION

			CASE ESTIMATES CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	700000.	1000000.	1350000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)				
	TYPE (2) = SHIELDED LIQUID WASTE STG - CONTACT MAINTENANCE (ITEM 10, TABLES 5 AND 6)				
	TYPE (3) = GLOVE BOXES AND HOODS - DIRECT MAINTENANCE (ITEM 8, TABLES 5 AND 6)				
2	TYPE (1)		7000.	10000.	14000.
3	TYPE (2)		200.	250.	300.
4	TYPE (3)		100.	150.	200.
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	1000.	1500.	2000.
	PROCESSING SPACE COST (HOT CELLS) ($)				
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT	(FT)	30.0	30.0	30.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
9	GROSS CELL VOLUME	(CU FT)	28000.	40000.	56000.
10	LINEAR FT. OF CELL	(FT)	35.90	51.28	71.79
11	TYPE (2) STD. CELL WIDTH	(FT)	10.0	10.0	10.0
12	STD. CELL HEIGHT	(FT)	12.0	12.0	12.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
14	GROSS CELL VOLUME	(CU FT)	500.	625.	750.
15	LINEAR FT. OF CELL	(FT)	4.17	5.21	6.25
16	TYPE (3) STD. CELL WIDTH	(FT)	2.5	2.5	2.5
17	STD. CELL HEIGHT	(FT)	4.0	4.0	4.0
18	SUF (FROM ORNL TM-4613, TABLE 5)		2.20	2.20	2.20
19	GROSS CELL VOLUME	(CU FT)	220.	330.	440.
20	LINEAR FT. OF CELL	(FT)	22.00	33.00	44.00
	IN-CELL SPACE UNIT COST ($/CU FT)				
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		39.00	39.00	39.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		2.30	2.30	2.30
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)		146.00	146.00	146.00
	IN-CELL SPACE TOTAL COST ($)				
24	TYPE (1)		1092000.	1560000.	2184000.
25	TYPE (2)		1150.	1437.	1725.
26	TYPE (3)		32120.	48180.	64240.
27	TOTAL		1125268.	1609616.	2249963.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	2700.	4050.	5400.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	16082.	22974.	32164.
36	TYPE (2) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
37	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
38	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
39	GROSS VOLUME	(CU FT)	583.	729.	875.
40	TYPE (3) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
41	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
42	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
43	GROSS VOLUME	(CU FT)	3080.	4620.	6160.
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	933.	1333.	1867.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	143733.	205333.	287466.
48	TYPE (2) CELL AREA	(SQ FT)	42.	52.	63.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	0.0	0.0	0.0
51	GROSS VOLUME	(CU FT)	0.	0.	0.
52	TYPE (3) CELL AREA	(SQ FT)	55.	82.	110.
53	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
54	STD. BAY HEIGHT	(FT)	0.0	0.0	0.0
55	GROSS VOLUME	(CU FT)	0.	0.	0.
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)		7.00	7.00	7.00
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		0.0	0.0	0.0
62	TYPE (3)		0.0	0.0	0.0

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		18900.	28350.	37800.
	CELL OPERATING SPACE				
64	TYPE (1)		112574.	160820.	225149.
65	TYPE (2)		4083.	5104.	6125.
66	TYPE (3)		21560.	32340.	43120.
67	TOTAL		138218.	198265.	274394.
	CRANE BAY SPACE				
68	TYPE (1)		330586.	472266.	661173.
69	TYPE (2)		0.	0.	0.
70	TYPE (3)		0.	0.	0.
71	TOTAL		330586.	472266.	661173.
72	TOTAL OUT-OF-CELL SPACE COST		487704.	698881.	973366.
73	PROCESSING SPACE TOTAL COST	($)	1612971.	2308496.	3223329.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	80752.	115085.	159871.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	565263.	805592.	1119093.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		2878234.	4114087.	5692422.
81	OUTSIDE UTILITIES COST		287823.	411409.	569242.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	3166057.	4525495.	6261663.
84	SITE IMPROVEMENT COST	($)	15830.	22627.	31308.
85	TOTAL DIRECT CONSTRUCTION COST	($)	3181887.	4548122.	6292971.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST					
86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	318189.	454812.	629297.
ENGINEERING COST					
88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	954566.	1364436.	1887890.
MISC. CONSTRUCTION COST					
90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	159094.	227406.	314649.
CONTINGENCY ALLOWANCE					
92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	636377.	909624.	1258594.
SPARE PARTS COST					
94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	22273.	31837.	44051.
NONINSTALLED SPARE EQUIPMENT COST					
96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	95457.	136444.	188789.
QUALITY ASSURANCE COST					
98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	190913.	272887.	377578.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	2376867.	3397444.	4700845.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	31819.	45481.	62930.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	63638.	90962.	125859.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	127275.	181925.	251719.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	636377.	909624.	1258594.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	636377.	909624.	1258594.
111	TOTAL OWNER'S COST	($)	1495486.	2137616.	2957695.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	7054240.	10083182.	13951511.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	23.10	71.80	143.60
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		6745.	20966.	41931.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	2116271.	3024954.	4185452.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	313.74	144.28	99.82

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	23.1	71.8	143.6
PROCESSING EQUIPMENT COST	($1000)	700.0	1000.0	1350.0
PLANT DIRECT CONSTRUCTION COST	($1000)	3181.9	4548.1	6293.0
PLANT INDIRECT CONSTRUCTION COST	($1000)	2376.9	3397.4	4700.8
PLANT OWNER'S COST	($1000)	1495.5	2137.6	2957.7
PLANT TOTAL COST	($1000)	7054.2	10083.2	13951.5
UNIT COST	(DOLLARS/KILOGRAM)	313.74	144.28	99.82

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 4.53523E 02 A2 = 2.08554E 02 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -1.59510E-02 B2 = -5.13132E-03 B3 = 0.0 B4 = 0.0

			CASE ESTIMATES		
* * C O S T E S T I M A T E P R E P A R A T I O N * *			CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	70000.	135000.	215000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)				
2	TYPE (1)		5700.	6500.	7800.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	3500.	3700.	4200.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT	(FT)	30.0	30.0	30.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
9	GROSS CELL VOLUME	(CU FT)	22800.	26000.	31200.
10	LINEAR FT. OF CELL	(FT)	29.23	33.33	40.00
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		39.00	39.00	39.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		889200.	1014000.	1216800.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		922470.	1063617.	1282763.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	9450.	9990.	11340.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	13095.	14933.	17920.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	760.	867.	1040.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	117040.	133467.	160160.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		66150.	69930.	79380.
	CELL OPERATING SPACE				
64	TYPE (1)		91668.	104533.	125440.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		91668.	104533.	125440.
	CRANE BAY SPACE				
68	TYPE (1)		269192.	306973.	368368.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		269192.	306973.	368368.
72	TOTAL OUT-OF-CELL SPACE COST		427009.	481436.	573188.
73	PROCESSING SPACE TOTAL COST	($)	1349479.	1545053.	1855950.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	67163.	78498.	95060.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCP (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	470138.	549486.	665420.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		1889616.	2229538.	2736369.
81	OUTSIDE UTILITIES COST		188962.	222954.	273637.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	2078577.	2452491.	3010005.
84	SITE IMPROVEMENT COST	($)	10393.	12262.	15050.
85	TOTAL DIRECT CONSTRUCTION COST	($)	2088969.	2464753.	3025055.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST					
86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	208897.	246475.	302505.
ENGINEERING COST					
88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	626691.	739426.	907516.
MISC. CONSTRUCTION COST					
90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	104448.	123238.	151253.
CONTINGENCY ALLOWANCE					
92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	417794.	492951.	605011.
SPARE PARTS COST					
94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	14623.	17253.	21175.
NONINSTALLED SPARE EQUIPMENT COST					
96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	62669.	73943.	90752.
QUALITY ASSURANCE COST					
98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	125338.	147885.	181503.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	1560458.	1841168.	2259712.

OWNER'S COST

LAND COST

101	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	20890.	24648.	30251.

PROJECT MANAGEMENT COST

103	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	41779.	49295.	60501.

LICENSING COST

105	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	83559.	98590.	121002.

TAXES, INSURANCE AND INTEREST

107	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	417794.	492951.	605011.

PREOPERATIONAL TESTING AND STARTUP

109	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	417794.	492951.	605011.
111	TOTAL OWNER'S COST	($)	981815.	1150433.	1421775.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	4631242.	5464354.	6706542.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	22.70	68.10	136.10
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		6628.	19885.	39741.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	1389372.	1639305.	2011962.
117	PRODUCT UNIT COST (DOLLARS/KILOGRAM OF HEAVY METAL)		209.61	82.44	50.63

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	22.7	68.1	136.1
PROCESSING EQUIPMENT COST	($1000)	70.0	135.0	215.0
PLANT DIRECT CONSTRUCTION COST	($1000)	2089.0	2464.8	3025.1
PLANT INDIRECT CONSTRUCTION COST	($1000)	1560.5	1841.2	2259.7
PLANT OWNER'S COST	($1000)	981.8	1158.4	1421.8
PLANT TOTAL COST	($1000)	4631.2	5464.4	6706.5
UNIT COST	(DOLLARS/KILOGRAM)	209.61	82.44	50.63

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 3.34233E 02 A2 = 1.34336E 02 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -2.05549E-02 B2 = -7.17021E-03 B3 = 0.0 B4 = 0.0

			CASE 1	ESTIMATES CASE 2	CASE 3
	*** * C O S T E S T I M A T E P R E P A R A T I O N * ***				
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	200000.	350000.	510000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM 7, TABLES 5 AND 6)				
2	TYPE (1)		5000.	7000.	10000.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	500.	900.	1200.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	20.0	20.0	20.0
7	STD. CELL HEIGHT	(FT)	20.0	20.0	20.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
9	GROSS CELL VOLUME	(CU FT)	12500.	17500.	25000.
10	LINEAR FT. OF CELL	(FT)	31.25	43.75	62.50
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		9.00	9.00	9.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		112500.	157500.	225000.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		145770.	207117.	290965.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	1350.	2430.	3240.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
33	STD. AREA HEIGHT	(FT)	20.0	20.0	20.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	6250.	8750.	12500.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	625.	875.	1250.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	96250.	134750.	192500.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		9450.	17010.	22680.
	CELL OPERATING SPACE				
64	TYPE (1)		43750.	61250.	87500.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		43750.	61250.	87500.
	CRANE BAY SPACE				
68	TYPE (1)		221375.	309925.	442750.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		221375.	309925.	442750.
72	TOTAL OUT-OF-CELL SPACE COST		274575.	388185.	552930.
73	PROCESSING SPACE TOTAL COST	($)	420345.	595302.	843895.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUP (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	56579.	79151.	111524.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCP (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	396050.	554059.	780668.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		1016395.	1499360.	2134561.
81	OUTSIDE UTILITIES COST		101639.	149936.	213456.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	1118034.	1649295.	2348017.
84	SITE IMPROVEMENT COST	($)	5590.	8246.	11740.
85	TOTAL DIRECT CONSTRUCTION COST	($)	1123624.	1657541.	2359757.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST					
86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	112362.	165754.	235976.
ENGINEERING COST					
88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	337087.	497262.	707927.
MISC. CONSTRUCTION COST					
90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	56181.	82877.	117988.
CONTINGENCY ALLOWANCE					
92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	224725.	331508.	471951.
SPARE PARTS COST					
94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	7865.	11603.	16518.
NONINSTALLED SPARE EQUIPMENT COST					
96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	33709.	49726.	70793.
QUALITY ASSURANCE COST					
98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	67417.	99452.	141585.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	839347.	1238181.	1762736.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	11236.	16575.	23598.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	22472.	33151.	47195.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	44945.	66302.	94390.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	224725.	331508.	471951.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	224725.	331508.	471951.
111	TOTAL OWNER'S COST	($)	528103.	779044.	1109085.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	2491073.	3674766.	5231578.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	20.70	62.20	124.50
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		6044.	18162.	36354.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	747322.	1102429.	1569473.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	123.64	60.70	43.17

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	20.7	62.2	124.5
PROCESSING EQUIPMENT COST	($1000)	200.0	350.0	510.0
PLANT DIRECT CONSTRUCTION COST	($1000)	1123.6	1657.5	2359.8
PLANT INDIRECT CONSTRUCTION COST	($1000)	839.3	1238.2	1762.7
PLANT OWNER'S COST	($1000)	528.1	779.0	1109.1
PLANT TOTAL COST	($1000)	2491.1	3674.8	5231.6
UNIT COST	(DOLLARS/KILOGRAM)	123.64	60.70	43.17

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 1.76307E 02 A2 = 8.52934E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -1.71433E-02 B2 = -5.46912E-03 B3 = 0.0 B4 = 0.0

*** * C O S T E S T I M A T E P R E P A R A T I O N * ***

			CASE ESTIMATES MS23 1	MS23 2	MS23 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	2155000.	3854000.	6347000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = MEDIUM SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM 4, TABLES 5 AND 6)				
	TYPE (2) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)				
2	TYPE (1)		7200.	8640.	11700.
3	TYPE (2)		22200.	38400.	61800.
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	16800.	28000.	38500.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	30.0	30.0	30.0
7	STD. CELL HEIGHT	(FT)	40.0	40.0	40.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.33	2.33	2.33
9	GROSS CELL VOLUME	(CU FT)	16776.	20131.	27261.
10	LINEAR FT. OF CELL	(FT)	13.98	16.78	22.72
11	TYPE (2) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
12	STD. CELL HEIGHT	(FT)	36.0	36.0	36.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
14	GROSS CELL VOLUME	(CU FT)	88800.	153600.	247200.
15	LINEAR FT. OF CELL	(FT)	94.87	164.10	264.10
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		16.00	16.00	16.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		39.00	39.00	39.00
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		268416.	322099.	436176.
25	TYPE (2)		3463200.	5990400.	9640800.
26	TYPE (3)				
27	TOTAL		3763734.	6360678.	10141214.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	28.0	28.0	28.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	45360.	75600.	103950.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	4.0	4.0	4.0
33	STD. AREA HEIGHT	(FT)	10.0	10.0	10.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	559.	671.	909.
36	TYPE (2) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
37	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
38	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
39	GROSS VOLUME	(CU FT)	42503.	73518.	118318.
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	419.	503.	682.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	64588.	77505.	104955.
48	TYPE (2) CELL AREA	(SQ FT)	2467.	4267.	6867.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
51	GROSS VOLUME	(CU FT)	379866.	657066.	1057466.
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		2.30	2.30	2.30
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		317520.	529200.	727650.
	CELL OPERATING SPACE				
64	TYPE (1)		3914.	4697.	6361.
65	TYPE (2)		297518.	514626.	828226.
66	TYPE (3)				
67	TOTAL		301432.	519323.	834586.
	CRANE BAY SPACE				
68	TYPE (1)		148551.	178261.	241396.
69	TYPE (2)		873693.	1511251.	2432170.
70	TYPE (3)				
71	TOTAL		1022244.	1689512.	2673565.
72	TOTAL OUT-OF-CELL SPACE COST		1641195.	2738034.	4235801.
73	PROCESSING SPACE TOTAL COST	($)	5404929.	9098712.	14377015.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	230579.	380431.	600401.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	1614056.	2663016.	4302809.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		9173985.	15615728.	24926800.
81	OUTSIDE UTILITIES COST		917398.	1561572.	2492679.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	10091383.	17177296.	27419472.
84	SITE IMPROVEMENT COST	($)	50457.	85886.	137097.
85	TOTAL DIRECT CONSTRUCTION COST	($)	10141839.	17263168.	27556560.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST					
86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	1014184.	1726316.	2755655.
ENGINEERING COST					
88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	3042551.	5178949.	8266966.
MISC. CONSTRUCTION COST					
90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	507092.	863158.	1377827.
CONTINGENCY ALLOWANCE					
92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	2028367.	3452633.	5511311.
SPARE PARTS COST					
94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	70993.	120842.	192896.
NONINSTALLED SPARE EQUIPMENT COST					
96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	304255.	517895.	826697.
QUALITY ASSURANCE COST					
98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	608510.	1035790.	1653393.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	7575949.	12895582.	20584704.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	101418.	172632.	275566.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	202837.	345263.	551131.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	405674.	690527.	1102262.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	2028367.	3452633.	5511311.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	2028367.	3452633.	5511311.
111	TOTAL OWNER'S COST	($)	4766662.	8113687.	12951580.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	22484432.	38272416.	61092832.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	30.38	91.13	182.25
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		8870.	26609.	53217.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	6745329.	11481722.	18[illegible]7840.
117	PRODUCT UNIT COST (DOLLARS/KILOGRAM OF HEAVY METAL)		760.51	431.51	[illegible]4.40

* * * CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (IN RECYCLE)$ B1* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	30.4	91.1	182.3
PROCESSING EQUIPMENT COST	($1000)	2155.0	3854.0	6347.0
PLANT DIRECT CONSTRUCTION COST	($1000)	10141.8	17263.2	27556.6
PLANT INDIRECT CONSTRUCTION COST	($1000)	7575.9	12895.6	20584.7
PLANT OWNER'S COST	($1000)	4766.7	8113.7	12951.6
PLANT TOTAL COST	($1000)	22484.4	38272.4	61092.8
UNIT COST	(DOLLARS/KILOGRAM)	760.51	431.51	344.40

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 1.00963E 03 A2 = 5.40644E 02 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -9.32850F-03 B2 = -2.47442E-03 B3 = 0.0 B4 = 0.0

COST ESTIMATE PREPARATION

			CASE 1	CASE ESTIMATES CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	1913000.	4094200.	6366100.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM 7, TABLES 5 AND 6)				
	TYPE (2) = GLOVE BOXES AND HOODS - DIRECT MAINTENANCE (ITEM 8, TABLES 5 AND 6)				
2	TYPE (1)		2579.	4813.	7938.
3	TYPE (2)		307.	307.	461.
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	1638.	3260.	4902.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	20.0	20.0	20.0
7	STD. CELL HEIGHT	(FT)	20.0	20.0	20.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
9	GROSS CELL VOLUME	(CU FT)	6448.	12033.	19845.
10	LINEAR FT. OF CELL	(FT)	16.12	30.08	49.61
11	TYPE (2) STD. CELL WIDTH	(FT)	2.5	2.5	2.5
12	STD. CELL HEIGHT	(FT)	4.0	4.0	4.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		2.20	2.20	2.20
14	GROSS CELL VOLUME	(CU FT)	675.	675.	1014.
15	LINEAR FT. OF CELL	(FT)	67.54	67.54	101.42
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		9.00	9.00	9.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		146.00	146.00	146.00
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		58028.	108293.	178605.
25	TYPE (2)		98608.	98608.	148073.
26	TYPE (3)				
27	TOTAL		188756.	255081.	390918.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	4423.	8602.	13235.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
33	STD. AREA HEIGHT	(FT)	20.0	20.0	20.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	3224.	6016.	9922.
36	TYPE (2) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
37	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
38	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
39	GROSS VOLUME	(CU FT)	9456.	9456.	14199.
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	322.	602.	992.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	49646.	92650.	152806.
48	TYPE (2) CELL AREA	(SQ FT)	169.	169.	254.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	0.0	0.0	0.0
51	GROSS VOLUME	(CU FT)	0.	0.	0.
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		0.0	0.0	0.0
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		30958.	61614.	92648.
	CELL OPERATING SPACE				
64	TYPE (1)		22566.	42114.	69457.
65	TYPE (2)		66189.	66189.	99392.
66	TYPE (3)				
67	TOTAL		88755.	108303.	168849.
	CRANE BAY SPACE				
68	TYPE (1)		114185.	213095.	351455.
69	TYPE (2)		0.	0.	0.
70	TYPE (3)				
71	TOTAL		114185.	213095.	351455.
72	TOTAL OUT-OF-CELL SPACE COST		233899.	383012.	612951.
73	PROCESSING SPACE TOTAL COST	($)	422654.	638093.	1003869.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	42824.	66873.	106295.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	299768.	468112.	744062.
	OUTSIDE UTILITIES COST	($)			
79	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		2635421.	5200403.	8114031.
81	OUTSIDE UTILITIES COST		263542.	520040.	811403.
	SITE IMPROVEMENT COST	($)			
82	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	2898963.	5720443.	8925433.
84	SITE IMPROVEMENT COST	($)	14495.	28602.	44627.
85	TOTAL DIRECT CONSTRUCTION COST	($)	2913457.	5749045.	8970060.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	291346.	574904.	897006.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	874037.	1724713.	2691017.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	145673.	287452.	448503.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	582691.	1149808.	1794011.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	20394.	40243.	62790.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	87404.	172471.	269102.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	174807.	344943.	538204.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	2176349.	4294533.	6700629.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	29135.	57490.	89701.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	58269.	114981.	179401.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	116538.	229962.	358802.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	582691.	1149808.	1794011.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	582691.	1149808.	1794011.
111	TOTAL OWNER'S COST	($)	1369320.	2702049.	4215926.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	6459130.	12745627.	19886608.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	23.30	69.80	139.60
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		6804.	20382.	40763.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	1937738.	3823687.	5965981.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	284.91	187.60	146.36

* * * TRISO COATING PROCESS IN FISILE PARTICLES UO2 (L-2.J.(1))$ B15* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	23.3	69.8	139.6
PROCESSING EQUIPMENT COST	($1000)	1913.0	4094.2	6366.1
PLANT DIRECT CONSTRUCTION COST	($1000)	2913.5	5749.0	8970.1
PLANT INDIRECT CONSTRUCTION COST	($1000)	2176.3	4294.5	6700.6
PLANT OWNER'S COST	($1000)	1369.3	2702.0	4215.9
PLANT TOTAL COST	($1000)	6459.1	12745.6	19886.6
UNIT COST	(DOLLARS/KILOGRAM)	284.81	187.60	146.36

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 3.51081E 02 A2 = 2.40477E 02 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -8.97820E-03 B2 = -3.55714E-03 B3 = 0.0 B4 = 0.0

*** * C O S T   E S T I M A T E   P R E P A R A T I O N * ***

			CASE 1	CASE ESTIMATES CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	525200.	1123500.	1800400.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM 7, TABLES 5 AND 6)				
	TYPE (2) = GLOVE BOXES AND HOODS - DIRECT MAINTENANCE (ITEM 8, TABLES 5 AND 6)				
2	TYPE (1)		2700.	7614.	11502.
3	TYPE (2)		195.	300.	600.
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	1836.	3672.	5784.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	20.0	20.0	20.0
7	STD. CELL HEIGHT	(FT)	20.0	20.0	20.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
9	GROSS CELL VOLUME	(CU FT)	6750.	19035.	28755.
10	LINEAR FT. OF CELL	(FT)	16.88	47.59	71.89
11	TYPE (2) STD. CELL WIDTH	(FT)	2.5	2.5	2.5
12	STD. CELL HEIGHT	(FT)	4.0	4.0	4.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		2.20	2.20	2.20
14	GROSS CELL VOLUME	(CU FT)	429.	660.	1320.
15	LINEAR FT. OF CELL	(FT)	42.90	66.00	132.00
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		9.00	9.00	9.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		146.00	146.00	146.00
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		60750.	171315.	258795.
25	TYPE (2)		62634.	96360.	192720.
26	TYPE (3)				
27	TOTAL		155504.	315855.	515755.

	GROSS OUT-OF-CELL SPACE REQUIRED (CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE			
28	STD. AREA WIDTH (FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT (FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)	2.70	2.70	2.70
31	GROSS VOLUME (CU FT)	4957.	9914.	15617.
	CELL OPERATING SPACE (CU FT)			
32	TYPE (1) STD. AREA WIDTH (FT)	10.0	10.0	10.0
33	STD. AREA HEIGHT (FT)	20.0	20.0	20.0
34	NO. OF CELL SIDES WITH OP. AREA	1.0	1.0	1.0
35	GROSS VOLUME (CU FT)	3375.	9517.	14377.
36	TYPE (2) STD. AREA WIDTH (FT)	10.0	10.0	10.0
37	STD. AREA HEIGHT (FT)	14.0	14.0	14.0
38	NO. OF CELL SIDES WITH OP. AREA	1.0	1.0	1.0
39	GROSS VOLUME (CU FT)	6006.	9240.	18480.
40	TYPE (3) STD. AREA WIDTH (FT)			
41	STD. AREA HEIGHT (FT)			
42	NO. OF CELL SIDES WITH OP. AREA			
43	GROSS VOLUME (CU FT)			
	CRANE BAY SPACE			
44	TYPE (1) CELL AREA (SQ FT)	338.	952.	1438.
45	SUF (FROM ORNL TM-4613, TABLE 5)	3.50	3.50	3.50
46	STD. BAY HEIGHT (FT)	44.0	44.0	44.0
47	GROSS VOLUME (CU FT)	51975.	146569.	221413.
48	TYPE (2) CELL AREA (SQ FT)	107.	165.	330.
49	SUF (FROM ORNL TM-4613, TABLE 5)	3.50	3.50	3.50
50	STD. BAY HEIGHT (FT)	0.0	0.0	0.0
51	GROSS VOLUME (CU FT)	0.	0.	0.
52	TYPE (3) CELL AREA (SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)			
54	STD. BAY HEIGHT (FT)			
55	GROSS VOLUME (CU FT)			
	OUT-OF-CELL SPACE UNIT COST ($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE	7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)			
57	TYPE (1)	7.00	7.00	7.00
58	TYPE (2)	7.00	7.00	7.00
59	TYPE (3)			
	CRANE BAY SPACE UCCF (FROM TM-4613, TABLE 6)			
60	TYPE (1)	2.30	2.30	2.30
61	TYPE (2)	0.0	0.0	0.0
62	TYPE (3)			

No.	Item	Units			
	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		34700.	69401.	109318.
	CELL OPERATING SPACE				
64	TYPE (1)		23625.	66622.	100642.
65	TYPE (2)		42042.	64680.	129360.
66	TYPE (3)				
67	TOTAL		65667.	131302.	230002.
	CRANE BAY SPACE				
68	TYPE (1)		119542.	337110.	509250.
69	TYPE (2)		0.	0.	0.
70	TYPE (3)				
71	TOTAL		119542.	337110.	509250.
72	TOTAL OUT-OF-CELL SPACE COST		219910.	537813.	848570.
73	PROCESSING SPACE TOTAL COST	($)	375414.	853668.	1364325.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	39180.	94021.	147216.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCP (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	274262.	658147.	1030509.
	OUTSIDE UTILITIES COST	($)			
79	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		1174876.	2635314.	4195233.
81	OUTSIDE UTILITIES COST		117488.	263531.	419523.
	SITE IMPROVEMENT COST	($)			
82	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	1292363.	2898845.	4614756.
84	SITE IMPROVEMENT COST	($)	6462.	14494.	23074.
85	TOTAL DIRECT CONSTRUCTION COST	($)	1298824.	2913339.	4637829.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST					
86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	129882.	291334.	463783.
ENGINEERING COST					
88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	389647.	874002.	1391348.
MISC. CONSTRUCTION COST					
90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	64941.	145667.	231891.
CONTINGENCY ALLOWANCE					
92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	259765.	582668.	927566.
SPARE PARTS COST					
94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	9092.	20393.	32465.
NONINSTALLED SPARE EQUIPMENT COST					
96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	38965.	87400.	139135.
QUALITY ASSURANCE COST					
98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	77929.	174800.	278270.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	970221.	2176261.	3464453.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	12988.	29133.	46378.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	25976.	58267.	92757.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	51953.	116534.	105513.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	259765.	582668.	927566.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	259765.	582668.	927566.
111	TOTAL OWNER'S COST	($)	610447.	1369269.	2179778.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	2879492.	6458869.	10282060.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	321.90	432.70	1865.40
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		93995.	272348.	544697.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	963847.	1937660.	3084617.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	9.19	7.11	5.66

* * * PRP SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR IM FUEL M-4.A(1)$ B16* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	321.9	932.7	1865.4
PROCESSING EQUIPMENT COST	($1000)	525.2	1123.5	1800.4
PLANT DIRECT CONSTRUCTION COST	($1000)	1298.8	2913.3	4637.8
PLANT INDIRECT CONSTRUCTION COST	($1000)	970.2	2176.3	3464.5
PLANT OWNER'S COST	($1000)	610.4	1369.3	2179.8
PLANT TOTAL COST	($1000)	2879.5	6458.9	10282.1
UNIT COST	(DOLLARS/KILOGRAM)	9.19	7.11	5.66

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 1.05178E 01 A2 = 8.93838E 00 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -4.19126E-04 B2 = -2.44666E-04 B3 = 0.0 B4 = 0.0

*** * C O S T   E S T I M A T E   P R E P A R A T I O N * ***

			CASE ESTIMATES CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	408900.	631400.	899400.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM 7, TABLES 5 AND 6)				
2	TYPE (1)		8568.	14585.	23216.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	4440.	5772.	6660.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	20.0	20.0	20.0
7	STD. CELL HEIGHT	(FT)	20.0	20.0	20.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
9	GROSS CELL VOLUME	(CU FT)	21420.	36463.	58040.
10	LINEAR FT. OF CELL	(FT)	53.55	91.16	145.10
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLF 6)		9.00	9.00	9.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		192780.	328163.	522360.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		287534.	472702.	779320.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	11988.	15584.	17982.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
33	STD. AREA HEIGHT	(FT)	20.0	20.0	20.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	10710.	18231.	29020.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	1071.	1823.	2902.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	164934.	280761.	446908.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		83916.	109091.	125874.
	CELL OPERATING SPACE				
64	TYPE (1)		74970.	127619.	203140.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		74970.	127619.	203140.
	CRANE BAY SPACE				
68	TYPE (1)		379348.	645751.	1027888.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		379348.	645751.	1027888.
72	TOTAL OUT-OF-CELL SPACE COST		538234.	882460.	1356901.
73	PROCESSING SPACE TOTAL COST	($)	825768.	1355162.	2136220.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	96687.	162337.	262013.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	676807.	1136358.	1834088.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		1911473.	3122920.	4869708.
81	OUTSIDE UTILITIES COST		191147.	312292.	486971.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	2102620.	3435211.	5356678.
84	SITE IMPROVEMENT COST	($)	10513.	17176.	26783.
85	TOTAL DIRECT CONSTRUCTION COST	($)	2113133.	3452387.	5383461.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	211313.	345239.	538346.

