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PARVCOST: A PARTICLEBOARD VARIABLE COST PROGRAM.(U)
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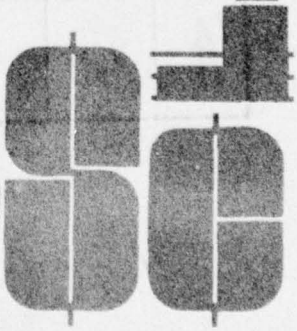
PARVCOST:
A PARTICLEBOARD VARIABLE COST PROGRAM

USDA FOREST SERVICE
GENERAL TECHNICAL REPORT
FPL-14
1977

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
FOREST PRODUCTS LABORATORY
MADISON, WIS.



ABSTRACT

PARVCOST, A FORTRAN program, was designed to develop economic and financial analyses of systems for manufacturing particleboard. In the program, costs and requirements of wood are calculated as are chemicals and energy per unit of finished board products. Estimates are made of sensitivity of the finished product costs to changes in unit costs of energy and raw materials. Weight statistics are computed for the finished product and for the profit contribution ratio for values of given products. An appendix is included with a sample program output, two versions of data decks and modifications, notes on use of the two versions, and a listing of the program and documentation cards.

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PARVCOST: A PARTICLEBOARD VARIABLE COST PROGRAM

By

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INTRODUCTION

A computer program for the variable cost of particleboard, PARVCOST, was developed by the Marketing and Economics Analysis Research Work Unit of the Forest Products Laboratory (FPL). The objective was to automate the computations of raw material and energy unit cost, board statistics, and energy requirements for particleboard manufacture from estimates of material costs and energy requirements. Many of the basic concepts used in PARVCOST were adapted from a computer program developed by G. A. Koenigshof, USDA, Forest Service, Athens, Ga., to evaluate veneered particleboard manufacturing systems.

PARVCOST is written in FORTRAN and can be run on a UNIVAC 1110 (Univ. of Wis.), a CDC 6500 (Purdue Univ.), and a DATACRAFT 6024/3 (FPL).

Appended to this report are the following: A sample program output; a listing of a long (documented) version data deck; a sample of a short version data deck; two program cards needed for modification of the two versions; notes on use of the two versions; and a listing of the PARVCOST program and documentation cards.

COMPUTATIONS

PARVCOST calculates costs and requirements of wood, chemicals, and energy per unit of finished board product. It estimates sensitivity of costs of finished products to changes in costs of units of energy and raw materials. It also computes weight statistics for the finished product and the profit contribution ratio for given product values.

Raw Materials, Energy, and Costs

PARVCOST computes input requirements for raw material and energy and variable costs of particleboard manufacture in standard units of finished product output (Mft^2-3/8 in., Mft^2-1/2-in., m^3). Computational outputs of PARVCOST (appendix A) are derived from estimates of process and supply requirements.

Gross input requirements per unit of output for particleboard manufacture are always greater than the final amount of raw materials that physically appear in a unit of the finished product. This is caused by fines, trims, and other processing material and energy losses. The phrase "per unit of output" in this program refers to the gross input requirements per unit of finished board product. Variable costs of production are calculated as gross input requirements per unit of product multiplied by estimated price for given raw material and energy input.

1/ The Laboratory is maintained in cooperation with the University of Wisconsin-Madison.

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If an external fuel, in addition to residues fuels, is needed, PARVCOST selects the least expensive alternative fuel—wood, oil, gas, or coal—on the basis of cost per effective heating value. Energy requirements and costs are computed in terms of the least expensive fuel available.

Sensitivity of Unit Variable Costs

Another objective of PARVCOST is to gage the sensitivity of total gross variable cost to possible changes in individual market costs of raw material (wood, resin, and wax) and energy (electricity and fuel). Sensitivity of total gross variable cost to the cost for each of these is given in the PARVCOST printed output in terms of total gross variable cost per cubic foot of finished product. Sensitivity is expressed as simple linear equations of the form,

$$Y = AX + B$$

where

Y is total gross variable cost per cubic foot of panel product;

A, a "slope" coefficient calculated by the program;

X, an individual item cost on an imput basis (wood cost in $\$/ft^3$, price of oil in \$/barrel); and

B, a constant term calculated by the program.

Sensitivity equations provide for determining the effect that changes in input prices for raw materials will have on total gross variable cost per cubic foot of finished product. If there is a change in the cost of one raw material, the new total gross variable cost can be calculated by simply applying a sensitivity equation to the new cost of that raw material.

The effect of any magnitude of change in cost of wood raw material, resin, wax, or electricity can be evaluated using the appropriate sensitivity equation. Gross variable cost is a strictly linear function of cost of wood, resin, wax, and electricity for any value of these individual costs. However, only the effect of marginal changes in fuel costs can be evaluated by the sensitivity to the fuel-cost formula. PARVCOST always selects the least expensive fuel on the basis of cost per effective British thermal unit. Large changes in fuel cost may result in substituting one fuel for another.

Profit Contribution Ratio

PARVCOST calculates a profit contribution ratio. Profit contribution is the net sales value plus any benefits from the sale of surplus residues minus variable costs of production. The profit contribution ratio is the ratio of the profit contribution to the net sales value, which expresses the percent of revenues available to cover other operating costs and yield profits. The PARVCOST profit contribution ratio can be used to gage the relative feasibility of manufacturing particleboard between sites where raw materials, energy, and product outputs have different values, but other operating costs may be assumed equal.

DATA REQUIREMENTS OF OF PARVCOST PROGRAM

Data required by PARVCOST consist of estimates of the following factors: (1) Specific gravity and moisture content of wood, bark, and pressed panel, (2) cost of procuring wood, chemicals, residues, fuel, electricity, (3) costs of finished board product, (4) ratio of bark to wood in roundwood,(5) percents of process residues loss and the width of edging trims, (6) finished panel size, (7) percent face and core furnish, (8) weight percentages of chemicals needed in face and core furnish, (9) British thermal unit value of fines, trims, bark, and fuel, and (10) requirements of heat energy (Btu) and electricity (kWh) per cubic foot of output.

Of a total of 48 input variables, each must be assigned a value. Forty-two are estimates of various particleboard manufacturing factors; five are simple integer option variables that control the format of the printed program output; and one is the title of the printed output. Following is a listing of the 48 input variables required by PARVCOST. The variables are in the order in which they occur in the data deck. The four-letter program name of each variable procedes each definition.

INPUT VARIABLES

1. **CCUF,** cost of wood raw material in dollars per cubic foot (solid volume).
2. **SGRW,** ovendry specific gravity of wood raw material (average value, green volume, and dry weight).
3. **GRMC,** moisture content on an ovendry basis of wood raw material (as a decimal).
4. **PCTB,** ratio of bark to wood in wood raw material (this ratio is on a weight basis and refers only to the bark that is removed and used as fuel).
5. **WBMC,** moisture content on an ovendry basis of bark (as a decimal).
6. **SGBK,** ovendry specific gravity of bark (average value, green volume, and dry weight).
7. **CRES,** cost of resin in dollars per pound of resin.
8. **PRRF,** weight percent of face blend required to be resin (as a decimal).
9. **PRRC,** weight percent of core blend required to be resin (as a decimal).
10. **CWAX,** cost of wax in dollars per pound of wax.
11. **PWRF,** weight percent of face blend required to be wax (as a decimal).
12. **PWRC,** weight percent of core blend required to be wax (as a decimal).
13. **ODMC,** ovendry basis moisture content of wood coming out of dryer (as a decimal).
14. **PCTF,** weight percent of furnish material lost as dry fines but mostly recoverable as fines fuel (as a decimal).
15. **PCFF,** weight percent of product that is face furnish (as a decimal).
16. **PCCF,** weight percent of product that is core furnish (as a decimal).
17. **ODWP,** weight in pounds per solid cubic foot of finished product.
18. **FPMC,** ovendry basis moisture content of wood in finished product (as a decimal).
19. **PTLG,** width in inches of panel trims cut away along length of product.
20. **PTWD,** width in inches of panel trims cut away along width of product.
21. **PWSR,** weight percent of wood raw material that becomes green (wet screened) wood residue.
22. **CORM,** f.o.b.—mill value of any surplus residues (residue mix) in dollars per pound.
23. **CKWH,** cost of electricity in dollars per kilowatt-hour.
24. **BTUF,** average higher heating value of nonbark wood fuel residues in million British thermal units per pound.
25. **BTUB,** average higher heating value of bark residues in million British thermal units per pound.
26. **BTRD,** million British thermal units required at boiler or other heat recovery device per pound of water evaporated by wood dryer.
27. **BTRP,** million British thermal units required at boiler for press steam per cubic foot cut panel product.
28. **BTRT,** million British thermal units required at boiler for thaw pond per cubic foot cut panel product.
29. **BTRH,** million British thermal units required at boiler for heating per cubic foot cut panel product.
30. **BTRM,** million British thermal units required at boiler for miscellaneous purposes per cubic foot cut panel product.
31. **RKWH,** kilowatt-hours of electricity required per cubic foot of cut panel product.
32. **PPWD,** width of pressed panel in inches (trimmed dimension).
33. **PPLG,** length of pressed panel in inches (trimmed dimension).
34. **SALE,** net sales value f.o.b. mill of product in dollars per solid cubic foot.
35. **PGAS,** price of natural gas in dollars per thousand cubic foot.
36. **POIL,** price of fuel oil in dollars per barrel.
37. **PWOD,** price of external (nonprocess residue) wood fuel in dollars per ton.
38. **PCOL,** price of coal in dollars per ton.
39. **BTUG,** million British thermal units per thousand cubic foot of natural gas.
40. **BTUO,** million British thermal units per barrel of oil.
41. **BTUW,** million British thermal units per ton of wood fuel.
42. **BTUC,** million British thermal units per ton of coal.
43. **ITOP,** coded specification of how trims are to be handled (0 = trims recycled as furnish; 1 = trims used as fuel).
44. **IOP1,** coded specification of size of panel for which data should be printed in second data column of data printout (0 (or blank) for 3/8 in., 1 for 1/4 in., 2 for 3/4 in., 3 for 5/8 in., and 4 for 1/2 in.).

45. **IOP2,** coded specification of size of panel for which data should be printed in third data column of data printout (0 (or blank) for 1/2 in., 1 for 1/4 in., 2 for 3/4 in., 3 for 5/8 in., and 4 for cubic meter).
46. **NOPT,** coded specification of number of data columns to be printed on printed output (3 for 3 columns, 0 (or blank) for 5 columns).
47. **NCOP,** specification of number of copies of output to be printed (01 to 10).
48. **TITL,** an alphanumeric array for input of title of printed output.

STRUCTURE OF DATA DECK

The PARVCOST data deck has two versions: A long, documented version (DV) (appendix B) and a short, not documented version (SV) for which a sample is given in appendix C. Either version may be used for entering data into the PARVCOST program. The two versions enter exactly the same data in the same order. The only difference between the two versions is that only the long version contains documentation of each input variable.

LONG VERSION DATA DECK

The DV data deck (appendix B) has 104 lines. Most of the DV data deck is documentation that explains the data-coding sequence; it does not influence the function of the program. The documentation in the DV data deck is essential if the deck is stored in a computing facility, communication is established via a teletype terminal or similar device, and stored data is to be edited line-by-line. A list of the DV data deck can also be used as a coding guide reference if using the SV data deck.

In using the DV data deck, data to be entered is shown in appendix B and follows "WOOD RAW MATERIAL COST PER CUBIC FOOT." The numerical information is given that should be entered in columns 6 through 18; each datum must include a decimal point. Program controls are entered as integer data without decimal points in columns 1 and 2 (as indicated) on the five data cards preceding the program title cards (last cards in data deck). Alphanumeric (title of output) data are entered on the last two cards of the data deck. All of the other data columns and documentation comments of the DV data deck are nonfunctional.

Use of the DV data deck requires that program card 6 be replaced by card 6B (appendix D). Thus, if using the DV data deck, remove main program card number 6 and insert card number 6B in the same place in the main program. The program will not run with the DV data deck unless this modification has been made.

SHORT VERSION DATA DECK FORMAT

The SV data deck consists of 10 data cards. Forty-eight input variables are entered on 10 cards in the same order listed in the long version section on data requirements. If using the SV deck, all of the required statistics of particleboard manufacture (the first 42 input variables) are entered on cards 1 to 6 (table 1). Program control specifications (input variables 43-47) are entered on card 7. The title of the output is entered on cards 8 through 10.

Cards 1 through 6, instructions: The estimates for the first 42 input variables are

entered on the first six cards of the SV data deck. Seven estimates are entered on each card. One estimate is punched in every 10 spaces starting in columns 1 through 10 of each card. Each estimate that is punched must include a decimal point. An estimate may be punched anywhere in the 10-space field allotted to each variable. Input variables for cards 1 through 6 and the columns for their entry are listed in table 1.

Table 1.—**Input variables for cards 1 through 6**

Card. No.	Columns						
	1-10	11-20	21-30	31-40	41-50	51-60	61-70
1	CCUF	SGRW	GRMC	PCTB	WBMC	SGBK	CRES
2	PRRF	PRRC	CWAX	PWRF	PWRC	ODMC	PCTF
3	PCFF	PCCF	ODWP	FPMC	PTLG	PTWD	PWSR
4	CORM	CKWH	BTUF	BTUB	BTRD	BTRP	BTRT
5	BTRH	BTRM	RKWH	PPWD	PPLG	SALE	PGAS
6	POIL	PWOD	PCOL	BTUG	BTUO	BTUW	BTUC

Card 7, instructions: input variables 43 through 47 are specified on card 7. The single integer specifications for ITOP, IOP1, IOP2, and NOPT are punched in columns 1 through 4, respectively. The two integer specifications for NCOP are punched in columns 5 and 6. The appropriate integers to punch in these columns are discussed in the listing of input variables in the various section on data requirements for the PARVCOST program.

Cards 8 through 10, instructions: The title desired to be printed at the top of the program output is punched on cards 8 through 10 of the SV data deck. The title should be typed on the center of these cards.

Appendix B is a listing of a sample SV data deck. Note that it contains the same data as the sample listing of the DV version in appendix A. If the SV version of the data deck is used, program card 6 (not 6B, see appendix D) must be in the program deck. The program will not run with the SV data deck unless program card 6 is in the program deck and card 6B has been removed.