ENGINEERING COST

88	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	633940.	1035716.	1615038.

MISC. CONSTRUCTION COST

90	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	105657.	172619.	269173.

CONTINGENCY ALLOWANCE

92	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	422627.	690477.	1076692.

SPARE PARTS COST

94	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	14792.	24167.	37684.

NONINSTALLED SPARE EQUIPMENT COST

96	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	63394.	103572.	161504.

QUALITY ASSURANCE COST

98	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	126788.	207143.	323008.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	1576507.	2578930.	4021442.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	21131.	34524.	53835.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	42263.	69048.	107669.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	84525.	138095.	215338.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	422627.	690477.	1076692.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	422627.	690477.	1076692.
111	TOTAL OWNER'S COST	($)	993172.	1622621.	2530226.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	4684812.	7653938.	11935129.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	295.50	886.50	1773.00
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	96266.	258858.	517716.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	1405443.	2296181.	3580538.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	16.29	8.87	6.92

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	295.5	886.5	1773.0
PROCESSING EQUIPMENT COST	($1000)	408.9	631.4	899.4
PLANT DIRECT CONSTRUCTION COST	($1000)	2113.1	3452.4	5383.5
PLANT INDIRECT CONSTRUCTION COST	($1000)	1578.5	2578.9	4021.4
PLANT OWNER'S COST	($1000)	993.2	1622.6	2530.2
PLANT TOTAL COST	($1000)	4684.8	7653.9	11935.1
UNIT COST	(DOLLARS/KILOGRAM)	16.29	8.87	6.92

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 2.20717E 01 A2 = 1.13771E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -1.02829E-03 B2 = -2.80745E-04 B3 = 0.0 B4 = 0.0

*** * C O S T   E S T I M A T E   P R E P A R A T I O N * ***

No.	Item	Unit	CASE ESTIMATES CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	1637000.	5420000.	9875000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = LIGHTLY SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM 6, TABLES 5 AND 6)				
2	TYPE (1)		1200.	1800.	2000.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	840.	1200.	1400.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	30.0	30.0	30.0
7	STD. CELL HEIGHT	(FT)	40.0	40.0	40.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.33	2.33	2.33
9	GROSS CELL VOLUME	(CU FT)	2796.	4194.	4660.
10	LINEAR FT. OF CELL	(FT)	2.33	3.49	3.88
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCP FROM ORNL TM-4613, TABLE 6)		13.00	13.00	13.00
22	TYPE (2) (UCCP FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCP FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		36348.	54522.	60580.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		131102.	199062.	317540.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	2268.	3240.	3780.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	4.0	4.0	4.0
33	STD. AREA HEIGHT	(FT)	10.0	10.0	10.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	93.	140.	155.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	70.	105.	116.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	10768.	16147.	17941.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM-4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		15876.	22680.	26460.
	CELL OPERATING SPACE				
64	TYPE (1)		652.	979.	1087.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		652.	979.	1087.
	CRANE BAY SPACE				
68	TYPE (1)		24759.	37138.	41264.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		24759.	37138.	41264.
72	TOTAL OUT-OF-CELL SPACE COST		41287.	60796.	68812.
73	PROCESSING SPACE TOTAL COST	($)	172389.	259858.	386351.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	18201.	27624.	43630.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	127404.	193369.	305407.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		1936791.	5873227.	10566757.
81	OUTSIDE UTILITIES COST		193679.	587322.	1056675.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	2130470.	6460549.	11623432.
84	SITE IMPROVEMENT COST	($)	10652.	32303.	58117.
85	TOTAL DIRECT CONSTRUCTION COST	($)	2141122.	6492851.	11681549.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	214112.	649285.	1168154.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	642336.	1947854.	3504464.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	107056.	324643.	584077.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	428224.	1298570.	2336309.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	14988.	45450.	81771.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	64234.	194786.	350446.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	128467.	389571.	700893.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	1599415.	4850155.	8726112.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	21411.	64928.	116815.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	42822.	129857.	233631.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	85645.	259714.	467262.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	428224.	1298570.	2336309.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	428224.	1298570.	2336309.
111	TOTAL OWNER'S COST	($)	1006327.	3051639.	5490326.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	4746864.	14394645.	25897968.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	437.20	1311.60	2623.20
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	127662.	382987.	765974.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	1424058.	4318392.	7769389.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	11.15	11.28	10.14

* * * THORIUM RECOVERY PROCESS (T-2)$ B18* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	437.2	1311.6	2623.2
PROCESSING EQUIPMENT COST	($1000)	1637.0	5420.0	9875.0
PLANT DIRECT CONSTRUCTION COST	($1000)	2141.1	6492.8	11681.5
PLANT INDIRECT CONSTRUCTION COST	($1000)	1599.4	4850.2	8726.1
PLANT OWNER'S COST	($1000)	1006.3	3051.6	5490.3
PLANT TOTAL COST	($1000)	4746.9	14394.6	25898.0
UNIT COST	(DOLLARS/KILOGRAM)	11.15	11.28	10.14

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 1.10950E 01 A2 = 1.25344E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = 1.23060E-05 B2 = -8.06938E-05 B3 = 0.0 B4 = 0.0

* * C O S T   E S T I M A T E   P R E P A R A T I O N * *

			CASE ESTIMATES		
			CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	252000.	360000.	570000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM 7, TABLES 5 AND 6)				
2	TYPE (1)		6600.	9800.	18000.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	700.	1260.	1680.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	20.0	20.0	20.0
7	STD. CELL HEIGHT	(FT)	20.0	20.0	20.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
9	GROSS CELL VOLUME	(CU FT)	16500.	24500.	45000.
10	LINEAR FT. OF CELL	(FT)	41.25	61.25	112.50
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCP FROM ORNL TM-4613, TABLE 6)		9.00	9.00	9.00
22	TYPE (2) (UCCP FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCP FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		148500.	220500.	405000.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		243254.	365040.	661960.

No.	Item	Unit			
	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	1890.	3402.	4536.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
33	STD. AREA HEIGHT	(FT)	20.0	20.0	20.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	8250.	12250.	22500.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	825.	1225.	2250.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	127050.	188650.	346500.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		13230.	23814.	31752.
	CELL OPERATING SPACE				
64	TYPE (1)		57750.	85750.	157500.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		57750.	85750.	157500.
	CRANE BAY SPACE				
68	TYPE (1)		292215.	433895.	796950.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		292215.	433895.	796950.
72	TOTAL OUT-OF-CELL SPACE COST		363195.	543459.	986202.
73	PROCESSING SPACE TOTAL COST	($)	606449.	908499.	1648161.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUP (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	77400.	115444.	210896.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCP (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	541802.	808107.	1476271.
	OUTSIDE UTILITIES COST	($)			
79	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		1400250.	2076605.	3694432.
81	OUTSIDE UTILITIES COST		140025.	207660.	369443.
	SITE IMPROVEMENT COST	($)			
82	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	1540274.	2284265.	4063875.
84	SITE IMPROVEMENT COST	($)	7701.	11421.	20319.
85	TOTAL DIRECT CONSTRUCTION COST	($)	1547975.	2295686.	4084194.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST					
86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	154797.	229569.	408419.
ENGINEERING COST					
88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	464392.	688706.	1225258.
MISC. CONSTRUCTION COST					
90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	77399.	114784.	204210.
CONTINGENCY ALLOWANCE					
92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	309595.	459137.	816839.
SPARE PARTS COST					
94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	10836.	16070.	28589.
NONINSTALLED SPARE EQUIPMENT COST					
96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	46439.	68871.	122526.
QUALITY ASSURANCE COST					
98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	92878.	137741.	245052.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	1156336.	1714875.	3050889.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	15480.	22957.	40842.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	30959.	45914.	81684.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	61919.	91827.	163368.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	309595.	459137.	816839.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	309595.	459137.	816839.
111	TOTAL OWNER'S COST	($)	727548.	1078972.	1919570.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	3431859.	5089533.	9054653.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	542.90	1628.70	3257.40
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	158527.	475580.	951161.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	1029558.	1526859.	2716395.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	6.49	3.21	2.86

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	542.9	1628.7	3257.4
PROCESSING EQUIPMENT COST	($1000)	252.0	360.0	570.0
PLANT DIRECT CONSTRUCTION COST	($1000)	1548.0	2295.7	4084.2
PLANT INDIRECT CONSTRUCTION COST	($1000)	1156.3	1714.9	3050.9
PLANT OWNER'S COST	($1000)	727.5	1079.0	1919.6
PLANT TOTAL COST	($1000)	3431.9	5089.5	9054.7
UNIT COST	(DOLLARS/KILOGRAM)	6.49	3.21	2.86

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 9.23707E 00 A2 = 3.60920E 00 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -6.48857E-04 B2 = -7.18694E-05 B3 = 0.0 B4 = 0.0

COST ESTIMATE PREPARATION

			CASE ESTIMATES CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	716000.	1788500.	2785800.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM 7, TABLES 5 AND 6)				
2	TYPE (1)		12272.	25216.	48670.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	8560.	9850.	17710.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT	(FT)	10.0	10.0	10.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
9	GROSS CELL VOLUME	(CU FT)	30680.	63040.	121675.
10	LINEAR FT. OF CELL	(FT)	39.33	80.82	155.98
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCP FROM ORNL TM-4613, TABLE 6)		9.00	9.00	9.00
22	TYPE (2) (UCCP FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCP FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		276120.	567360.	1095075.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		370874.	711900.	1152031.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	12312.	25515.	48357.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	17621.	36208.	69885.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	1023.	2101.	4056.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	157491.	323605.	624598.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		86184.	178605.	338499.
	CELL OPERATING SPACE				
64	TYPE (1)		123349.	253453.	489195.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		123349.	253453.	489195.
	CRANE BAY SPACE				
68	TYPE (1)		362228.	744292.	1436575.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		362228.	744292.	1436575.
72	TOTAL OUT-OF-CELL SPACE COST		571762.	1176349.	2264269.
73	PROCESSING SPACE TOTAL COST	($)	942635.	1888248.	3616302.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	92897.	184148.	352473.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	650282.	1289039.	2467309.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		2308916.	4965787.	9069411.
81	OUTSIDE UTILITIES COST		230892.	496579.	906941.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	2539807.	5462365.	9976351.
84	SITE IMPROVEMENT COST	($)	12699.	27312.	49882.
85	TOTAL DIRECT CONSTRUCTION COST	($)	2552506.	5489676.	10026232.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	255251.	548967.	1032623.

ENGINEERING COST

88	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	765752.	1646902.	3007869.

MISC. CONSTRUCTION COST

90	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	127625.	274484.	501312.

CONTINGENCY ALLOWANCE

92	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	510501.	1097935.	2005246.

SPARE PARTS COST

94	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	17868.	38428.	70184.

NONINSTALLED SPARE EQUIPMENT COST

96	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	76575.	164690.	300787.

QUALITY ASSURANCE COST

98	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	153150.	329381.	601574.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	1906720.	4100784.	7489390.

OWNER'S COST

	LAND COST				
101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	25525.	54897.	100262.
	PROJECT MANAGEMENT COST				
103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	51050.	109794.	200525.
	LICENSING COST				
105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	102100.	219587.	401049.
	TAXES, INSURANCE AND INTEREST				
107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	510501.	1097935.	2005246.
	PREOPERATIONAL TESTING AND STARTUP				
109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	510501.	1097935.	2005246.
111	TOTAL OWNER'S COST	($)	1199677.	2580147.	4712328.
	TOTAL CAPITAL CONSTRUCTION COST				
112	INCREMENT OF TOTAL PLANT COST	($)	5658903.	12170607.	22228128.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	443.20	1329.60	2659.20
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	129414.	388243.	776486.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	1697670.	3651181.	6668437.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	13.12	9.40	8.59

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	443.2	1329.6	2659.2
PROCESSING EQUIPMENT COST	($1000)	716.0	1788.5	2985.8
PLANT DIRECT CONSTRUCTION COST	($1000)	2552.5	5489.7	10026.2
PLANT INDIRECT CONSTRUCTION COST	($1000)	1906.7	4100.8	7489.6
PLANT OWNER'S COST	($1000)	1199.7	2580.1	4712.3
PLANT TOTAL COST	($1000)	5658.9	12170.6	22228.1
UNIT COST	(DOLLARS/KILOGRAM)	13.12	9.40	8.59

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 1.54932E 01 A2 = 1.02984E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -3.75472E-04 B2 = -6.83003E-05 B3 = 0.0 B4 = 0.0

* * * BISO MICROSPHERE COATING PROCESS - FERTILE PARTICLES-THO2 (L-1.A.(1)$ B21* * * DATE IS 07-18-70 PAGE 1

C O S T   E S T I M A T E   P R E P A R A T I O N

			CASE ESTIMATES CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	2457100.	5203500.	856[illegible]200.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED (CU FT)				
	TYPE (1) = UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM 7, TABLES 5 AND 6)				
	TYPE (2) = GLOVE BOXES AND HOODS - DIRECT MAINTENANCE (ITEM 8, TABLES 5 AND 6)				
2	TYPE (1)		3646.	7804.	16338.
3	TYPE (2)		384.	768.	1152.
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	1704.	3408.	5112.
	PROCESSING SPACE COST (HOT CELLS) ($)				
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	20.0	20.0	20.0
7	STD. CELL HEIGHT	(FT)	20.0	20.0	20.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
9	GROSS CELL VOLUME	(CU FT)	9115.	19510.	40845.
10	LINEAR FT. OF CELL	(FT)	22.79	48.77	102.11
11	TYPE (2) STD. CELL WIDTH	(FT)	2.5	2.5	2.5
12	STD. CELL HEIGHT	(FT)	4.0	4.0	4.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		2.20	2.20	2.20
14	GROSS CELL VOLUME	(CU FT)	845.	1690.	2534.
15	LINEAR FT. OF CELL	(FT)	84.48	168.96	253.44
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST ($/CU FT)				
21	TYPE (1) (UCCP FROM ORNL TM-4613, TABLE 6)		9.00	9.00	9.00
22	TYPE (2) (UCCP FROM ORNL TM-4613, TABLE 6)		146.00	146.00	146.00
23	TYPE (3) (UCCP FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST ($)				
24	TYPE (1)		82035.	175590.	367605.
25	TYPE (2)		123341.	246682.	370022.
26	TYPE (3)				
27	TOTAL		237496.	470452.	801867.

No.	Item	Units			
	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	4601.	9202.	13802.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
33	STD. AREA HEIGHT	(FT)	20.0	20.0	20.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	4557.	9755.	20422.
36	TY' (2) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
37	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
38	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
39	GROSS VOLUME	(CU FT)	11827.	23654.	35482.
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	456.	975.	2042.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	70185.	150227.	314506.
48	TYPE (2) CELL AREA	(SQ FT)	211.	422.	634.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	0.0	0.0	0.0
51	GROSS VOLUME	(CU FT)	0.	0.	0.
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		0.0	0.0	0.0
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		32206.	64411.	96617.
	CELL OPERATING SPACE				
64	TYPE (1)		31902.	68285.	142957.
65	TYPE (2)		82790.	165581.	248371.
66	TYPE (3)				
67	TOTAL		114693.	233866.	391329.
	CRANE BAY SPACE				
68	TYPE (1)		161426.	345522.	723364.
69	TYPE (2)		0.	0.	0.
70	TYPE (3)				
71	TOTAL		161426.	345522.	723364.
72	TOTAL OUT-OF-CELL SPACF COST		308325.	643799.	1211309.
73	PROCESSING SPACE TOTAL COST	($)	545820.	1114250.	2013176.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	56601.	116063.	218411.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	396206.	812443.	1528873.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		3399125.	7130192.	12106249.
81	OUTSIDE UTILITIES COST		339912.	713019.	1210624.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	3739037.	7843210.	13316873.
84	SITE IMPROVEMENT COST	($)	19595.	39216.	66584.
85	TOTAL DIRECT CONSTRUCTION COST	($)	3757732.	7882426.	13383457.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST					
86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	375773.	788242.	1338345.
ENGINEERING COST					
88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	1127319.	2364727.	4015036.
MISC. CONSTRUCTION COST					
90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	187887.	394121.	669173.
CONTINGENCY ALLOWANCE					
92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	751546.	1576485.	2676691.
SPARE PARTS COST					
94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	26304.	55177.	93684.
NONINSTALLED SPARE EQUIPMENT COST					
96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	112732.	236473.	401504.
QUALITY ASSURANCE COST					
98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	225464.	472946.	803007.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	2807022.	5888168.	9997438.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	37577.	78824.	133835.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	75155.	157649.	267669.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	150309.	315297.	535338.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	751546.	1576485.	2676691.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	751546.	1576485.	2676691.
111	TOTAL OWNER'S COST	($)	1766133.	3704739.	6290223.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	8330887.	17475328.	29671088.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	419.90	1259.70	2519.40
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		122611.	367832.	735665.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	2499265.	5242597.	8901324.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	20.38	14.25	12.10

* * * BISO MICROSPHERE COATING PROCESS - FERTILE PARTICLES-THO2 (L-1.A.(1)$ B21* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	419.9	1259.7	2519.4
PROCESSING EQUIPMENT COST	($1000)	2457.1	5203.5	8564.2
PLANT DIRECT CONSTRUCTION COST	($1000)	3757.7	7882.4	13383.5
PLANT INDIRECT CONSTRUCTION COST	($1000)	2807.0	5888.2	9997.4
PLANT OWNER'S COST	($1000)	1766.1	3704.7	6290.2
PLANT TOTAL COST	($1000)	8330.9	17475.3	29671.1
UNIT COST	(DOLLARS/KILOGRAM)	20.38	14.25	12.10

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 2.43768E 01 A2 = 1.67887E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -4.26044E-04 B2 = -1.30002E-04 B3 = 0.0 B4 = 0.0

COST ESTIMATE PREPARATION

			CASE ESTIMATES	
		CASE 1	CASE 2	CASE 3
DIRECT CONSTRUCTION COST				
PROCESSING EQUIPMENT COST				
1 ESTIMATED EQUIPMENT COST	($)	52000.	59000.	70000.
ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
TYPE (1) = UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM 7, TABLES 5 AND 6)				
2 TYPE (1)		820.	1100.	1500.
3 TYPE (2)				
4 TYPE (3)				
5 ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	430.	600.	800.
PROCESSING SPACE COST (HOT CELLS)	($)			
GROSS IN-CELL SPACE REQUIRED				
6 TYPE (1) STD. CELL WIDTH	(FT)	20.0	20.0	20.0
7 STD. CELL HEIGHT	(FT)	20.0	20.0	20.0
8 SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
9 GROSS CELL VOLUME	(CU FT)	2050.	2750.	3750.
10 LINEAR FT. OF CELL	(FT)	5.13	6.88	9.38
11 TYPE (2) STD. CELL WIDTH	(FT)			
12 STD. CELL HEIGHT	(FT)			
13 SUF (FROM ORNL TM-4613, TABLE 5)				
14 GROSS CELL VOLUME	(CU FT)			
15 LINEAR FT. OF CELL	(FT)			
16 TYPE (3) STD. CELL WIDTH	(FT)			
17 STD. CELL HEIGHT	(FT)			
18 SUF (FROM ORNL TM-4613, TABLE 5)				
19 GROSS CELL VOLUME	(CU FT)			
20 LINEAR FT. OF CELL	(FT)			
IN-CELL SPACE UNIT COST	($/CU FT)			
21 TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		9.00	9.00	9.00
22 TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)				
23 TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
IN-CELL SPACE TOTAL COST	($)			
24 TYPE (1)		18450.	24750.	33750.
25 TYPE (2)				
26 TYPE (3)				
27 TOTAL		173911.	319612.	468012.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	1161.	1620.	2160.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
33	STD. AREA HEIGHT	(FT)	20.0	20.0	20.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	1025.	1375.	1875.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	103.	138.	188.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	15785.	21175.	28875.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

No.	Item	Unit			
	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		8127.	11340.	15120.
	CELL OPERATING SPACE				
64	TYPE (1)		7175.	9625.	13125.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		7175.	9625.	13125.
	CRANE BAY SPACE				
68	TYPE (1)		36305.	48702.	66412.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		36305.	48702.	66412.
72	TOTAL OUT-OF-CELL SPACE COST		51607.	69667.	94657.
73	PROCESSING SPACE TOTAL COST	($)	225518.	389279.	562670.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	28906.	50364.	72998.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	202342.	352549.	510987.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		479860.	800828.	1143656.
81	OUTSIDE UTILITIES COST		47986.	80083.	114366.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	527846.	880910.	1258021.
84	SITE IMPROVEMENT COST	($)	2639.	4405.	6290.
85	TOTAL DIRECT CONSTRUCTION COST	($)	530486.	885315.	1264311.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST					
86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	53049.	88531.	126431.
ENGINEERING COST					
88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	159146.	265594.	379293.
MISC. CONSTRUCTION COST					
90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	26524.	44266.	63216.
CONTINGENCY ALLOWANCE					
92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	106097.	177063.	252862.
SPARE PARTS COST					
94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	3713.	6197.	8850.
NONINSTALLED SPARE EQUIPMENT COST					
96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	15915.	26559.	37929.
QUALITY ASSURANCE COST					
98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	31829.	53119.	75859.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	396273.	661330.	944440.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	5305.	8853.	12643.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	10610.	17706.	25286.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	21219.	35413.	50572.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	106097.	177063.	252862.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	106097.	177063.	252862.
111	TOTAL OWNER'S COST	($)	249328.	416098.	594226.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	1176086.	1962741.	2802976.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	44.30	133.00	265.90
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		12936.	38836.	77643.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	352826.	588822.	840893.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	27.28	15.16	10.83

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	44.3	133.0	265.9
PROCESSING EQUIPMENT COST	($1000)	52.0	59.0	70.0
PLANT DIRECT CONSTRUCTION COST	($1000)	530.5	885.3	1264.3
PLANT INDIRECT CONSTRUCTION COST	($1000)	396.3	661.3	944.4
PLANT OWNER'S COST	($1000)	249.3	416.1	594.2
PLANT TOTAL COST	($1000)	1176.1	1962.7	2803.0
UNIT COST	(DOLLARS/KILOGRAM)	27.28	15.16	10.83

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 3.65714E 01   A2 = 2.12309E 01   A3 = 0.0   A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -6.62023E-03   B2 = -2.53146E-03   B3 = 0.0   B4 = 0.0

* * C O S T   E S T I M A T E   P R E P A R A T I O N * *

			CASE 1	CASE ESTIMATES CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	79000.	93000.	176000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM 7, TABLES 5 AND 6)				
2	TYPE (1)		500.	700.	2000.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	500.	700.	900.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	20.0	20.0	20.0
7	STD. CELL HEIGHT	(FT)	20.0	20.0	20.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
9	GROSS CELL VOLUME	(CU FT)	1250.	1750.	5000.
10	LINEAR FT. OF CELL	(FT)	3.13	4.38	12.50
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		9.00	9.00	9.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		11250.	15750.	45000.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		166711.	310612.	479262.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	1350.	1890.	2430.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
33	STD. AREA HEIGHT	(FT)	20.0	20.0	20.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	625.	875.	2500.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	63.	88.	250.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	9625.	13475.	38500.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM-4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		9450.	13230.	17010.
	CELL OPERATING SPACE				
64	TYPE (1)		4375.	6125.	17500.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		4375.	6125.	17500.
	CRANE BAY SPACE				
68	TYPE (1)		22137.	30992.	88550.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		22137.	30992.	88550.
72	TOTAL OUT-OF-CELL SPACE COST		35962.	50347.	123060.
73	PROCESSING SPACE TOTAL COST	($)	202673.	360959.	602322.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	25770.	46444.	77898.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	180390.	325109.	545[illegible].
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		462063.	779068.	1323609.
81	OUTSIDE UTILITIES COST		46206.	77907.	132361.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	508270.	856974.	1455969.
84	SITE IMPROVEMENT COST	($)	2541.	4285.	7280.
85	TOTAL DIRECT CONSTRUCTION COST	($)	510811.	861259.	1463248.

INDIRECT CONSTRUCTION COST

	GENERAL AND ADMINISTRATIVE COST				
86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	51081.	86126.	146325.
	ENGINEERING COST				
88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	153243.	258378.	438974.
	MISC. CONSTRUCTION COST				
90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	25541.	43063.	73162.
	CONTINGENCY ALLOWANCE				
92	UCF (FROM ORNL TM-^613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	102162.	172252.	292650.
	SPARE PARTS COST				
94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	3576.	6029.	10243.
	NONINSTALLED SPARE EQUIPMENT COST				
96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	15324.	25838.	43897.
	QUALITY ASSURANCE COST				
98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	30649.	51676.	87795.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	381576.	643360.	1093045.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	5108.	8613.	14632.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	10216.	17225.	29265.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	20432.	34450.	58530.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	102162.	172252.	292650.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	102162.	172252.	292650.
111	TOTAL OWNER'S COST	($)	240081.	404792.	687726.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	1132467.	1909410.	3244019.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	21.00	63.00	126.00
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		6132.	18396.	36792.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	339740.	572823.	973206.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	55.40	31.14	26.45

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	21.0	63.0	126.0
PROCESSING EQUIPMENT COST	($1000)	79.0	93.0	176.0
PLANT DIRECT CONSTRUCTION COST	($1000)	510.8	861.3	1463.2
PLANT INDIRECT CONSTRUCTION COST	($1000)	381.6	643.4	1093.0
PLANT OWNER'S COST	($1000)	240.1	404.8	687.7
PLANT TOTAL COST	($1000)	1132.5	1909.4	3244.0
UNIT COST	(DOLLARS/KILOGRAM)	55.40	31.14	26.45

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 7.39040E 01 A2 = 3.66558E 01 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -1.37194E-02 B2 = -2.58934E-03 B3 = 0.0 B4 = 0.0

COST ESTIMATE PREPARATION

			CASE 1	CASE ESTIMATES CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	16.	16.	16.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)				
	TYPE (2) = MEDIUM SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM 4, TABLES 5 AND 6)				
2	TYPE (1)		7775.	8155.	8700.
3	TYPE (2)		13200.	16500.	21500.
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	3485.	4060.	4595.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT	(FT)	30.0	30.0	30.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
9	GROSS CELL VOLUME	(CU FT)	31100.	32620.	34800.
10	LINEAR FT. OF CELL	(FT)	39.87	41.82	44.62
11	TYPE (2) STD. CELL WIDTH	(FT)	30.0	30.0	30.0
12	STD. CELL HEIGHT	(FT)	40.0	40.0	40.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		2.33	2.33	2.33
14	GROSS CELL VOLUME	(CU FT)	30756.	38445.	50095.
15	LINEAR FT. OF CELL	(FT)	25.63	32.04	41.75
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		39.00	39.00	39.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		16.00	16.00	16.00
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		1212900.	1272180.	1357200.
25	TYPE (2)		492096.	615120.	801520.
26	TYPE (3)				
27	TOTAL		1737114.	1935478.	2222958.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	1460000.0	1622700.0	1872000.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	9409.	10962.	12406.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	17863.	18736.	19988.
36	TYPE (2) STD. AREA WIDTH	(FT)	4.0	4.0	4.0
37	STD. AREA HEIGHT	(FT)	10.0	10.0	10.0
38	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
39	GROSS VOLUME	(CU FT)	1025.	1281.	1670.
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	1037.	1087.	1160.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	159647.	167449.	178640.
48	TYPE (2) CELL AREA	(SQ FT)	769.	961.	1252.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
51	GROSS VOLUME	(CU FT)	118411.	148013.	192866.
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		2.30	2.30	2.30
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		65866.	76734.	86845.
	CELL OPERATING SPACE				
64	TYPE (1)		125038.	131149.	139914.
65	TYPE (2)		7176.	8970.	11689.
66	TYPE (3)				
67	TOTAL		132214.	140120.	151603.
	CRANE BAY SPACE				
68	TYPE (1)		367187.	385133.	410872.
69	TYPE (2)		272344.	340430.	443591.
70	TYPE (3)				
71	TOTAL		639531.	725563.	854462.
72	TOTAL OUT-OF-CELL SPACE COST		837612.	942417.	1092910.
73	PROCESSING SPACE TOTAL COST	($)	2574725.	2877894.	3315868.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	145868.	167067.	197754.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	1021078.	1169469.	1384278.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		3595818.	4047379.	4700162.
81	OUTSIDE UTILITIES COST		359582.	404738.	470016.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	3955399.	4452116.	5170178.
84	SITE IMPROVEMENT COST	($)	19777.	22261.	25851.
85	TOTAL DIRECT CONSTRUCTION COST	($)	3975175.	4474376.	5196028.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST					
86	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	397517.	447437.	519603.
ENGINEERING COST					
88	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	1192552.	1342312.	1558808.
MISC. CONSTRUCTION COST					
90	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	198759.	223719.	259801.
CONTINGENCY ALLOWANCE					
92	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	795035.	894875.	1039206.
SPARE PARTS COST					
94	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	27826.	31321.	36372.
NONINSTALLED SPARE EQUIPMENT COST					
96	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	119255.	134231.	155881.
QUALITY ASSURANCE COST					
98	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	238510.	268463.	311762.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	2969452.	3342355.	3881429.

OWNER'S COST

LAND COST

101	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	39752.	44744.	51960.

PROJECT MANAGEMENT COST

103	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	79503.	89488.	103921.

LICENSING COST

105	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	159007.	178975.	207841.

TAXES, INSURANCE AND INTEREST

107	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	795035.	894875.	1039206.