APPENDIX A.—Sample Program Output Obtained by Running PARVCOST with Sample Data from Appendixes B or C

MATERIAL AND RESOURCE REQUIREMENTS, BOARD STATS, AND VARIABLE COSTS FOR MANUFACTURE OF STRUCTURAL PARTICLEBOARD PER UNIT OF OUTPUT (HYPOTHETICAL TEST)

	$/CU.FT.	$/MSF 3/8 IN. BASIS	1/2 IN. BASIS	5/8 IN. BASIS	$/CU.METER
NET SALES VALUE	$ 2.4760	$ 93.000	$ 124.000	$ 155.000	$ 105.083
VARIABLE COSTS OF PRODUCTION					
WOOD ($ .2800/CU. FT.)	$ .2859	$ 8.936	$ 11.914	$ 14.893	$ 10.097
RESIN (6.5%, $ .38/LB.)	.9008	28.150	37.533	46.917	31.807
WAX (1.0%, $ .12/LB.)	.0438	1.368	1.823	2.279	1.545
ELECTRIC POWER ($ .020/KWH)	.1200	3.750	5.000	6.250	4.237
DRYER HEAT(FUEL=$ .206/MM BTU)	.0112	.351	.468	.585	.396
PROC.STEAM(FUEL=$ .206/MM BTU)	.0095	.298	.398	.497	.337
LESS RESIDUE VAL.($ 48.00/BDU)	.0000	.000	.000	.000	.000
GROSS VARIABLE COST	$ 1.3713	$ 42.853	$ 57.137	$ 71.421	$ 48.420
PROFIT CONTRIBUTION	$ 1.6047	$ 50.147	$ 66.863	$ 83.579	$ 56.662
P. C. RATIO	53.9%				

SENSITIVITY OF GROSS VARIABLE COST PER CU. FT. OF FINISHED PRODUCT OUTPUT

VAR. COST/CU. FT. = 1.0212 * (WOOD COST/CU. FT.) + 1.0853
VAR. COST/CU. FT. = 2.3705 * (RESIN COST/LB.) + .4705
VAR. COST/CU. FT. = .3647 * (WAX COST/LB.) + 1.3275
VAR. COST/CU. FT. = 6.0000 * (ELECTRICITY COST/KWH) + 1.2513
VAR. COST/CU. FT. = .0005 * (PRICE OF COAL/TON) + 1.3624
VAR. COST/CU. FT. = .0133 * (PRICE OF NAT. GAS/MCF) + 1.3594

BOARD STATISTICS	LBS./CU.FT.	LBS./MSF 3/8 IN.BASIS	1/2 IN. BASIS	5/8 IN. BASIS	LBS./CU.METER
GROSS BOARD WEIGHT	38.150	1192.187	1589.585	1986.979	1347.076
WEIGHT OF WATER(9.0% M.C.)	3.150	98.437	131.250	164.062	111.226
OVEN DRY WGT. OF BOARD	35.000	1093.750	1458.334	1822.917	1235.850
WGT. OF RESINS(6.5% SOLIDS)	2.275	71.094	94.792	118.490	80.330
WGT. OF WAX(1.0% SOLIDS)	.350	10.937	14.583	18.229	12.358
WEIGHT OF WOOD	32.375	1011.719	1348.959	1686.198	1143.161

RAW MATERIAL REQUIREMENTS	REQ./CU.FT.	REQ./MSF 3/8 IN.BASIS	1/2 IN. BASIS	5/8 IN. BASIS	REQ./CU.METER
WOOD (O. D. SPEC. GRAV. = .59)					
POUNDS OF O.D. WOOD	37.757	1179.907	1573.210	1966.511	1333.200
POUNDS OF GREEN WOOD	67.963	2123.632	2831.778	3539.720	2399.760
CU. FT. OF ROUNDWOOD	1.021	31.914	42.551	53.189	36.060
RESIN (LBS. SOLIDS/LIQUID)	2.371	74.079	98.772	123.465	83.703
WAX (LBS. SOLIDS)	.365	11.397	15.196	18.995	12.877

FUEL AND POWER STATISTICS IN MILLION B.T.U.S

	BTUS/CU.FT.	BTUS/MSF 3/8 IN.BASIS	1/2 IN. BASIS	5/8 IN. BASIS	BTUS/CU.METER
FUEL REQUIREMENTS					
DRYER HEAT					
(.0017008TUS/LB.WATER EVAP.)	.047498	1.484323	1.979098	2.473871	1.677166
PROCESS STEAM					
PRESS	.019200	.600000	.800001	1.000000	.677952
THAW POND	.002000	.062500	.083333	.104167	.070620
HEATING	.016000	.500000	.666667	.833333	.564960
MISCELLANEOUS	.003200	.100000	.133333	.166667	.112992
TOTAL FUEL REQUIRED	.087898	2.746823	3.662433	4.578037	3.103690
WOOD FUEL GENERATED					
DRY FINES/TRIMS(8.0%/ 2.0%)	.023277	.727416	.969889	1.212360	.821922
WET BARK(.12:1 RATIO OF WOOD)	.031196	.974865	1.299821	1.624775	1.101519
SCREENED WET WOOD RESIDUES	.010886	.340184	.453579	.566974	.384381
TOTAL FUEL GENERATED	.065359	2.042465	2.723289	3.404109	2.307822
AUXILIARY FUEL BTU	.011534	.360435	.480580	.600725	.407263
NET FUEL REQUIREMENT	.011006	.343922	.458563	.573204	.388605

FUEL AND POWER REQUIRED	REQ./CU.FT.	REQ./MSF 3/8 IN.BASIS	1/2 IN. BASIS	5/8 IN. BASIS	REQ./CU.METER
KWH. ELECT. POWER ($.020/KWH)	6.0000	187.500	250.000	312.500	211.860
TONS COAL ($ 18.00/TON)	.000491	.015354	.020472	.025589	.017348
MCF. AUX. GAS ($ .90/MCF.)	.013257	.414293	.552391	.690489	.468118

APPENDIX B.—Listing of Long, or Documented, Version Data Deck

```
THIS THE DOCUMENTED VERSION OF THE PANVCOST DATA DECK
          COLUMN WIDTHS
     6X          18X          30X
WOOD RAW MATERIAL COST PER CUBIC FOOT
CCUF=  .28
O. D. SPECIFIC GRAVITY OF THE WOOD RAW MATERIAL
SGRW= 0.59295
MOISTURE CONTENT O. D. BASIS OF THE GREEN WOOD RAW MATERIAL
GRMC=  .80
RATIO OF BARK TO WOOD IN WOOD RAW MATERIAL
PCTB=  .12
MOISTURE CONTENT O. D. BASIS OF GREEN BARK MATERIAL
WBMC= 1.00
O. D. SPECIFIC GRAVITY OF THE BARK
SGBK=0.700
COST OF RESIN PER POUND IS
CRES=  .38
PERCENT RESIN REQUIRED IN FACE IS
PRRF=  .07
PERCENT RESIN REQUIRED IN CORE IS
PRRC=  .05
COST OF WAX PER POUND OF WAX IS
CWAX=  .12
PERCENT OF WAX REQUIRED IN FACE IS
PWRF=  .01
PERCENT OF WAX REQUIRED IN CORE IS
PWRC=  .01
MOIST. CONTENT WOOD OUT OF DRYER
ODMC=  .06
THE RECOVERABLE PERCENT OF FINES LOSS (WEIGHT PERCENT OF WOOD RAW MATERIAL)
PCTF=  .08
PERCENT OF PRODUCT IN FACE FURNISH
PCFF=  .75
PERCENT OF PRODUCT IN CORE FURNISH
PCCF=  .25
O.D. WT. OF PRESSED PANEL/CU.FT.
ODWP=35.0
MOIST. CONTENT OF WOOD IN PRODUCT
FPMC=  .09
PANEL TRIMS ALONG LENGTH (INCHES)
PTLG= 1.5
PANEL TRIMS ALONG WIDTH (INCHES)
PTWD= 1.5
PERCENT OF WOOD RAW MATERIAL LOST AS GREEN RESIDUE, (RECOVERED AS FUEL)
PWSR= 0.05
VALUE F.O.B.-MILL PROCESS GENERATED WOOD AND BARK RESIDUES (AVERAGE$/POUND)
CODR=0.000
COST OF ELECTRICITY PER KWH.
CKWH=  .020
BTU IN WOOD FINES AND RESIDUES (MILLION BTU/LB. O.D. HIGHER HEATING VALUE)
BTUF=.008500
BTU IN BARK (MILLION BTU/LB. O.D. HIGHER HEATING VALUE)
BTUB=.009500
DRYER BTU DEMAND AT BOILER--MILLION BTU/LB. WATER EVAPORATED
BTRD=  .001700
PROC. STEAM PRESS BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS
BTRP=  .019200
THAW POND STEAM BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS
BTRT= 0.002000
HEATING STEAM BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS
BTRH=  .016000
MISCELLANEOUS STEAM BTU DEMAND AT BOILER--MILL. BTU/CU. FT. PANELS
BTRM=  .003200
ELECTRIC USAGE--KWH./CU. FT. PANELS
AKWH= 6.000
PRESSED PANEL WIDTH (INCHES)
PPWD= 48.0
PRESSED PANEL LENGTH (INCHES)
PPLG= 96.0
THE NET SALES VALUE ($/CU. FT.)
SALE=  2.976
AVERAGE ANTICIPATED PRICE OF NATURAL GAS PER MCF
PGAS= 0.90
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AVERAGE ANTICIPATED PRICE OF OIL PER BARREL
POIL= 9.00
AVERAGE ANTICIPATED PRICE OF WOOD TO BE USED AS FUEL PER TON
PWOD=17.00
AVERAGE ANTICIPATED PRICE OF COAL PER TON
PCOL= 18.0
MILLION BTUS AVAILABLE PER MCF OF NATURAL GAS
BTUG= 1.00
MILLION BTUS AVAILABLE PER BARREL OF OIL
BTUO= 5.00
MILLION BTUS AVAILABLE PER TON OF WOOD
BTUW=  18.0
MILLION BTUS AVAILABLE PER TON OF COAL
BTUC=  28.0
LEAVE NEXT LINE BLANK IF TRIMS ARE RECYCLED AS FURNISH, 1 IN COL. 1 IF AS FUEL

ON THE FOLLOWING LINE SPECIFY IOP1, THE TYPE OF OUTPUT IN COLUMN 2, SPECIFY
1 FOR 1/4 IN.,2 FOR 3/4 IN.,3 FOR 5/8 IN.,4 FOR 1/2 IN., DEFAULT (0) IS 3/8 IN.
0
ON THE FOLLOWING LINE SPECIFY IOP2, THE TYPE OF OUTPUT IN COLUMN 3, SPECIFY
1 FOR 1/4 IN.,2 FOR 3/4 IN.,3 FOR 5/8 IN.,4 FOR CU.METER, DEFAULT (0) IS 1/2 IN.
0
ON THE NEXT LINE SPECIFY THE NUMBER OF COLUMNS OF DATA OUTPUT TO BE PRINTED
SPECIFY 3 FOR 3 COLUMN WIDTH, DEFAULT (0) IS 5 COLUMN WIDTH
0
ON THE FOLLOWING LINE SPECIFY NCOP, THE NUMBER OF COPIES (01 TO 10)
01
CENTER THE TITLE ON THE NEXT THREE LINES
 MATERIAL AND RESOURCE REQUIREMENTS, BOARD STATS, AND VARIABLE COSTS FOR MAN-
  UFACTURE OF STRUCTURAL PARTICLEBOARD PER UNIT OF OUTPUT (HYPOTHETICAL TEST)
```
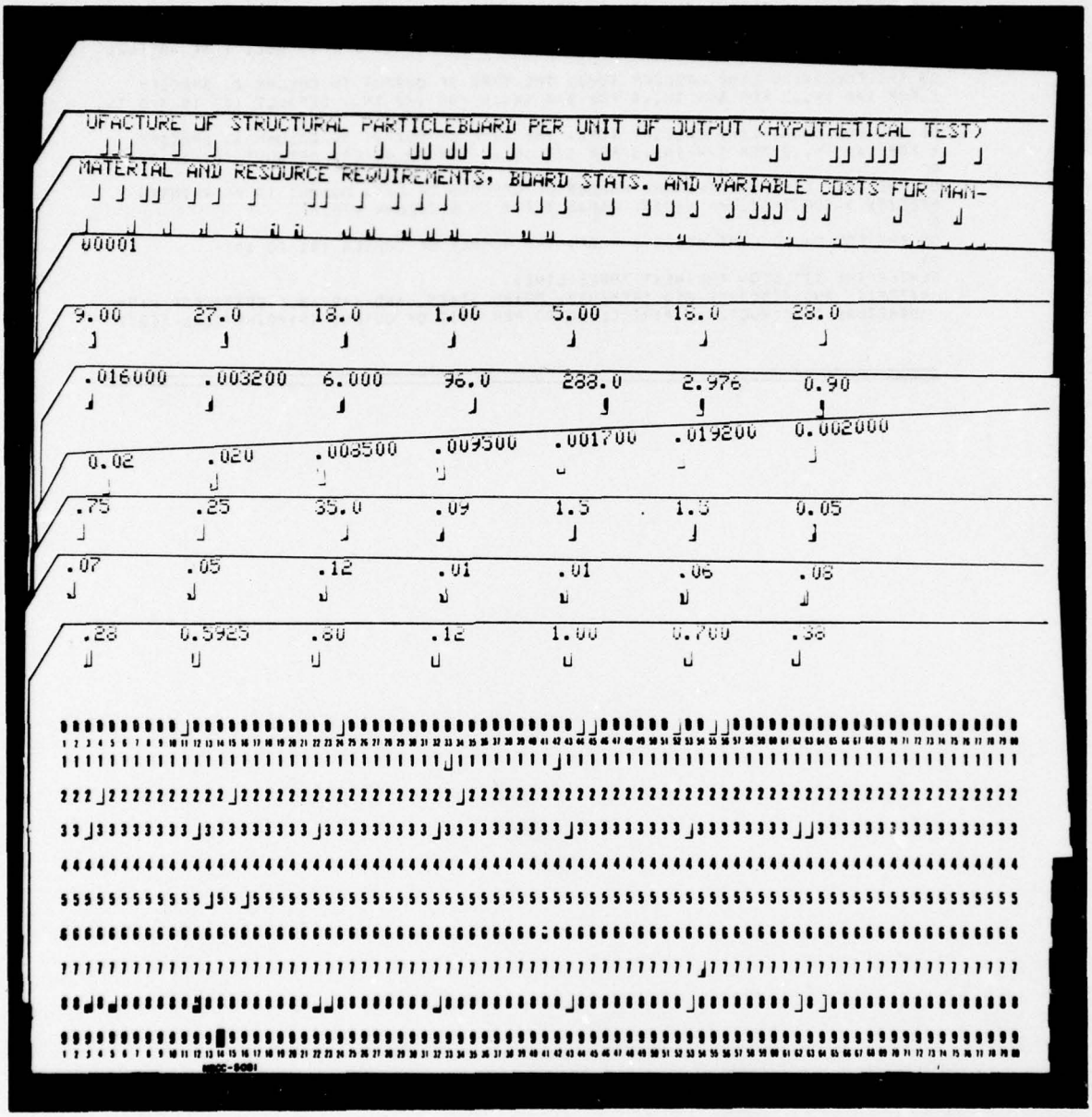
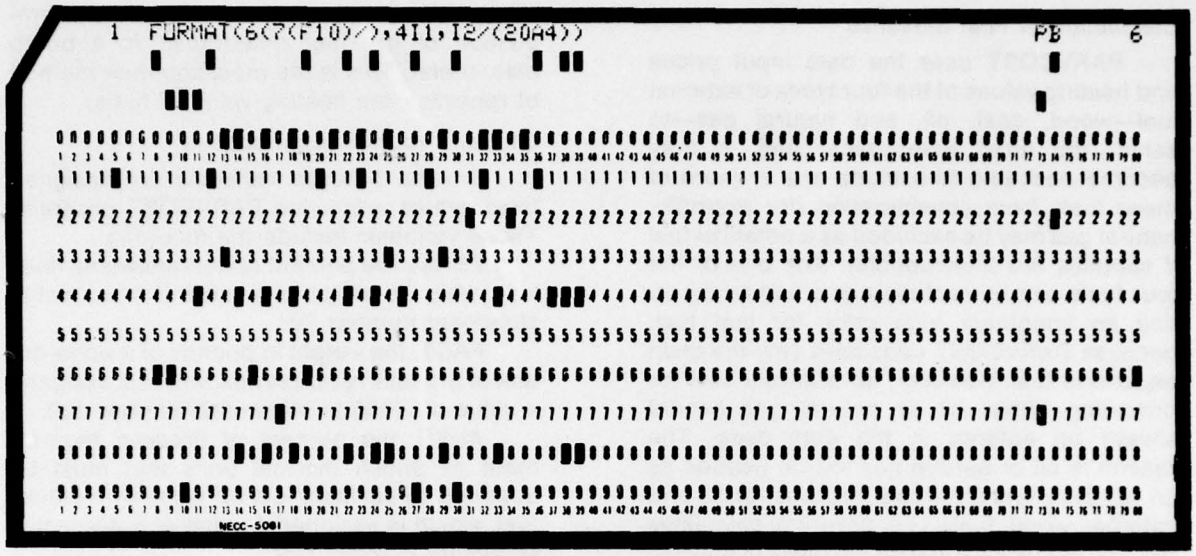