PREOPERATIONAL TESTING AND STARTUP

109	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	795035.	894875.	1039206.
111	TOTAL OWNER'S COST	($)	1868331.	2102956.	2442132.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	8812958.	9919687.	11519589.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	17.20	51.60	103.20
114	ANNUAL PRODUCTION RATE (KILOGRAMS OF HEAVY METAL/YEAR)		5022.	15067.	30134.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	2643886.	2975905.	3455876.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	526.42	197.51	114.68

* * * RECLAMATION PROCESSING OF REJECT 23 RECYCLE FUEL (A-15 ELEMENT)$ B24* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	17.2	51.6	103.2
PROCESSING EQUIPMENT COST	($1000)	0.0	0.0	0.0
PLANT DIRECT CONSTRUCTION COST	($1000)	3975.2	4474.4	5196.0
PLANT INDIRECT CONSTRUCTION COST	($1000)	2969.5	3342.4	3881.4
PLANT OWNER'S COST	($1000)	1868.3	2103.0	2442.1
PLANT TOTAL COST	($1000)	8813.0	9919.7	11519.6
UNIT COST	(DOLLARS/KILOGRAM)	526.42	197.51	114.68

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 8.59416E 02   A2 = 3.40155E 02   A3 = 0.0   A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -2.84975E-02   B2 = -1.05353E-02   B3 = 0.0   B4 = 0.0

* * * RECLAMATION PROCESSING OF REJECT 25 RECYCLE FUEL (A-19 ELEMENTS)$ B25* * * DATE IS 07-18-74 PAGE 1

****C O S T E S T I M A T E P R E P A R A T I O N****

			CASE ESTIMATES		
			CASE 1	CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	1136000.	1192000.	1336000.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = MEDIUM SHIELDED HOT CELL - REMOTE MAINTENANCE (ITEM 3, TABLES 5 AND 6)				
	TYPE (2) = MEDIUM SHIELDED HOT CELL - CONTACT MAINTENANCE (ITEM 4, TABLES 5 AND 6)				
2	TYPE (1)		7220.	7290.	7450.
3	TYPE (2)		12700.	13200.	13800.
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	3460.	3765.	4130.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	26.0	26.0	26.0
7	STD. CELL HEIGHT	(FT)	30.0	30.0	30.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		4.00	4.00	4.00
9	GROSS CELL VOLUME	(CU FT)	28880.	29160.	29800.
10	LINEAR FT. OF CELL	(FT)	37.03	37.38	38.21
11	TYPE (2) STD. CELL WIDTH	(FT)	30.0	30.0	30.0
12	STD. CELL HEIGHT	(FT)	40.0	40.0	40.0
13	SUF (FROM ORNL TM-4613, TABLE 5)		2.33	2.33	2.33
14	GROSS CELL VOLUME	(CU FT)	29591.	30756.	32154.
15	LINEAR FT. OF CELL	(FT)	24.66	25.63	26.79
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		39.00	39.00	39.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)		16.00	16.00	16.00
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		1126320.	1137240.	1162200.
25	TYPE (2)		473456.	492096.	514464.
26	TYPE (3)				
27	TOTAL		1631894.	1677514.	1740902.

No.	Item	Unit			
	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	9342.	10165.	11151.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	16.0	16.0	16.0
33	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
34	NO. OF CELL SIDES WITH OP. AREA		2.0	2.0	2.0
35	GROSS VOLUME	(CU FT)	16587.	16748.	17116.
36	TYPE (2) STD. AREA WIDTH	(FT)	4.0	4.0	4.0
37	STD. AREA HEIGHT	(FT)	10.0	10.0	10.0
38	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
39	GROSS VOLUME	(CU FT)	986.	1025.	1072.
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	963.	972.	993.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	148251.	149688.	152973.
48	TYPE (2) CELL AREA	(SQ FT)	740.	769.	804.
49	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
50	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
51	GROSS VOLUME	(CU FT)	113925.	118411.	123793.
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)		7.00	7.00	7.00
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE ()				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)		2.30	2.30	2.30
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		65394.	71158.	78057.
	CELL OPERATING SPACE				
64	TYPE (1)		116112.	117238	119811.
65	TYPE (2)		6905.	7176	7503.
66	TYPE (3)				
67	TOTAL		123017.	124415.	127314.
	CRANE BAY SPACE				
68	TYPE (1)		340976.	344282.	351838.
69	TYPE (2)		262028.	272344.	284723.
70	TYPE (3)				
71	TOTAL		603004.	616626.	636562.
72	TOTAL OUT-OF-CELL SPACE COST		791415.	812199.	841932.
73	PROCESSING SPACE TOTAL COST	($)	2423309.	2489713.	2582834.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUF (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	137783.	142954.	149523.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCF (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	964483.	1000681.	1046661.
	OUTSIDE UTILITIES COST	($)			
79	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		4523791.	4682394.	4965495.
81	OUTSIDE UTILITIES COST		452379.	468239.	496549.
	SITE IMPROVEMENT COST	($)			
82	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	4976169.	5150633.	5462044.
84	SITE IMPROVEMENT COST	($)	24881.	25753.	27310.
85	TOTAL DIRECT CONSTRUCTION COST	($)	5001049.	5176386.	5489354.

INDIRECT CONSTRUCTION COST

GENERAL AND ADMINISTRATIVE COST

86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	500105.	517638.	548935.

ENGINEERING COST

88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	1500314.	1552915.	1646805.

MISC. CONSTRUCTION COST

90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	250052.	258819.	274468.

CONTINGENCY ALLOWANCE

92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	1000210.	1035277.	1097870.

SPARE PARTS COST

94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	35007.	36235.	38425.

NONINSTALLED SPARE EQUIPMENT COST

96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	150031.	155292.	164681.

QUALITY ASSURANCE COST

98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	300063.	310583.	329361.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	3735779.	3860757.	4100543.

OWNER'S COST

LAND COST

101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	50010.	51764.	54894.

PROJECT MANAGEMENT COST

103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	100021.	103528.	109787.

LICENSING COST

105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	200042.	207055.	219574.

TAXES, INSURANCE AND INTEREST

107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	1000210.	1035277.	1097870.

PREOPERATIONAL TESTING AND STARTUP

109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	1000210.	1035277.	1097870.
111	TOTAL OWNER'S COST	($)	2350492.	2432901.	2579994.

TOTAL CAPITAL CONSTRUCTION COST

112	INCREMENT OF TOTAL PLANT COST	($)	11087320.	11476044.	12169891.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	1.70	5.10	10.20
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	496.	1489.	2978.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	3326195.	3442812.	3650966.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	6700.63	2311.85	1225.81

* * * RECLAMATION PROCESSING OF REJECT 25 RECYCLE FUEL (A-19 ELEMENTS) $ B25* * *

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	1.7	5.1	10.2
PROCESSING EQUIPMENT COST	($1000)	1136.0	1192.0	1336.0
PLANT DIRECT CONSTRUCTION COST	($1000)	5001.0	5176.4	5489.4
PLANT INDIRECT CONSTRUCTION COST	($1000)	3735.8	3866.8	4100.5
PLANT OWNER'S COST	($1000)	2350.5	2432.9	2580.0
PLANT TOTAL COST	($1000)	11087.3	11476.0	12169.9
UNIT COST	(DOLLARS/KILOGRAM)	6700.63	2311.85	1225.81

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 1.14076E 04 A2 = 4.36009E 03 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

B1 = -3.12986E-01 B2 = -1.24401E-01 B3 = 0.0 B4 = 0.0

* * * RECLAMATION PROCESSING OF REJECT IN FUEL (A-1 ELEMENTS)$ B26* * * DATE IS 07-18-74 PAGE 1

COST ESTIMATE PREPARATION

No.	Item	Units	CASE 1	CASE ESTIMATES CASE 2	CASE 3
	DIRECT CONSTRUCTION COST				
	PROCESSING EQUIPMENT COST				
1	ESTIMATED EQUIPMENT COST	($)	960100.	1094300.	1341600.
	ACTUAL IN-CELL EQUIPMENT SPACE REQUIRED	(CU FT)			
	TYPE (1) = UNSHIELDED HOT ALPHA CELL - CONTACT MAINTENANCE (ITEM 7, TABLES 5 AND 6)				
2	TYPE (1)		14785.	17781.	21477.
3	TYPE (2)				
4	TYPE (3)				
5	ACTUAL OUT-OF-CELL EQUIPMENT SPACE REQUIRED	(CU FT)	3950.	5010.	6030.
	PROCESSING SPACE COST (HOT CELLS)	($)			
	GROSS IN-CELL SPACE REQUIRED				
6	TYPE (1) STD. CELL WIDTH	(FT)	20.0	20.0	20.0
7	STD. CELL HEIGHT	(FT)	20.0	20.0	20.0
8	SUF (FROM ORNL TM-4613, TABLE 5)		2.50	2.50	2.50
9	GROSS CELL VOLUME	(CU FT)	36963.	44453.	53693.
10	LINEAR FT. OF CELL	(FT)	92.41	111.13	134.23
11	TYPE (2) STD. CELL WIDTH	(FT)			
12	STD. CELL HEIGHT	(FT)			
13	SUF (FROM ORNL TM-4613, TABLE 5)				
14	GROSS CELL VOLUME	(CU FT)			
15	LINEAR FT. OF CELL	(FT)			
16	TYPE (3) STD. CELL WIDTH	(FT)			
17	STD. CELL HEIGHT	(FT)			
18	SUF (FROM ORNL TM-4613, TABLE 5)				
19	GROSS CELL VOLUME	(CU FT)			
20	LINEAR FT. OF CELL	(FT)			
	IN-CELL SPACE UNIT COST	($/CU FT)			
21	TYPE (1) (UCCF FROM ORNL TM-4613, TABLE 6)		9.00	9.00	9.00
22	TYPE (2) (UCCF FROM ORNL TM-4613, TABLE 6)				
23	TYPE (3) (UCCF FROM ORNL TM-4613, TABLE 6)				
	IN-CELL SPACE TOTAL COST	($)			
24	TYPE (1)		332663.	400073.	483233.
25	TYPE (2)				
26	TYPE (3)				
27	TOTAL		838238.	940348.	1061936.

	GROSS OUT-OF-CELL SPACE REQUIRED	(CU FT)			
	MAKE UP AND PROCESS SERVICE SPACE				
28	STD. AREA WIDTH	(FT)	16.0	16.0	16.0
29	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
30	SUF (FROM ORNL TM-4613, TABLE 5)		2.70	2.70	2.70
31	GROSS VOLUME	(CU FT)	10665.	13527.	16281.
	CELL OPERATING SPACE	(CU FT)			
32	TYPE (1) STD. AREA WIDTH	(FT)	10.0	10.0	10.0
33	STD. AREA HEIGHT	(FT)	20.0	20.0	20.0
34	NO. OF CELL SIDES WITH OP. AREA		1.0	1.0	1.0
35	GROSS VOLUME	(CU FT)	18481.	22226.	26846.
36	TYPE (2) STD. AREA WIDTH	(FT)			
37	STD. AREA HEIGHT	(FT)			
38	NO. OF CELL SIDES WITH OP. AREA				
39	GROSS VOLUME	(CU FT)			
40	TYPE (3) STD. AREA WIDTH	(FT)			
41	STD. AREA HEIGHT	(FT)			
42	NO. OF CELL SIDES WITH OP. AREA				
43	GROSS VOLUME	(CU FT)			
	CRANE BAY SPACE				
44	TYPE (1) CELL AREA	(SQ FT)	1848.	2223.	2685.
45	SUF (FROM ORNL TM-4613, TABLE 5)		3.50	3.50	3.50
46	STD. BAY HEIGHT	(FT)	44.0	44.0	44.0
47	GROSS VOLUME	(CU FT)	284611.	342284.	413432.
48	TYPE (2) CELL AREA	(SQ FT)			
49	SUF (FROM ORNL TM-4613, TABLE 5)				
50	STD. BAY HEIGHT	(FT)			
51	GROSS VOLUME	(CU FT)			
52	TYPE (3) CELL AREA	(SQ FT)			
53	SUF (FROM ORNL TM-4613, TABLE 5)				
54	STD. BAY HEIGHT	(FT)			
55	GROSS VOLUME	(CU FT)			
	OUT-OF-CELL SPACE UNIT COST	($/CU FT)			
56	MAKE-UP AND PROCESS SERVICE SPACE		7.00	7.00	7.00
	CELL OPERATING SPACE UCCF (FROM TM-4613, TABLE 6)				
57	TYPE (1)		7.00	7.00	7.00
58	TYPE (2)				
59	TYPE (3)				
	CRANE BAY SPACE UCCF (FROM TM=4613, TABLE 6)				
60	TYPE (1)		2.30	2.30	2.30
61	TYPE (2)				
62	TYPE (3)				

	OUT-OF-CELL SPACE TOTAL COST	($)			
63	MAKE-UP AND PROCESS SERVICE SPACE		74655.	94689.	113967.
	CELL OPERATING SPACE				
64	TYPE (1)		129369.	155584.	187924.
65	TYPE (2)				
66	TYPE (3)				
67	TOTAL		129369.	155584.	187924.
	CRANE BAY SPACE				
68	TYPE (1)		654606.	787253.	950893.
69	TYPE (2)				
70	TYPE (3)				
71	TOTAL		654606.	787253.	950893.
72	TOTAL OUT-OF-CELL SPACE COST		858629.	1037526.	1252784.
73	PROCESSING SPACE TOTAL COST	($)	1696867.	1977874.	2314720.
	PROCESSING SUPPORT SPACE COST (BLDG. EXCLUDING HOT CELLS)				
	INDIRECT PROCESS SUPPORT SPACE				
74	STD. AREA HEIGHT	(FT)	14.0	14.0	14.0
75	SUP (FROM ORNL TM-4613, TABLE 5)		5.60	5.60	5.60
76	TOTAL SPACE REQUIRED	(CU FT)	207203.	241003.	282120.
	INDIRECT PROCESS SUPPORT SPACE UNIT COST ($/CU FT)				
77	UCCP (FROM ORNL TM-4613, TABLE 6)	($/CU FT)	7.00	7.00	7.00
78	PROCESSING SUPPORT SPACE TOTAL COST	($)	1450422.	1687023.	1974841.
	OUTSIDE UTILITIES COST	($)			
79	UCP (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
80	EQUIPMENT AND FACILITY COST		4107389.	4759197.	5631161.
81	OUTSIDE UTILITIES COST		410739.	475920.	563116.
	SITE IMPROVEMENT COST	($)			
82	UCP (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.005	0.005	0.005
83	SUBTOTAL DIRECT CONSTRUCTION COST	($)	4518127.	5235116.	6194276.
84	SITE IMPROVEMENT COST	($)	22591.	26176.	30971.
85	TOTAL DIRECT CONSTRUCTION COST	($)	4540717.	5261291.	6225247.

INDIRECT CONSTRUCTION COST

	GENERAL AND ADMINISTRATIVE COST				
86	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.10	0.10	0.10
87	SUBTOTAL GEN. + ADM. COST	($)	454072.	526129.	622524.
	ENGINEERING COST				
88	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.30	0.30	0.30
89	SUBTOTAL ENGR. COST	($)	1362214.	1578387.	1867573.
	MISC. CONSTRUCTION COST				
90	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.05	0.05	0.05
91	SUBTOTAL MISC. CONSTRUCTION COST	($)	227036.	263065.	311262.
	CONTINGENCY ALLOWANCE				
92	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.20	0.20	0.20
93	SUBTOTAL CONTINGENCY ALLOWANCE	($)	908143.	1052258.	1245049.
	SPARE PARTS COST				
94	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.007	0.007	0.007
95	SUBTOTAL SPARE PARTS COST	($)	31785.	36829.	43577.
	NONINSTALLED SPARE EQUIPMENT COST				
96	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.03	0.03	0.03
97	SUBTOTAL NONINSTLED SPARE EQUIPMENT COST	($)	136221.	157839.	186757.
	QUALITY ASSURANCE COST				
98	UCF (FROM ORNL TM-4613, TABLE 7)	(FRACT.)	0.06	0.06	0.06
99	SUBTOTAL QUALITY ASSURANCE COST	($)	272443.	315677.	373515.
100	TOTAL INDIRECT CONSTRUCTION COST	($)	3391912.	3930181.	4650255.

OWNER'S COST					
LAND COST					
101	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.01	0.01	0.01
102	SUBTOTAL LAND COST	($)	45407.	52613.	62252.
PROJECT MANAGEMENT COST					
103	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.02	0.02	0.02
104	SUBTOTAL PROJ. MANGT. COST	($)	90816.	105226.	124505.
LICENSING COST					
105	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.04	0.04	0.04
106	SUBTOTAL LICENSING COST	($)	181629.	210452.	249010.
TAXES, INSURANCE AND INTEREST					
107	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
108	SUBTOTAL TAXES, INSURANCE AND INT.	($)	908143.	1052258.	1245049.
PREOPERATIONAL TESTING AND STARTUP					
109	UCF (FROM ORNL TM-4613, TABLE 8)	(FRACT.)	0.20	0.20	0.20
110	SUBTOTAL PREOP. TESTING AND STARTUP	($)	908143.	1052258.	1245049.
111	TOTAL OWNER'S COST	($)	2134136.	2472806.	2925865.
TOTAL CAPITAL CONSTRUCTION COST					
112	INCREMENT OF TOTAL PLANT COST	($)	10066765.	11664278.	13801367.
113	PROCESSING THROUGHPUT OF ACCEPTABLE PROD	(KGHM/DAY)	22.20	66.60	133.20
114	ANNUAL PRODUCTION RATE	(KILOGRAMS OF HEAVY METAL/YEAR)	6482.	19447.	38894.
115	CAPITAL CHARGE RATE	(FRACT.)	0.30	0.30	0.30
116	ANNUAL CAPITAL CHARGE	(DOLLARS/YEAR)	3020029.	3499282.	4140409.
117	PRODUCT UNIT COST	(DOLLARS/KILOGRAM OF HEAVY METAL)	465.88	179.94	106.45

SUMMARY OF RESULTS

DESCRIPTION		PLANT CAPACITY 0.5 TONNE PER DAY	1.5 TONNE PER DAY	3.0 TONNE PER DAY
PROCESS THROUGHPUT	(KILOGRAMS)	22.2	66.6	133.2
PROCESSING EQUIPMENT COST	($1000)	960.1	1094.3	1341.6
PLANT DIRECT CONSTRUCTION COST	($1000)	4540.7	5261.3	6225.2
PLANT INDIRECT CONSTRUCTION COST	($1000)	3391.9	3930.2	4650.3
PLANT OWNER'S COST	($1000)	2134.1	2472.8	2925.9
PLANT TOTAL COST	($1000)	10066.8	11664.3	13801.4
UNIT COST	(DOLLARS/KILOGRAM)	465.88	179.94	106.45

FUNCTION COEFFICIENTS ARE AS FOLLOWS =

A1 = 7.49638E 02 A2 = 3.04149E 02 A3 = 0.0 A4 = 0.0

FUNCTION EXPONENTS ARE AS FOLLOWS =

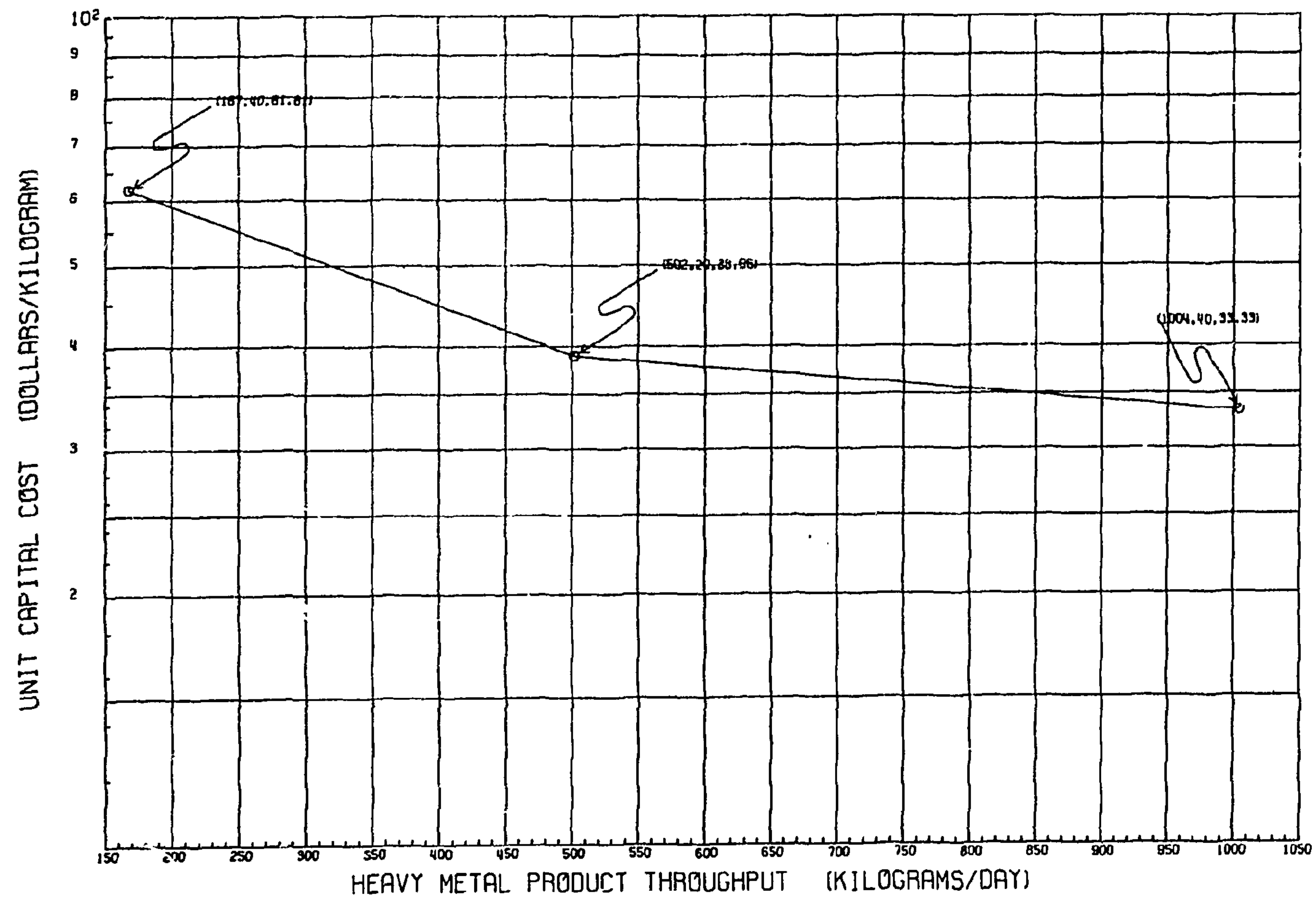
B1 = -2.14261E-02 B2 = -7.88154E-03 B3 = 0.0 B4 = 0.0

Appendix B-7

PROCESS GRAPHS FOR BASE-CASE DATA

ORNL-DWG 74-6461

HEAD END REPROCESSING OF 23 RECYCLE SPENT FUEL ELEMENTS (A-15)



PROCESS BLOCK NUMBER = 1

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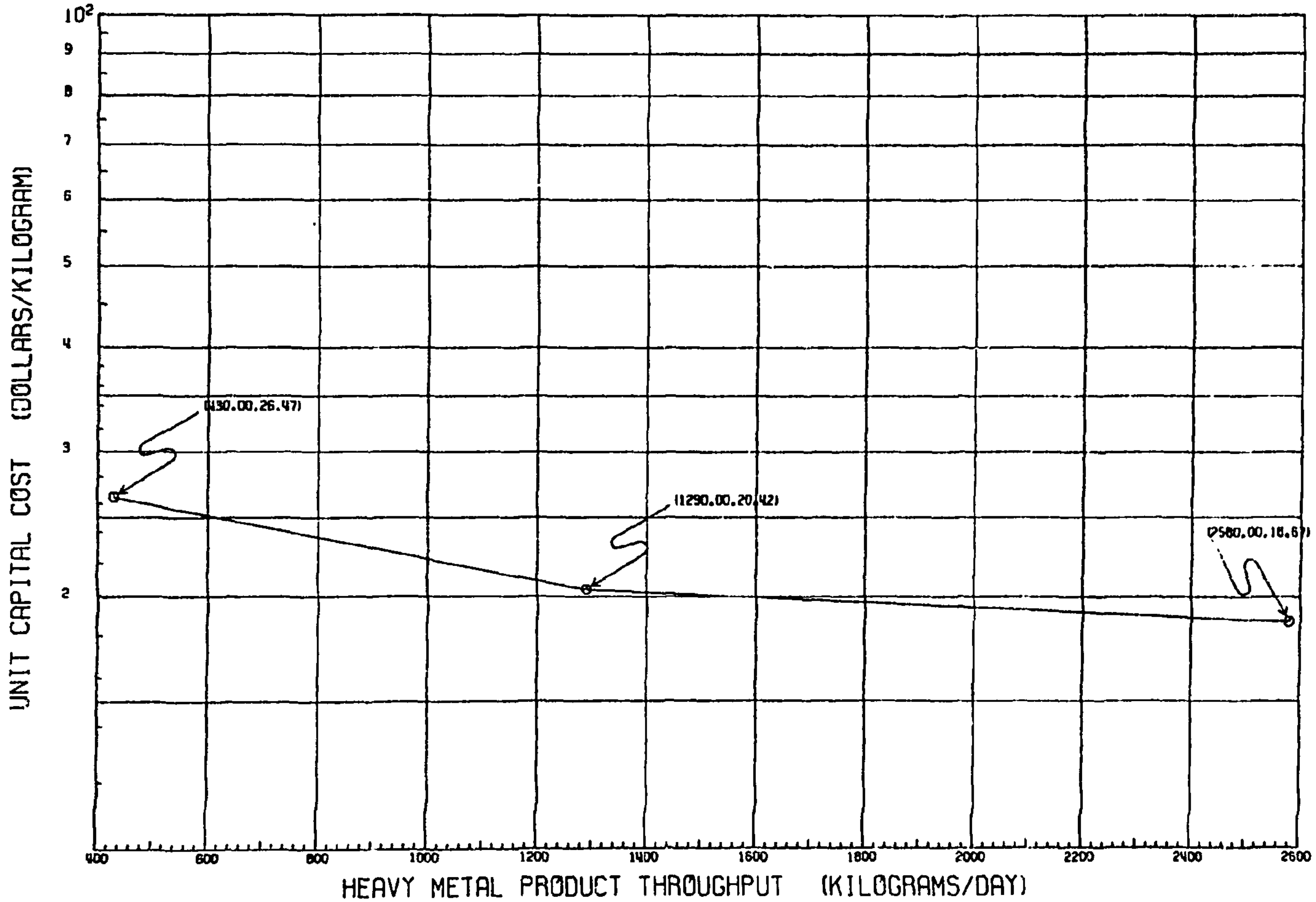
ORNL-DWG 74-6460

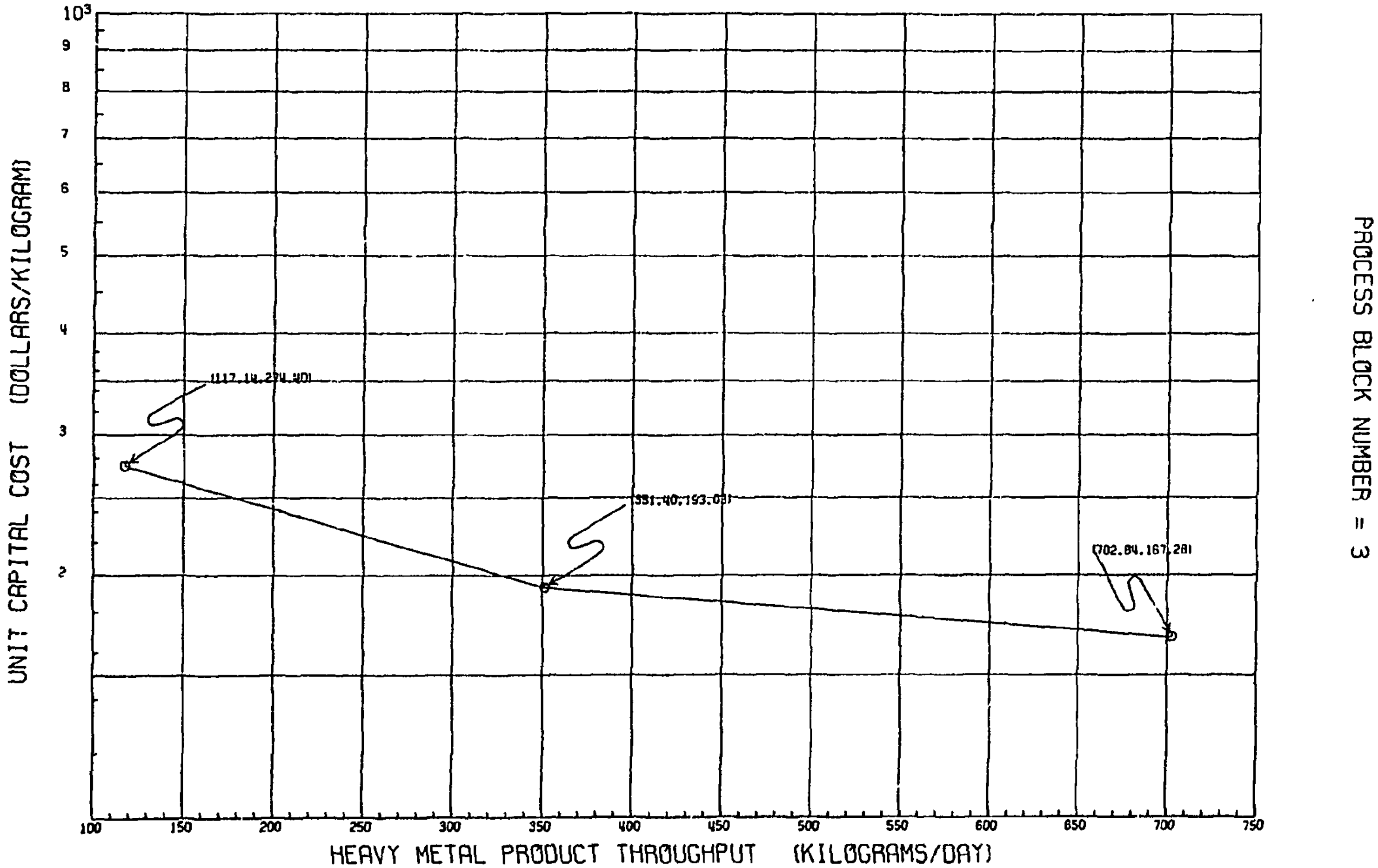
ACID THOREX REPROCESSING (23 RECYCLE FUEL)



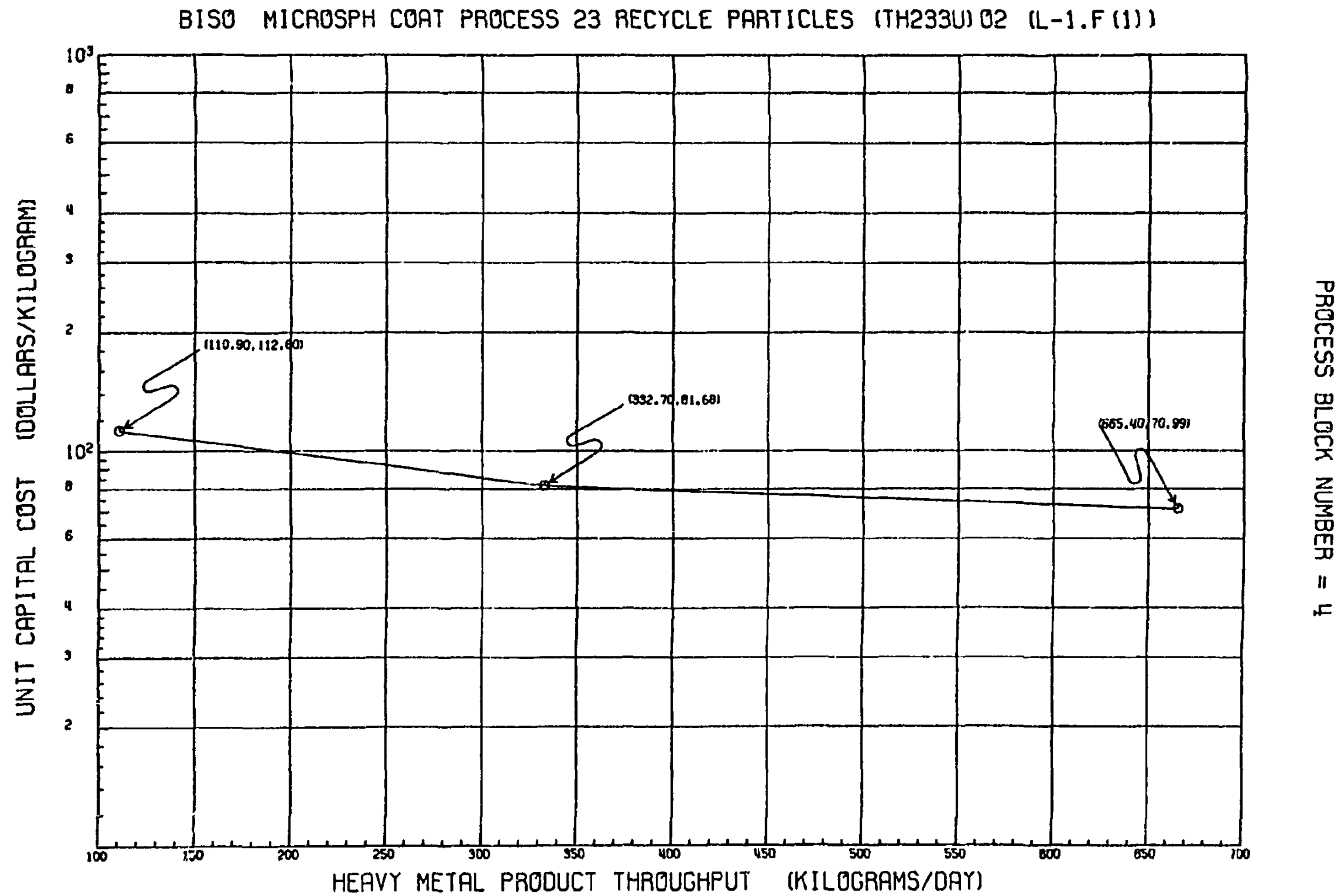
PROCESS BLOCK NUMBER = 2

ORNL-DWG 74-6459

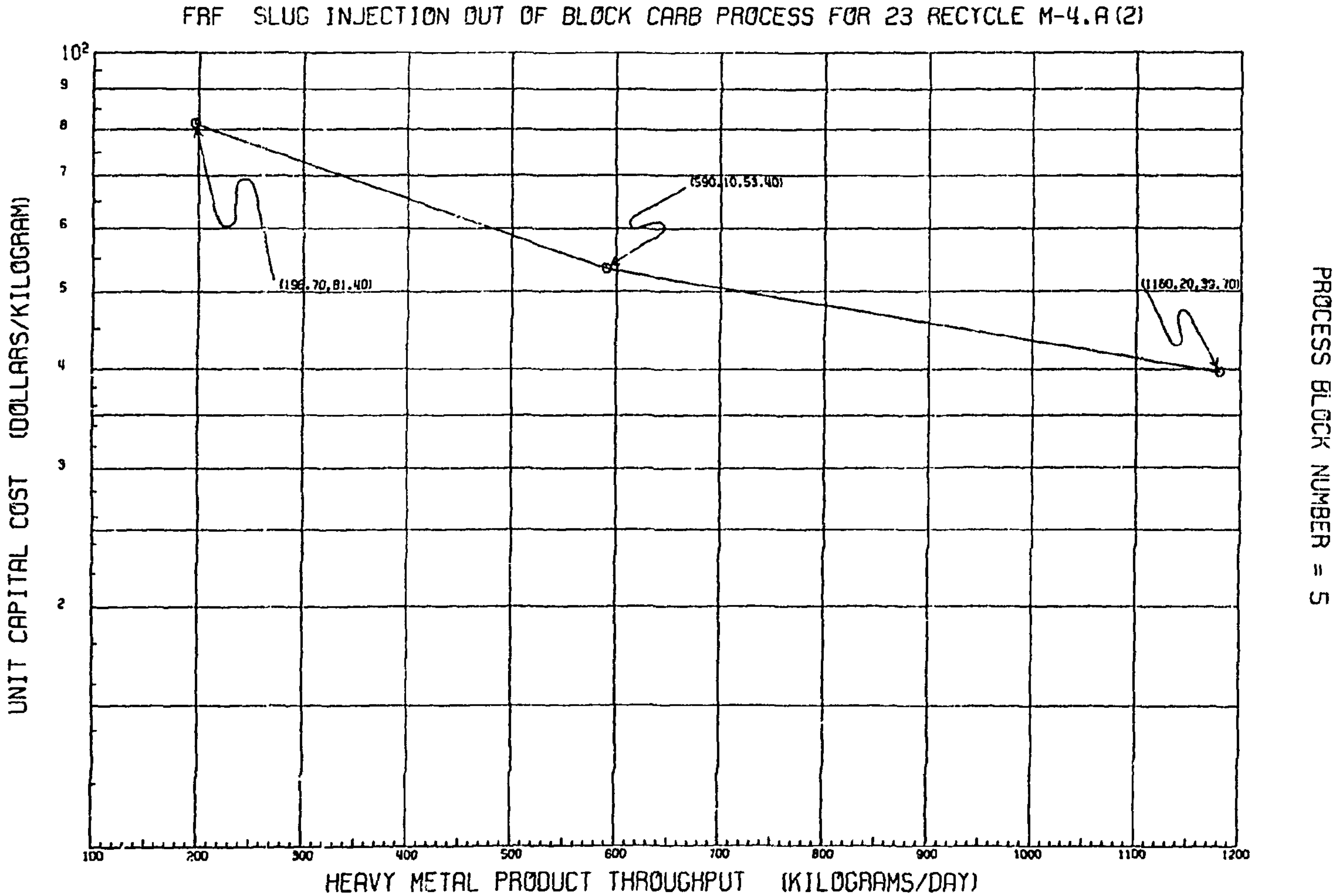
SØLEX PROCESS FØR MICRØSPHERE PREPARATIØN (23 RECYCLE)



ORNL-DWG 74-6458

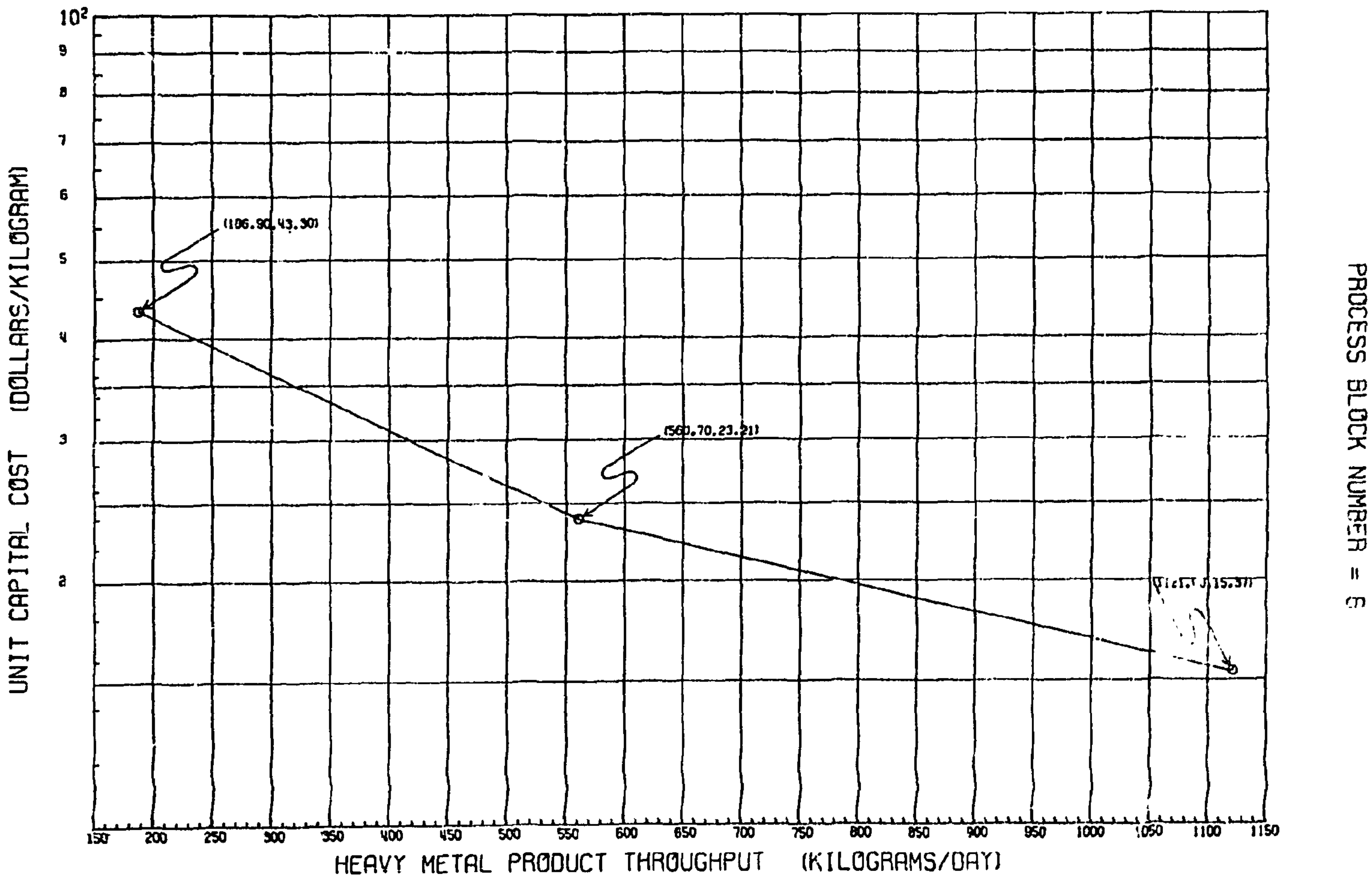


ORNL-DWG 74-6457



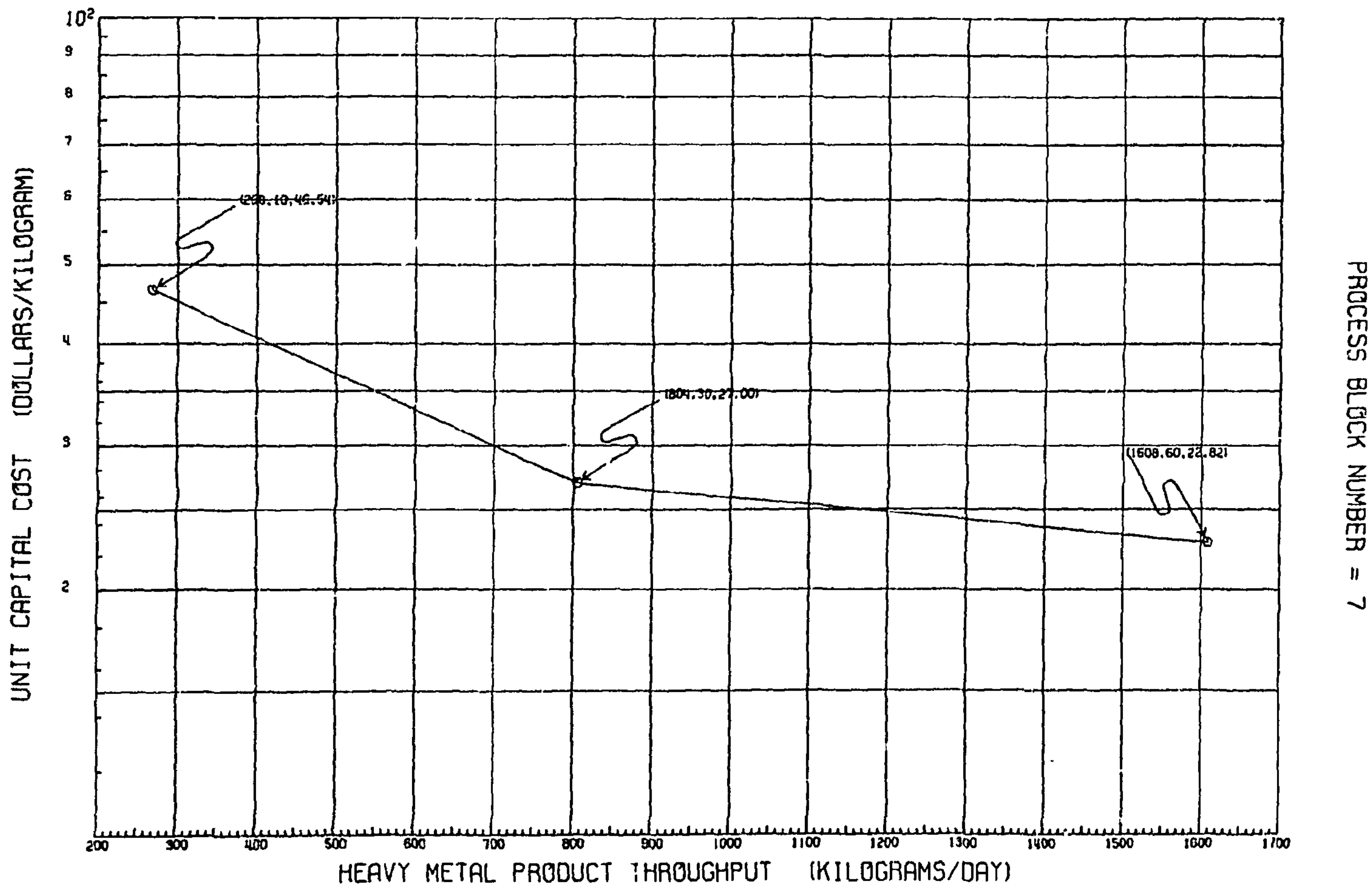
ORNL-DWG 74-6456

FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 23 RECYCLE N-1.B



ORNL-DWG 74-6455

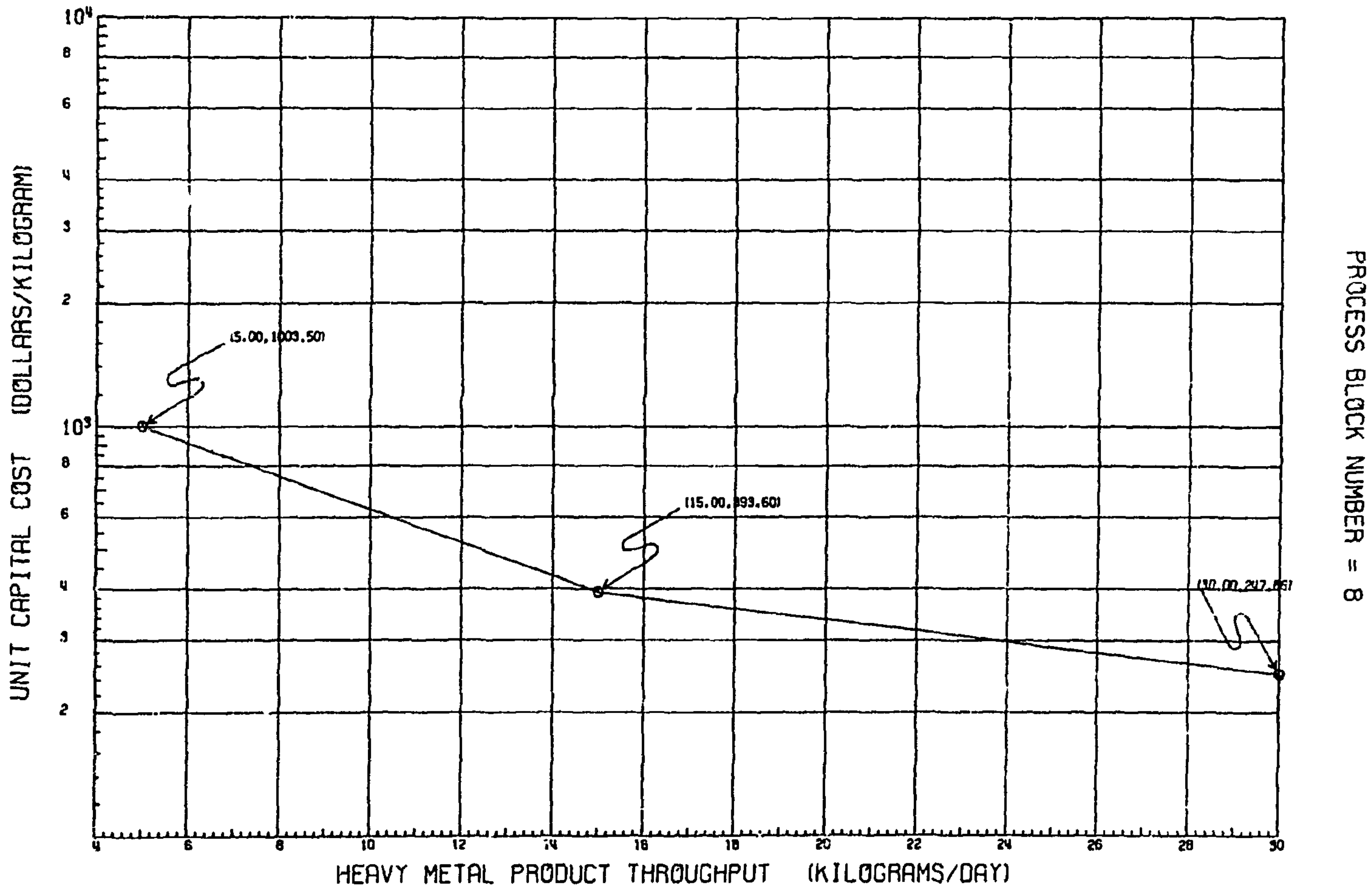
HEAD END REPROCESSING OF 1M AND 25 RECYCLE SPENT FUEL ELEMENTS (A1 & A19)



PROCESS BLOCK NUMBER = 7

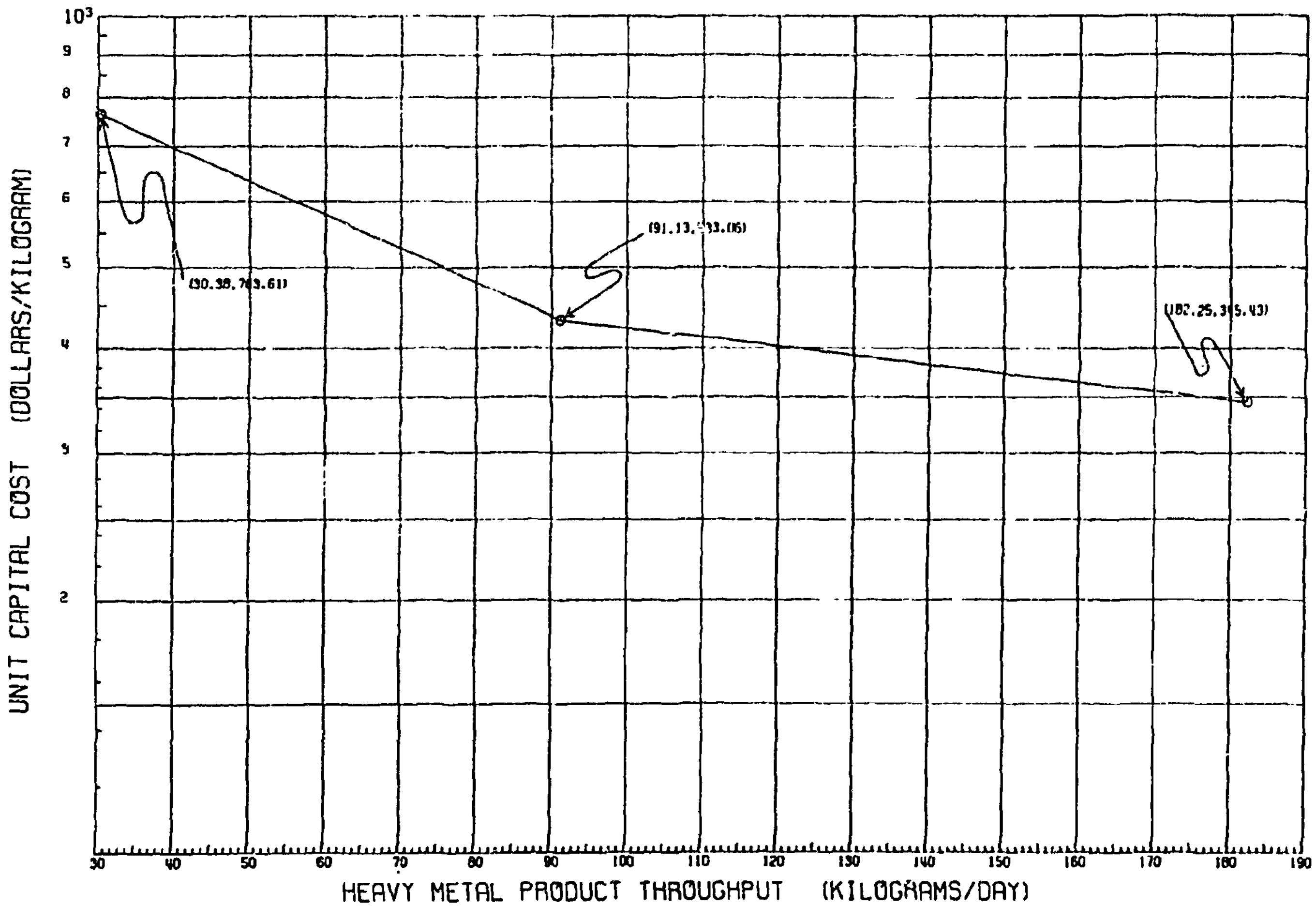
ORNL-DWG 74-6454

ACID THOREX REPROCESSING (IM SPENT & 25 RECYCLE FUEL)



ORNL-DWG 74-6453

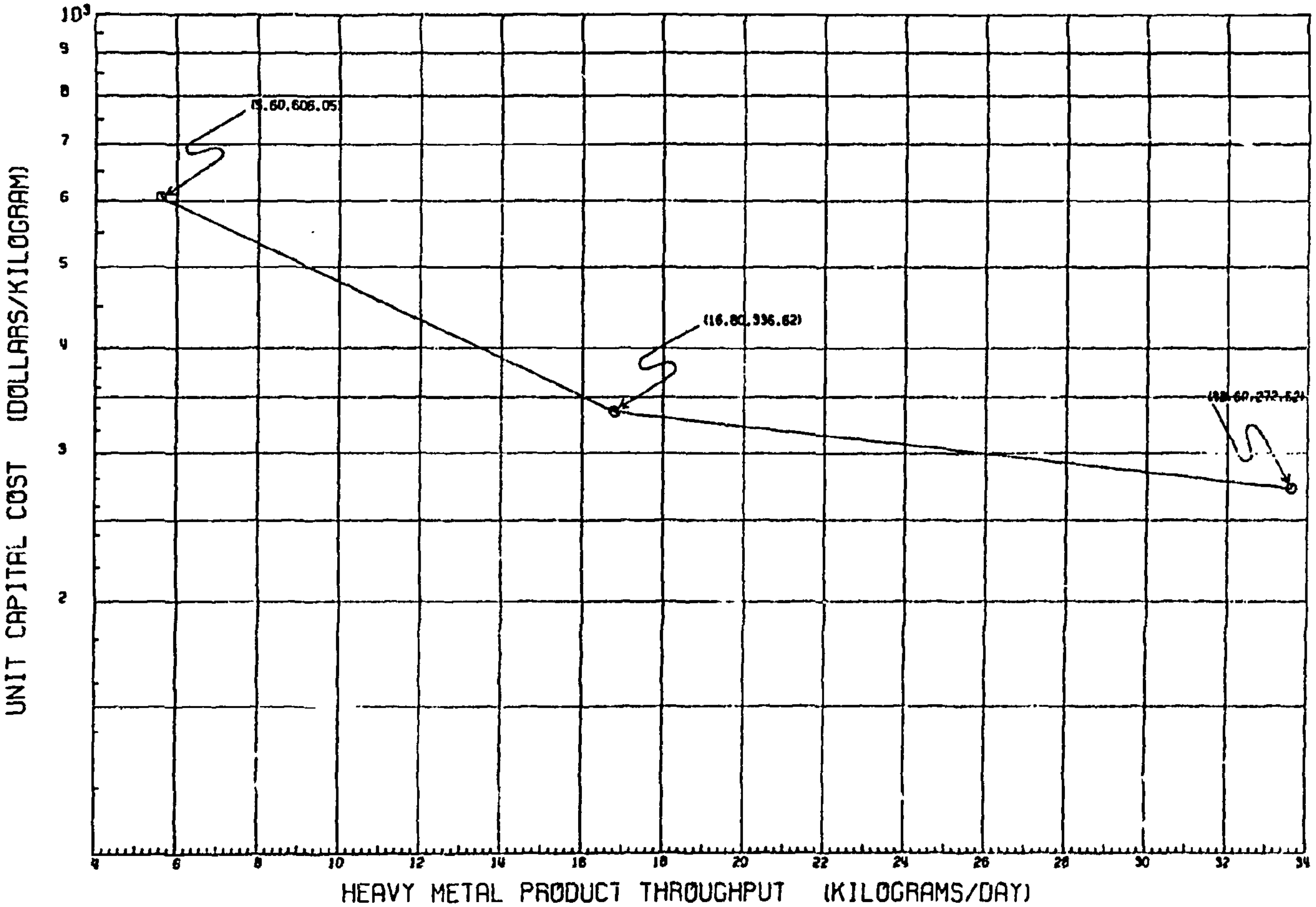
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (23 RECYCLE)



PROCESS BLOCK NUMBER = 9

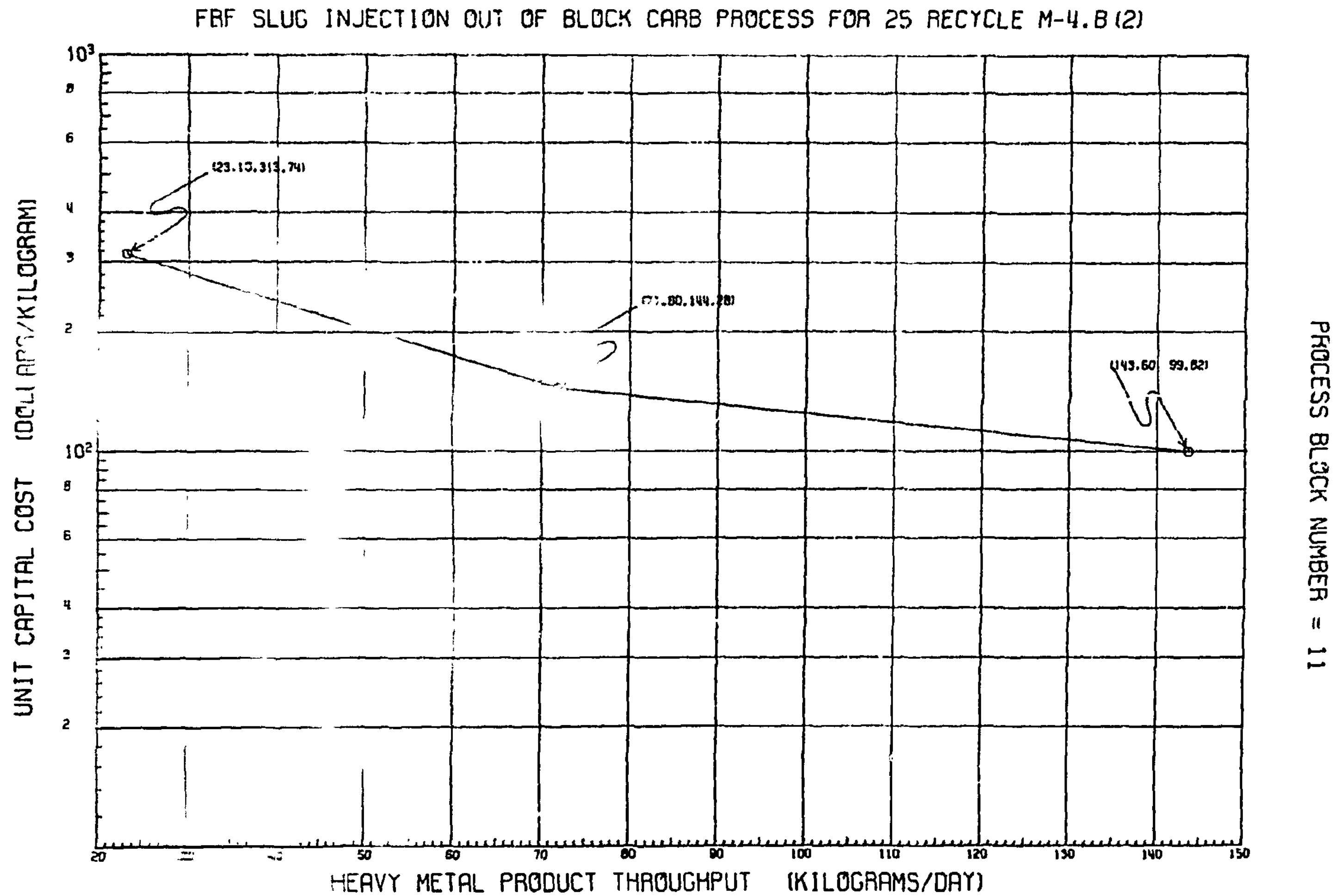
ORNL-DWG 74-6452

TRISO MICROSPHERE COATING PROCESS (25 RECYCLE PARTICLES) 235U02 (L-2.C.(1))