APPENDIX C.—Sample of Short Version Data Deck

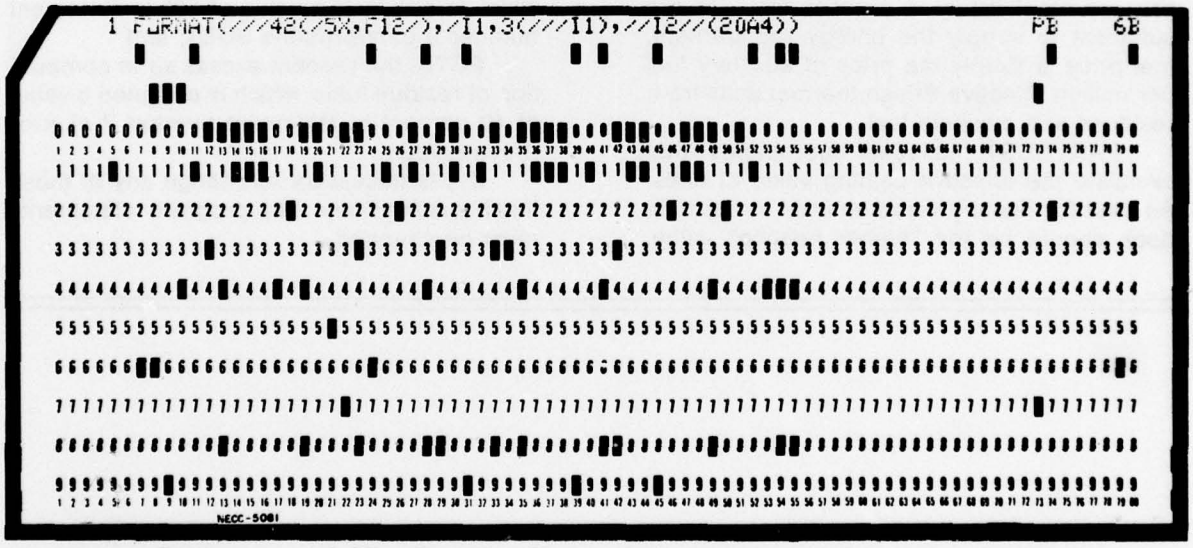
Data and cards of the short version data deck: The same sample data presented for the documented version sample in appendix A are presented here as they would be entered in the data deck for the short version.



APPENDIX D.—Program Cards 6 and 6B



Program card 6, to be used with the short version data deck:



Program card 6B, for the long, documented version data deck:

APPENDIX E.—Notes on Use of Program

Calculation of Fuel Statistics

PARVCOST uses the data input prices and heating values of the four types of external fuel—wood, coal, oil, and natural gas—to select the most economical fuel. It may become desirable to exclude one or more of these fuels from consideration (for example, natural gas may be excluded as a potential fuel if supplies are interruptible). Any one of the four fuels can be excluded as a fuel by inputting an imaginary high price for that fuel, because PARVCOST considers only the least expensive fuel. However, an accurate cost for procuring either oil **or** natural gas should always be entered in the data deck. The reason is oil or natural gas will be needed as an auxiliary fuel for wood residues, bark, and external wood fuel. The program calculates the cost of auxiliary fuel on the basis of the cost of oil or natural gas, whichever is cheapest per effective British thermal unit.

The price of fuel as given in the output (in dollars per million effective Btu's) is a weighted average that includes the cost of auxiliary fuel and the reduction in costs attributable to using process residue fuel. If process residues are sufficient to supply the energy requirement, fuel price is simply the price of auxiliary fuel per million effective British thermal units from residues and auxiliary fuel.

PARVCOST includes subroutines that calculate the effective heating value of fuels. All data for heating value entered in the data deck should be the "higher heating" value, which is the maximum heat released by combustion of dry fuel determined in a bomb calorimeter. This is the most common method of reporting the heating value of fuels.

Internal Program Assumptions

Several process variables are assigned fixed values within the PARVCOST program. These variables include the following:

PERM, the percent of nonrenewable fines loss, which is assigned a value of 3 percent in statement number 78;

FACT, the weight in pounds of a bone-dry unit of process residues mix, which is assigned a value of 2,400 in statement number 182;

AUXF, the percent of process requirement of British thermal units that must be supplied by auxiliary fuel for wood or residues fuel, which is assigned a value of 5 percent in statement number 109;

T1, the ambient temperature of fuel and air for combustion of residue fuels in degrees Fahrenheit, which is assigned a value of 68 in statement number 8 of subroutine SUB1;

T2, the stack gas temperature for combustion of residue fuels in degrees Fahrenheit, which is assigned a value of 400 in statement number 9 of subroutine SUB1; and

PCTR, the percent excess air in combustion of residue fuels, which is assigned a value of 40 percent in statement number 7 of subroutine SUB1.

If it is necessary to change any of these fixed assumptions, the program statements must be changed.