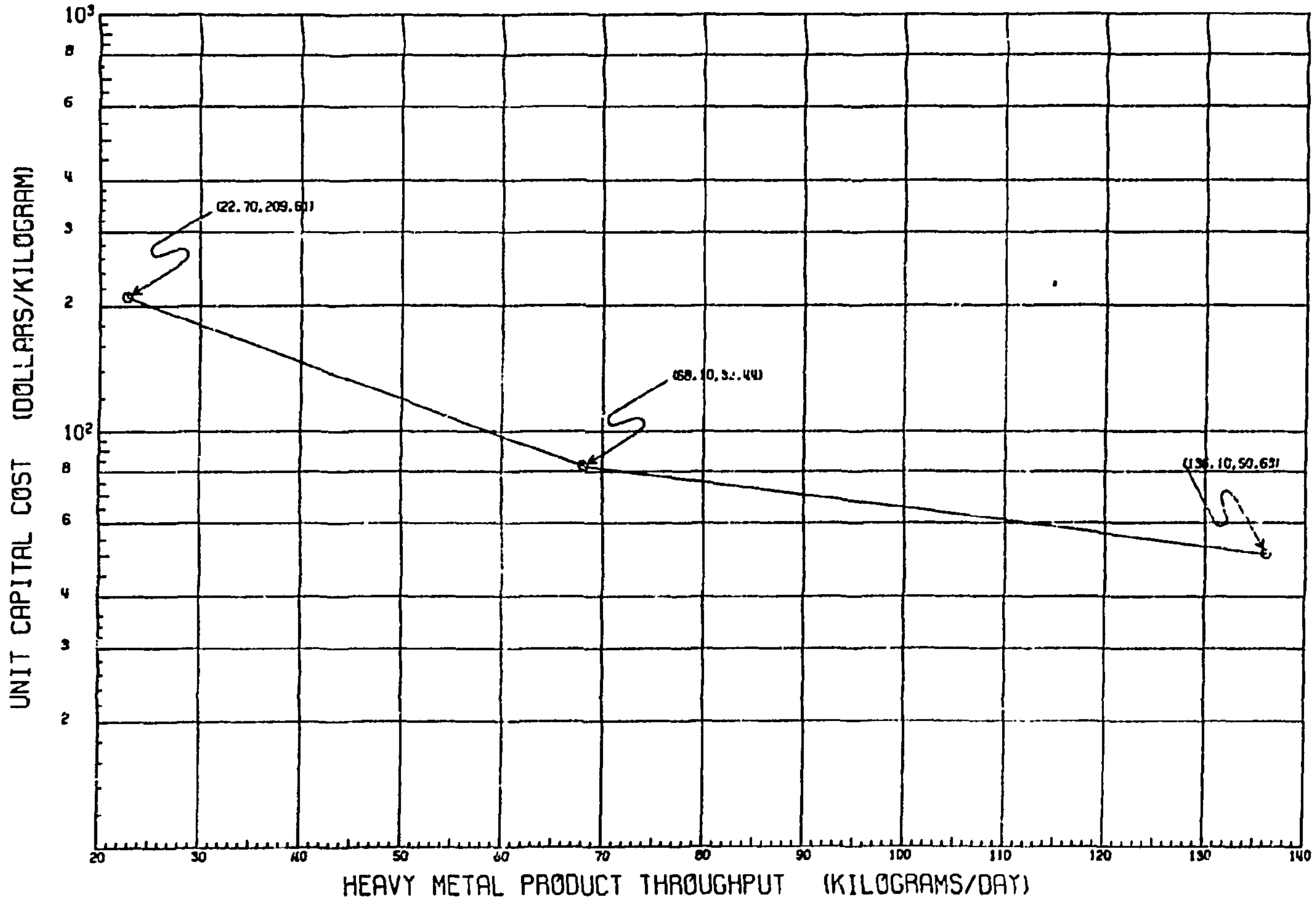
PROCESS BLOCK NUMBER = 10

ORNL-DWG 74-6451

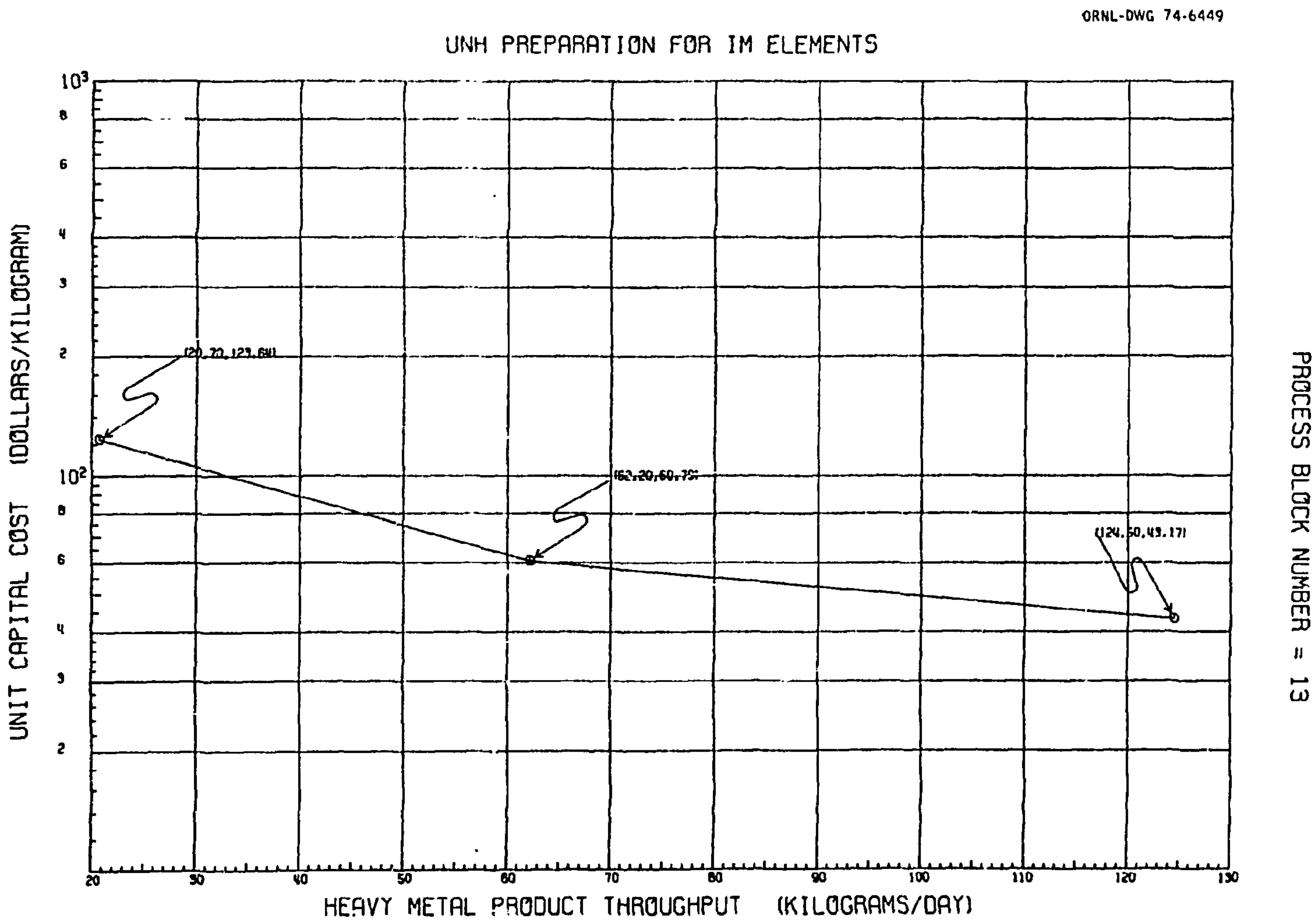


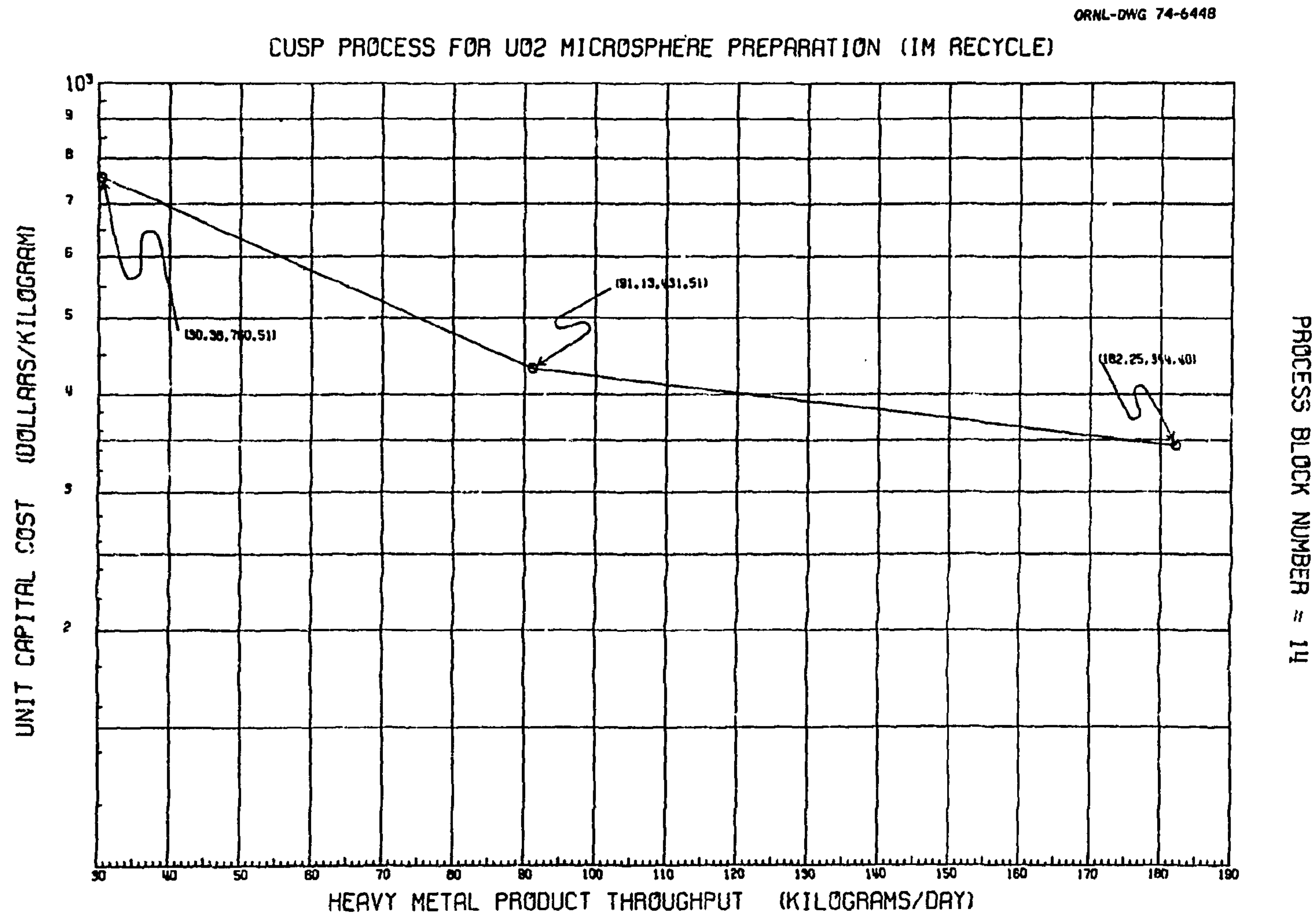
ORNL-DWG 74-6450

FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 25 RECYCLE N-1.C



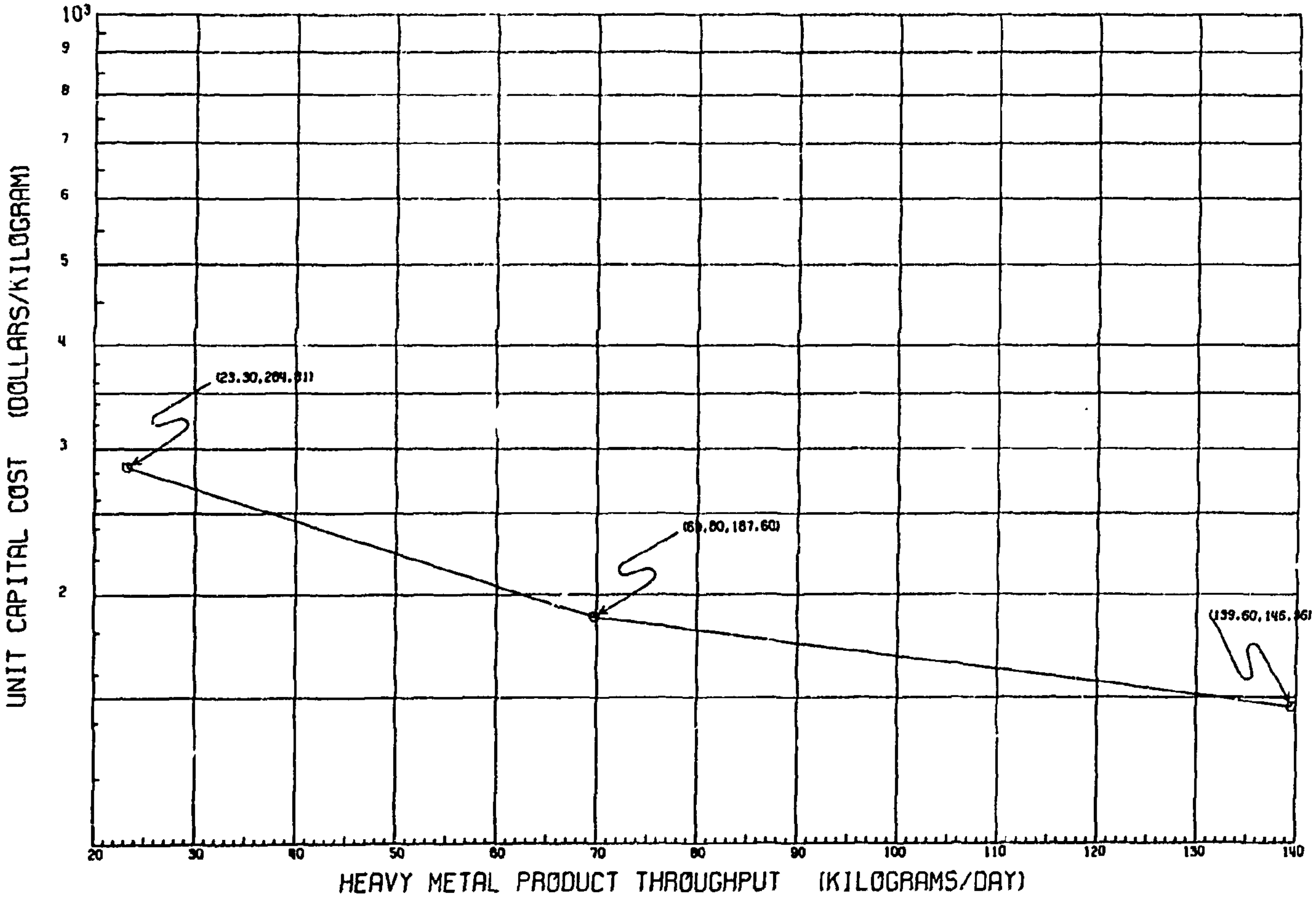
PROCESS BLOCK NUMBER = 12


ORNL-DWG 74-6449
UNH PREPARATION FOR IM ELEMENTS
UNIT CAPITAL COST (DOLLARS/KILOGRAM)
HEAVY METAL PRODUCT THROUGHPUT (KILOGRAMS/DAY)
PROCESS BLOCK NUMBER = 13
(20.70,123.64)
(62.20,60.79)
(124.50,43.17)


ORNL-DWG 74-6448
CUSP PROCESS FOR U02 MICROSPHERE PREPARATION (IM RECYCLE)
UNIT CAPITAL COST (DOLLARS/KILOGRAM)
HEAVY METAL PRODUCT THROUGHPUT (KILOGRAMS/DAY)
(30.38,760.51)
(91.13,431.51)
(182.25,364.40)
PROCESS BLOCK NUMBER = 14

ORNL-DWG 74-6447

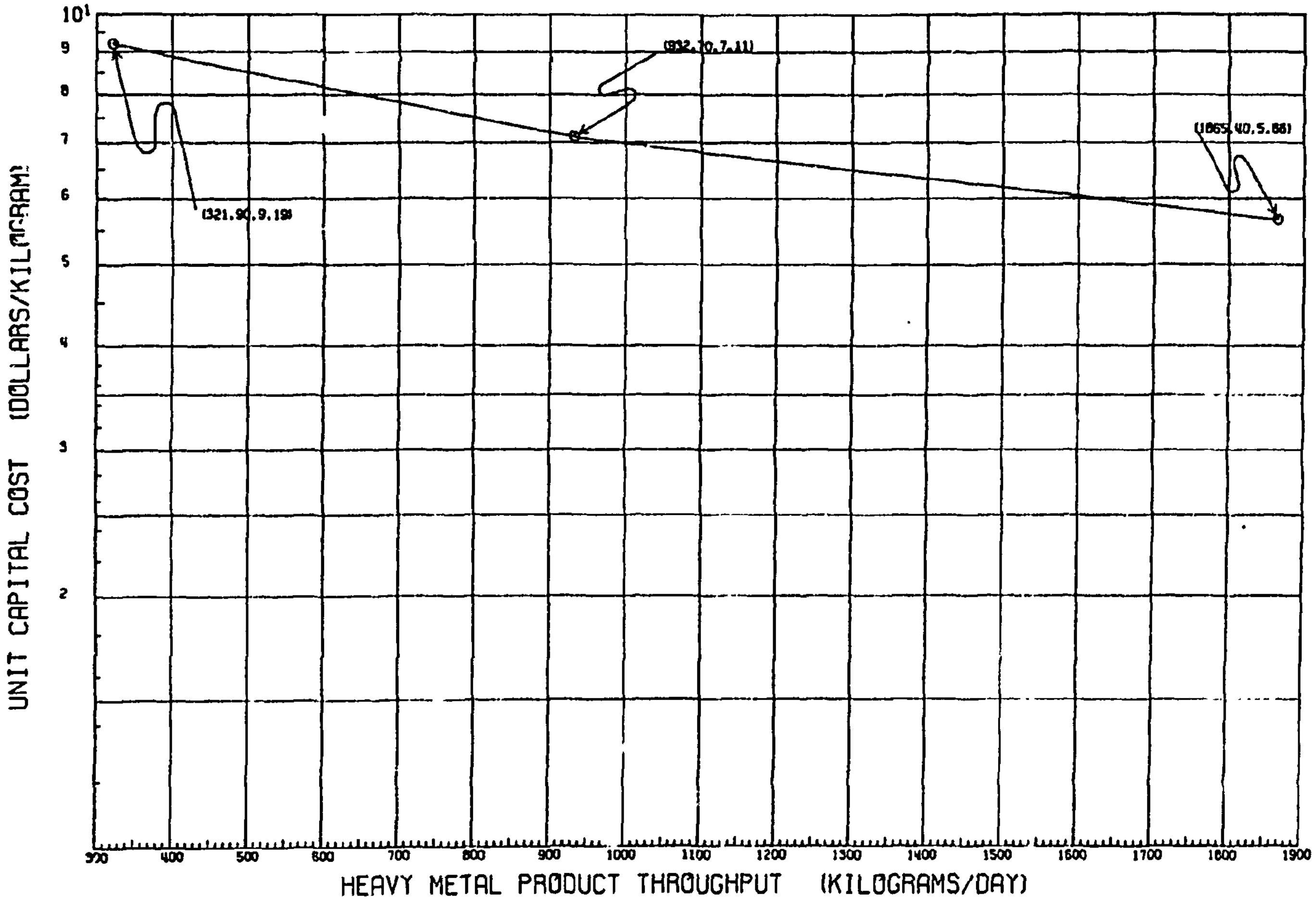
TRISO COATING PROCESS IM FISILE PARTICLES U02 (L-2.J.(1))



PROCESS BLOCK NUMBER = 15

ORNL-DWG 74-6446

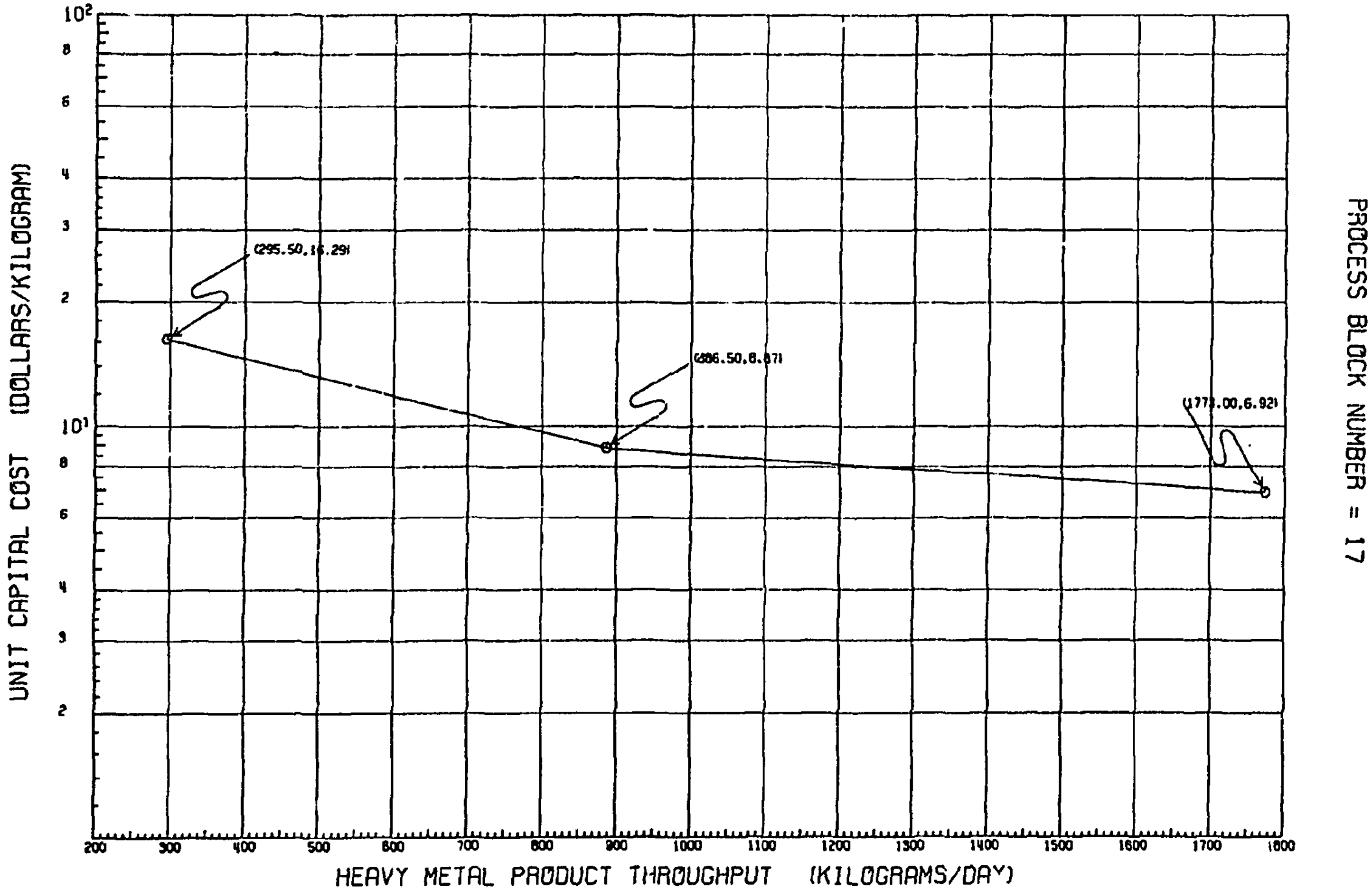
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR IM FUEL M-4.A(1)