APPENDIX F.—Listing of PARVCOST Program and Documentation Cards

```
C*****************************************************************
C*****************************************************************
C*                                                               *
C*                                                               *
C*          PARTICLEBOARD  VARIABLE  COST  PROGRAM:  PARVCOST    *
C*                                                               *
C*                                BY                             *
C*                                                               *
C*                           PETER  J.  INCE                     *
C*                                                               *
C*                                AND                            *
C*                                                               *
C*                         GEORGE  B.  HARPOLE                   *
C*                                                               *
C*                   U. S.  FOREST  PRODUCTS  LAB.,  USDA        *
C*                                                               *
C*                      MADISON,  WISCONSIN  53705               *
C*                                                               *
C*                              MARCH, 1977                      *
C*                                                               *
C*                                                               *
C*                                                               *
C*       PARVCOST IS A FORTRAN PROGRAM DESIGNED TO ASSIST        *
C*   DEVELOPMENT OF ECONOMIC AND FINANCIAL ANALYSIS OF PARTICLEBOARD *
C*   MANUFACTURING SYSTEMS.  PARVCOST CALCULATES COSTS AND       *
C*   REQUIREMENTS OF WOOD, CHEMICALS AND ENERGY PER UNIT OF      *
C*   FINISHED BOARD PRODUCT.  IT ESTIMATES SENSITIVITY OF FINISHED *
C*   PRODUCT COSTS TO CHANGES IN UNIT COSTS OF ENERGY AND RAW    *
C*   MATERIALS.  IT ALSO COMPUTES WEIGHT STATISTICS FOR THE      *
C*   FINISHED PRODUCT AND THE PROFIT CONTRIBUTION RATIO FOR      *
C*   GIVEN PRODUCT VALUES.                                       *
C*                                                               *
C*       PARVCOST PROGRAM INPUT REQUIRES ESTIMATES OF (1) SPECIFIC *
C*   GRAVITY AND MOISTURE CONTENT OF WOOD, BARK AND PRESSED PANEL, *
C*   (2) MARKET PRICES OF WOOD, CHEMICALS, RESIDUES, BARK,       *
C*   FUEL, ELECTRICITY AND THE FINISHED BOARD PRODUCT, (3) RATIO *
C*   OF BARK TO WOOD IN ROUNDWOOD, (4) PROCESS FINES LOSS PERCENT *
C*   AND WIDTH OF EDGING TRIMS, (5) FINISHED PANEL SIZE, PERCENT *
C*   FACE AND CORE FURNISH, AND PERCENTAGES OF CHEMICALS NEEDED  *
C*   IN FURNISH, (6) B.T.U. VALUE OF RESIDUES, BARK AND FUEL,    *
C*   (7) B.T.U. REQUIREMENTS PER CUBIC FOOT OF OUTPUT FOR PROCESS *
C*   STEAM AND ALSO ELECTRICITY REQUIREMENTS.                    *
C*                                                               *
C*                                                               *
C*                                                               *
C*                            KEY  TERMS                         *
C*                             *  *  *  *                        *
C*                                                               *
C*   PER UNIT OF OUTPUT *** (PER UNIT OF PRODUCT, PER CUBIC FOOT *
C*        CUT PANELS, OR PER CUBIC FOOT OF CUT PANEL PRODUCT)    *
C*        EXCEPT FOR BOARD WEIGHT STATISTICS, PER UNIT OF OUTPUT *
C*        ALWAYS REFERS TO THE GROSS MATERIAL REQUIREMENTS OR    *
C*        COSTS OF INPUTS PER UNIT OF FINISHED BOARD PRODUCT     *
C*        OUTPUT AND INCLUDE THE QUANTITIES OR COSTS OF ALL      *
C*        MATERIALS LOST FROM THE FINISHED PRODUCT OUTPUT AS     *
C*        TRIMS OR RESIDUE.  BOARD WEIGHT STATISTICS ARE ABSOLUTE *
C*        STATISTICS WHICH DO NOT INVOLVE PROCESSING WEIGHT LOSSES. *
C*                                                               *
C*   SENSITIVITY OF UNIT VARIABLE COST *** THE SENSITIVITY OF THE *
C*        UNIT VARIABLE COST (COST PER CUBIC FOOT OF OUTPUT) TO THE *
C*        COSTS OF WOOD, RESIN, WAX, ELECTRICITY, AND FUEL ARE   *
C*        EXPRESSED IN THE FORM OF LINEAR EQUATIONS.  THESE      *
C*        EQUATIONS APPLY ONLY TO THE SENSITIVITY OF GROSS VARIABLE *
C*        COST PER CUBIC FOOT OF FINISHED PRODUCT OUTPUT.        *
C*                                                               *
C*                                                               *
C*****************************************************************
C*                                                               *
C*                                                               *
C*   ALPHABETICAL  LISTING  AND  DEFINITIONS  OF  PROGRAM  VARIABLES *
C*                                                               *
C*                                                               *
C*      'INPUT'  MEANS  THE  VARIABLE  IS  AN  INPUT  VARIABLE   *
C*               AND  HENCE  OCCURS  ALSO  IN  THE  DATA  DECK   *
```

```
C*                                                                      *
C*      'INTERNAL' MEANS THE VARIABLE IS USED STRICTLY WITHIN           *
C*                 THE PROGRAM AND APPEARS ONLY FOR THE PURPOSES        *
C*                 OF CALCULATION OR CLARIFICATION                      *
C*                                                                      *
C*      'OUTPUT'  MEANS THE VARIABLE WILL APPEAR AS PART                *
C*                 OF THE PRINTED OUTPUT (A FEW VARIABLES ARE           *
C*                 BOTH 'INPUT' AND 'OUTPUT')                           *
C*                                                                      *
C*      'SUB1'  MEANS THE VARIABLE IS USED WITHIN SUBROUTINE 'SUB1'     *
C*                                                                      *
C*      'SUB2'  MEANS THE VARIABLE IS USED WITHIN SUBROUTINE 'SUB2'     *
C*                                                                      *
C*      *       *       *       *       *       *       *       *      *
C*                                                                      *
C*   A1-A5...(OUTPUT) SENSITIVITY ANALYSIS FIRST ORDER COEFFICIENTS     *
C*           OR 'SLOPE' TERMS IN THE LINEAR EQUATIONS RELATING NET      *
C*           VARIABLE COST TO THE COST, ON AN INPUT BASIS OF ROUNDWOOD,*
C*           RESIN, WAX, ELECTRIC POWER, AND FUEL                       *
C*                                                                      *
C*   ABTR....(INTERNAL) AVERAGE EFFECTIVE B.T.U. PER POUND OF           *
C*           RESIDUES                                                   *
C*                                                                      *
C*   AUXF....(INTERNAL) THE PERCENT OF TOTAL WOOD AND AUXILIARY FUEL    *
C*           ON A B.T.U. BASIS WHICH MUST BE AUXILIARY FUEL REQUIRED    *
C*           TO BURN WOOD OR BARK FUEL (AUXF IS ASSIGNED A VALUE BY     *
C*           THE PROGRAM)                                               *
C*                                                                      *
C*   AUXI....(OUTPUT) UNITS OF AUXILIARY FUEL REQUIRED (BARRELS OF OIL *
C*           OR MCF OF NATURAL GAS) PER CUBIC FOOT OF CUT PANEL         *
C*           PRODUCT                                                    *
C*                                                                      *
C*   AVH.....(SUB1) AVAILABLE HEAT OF WOOD FUEL (BTU'S PER POUND)       *
C*                                                                      *
C*   B1-B5...(OUTPUT) SENSITIVITY ANALYSIS CONSTANTS IN THE LINEAR      *
C*           EQUATIONS RELATING NET VARIABLE COST TO THE COST, ON AN    *
C*           INPUT BASIS OF ROUNDWOOD, RESIN, WAX, ELECTRIC POWER,      *
C*           AND FUEL                                                   *
C*                                                                      *
C*   BAUX....(OUTPUT) B.T.U.S SUPPLIED BY AUXILIARY FUEL PER CU. FT.    *
C*           CUT PANEL PRODUCT                                          *
C*                                                                      *
C*   BTBK....(OUTPUT) B.T.U. VALUE OF THE BARK FUEL GENERATED PER       *
C*           CUBIC FOOT OF CUT PANEL PRODUCT                            *
C*                                                                      *
C*   BTEF....(SUB2) MILLION EFFECTIVE B.T.U. PER UNIT OF FUEL FOR       *
C*           NON-RESIDUE FUELS                                          *
C*                                                                      *
C*   BTFR....(INTERNAL) MILLION EFFECTIVE B.T.U.'S IN PROCESS WOOD      *
C*           RESIDUE FUEL PER CUBIC FOOT CUT PANELS                     *
C*                                                                      *
C*   BTFU....(SUB2) B.T.U. VALUE OF FUEL PER UNIT OF FUEL IN            *
C*           MILLION B.T.U. PER FUEL UNIT                               *
C*                                                                      *
CM  BT-+CCCCO+N-OT+OOTPOT+ M+LL+ONS OF BCTCOC -+- +-E+ +T T+E BO+LE-  Q
C*          BY THE DRIER TO EVAPORATE ONE POUND OF MOISTURE             *
C*                                                                      *
C*   BTRH....(INPUT+OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER   *
C*           FOR HEATING STEAM PER CUBIC FOOT OF CUT PANEL PRODUCT      *
C*                                                                      *
C*   BTRM....(INPUT+OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER   *
C*           FOR MISCELLANEOUS PURPOSES PER CUBIC FOOT OF CUT PANEL     *
C*           PROCUCT                                                    *
C*                                                                      *
C*   BTRP....(INPUT+OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER   *
C*           FOR THE PRESS PER CUBIC FOOT OF CUT PANEL PRODUCT          *
C*                                                                      *
C*   BTRT....(INPUT+OUTPUT) MILLIONS OF B.T.U. REQUIRED AT THE BOILER   *
C*           FOR THE THAW POND PER CUBIC FOOT OF CUT PANEL PRODUCT      *
C*                                                                      *
C*   BTUB....(INPUT) HIGHER HEATING VALUE IN MILLIONS OF B.T.U. PER     *
C*           POUND OF OVEN DRY BARK FUEL                                *
C*                                                                      *
C*   BTUC....(INPUT) HIGHER HEATING VALUE OF COAL IN MILLION B.T.U.     *
C*           PER TON OF COAL                                            *
C*                                                                      *
C*   BTUE....(SUB1) EFFECTIVE B.T.U.S PER POUND OF WOOD OR BARK         *
C*           RESIDUES FUEL                                              *
C*                                                                      *
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C*    BTUF....(INPUT) HIGHER HEATING VALUE IN MILLIONS OF B.T.U. PER      *
C*            POUND OF OVEN DRY FINES FUEL                               *
C*                                                                       *
C*    BTUG....(INPUT) HIGHER HEATING VALUE OF NAT. GAS IN MILLION        *
C*            B.T.U. OF NATURAL GAS                                      *
C*                                                                       *
C*    BTUO....(INPUT) HIGHER HEATING VALUE OF OIL IN MILLION B.T.U.      *
C*            PER BARREL OF OIL                                          *
C*                                                                       *
C*    BTUW....(INPUT) HIGHER HEATING VALUE OF EXTERNAL WOOD FUEL IN      *
C*            MILLION B.T.U. PER TON OF WOOD FUEL                        *
C*                                                                       *
C*    BTVF....(INTERNAL) EFFECTIVE B.T.U. VALUE OF FINES PER CUBIC       *
C*            FOOT OF CUT PANEL PRODUCT                                  *
C*                                                                       *
C*    BTWR....(OUTPUT) MILLION EFFECTIVE B.T.U.'S IN WET WOOD            *
C*            RESIDUES PER CUBIC FOOT CUT PANELS                         *
C*                                                                       *
C*    CAUX....(OUTPUT) THE COST OF AUXILIARY FUEL PER CUBIC FOOT OF      *
C*            CUT PANEL PRODUCT                                          *
C*                                                                       *
C*    CCUF....(INPUT) THE COST OF WOOD RAW MATERIAL PER CUBIC FOOT OF    *
C*            WOOD RAW MATERIAL                                          *
C*                                                                       *
C*    CFRW....(OUTPUT) CUBIC FEET OF WOOD RAW MATERIAL REQUIRED PER      *
C*            CUBIC FOOT OF CUT PANEL PRODUCT                            *
C*                                                                       *
C*    CKWH....(INPUT+OUTPUT) COST OF ELECTRICITY PER KILOWATT-HOUR       *
C*                                                                       *
C*    COST....(OUTPUT) THE COST OF FUEL PER MILLION AVERAGE EFFECTIVE     *
C*            B.T.U.                                                     *
C*                                                                       *
C*    CORM....(INPUT) F.O.B.-MILL MARKET VALUE OF THE RESIDUE MIX        *
C*            PER POUND OF RESIDUES                                      *
C*                                                                       *
C*    CORR....(INTERNAL) WEIGHT OF RESINS REQUIRED BY PROCESS FOR        *
C*            CORE FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)  *
C*                                                                       *
C*    CORW....(INTERNAL) WEIGHT OF WAX REQUIRED BY PROCESS FOR CORE      *
C*            FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)       *
C*                                                                       *
C*    CRES....(INPUT+OUTPUT) THE COST OF RESIN PER POUND OF RESIN        *
C*                                                                       *
C*    CWAX....(INPUT+OUTPUT) THE COST OF WAX PER POUND OF WAX            *
C*                                                                       *
C*    DHL.....(SUB1) DRY GAS HEAT LOSS PERCENT OF AVAILABLE HEAT         *
C*                                                                       *
C*    DMCT....(SUB1) DRY BASIS MOISTURE CONTENT OF WOOD OR BARK FUEL     *
C*                                                                       *
C*    DRYH....(OUTPUT) FUEL VALUE REQUIRED BY DRYER IN MILLION           *
C*            EFFECTIVE B.T.U. PER CUBIC FOOT OF CUT PANEL PRODUCT       *
C*                                                                       *
C*    EBDF....(INTERNAL) MILLION EFFECTIVE B.T.U.'S PER POUND OF         *
C*            PROCESS DRY WOOD RESIDUE FUEL                              *
C*                                                                       *
C*    EBTB....(INTERNAL) THE EFFECTIVE B.T.U.'S PER POUND OF BARK FUEL   *
C*                                                                       *
C*    EBTC....(INTERNAL) MILLION EFFECTIVE B.T.U. PER TON OF COAL        *
C*                                                                       *
C*    EBTG....(INTERNAL) MILLION EFFECTIVE B.T.U. PER MCF OF NAT. GAS    *
C*                                                                       *
C*    EBTO....(INTERNAL) MILLION EFFECTIVE B.T.U. PER BARREL OF OIL      *
C*                                                                       *
C*    EBTW....(INTERNAL) MILLION EFFECTIVE B.T.U. PER TON OF EXTERNAL    *
C*            (NON-PROCESS RESIDUE) WOOD FUEL                            *
C*                                                                       *
C*    EBWR....(INTERNAL) MILLION EFFECTIVE B.T.U.'S PER POUND OF         *
C*            PROCESS WET WOOD RESIDUE FUEL                              *
C*                                                                       *
C*    EFF.....(SUB1) EFFICIENCY PERCENT OF AVAILABLE HEAT                *
C*                                                                       *
C*    FACR....(INTERNAL) WEIGHT OF RESINS REQUIRED BY PROCESS FOR        *
C*            FACE FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)  *
C*                                                                       *
C*    FACT....(INTERNAL) NUMBER OF POUNDS PER BONE-DRY-UNIT              *
C*                                                                       *
C*    FACW....(INTERNAL) WEIGHT OF WAX REQUIRED BY PROCESS FOR FACE      *
C*            FURNISH PER CU. FT. OF CUT PANEL PRODUCT (IN POUNDS)       *
C*                                                                       *
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C*   FPMC....(INPUT+OUTPUT) MOISTURE CONTENT OF THE WOOD IN THE          *
C*           FINISHED PRODUCT (PERCENT O.D. BASIS)                       *
C*                                                                       *
C*   FPSZ....(INTERNAL) FINISHED PANEL SIZE IN SQUARE INCHES             *
C*                                                                       *
C*   FRON....(OUTPUT) NET FUEL VALUE REQUIRED IN MILLION EFFECTIVE       *
C*           B.T.U. PER CU. FT. OF CUT PANEL PRODUCT                     *
C*                                                                       *
C*   FUEL....(OUTPUT) THE UNITS OF EXTERNAL NON-RESIDUE FUEL (BARRELS,   *
C*           TONS, OR MCF) REQUIRED PER CUBIC FOOT OF CUT PANEL          *
C*           PRODUCT                                                     *
C*                                                                       *
C*   GB*.....(OUTPUT) GROSS BOARD WEIGHT OF PANELS PER CUBIC FOOT        *
C*           OF PANEL (IN POUNDS)                                        *
C*                                                                       *
C*   GMCT....(SUB1) GREEN BASIS MOISTURE CONTENT OF WOOD OR BARK FUEL    *
C*                                                                       *
C*   GRFF....(INTERNAL) POUNDS OF PROCESS WOOD FUEL FINES AND TRIMS      *
C*           GENERATED PER CU. FT. OF CUT PANEL PRODUCT                  *
C*                                                                       *
C*   GRMC....(INPUT. MOISTURE CONTENT OF WOOD FURNISH RAW MATERIAL       *
C*           BEFORE ENTERING PROCESS (% O.D.)                            *
C*                                                                       *
C*   GRWD....( OUTPUT) POUNDS OF GREEN WOOD RAW MATERIAL REQUIRED        *
C*           PER CU. FT. OF CUT PANEL PRODUCT                            *
C*                                                                       *
C*   GRWF....(INTERNAL) POUNDS OF PROCESS WOOD FUEL FINES AND TRIMS      *
C*           AVAILABLE (AFTER DEDUCTION OF THE NON-RENEWABLE LOSS)       *
C*           PER CUBIC FOOT OF CUT PANEL PRODUCT                         *
C*                                                                       *
C*   GWOD....(OUTPUT) POUNDS OF OVEN DRY WOOD REQUIRED PER CUBIC         *
C*           FOOT OF CUT PANEL PRODUCT                                   *
C*                                                                       *
C*   GWOO....(INTERNAL) GROSS OVEN DRY WEIGHT OF PARTICLEBOARD           *
C*           OUTPUT PER CUBIC FOOT OF CUT PANEL PRODUCT (IN POUNDS)      *
C*                                                                       *
C*   GWTF....(INTERNAL) GROSS POUNDS OF FURNISH (WOOD PLUS ANY           *
C*           RECYCLED TRIMS) PER CUBIC FOOT CUT PANEL PRODUCT            *
C*                                                                       *
C*   HHL.....(SUB1) HYDROGEN HEAT LOSS PERCENT OF AVAILABLE HEAT         *
C*                                                                       *
C*   HHTV....(SUB1) THE HIGHER HEATING VALUE OF A WOOD OR BARK FUEL      *
C*           IN B.T.U.S PER POUND                                        *
C*                                                                       *
C*   IFOP....(INTERNAL) INTEGER OPTION VARIABLE SPECIFYING THE TYPE OF   *
C*           FUEL BEING USED; OIL, COAL, NAT. GAS OR WOOD                *
C*                                                                       *
C*   IOP1....(INPUT) AN OPTION VARIABLE TO SPECIFY THE KIND OF           *
C*           OUTPUT TO BE DELIVERED IN COLUMN TWO OF THE PRINTOUT        *
C*                                                                       *
C*   IOP2....(INPUT) AN OPTION VARIABLE TO SPECIFY THE KIND OF           *
C*           OUTPUT TO BE DELIVERED IN COLUMN THREE OF THE PRINTOUT      *
C*                                                                       *
C*   ITOP....(INPUT) AN OPTION VARIABLE TO SPECIFY WHETHER OR NOT        *
C*           TRIMS WILL BE RECYCLED AS FURNISH (0=RECYCLED, 1=TRIMS      *
C*           USED AS FUEL)                                               *
C*                                                                       *
C*   NAXF....(INTERNAL) AN OPTION VARIABLE TO CONTROL THE TYPE OF        *
C*           AUXILIARY FUEL BEING USED (1 FOR OIL, 2 FOR NATURAL GAS)    *
C*                                                                       *
C*   NCOP....(INPUT) AN OPTION VARIABLE TO CONTROL THE NUMBER OF         *
C*           COPIES OF PRINTED OUTPUT (1 TO 10)                          *
C*                                                                       *
C*   NOPT....(INPUT) AN OPTION VARIABLE TO CONTROL THE WIDTH OF          *
C*           THE PRINTED OUTPUT (3 OR 5 COLUMS OF DATA)                  *
C*                                                                       *
C*   ODMC....(INPUT) MOISTURE CONTENT OF THE WOOD COMING OUT OF THE      *
C*           DRYER (% O.D.)                                              *
C*                                                                       *
C*   ODWP....(INPUT+OUTPUT) THE OVEN DRY WEIGHT OF THE PRESSED PANELS    *
C*           PER CUBIC FOOT OF PANEL (IN POUNDS)                         *
C*                                                                       *
C*   ODWW....(OUTPUT) THE OVEN DRY WEIGHT OF WOOD AFTER PRESSING         *
C*           IN A CUBIC FOOT OF PRESSED PANEL (IN POUNDS)                *
C*                                                                       *
C*   P.......(INTERNAL) PRICE OF FUEL PER EFFECTIVE B.T.U.               *
C*                                                                       *
C*   PCCF....(INPUT) PERCENT OF THE PRODUCT THAT IS CORE FURNISH         *
C*                                                                       *
C*   PCFF....(INPUT) PERCENT OF THE PRODUCT THAT IS FACE FURNISH         *
```

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C*                                                                      *
C*   PCOL....(INPUT) PRICE OF COAL IN DOLLARS PER TON                   *
C*                                                                      *
C*   PCON....(OUTPUT) THE PROFIT CONTRIBUTION AS THE NET SALES VALUE    *
C*           MINUS THE VARIABLE COSTS OF PRODUCTION PER CUBIC FOOT      *
C*           OF CUT PANEL PRODUCT                                       *
C*                                                                      *
C*   PCRA....(OUTPUT) THE PROFIT CONTRIBUTION RATIO (RATIO OF THE       *
C*           PROFIT CONTRIBUTION TO NET SALES VALUE)                    *
C*                                                                      *
C*   PCTB....(INPUT*OUTPUT) VOLUME RATIO OF BARK TO WOOD IN THE         *
C*           ROUNDWOOD RAW MATERIAL EXPRESSED AS A DECIMAL              *
C*                                                                      *
C*   PCTF....(INPUT*OUTPUT) THE RECOVERABLE PERCENT FINES-LOSS IN       *
C*           CUTTING AND CHIPPING OF RAW WOOD (PERCENT OF RAW WOOD)     *
C*                                                                      *
C*   PCTR....(SUB1) PERCENT EXCESS AIR IN RESIDUE FUEL COMBUSTION       *
C*           (ASSIGNED A VALUE OF 40% BY THE PROGRAM)                   *
C*                                                                      *
C*   PCTT....(OUTPUT) PERCENT OF PARTICLEBOARD OUTPUT THAT IS CUT       *
C*           AWAY AS TRIMS                                              *
C*                                                                      *
C*   PERM....(INTERNAL) A PERCENT OF THE FINES GENERATED THAT IS        *
C*           PERMANENTLY LOST (NON-RECOVERABLE LOSS-NOT TO BE           *
C*           CONFUSED WITH 'PCTF')                                      *
C*                                                                      *
C*   PF......(INTERNAL) COST OF EXTERNAL PURCHASED FUEL, EXCLUDING      *
C*           AUXILIARY FUEL PER CU. FT. CUT PANELS                      *
C*                                                                      *
C*   PGAS....(INPUT) PRICE OF NATURAL GAS IN DOLLARS PER MCF            *
C*                                                                      *
C*   POIL....(INPUT) PRICE OF OIL IN DOLLARS PER BARREL                 *
C*                                                                      *
C*   PPLG....(INPUT) THE LENGTH OF THE CUT PANEL PRODUCT IN INCHES      *
C*                                                                      *
C*   PPWD....(INPUT) THE WIDTH OF THE CUT PANEL PRODUCT IN INCHES       *
C*                                                                      *
C*   PR......(OUTPUT) THE PERCENT OF THE OVEN DRY PANEL PRODUCT THAT    *
C*           IS RESIN, BY WEIGHT                                        *
C*                                                                      *
C*   PRRC....(INPUT) THE REQUIRED RESIN WEIGHT PERCENT OF CORE FURNISH  *
C*                                                                      *
C*   PRRF....(INPUT) THE REQUIRED RESIN WEIGHT PERCENT OF FACE FURNISH  *
C*                                                                      *
C*   PTLG....(INPUT) THE WIDTH IN INCHES OF THE STRIP OF TRIMS CUT      *
C*           AWAY ALONG THE PANEL LENGTH (AVERAGE FIGURE)               *
C*                                                                      *
C*   PTWD....(INPUT) THE WIDTH IN INCHES OF THE STRIP OF TRIMS CUT      *
C*           AWAY ALONG THE PANEL WIDTH (AVERAGE FIGURE)                *
C*                                                                      *
C*   PW......(OUTPUT) THE PERCENT OF THE OVEN DRY PANEL PRODUCT THAT    *
C*           IS WAX, BY WEIGHT                                          *
C*                                                                      *
C*   PWOD....(INPUT) PRICE OF EXTERNAL WOOD FUEL IN DOLLARS PER TON     *
C*                                                                      *
C*   PWRC....(INPUT) THE REQUIRED WAX PERCENT OF CORE FURNISH           *
C*                                                                      *
C*   PWRF....(INPUT) THE REQUIRED WAX PERCENT OF FACE FURNISH           *
C*                                                                      *
C*   PWSR....(INPUT) THE PERCENT OF GREEN WOOD RAW MATERIAL WHICH IS    *
C*           LOST AS SCREENED WET RESIDUES IN THE PROCESS FROM THE      *
C*           DEBARKER TO THE DRYER BUT WHICH MAY BE RECOVERED AS        *
C*           'WET SCREENED' WOOD FUEL                                   *
C*                                                                      *
C*   RDWC....(OUTPUT) THE COST OF WOOD RAW MATERIAL PER CUBIC FOOT      *
C*           OF CUT PANEL PRODUCT                                       *
C*                                                                      *
C*   RESR....(OUTPUT) MARKET VALUE OR REALIZATION FOR EXCESS RESIDUES   *
C*           (ASSUMES EXCESS RESIDUES ARE MARKETED IN A MIX WITH        *
C*           AMOUNTS OF EACH RESIDUE TYPE PROPORTIONAL TO AMOUNTS       *
C*           PRODUCED) PER CU. FT. CUT PANEL PRODUCT                    *
C*                                                                      *
C*   RESV....(OUTPUT) MARKET VALUE OF RESIDUE MIX PER BONE-DRY-UNIT     *
C*           (2400 POUNDS)                                              *
C*                                                                      *
C*   RKWH....(INPUT*OUTPUT) THE REQUIRED KILOWATT-HOURS OF ELECTRICITY  *
C*           PER CUBIC FOOT OF CUT PANEL PRODUCT                        *
C*                                                                      *
C*   SALE....(INPUT*OUTPUT) THE NET SALES VALUE OF THE CUT PANEL        *
C*           PRODUCT PER CUBIC FOOT                                     *
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C*                                                                      *
C*   SGBK....(INPUT) THE OVEN DRY SPECIFIC GRAVITY OF THE BARK          *
C*                                                                      *
C*   SGRW....(INPUT+OUTPUT) THE OVEN DRY SPECIFIC GRAVITY OF THE WOOD   *
C*           RAW MATERIAL                                               *
C*                                                                      *
C*   SHL.....(SUB1) SENSIBLE HEAT LOSS (HEAT LOSS DUE TO MOISTURE)      *
C*           PERCENT OF AVAILABLE HEAT                                  *
C*                                                                      *
C*   T1......(SUB1) TEMPERATURE OF RESIDUE FUELS AND FURNACE AIR        *
C*           BEFORE COMBUSTION IN DEGREES FAHRENHEIT                    *
C*                                                                      *
C*   T2......(SUB1) STACK GAS TEMPERATURE FOR COMBUSTION OF RESIDUE     *
C*           FUELS IN DEGREES FAHRENHEIT                                *
C*                                                                      *
C*   TBTG....(OUTPUT) TOTAL FUEL VALUE GENERATED, MILLION EFFECTIVE     *
C*           B.T.U. PER CUBIC FOOT OF CUT PANEL PRODUCT                 *
C*                                                                      *
C*   TBTR....(OUTPUT) TOTAL FUEL VALUE REQUIRED BY DRYER AND PROCESS    *
C*           STEAM, MILLION B.T.U. PER CUBIC FOOT OF CUT PANEL PRODUCT  *
C*                                                                      *
C*   TCDH....(OUTPUT) THE DRYER HEAT PORTION OF HEAT ENERGY COST        *
C*           PER CUBIC FOOT OF CUT PANEL PRODUCT                        *
C*                                                                      *
C*   TCFR....(INTERNAL) THE TOTAL COST OF FUEL PER CUBIC FOOT OF CUT    *
C*           PANEL PRODUCT (INCLUDES COST OF AUXILIARY FUEL)            *
C*                                                                      *
C*   TCHP....(OUTPUT) THE TOTAL COST FOR ELECTRIC POWER PER CUBIC       *
C*           FOOT OF CUT PANEL PRODUCT                                  *
C*                                                                      *
C*   TCPS....(OUTPUT) THE PROCESS STEAM SHARE OF TOTAL HEAT ENERGY      *
C*           COST PER CUBIC FOOT OF CUT PANEL PRODUCT                   *
C*                                                                      *
C*   TCRE....(OUTPUT) TOTAL COST OF RESIN PER CUBIC FOOT OF CUT         *
C*           PANEL PRODUCT                                              *
C*                                                                      *
C*   TCWX....(OUTPUT) TOTAL COST OF WAX PER CUBIC FOOT OF CUT PANEL     *
C*           PRODUCT                                                    *
C*                                                                      *
C*   THL.....(SUB1) TOTAL HEAT LOSS PERCENT OF AVAILABLE HEAT           *
C*                                                                      *
C*   TITL....(INPUT+OUTPUT) AN ALPHANUMERIC ARRAY FOR THE PRINTED       *
C*           OUTPUT TITLE WHICH MAY BE SPECIFIED IN THE DATA DECK       *
C*                                                                      *
C*   TWWT....(INTERNAL) POUNDS OF TRIMS GENERATED PER CUBIC FOOT OF     *
C*           CUT PANEL PRODUCT                                          *
C*                                                                      *
C*   TWVC....(OUTPUT) THE GROSS VARIABLE COST OF ENERGY AND RAW         *
C*           MATERIALS FOR THE PRODUCTION PROCESS PER CUBIC FOOT OF     *
C*           CUT PANEL PRODUCT                                          *
C*                                                                      *
C*   TRES....(OUTPUT) TOTAL WEIGHT OF RESIN REQUIRED IN POUNDS PER      *
C*           CUBIC FOOT OF CUT PANEL PRODUCT                            *
C*                                                                      *
C*   TRMS....(INTERNAL) SQUARE INCHES OF TRIM LOSS PER PANEL            *
C*                                                                      *
C*   TWAX....(OUTPUT) TOTAL WEIGHT OF WAX REQUIRED IN POUNDS PER        *
C*           CUBIC FOOT OF CUT PANEL PRODUCT                            *
C*                                                                      *
C*   V(I,J)..(OUTPUT) TWO DIMENSIONAL ARRAY FOR STORAGE OF OUTPUT       *
C*           VARIABLES AND CONVERSION TO MSF AND CUBIC METER BASIS      *
C*           BASIS                                                      *
C*                                                                      *
C*   WBMC....(INPUT) THE MOISTURE CONTENT OF THE BARK (PERCENT          *
C*           OVEN DRY BASIS)                                            *
C*                                                                      *
C*   WOR.....(OUTPUT) WEIGHT OF RESINS IN THE PANELS (IN POUNDS         *
C*           PER CUBIC FOOT OF PRESSED PANEL)                           *
C*                                                                      *
C*   WOW.....(OUTPUT) WEIGHT OF WATER IN THE PANELS (IN POUNDS PER      *
C*           CUBIC FOOT OF PRESSED PANEL)                               *
C*                                                                      *
C*   WTWD....(SUB1) WEIGHT OF DRY FUEL PER POUND OF GREEN OR WET        *
C*           WOOD OR BARK FUEL                                          *
C*                                                                      *
C*   WTWR....(INTERNAL) POUNDS OF WET WOOD RESIDUES GENERATED PER       *
C*           CUBIC FOOT CUT PANEL PRODUCT                               *
C*                                                                      *
C*   WWX.....(OUTPUT) WEIGHT OF WAX IN THE PANELS (IN POUNDS PER        *
C*           CUBIC FOOT OF PRESSED PANEL)                               *
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      DIMENSION V(5,40),TITL(60),P(4)                                    PB     1
      READ(5,1) CCUF,SGRW,GRMC,PCTB,WBMC,SGSK,CRES,PWRF,PRRC,CWAX,PWRF,  PB     2
     1PWRC,ODMC,PCTF,PCFF,PCCF,ODWP,FPMC,PTLG,PTWD,PWSR,CORM,CKWM,BTUF,  PB
     2BTUR,BTRD,BTRP,HTRT,BTRM,BTRM,RKWM,PPWD,PPLG,SALE,PGAS,POIL,PWOD,  PB
     3PCOL,BTUG,BTUO,BTUW,BTUC,ITOP,IOP1,IOP2,NOPT,NCOP,(TITL(I),I=1,60)  PB     5
    1 FORMAT(6(7(F10.),),4I1,I2/(20A4))                                  PB     6
      V(1,1)=SALE                                                        PB     7
      V(1,13)=ODWP                                                       PB     8
      V(1,34)=RKWM                                                       PB     9
C *** WATER WT. IN CU. FT. PRESSED PANEL (M.C. BASED ON O.D. WT.)         PB    10
      WOW=ODWP*FPMC                                                      PB    11
      V(1,12)=WOW                                                        PB    12
C *** RESIN WT. IN CU. FT. PRESSED PANEL-EXCLUDING RECYCLED TRIMS RESIN   PB    13
      WOR=ODWP*((PCFF*PRRF)+(PCCF*PRRC))                                 PB    14
      V(1,14)=WOR                                                        PB    15
C *** WAX WT. IN CU. FT. PRESSED PANEL-EXCLUDING RECYCLED TRIMS WAX       PB    16
      WWX=ODWP*((PCFF*PWRF)+(PCCF*PWRC))                                 PB    17
      V(1,15)=WWX                                                        PB    18
C *** O.D. WT. OF WOOD (OR 'FURNISH' IF TRIMS RECYCLED) IN CU. FT. PANEL PB    19
      COWW=ODWP-WOR-WWX                                                  PB    20
      V(1,17)=ODWW                                                       PB    21
C *** WT. OF PANELS INCLUDING MOISTURE/CU. FT.                           PB    22
      GBW=ODWP+WOW                                                       PB    23
      V(1,11)=GBW                                                        PB    24
C *** RESIN WEIGHT PERCENT OF FURNISH,WAX AND RESIN IN O.D. PANEL         PB    25
      PR=WOR/ODWP                                                        PB    26
C *** WAX WEIGHT PERCENT OF FURNISH,WAX AND RESIN IN O.D. PANEL           PB    27
      PW=WWX/ODWP                                                        PB    28
C *** SQUARE INCH OF TRIM LOSS PER PANEL                                 PB    29
      TRMS=((PTLG*PPLG)+(PTWD*(PPWD+(2.0*PTLG))))*2.0                    PB    30
C *** FINISHED PANEL SIZE IN SQ. IN.                                     PB    31
      FPSZ=PPLG*PPWD                                                     PB    32
C *** PERCENT OF GROSS OUTPUT THAT IS TRIMS                              PB    33
      PCTT=TRMS/(FPSZ+TRMS)                                              PB    34
C *** O.D. WT. OF GROSS OUTPUT PER CU. FT. TRIMMED FINISHED PANELS       PB    35
      GWOO=ODWP*(1.0/(1.0-PCTT))                                         PB    36
C *** WEIGHT OF FACE RESINS REQUIRED PER CU. FT. CUT PANELS              PB    37