PROCESS BLOCK NUMBER = 16

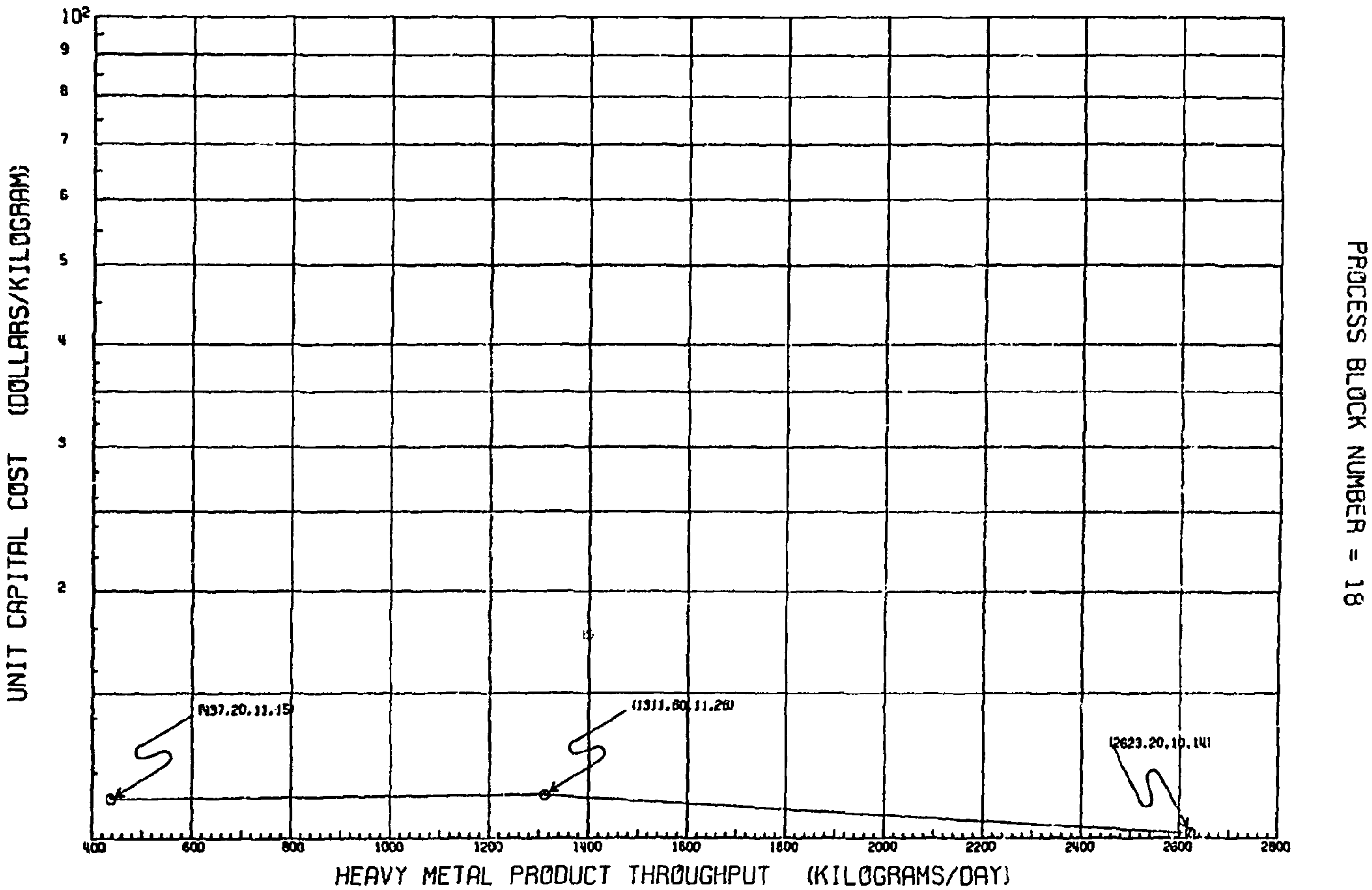
ORNL-DWG 74-6445

FUEL ELEMENT ASSEMBLY OUT OF BLOCK CABB PROCESS IN FUEL N-1.A

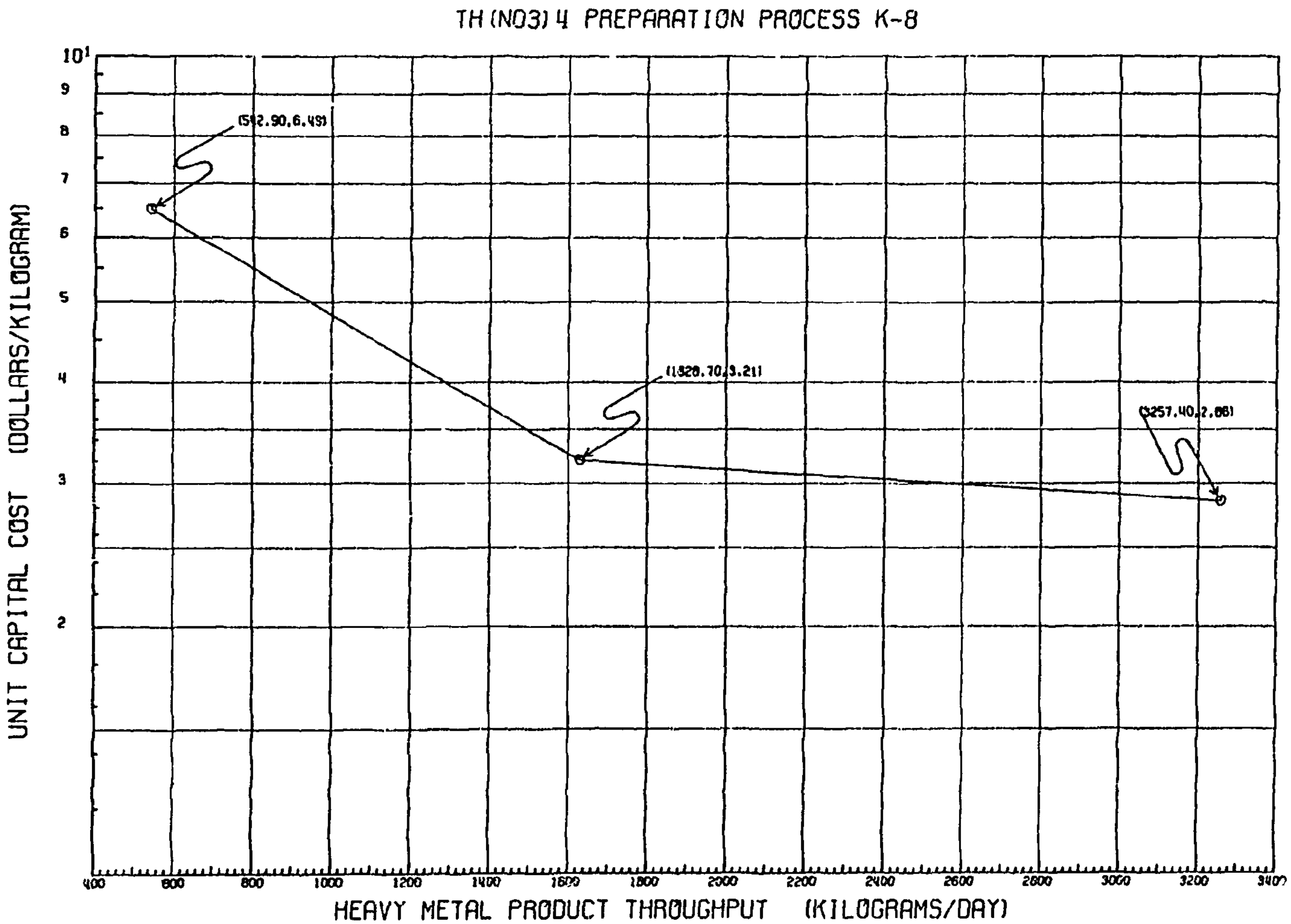


ORNL-DWG 74-6444

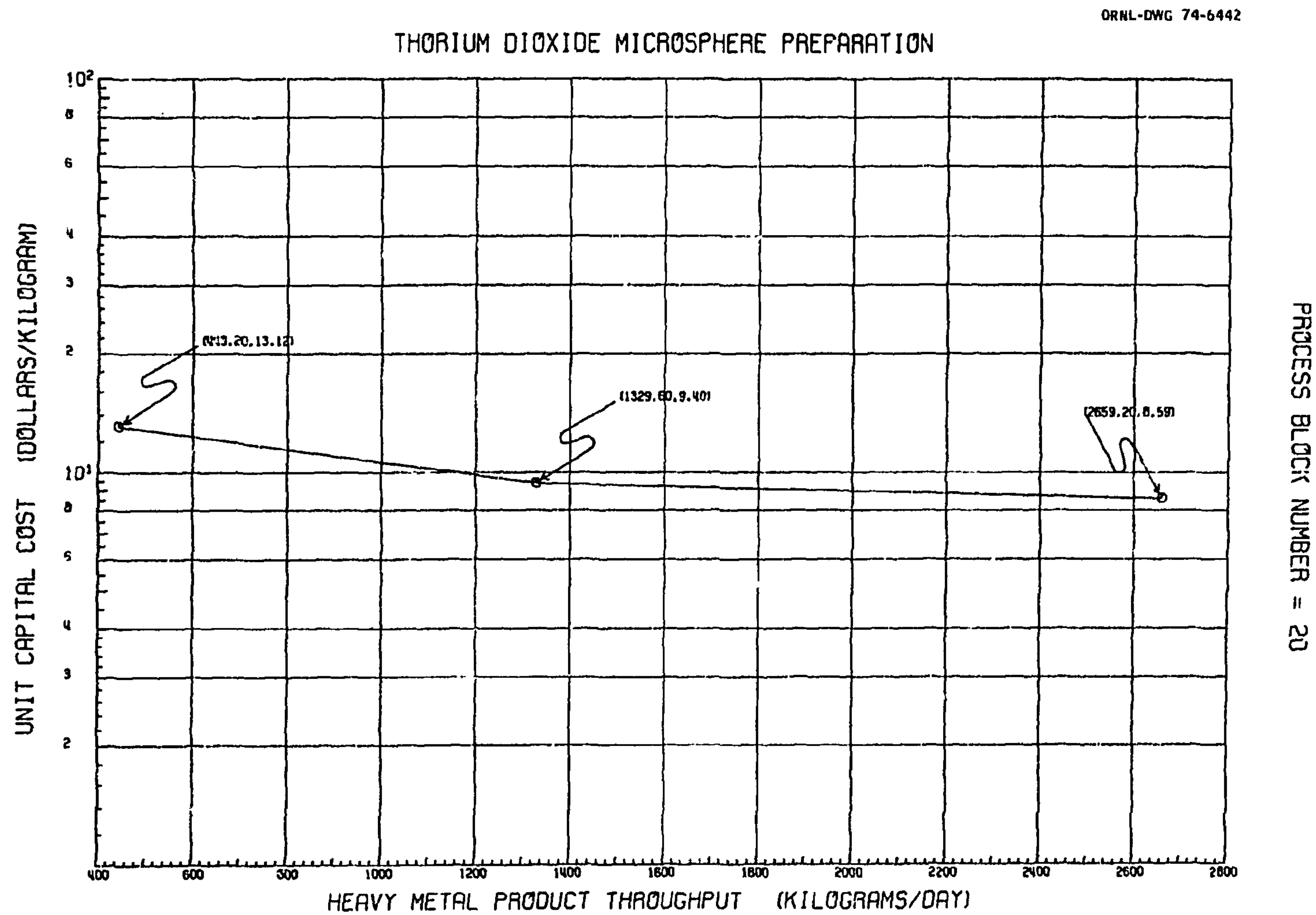
THORIUM RECOVERY PROCESS (T-2)



ORNL-DWG 74-6443

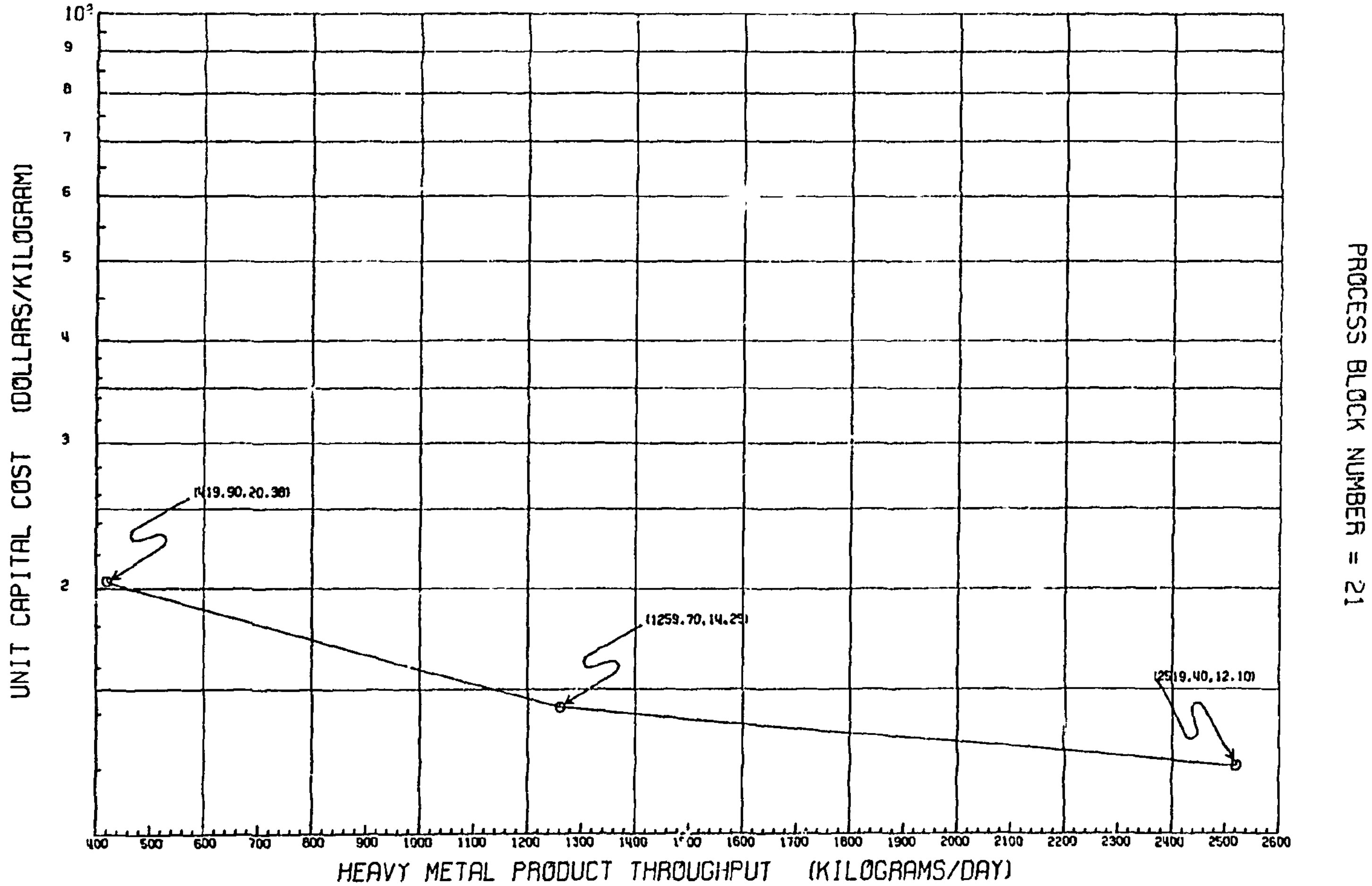


PROCESS BLOCK NUMBER = 19

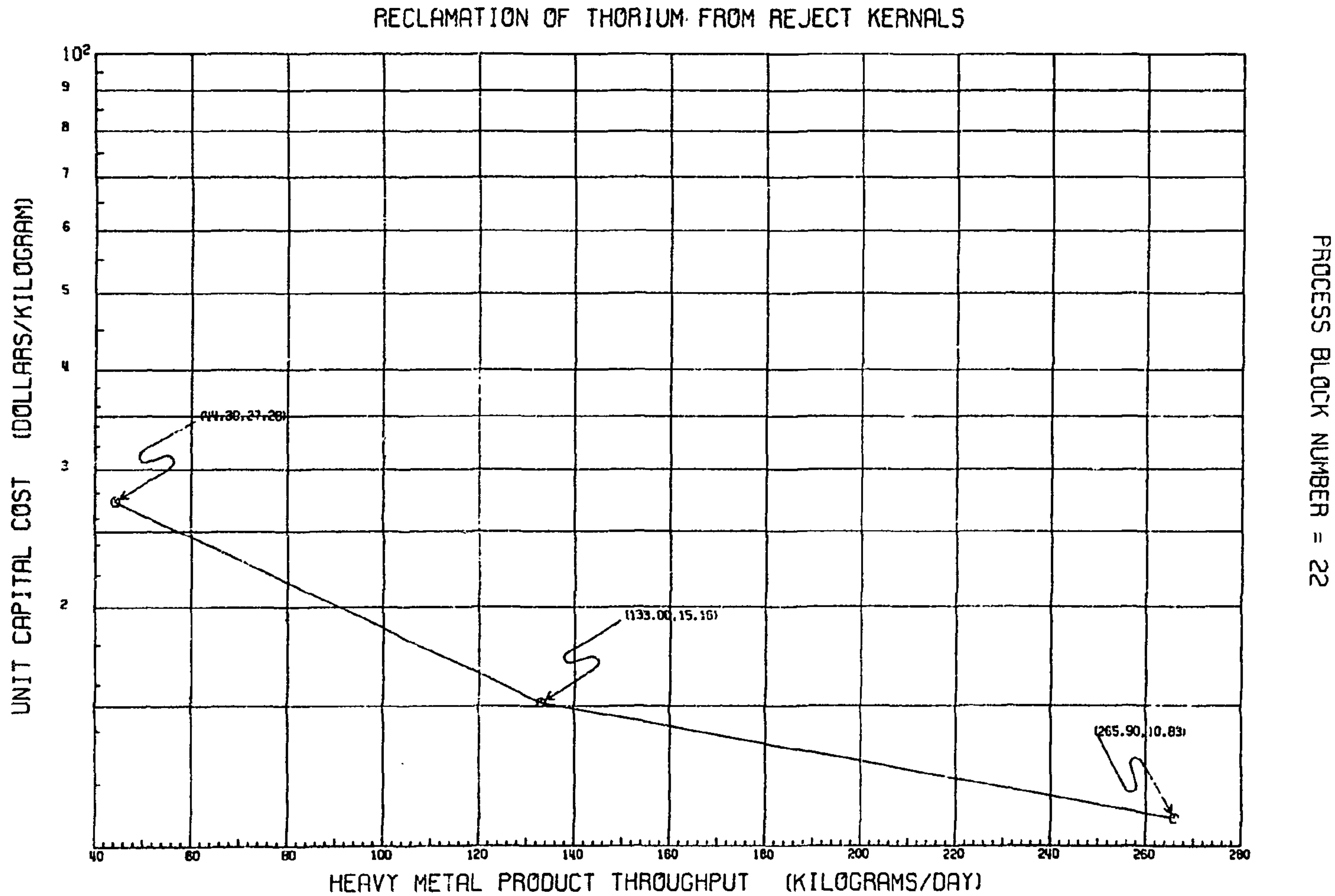

ORNL-DWG 74-6442
THORIUM DIOXIDE MICROSPHERE PREPARATION
UNIT CAPITAL COST (DOLLARS/KILOGRAM)
HEAVY METAL PRODUCT THROUGHPUT (KILOGRAMS/DAY)
10^2
8
6
4
3
2
10^1
8
6
4
3
2
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
(443.20,13.12)
(1329.60,9.40)
(2659.20,8.59)
PROCESS BLOCK NUMBER = 20

ORNL-DWG 74-6441

BISO MICROSPHERE COATING PROCESS - FERTILE PARTICLES-THO2 (L-1.A.(1)

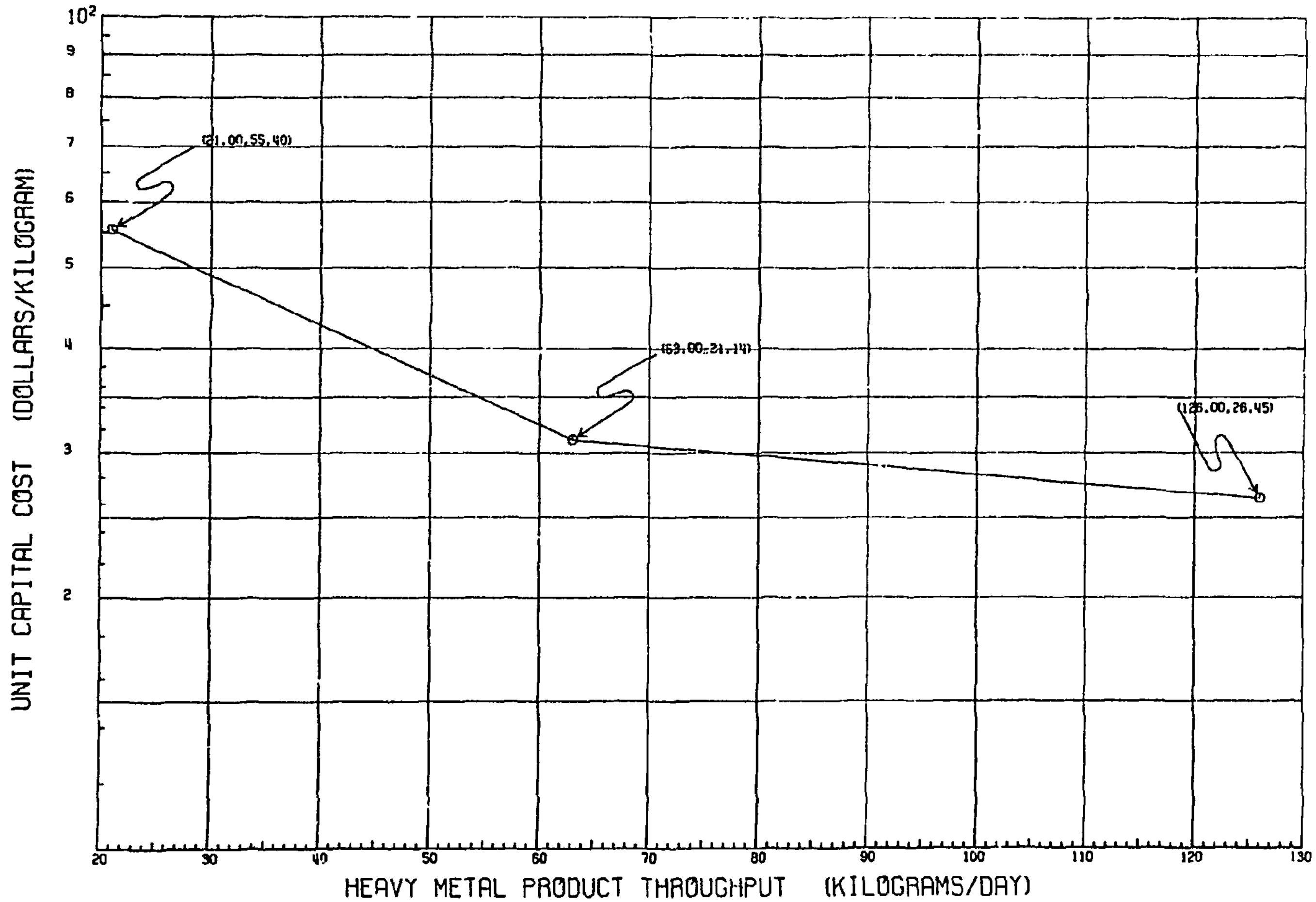


ORNL-DWG 74-6440



ORNL-DWG 74-6439

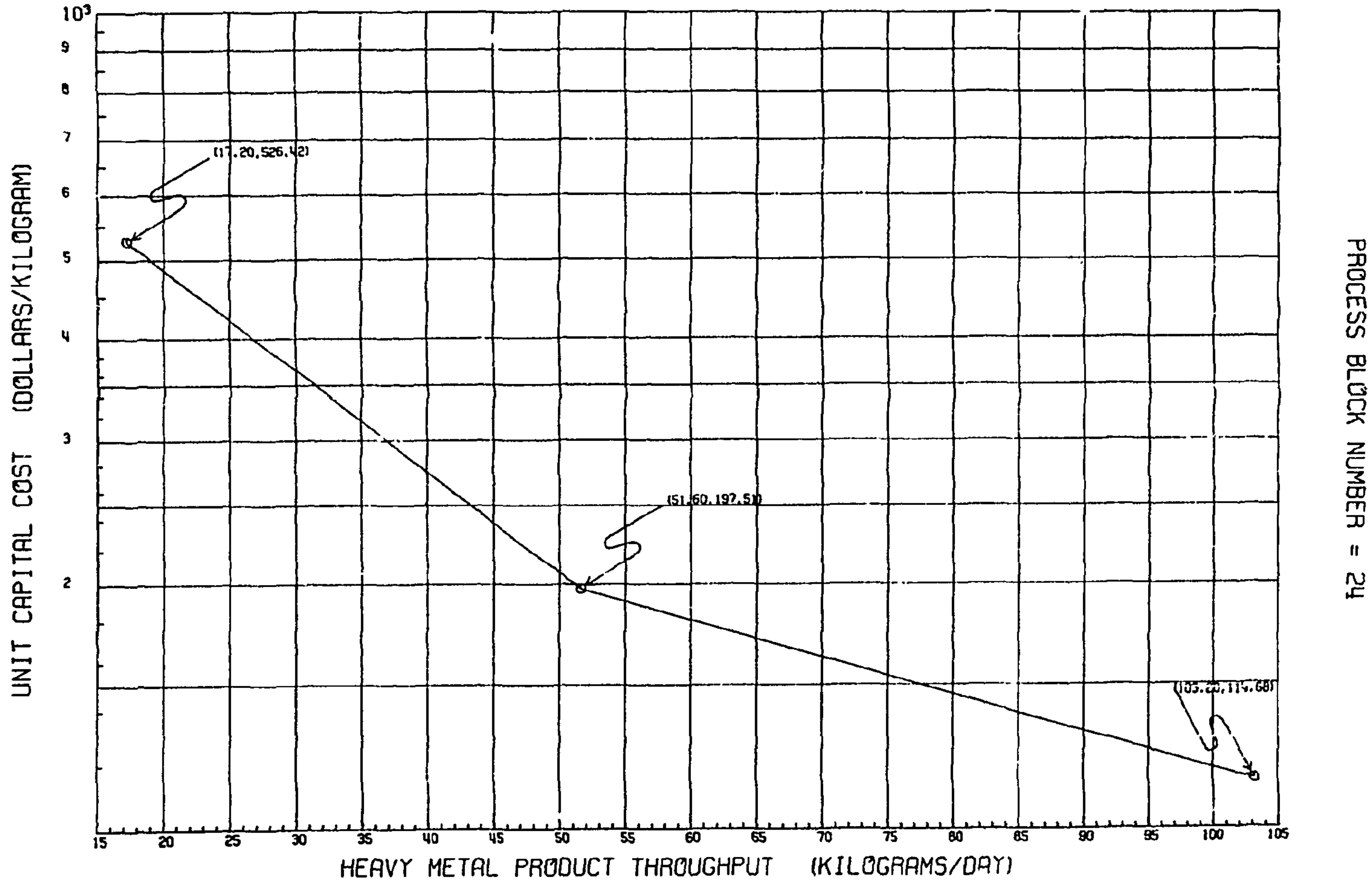
THORIUM DIOXIDE REJECT RECLAMATION COATING REMOVAL



PROCESS BLOCK NUMBER = 23

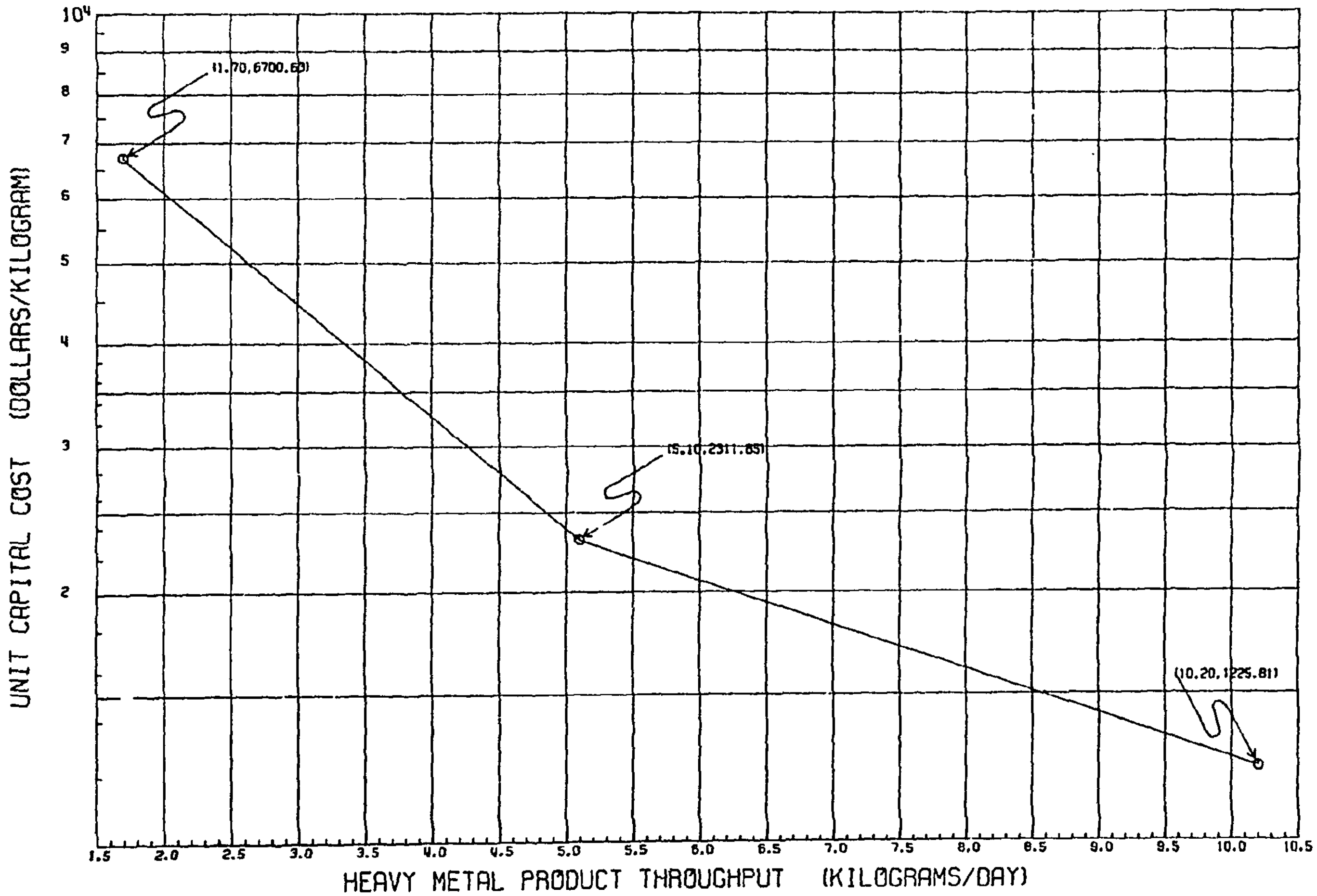
ORNL-DWG 74-6362

RECLAMATION PROCESSING OF REJECT 23 RECYCLE FUEL (A-15 ELEMENT)



ORNL-DWG 74-6463

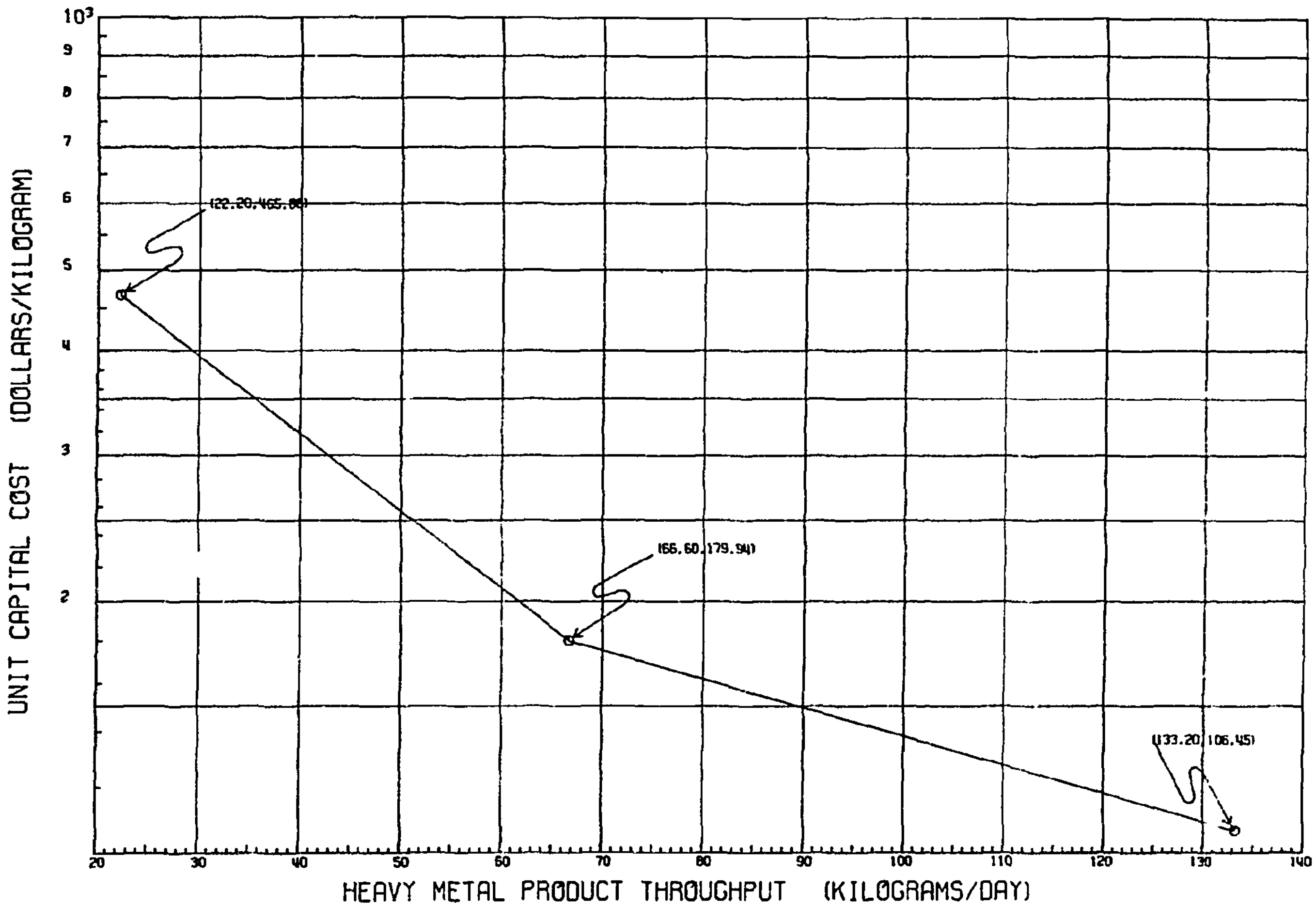
RECLAMATION PROCESSING OF REJECT 25 RECYCLE FUEL (A-19 ELEMENTS)



PROCESS BLOCK NUMBER = 25

ORNL-DWG 74-6464

RECLAMATION PROCESSING OF REJECT IM FUEL (A-1 ELEMENTS)