      FACR=GWOO*PWRF*PCFF                                                PB    38
C *** WEIGHT OF CORE RESINS REQUIRED PER CU. FT. OF CUT PANELS           PB    39
      CORR=GWOO*PWRC*PCCF                                                PB    40
C *** WEIGHT OF FACE WAX REQUIRED PER CU. FT. OF CUT PANEL PRODUCT       PB    41
      FACW=GWOO*PWWF*PCFF                                                PB    42
C *** WEIGHT OF CORE WAX REQUIRED PER CU. FT. OF CUT PANEL PRODUCT       PB    43
      CORW=GWOO*PWRC*PCCF                                                PB    44
C *** TOTAL WT. OF RESIN REQUIRED/CU. FT. CUT PANELS                     PB    45
      TRES=FACR+CORR                                                     PB    46
      V(1,21)=TRES                                                       PB    47
C *** TOTAL WT. OF WAX REQUIRED/CU. FT. CUT PANELS                       PB    48
      TWAX=FACW+CORW                                                     PB    49
      V(1,22)=TWAX                                                       PB    50
C *** TOTAL COST OF RESIN/CU. FT. CUT PANELS                             PB    51
      TCRE=TRES*CRES                                                     PB    52
      V(1,3)=TCRE                                                        PB    53
C *** TOTAL COST OF WAX/CU. FT. CUT PANELS                               PB    54
      TCWX=TWAX*CWAX                                                     PB    55
      V(1,4)=TCWX                                                        PB    56
C *** GROSS LBS. OF FURNISH NEEDED/CU. FT. CUT PANEL                     PB    57
      GWTF=(GWOO-(TWAX+TRES))                                            PB    58
C *** GROSS O.D. LBS. OF WOOD NEEDED IF TRIMS ARE NOT RECYCLED           PB    59
      IF(ITOP .EQ. 1) GWOD=(GWTF*(1.0/(1.0-PCTF)))*(1.0/(1.0-PWSR))      PB    60
C *** LBS. OF TRIMS GENERATED/CU. FT. CUT PANELS                         PB    61
      TMWT=GWOO*PCTT                                                     PB    62
C *** GROSS O.D. LBS. OF WOOD NEEDED IF TRIMS ARE RECYCLED               PB    63
      IF(ITOP .EQ. 0) GWOD=(GWTF-(0.5*TMWT))*(1.0/(1.0-PCTF))*(1.0/(1.0-PB    64
     1PWSR))                                                             PB    65
      V(1,18)=GWOD                                                       PB    66
C *** GROSS LBS. OF GREEN WOOD NEEDED/CU. FT. CUT PANELS                 PB    67
      GRWD=GWOD*(1.0+GRMC)                                               PB    68
      V(1,19)=GRWD                                                       PB    69
C *** CU. FT. OF ROUNDWOOD NEEDED/CU. FT. CUT PANELS                     PB    70
      CFRW=GWOD*(1.0/(62.4*SGRW))                                        PB    71
      V(1,20)=CFRW                                                       PB    72
C *** LBS. OF GENERATED DRY FUEL FINES AND TRIMS/CU. FT. CUT PANELS      PB    73
      IF(ITOP .EQ. 0) GRFF=((GWTF-(0.5*TMWT))*(1.0/(1.0-PCTF)))-(GWTF-(0PB    74
     1.5*TMWT))+0.5*TMWT                                                 PB    75
      IF(ITOP .EQ. 1) GRFF=(GWTF*(1.0/(1.0-PCTF))-GWTF)+TMWT             PB    76
C *** PERM=THE NON-RENEWABLE FINES LOSS PERCENT (PERMANENTLY LOST)       PB    77
      PERM=0.03                                                          PB    78
C *** LBS OF GENERATED DRY WOOD FUELS MINUS THE NON-RENEWABLE LOSS       PB    79
      GRWF=GRFF-(GRFF*PERM)                                              PB    80
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C *** B.T.U. VALUE OF DRIED WOOD FUELS/CU. FT. CUT PANELS                PB    81
      CALL SUB1(BTUF,ODMC,EBDF)                                         PB    82
      BTVF=GRWF*(1.0+ODMC)*EBDF                                         PB    83
      V(1,29)=BTVF                                                      PB    84
C *** POUNDS OF WET SCREENED WOOD RESIDUE FUEL (FROM DEBARKER)           PB    85
      WTWR=GRWD*PWSR                                                    PB    86
C *** B.T.U. VALUE OF WET SCREENED WOOD RESIDUE/CU. FT. CUT PANEL        PB    87
      CALL SUB1(BTUF,GRMC,EHWR)                                         PB    88
      BTWR=WTWR*EHWR                                                    PB    89
C *** TOTAL B.T.U.VALUE OF GENERATED WOOD FUELS                          PB    90
      BTFR=BTVF+BTWR                                                    PB    91
C *** B.T.U. VALUE OF BARK/CU. FT. CUT PANELS                           PB    92
      CALL SUB1(BTUR,WBMC,EBTB)                                         PB    93
      BTBK=PCTH*(SGBK/SGRW)*GRWD*EBTB                                   PB    94
      V(1,30)=BTBK                                                      PB    95
C *** TOTAL FUEL VALUE GENERATED/CU. FT. CUT PANELS                     PB    96
      TBTG=BTFR+BTBK                                                    PB    97
C *** WEIGHTED AVERAGE EFFECTIVE B.T.U. PER POUND OF RESIDUE MIX        PB    98
      ABTR=TBTG/(GRWF+WTWR+PCTB*GRWD*(SGBK/SGRW))                       PB    99
      V(1,31)=TBTG                                                      PB   100
C *** FUEL VALUE REQUIRED BY DRYER/CU. FT. CUT PANELS                   PB   101
      DRYH=(G*OD*GRMC-GWOD*ODMC)*BTUD                                   PB   102
      V(1,23)=DRYH                                                      PB   103
C *** TOTAL FUEL VALUE REQUIRED, DRYER AND PROC. STEAM/CU. FT. PANELS    PB   104
      TBTR=DRYH+BTRP+BTRT+ATRH+BTRM                                     PB   105
      V(1,28)=TBTR                                                      PB   106
C *** AUXF IS THE AVG. PERCENT OF GENERATED B.T.U.'S THAT MUST COME      PB   107
C *** FROM AUXILIARY OIL FUEL FOR B.T.U.'S GENERATED WITH WOOD FUELS     PB   108
      AUXF=0.15                                                         PB   109
C *** NET EXTERNAL FUEL B.T.U. REQUIRED/CU. FT. CUT PANEL               PB   110
      FRQN=TBTR-(TBTG*(1.0/(1.0-AUXF)))                                 PB   111
      IF (FRQN .LE. 0.0) FRQN=0.0                                       PB   112
      V(1,32)=FRQN                                                      PB   113
      TCFR=0.0                                                          PB   114
      TCPS=0.0                                                          PB   115
      TCDM=0.0                                                          PB   116
      FUEL=0.0                                                          PB   117
      IF(FRQN .LE. 0.0) IFOP=4                                          PB   118
      PF=0.0                                                            PB   119
      CALL SUB2(BTUO,EBTO,0)                                            PB   120
      CALL SUB2(BTUC,EBTC,1)                                            PB   121
      CALL SUB2(BTUG,EBTG,2)                                            PB   122
      CALL SUB2(BTUW,EBTW,3)                                            PB   123
      P(1)=POIL*(EBTO**-1.0)                                            PB   124
      P(2)=PCOL*(EBTC**-1.0)                                            PB   125
      P(3)=PGAS*(EBTG**-1.0)                                            PB   126
      P(4)=PWOD*(1.0-AUXF)*(EBTW**-1.0)+(POIL*AUXF*(EBTO**-1.0))        PB   127
C *** FIND THE CHEAPEST AUXILIARY FUEL (OIL OR NAT. GAS)                PB   128
      IF(P(1) .LT. P(3)) NAXF=1                                         PB   129
      IF(P(3) .LT. P(1)) NAXF=3                                         PB   130
      IF(IFOP .EQ. 4) GO TO 40                                          PB   131
C *** FIND THE CHEAPEST EXTERNAL FUEL; OIL, COAL, GAS, OR WOOD PER BTU  PB   132
      IFOP=0                                                            PB   133
      K=IFOP+1                                                          PB   134
      DO 10 I=2,4                                                       PB   135
      IF(P(I) .LT. P(K)) K=I                                            PB   136
   10 CONTINUE                                                          PB   137
      IFOP=(K-1)                                                        PB   138
C *** TOTAL COST OF EXTERNAL FUEL PER CU. FT. CUT PANEL                 PB   139
      PF=P(K)*FRQN                                                      PB   140
C *** CALCULATE UNITS OF EXTERNAL FUEL REQUIRED, BBL. OIL, MCF. NAT.    PB   141
C *** GAS, TONS COAL OR TONS WOOD (EXCLUDING AUXILIARY OIL)             PB   142
      IF(IFOP .EQ. 0) FUEL=FRQN*(EBTO**-1.0)                            PB   143
      IF(IFOP .EQ. 1) FUEL=FRQN*(EBTC**-1.0)                            PB   144
      IF(IFOP .EQ. 2) FUEL=FRQN*(EBTG**-1.0)                            PB   145
      IF(IFOP .EQ. 3) FUEL=(FRQN-(AUXF*FRQN))*(EBTW**-1.0)              PB   146
C *** WEIGHTED AVERAGE COST PER MILLION EFFECTIVE B.T.U. OF FUEL         PB   147
      IF(IFOP .EQ. 0) COST=P(1)*((FRQN/TBTR)+((TBTR-FRQN)/TBTR)*AUXF)   PB   148
      IF(IFOP .EQ. 1) COST=P(2)*((FRQN/TBTR)+((TBTR-FRQN)/TBTR)*AUXF)   PB   149
      IF(IFOP .EQ. 2) COST=P(3)*((FRQN/TBTR)+((TBTR-FRQN)/TBTR)*AUXF)   PB   150
      IF(IFOP .EQ. 3) COST=P(4)*FRQN/TBTR+P(1)*(((TBTR-FRQN)/TBTR)*AUXF PB   151
      RESR=0.0                                                          PB   152
   40 CONTINUE                                                          PB   153
      V(1,33)=FUEL                                                      PB   154
C *** CALCULATE AUXILIARY FUEL NEEDED (AUXI) PER CU. FT. CUT PANEL      PB   155
C *** UNITS OF AUXILIARY FUEL REQUIRED TO BURN RESIDUES                 PB   156
      IF(NAXF .EQ. 1) AUXI=(AUXF/(1.0-AUXF))*TBTG*(EBTO**-1.0)          PB   157
      IF(NAXF .EQ. 3) AUXI=(AUXF/(1.0-AUXF))*TBTG*(EBTG**-1.0)          PB   158
C *** AUXILIARY FUEL REQUIRED IF ONLY WOOD FUEL (INCL. RESIDUES) IS USEDPB   159
      IF(IFOP .GE. 3 .AND. NAXF .EQ. 1) AUXI=AUXF*TBTR*(EBTO**-1.0)     PB   160
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      IF(IFOP .GE. 3 .AND. NAXF .EQ. 3) AUXI=AUXF*TBTR*(EBTG**-1.0)      PB  161
      V(1,35)=AUXI                                                       PB  162
C *** B.T.U.S SUPPLIED BY AUXILIARY FUEL PER CU. FT. CUT PANEL           PB  163
      IF(NAXF .EQ. 1) BAUX=AUXI*EBTO                                     PB  164
      IF(NAXF .EQ. 3) BAUX=AUXI*EBTG                                     PB  165
      V(1,37)=BAUX                                                       PB  166
C *** CALCULATE COST OF AUXILIARY FUEL PER CU. FT. CUT PANEL             PB  167
      IF(NAXF .EQ. 1) CAUX=AUXI*POIL                                     PB  168
      IF(NAXF .EQ. 3) CAUX=AUXI*PGAS                                     PB  169
C *** TOTAL COST OF PURCHASED FUEL PER CU. FT. CUT PANEL                 PB  170
      TCFR=CAUX+PF                                                       PB  171
      TCDM=(DRYM/TBTR)*TCFR                                              PB  172
      TCPS=TCFR-TCDM                                                     PB  173
      IF(IFOP .NE. 4) GO TO 50                                           PB  174
C *** RESIDUE REALIZATION IF EXCESS RESIDUES ARE AVAILABLE               PB  175
      RESR=(TBTR*(1.0-AUXF)-TBTG)*(ABTR**-1.0)*CORM                      PB  176
C *** WEIGHTED AVERAGE COST PER B.T.U.                                   PB  177
      IF(NAXF .EQ. 1) COBT=POIL*(EBTO**-1.0)*AUXF                        PB  178
      IF(NAXF .EQ. 3) COBT=PGAS*(EBTG**-1.0)*AUXF                        PB  179
   50 CONTINUE                                                           PB  180
C *** FACT=APPROX. POUNDS PER BONE DRY UNIT OF PROCESS RESIDUES          PB  181
      FACT=2400.0                                                        PB  182
C *** RESV=VALUE OF PROCESS RESIDUES/BDU                                 PB  183
      RESV=CORM*FACT                                                     PB  184
C *** COST OF ROUNDWOOD/CU. FT. CUT PANELS                               PB  185
      RDWC=CFRW*CCUF                                                     PB  186
      V(1,2)=RDWC                                                        PB  187
C *** COST OF ELECTRICITY                                                PB  188
      TCKW=RKWH*CKWH                                                     PB  189
C *** TOTAL NET VARIABLE COST/CU. FT. CUT PANELS                         PB  190
      TNVC=RDWC+TCRE+TCWX+TCKW+TCPS+RESR+TCDM                            PB  191
C *** PROFIT CONTRIBUTION AND RATIO TO SALES VALUE                       PB  192
      PCON=SALE-TNVC                                                     PB  193
      PCRA=PCON/SALE                                                     PB  194
      V(1,5)=TCKW                                                        PB  195
      V(1,6)=TCDM                                                        PB  196
      V(1,7)=TCPS                                                        PB  197
      V(1,8)=RESR                                                        PB  198
      V(1,9)=TNVC                                                        PB  199
      V(1,10)=PCON                                                       PB  200
      V(1,24)=BTRP                                                       PB  201
      V(1,25)=BTRT                                                       PB  202
      V(1,26)=BTRW                                                       PB  203
      V(1,27)=BTRM                                                       PB  204
      V(1,36)=BTWR                                                       PB  205
      IF(ITOP .EQ. 0) PCTT=0.5*PCTT                                      PB  206
C ***                                                                    PB  207
C *** ANALYSIS OF SENSITIVITY OF NET VARIABLE COST TO THE COST, ON AN     PB  208
C *** INPUT BASIS, OF ROUNDWOOD, RESIN, WAX, ELECTRIC POWER, AND FUEL     PB  209
C ***                                                                    PB  210
C *** SENSITIVITY TO ROUNDWOOD COST (ROUNDWOOD COST/CU. FT. = X )        PB  211
C *** TNVC = (CFRW)*(CCUF) + (TNVC - RDWC)    (Y=A*X+B)                  PB  212
      A1=CFRW                                                            PB  213
      B1=TNVC-RDWC                                                       PB  214
C *** SENSITIVITY TO RESIN COST (RESIN COST/LB. = X )                    PB  215
C *** TNVC = (TRES)*(CRES) + (TNVC - TCRE)    (Y=A*X+B)                  PB  216
      A2=TRES                                                            PB  217
      B2=TNVC-TCRE                                                       PB  218
C *** SENSITIVITY TO WAX COST (WAX COST/LB. = X )                        PB  219
C *** TNVC = (TWAX)*(CWAX) + (TNVC - TCWX)    (Y=A*X+B)                  PB  220
      A3=TWAX                                                            PB  221
      B3=TNVC-TCWX                                                       PB  222
C *** SENSITIVITY TO ELECTRIC POWER COST (COST/KWH = X )                 PB  223
C *** TNVC = (RKWH)*(CKWH) + (TNVC - TCKW)    (Y=A*X+B)                  PB  224
      A4=RKWH                                                            PB  225
      B4=TNVC-TCKW                                                       PB  226
C *** SENSITIVITY TO FUEL COST (PRICE OF FUEL/FUEL UNIT = X )            PB  227
      IF(IFOP .EQ. 0) B5=TNVC-FUEL*POIL                                  PB  228
      IF(IFOP .EQ. 1) B5=TNVC-FUEL*PCOL                                  PB  229
      IF(IFOP .EQ. 2) B5=TNVC-FUEL*PGAS                                  PB  230
      IF(IFOP .EQ. 3) B5=TNVC-FUEL*PWOD                                  PB  231
      A5=FUEL                                                            PB  232
      A6=AUXI                                                            PB  233
      B6=TNVC-CAUX                                                       PB  234
      IF(IFOP .EQ. 0 .OR. IFOP .EQ. 2) A5=A5+A6                          PB  235
      IF(IFOP .EQ. 0 .OR. IFOP .EQ. 2) B5=B5-CAUX                        PB  236
C ***                                                                    PB  237
C *** DETERMINE OUTPUT VARIABLES                                         PB  238
C ***                                                                    PB  239
      DO 60 M=1,37                                                       PB  240
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      IF (IOP1 .EQ. 0) V(2,M)=31.25*V(1,M)                                  PB   241
      IF (IOP1 .EQ. 1) V(2,M)=20.833333*V(1,M)                              PB   242
      IF (IOP1 .EQ. 2) V(2,M)=62.5*V(1,M)                                   PB   243
      IF (IOP1 .EQ. 3) V(2,M)=52.08333*V(1,M)                               PB   244
      IF (IOP1 .EQ. 4) V(2,M)=41.6667*V(1,M)                                PB   245
      IF (IOP2 .EQ. 0) V(3,M)=41.6667*V(1,M)                                PB   246
      IF (IOP2 .EQ. 1) V(3,M)=20.833333*V(1,M)                              PB   247
      IF (IOP2 .EQ. 2) V(3,M)=62.5*V(1,M)                                   PB   248
      IF (IOP2 .EQ. 3) V(3,M)=52.08333*V(1,M)                               PB   249
      IF (IOP2 .EQ. 4) V(3,M)=35.31*V(1,M)                                  PB   250
      IF (NOPT .EQ. 3) GO TO 60                                             PB   251
      V(4,M)=52.08333*V(1,M)                                                PB   252
      V(5,M)=35.31*V(1,M)                                                   PB   253
   60 CONTINUE                                                              PB   254
      IF (NOPT .NE. 3) J=5                                                  PB   255
      IF (NOPT .EQ. 3) J=3                                                  PB   256
      PR=100.0*PR                                                           PB   257
      PW=100.0*PW                                                           PB   258
      FPMC=100.0*FPMC                                                       PB   259
      PCRA=100.0*PCRA                                                       PB   260
      PCTF=100.0*PCTF                                                       PB   261
      PCTT=100.0*PCTT                                                       PB   262
      DO 998 K=1,10                                                         PB   263
      IF(K .GE. (NCOP+1)) GO TO 999                                         PB   264
      IF(NOPT .NE. 3) WRITE(6,70) (TITL(I),I=1,60)                          PB   265
   70 FORMAT('1',5(25X,20A4/)///)                                           PB   266
      IF(NOPT .EQ. 3) WRITE(6,80) (TITL(I),I=1,60)                          PB   267
   80 FORMAT('1',3(20A4/)///)                                               PB   268
      WRITE(6,90)                                                           PB   269
   90 FORMAT(' ',32X,'$/CU.FT.')                                            PB   270
      IF(IOP1 .EQ. 0) WRITE(6,100)                                          PB   271
  100 FORMAT('+',44X,'$/MSF 3/8 IN. BASIS')                                 PB   272
      IF(IOP1 .EQ. 1) WRITE(6,110)                                          PB   273
  110 FORMAT('+',44X,'$/MSF 1/4 IN. BASIS')                                 PB   274
      IF(IOP1 .EQ. 2) WRITE(6,120)                                          PB   275
  120 FORMAT('+',44X,'$/MSF 3/4 IN. BASIS')                                 PB   276
      IF(IOP1 .EQ. 3) WRITE(6,130)                                          PB   277
  130 FORMAT('+',44X,'$/MSF 5/8 IN. BASIS')                                 PB   278
      IF(IOP1 .EQ. 4) WRITE(6,140)                                          PB   279
  140 FORMAT('+',44X,'$/MSF 1/2 IN. BASIS')                                 PB   280
      IF(IOP2 .EQ. 0) WRITE(6,150)                                          PB   281
  150 FORMAT('+',66X,'1/2 IN. BASIS')                                       PB   282
      IF(IOP2 .EQ. 1) WRITE(6,160)                                          PB   283
  160 FORMAT('+',66X,'1/4 IN. BASIS')                                       PB   284
      IF(IOP2 .EQ. 2) WRITE(6,170)                                          PB   285
  170 FORMAT('+',66X,'3/4 IN. BASIS')                                       PB   286
      IF(IOP2 .EQ. 3) WRITE(6,180)                                          PB   287
  180 FORMAT('+',66X,'5/8 IN. BASIS')                                       PB   288
      IF(IOP2 .EQ. 4) WRITE(6,190)                                          PB   289
  190 FORMAT('+',66X,'$/CUBIC METER')                                       PB   290
      IF(NOPT .EQ. 0) WRITE(6,200) (V(I,1),I=1,5)                           PB   291
  200 FORMAT('+',84X,'5/8 IN. BASIS',5X,'$/CU.METER'/                       PB   292
     1' NET SALES VALUE',17X,'$',F7.4,7X,3('$',F9.3,8X),'$',F9.3/)          PB   293
      IF(NOPT .EQ. 3) WRITE(6,210) (V(I,1),I=1,3)                           PB   294
  210 FORMAT(' NET SALES VALUE',17X,'$',F7.4,7X,'$',F9.3,8X,'$',            PB   295
     1F9.3/)                                                                PB   296
      WRITE(6,220)                                                          PB   297
  220 FORMAT(' VARIABLE COSTS OF PRODUCTION')                               PB   298
      IF(NOPT .EQ. 0) WRITE(6,230) CCUF,                                    PB   299
     1(V(I,2),I=1,5),PR,CRES,(V(I,3),I=1,5)                                 PB  299A
     1,PW,CWAX,(V(I,4),I=1,5),CKWH,(V(I,5),I=1,5),COBT,(V(I,6),I=1,5),      PB   300
     2COBT,(V(I,7),I=1,5),RESV,(V(I,8),I=1,5),(V(I,9),I=1,5),               PB   301
     3(V(I,10),I=1,5),PCRA                                                  PB   302
      IF(NOPT .EQ. 3) WRITE(6,240) (V(I,2),I=1,3),PR,CRES,(V(I,3),I=1,3)PB  303
     1,PW,CWAX,(V(I,4),I=1,3),CKWH,(V(I,5),I=1,3),COBT,(V(I,6),I=1,3),      PB   304
     2COBT,(V(I,7),I=1,3),RESV,(V(I,8),I=1,3),(V(I,9),I=1,3),               PB   305
     3(V(I,10),I=1,3),PCRA                                                  PB   306
  230 FORMAT(' ',2X,'WOOD ($',F6.4,'/CU. FT.)',8X,'$',                      PB   307
     1F7.4,7X,3('$',F9.3,8X),'$',F9.3/                                      PB  307A
     13X,'RESIN (',F4.1,'%, $',F4.2,'/LB.)',7X,F7.4,8X,3(F9.3,9X),F9.3/     PB   308
     23X,'WAX (',F4.1,'%, $',F4.2,'/LB.)',9X,F7.4,8X,3(F9.3,9X),F9.3/       PB   309
     33X,'ELECTRIC POWER ($',F5.3,'/KWH)',4X,F7.4,8X,3(F9.3,9X),F9.3/       PB   310
     53X,'DRYER HEAT(FUEL=$',F5.3,'/MM BTU)',1X,F7.4,8X,3(F9.3,9X),F9.3/PB  311
     53X,'PROC.STEAM(FUEL=$',F5.3,'/MM BTU)',1X,F7.4,8X,3(F9.3,9X),F9.3/PB  312
     63X,'LESS RESIDUE VAL.($',F6.2,'/BDU)',1X,F7.4,8X,3(F9.3,9X),F9.3/     PB   313
     77X,'GROSS VARIABLE COST',7X,'$',F7.4,7X,3('$',F9.3,8X),'$',F9.3//      PB   314
     F' PROFIT CONTRIBUTION',13X,'$',F7.4,7X,3('$',F9.3,8X),'$',F9.3/        PB   315
     93X,'P. C. RATIO',20X,F4.1,'%',/)                                      PB   316
  240 FORMAT(' ',2X,'WOOD',26X,'$',F7.4,7X,'$',F9.3,8X,'$',F9.3/            PB   317
     13X,'RESIN (',F4.1,'%, $',F4.2,'/LB.)',7X,F7.4,8X,F9.3,9X,F9.3/        PB   318
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     23X,'WAX (',F4.1,'%, $',F4.2,'/LB.)',9X,F7.4,8X,F9.3,9X,F9.3/      PB   319
     33X,'ELECTRIC POWER ($',F5.3,'/KWH)',4X,F7.4,8X,F9.3,9X,F9.3/      PB   320
     53X,'PROC.STEAM(FUEL=$',F5.3,'/MM BTU)',1X,F7.4,8X,F9.3,9X,F9.3/   PB   321
     53X,'DRYER HEAT(FUEL=$',F5.3,'/MM BTU)',1X,F7.4,8X,F9.3,9X,F9.3/   PB   322
     63X,'LESS RESIDUE VAL.($',F6.2,'/BDU)',1X,F7.4,8X,F9.3,9X,F9.3/    PB   323
     77X,'GROSS VARIABLE COST',7X,'$',F7.4,7X,'$',F9.3,8X,'$',F9.3//     PB   324
     8' PROFIT CONTRIBUTION',13X,'$',F7.4,7X,'$',F9.3,8X,'$',F9.3/       PB   325
     93X,'P. C. RATIO'.20X,F4.1,'%',/)                                   PB   326
      WRITE(6,250)                                                       PB   327
250 FORMAT(' SENSITIVITY OF GROSS VARIABLE COST PER CU. FT. OF FINISHEPB   328
     1D PRODUCT OUTPUT'/)                                               PB   329
      WRITE(6,270) A1,B1,A2,B2,A3,B3,A4,B4                              PB   330
270 FORMAT(' ',8X,'VAR. COST/CU. FT. =',F7.4,' * (WOOD COST/CU. FT.) +PB   331
     1',F7.4/                                                           PB   332
     29X,'VAR. COST/CU. FT. =',F7.4,' * (RESIN COST/LB.) + ',F7.4/      PB   333
     39X,'VAR. COST/CU. FT. =',F7.4,' * (WAX COST/LB.) + ',F7.4/        PB   334
     49X,'VAR. COST/CU. FT. =',F7.4,' * (ELECTRICITY COST/KWH) + ',F7.4)PB   335
      IF(IFOP .EQ. 0) WRITE(6,271) A5,B5                                PB   336
      IF(IFOP .EQ. 1) WRITE(6,272) A5,B5                                PB   337
      IF(IFOP .EQ. 2) WRITE(6,273) A5,B5                                PB   338
      IF(IFOP .EQ. 3) WRITE(6,274) A5,B5                                PB   339
      IF(IFOP .EQ. 0 .OR. IFOP .EQ. 2) GO TO 275                        PB   340
      IF(NAXF .EQ. 1) WRITE (6,271) A6,B6                               PB   341
      IF(NAXF .EQ. 3) WRITE(6,273) A6,B6                                PB   342
275 CONTINUE                                                            PB   343
271 FORMAT(' ',8X,'VAR. COST/CU. FT. =',F7.4,' * (PRICE OF OIL/BBL.) +PB   344
     1 ',F7.4)                                                          PB   345
272 FORMAT(' ',8X,'VAR. COST/CU. FT. =',F7.4,' * (PRICE OF COAL/TON) +PB   346
     1 ',F7.4)                                                          PB   347
273 FORMAT(' ',8X,'VAR. COST/CU. FT. =',F7.4,' * (PRICE OF NAT. GAS/MCPB   348
     1F) + ',F7.4)                                                      PB   349
274 FORMAT(' ',8X,'VAR. COST/CU. FT. =',F7.4,' * (PRICE OF FUELWOOD/TOPB   350
     1N) + ',F7.4)                                                      PB   351
      WRITE(6,280)                                                      PB   352
280 FORMAT('0BOARD STATISTICS',13X,'LBS./CU.FT.')                       PB   353
      IF(IOP1 .EQ. 0) WRITE(6,290)                                      PB   354
290 FORMAT('+',43X,'LBS./MSF 3/8 IN.BASIS')                             PB   355
      IF(IOP1 .EQ. 1) WRITE(6,300)                                      PB   356
300 FORMAT('+',43X,'LBS./MSF 1/4 IN.BASIS')                             PB   357
      IF(IOP1 .EQ. 2) WRITE(6,310)                                      PB   358
310 FORMAT('+',43X,'LBS./MSF 3/4 IN.BASIS')                             PB   359
      IF(IOP1 .EQ. 3) WRITE(6,320)                                      PB   360
320 FORMAT('+',43X,'LBS./MSF 5/8 IN.BASIS')                             PB   361
      IF(IOP1 .EQ. 4) WRITE(6,330)                                      PB   362
330 FORMAT('+',43X,'LBS./MSF 1/2 IN.BASIS')                             PB   363
      IF(IOP2 .EQ. 0) WRITE(6,150)                                      PB   364
      IF(IOP2 .EQ. 1) WRITE(6,160)                                      PB   365
      IF(IOP2 .EQ. 2) WRITE(6,170)                                      PB   366
      IF(IOP2 .EQ. 3) WRITE(6,180)                                      PB   367
      IF(IOP2 .EQ. 4) WRITE(6,340)                                      PB   368
340 FORMAT('+',67X,'LBS./CU.METER')                                     PB   369
      IF(NOPT .EQ. 0) WRITE(6,350)                                      PB   370
350 FORMAT('+',84X,'5/8 IN. BASIS',5X,'LBS./CU.METER')                  PB   371
      IF(NOPT .EQ. 0) WRITE(6,360) (V(I,11),I=1,5),FPMC,(V(I,12),I=1,5),PB   372
     1(V(I,13),I=1,5),PR,(V(I,14),I=1,5),PW,(V(I,15),I=1,5),            PB   373
     2(V(I,17),I=1,5)                                                   PB   374
      IF(NOPT .EQ. 3) WRITE(6,370) (V(I,11),I=1,3),FPMC,(V(I,12),I=1,3),PB   375
     1(V(I,13),I=1,3),PR,(V(I,14),I=1,3),PW,(V(I,15),I=1,3),            PB   376
     2(V(I,17),I=1,3)                                                   PB   377
360 FORMAT(' ',2X,'GROSS BOARD WEIGHT',12X,F8.3,8X,3(F9.3,9X),F9.3/     PB   378
     13X,'WEIGHT OF WATER(',F4.1,'% M.C.)',3X,F8.3,8X,3(F9.3,9X),F9.3/  PB   379
     23X,'OVEN DRY WGT. OF BOARD',8X,F8.3,8X,3(F9.3,9X),F9.3/           PB   380
     35X,'WGT. OF RESINS(',F4.1,'% SOLIDS)',F8.3,8X,3(F9.3,9X),F9.3/    PB   381
     45X,'WGT. OF WAX(',F4.1,'% SOLIDS)',3X,F8.3,8X,3(F9.3,9X),F9.3/    PB   382
     55X,'WEIGHT OF WOOD ',13X,F8.3,8X,3(F9.3,9X),F9.3/)                PB   383
370 FORMAT(' ',2X,'GROSS BOARD WEIGHT',12X,F8.3,8X,F9.3,9X,F9.3/        PB   384
     13X,'WEIGHT OF WATER(',F5.1,'% M.C.)',2X,F8.3,8X,F9.3,9X,F9.3/     PB   385
     23X,'OVEN DRY WGT. OF BOARD',8X,F8.3,8X,F9.3,9X,F9.3/              PB   386
     35X,'WGT. OF RESINS(',F4.1,'% SOLIDS)',F8.3,8X,F9.3,9X,F9.3/       PB   387
     45X,'WGT. OF WAX(',F4.1,'% SOLIDS)',3X,F8.3,8X,F9.3,9X,F9.3/       PB   388
     55X,'WEIGHT OF WOOD ',13X,F8.3,8X,F9.3,9X,F9.3/)                   PB   389
      WRITE(6,380)                                                      PB   390
380 FORMAT(' RAW MATERIAL REQUIREMENTS',4X,'REQ./CU.FT.')               PB   391
      IF(IOP1 .EQ. 0) WRITE(6,390)                                      PB   392
390 FORMAT('+',43X,'REQ./MSF 3/8 IN.BASIS')                             PB   393
      IF(IOP1 .EQ. 1) WRITE(6,400)                                      PB   394
400 FORMAT('+',43X,'REQ./MSF 1/4 IN.BASIS')                             PB   395
      IF(IOP1 .EQ. 2) WRITE(6,410)                                      PB   396
410 FORMAT('+',43X,'REQ./MSF 3/4 IN.BASIS')                             PB   397
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      IF(IOP1 .EQ. 3) WRITE(6,420)                                          PB   398