PROCESS BLOCK NUMBER = 26

Appendix B-8

PUNCHED OUTPUT FROM CEP

```
    1   26
HEAD END REPROCESSING OF 23 RECYCLE SPENT FUEL ELEMENTS(A-15)$               B1
 3   1.67400E 02   5.02200E 02   1.00440E 03
 1   6.18090E 01   3.99570E 01   3.33257E 01
ACID THOREX REPROCESSING (23 RECYCLE FUEL) $                                 B2
 3   4.30000E 02   1.29000E 03   2.58000E 03
 2   2.64745E 01   2.04184E 01   1.86684E 01
SOLEX PROCESS FOR MICROSPHERE PREPARATION (23 RECYCLE)$                      B3
 3   1.17140E 02   3.51400E 02   7.02840E 02
 3   2.74396E 02   1.93048E 02   1.67278E 02
BISO  MICROSPH COAT PROCESS 23 RECYCLE PARTICLES (TH233U)O2 (L-1.F(1))$      B4
 3   1.10900E 02   3.32700E 02   6.65400E 02
 4   1.12598E 02   8.16793E 01   7.09926E 01
FRF  SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 23 RECYCLE M-4.A(2)$       B5
 3   1.96700E 02   5.90100E 02   1.18020E 03
 5   8.14019E 01   5.34006E 01   3.96986E 01
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 23 RECYCLE N-1.B$            B6
 3   1.86900E 02   5.60700E 02   1.12140E 03
 6   4.33024E 01   2.39099E 01   1.53726E 01
HEAD END REPROCESSING OF IN AND 25 RECYCLE SPENT FUEL ELEMENTS (A1 & A19)$   B7
 3   2.68100E 02   8.04300E 02   1.60860E 03
 7   4.65426E 01   2.69976E 01   2.28244E 01
ACID THOREX REPROCESSING (IN SPENT & 25 RECYCLE FUEL)$                       B8
 3   5.00000E 00   1.50000E 01   3.00000E 01
 8   1.00350E 03   3.93600E 02   2.47862E 02
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (23 RECYCLE)$                   B9
 3   3.03750E 01   9.11250E 01   1.82250E 02
 9   7.63607E 02   4.33055E 02   3.45431E 02
TRISO MICROSPHERE COATING PROCESS (25 RECYCLE PARTICLES) 235UO2 (L-2.C.(1))$ B10
 3   5.60000E 00   1.68000E 01   3.36000E 01
10   6.06048E 02   3.36616E 02   2.72515E 02
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 25 RECYCLE M-4.B(2)$        B11
 3   2.31000E 01   7.18000E 01   1.43600E 02
11   3.13745E 02   1.44282E 02   9.98171E 01
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 25 RECYCLE N-1.C$            B12
 3   2.27000E 01   6.81000E 01   1.36100E 02
12   2.09609E 02   8.24385E 01   5.06266E 01
UNH PREPARATION FOR IN ELEMENTS$                                             B13
 3   2.07000E 01   6.22000E 01   1.24500E 02
13   1.23639E 02   6.06984E 01   4.31719E 01
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (IN RECYCLE)$                   B14
 3   3.03750E 01   9.11250E 01   1.82250E 02
14   7.60508E 02   4.31506E 02   3.44398E 02
TRISO COATING PROCESS IN FISILE PARTICLES UO2 (L-2.J.(1))$                   B15
 3   2.33000E 01   6.98000E 01   1.39600E 02
15   2.84811E 02   1.87605E 02   1.46357E 02
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR IN FUEL M-4.A(1)$           B16
 3   3.21900E 02   9.32700E 02   1.86540E 03
16   9.19038E 00   7.11464E 00   5.66300E 00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS IN FUEL N-1.A$               B17
 3   2.95500E 02   8.86500E 02   1.77300E 03
17   1.62882E 01   8.87043E 00   6.91603E 00
THORIUM RECOVERY PROCESS (T-2)$                                              B18
 3   4.37200E 02   1.31160E 03   2.62320E 03
18   1.11549E 01   1.12756E 01   1.01431E 01
TH(NO3)4 PREPARATION PROCESS K-8$                                            B19
 3   5.42900E 02   1.62870E 03   3.25740E 03
19   6.49453E 00   3.21052E 00   2.85587E 00
THORIUM DIOXIDE MICROSPHERE PREPARATION$                                     B20
 3   4.43200E 02   1.32960E 03   2.65920E 03
20   1.31181E 01   9.40437E 00   8.58796E 00
BISO MICROSPHERE COATING PROCESS - FERTILE PARTICLES-THO2 (L-1.A.(1)$        B21
 3   4.19900E 02   1.25970E 03   2.51940E 03
21   2.03837E 01   1.42527E 01   1.20997E 01
RECLAMATION OF THORIUM FROM REJECT KERNALS$                                  B22
 3   4.43000E 01   1.33000E 02   2.65900E 02
22   2.72756E 01   1.51618E 01   1.08303E 01
THORIUM DIOXIDE REJECT RECLAMATION COATING REMOVAL$                          B23
 3   2.10000E 01   6.30000E 01   1.26000E 02
23   5.54044E 01   3.11384E 01   2.64515E 01
```

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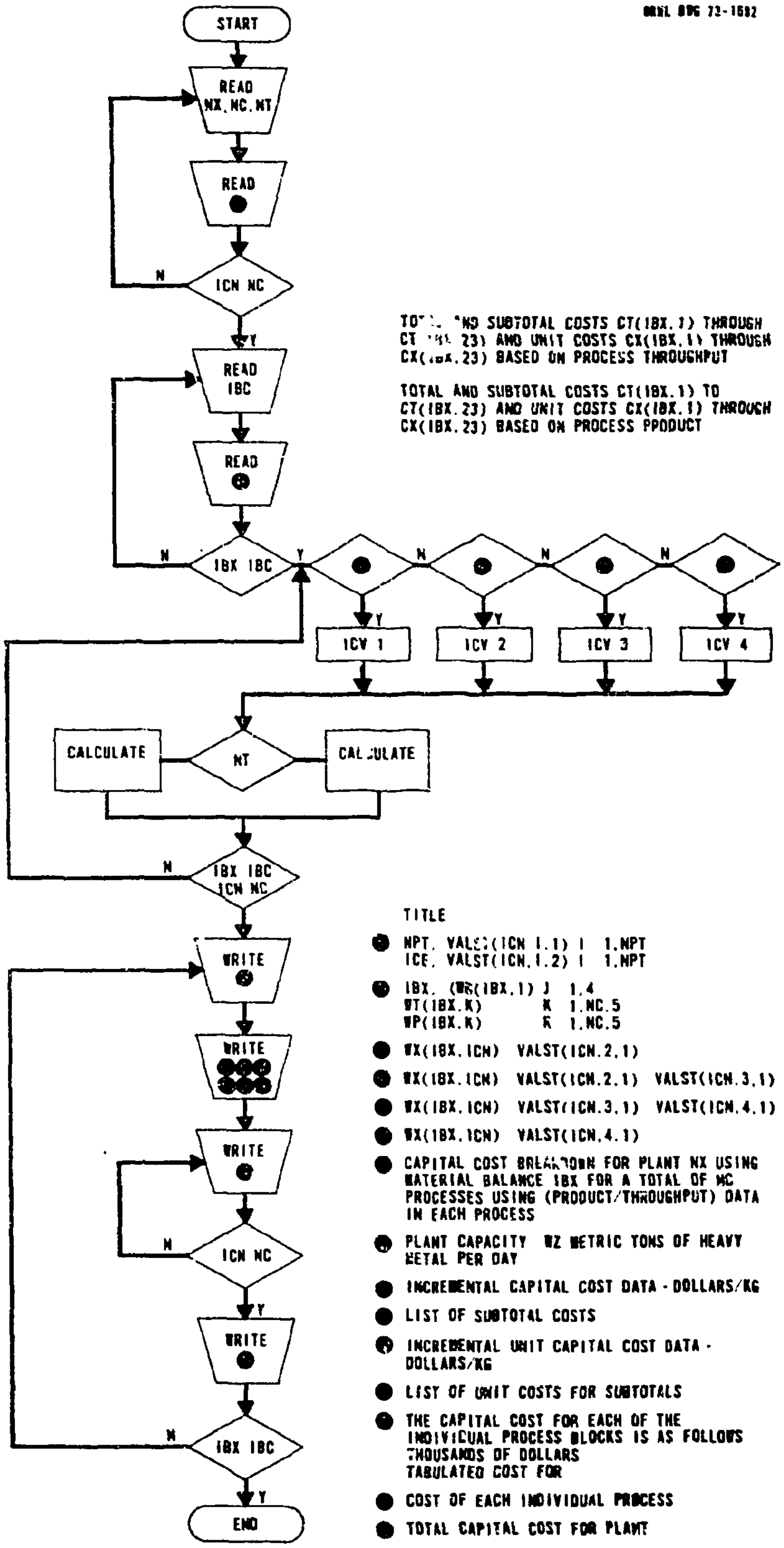
RECLAMATION PROCESSING OF REJECT 23 RECYCLE FUEL (A-15 ELEMENT)$              B24
 3    1.72000E 01    5.16000E 01    1.03200E 02
24    5.26419E 02    1.97509E 02    1.14682E 02
RECLAMATION PROCESSING OF REJECT 25 RECYCLE FUEL (A-19 ELEMENTS)$             B25
 3    1.70000E 00    5.10000E 00    1.02000E 01
25    6.70063E 03    2.31185E 03    1.22581E 03
RECLAMATION PROCESSING OF REJECT IM FUEL (A-1 ELEMENTS)$                      B26
 3    2.22000E 01    6.66000E 01    1.33200E 02
26    4.65881E 02    1.79938E 02    1.06453E 02
```

Appendix C-1

BLOCK DIAGRAM OF TCP


START
READ NX, NC, NT
READ
ICN NC
READ IBC
READ
IBX IBC
ICV 1
ICV 2
ICV 3
ICV 4
CALCULATE
NT
CALCULATE
IBX IBC ICN NC
WRITE
WRITE
WRITE
ICN NC
WRITE
IBX IBC
END
N
Y
TOTAL AND SUBTOTAL COSTS CT(IBX.1) TO CT(IBX.23) AND UNIT COSTS CX(IBX.1) THROUGH CX(IBX.23) BASED ON PROCESS PRODUCT
TITLE
NPT. VALST(ICN.I.1) I 1.NPT ICE. VALST(ICN.I.2) I 1.NPT
WX(IBX.ICN) VALST(ICN.2.1)
WX(IBX.ICN) VALST(ICN.2.1) VALST(ICN.3.1)
WX(IBX.ICN) VALST(ICN.3.1) VALST(ICN.4.1)
WX(IBX.ICN) VALST(ICN.4.1)
PLANT CAPACITY WZ METRIC TONS OF HEAVY METAL PER DAY
INCREMENTAL CAPITAL COST DATA - DOLLARS/KG
LIST OF SUBTOTAL COSTS
INCREMENTAL UNIT CAPITAL COST DATA - DOLLARS/KG
LIST OF UNIT COSTS FOR SUBTOTALS
THE CAPITAL COST FOR EACH OF THE INDIVIDUAL PROCESS BLOCKS IS AS FOLLOWS THOUSANDS OF DOLLARS TABULATED COST FOR
COST OF EACH INDIVIDUAL PROCESS
TOTAL CAPITAL COST FOR PLANT

Appendix C-2

PROGRAM LISTING OF TCP

```
C     PROGRAM TCP
C      TCP (TOTAL CAPITAL COST PROGRAM)
C
C      THIS PROGRAM SIMPLY  INTERFACES  THE  OUTPUT  FROM  THE  MATERIAL
C      BALANCE PROGRAM (BAL) AND FUNCTIONS GENERATED BY THE CAPITAL COST
C      PROGRAM (CEP) AND DETERMINES THE CAPITAL COST FOR ANY OR  ALL  OF
C      THE  29  PROCESS BLOCKS IN THE HTGR FUEL REPROCESSING PLANT.  THE
C      COST FUNCTIONS CAN BE BASED ON THE MASS THROUGHPUT OR THE PRODUCT
C      OUTPUT  OF  HEAVY  METAL IN THE PROCESSES.  THE INPUT DATA TO TCP
C      CAN BE READ IN FROM CARDS OR TAPE.  THE REQUIRED INPUT DATA IS :
C
C       (1) 29 MASS FLOW RATES FROM BAL , AND
C       (2) 29 SETS OF POINTS FROM CEP.
C
C      THE POINT SET IS FROM 2 TO 5 PRODUCT THROUGHPUTS (VALUE 113) AND
C      FROM 2 TO 5 PRODUCT UNIT COSTS (VALUE 117).
      REAL*4 TITLE
      REAL*8 AT,BT,WORD
      DATA  AT/'THRUPUT '/, BT/'PRODUCT '/
      DIMENSION WX(25,30), CST(25,29), CXD(25,29),CT(25,23),WZ(25,4),
     1CX(25,23), VALST(30,5,2),TITLE(20,29), WB(25,4), CTO(25),
     2CTX(25,29),WP(25,30), WT(25,30)
      DO 1 K2=1,25
      DO 1 K3=1,29
      CST(K2,K3) = 0.0
    1 CONTINUE
      READ(50,1002) NX,NC,NT
      DO 2 ICN=1,NC
      READ(50,1001)        (TITLE(J,ICN),J=1,20)
      READ(50,1003) NPT,(VALST(ICN,I,1),I=1,NPT)
      READ(50,1003) ICZ,(VALST(ICN,I,2),I=1,NPT)
    2 CONTINUE
      READ(50,1011) IBC
    3 READ(50,1004) IBX,(WB(IBX,J),J=1,4)
      WZ(IBX,1) = WB(IBX,1)*0.001
      DO 4 K=1,NC,5
      READ(50,1012) WT(IBX,K), WT(IBX,K+1), WT(IBX,K+2), WT(IBX,K+3)
     1, WT(IBX,K+4)
    4 CONTINUE
      DO 5 K=1,26,5
      READ(50,1012) WP(IBX,K), WP(IBX,K+1), WP(IBX,K+2), WP(IBX,K+3)
     1, WP(IBX,K+4)
    5 CONTINUE
      WX(IBX,30) = 0.0
      IF(IBX.LT.IBC) GO TO 3
      IF(NT.EQ.1) WORD = BT
      IF(NT.EQ.0) WORD = AT
      DO 8 IBX=1,IBC
      DO 7 ICN=1,NC
      IF(NT.EQ.0) WX(IBX,ICN) = WT(IBX,ICN)
      IF(NT.EQ.1) WX(IBX,ICN) = WP(IBX,ICN)
      IF(WX(IBX,ICN).EQ.0.0) CST(IBX,ICN) = 0.0
      IF(WX(IBX,ICN).EQ.0.0) GO TO 6
      R = WX(IBX,ICN)
      S2= VALST(ICN,2,1)
      S3 = VALST(ICN,3,1)
      S4 = VALST(ICN,4,1)
      IF(NPT.EQ.2) ICV = 1
      IF((NPT.EQ.3).AND.(R.LE.S2)) ICV = 1
      IF((NPT.EQ.3).AND.(R.GT.S2)) ICV = 2
      IF((NPT.EQ.4).AND.(R.LE.S2)) ICV = 1
      IF((NPT.EQ.4).AND.(R.GT.S2).AND.(R.LE.S3)) ICV = 2
      IF((NPT.EQ.4).AND.(R.GT.S3)) ICV = 3
      IF((NPT.EQ.5).AND.(R.LE.S2)) ICV = 1
      IF((NPT.EQ.5).AND.(R.GT.S2).AND.(R.LE.S3)) ICV = 2
      IF((NPT.EQ.5).AND.(R.GT.S3).AND.(R.LE.S4)) ICV = 3
      IF((NPT.EQ.5).AND.(R.GT.S4)) ICV = 4
      ICO = ICV + 1
      C1 = VALST(ICN,ICV,2)
      C2 = VALST(ICN,ICO,2)
      W1 = VALST(ICN,ICV,1)
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```
      W2 = VALST(ICN,ICO,1)
      RAT = ALOG(C1/C2)
      B = RAT/(W1-W2)
      A1 = C1/EXP(B*W1)
      A2 = C2/EXP(B*W2)
      A = (A1 + A2)*0.5
      CST(IBX,ICN) =.973333*A*EXP(B*WX(IBX,ICN))*WX(IBX,ICN)
      CTX(IBX,ICN) = CST(IBX,ICN)*0.001
      CTO(IBX) = CTO(IBX) + CTX(IBX,ICN)
6     CXD(IBX,ICN) = CST(IBX,ICN)
7     CONTINUE
8     CONTINUE
      DO 10 IBX = 1,IBC
      CT(IBX, 1) = CST(IBX,27)
      CT(IBX, 2) = CST(IBX, 4) + CST(IBX, 5) + CST(IBX, 6)
      CT(IBX, 3) =  CT(IBX, 2) + CST(IBX, 3)
      CT(IBX, 4) =  CT(IBX, 3) + CST(IBX,24)
      CT(IBX, 5) = CST(IBX, 1) + CST(IBX, 2)
      CT(IBX, 6) =  CT(IBX, 4) +  CT(IBX, 5)
      CT(IBX, 7) = CST(IBX,10) + CST(IBX,11) + CST(IBX,12)
      CT(IBX, 8) =  CT(IBX, 7) + CST(IBX, 9)
      CT(IBX, 9) =  CT(IBX, 8) + CST(IBX,25)
      CT(IBX,10) = CST(IBX, 7) + CST(IBX, 8) + CST(IBX,29)
      CT(IBX,11) =  CT(IBX, 9) +  CT(IBX,10)
      CT(IBX,12) = CST(IBX,15) + CST(IBX,16) + CST(IBX,17)
      CT(IBX,13) =  CT(IBX,12) + CST(IBX,14)
      CT(IBX,14) =  CT(IBX,13) + CST(IBX,26)
      CT(IBX,15) = CT(IBX,14) + CST(IBX,13)
      CT(IBX,16) = CST(IBX,20) + CST(IBX,21)
      CT(IBX,17) =  CT(IBX,16) + CST(IBX,22) + CST(IBX,23)
      CT(IBX,18) =  CT(IBX,17) + CST(IBX,19)
      CT(IBX,19) = CST(IBX, 1) + CST(IBX, 2) + CST(IBX, 7) + CST(IBX,8)
     1 + CST(IBX,27) + CST(IBX,28) + CST(IBX,29)
      CT(IBX,20) =  CT(IBX, 4) +  CT(IBX, 9)
      CT(IBX,21) =  CT(IBX,19) +  CT(IBX,20) + CST(IBX,18)
      CT(IBX,22) =  CT(IBX,15) +  CT(IBX,18)
      CT(IBX,23) =  CT(IBX,21) +  CT(IBX,22)
      Q=1.0273973
      IF(WX(IBX,27).EQ.0.0) GO TO 9
      Q27=Q/WX(IBX,27)
9     Q6=Q/WX(IBX,6)
      Q2=Q/WX(IBX,2)
      Q12=Q/WX(IBX,12)
      Q8=Q/WX(IBX,8)
      Q15=Q/(WX(IBX,15) + WX(IBX,21))
      Q17=Q/WX(IBX,17)
      Q21=Q/WX(IBX,21)
      QX=Q/(WX(IBX,8) + WX(IBX,2))
      Q1=Q/(WX(IBX,6) + WX(IBX,12))
      WG = WB(IBX,2) + WB(IBX,3) + WB(IBX,4)
      IF(NT.EQ.0) QT= Q/WB(IBX,1)
      IF(NT.EQ.1)  QT = Q/WG
      IF(WX(IBX,27).GT.0.0)  CX(IBX,1) = CT(IBX,1)*Q27
      IF(WX(IBX,27).EQ.0.0) CX(IBX,1) = 0.0
      CX(IBX,2) = CT(IBX,2)*Q6
      CX(IBX,3) = CT(IBX,3)*Q6
      CX(IBX,4) = CT(IBX,4)*Q6
      CX(IBX,5) = CT(IBX,5)*Q2
      CX(IBX,6) = CT(IBX,6)*Q2
      CX(IBX,7) = CT(IBX,7)*Q12
      CX(IBX,8) = CT(IBX,8)*Q12
      CX(IBX,9) = CT(IBX,9)*Q12
      CX(IBX,10) = CT(IBX,10)*Q8
      CX(IBX,11) = CT(IBX,11)*Q12
      CX(IBX,12) = CT(IBX,12)*Q17
      CX(IBX,13) = CT(IBX,13)*Q17
      CX(IBX,14) = CT(IBX,14)*Q17
      CX(IBX,15) = CT(IBX,15)*Q17
      CX(IBX,16) = CT(IBX,16)*Q21
      CX(IBX,17) = CT(IBX,17)*Q21
      CX(IBX,18) = CT(IBX,18)*Q21
```

```
      CX(IBX,19) = CT(IBX,19)*QX
      CX(IBX,20) = CT(IBX,20)*QX
      CX(IBX,21) = CT(IBX,21)*Q1
      CX(IBX,22) = CT(IBX,22)*Q15
      CX(IBX,23) = CT(IBX,23)*QT
 10   CONTINUE
      DO 12 IBX = 1,IBC
      WRITE(51,1039) NX,IBX,NC,WORD
      WRITE(51,1005)
      WRITE(51,1007) WZ(IBX,1)
      WRITE(51,1005)
      WRITE(51,1040)
      WRITE(51,1005)
      WRITE(51,1016)   CT(IBX, 1)
      WRITE(51,1017)   CT(IBX, 2)
      WRITE(51,1018)   CT(IBX, 3)
      WRITE(51,1019)   CT(IBX, 4)
      WRITE(51,1020)   CT(IBX, 5)
      WRITE(51,1021)   CT(IBX, 6)
      WRITE(51,1022)   CT(IBX, 7)
      WRITE(51,1023)   CT(IBX, 8)
      WRITE(51,1024)   CT(IBX, 9)
      WRITE(51,1025)   CT(IBX,10)
      WRITE(51,1026)   CT(IBX,11)
      WRITE(51,1027)   CT(IBX,12)
      WRITE(51,1028)   CT(IBX,13)
      WRITE(51,1029)   CT(IBX,14)
      WRITE(51,1030)   CT(IBX,15)
      WRITE(51,1031)   CT(IBX,16)
      WRITE(51,1032)   CT(IBX,17)
      WRITE(51,1033)   CT(IBX,18)
      WRITE(51,1034)   CT(IBX,19)
      WRITE(51,1035)   CT(IBX,20)
      WRITE(51,1036)   CT(IBX,21)
      WRITE(51,1037)   CT(IBX,22)
      WRITE(51,1038)   CT(IBX,23)
      WRITE(51,1041)
      WRITE(51,1005)
      WRITE(51,1005)
      WRITE(51,1016)   CX(IBX, 1)
      WRITE(51,1017)   CX(IBX, 2)
      WRITE(51,1018)   CX(IBX, 3)
      WRITE(51,1019)   CX(IBX, 4)
      WRITE(51,1020)   CX(IBX, 5)
      WRITE(51,1021)   CX(IBX, 6)
      WRITE(51,1022)   CX(IBX, 7)
      WRITE(51,1023)   CX(IBX, 8)
      WRITE(51,1024)   CX(IBX, 9)
      WRITE(51,1025)   CX(IBX,10)
      WRITE(51,1026)   CX(IBX,11)
      WRITE(51,1027)   CX(IBX,12)
      WRITE(51,1028)   CX(IBX,13)
      WRITE(51,1029)   CX(IBX,14)
      WRITE(51,1030)   CX(IBX,15)
      WRITE(51,1031)   CX(IBX,16)
      WRITE(51,1032)   CX(IBX,17)
      WRITE(51,1033)   CX(IBX,18)
      WRITE(51,1034)   CX(IBX,19)
      WRITE(51,1035)   CX(IBX,20)
      WRITE(51,1036)   CX(IBX,21)
      WRITE(51,1037)   CX(IBX,22)
      WRITE(51,1038)   CX(IBX,23)
      WRITE(51,1014)
      WRITE(51,1005)
      WRITE(51,1005)
      DO 11 ICN=1,NC
      Z = CXD(IBX,ICN)
      WRITE(51,1015) ((TITLE(KA,ICN),KA=1,20),Z)
 11   CONTINUE
      WRITE(51,1008)
      WRITE(51,1009) CTO(IBX)
```

```
12   CONTINUE                                                           TCP 2090
1001 FORMAT(20A4)                                                       TCP 2100
1002 FORMAT(3I5)                                                        TCP 2110
1003 FORMAT(I2,5(2X,1PE12.5))                                           TCP 2120
1004 FORMAT(I5,4(2X,1PE12.5))                                           TCP 2130
1005 FORMAT(1H )                                                        TCP 2140
1006 FORMAT(I5,3X,I5,3(3X,E12.5))                                       TCP 2150
1007 FORMAT(' PLANT CAPACITY = ',F5.2,' METRIC TONS OF HEAVY METAL PE   TCP 2160
    1R DAY')                                                            TCP 2161
1008 FORMAT('                                                           TCP 2170
    1                                  **************')                 TCP 2171
1009 FORMAT(1H0,'SUM OF ABOVE PROCESSES (MILLIONS OF DOLLARS)           TCP 2180
    1                                  =     ',F8.4)                    TCP 2181
1010 FORMAT(1H1)                                                        TCP 2190
1011 FORMAT(2I5)                                                        TCP 2200
1012 FORMAT(5(4X,E12.5))                                                TCP 2210
1013 FORMAT(4(4X,E12.5))                                                TCP 2220
1014 FORMAT(1H1'THE CAPITAL COST FOR EACH OF THE INDIVIDUAL PROCESS BLOTCP 2230
    1CKS IS AS FOLLOWS -THOUSANDS OF DOLLARS***')                       TCP 2231
1015 FORMAT(1H020A4,'      = ',F9.0,'00')                               TCP 2240
1016 FORMAT(1H0'      COST OF SPENT FUEL STORAGE   *********************TCP 2250
    1************   =   ',F9.0,'00')                                    TCP 2251
1017 FORMAT(1H0'      COST OF 23 RECYCLE FABRICATION   *****************TCP 2260
    1************   =   ',F9.0,'00')                                    TCP 2261
1018 FORMAT(1H0'      COST OF 23 RECYCLE REFRABRICATION   **************TCP 2270
    1************   =   ',F9.0,'00')                                    TCP 2271
1019 FORMAT(1H0'      COST OF 23 RECYCLE REFABRICATION WITH REJECT RECLATCP 2280
    1MATION    ***   =   ',F9.0,'00')                                   TCP 2281
1020 FORMAT(1H0'      COST OF 23 RECYCLE REPROCESSING   ****************TCP 2290
    1************   =   ',F9.0,'00')                                    TCP 2291
1021 FORMAT(1H0'      COST OF 23 RECYCLE PROCESSING   ******************TCP 2300
    1************   =   ',F9.0,'00')                                    TCP 2301
1022 FORMAT(1H0'      COST OF 25 RECYCLE FABRICATION   *****************TCP 2310
    1************   =   ',F9.0,'00')                                    TCP 2311
1023 FORMAT(1H0'      COST OF 25 RECYCLE REFABRICATION   ***************TCP 2320
    1************   =   ',F9.0,'00')                                    TCP 2321
1024 FORMAT(1H0'      COST OF 25 RECYCLE REFABRICATION WITH REJECT RECLATCP 2330
    1MATION    ***   =   ',F9.0,'00')                                   TCP 2331
1025 FORMAT(1H0'      COST OF IM RECYCLE REPROCESSING   ****************TCP 2340
    1************   =   ',F9.0,'00')                                    TCP 2341
1026 FORMAT(1H0'      COST OF 25 RECYCLE PROCESSING   ******************TCP 2350
    1************   =   ',F9.0,'00')                                    TCP 2351
1027 FORMAT(1H0'      COST OF IM FABRICATION   *************************TCP 2360
    1************   =   ',F9.0,'00')                                    TCP 2361
1028 FORMAT(1H0'      COST OF IM PREPARATION AND FABRICATION   *********TCP 2370
    1************   =   ',F9.0,'00')                                    TCP 2371
1029 FORMAT(1H0'      COST OF IM PREPARATION AND FABRICATION WITH REJECTTCP 2380
    1 RECLAMATION   =   ',F9.0,'00')                                    TCP 2381
1030 FORMAT(1H0'      COST OF IM FUEL PROCESSING   *********************TCP 2390
    1************   =   ',F9.0,'00')                                    TCP 2391
1031 FORMAT(1H0'      COST OF THORIA FABRICATION   *********************TCP 2400
    1************   =   ',F9.0,'00')                                    TCP 2401
1032 FORMAT(1H0'      COST OF 22 AND 23 AND THORIA FABRICATION WITH REJETCP 2410
    1CT RECLAMATION =   ',F9.0,'00')                                    TCP 2411
1033 FORMAT(1H0'      COST OF THORIA PROCESSING   **********************TCP 2420
    1************   =   ',F9.0,'00')                                    TCP 2421
1034 FORMAT(1H0'      COST OF TOTAL REPROCESSING   *********************TCP 2430
    1************   =   ',F9.0,'00')                                    TCP 2431
1035 FORMAT(1H0'      COST OF TOTAL REFABRICATION   ********************TCP 2440
    1************   =   ',F9.0,'00')                                    TCP 2441
1036 FORMAT(1H0'      COST OF TOTAL RECYCLE PROCESSING   ***************TCP 2450
    1************   =   ',F9.0,'00')                                    TCP 2451
1037 FORMAT(1H0'      COST OF TOTAL IM PROCESSING   ********************TCP 2460
    1************   =   ',F9.0,'00')                                    TCP 2461
1038 FORMAT(1H0'      COST OF TOTAL FUEL PROCESSING   ******************TCP 2470
    1************   =   ',F9.0,'00')                                    TCP 2471
1039 FORMAT(1H1'CAPITAL COST BREAKDOWN FOR PLANT ',I2,' USING MATERIAL TCP 2480
    1BALANCE NO. ',I2,' FOR A TOTAL OF ',I2,' PROCESSES USING ',A8,'DATTCP 2481
    2A IN EACH PROCESS')                                                TCP 2482
1040 FORMAT(1H0'INCREMENTAL PLANT CAPITAL COST DATA - THOUSANDS OF DOLLTCP 2490
    1ARS')                                                              TCP 2491
1041 FORMAT(1H1,'INCREMENTAL UNIT CAPITAL COST DATA - DOLLARS           TCP 2500
    1/KILOGRAM')                                                        TCP 2501
     STOP                                                               TCP 2510
     END                                                                TCP 2520
```

Appendix C-3

INPUT TO SAMPLE PROBLEM FOR TCP

The input to TCP is made by combining the punched decks from CEP and BAL in that order. There is no punched output from TCP, and the printed output from TCP is presented in Appendix C-4. These are the total capital cost summaries for particular plant sizes using selected processes.