  420 FORMAT('+',43X,'REQ./MSF 5/8 IN.BASIS')                               PB   399
      IF(IOP1 .EQ. 4) WRITE(6,430)                                          PB   400
  430 FORMAT('+',43X,'REQ./MSF 1/2 IN.BASIS')                               PB   401
      IF(IOP2 .EQ. 0) WRITE(6,150)                                          PB   402
      IF(IOP2 .EQ. 1) WRITE(6,160)                                          PB   403
      IF(IOP2 .EQ. 2) WRITE(6,170)                                          PB   404
      IF(IOP2 .EQ. 3) WRITE(6,180)                                          PB   405
      IF(IOP2 .EQ. 4) WRITE(6,440)                                          PB   406
  440 FORMAT('+',67X,'REQ./CU.METER')                                       PB   407
      IF(NOPT .EQ. 0) WRITE(6,450)                                          PB   408
  450 FORMAT('+',84X,'5/8 IN. BASIS',5X,'REQ./CU.METER')                    PB   409
      IF(NOPT .EQ. 0) WRITE(6,460) SGRW,(V(I,18),I=1,5),(V(I,19),I=1,5),PB  410
     1(V(I,20),I=1,5),(V(I,21),I=1,5),(V(I,22),I=1,5)                       PB   411
      IF(NOPT .EQ. 3) WRITE(6,470) SGRW,(V(I,18),I=1,3),(V(I,19),I=1,3),PB  412
     1(V(I,20),I=1,3),(V(I,21),I=1,3),(V(I,22),I=1,3)                       PB   413
  460 FORMAT(' ',2X,'WOOD (O. D. SPEC. GRAV. =',F4.2,')',/                  PB   414
     1 5X,'POUNDS OF O.D. WOOD  ',7X,F8.3,8X,3(F9.3,9X),F9.3/               PB   415
     2 5X,'POUNDS OF GREEN WOOD ',7X,F8.3,8X,3(F9.3,9X),F9.3/               PB   416
     3 5X,'CU. FT. OF ROUNDWOOD ',7X,F8.3,8X,3(F9.3,9X),F9.3/               PB   417
     4 3X,'RESIN (LBS. SOLIDS/LIQUID)',4X,F8.3,8X,3(F9.3,9X),F9.3/          PB   418
     5 3X,'WAX (LBS. SOLIDS)',13X,F8.3,8X,3(F9.3,9X),F9.3/)                 PB   419
  470 FORMAT(' ',2X,'WOOD (O. D. SPEC. GRAV. =',F4.2,')',/                  PB   420
     1 5X,'POUNDS OF O.D. WOOD  ',7X,F8.3,8X,F9.3,9X,F9.3/                  PB   421
     2 5X,'POUNDS OF GREEN WOOD ',7X,F8.3,8X,F9.3,9X,F9.3/                  PB   422
     3 5X,'CU. FT. OF ROUNDWOOD ',7X,F8.3,8X,F9.3,9X,F9.3/                  PB   423
     4 3X,'RESIN (LBS. SOLIDS/LIQUID)',4X,F8.3,8X,F9.3,9X,F9.3/             PB   424
     5 3X,'WAX (LBS. SOLIDS)',13X,F8.3,8X,F9.3,9X,F9.3/)                    PB   425
      WRITE(6,480)                                                          PB   426
  480 FORMAT('1FUEL AND POWER STATISTICS IN MILLION B.T.U.S'/                PB   427
     1 30X,'BTUS/CU.FT.')                                                   PB   428
      IF(IOP1 .EQ. 0) WRITE(6,490)                                          PB   429
  490 FORMAT('+',43X,'BTUS/MSF 3/8 IN.BASIS')                               PB   430
      IF(IOP1 .EQ. 1) WRITE(6,500)                                          PB   431
  500 FORMAT('+',43X,'BTUS/MSF 1/4 IN.BASIS')                               PB   432
      IF(IOP1 .EQ. 2) WRITE(6,510)                                          PB   433
  510 FORMAT('+',43X,'BTUS/MSF 3/4 IN.BASIS')                               PB   434
      IF(IOP1 .EQ. 3) WRITE(6,520)                                          PB   435
  520 FORMAT('+',43X,'BTUS/MSF 5/8 IN.BASIS')                               PB   436
      IF(IOP1 .EQ. 4) WRITE(6,530)                                          PB   437
  530 FORMAT('+',43X,'BTUS/MSF 1/2 IN.BASIS')                               PB   438
      IF(IOP2 .EQ. 0) WRITE(6,150)                                          PB   439
      IF(IOP2 .EQ. 1) WRITE(6,160)                                          PB   440
      IF(IOP2 .EQ. 2) WRITE(6,170)                                          PB   441
      IF(IOP2 .EQ. 3) WRITE(6,180)                                          PB   442
      IF(IOP2 .EQ. 4) WRITE(6,540)                                          PB   443
  540 FORMAT('+',67X,'BTUS/CU.METER')                                       PB   444
      IF(NOPT .EQ. 0) WRITE(6,550)                                          PB   445
  550 FORMAT('+',84X,'5/8 IN. BASIS',5X,'BTUS/CU.METER')                    PB   446
      IF(NOPT .EQ. 0) WRITE(6,560) BTRD,(V(I,23),I=1,5),(V(I,24),I=1,5),PB  447
     1(V(I,25),I=1,5),(V(I,26),I=1,5),(V(I,27),I=1,5),(V(I,28),I=1,5),      PB   448
     2PCTF,PCTT,(V(I,29),I=1,5),PCT8,(V(I,30),I=1,5),(V(I,36),I=1,5),       PB   449
     3(V(I,31),I=1,5),(V(I,37),I=1,5),(V(I,32),I=1,5)                       PB   450
      IF(NOPT .EQ. 3) WRITE(6,570) BTRD,(V(I,23),I=1,3),(V(I,24),I=1,3),PB  451
     1(V(I,25),I=1,3),(V(I,26),I=1,3),(V(I,27),I=1,3),(V(I,28),I=1,3),      PB   452
     2PCTF,PCTT,(V(I,29),I=1,3),PCT8,(V(I,30),I=1,3),(V(I,36),I=1,3),       PB   453
     3(V(I,31),I=1,3),(V(I,37),I=1,3),(V(I,32),I=1,3)                       PB   454
  560 FORMAT(' FUEL REQUIREMENTS'/3X,'DRYER HEAT'/3X,'(',F8.6,'BTUS/LB.WPB  455
     1ATER EVAP.)',1X,F8.6,8X,3(F9.6,9X),F9.6/                              PB   456
     2 3X,'PROCESS STEAM'/7X,'PRESS',21X,F8.6,8X,3(F9.6,9X),F9.6/           PB   457
     3 7X,'THAW POND',17X,F8.6,8X,3(F9.6,9X),F9.6/                          PB   458
     4 7X,'HEATING',19X,F8.6,8X,3(F9.6,9X),F9.6/                            PB   459
     5 7X,'MISCELLANEOUS',13X,F8.6,8X,3(F9.6,9X),F9.6/                      PB   460
     6 10X,'TOTAL FUEL REQUIRED',4X,F8.6,8X,3(F9.6,9X),F9.6//               PB   461
     7' WOOD FUEL GENERATED'/3X,'DRY FINES/TRIMS(',F4.1,'%',F4.1,'%)',      PB   462
     8 2X,F8.6,8X,3(F9.6,9X),F9.6/                                          PB   463
     9 3X,'WET BARK(',F3.2,'#1 RATIO OF RDWD) ',F8.6,8X,3(F9.6,9X),F9.6/    PB   464
     9 3X,'SCREENED WET WOOD RESIDUES',4X,F8.6,8X,3(F9.6,9X),F9.6/          PB   465
     1 7X,'TOTAL FUEL GENERATED',6X,F8.6,8X,3(F9.6,9X),F9.6//               PB   466
     2' AUXILIARY FUEL BTU  ',12X,F8.6,8X,3(F9.6,9X),F9.6//                 PB   467
     3' NET FUEL REQUIREMENT',12X,F8.6,8X,3(F9.6,9X),F9.6//)                PB   468
  570 FORMAT(' FUEL REQUIREMENTS'/3X,'DRYER HEAT'/3X,'(',F8.6,'BTUS/LB.WPB  469
     1ATER EVAP.)',1X,F8.6,8X,F9.6,9X,F9.6/3X,'PROCESS STEAM'/              PB   470
     2 7X,'PRESS',21X,F8.6,8X,F9.6,9X,F9.6/                                 PB   471
     3 7X,'THAW POND',17X,F8.6,8X,F9.6,9X,F9.6/                             PB   472
     4 7X,'HEATING',19X,F8.6,8X,F9.6,9X,F9.6/                               PB   473
     5 7X,'MISCELLANEOUS',13X,F8.6,8X,F9.6,9X,F9.6/                         PB   474
     6 10X,'TOTAL FUEL REQUIRED',4X,F8.6,8X,F9.6,9X,F9.6//                  PB   475
     7' WOOD FUEL GENERATED'/3X,'DRY FINES/TRIMS(',F4.1,'%',F4.1,'%)',      PB   476
     8 2X,F8.6,8X,F9.6,9X,F9.6/                                             PB   477
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     93X,'WET BARK(',F3.2,':1 RATIO OF WOWD) ',F8.6,8X,F9.6,9X,F9.6/      PB   478
     95X,'SCREENED WET WOOD RESIDUES',4X,F8.6,8X,F9.6,9X,F9.6/            PB   479
     17X,'TOTAL FUEL GENERATED',6X,F8.6,8X,F9.6,9X,F9.6//                 PB   480
     2' AUXILIARY FUEL BTU  ',12X,F8.6,8X,F9.6,9X,F9.6//                  PB   481
     3' NET FUEL REQUIREMENT',12X,F8.6,8X,F9.6,9X,F9.6//)                 PB   482
      WRITE(6,580)                                                        PB   483
  580 FORMAT(' FUEL AND POWER REQUIRED',6X,'WEQ./CU.FT.')                 PB   484
      IF(IOP1 .EQ. 0) WRITE(6,390)                                        PB   485
      IF(IOP1 .EQ. 1) WRITE(6,400)                                        PB   486
      IF(IOP1 .EQ. 2) WRITE(6,410)                                        PB   487
      IF(IOP1 .EQ. 3) WRITE(6,420)                                        PB   488
      IF(IOP1 .EQ. 4) WRITE(6,430)                                        PB   489
      IF(IOP2 .EQ. 0) WRITE(6,150)                                        PB   490
      IF(IOP2 .EQ. 1) WRITE(6,160)                                        PB   491
      IF(IOP2 .EQ. 2) WRITE(6,170)                                        PB   492
      IF(IOP2 .EQ. 3) WRITE(6,180)                                        PB   493
      IF(IOP2 .EQ. 4) WRITE(6,440)                                        PB   494
      IF(NOPT .EQ. 0) WRITE(6,450)                                        PB   495
      IF(NOPT .EQ. 0) WRITE(6,590) CKWH,(V(I,34),I=1,5)                   PB   496
      IF(NOPT .EQ. 3) WRITE(6,600) CKWH,(V(I,34),I=1,3)                   PB   497
  590 FORMAT('0KWH. ELECT. POWER ($',F4.3,'/KWH)',3X,F8.4,8X,3(F9.3,9X),PB   498
     1F9.3/)                                                              PB   499
  600 FORMAT('0KWH. ELECT. POWER ($',F4.3,'/KWH)',3X,F8.4,8X,F9.3,9X,F9.PB   500
     13/)                                                                 PB   501
      IF(NOPT .EQ. 0 .AND. IFOP .EQ. 0) WRITE(6,610)POIL,(V(I,33),I=1,5)PB   502
      IF(NOPT .EQ. 0 .AND. IFOP .EQ. 1) WRITE(6,620)PCOL,(V(I,33),I=1,5)PB   503
      IF(NOPT .EQ. 0 .AND. IFOP .EQ. 2) WRITE(6,630)PGAS,(V(I,33),I=1,5)PB   504
      IF(NOPT .EQ. 0 .AND. IFOP .EQ. 3) WRITE(6,640)PWOD,(V(I,33),I=1,5)PB   505
      IF(NOPT .EQ. 3 .AND. IFOP .EQ. 0) WRITE(6,650)POIL,(V(I,33),I=1,3)PB   506
      IF(NOPT .EQ. 3 .AND. IFOP .EQ. 1) WRITE(6,660)PCOL,(V(I,33),I=1,3)PB   507
      IF(NOPT .EQ. 3 .AND. IFOP .EQ. 2) WRITE(6,670)PGAS,(V(I,33),I=1,3)PB   508
      IF(NOPT .EQ. 3 .AND. IFOP .EQ. 3) WRITE(6,680)PWOD,(V(I,33),I=1,3)PB   509
      IF(NOPT .EQ. 0 .AND. NAXF .EQ. 1) WRITE(6,690)POIL,(V(I,35),I=1,5)PB   510
      IF(NOPT .EQ. 0 .AND. NAXF .EQ. 3) WRITE(6,691)PGAS,(V(I,35),I=1,5)PB   511
  610 FORMAT(' BBL. OIL ($',F6.2,'/BBL.)',9X,F8.6,8X,3(F9.6,9X),F9.6)     PB   512
  620 FORMAT(' TONS COAL ($',F6.2,'/TON)',9X,F8.6,8X,3(F9.6,9X),F9.6)     PB   513
  630 FORMAT(' MCF. GAS ($',F6.2,'/MCF.)',9X,F8.6,8X,3(F9.6,9X),F9.6)     PB   514
  640 FORMAT(' TONS WOOD ($',F6.2,'/TON)',9X,F8.6,8X,3(F9.6,9X),F9.6)     PB   515
  650 FORMAT(' BBL. OIL ($',F6.2,'/BBL.)',9X,F8.6,8X,F9.6,9X,F9.6)        PB   516
  660 FORMAT(' TONS COAL ($',F6.2,'/TON)',9X,F8.6,8X,F9.6,9X,F9.6)        PB   517
  670 FORMAT(' MCF. GAS ($',F6.2,'/MCF.)',9X,F8.6,8X,F9.6,9X,F9.6)        PB   518
  680 FORMAT(' TONS WOOD ($',F6.2,'/TON)',9X,F8.6,8X,F9.6,9X,F9.6)        PB   519
      IF(NOPT .EQ. 3 .AND. NAXF .EQ. 1) WRITE(6,700)POIL,(V(I,35),I=1,3)PB   520
      IF(NOPT .EQ. 3 .AND. NAXF .EQ. 3) WRITE(6,701)PGAS,(V(I,35),I=1,3)PB   521
  690 FORMAT(' BBL. AUX. OIL ($',F5.2,'/BBL.)',5X,F8.6,8X,3(F9.6,9X),F9.PB   522
     16)                                                                  PB   523
  691 FORMAT(' MCF. AUX. GAS ($',F5.2,'/MCF.)',5X,F8.6,8X,3(F9.6,9X),F9.PB   524
     16)                                                                  PB   525
  700 FORMAT(' BBL. AUX. OIL ($',F5.2,'/BBL.)',5X,F8.6,8X,F9.6,9X,F9.6)  PB   526
  701 FORMAT(' MCF. AUX. GAS ($',F5.2,'/MCF.)',5X,F8.6,8X,F9.6,9X,F9.6)  PB   527
  998 CONTINUE                                                            PB   528
  999 CONTINUE                                                            PB   529
      WRITE(6,1000)                                                       PB   530
 1000 FORMAT('1')                                                         PB   531
      SUBROUTINE SUB1(HHTV,DMCT,ATUE)                                     SUB1   1
C ***                                                                     SUB1   2
C ***       THIS SUBROUTINE CALCULATES THE EFFECTIVE HEATING VALUE OF     SUB1   3
C *** WOOD TYPE FUELS AT A GIVEN MOISTURE CONTENT ASSUMING A FLUE GAS      SUB1   4
C *** TEMPERATURE OF 400 DEGREES FAHRENHEIT, 40% EXCESS AIR               SUB1   5
C ***                                                                     SUB1   6
      PCTR=0.40                                                           SUB1   7
      T1=68.0                                                             SUB1   8
      T2=400.0                                                            SUB1   9
C *** GREEN BASIS MOISTURE CONT.(OR LBS. WATER/LB. FUEL)                  SUB1  10
      GMCT=DMCT/(1.0+DMCT)                                                SUB1  11
C *** WEIGHT OF WOOD PER LB. OF GREEN OR WET WOOD FUEL                    SUB1  12
      WTWD=1.0-GMCT                                                       SUB1  13
C *** HEAT LOSS PERCENT DUE TO MOISTURE (CALLED SENSIBLE HEAT LOSS,SHL)   SUB1  14
      HHTV=HHTV*10.0**6                                                   SUB1  15
      SHL=(GMCT*(1090.7-T1+(0.455*T2)))/((1.0-GMCT)*HHTV)                 SUB1  16
C *** HYDROGEN HEAT LOSS PERCENT                                          SUB1  17
      HHL=0.54*(1090.7-T1+(0.455*T2))/HHTV                                SUB1  18
C *** DRY GAS HEAT LOSS PERCENT                                           SUB1  19
      DHL=((T2-T1)*(1.429*(PCTR)+1.52))/HHTV                              SUB1  20
C *** OTHER (MISCELLANEOUS) HEAT LOSS PERCENT = 5 PERCENT                 SUB1  21
C *** TOTAL HEAT LOSS PERCENT                                             SUB1  22
      THL=SHL+HHL+DHL+0.05                                                SUB1  23
C *** EFFICIENCY PERCENT                                                  SUB1  24
      EFF=1.00-THL                                                        SUB1  25
      IF(EFF .LT. 0.0) EFF=0.0                                            SUB1  26
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C *** FURNACE BLACKOUT OCCURS AT GREEN M.C. GREATER THAN 68 PERCENT      SUB1  27
      IF(GMCT .GT. 0.68) EFF=0.0                                        SUB1  28
C *** AVAILABLE HEAT PER POUND                                          SUB1  29
      AVH=WTHD*HHTV                                                     SUB1  30
C *** EFFECTIVE BTU'S PER POUND                                         SUB1  31
      BTUE=AVH*EFF                                                      SUB1  32
      IF(BTUE .LT. 0.0) BTUE=0.0                                        SUB1  33
C *** MILLION EFFECTIVE BTU'S PER POUND OF FUEL                         SUB1  34
      BTUE=BTUE/10.0**6.0                                               SUB1  35
      HHTV=HHTV/10.0**6.0                                               SUB1  36
      RETURN                                                            SUB1  37
      SUBROUTINE SUB2(BTFU,BTEF,IFOP)                                   SUB    1
C *** THIS SUBROUTINE CALCULATES THE EFFECTIVE HEATING VALUE OF THE     SUB    2
C *** VARIOUS FUELS ON THE BASIS OF A SIMPLE PERCENT EFFICIENCY LOSS    SUB    3
      IF(IFOP .EQ. 0) BTEF=0.80*BTFU                                    SUB    4
      IF(IFOP .EQ. 1) BTEF=0.80*BTFU                                    SUB    5
      IF(IFOP .EQ. 2) BTEF=0.87*BTFU                                    SUB    6
      IF(IFOP .EQ. 3) BTEF=0.65*BTFU                                    SUB    7
      RETURN                                                            SUB    8
      END                                                               PB   532
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