```
      1    26
HEAD END REPROCESSING OF 23 RECYCLE SPENT FUEL ELEMENTS(A-15)$                 B1
 3    1.67400E 02    5.02200E 02    1.00440E 03
 1    6.18090E 01    3.89570E 01    3.33257E 01
ACID THOREX REPROCESSING (23 RECYCLE FUEL) $                                   B2
 3    4.30000E 02    1.29000E 03    2.58000E 03
 2    2.64745E 01    2.04184E 01    1.86684E 01
SOLEX PROCESS FOR MICROSPHERE PREPARATION (23 RECYCLE)$                        B3
 3    1.17140E 02    3.51400E 02    7.02840E 02
 3    2.74396E 02    1.93048E 02    1.67278E 02
BISO  MICROSPH COAT PROCESS 23 RECYCLE PARTICLES (TH233U)O2 (L-1.F(1)) $       B4
 3    1.10900E 02    3.32700E 02    6.65400E 02
 4    1.12598E 02    8.16793E 01    7.09926E 01
FRF  SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 23 RECYCLE M-4.A(2) $        B5
 3    1.96700E 02    5.90100E 02    1.18020E 03
 5    8.14019E 01    5.34006E 01    3.96986E 01
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 23 RECYCLE M-1.B$              B6
 3    1.86900E 02    5.60700E 02    1.12140E 03
 6    4.33024E 01    2.39099E 01    1.53726E 01
HEAD END REPROCESSING OF IM AND 25 RECYCLE SPENT FUEL ELEMENTS (A1 _A19) $    B7
 3    2.68100E 02    8.04300E 02    1.60860E 03
 7    4.65426E 01    2.69976E 01    2.28244E 01
ACID THOREX REPROCESSING (IM SPENT _25 RECYCLE FUEL) $                        B8
 3    5.00000E 00    1.50000E 01    3.00000E 01
 8    1.00350E 03    3.93600E 02    2.47862E 02
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (23 RECYCLE) $                   B9
 3    3.03750E 01    9.11250E 01    1.82250E 02
 9    7.63607E 02    4.33055E 02    3.45431E 02
TRISO MICROSPHERE COATING PROCESS (25 RECYCLE PARTICLES) 235UO2 (L-2.C.(1)) $ B10
 3    5.60000E 00    1.68000E 01    3.36000E 01
10    6.06048E 02    3.36616E 02    2.72515E 02
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 25 RECYCLE M-4.B(2) $        B11
 3    2.31000E 01    7.18000E 01    1.43600E 02
11    3.13745E 02    1.44282E 02    9.98171E 01
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 25 RECYCLE M-1.C$             B12
 3    2.27000E 01    6.81000E 01    1.36100E 02
12    2.09609E 02    8.24385E 01    5.06266E 01
UNH PREPARATION FOR IM ELEMENTS$                                              B13
 3    2.07000E 01    6.22000E 01    1.24500E 02
13    1.23639E 02    6.06984E 01    4.31719E 01
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (IM RECYCLE) $                   B14
 3    3.03750E 01    9.11250E 01    1.82250E 02
14    7.60508E 02    4.31506E 02    3.44398E 02
TRISO COATING PROCESS IM FISILE PARTICLES UO2 (L-2.J.(1)) $                   B15
 3    2.33000E 01    6.98000E 01    1.39600E 02
15    2.84811E 02    1.87605E 02    1.46357E 02
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR IM FUEL M-4.A(1)$            B16
 3    3.21900E 02    9.32700E 02    1.86540E 03
16    9.19038E 00    7.11464E 00    5.66300E 00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS IM FUEL M-1.A$                B17
 3    2.95500E 02    8.86500E 02    1.77300E 03
17    1.62882E 01    8.87043E 00    6.91603E 00
THORIUM RECOVERY PROCESS (T-2) $                                              B18
 3    4.37200E 02    1.31160E 03    2.62320E 03
18    1.11549E 01    1.12756E 01    1.01431E 01
TH(NO3)4 PREPARATION PROCESS K-8$                                             B19
 3    5.42900E 02    1.62870E 03    3.25740E 03
19    6.49453E 00    3.21052E 00    2.85587E 00
THORIUM DIOXIDE MICROSPHERE PREPARATION$                                      B20
 3    4.43200E 02    1.32960E 03    2.65920E 03
20    1.31181E 01    9.40437E 00    8.58796E 00
BISO MICROSPHERE COATING PROCESS - FERTILE PARTICLES-THO2 (L-1.A.(1) $        B21
 3    4.19900E 02    1.25970E 03    2.51940E 03
21    2.03837E 01    1.42527E 01    1.20997E 01
RECLAMATION OF THORIUM FROM REJECT KERNALS$                                   B22
 3    4.43000E 01    1.33000E 02    2.65900E 02
22    2.72756E 01    1.51618E 01    1.08303E 01
THORIUM DIOXIDE REJECT RECLAMATION COATING REMOVAL$                           B23
 3    2.10000E 01    6.30000E 01    1.26000E 02
23    5.54044E 01    3.11384E 01    2.64515E 01
```

```
RECLAMATION PROCESSING OF REJECT 23 RECYCLE FUEL (A-15 ELEMENT)$              B24
 3   1.72000E 01   5.16000E 01   1.03200E 02
24   5.26419E 02   1.97509E 02   1.14682E 02
RECLAMATION PROCESSING OF REJECT 25 RECYCLE FUEL (A-19 ELEMENTS)$             B25
 3   1.70000E 00   5.10000E 00   1.02000E 01
25   6.70063E 03   2.31185E 03   1.22581E 03
RECLAMATION PROCESSING OF REJECT IN FUEL (A-1 ELEMENTS)$                      B26
 3   2.22000E 01   6.66000E 01   1.33200E 02
26   4.65881E 02   1.79938E 02   1.06453E 02
    3
    1   0.50000E+03   0.20745E+02   0.44243E+02   0.43645E+03
     4.30013E+02   4.30013E+02   1.23248E+02   1.10923E+02   1.96704E+02
     1.86869E+02   2.79592E+02   5.00000E+00   6.21792E+00   5.59613E+00
     2.39234E+01   2.27273E+01   2.07447E+01   2.57978E+01   2.32180E+01
     3.11005E+02   2.95455E+02   4.37219E+02   5.42974E+02   4.43202E+02
     4.18826E+02   4.43202E+01   1.99441E+01   2.95748E+01   2.32504E+00
     2.22455E+01   0.00000E-01   0.00000E-01   1.44164E+00
     4.30013E+02   1.88776E+01   1.10923E+02   1.05377E+02   1.86869E+02
     1.85000E+02   5.00000E+00   5.00000E+00   5.59613E+00   5.31632E+00
     2.27273E+01   2.25000E+01   2.07447E+01   2.32180E+01   2.20571E+01
     2.95455E+02   2.92500E+02   4.37219E+02   5.42974E+02   3.98882E+02
     3.98882E+02   4.43202E+01   1.99441E+01   2.95748E+01   2.32504E+00
     2.22455E+01   0.00000E-01   0.00000E-01   1.44164E+00
    2   0.15000E+04   0.62234E+02   0.13273E+03   0.13094E+04
     1.29004E+03   1.29004E+03   3.69744E+02   3.32770E+02   5.90112E+02
     5.60606E+02   8.38775E+02   1.50000E+01   1.86538E+01   1.67884E+01
     7.17703E+01   6.81818E+01   6.22340E+01   7.73933E+01   6.96539E+01
     9.33014E+02   8.86364E+02   1.31166E+03   1.62892E+03   1.32961E+03
     1.25648E+03   1.32961E+02   5.98322E+01   8.87245E+01   6.97513E+00
     6.67364E+01   0.00000E-01   0.00000E-01   4.32492E+00
     1.29004E+03   5.66327E+01   3.32770E+02   3.16131E+02   5.60606E+02
     5.55000E+02   1.50000E+01   1.50000E+01   1.67884E+01   1.59490E+01
     6.81818E+01   6.75000E+01   6.22340E+01   6.96539E+01   6.61712E+01
     8.86364E+02   8.77500E+02   1.31166E+03   1.62892E+03   1.19664E+03
     1.19664E+03   1.32961E+02   5.98322E+01   8.87245E+01   6.97513E+00
     6.67364E+01   0.00000E-01   0.00000E-01   4.32492E+00
    3   0.30000E+04   0.12447E+03   0.26546E+03   0.26187E+04
     2.58008E+03   2.58008E+03   7.39488E+02   6.65539E+02   1.18022E+03
     1.12121E+03   1.67755E+03   3.00000E+01   3.73075E+01   3.35768E+01
     1.43541E+02   1.36364E+02   1.24468E+02   1.54787E+02   1.39308E+02
     1.86603E+03   1.77273E+03   2.62331E+03   3.25784E+03   2.65921E+03
     2.51295E+03   2.65921E+02   1.19664E+02   1.77449E+02   1.39503E+01
     1.33473E+02   0.00000E-01   0.00000E-01   8.64983E+00
     2.58008E+03   1.13265E+02   6.65539E+02   6.32262E+02   1.12121E+03
     1.11004E+03   3.00000E+01   3.00000E+01   3.35768E+01   3.18979E+01
     1.36364E+02   1.35000E+02   1.24468E+02   1.39308E+02   1.32342E+02
     1.77273E+03   1.75500E+03   2.62331E+03   3.25784E+03   2.39329E+03
     2.39329E+03   2.65921E+02   1.19664E+02   1.77449E+02   1.39503E+01
     1.33473E+02   0.00000E-01   0.00000E-01   8.64983E+00
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Appendix C-4

OUTPUT FROM SAMPLE PROBLEM FOR TCP

CAPITAL COST BREAKDOWN FOR PLANT 1 USING MATERIAL BALANCE NO. 1 FOR A TOTAL OF 26 PROCESSES USING THRUPUT DATA IN EACH PROCESS

PLANT CAPACITY = 0.50 METRIC TONS OF HEAVY METAL PE R DAY

INCREMENTAL PLANT CAPITAL COST DATA - THOUSANDS OF DOLLARS

COST OF SPENT FUEL STORAGE	=	0.00
COST OF 23 RECYCLE FABRICATION	=	35618.00
COST OF 23 RECYCLE REFRABRICATION	=	60234.00
COST OF 23 RECYCLE REFABRICATION WITH REJECT RECLAMATION	=	78884.00
COST OF 23 RECYCLE REPROCESSING	=	29092.00
COST OF 23 RECYCLE PROCESSING	=	107977.00
COST OF 25 RECYCLE FABRICATION	=	15146.00
COST OF 25 RECYCLE REFABRICATION	=	20937.00
COST OF 25 RECYCLE REFABRICATION WITH REJECT RECLAMATION	=	33406.00
COST OF IM RECYCLE REPROCESSING	=	17403.00
COST OF 25 RECYCLE PROCESSING	=	50809.00
COST OF IM FABRICATION	=	13920.00
COST OF IM PREPARATION AND FABRICATION	=	33849.00
COST OF IM PREPARATION AND FABRICATION WITH REJECT RECLAMATION	=	43927.00
COST OF IM FUEL PROCESSING	=	46422.00
COST OF THORIA FABRICATION	=	13972.00
COST OF 22 AND 23 AND THORIA FABRICATION WITH REJECT RECLAMATION	=	16240.00
COST OF THORIA PROCESSING	=	19672.00
COST OF TOTAL REPROCESSING	=	46495.00
COST OF TOTAL REFABRICATION	=	112291.00
COST OF TOTAL RECYCLE PROCESSING	=	163533.00
COST OF TOTAL IM PROCESSING	=	66094.00
COST OF TOTAL FUEL PROCESSING	=	229626.00

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INCREMENTAL UNIT CAPITAL COST DATA - DOLLARS /KILOGRAM

COST OF SPENT FUEL STORAGE	=	0.00
COST OF 23 RECYCLE FABRICATION	=	196.00
COST OF 23 RECYCLE REFRABRICATION	=	375.00
COST OF 23 RECYCLE REFABRICATION WITH REJECT RECLAMATION	=	434.00
COST OF 23 RECYCLE REPROCESSING	=	70.00
COST OF 23 RECYCLE PROCESSING	=	258.00
COST OF 25 RECYCLE FABRICATION	=	685.00
COST OF 25 RECYCLE REFABRICATION	=	946.00
COST OF 25 RECYCLE REFABRICATION WITH REJECT RECLAMATION	=	1510.00
COST OF IM RECYCLE REPROCESSING	=	3576.00
COST OF 25 RECYCLE PROCESSING	=	2297.00
COST OF IM FABRICATION	=	48.00
COST OF IM PREPARATION AND FABRICATION	=	118.00
COST OF IM PREPARATION AND FABRICATION WITH REJECT RECLAMATION	=	153.00
COST OF IM FUEL PROCESSING	=	161.00
COST OF THORIA FABRICATION	=	34.00
COST OF 22 AND 23 AND THORIA FABRICATION WITH REJECT RECLAMATION	=	40.00
COST OF THORIA PROCESSING	=	48.00
COST OF TOTAL REPROCESSING	=	110.00
COST OF TOTAL REFABRICATION	=	265.00
COST OF TOTAL RECYCLE PROCESSING	=	802.00
COST OF TOTAL IM PROCESSING	=	154.00
COST OF TOTAL FUEL PROCESSING	=	472.00

THE CAPITAL COST FOR EACH OF THE INDIVIDUAL PROCESS BLOCKS IS AS FOLLOWS -THOUSANDS OF DOLLARS***

HEAD END REPROCESSING OF 23 RECYCLE SPENT FUEL ELEMENTS(A-15)$	B1	=	18012.00
ACID THOREX REPROCESSING (23 RECYCLE FUEL)$	B2	=	11081.00
SOLEX PROCESS FOR MICROSPHERE PREPARATION (23 RECYCLE)$	B3	=	32616.00
BISO MICROSPH COAT PROCESS 23 RECYCLE PARTICLES (TH233U)O2 (L-1.F(1))$	B4	=	12156.00
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 23 RECYCLE M-4.A(2)$	B5	=	15585.00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 23 RECYCLE N-1.B$	B6	=	7876.00
HEAD END REPROCESSING OF IM AND 25 RECYCLE SPENT FUEL ELEMENTS (A1 & A19)$	B7	=	12519.00
ACID THOREX REPROCESSING (IM SPENT & 25 RECYCLE FUEL)$	B8	=	4804.00
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (23 RECYCLE)$	B9	=	5791.00
TRISO MICROSPHERE COATING PROCESS (25 RECYCLE PARTICLES) 235UO2 (L-2.C.(1))$	B10	=	3302.00
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 25 RECYCLE M-4.B(2)$	B11	=	7210.00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 25 RECYCLE N-1.C$	B12	=	4634.00
UNH PREPARATION FOR IM ELEMENTS$	B13	=	2495.00
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (IM RECYCLE)$	B14	=	19929.00
TRISO COATING PROCESS IM FISILE PARTICLES UO2 (L-2.J.(1))$	B15	=	6441.00
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR IM FUEL M-4.A(1)$	B16	=	2795.00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CABB PROCESS IM FUEL N-1.A$	B17	=	4684.00
THORIUM RECOVERY PROCESS (T-2)$	B18	=	4747.00
TH(NO3)4 PREPARATION PROCESS K-8$	B19	=	3432.00
THORIUM DIOXIDE MICROSPHERE PREPARATIONS	B20	=	5659.00
BISO MICROSPHERE COATING PROCESS - FERTILE PARTICLES-THO2 (L-1.A.(1)$	B21	=	8313.00
RECLAMATION OF THORIUM FROM REJECT KERNALS$	B22	=	1176.00
THORIUM DIOXIDE REJECT RECLAMATION COATING REMOVAL$	B23	=	1091.00
RECLAMATION PROCESSING OF REJECT 23 RECYCLE FUEL (A-15 ELEMENT)$	B24	=	10650.00
RECLAMATION PROCESSING OF REJECT 25 RECYCLE FUEL (A-19 ELEMENTS)$	B25	=	12469.00
RECLAMATION PROCESSING OF REJECT IM FUEL (A-1 ELEMENTS)$	B26	=	10078.00
			**************
SUM OF ABOVE PROCESSES (MILLIONS OF DOLLARS)		=	2[illegible].6267

CAPITAL COST BREAKDOWN FOR PLANT 1 USING MATERIAL BALANCE NO. 2 FOR A TOTAL OF 26 PROCESSES USING THRUPUT DATA IN EACH PROCESS

PLANT CAPACITY = 1.50 METRIC TONS OF HEAVY METAL PER DAY

INCREMENTAL PLANT CAPITAL COST DATA - THOUSANDS OF DOLLARS

COST OF SPENT FUEL STORAGE **************************************	=	0.00
COST OF 23 RECYCLE FABRICATION *********************************	=	70175.00
COST OF 23 RECYCLE REFRABRICATION *****************************	=	139132.00
COST OF 23 RECYCLE REFABRICATION WITH REJECT RECLAMATION ***	=	150668.00
COST OF 23 RECYCLE REPROCESSING ******************************	=	63927.00
COST OF 23 RECYCLE PROCESSING *********************************	=	214595.00
COST OF 25 RECYCLE FABRICATION *********************************	=	21055.00
COST OF 25 RECYCLE REFABRICATION ******************************	=	36523.00
COST OF 25 RECYCLE REFABRICATION WITH REJECT RECLAMATION ***	=	48953.00
COST OF IM RECYCLE REPROCESSING *******************************	=	27629.00
COST OF 25 RECYCLE PROCESSING **********************************	=	76582.00
COST OF IM FABRICATION ***************************************	=	26850.00
COST OF IM PREPARATION AND FABRICATION **********************	=	63797.00
COST OF IM PREPARATION AND FABRICATION WITH REJECT RECLAMATION	=	75473.00
COST OF IM FUEL PROCESSING ************************************	=	79149.00
COST OF THORIA FABRICATION ************************************	=	29625.00
COST OF 22 AND 23 AND THORIA FABRICATION WITH REJECT RECLAMATIO	=	33482.00
COST OF THORIA PROCESSING *************************************	=	38572.00
COST OF TOTAL REPROCESSING *************************************	=	91557.00
COST OF TOTAL REFABRICATION ***********************************	=	199620.00
COST OF TOTAL RECYCLE PROCESSING ******************************	=	305572.00
COST OF TOTAL IM PROCESSING ************************************	=	117721.00
COST OF TOTAL FUEL PROCESSING *********************************	=	423293.00

INCREMENTAL UNIT CAPITAL COST DATA - DOLLARS /KILOGRAM

COST OF SPENT FUEL STORAGE =	0.00
COST OF 23 RECYCLE FABRICATION =	129.00
COST OF 23 RECYCLE REFRABRICATION =	255.00
COST OF 23 RECYCLE REFABRICATION WITH REJECT RECLAMATION =	276.00
COST OF 23 RECYCLE REPROCESSING =	51.00
COST OF 23 RECYCLE PROCESSING =	171.00
COST OF 25 RECYCLE FABRICATION =	317.00
COST OF 25 RECYCLE REFABRICATION =	550.00
COST OF 25 RECYCLE REFABRICATION WITH REJECT RECLAMATION =	738.00
COST OF IM RECYCLE REPROCESSING =	1892.00
COST OF 25 RECYCLE PROCESSING =	1154.00
COST OF IM FABRICATION =	31.00
COST OF IM PREPARATION AND FABRICATION =	74.00
COST OF IM PREPARATION AND FABRICATION WITH REJECT RECLAMATION =	87.00
COST OF IM FUEL PROCESSING =	92.00
COST OF THORIA FABRICATION =	24.00
COST OF 22 AND 23 AND THORIA FABRICATION WITH REJECT RECLAMATION =	27.00
COST OF THORIA PROCESSING =	32.00
COST OF TOTAL REPROCESSING =	72.00
COST OF TOTAL REFABRICATION =	157.00
COST OF TOTAL RECYCLE PROCESSING =	499.00
COST OF TOTAL IM PROCESSING =	91.00
COST OF TOTAL FUEL PROCESSING =	290.00

THE CAPITAL COST FOR EACH OF THE INDIVIDUAL PROCESS BLOCKS IS AS FOLLOWS -THOUSANDS OF DOLLARS***

HEAD END REPROCESSING OF 23 RECYCLE SPENT FUEL ELEMENTS(A-15)$	B1	=	38289.00
ACID THOREX REPROCESSING (23 RECYCLE FUEL)$	B2	=	25638.00
SOLEX PROCESS FOR MICROSPHERE PREPARATION (23 RECYCLE)$	B3	=	68957.00
BISO MICROSPH COAT PROCESS 23 RECYCLE PARTICLES (TH233U)O2 (L-1.F(1))$	B4	=	26455.00
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 23 RECYCLE M-4.A(2)$	B5	=	30672.00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 23 RECYCLE N-1.B$	B6	=	13049.00
HEAD END REPROCESSING OF IM AND 25 RECYCLE SPENT FUEL ELEMENTS (A1 & A19)$	B7	=	21883.00
ACID THOREX REPROCESSING (IM SPENT & 25 RECYCLE FUEL)$	B8	=	5747.00
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (23 RECYCLE)$	B9	=	15468.00
TRISO MICROSPHERE COATING PROCESS (25 RECYCLE PARTICLES) 235UO2 (L-2.C.(1))$	B10	=	5504.00
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 25 RECYCLE M-4.B(2)$	B11	=	10084.00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 25 RECYCLE N-1.C$	B12	=	5468.00
UNH PREPARATION FOR IM ELEMENTS$	B13	=	3676.00
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (IM RECYCLE)$	B14	=	36947.00
TRISO COATING PROCESS IM FISILE PARTICLES UO2 (L-2.J.(1))$	B15	=	12736.00
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR IM FUEL M-4.A(1)$	B16	=	6461.00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CABB PROCESS IM FUEL N-1.A$	B17	=	7654.00
THORIUM RECOVERY PROCESS (T-2)$	B18	=	14[illegible]45.00
TH(NO3)4 PREPARATION PROCESS K-8$	B19	=	5090.00
THORIUM DIOXIDE MICROSPHERE PREPARATION$	B20	=	12171.00
BISO MICROSPHERE COATING PROCESS - FERTILE PARTICLES-THO2 (L-1.A.([illegible]	B21	=	174[illegible]5.00
RECLAMATION OF THORIUM FROM REJECT KERNALS$	B22	=	1963.00
THORIUM DIOXIDE REJECT RECLAMATION COATING REMOVAL$	B23	=	1894.00
RECLAMATION PROCESSING OF REJECT 23 RECYCLE FUEL (A-15 ELEMENT)$	B24	=	11535.00
RECLAMATION PROCESSING OF REJECT 25 RECYCLE FUEL (A-19 ELEMENTS)$	B25	=	12430.00
RECLAMATION PROCESSING OF REJECT IM FUEL (A-1 ELEMENTS)$	B26	=	11676.00
			**************
SUM OF ABOVE PROCESSES (MILLIONS OF DOLLARS)		=	423.2940

CAPITAL COST BREAKDOWN FOR PLANT 1 USING MATERIAL BALANCE NO. 3 FOR A TOTAL OF 26 PROCESSES USING THRUPUT DATA IN EACH PROCESS

PLANT CAPACITY = 3.00 METRIC TONS OF HEAVY METAL PE R DAY

INCREMENTAL PLANT CAPITAL COST DATA - THOUSANDS OF DOLLARS

COST OF SPENT FUEL STORAGE ************************************	=	0.00
COST OF 23 RECYCLE FABRICATION ******************************	=	108368.00
COST OF 23 RECYCLE REFRABRICATION **************************	=	226983.00
COST OF 23 RECYCLE REFABRICATION WITH REJECT RECLAMATION ***	=	236043.00
COST OF 23 RECYCLE REPROCESSING ****************************	=	98159.00
COST OF 23 RECYCLE PROCESSING ******************************	=	334202.00
COST OF 25 RECYCLE FABRICATION *****************************	=	29566.00
COST OF 25 RECYCLE REFABRICATION ***************************	=	55556.00
COST OF 25 RECYCLE REFABRICATION WITH REJECT RECLAMATION ***	=	65995.00
COST OF IM RECYCLE REPROCESSING ****************************	=	43973.00
COST OF 25 RECYCLE PROCESSING ******************************	=	109968.00
COST OF IM FABRICATION ***********************************	=	42084.00
COST OF IM PREPARATION AND FABRICATION *********************	=	97619.00
COST OF IM PREPARATION AND FABRICATION WITH REJECT RECLAMATION	=	111419.00
COST OF IM FUEL PROCESSING ********************************	=	116650.00
COST OF THORIA FABRICATION *********************************	=	51848.00
COST OF 22 AND 23 AND THORIA FABRICATION WITH REJECT RECLAMATION	=	57783.00
COST OF THORIA PROCESSING **********************************	=	66839.00
COST OF TOTAL REPROCESSING *********************************	=	142132.00
COST OF TOTAL REFABRICATION ********************************	=	302038.00
COST OF TOTAL RECYCLE PROCESSING ***************************	=	470068.00
COST OF TOTAL IM PROCESSING ********************************	=	183489.00
COST OF TOTAL FUEL PROCESSING ******************************	=	653557.00

INCREMENTAL UNIT CAPITAL COST DATA - DOLLARS /KILOGRAM

COST OF SPENT FUEL STORAGE =	0.00
COST OF 23 RECYCLE FABRICATION =	99.00
COST OF 23 RECYCLE REFRABRICATION =	208.00
COST OF 23 RECYCLE REFABRICATION WITH REJECT RECLAMATION =	210.00
COST OF 23 RECYCLE REPROCESSING =	39.00
COST OF 23 RECYCLE PROCESSING =	133.00
COST OF 25 RECYCLE FABRICATION =	223.00
COST OF 25 RECYCLE REFABRICATION =	419.00
COST OF 25 RECYCLE REFABRICATION WITH REJECT RECLAMATION =	497.00
COST OF IM RECYCLE REPROCESSING =	1506.00
COST OF 25 RECYCLE PROCESSING =	629.00
COST OF IM FABRICATION =	24.00
COST OF IM PREPARATION AND FABRICATION =	57.00
COST OF IM PREPARATION AND FABRICATION WITH REJECT RECLAMATION =	65.00
COST OF IM FUEL PROCESSING =	66.00
COST OF THORIA FABRICATION =	21.00
COST OF 22 AND 23 AND THORIA FABRICATION WITH REJECT RECLAMATION =	24.00
COST OF THORIA PROCESSING =	77.00
COST OF TOTAL REPROCESSING =	56.00
COST OF TOTAL REFABRICATION =	119.00
COST OF TOTAL RECYCLE PROCESSING =	354.00
COST OF TOTAL IM PROCESSING =	71.00
COST OF TOTAL FUEL PROCESSING =	224.00

THE CAPITAL COST FOR EACH OF THE INDIVIDUAL PROCESS BLOCKS IS AS FOLLOWS -THOUSANDS OF DOLLARS***

HEAD END REPROCESSING OF 23 RECYCLE SPENT FUEL ELEMENTS(A-15)$	B1	*	51278.00
ACID THOREX REPROCESSING (23 RECYCLE FUEL)$	B2	*	46881.00
SOLEX PROCESS FOR MICROSPHERE PREPARATION (23 RECYCLE)$	B3	*	118518.00
BISO MICROSPH COAT PROCESS 23 RECYCLE PARTICLES (TH233U)O2 (L-1.F(1))$	B4	*	45986.00
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 23 RECYCLE M-4.A(2)$	B5	*	45603.00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 23 RECYCLE N-1.B$	B6	*	16779.00
HEAD END REPROCESSING OF IM AND 25 RECYCLE SPENT FUEL ELEMENTS (A1 & A19)$	B7	*	36735.00
ACID THOREX REPROCESSING (IM SPENT & 25 RECYCLE FUEL)$	B8	*	7236.00
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (23 RECYCLE)$	B9	*	25991.00
TRISO MICROSPHERE COATING PROCESS (25 RECYCLE PARTICLES) 235UO2 (L-2.C.(1))$	B10	*	6409.00
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR 25 RECYCLE M-4.B(2)$	B11	*	13350.00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CARB PROCESS 25 RECYCLE N-1.C$	B12	*	6707.00
UNH PREPARATION FOR IM ELEMENTS$	B13	*	5231.00
CUSP PROCESS FOR UO2 MICROSPHERE PREPARATION (IM RECYCLE)$	B14	*	55525.00
TRISO COATING PROCESS IM FISILE PARTICLES UO2 (L-2.J.(1))$	B15	*	19306.00
FRF SLUG INJECTION OUT OF BLOCK CARB PROCESS FOR IM FUEL M-4.A(1)$	B16	*	10284.00
FUEL ELEMENT ASSEMBLY OUT OF BLOCK CABB PROCESS IM FUEL N-1.A$	B17	*	11934.00
THORIUM RECOVERY PROCESS (T-2)$	B18	*	25699.00
TH(NO3)4 PREPARATION PROCESS K-8$	B19	*	9056.00
THORIUM DIOXIDE MICROSPHERE PREPARATION$	B20	*	22228.00
BISO MICROSPHERE COATING PROCESS - FERTILE PARTICLES-THO2 (L-1.A.(1))$	B21	*	29820.00
RECLAMATION OF THORIUM FROM REJECT KERNALS$	B22	*	2803.00
THORIUM DIOXIDE REJECT RECLAMATION COATING REMOVAL$	B23	*	3132.00
RECLAMATION PROCESSING OF REJECT 23 RECYCLE FUEL (A-15 ELEMENT)$	B24	*	9040.00
RECLAMATION PROCESSING OF REJECT 25 RECYCLE FUEL (A-19 ELEMENTS)$	B25	*	10439.00
RECLAMATION PROCESSING OF REJECT IM FUEL (A-1 ELEMENTS)$	B26	*	13800.00
			**************
SUM OF ABOVE PROCESSES (MILLIONS OF DOLLARS)		*	[illegible]